Agenda
Utility Advisory Committee Meeting
Tuesday, March 9, 2021
Zoom - Public Telephone Access: (206) 337-9723 or (253) 215-8782
Meeting ID No. 930 7525 3836

City of Richland Resolution No. 100-20 temporarily designates virtual locations for all municipal meetings. This meeting will be conducted remotely via Zoom. The public may attend this meeting by accessing the Zoom information provided.

Committee Members: Chair Sanders, Committee Members Anderson, Campbell, Felton, Gregoire, LoPresti and Porter

Liaisons: Council Liaison Lemley
Staff Liaison: Energy Services Director Whitney

Regular Meeting - 3:00 p.m.

Call to Order/Attendance:

UAC Chair and Vice Chair Selection:

Approval of Agenda: (Approved by Motion)

Approval of Minutes: (Approved by Motion)

Approval of November 10, 2020, Meeting Minutes

Public Comments:

Items of Business:

1. Status - Each City Utility (45 Minutes)
   - Pete Rogalsky, Public Works Director
     Clint Whitney, Energy Services Director
     Tom Huntington, Fire & Emergency Services Director
2. RES Electric Vehicle Draft Program Discussion (10 Minutes)
   - Greg Sullivan, P.E.
     Sandi Edgemon, Energy Services Business Services Manager
3. RES Financials and Preliminary COSA (20 Minutes)
   - Clint Whitney, Energy Services Director
4. Medical Service Utility Update and Recommendation (30 Minutes)
   - Tom Huntington, Fire & Emergency Services Director

Unfinished Business:

Other Informational Items:

1. Capital Work Plan Through December 2020
   - Clint Whitney, Energy Services Director

2. COVID-19 Utility Disconnects and 2020 CARES Funds
   - Clint Whitney, Energy Services Director

3. Idaho US Representative Simpson's Columbia Basin Funding Concept
   - Clint Whitney, Energy Services Director

4. PPC Legislative Talking Points for BPA Competitiveness
   - Clint Whitney, Energy Services Director

5. Washington 2021 State Energy Strategy
   - Sandi Edgemon, Energy Services Business Services Manager

6. Forward Agenda Items
   - Clint Whitney, Energy Services Director

Adjournment

The next Utility Advisory Committee Meeting is May 11, 2021.

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UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021

Agenda Category: Approval of Minutes

Prepared By:

Subject:
Approval of November 10, 2020, Meeting Minutes

Department:
Energy Services

Recommended Motion:
Approve minutes of the November 10, 2020, Utility advisory committee meeting.

Summary:

Fiscal Impact:

Attachments:
1. 111020 UAC Minutes - DRAFT - For Approval

MINUTES DRAFT

UTILITY ADVISORY COMMITTEE REGULAR MEETING

Zoom ~ Meeting ID: 97987121275
November 10, 2020 ~ 3:00 p.m.

CALL TO ORDER:

Chair Sanders called the meeting to order at 3:00 p.m.

ATTENDANCE:

Chair James Sanders, Committee Members Amy Anderson, Charlton Campbell, Larry Felton, Don Gregoire, Charles LoPresti, and Dan Porter were present. Also present were Council Member Phil Lemley, Staff Liaison and Energy Services Director Whitney, Public Works Director Rogalsky, Fire & Emergency Services Director and Chief Tom Huntington, Business Services Manager Edgemon, Power Analyst Manzo, and Support Specialist Steagall.

APPROVAL OF THE AGENDA:

MEMBER ANDERSON MOVED AND MEMBER LOPRESTI SECONDED THE <u>MOTION TO APPROVE THE AGENDA AS PUBLISHED</u>. THE MOTION CARRIED 7-0.

APPROVAL OF MINUTES:

MEMBER PORTER MOVED AND MEMBER LOPRESTI SECONDED THE <u>MOTION TO APPROVE THE JULY 14, 2020 MEETING MINUTES AS AMENDED</u>. THE MOTION CARRIED 7-0.

Mr. Sanders introduced new UAC members Campbell and Felton. Each provided a summary of his background and interest in serving on the UAC.

PUBLIC COMMENTS:

There were no public comments.

ITEMS OF BUSINESS:

1. Status – Each City Utility

Staff Report: Each director presented information.

Public Works
Director Rogalsky reported City Council will consider adopting Public Works' 2021 budget when it considers the City's 2021 budget in a few weeks.

Solid Waste Utility
Director Rogalsky reported on a multiyear capital program that will enable waste handling at the Richland landfill for up to 75 years. The constructed improvements include a new landfill cell and a new scale house that began operating this week. The new landfill cell has been receiving waste since September. The current phase of the new cell is expected to have capacity sufficient for the next eight to ten years, after which additional capacity will be added on in phases for many decades.

The City will begin providing solid waste services for about 600 new customers in the Badger Mountain South and adjacent property annexed in 2010. By comparison, Solid Waste adds approximately 250 customers in a normal year.

No rate increases are needed in 2021. The revenue analysis will be updated by mid-2021, and staff will present the results and rate recommendations at a future UAC meeting. The last solid waste rate increase was in 2015.

Earlier in 2020 the UAC supported staff recommendations for rate adjustments at the landfill that were revenue neutral overall. The City Manager and City Council decided to defer all revenue neutral rate actions due to the COVID-19 response.

Water Utility
Director Rogalsky reported staff is positioning the Water Utility fund to retire debt in 2022-24 making a rate increase unlikely for the next five years. He will seek UAC's input on capital financing and a debt refinancing strategy in mid-2021.

Staff has completed the first two-thirds of its multi-year capital improvement plan, which includes the new pipelines at the Duportail Bridge, replacing screens at the Snyder Street water intake, and AMI deployment. These projects are in addition to a small program of renewal and replacement investments in existing facilities.

Director Rogalsky anticipates bringing to the UAC a cost of service analysis (COSA) and rate recommendation for irrigation services in 2021. Irrigation services revenue is a small portion of the Water Utility fund. It has been a number of years since the last COSA and the City's irrigation rates are substantially lower than other area irrigation rates.

Wastewater Utility
Director Rogalsky reported staff is conducting several system updates and equipment replacements at the 35 year-old waste treatment plant. Staff will retire debt 2022-24 and free up revenue for other work needed. No wastewater rate increase is expected for the next five years.

Stormwater Utility
Director Rogalsky reported that no storm water rate increase is expected for the next couple of years.

The UAC Members asked several clarifying questions and stated their views including how the Public Works utilities plan for future growth and plant upgrades. Director Rogalsky explained how staff projects growth and analyzes capacity improvements needed.

Fire and Emergency Services
Chief Huntington reported on the Emergency Medical Services (EMS) Utility Strategic Plan, which is five-year projection considering the business model, expenses, and revenue. In 2019 UAC requested staff develop a strategy to guide and enable effective planning for future years.

Chief Huntington will present the draft strategic plan to the UAC at its January 2021 meeting and looks forward to discussing expected Strategic Plan outcomes at the January meeting.

No rate increase is expected in 2021.

Chief Huntington said staff will discuss with Council in 2021 the next Public Service Station 76 in Badger Mountain South where there is a critical need for decreased response times. He expressed a need for the new station to be operating in 2024. Based on the discussion's outcome, he will provide results from a 2022-25 COSA to the UAC, which will include staffing expenses and revenue requirements for Stations 75 and 76.

The UAC members asked several clarifying questions and stated their views.

Chief Huntington reported a vendor is conducting a COSA to optimize revenue from GEMT funding, which reimburses the utility for a portion of the Medicare/Medicaid gap. The gap is the difference between the amount the utility bills for service and the amount Medicare or Medicaid pays. Without GEMT funding, the utility would have to write off the amount of the gap. The increase in GEMT funds has contributed to deferring a 2021 rate increase. Staff will use the results from the COSA to set rates for GEMT funding.

Chief Huntington reported the EMS utility received $50,000 of Coronavirus Aid, Relief, and Economic Security Act (CARES) funding for expendables such as COVID-19 PPE that first responders wear. He discussed that crews will wear COVID-19 PPE on all calls and monitor themselves for COVID-19 symptoms which is critical for operational continuity.

Chief Huntington expressed appreciation to FES and Finance staff assisting with the strategic plan. He said developing the plan has been a very positive learning experience for the FES senior leadership team.

Energy Services
Director Whitney presented draft revenue and energy consumption information and discussed how COVID-19 has affected energy use and revenue. Total 2020 consumption is down 2.4% compared to the utility's five-year average. When normalized for weather, consumption is up 0.6%, so the consumption is essentially unchanged.

Director Whitney presented data about disconnects and customers with outstanding account balances. Over 1200, or 4.5%, of the utility's accounts are on the disconnect list. Eighty percent are residential accounts. The outstanding balances total over $950,000.

Director Whitney reported the City Council approved $750,000 in CARES funding to be used for customers with outstanding balances due to COVID-19-related issues. Customers have been slow to apply for the one-time funding up to $1,000 per account. Staff is using all communication media to make affected customers aware of the funding. The CARES funding will be available until December 15.

Director Whitney said given the projected financial forecast and cost control measures, he anticipates no rate increase until 2022.

Director Whitney reported FCS Group is conducting a COSA to determine revenue required for streetlights and if a rate design change is needed. The City is transitioning from high pressure sodium to LED lamps. Director Whitney expects that the decreased energy, longer lamp life, and decreased maintenance for LEDs will result in a streetlight rate decrease.

2. FY22 Wholesale Power Market Transfer Agreement

Director Whitney discussed how staff monitors wholesale power prices for future year purchases. He reported the City purchased through Northwest Energy Management Services (NEMS) 2 aMW from Columbia REA. The purchase price was $29.30/MWh, which was less than FY22 market rates at that time. The total cost including shaping is $30.00/MWh.

The UAC Members asked several clarifying questions and stated their views on the topic. Members expressed the purchase is a good deal for RES customers given market variability.

3. Horn Rapids Solar, Storage and Training Project (HRSST) Update

Director Whitney reported Councilmember Lemley participated in the HRSST ribbon cutting ceremony and celebration earlier in the day. The 4 MW solar and 1 MW battery storage project is located north of Richland and began generating October 21. The City is purchasing the solar generation for $53.50/MWh, which includes $38.50/MWh for energy and $16.00/MWh for shaping. RES will use the renewable energy to meet its Energy Independence Act renewable energy requirement.

Energy Northwest developed HRSST, and project partners include Tucci Energy Services, the City of Richland, Potelco Inc., the Department of Commerce, and Pacific Northwest National Laboratory.

The project includes a training center for solar and battery technicians to learn and gain experience with project construction, operations, maintenance, and safety and hazard prevention. Hundreds of workers from throughout the United States are expected to train annually at the center.

PNNL's analysis indicated the HRSST training activities will generate an estimated $3 million in annual revenue for the City and provides a positive net present value over the 20-year term of the power purchase agreement.

The UAC Members stated their views on the topic.

UNFINISHED BUSINESS:
None

OTHER INFORMATION:

Director Whitney provided an update on the RES Capital Work Plan. He expects staff will complete $9 million in capital work by the end of 2020. The 2021 $11 million CIP includes $3.5 million for AMI deployment and $3.7 million for constructing the Gateway Substation in north Richland.

Director Whitney reported the US Department of Energy selected Terra Power-GE Hitachi and XEnergy for its Advanced Reactor Demonstration Program. Energy Northwest is a utility partner with both companies. Terra Power-GE Hitachi and XEnergy were awarded $160 million each to test, license, and build advanced reactors.

Committee members discussed the advanced reactor technologies, funding, positive economic impact, and potential opportunity for the Tri-Cities to be the site of an advanced nuclear reactor in the future.

Director Whitney said there is a need for carbon-free base generation such as nuclear to replace the generation from coal plants that are being decommissioned. Baseload generation is critical to and ensure there is adequate capacity to prevent blackouts in the Northwest.

FORWARD PLANNING AGENDA:
The FES Strategic Plan, Electric Utility Reserves Analysis, and Election of Officers will be business items for the January 12, 2021, UAC meeting.

ADJOURNMENT:

Chair Sanders adjourned the meeting at 4:44 p.m.

Respectfully submitted: ____
Sandi Edgemon, Business Services Manager

Reviewed by: ____
Clinton R. Whitney, Energy Services Director

Date Approved:

Date Published:

UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021

Agenda Category: Items of Business

Prepared By: Pete Rogalsky, Public Works Director
Clint Whitney, Energy Services Director
Tom Huntington, Fire & Emergency Services Director

Subject:
Status - Each City Utility (45 Minutes)

Department:
Energy Services

Recommended Motion:
This is an informational item.

Summary:
Per request from UAC members, a representative for each of the five City utilities will present a policy summary.

Fiscal Impact:
This is an informational item only.

Attachments:

UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021 Agenda Category: Items of Business

Prepared By: Greg Sullivan P.E.
Sandi Edgemon, Energy Services Business Services Manager

Subject:
RES Electric Vehicle Draft Program Discussion (10 Minutes)

Department:
Energy Services

Recommended Motion:
Endorse staff's recommendation to develop a residential EV program.

Summary:

The market for electric vehicles (EV) locally, regionally, and nationally is growing steadily and is expected to continue for the foreseeable future. Transportation electrification has significant potential benefits to vehicle owners, electric utilities and the environment. Richland Energy Services is expecting a significant increase in load resulting from electric vehicles.

The transportation sector emits Washington State's largest share of greenhouse gas -- 45% of 2018 missions. The Washington 2021 State Energy Strategy states, "No sector is as important as transportation to achieving decarbonization, nor as complex in its operation and governance." Existing and proposed legislation targets greenhouse emissions reductions through transportation electrification and incentivizing purchases of EVs. The increased load for RES will create many business and operational opportunities and challenges.

Energy Services staff tasked Efficiency Solutions, LLC, with identifying these opportunities and challenges so RES can plan and develop ways to benefit from the opportunities while mitigating risk posed by the challenges. Efficiency Solutions and RES staff will present information and propose the development of a residential EV program at the March 9 meeting.

Fiscal Impact:
Budget for resource program development, consulting and incentives are included the 2021 Electric Utility's fund.

Attachments:
1. EV UAC Presentation
2. RES Residential Customer EV Program Final Draft

City of Richland Energy Services Residential Electric Vehicle (EV) Program Planning

Background and Planning Concepts

Greg Sullivan, Efficiency Solutions

Sandi Edgemon, Richland Energy Services

Overview

- **Why Develop an EV Program – Effective business and operational results**
- **City and Richland Energy Services Considerations**
- **EV and Chargers Overview**
- **EV Program Opportunities, Challenges and Program Drivers**
- **Recommendation**

RES Electric Vehicle Program Drivers: Electric Utility Planning

- **Effective business and system operations results**
  - Create positive economic benefit for customers
  - Increase RES load factor
- **EVs are part of City Strategic Leadership Plan Program**
  - Core Focus Area 4: Manage Our Natural Resources – “Respond to increased usage of electric vehicles”
- **Statewide/Regional Drivers:**
  - Washington 2021 State Energy Strategy
    - Decarbonize transportation industry
  - Air quality non-attainment zone contribution
  - Legislative authority for public power utilities including incentives
- **General grid and infrastructure planning needs**

RES Electric Vehicle Program: Opportunities

- <u>Taking advantage of unused capacity through power sales during off-peak periods.</u>
- Aligning additional power sales with BPA Tiered rate structure, notably Tier 1 resources.
- Strategic load growth to off-set (balance) the successes in efficiency, conservation, and self-generation.
- In conjunction with planned AMI roll-out, considerations for innovative rate design (time-of-use or other demand limiting) offering downward pressure on overall rates through targeted, tiered, and/or scheduled rate structures.
- Improving grid resiliency through grid/EV interaction.
- Offering customers a favorable economic position through reduced transportation fuel costs
    - Using average NW and BPA rates (estimated at $2.50/gallon and 8 cents/kWh), typical EVs cost 2.5 cents/mile versus the typical gasoline vehicle at 11.5 cents/mile (BEF, 2020).
- Further potential benefits reside in tax credit possibilities depending on vehicle type and program duration.
- Tracking and allocating credit for reduced carbon resulting from verified transportation electrification.

RES Electric Vehicle Program: Challenges

- Economics and the business case for EVs, charging infrastructure, and load growth
- Customer economics (EV incremental cost) and registration fees (currently $150/vehicle to offset lack of gasoline tax collection)
- Program development, logistics, and implementation
- Potential for regional or localized capacity (spot load) issues
    - Possibilities of localized peak issues in areas with higher EV density, unmanaged charging, and/or commercial charging opportunities
- Need for managed charging infrastructure to assure current and future grid stability and benefits
- Permitting and/or safety of systems, components, and connections
    - RES need to develop EV charger permitting process

RES Electric Vehicle Program: Challenges

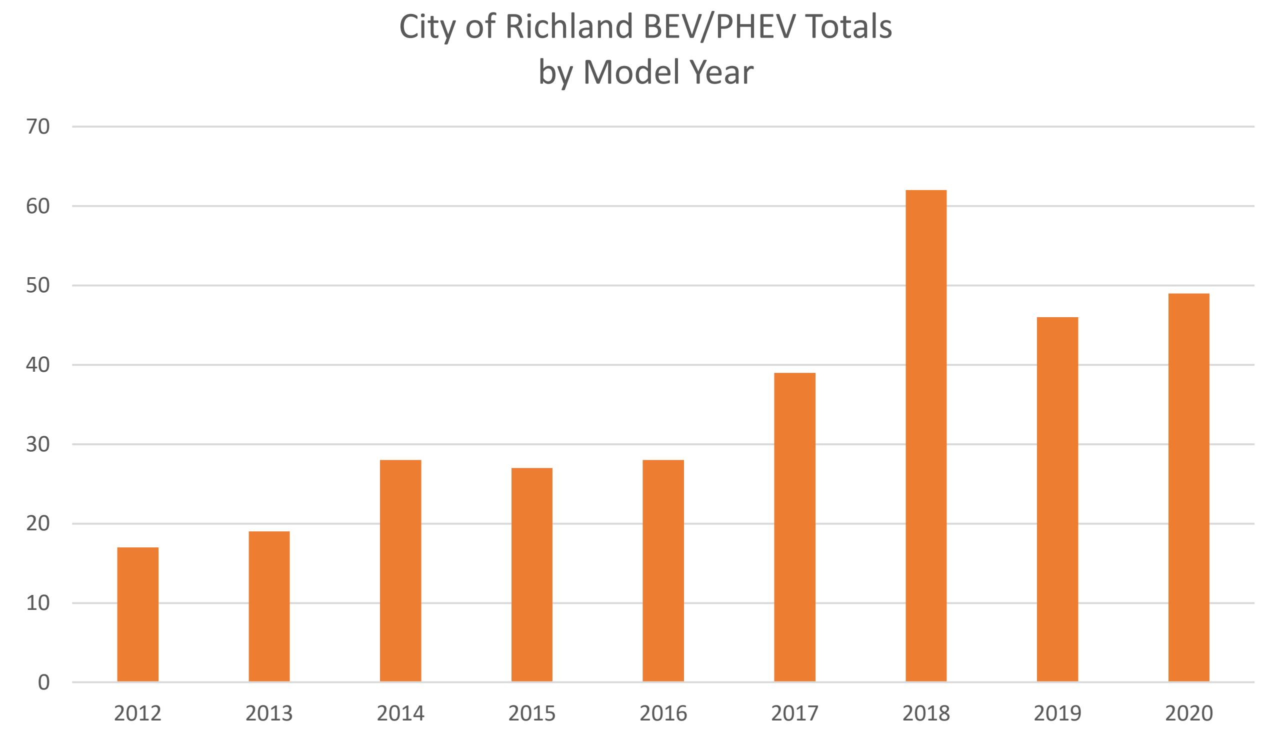
System Impacts/Spot Loads

- Loads will be a function of uptake.
  - Level 2 charger typically 7 – 10 kW
- Distribution and infrastructure can be impacted by EV load concentrations at the neighborhood level – spot loading/capacity issues at the transformer level.
  - Program participation/tracking will assist in the near-term
  - AMI will carry this forward into the future

RES Electric Vehicle Program Drivers

EVs are coming!

Access Washington registration portal reports City of Richland residents with 325 BEV/PHEVs as of late 2020



RES Electric Vehicle Program Drivers: Local Utility Responses

Utility	EV/PHEV Program Type	Incentive Structure
Benton REA	- BEV/PHEV Purchase - Level 2 charging station purchase	$100 incentive for BEV – no charger installed. $50 incentive for BEV – charger installed $300 incentive for Level 2 Smart charger, BEV only $2,000 loan for Level 2 Smart charger, BEV only
Benton PUD	- BEV purchase or lease	$250 for approved BEV purchase or lease
Franklin PUD	- No program currently	No program currently

RES Electric Vehicle Program Drivers: Legislative Authority

RCW 35.92.450 Electrification of Transportation Plan—Considerations—Incentive Programs

The governing authority of an electric utility formed under this chapter may adopt an electrification of transportation plan that, at a minimum, establishes a finding that utility outreach and investment in the electrification of transportation infrastructure <u>does not increase net costs to ratepayers in excess of one-quarter of one percent.</u>

RES estimate for maximum investment potential: $167,000.

RES Electric Vehicle Program Drivers: Utility Economics

Regional study of ***Load-Following*** utilities found:

- Utility benefits of electrifying transportation were positive in nearly all economic cases evaluated.
- For the ***unmanaged charging*** scenario the average net ratepayer benefit (the difference between the utility's cost of serving EV charging load with revenue from charging EVs) ranges between $300 to $800 per EV.
- For the ***managed charging*** case (utility enacts approved EV charge times) the average net ratepayer benefit ranges between $830 to $1,000 per EV.

If utilities' costs to serve EV customers are lower than the revenue that is collected from EV drivers' electric bills, then ratepayers as a whole benefit. As such, utilities can reduce electricity rates, spend funds on programs that reduce electric vehicle ownership costs for all ratepayers, or make other grid investments. The net benefit represents the amount that a utility can spend on BEV adoption programs or other investments without increasing electric rates (E3, 2017).

RES Electric Vehicle: Program Next Steps

1. Staff recommend UAC resolution supporting a residential EV program development
2. Develop program and incentives
3. Develop schedule, program logistics, outreach, tracking, reporting and analysis
4. Launch program in Q3 2021 and continue through 2022

Electric Vehicle Background: Passenger Vehicles

- **Battery Electric Vehicles (BEVs)**
  - All electric and powered by battery and electric motor/s
  - Fastest growing EV market segment
  - Mileage ranges:
    - Typical minimum: 100 miles
    - Typical average: 200 miles
    - Near-term future: 300 – 400 miles

- **Plug-in Hybrid Electric Vehicles (PHEVs)**
  - Combines battery and electric motor/s with internal combustion engine (ICE)
  - Popular segment in EV market, may be losing market share
  - Mileage ranges:
    - Typical battery-only: 20 - 50 miles
    - Combined battery/ICE : 300 – 400 miles

Electric Vehicle Background: Passenger Vehicles

- **Hybrid Electric Vehicles (HEVs)**
  - HEVs do not plug in
  - Combine small battery and electric motor/s with internal combustion engine (ICE)
  - Make use of regenerative braking for increased efficiency
  - Popular segment in EV market. May be losing market share
  - Mileage ranges:
    - Combined battery/ICE : 300 – 400 miles

Electric Vehicle Background: EV Chargers

- **Level 1 Chargers**:
  - Charging infrastructure that comes with vehicle
  - Typical 120 V AC, Standard outlet
  - Charging rate: 2 – 5 miles of range per hour of charge
  - Commonly for residential applications/setting

- **Level 2 Chargers:**
  - Third-party charging infrastructure
  - Typical 240 V AC, similar to dryer or oven. Requires professional/licensed installation
  - Charging rate: 10 – 25 miles of range per hour of charge
  - Commonly used for both residential and commercial applications/setting
  - Many have "managed charging" options
    - Allows for user and/or utility or third party to set/control charging schedules, times, and possibly charging rates

Electric Vehicle Background: EV Chargers

- **Level 3/DC Fast Charging**
  - Third-party charging infrastructure
  - Typically 480 V DC
  - Charging rate: 60 – 80 miles of range per 20 minutes of charging
  - Commercial-only, e.g., highway locations, service stations, Greenlots, etc.
  - Managed charging options

- **Level 4/DC Ultra-Fast Charging**
  - Third-party charging infrastructure: frontier of fast charging
  - Typically 480 V DC
  - Charging rate: 100 - 200 miles of range per 15 minutes of charging
  - Commercial-only, e.g., highway locations, service stations, Greenlots, etc.
  - Managed charging options

Electric Vehicle Background: EV Chargers

Charger Type	Voltage/ (Typical Power draw)	Charging Time (miles/charge time)	Plug type	Equipment Cost
Level 1	120 V AC (1.4 – 2.0 kW)	2 – 5 miles/hour	J1772	$0 – All equipment provided with vehicle.
Level 2	240 V AC (7 – 20 kW)	10 – 25 miles/hour	J1772	Residential: $500 - $2,000 Commercial: $6,000 - $10,000
Level 3 DC Fast	480 V DC (Up to 150 kW)	60 – 80 miles/20 minutes	J1772 Combo, CHAdeMO, Tesla	Range dependent on site: $50,000 - $300,000
Level 4 DC Ultrafast	480 V DC (150 – 500 kW)	100 – 200 miles/15 minutes	J1772 Combo, CHAdeMO, Tesla	Range dependent on site: $50,000 - $300,000

Electric Vehicle Background: Managed Charging

Managed Charging: Defined as the practice of *central* (utility or third party) or *customer* control of EV charging and takes the form of *Passive* or *Active* managed charging.

Passive **Managed Charging:** Charge control relying on the customer to affect the charging process. Customer behavior becomes the key element in passive charging and is typically influenced by:

- Time varying rates (time-of-use rates) or other demand-based dynamic rate indicators.
- Voluntary load reduction through customer communications requesting curtailment during certain times of the day and/or days of the week.
- Targeted incentive programs offering compensation for off-peak charging.

Active **Managed Charging:** Charge control, also known a direct load control, allow the utility (or other third party) to directly control not only when the charging takes place but also rate of charging. Active charging can be influenced by:

- Direct control of the charging device, i.e., the charger.
- Using the EV as the communication and control point to affect charging.
- Control by means of an ancillary device, e.g., smart electric meter, controlled circuit breaker, or a sub-controller/panel.

CITY OF RICHLAND ENERGY SERVICES

Residential Customer Electric Vehicle (EV) Program Development: Summary of the Residential EV Technologies, Markets, Options, Opportunities and Pathways

February 1, 2021

Prepared for:

Sandi Edgemon
Business Services Manager
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EXECUTIVE SUMMARY

This report was researched and written to serve as a resource for the development of a forthcoming Richland Energy Services (RES) Electric Vehicle (EV) program. The report (and its references) will serve as a documented foundation to build a cost-effective and sustainable *Residential EV Program* offering demonstrable benefit to the ratepayer, the utility, the region, and the environment.

The report presents an overview and summary of electric vehicle (EV) technologies, charging technologies and strategies, and the relevant economics. There is a summary of existing EV programs from regional utilities, as well as EV demographics of existing RES customers. Legislative requirements and guidelines are presented in both the body of the report and as a stand-alone appendix. Finally, there is section of the report dedicated to relevant tools useful in estimating EV fuel-related benefits to the customer and potential impacts of charging infrastructure.

The report contains eleven sections and is followed by four appendixes highlighting, (A) Glossary of relevant EV Terms, (B) the Legislation authorizing utility program spending for EV program development, (C) "Other" Legislation related to EVs, charging, electrical code, and environmental requirements, and (D) relevant regional and national EV organizations.

An expected outcome of this activity are paths toward the development of a formal RES Residential Customer EV Program. A Draft outline of an EV Strategy and Program Plan will follow this document.

I. INTRODUCTION

The market for electric vehicles locally, regionally, and nationally is growing steadily and is expected to continue for the foreseeable future. The electrification of transportation has significant potential benefits to vehicle owners, electric utilities, and the environment. One study (BEF 2020), reports that electric utilities can expect *up to 130% increase in electricity consumption among households that own one or two EVs.* While this projected increase has many underlying assumptions that may or may not be relevant to RES, the trend is unmistakable – electric utilities, RES included, can expect a significant increase in load resulting from the uptake of electric vehicles.

II. EV TECHNOLOGIES

The electric vehicle market can be segmented by technology type and vehicle type; for this phase of the program the focus will be passenger EVs, predominantly serving the residential customer class.

There are three main vehicle technologies that use electricity and batteries, however, only two of these recharge by plugging into the electricity grid.

BATTERY ELECTRIC VEHICLES (BEVs) are all electric and are only powered by battery and electric motor(s). This technology is the fastest growing segment in the overall EV market and expected to be the dominant technology type moving forward. BEVs are currently (or will be shortly) offered by all major domestic and foreign automakers, and most are planning to increase model offerings significantly in the next 3 to 5 years. The mileage range between recharge events in many BEVs has improved with improving battery technology and reduced battery costs. Most commercially available passenger BEVs have (as a minimum) a 100-mile range, with many reaching the 200-mile range. In the next 3 to 5 years, many expect a 300 to 400 mile-range to be commonplace. BEVs do carry a price premium over their internal combustion engine (ICE) counterparts, however, this should continue to decline with better/less expensive batteries and economies of scale. The US Department of Energy Alternative Fuels Data Center offers information on many BEV models on their website.

PLUG-IN HYBRID ELECTRIC VEHICLES (PHEVs) use the battery and electric motor technology of the BEV and, when necessary, a small gasoline powered ICE for power. Most PHEVs rely on only battery power until the battery is discharged and then operate the gasoline engine, while at times recharging the batteries. Most commercially available passenger PHEVs offer an all-battery range of between 20 and 50 miles, while the combined range (battery and ICE) is typically 300 to 400 miles. As with BEVs, many expect the battery range to increase with improved batteries. PHEV model information can be found here.

HYBRID ELECTRIC VEHICLES (HEVs) do have small batteries, however, they do not plug-in to recharge their batteries. HEVs use an electric drive train in combination with an internal combustion engine to achieve greater fuel efficiency and typically make use of regenerative braking and start/stop idling systems. HEVs report mileage as combined form the contribution of the Ice and supplemental battery power. HEV model information can be found here.

This guide will focus on the first two technology types, i.e., those that plug into the grid.

III. BATTERY TECHNOLOGIES

Both BEVs and PHEVs rely on existing and advancing battery technologies. Lithium-ion (Li-ion) is currently the predominant battery technology in most BEVs and PHEVs and represents a significant cost in all EVs -- in some cases more than 50%. As manufacturing and sourcing improves, battery performance and prices continue to drop. According to Bloomberg New Energy Finance (BNEF 2019) battery prices have fallen from $1,100/kWh in 2010 to $156/kWh in 2019. Battery technology improvements come in the form of:

- Better chemistries in combination with existing Li-ion technologies.
- Advances in solid-state batteries look promising with higher energy densities.
- Higher voltages - most current EVs run voltages in the 300 – 400 V range with next generation models targeting the 800 – 1,200 V range, affording quicker charging rates.

Battery life is an important input to the economic valuation of any EV. Battery life is directly impacted by the number of cycles (charge/discharge), the relative depth of discharge prior to recharge, and the ambient operating/storage temperatures of the battery pack.

Currently most EV manufacturers offer a standard warranty of 100,000 miles or 8 years, which-ever comes first. This standard is being pushed further by the state of California where EV manufacturers are being mandated to offer 150,000 miles or 10 years of battery life.

IV. CHARGING TECHNOLOGIES

There are four main EV charging technologies/infrastructure types. Within each, there is the potential for "managed charging" through either an active- or passive-managed control.

LEVEL 1 CHARGING. This makes use of the charging cord that comes standard with every EV. This is a conventional three-prong plug and connects to any properly grounded (120 volt AC) household electrical outlet. In most cases, this level of charging is used in the residential setting whereby the EV is plugged in all night and achieves a charge rate of roughly 2 to 5 miles of range per hour of charge. Level 1 charging make the most sense for EVs that are used for shorter commutes and local travel.

LEVEL 2 CHARGING. As the next step up, Level 2 charging requires specific and dedicated charging equipment. Level 2 chargers operate at 240 volts (AC) and are at least twice as fast as Level 1 chargers, offering 10 to 25 miles of range per hour of charge. Level 2 charges as commonly found commercial establishments, apartment buildings, public spaces, and increasingly in the residential setting.

LEVEL 3 - DC FAST CHARGING***.*** This charging infrastructure makes use of direct current (DC) and charges at the higher voltage range of 480 V. Charging rates do vary with battery and vehicle types, but typical rates are between 60 to 80 miles per 20 minutes of charge. In many cases these chargers will offer a full charge in roughly 1 hour.

DC ULTRAFAST CHARGING***.*** This infrastructure affords a faster charge rate with the same 480 V DC circuitry. While not as common as the standard DC Fast Charger, the Ultrafast Charger is becoming more available at fast charging sites often along highways, rest areas, gas stations and workplaces. The Ultrafast chargers offer 100 to 150 miles of range per 15 minutes of charging.

Table 1 Presents a Summary of Charging Infrastructure (RMI 2019, EPRI 2019, APPA 2017, SEPA 2019). It should be noted that the charge times and equipment costs are both improving as technology advances and economies of scale are realized.

Table 1. Summary of EV Charging Infrastructure

Charger Type	**Voltage/ (Typical Power draw)**	**Charging Time (miles/charge time)**	**Plug type**	**Equipment Cost**
Level 1	120 V AC/ (1.4 – 2.0 kW)	2 – 5 miles/hour	J1772	$0 – All equipment provided with vehicle.
Level 2	240 V AC/ (7 – 20 kW)	10 – 25 miles/hour	J1772	Residential: $500 - $2,000 Commercial: $6,000 - $10,000
DC Fast	480 V DC/ (Up to 150 kW)	60 – 80 miles/20 minutes	J1772 Combo, CHAdeMO, Tesla	Range dependent on site: $50,000 - $300,000
DC Ultrafast	480 V DC/ (150 – 500 kW)	100 – 200 miles/15 minutes	J1772 Combo, CHAdeMO, Tesla	Range dependent on site: $50,000 - $300,000

As with many new technologies, the proprietary nature of connections, communications, and interoperability, can impede widespread adoption. In EV charging, the communications interoperability and connector standards (i.e. plug types) are providing some challenge. While progress is being made for open access and standardization across manufacturers and platforms, this topic is worth monitoring.

V. MANAGED CHARGING

Managed charging, some refer to this as *smart* charging, is the practice of central or customer control of EV charging. This control can take the form of *Passive* or *Active* managed charging (BEF 2020, SEPA 2019).

PASSIVE MANAGED CHARGING***:*** This form of charge control relies on the customer to affect the charging process. Customer behavior becomes the key element in passive charging and is typically influenced by:

- Time varying rates (time-of-use rates) or other demand-based dynamic rate indicators.
- Voluntary load reduction through customer communications requesting curtailment during certain times of the day and/or days of the week.
- Targeted incentive programs offering compensation for off-peak charging.

ACTIVE MANAGED CHARGING***:*** This form of load control, also known a direct load control, allow the utility (or other third party) to directly control not only when the charging takes place but also rate of charging. Active charging can be influenced by:

- Direct control of the charging device, i.e., the charger.
- Using the EV as the communication and control point to affect charging.
- Control by means of an ancillary device, e.g., smart electric meter, controlled circuit breaker, or a sub-controller/panel.

To maximize EV benefits to electric utilities currently and into the future, some form of managed charge control is critical. Additional requirements center on the acceptance and adoption of interoperability standards for access and communication. These standards, such as the Open Charge Point Protocol (OCCP), can work to accelerate compatibility, efficiency, and cost effectiveness while reducing the potential for premature obsolescence and stranded assets.

Recent collaborations between the EPA/ENERGY STAR program, the BPA, and the Regional Technical Forum (RTF), have promoted ENERGY STAR Certified Electric Chargers in the Pacific Northwest. These chargers offer certified features including:

- Energy savings of at least 40% in stand-by mode
- Verified safety
- Open communications allowing for grid communications, open access, and customer override.

Details on the ENERGY STAR EV program along with the certified charger qualified products list can be found here.

VI. EVS AND THE UTILITY PERSPECTIVE

The electrification of transportation is an increasing trend across most transportation sectors with some advancing faster than others. Regionally, the passenger EV sector has seen significant growth and this is expected to continue. Electric utilities, including RES, are faced with both opportunities and challenges in meeting this growth.

OPPORTUNITIES:

- Taking advantage of unused capacity through power sales during off-peak periods.
- Aligning additional power sales with BPA Tiered rate structure, notably Tier 1 resources.
- Strategic load growth to off-set (balance) the successes in efficiency, conservation, and self-generation.
- In conjunction with planned AMI roll-out, considerations for innovative rate design (time-of-use or other demand limiting) offering downward pressure on overall rates through targeted, tiered, and/or scheduled rate structures.
- Improving grid resiliency through grid/EV interaction including:
    - Vehicle-to-grid (V2G), transmission grid services of stress relief, capacity upgrade deferral, and overall resiliency.
    - Vehicle-to-everything (V2X), e.g., EV to home, office, system loads, etc.
    - Virtual power plant (VPP), the frontier of the aggregation of EVs serving as virtual power plants affording critical system peak shifting.
    - Beneficial services such as voltage or frequency control where needed.
- Offering customers a favorable economic position through reduced transportation fuel costs
    - Using average NW and BPA rates (estimated at $2.50/gallon and 8 cents/kWh), typical EVs cost 2.5 cents/mile versus the typical gasoline vehicle at 11.5 cents/mile (BEF, 2020).
    - Further potential benefits reside in tax credit possibilities depending on vehicle type and program duration.
- Tracking and allocating credit for reduced carbon resulting from verified transportation electrification.

CHALLENGES:

- Economics and the business case for EVs, charging infrastructure, and load growth.
  - Customer economics (EV incremental cost) and registration fees (currently $150/vehicle to offset lack of gasoline tax collection)
- Program development, logistics, and implementation.
- Potential for regional or localized capacity (spot load) issues.
  - Possibilities of localized peak issues in areas with higher EV density, unmanaged charging, and/or commercial charging opportunities.
- Need for managed charging infrastructure to assure current and future grid stability and benefits.
- Permitting and/or safety of systems, components, and connections.
  - EV charger permitting requirements will need to be reviewed. Currently, RES does not have a permitting process for Level 2 (and above) EV chargers for new construction or retrofit; this will need to be reviewed and likely added to the City permitting process. As with any existing residential electrical additions or modifications, a Labor and Industries (L&I) electrical permit will need to be applied for, completed and inspected prior to system use.

VII. QUANTIFYING THE VALUE OF TRANSPORTATION ELECTRIFICATION TO UTILITIES

In 2016, a collaboration between seven NW utilities and the research firm Energy and Environmental Economics (E3) embarked on a study to quantify the costs and benefits of transportation electrification (E3, 2017). A related study, *Benefit-Cost Analysis of EVs for Load Following Utilities in the PNW* (BEF 2019) was also completed with a focus on BPA Full-Requirements customers. Both of these studies focused on a number of forms of electrified transportation including passenger vehicles, trucks, transit buses and electric forklifts. These studies estimated the benefits of transportation electrification from a regional perspective and from a utility rate payer perspective. Summary results of these studies include:

- Utility benefits of electrifying transportation were positive in nearly all economic cases evaluated. The specifics of each utility's benefits are subject to the utility's individual circumstances: wholesale utility prices, rate structure, expected EV loads, and program structure.
- For the unmanaged charging scenario (utility has no input of charging times or durations), the average net ratepayer benefit (the difference between the utility's cost of serving EV charging load with revenue from charging EVs) ranges between $300 to $800 per EV[1].
- For the "managed charging" case (utility enacts approved EV charge times) the average net ratepayer benefit ranges between $830 to $1,000 per EV.
- Most utility systems can accommodate near-term, incremental loads likely to come from transportation electrification. However, with increasing adoption, distribution system improvements may be necessary at specific locations.
- Because of the relative clean nature of the PNW power supply, electrification of transportation will result in significant reductions in CO_2 both locally and regionally.

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[1] If utilities' costs to serve EV customers are lower than the revenue that is collected from EV drivers' electric bills, then ratepayers as a whole benefit. As such, utilities can reduce electricity rates, spend funds on programs that reduce electric vehicle ownership costs for all ratepayers, or make other grid investments. The net benefit represents the amount that a utility can spend on BEV adoption programs or other investments without increasing electric rates (E3, 2017)

VIII. LOCAL UTILITY PERSPECTIVES AND PROGRAMS

Through personal communications, web site/program reviews, and local/regional webinar attendance, this assessment reviewed all local and many NW regional EV utility programs for ideas and perspective. In most case, utilities have some form of an EV program, dedicated web site/pages, and/or incentive offerings.

What was evident in this review - programs are generally in their infancy, relatively fluid, and developed such that they can adjust and change to EV market conditions, utility rate/capacity implications, and existing or future legislative directives. Maintaining an ability to adapt and be flexible appear to be the most common perspectives.

The utility-specific information below was assembled in November and December 2020.

BENTON REA

EV Program Structure: Incentives for BEV and PHEV as well Level 2 charging station purchase. Member EVITA

Incentive Offerings:

- $100 for BEV purchase without charger already installed.
- $50 for BEV purchase with charger already installed.
- $25 for PHEV purchase – no charger differentiation.
- $300 for Level 2 smart charger purchase, BEV only – Hybrid vehicles do not apply.
- $2,000 loan for Level 2 smart charger purchase.

Website type: In-house using “Choose EV” platform. Links to EVITA

Website URL: https://bentonrea.org/member-programs/electric-vehicles/

Source: Utility program web site. Communication with Ron Mitchell.

Other notes:

BREA owns an EV (Chevrolet Bolt) used for demonstrations and staff travel between office locations.

BENTON PUD

EV Program Structure: Incentives for BEV. Member EVITA

Incentive Offerings:

- $250 for BEV purchase or leased. Do not offer incentive on charger at this time.

Website type: In-house. Links to EVITA

Website URL: https://www.bentonpud.org/Energy-Programs/Solar-Connections/Electric-Vehicles

Source: Utility program web site. Communication with Chris Johnson.

Other notes:

BPUD owns an EV (Chevrolet Bolt) used for demonstrations and staff travel.

FRANKLIN PUD

EV Program Structure: No formal EV program. Have two Level 2 chargers in parking area. Member EVITA

Incentive Offerings:

- No incentives reported.

Website type: EV option links to EVITA

Website URL: https://www.franklinpud.com/safety-education/evita-charging-station/

Source: Utility program web site. Communication with Amy Valencia.

Other notes:

FPUD owns two EV chargers in their corporate parking lot for public use with credit card access.

Table 2. Regional Utility EV Programs and Offerings as of December 2020.

Utility	EV/PHEV Program Type	Incentive Structure	Website Type and URL
Benton REA	- BEV/PHEV Purchase - Level 2 charging station purchase	\$100 incentive for BEV – no charger installed. \$50 incentive for BEV – charger installed \$300 incentive for Level 2 Smart charger, BEV only \$2,000 loan for Level 2 Smart charger, BEV only	https://bentonrea.org/member-programs/electric-vehicles/ Links to EVITA
Benton PUD	- BEV purchase or lease	\$250 for approved BEV purchase or lease	https://www.bentonpud.org/Energy-Programs/Solar-Connections/Electric-Vehicles Links to EVITA
Franklin PUD	- No program currently	No program currently	https://www.franklinpud.com/safety-education/evita-charging-station/ Links to EVITA

CITY OF RICHLAND EV DEMOGRAPHICS

Without a current EV program, refined statistics on EVs within the City of Richland and important demographics on EV types and locations, charger types and totals, and overall usage are difficult to estimate. However, this assessment was able to make use of the Access Washington Data portal (https://data.wa.gov/Transportation/Electric-Vehicle-Population-Data/f6w7-q2d2) to identify EVs registered in the City of Richland and provide some relevant data on type (BEV versus PHEV), model type, and model year.

The data presented are current through November 2020. The figures below highlight:

- A combined total of 325 BEV/PHEVs are registered in the City of Richland (Figure 1).
- A consistent trend in increasing registrations by model year – with the 2018 annual total being a peak year (Figure 2).
- The model types registered are dominated by Tesla with Nissan and Chevrolet having respectable and comparable totals (Figure 3).

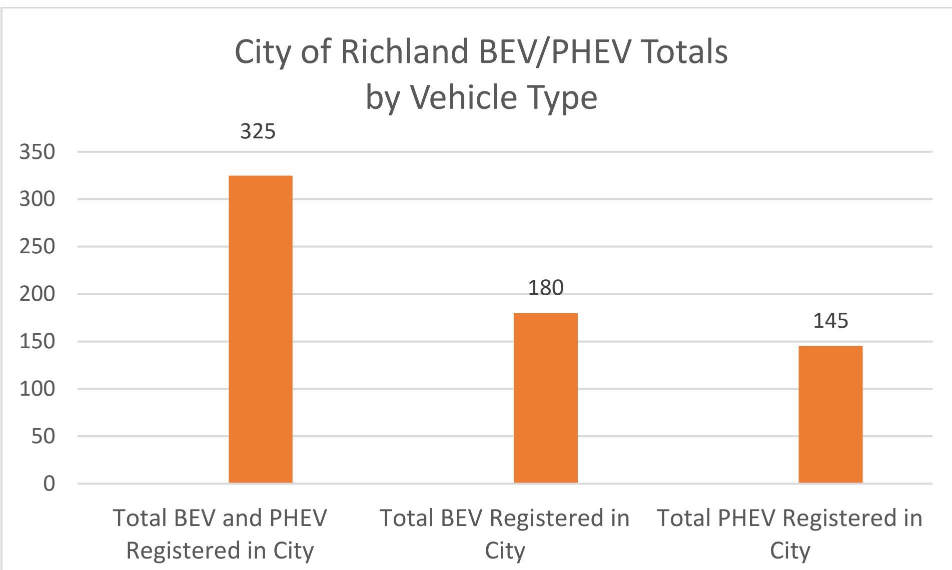


Figure 1. City of Richland Registered BEV and PHEV Totals

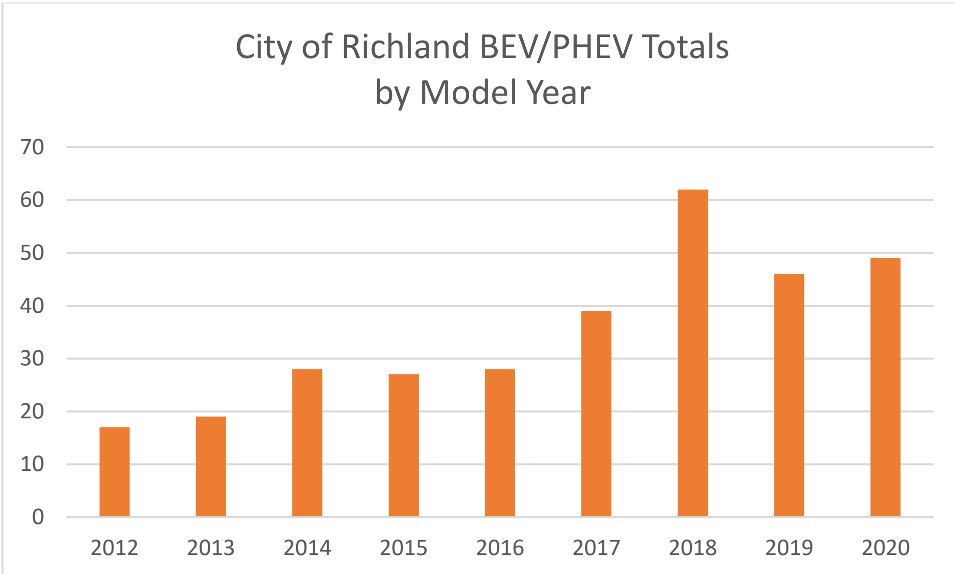


Figure 2. City of Richland Registered BEV and PHEV by Model Year

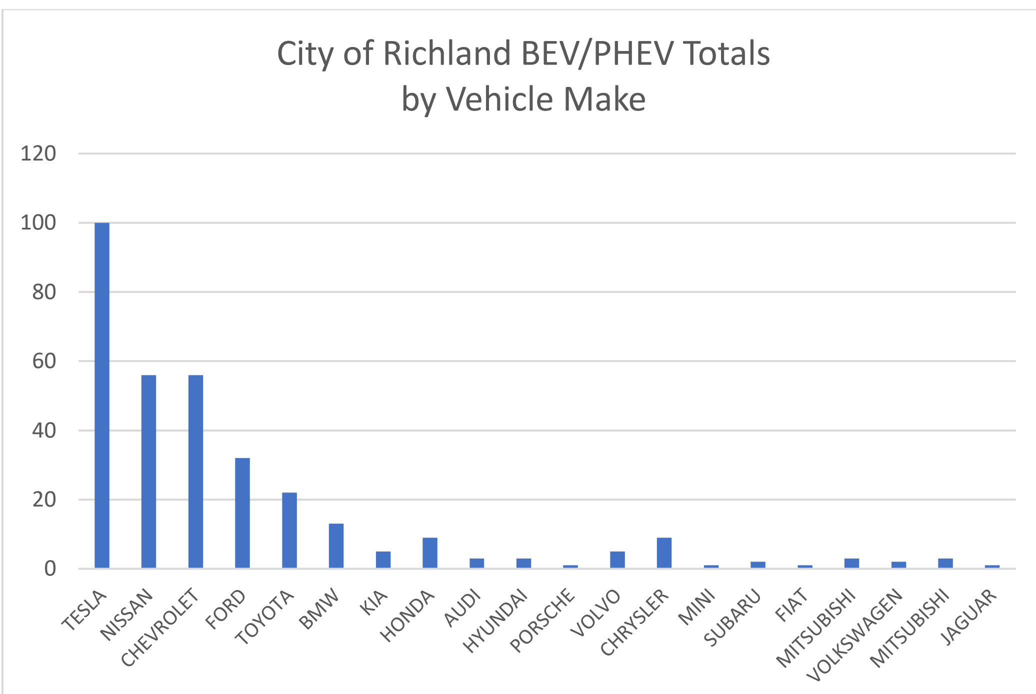


Figure 3. City of Richland Registered BEV and PHEV by Vehicle Make

IX. LEGISLATION

In 2019 Washington legislators passed Senate Bill 1521 (SB 1512) concerning the electrification of transportation. SB 1512 verified that the legislature would allow, with some constraints and restrictions, power utilities to engage their customer base in promoting and incentivizing transportation electrification.

Codified at RCW 25.92.450, Electrification of Transportation Plan—Considerations—Incentive Programs (see Appendix C for the full RCW):

The governing authority of an electric utility formed under this chapter may adopt an electrification of transportation plan that, at a minimum, establishes a finding that utility outreach and investment in the electrification of transportation infrastructure <u>does not increase net costs to ratepayers in excess of one-quarter of one percent.</u>

Programs for the electrification of transportation have the potential to allow electric utilities to optimize the use of electric grid infrastructure, improve the management of electric loads, and better manage the integration of variable renewable energy resources. Depending upon each utility's unique circumstances, electrification of transportation programs may provide cost-effective energy efficiency, through more efficient use of energy resources, and more efficient use of the electric delivery system. Electrification of transportation may result in cost savings and benefits for all ratepayers.

The RCW presents five categories for consideration in the development of a transportation electrification plan. In developing a formal EV plan, some strategy should be considered for each of these categories.

1. CUSTOMER CLASSES. The applicability of multiple options for electrification of transportation across all customer classes.

- Planning consideration should be made for transportation electrification benefits across all customer classes and categories.

2. UTILITY LOAD. The impact of electrification on the utility's load, and whether demand response or other load management opportunities, including direct load control and dynamic pricing, are operationally appropriate.

- Planning considerations should include the current and future need for distribution system upgrades brought on by additional transportation loads.
- Innovative charging infrastructure (managed charging) and time-of-use rates can assist in load mitigation and cost effectiveness.

3. RELIABILITY AND EFFICIENCY. System reliability and distribution system efficiencies.

- System reliability and efficiency should be addressed in any planning considerations. Future benefits to the technology may include improved reliability and grid stability via bi-directional charging and other with some opportunities for improved reliability.

4. INTEROPERABILITY. Concerns, including the interoperability of hardware and software systems in electrification of transportation proposals.

- Key to a successful implementation is the ability to "future-proof" the system. Good planning decisions on hardware and software infrastructure and interoperability will facilitate larger future roll outs.

5. CUSTOMER EXPERIENCE. The overall customer experience.

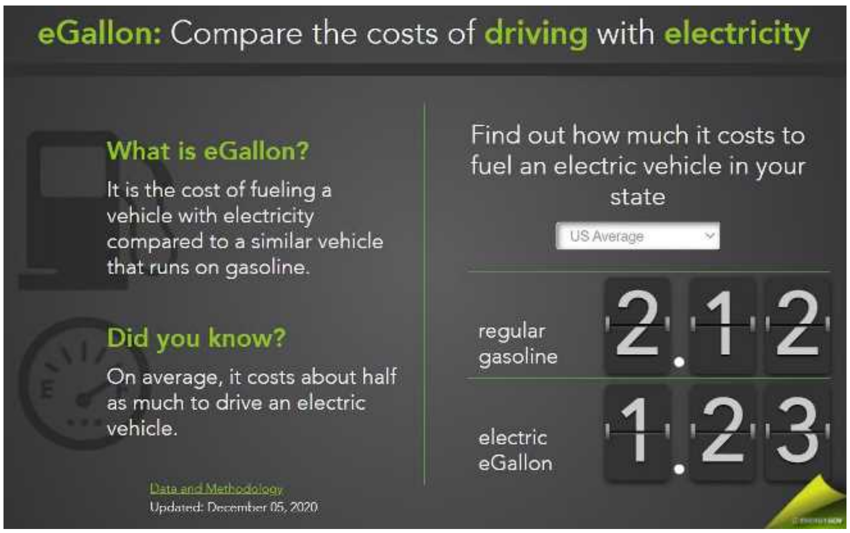
- Planning with the customer in mind assures higher probability of favorable uptake and positive outcomes. These plans can focus with customer input on transportation electrification plan development, technology and incentive offerings, and infrastructure upgrades.

In addition to SB 1512, there are other related legislative efforts focused on either emissions (SB 5811: Motor Vehicle Emissions Standards – Zero Emission Vehicles) or infrastructure (RCW 19.27.540: Electric Vehicle Infrastructure Requirements). These and other legislative efforts are summarized in Appendix C and will be monitored for future applicability.

X. EV TOOLS AND RESOURCES

There are a large variety of tools, assessments, and analysis packages available from public- and private-sector web sites. The challenge to any and all of these is confirming intent, accuracy, and unbiased representation. As such, and after review of many of these opportunities, this analysis has focused on tools and resources that are in the public domain, and have no apparent links or relationships to vendors, manufacturers, or interest groups.

A. U.S. DEPARTMENT OF ENERGY EGALLON CALCULATOR



The eGallon represents the cost of fueling a vehicle with electricity compared to a similar vehicle that runs on gasoline. For example, if gasoline costs $2.12 a gallon (December 2020 US average) and the eGallon price is $1.23 (also, December 2020 US average), that means that for $1.23 worth of electricity you can drive the same distance as you would for $2.12 worth of gasoline – for a 42% savings.

Customizing this calculator to prevailing Washington State (December 2020) results in an average gasoline cost of $2.65 and an eGallon price of $0.91. This differential highlights that for $0.91 worth of electricity you could drive a comparable distance as $2.65 worth of gasoline – the difference ($2.65 – $0.91 = $1.74) represents a 66% savings.

As the RES plan moves forward, this analysis can be further customized to RES rates and prevailing Tri-Cities average gasoline prices.

The DOE eGallon calculator can be found here.

B. IDAHO NATIONAL LABORATORY (INL) ELECTRIC AND GASOLINE FUEL COST PER MILE NOMOGRAPH

The fuel cost of driving an electric vehicle depends on the cost of electricity per kilowatt-hour (kWh) and the energy efficiency of the vehicle. The Idaho National Laboratory (INL) has shared a tool (Figure 4) to help compare fuel cost of common gasoline vehicles (designated by their fuel efficiency miles/gallon) with that of electric vehicles (designated by their fuel efficiency miles/kWh).

To determine the energy cost per mile of an electric vehicle, select the location on the left axis (Electricity Cost per kWh), estimate RES residential rate at 8.0 cents/kWh. Draw a horizontal line to the right until it bisects the EV 3 mi/kWh line – a decent average efficiency for modern EVs. Now draw a vertical line down until you bisect the bottom axis (Energy Cost per Mile). This indicates that the fuel for an electric vehicle with an energy efficiency of 3 miles per kWh costs about ***2.5 cents per mile when electricity costs 8 cents per kWh.***

To determine the energy cost per mile of a gasoline vehicle, pick the location on the right axis (Gasoline Cost/gallon) at $2.50 – a decent average as of December 2020. Draw a horizontal line to the left until it bisects the Gas 22 mi/gal line – a common average for mid-sized passenger/SUV gasoline vehicles. Now draw a vertical line down until it bisects the bottom axis (Energy Cost/Mile). This indicates that the fuel for a gasoline vehicle with an energy efficiency of 22 miles per gallon costs about ***11.5 cents per mile when gasoline costs $2.50 per gallon.*** Comparison Tool can be found here. Fuel efficiency information on recent EV models and be found here.

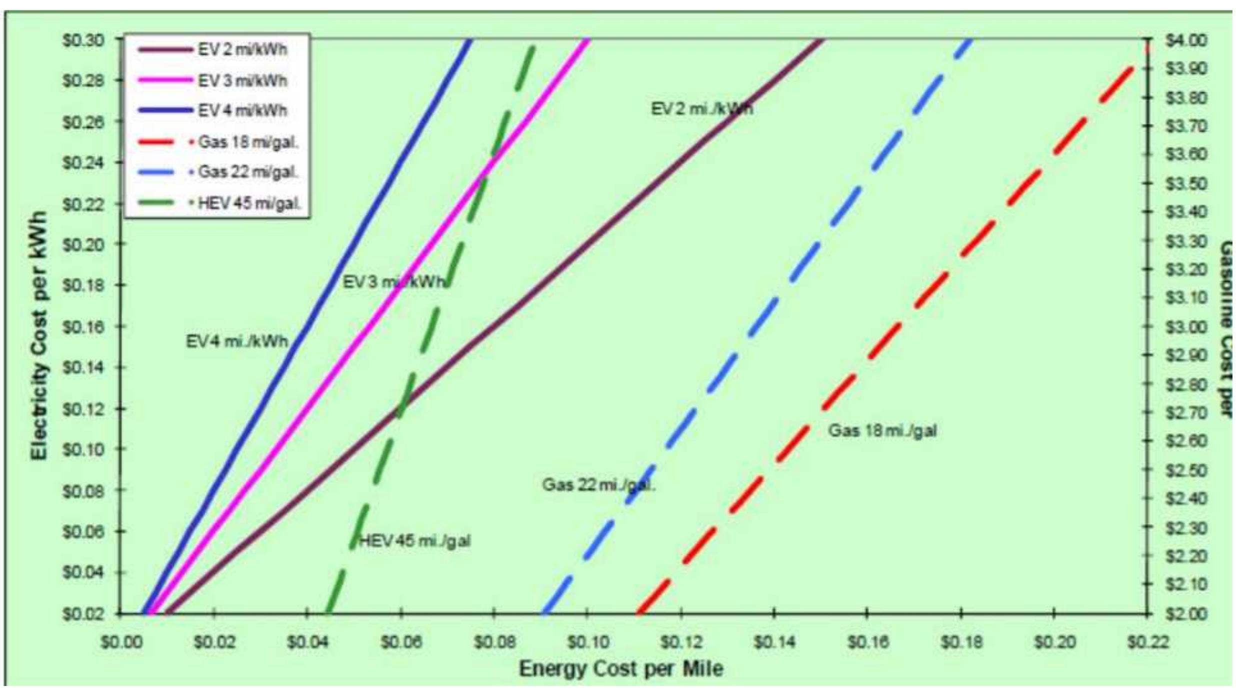
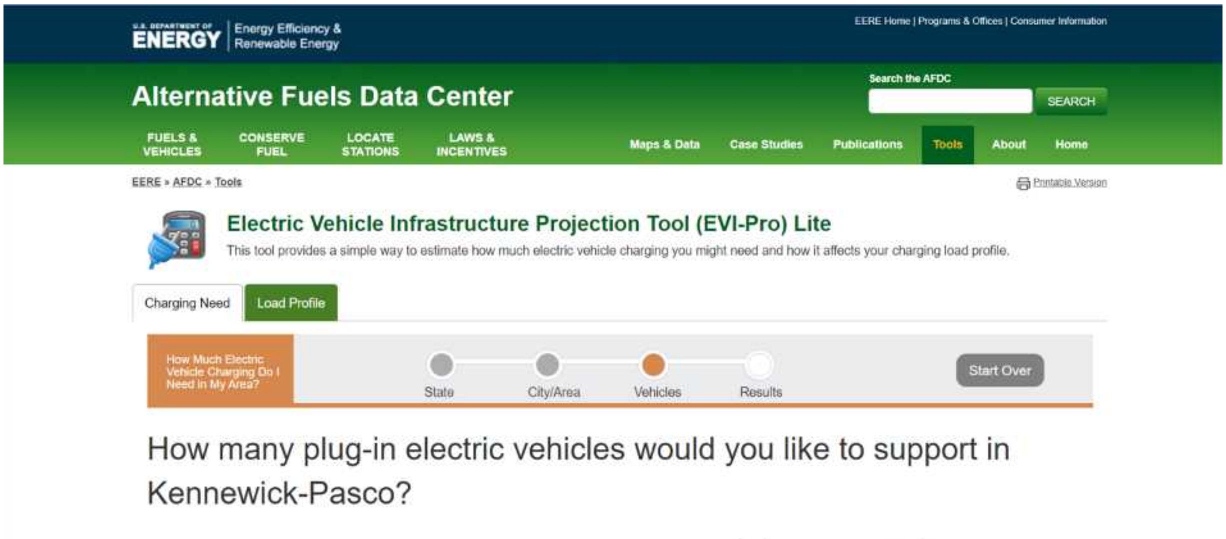


Figure 4. Comparative Cost per Mile: Electricity and Gasoline

C. U.S. DEPARTMENT OF ENERGY ELECTRIC VEHICLE INFRASTRUCTURE PROJECTION TOOL (EVI-PRO) LITE

This is a DOE tool useful in making regional estimates at required charging infrastructure and load characteristics based on user-input number of EVs and other parameters.

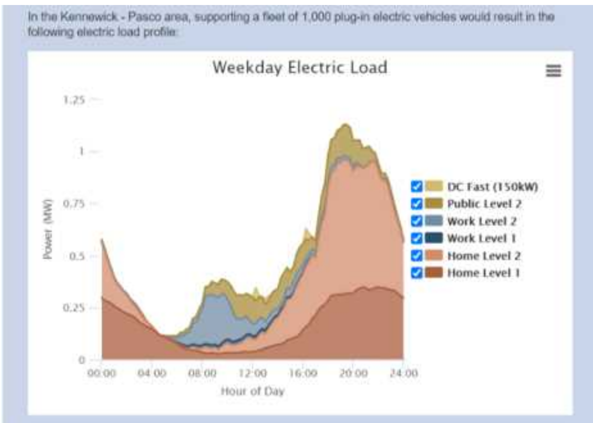
1. EVI-Pro for Estimating Requisite Charging Infrastructure

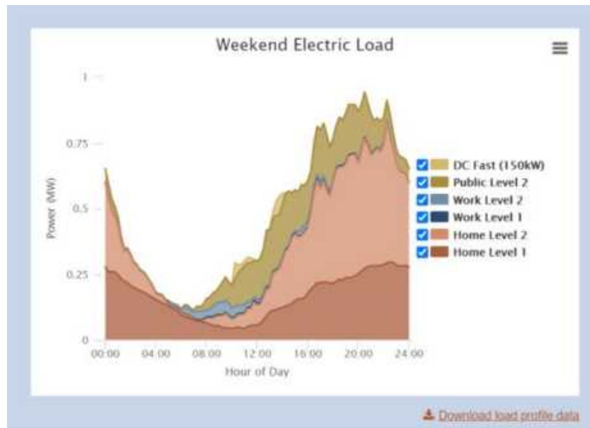


The EVI-Pro tool allows for a high-level estimate of the required (or desired) public charging infrastructure necessary to support a user-entered number of total EVs. The output is provided as the number of Level 2 chargers required in the Workplace and Public Spaces, and the number of DC Fast Chargers also in the Public space. This analysis is done regionally and can give planners some indication of realistic charging infrastructure based on averages. Note that while the tool lists “Kennewick-Pasco” as the region it does include Richland in the analysis.

2. EVI-Pro for Estimating Load Size and Shape Based on EVs and Charging Infrastructure

Embedded in this same tool is a load-profile estimator. This estimator offers some guidance on load profile based on a number of assumptions and user inputs. The output profiles are presented as a function of weekday and weekend load profiles and can be customized based on user inputs. Of interest in this tool are the abilities to complete sensitivity analysis focused more on relative results than absolutes.





The DOE EVI-Pro tool can be found [here](#).

XI. CONCLUSIONS

The research summarized here presents the current state of EV technology, charging types and infrastructure, legislative requirements, tools, and opportunities. As many utilities are finding, EVs and their managed charging infrastructure, are offering a significant opportunity to increase load while taking advantage of off-peak power sales.

Combining EV load growth with managed charging and AMI capabilities allows for future flexibility in innovative rate design, demand response program development, and alignment with various legislative requirements including I-937 and CETA.

A key to a successful residential EV program requires a managed charging infrastructure relying on open protocol communications chargers (e.g., Energy Star/BPA listed) to “future-proof” and maintain flexibility as the program and ecosystem develop.

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APPENDIX A. GLOSSARY OF TERMS

Electric Vehicle Terms and Definitions

Sources: Altas HUB, Alliance for Transportation Electrification, American Public Power Association (APPA), Avista Corporation, Electric Power Research Institute (EPRI), Wikipedia, and from SEPA as adapted from the California Public Utilities Commission (CPUC) Vehicle Grid Integration Communications Protocol Working Group Glossary of Terms.

Alternating Current (AC), Direct Current (DC). The U.S. electricity grid generally operates on AC. A typical household outlet is 110–120 VAC (volts alternating current). Larger home appliances use 240 VAC. Electric car batteries operate on DC.

AC Level 1 Charger: An AC Level 1 (L1) charger typically used in the residential settling offering EV charging at 120 volts and generally less-than 1.5 kW.

AC Level 2 Charger: An AC Level 2 (L2) charger can be found in both commercial and residential locations. They provide power at 220V-240V and various amperages resulting in power output ranging from 3.3kW to 19.2kW.

Aggregator: An aggregator is a third-party intermediary linking electric vehicles to grid operators. Increasingly, aggregators are stepping into a role of facilitating interconnections to entities that provide
electricity service. Broadly, aggregators serve two roles: downstream, they expand the size of charging
networks that electric vehicle (EV) customers can access seamlessly, facilitating back-office transactions and billing across networks; upstream, they aggregate a number of EVs and Charging Station Operators (CSO) to provide useful grid services to Distribution Network Operators (DNO) and Transmission System Operators (TSO).

Alternative Fuel Vehicle (AFV): Vehicles that are typically powered by ethanol, natural gas, propane, biodiesel, or electricity.

Autonomous Vehicle (AV): a vehicle that can guide itself without human input. There are various levels of autonomous technology as defined by SAE from level 0 (no driving automation) to level 5 (full driving automation).

Battery Electric Vehicle (BEV): Battery Electric Vehicle is a vehicle with a drivetrain that is only powered by an onboard battery and electric motor(s).

Connected Autonomous Vehicle (CAV): an autonomous vehicle that has vehicle-to-vehicle or vehicle-to-infrastructure capabilities.

Combined Charging System (CCS): a charging method for electric vehicles from the SAE J1772 connector. The plug contains a DC and AC option and is also referred to as a Combo connector. The automobile manufacturers supporting this standard include BMW, Daimler, FCA, Ford, General Motors, Hyundai, Jaguar, Tesla, and Volkswagen.

Charger: A layperson's term for the on-board or off-board device that interconnects the EV battery with the electricity grid and manages the flow of electrons to recharge the battery. Also known as Electric Vehicle Supply Equipment (EVSE).

Charge Session: A charge session is period of time an electric vehicle (EV) is actively charging its battery through the connection with a charger.

Charging: Charging is the process of recharging the onboard battery of an electric vehicle.

Charging Level: The terms, AC Level 1, AC Level 2, and DC Fast describe how energy is transferred from the electrical supply to the car's battery. Level 1 is the slowest charging speed. DC Fast is the fastest. Charging rate varies within each charging level, depending on a variety of factors including the electrical supply and the car's capability.

Charging Station: The physical site where the Electric Vehicle Supply Equipment (EVSE) (also known as the charger) or inductive charging equipment is located. A charging station typically includes parking, one or more chargers, and any necessary "make-ready equipment" (i.e., conduit, wiring to the electrical panel, etc.) to connect the chargers to the electricity grid, and can include ancillary equipment such as a payment kiosk, battery storage, or onsite generation.

CHAdeMO: The trade name of a quick charging method (DC fast charging standard) formed by Tokyo Electric Power Company, Nissan, Mitsubishi, Fuji Heavy Industries, and later joined by Toyota.

Combined Charging System (CCS): A charging standard developed by the Society of Automotive Engineers (SAE) and the European Automobile Manufacturers Association that supports both AC and DC charging, combined is a single plug.

Connector: The plug that connects the electricity supply to charge the car's battery. J-1772 is the standard connector used for Level 1 and Level 2 charging. CCS or "Combo" connectors are used for DC Fast charging on most American and European cars. CHAdeMO is the connector used to DC Fast charge some Japanese model cars.

Demand Response (DR): Central or customer control of EV charging to provide vehicle grid integration (VGI) offerings, including wholesale market services. Includes ramping up and ramping down of charging for individual EVs or multiple EVs whether the control is done at the EVSE, the EV, the EV management system, the parking lot EV energy management system or the building management system, or elsewhere.

DER: Distributed Energy Resource

DERMS: Distributed Energy Resource Management System

Direct Current Fast Charger (DCFC): Direct Current Fast Charging equipment is designed to rapidly deliver direct current to a vehicle's onboard battery. DCFCs commonly have power ratings of 50kW or higher.

Direct Install Costs: Corresponding to the direct costs associated with the installation of an EVSE. These costs include labor and materials for mounting the EVSE, wiring connections, network connections, signage, EVSE testing, and work to complete required permitting and inspections.

Electric Vehicle Service Provider (EVSP): Electric Vehicle Service Provider also known as a Network Service Provider (NSP), provides services related to chargers, such as data communications, billing, maintenance, reservations, and other non-grid information. The EVSP sends grid commands or messages to the EV or EVSE (e.g., rates information or grid information based on energy, capacity or ancillary services markets; this is sometimes called an electricity grid network services provider). The EVSP may send non-grid commands (e.g., reservations, billing, maintenance checks), and may receive data or grid commands from other entities, as well as send data back to other entities.

Electric Vehicle Supply Equipment (EVSE): Electric Vehicle Supply Equipment, also often called an EV charger, is standalone equipment used to deliver power to the input port connection on an EV. This device includes the ungrounded, grounded, and equipment grounding conductors, the electric vehicle connectors, attachment plugs, and all other fittings, devices, power outlets or apparatus associated with the device, but does not include Premises Wiring.

EPA: Environmental Protection Agency

EPRI: Electric Power Research Institute conducts research, development, and demonstration projects to benefit the public in the United States and internationally.

EV: Electric Vehicle is the commonly used name for vehicles with the capability to propel the vehicle fully or partially with onboard battery power and contains a mechanism to recharge the battery from an external power source. EVs can include full battery-electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).

GGE: Greenhouse Gas Emissions

GHG: Greenhouse Gas

GMS: Grid Management System is based on an architecture and guiding principles to proactively support changing requirements while minimizing disruption to existing operations, consumer commitments, and regulatory requirements.

GSE: Ground Support Equipment is equipment used in airports such as belt loaders, luggage tags, and water trucks.

Heavy-Duty Vehicles (HDV): A vehicle that have a gross vehicle weight above 26,000 pounds.

Internal Combustion Engine (ICE): Vehicles that generate mechanical power by burning liquid fuels such as gasoline or gaseous fuels such as compressed natural gas.

International Council on Clean Transportation (ICCT): A research group and has published several reports transportation electrification

Institute of Electrical and Electronics Engineers (IEEE): A professional association whose objectives are the educational and technical advancement of electrical and electronic engineering, telecommunications, computer engineering and allied disciplines.

IEEE 2030.5: A standard for communications between the smart grid and consumers. The standard is built using Internet of Things (IoT) concepts and gives consumers a variety of means to manage their energy usage and generation.

IEEE P2690: This standard defines communications between Electric Vehicle Charging Systems and a
device, network, and services management system, which is typically based "in the cloud" but could also include interfaces to site-specific components or systems (e.g., building energy management systems).

IGP: Integrated Grid Planning

Interoperability: The ability of devices, systems, or software provided by one vendor or service provider to exchange and make use of information, including payment information, between devices, systems, or software provided by a different vendor or service provider.

IOU: Investor-Owned Utility

ISO 15118-1:2013: A standard that specifies the communication between EV and the EVSE.

J1772 (also known as a "J plug"): North American standard for electrical connectors for electric vehicles maintained by the Society of Automotive Engineers (SAE) International, and has the formal title "SAE Surface Vehicle Recommended Practice J1772, SAE Electric Vehicle Conductive Charge Coupler". It covers the general physical, electrical, communication protocol, and performance requirements for the electric vehicle conductive charge system and coupler.

Long Range Battery Electric Vehicles (LBEV): Battery electric vehicles that have an average driving range greater than 200 miles for a full battery charge.

Light-Duty Vehicles (LDV): Vehicles that have a gross vehicle weight at or below 14,000 pounds.

Level 1 Charger: Part of the charging standard defined by the SAE for charging equipment using standard 120V household electricity.

Level 2 Charger: Part of the charging standard defined by the SAE for charging equipment using 208Vor 240V electricity, similar to the connection and power level used for ovens and clothes dryers.

Load Curves: A graph of electrical load over time. This is useful for utilities to determine how much electricity will need to be available at a given time for efficiency and reliability of power transmission.

Make-ready: Describes the installation and supply infrastructure up to, but not including the charging equipment. The customer procures and pays for the charging equipment, which could be funded by a separate rebate or other incentive by the electric company or other entity.

Managed Charging: Managed charging allows an electric utility or a third-party to control the charging of an EV remotely. This entity could enable or disable charging, or could control the power level for charging.

Medium-Duty Vehicles (MDV): Vehicles that have a gross vehicle weight more than 14,000 and less than 26,001 pounds.

NEMA: National Electric Manufacturers Association

Networked Electric Vehicle Supply Equipment (N-EVSE): Devices are connected to the Internet via a cable or wireless technology and can communicate with the computer system that manages a charging network or other software systems, such as a utility demand response management system (DRMS) or system that provides charging data to EV drivers on smartphones. This connection to a network allows EVSE owners or site hosts to manage who can access EVSE and how much it costs drivers to charge.

Non-networked EVSE**:** Devices are not connected to the internet and provide basic charging functionality without remote communications capabilities. For example, most Level 1 EVSE are designed to simply charge a vehicle; they are not networked and do not have additional software features that track energy use, process payment for a charging session, or determine which drivers are authorized to use the EVSE. Secondary systems that provide these features can be installed to supplement nonnetworked EVSE.

OEM: Original Equipment Manufacturer, commonly used to refer to automobile manufacturers.

OpenADR 2.0b: Open Automated Demand Response (OpenADR) is an open and standardized way for electricity providers and system operators to communicate DR signals with each other and with their customers using a common language over any existing IP-based communications network, such as the Internet.

Open Charge Point Protocol (OCPP): Charging protocol to offer a uniform solution for the method of communication between charge point and central system and centering on security, functionality, transaction handling, and smart charging capabilities.

Plug-in Electric Vehicle (PEV): Vehicle that uses only electricity for function.

Plug-in Hybrid Electric Vehicle (PHEV): Plug-in electric vehicle that can be powered by either or both a gasoline/diesel engine or an onboard battery.

Platform: The base hardware and software upon which software applications run.

Premises Wiring: Electrical supply panel and dedicated 208/240VAC circuits that supply electricity directly to EVSE. This includes the protective breaker at the supply panel, wiring, final junction box, receptacle and all attachments and connections.

Proprietary Protocol: A protocol that is owned and used by a single organization or individual company.

Protocol: Set of rules and requirements that specify the business process and data interactions between communicating entities, devices, or systems. Most protocols are voluntary in the sense that they are offered for adoption by people or industry without being mandated in law. Some protocols become mandatory when they are adopted by regulators as legal requirements. A standard method of exchanging data that is used between two communicating layers.

Public EVSE: Public EVSE can be found in multiple types of locations including but not limited to business parking lots, public buildings, or adjacent to public right-of-way. Public AC Level 2 EVSE have a standard J1772 connector, while DCFC have a CHAdeMO and/or CCS connectors. Tesla vehicles may utilize public EVSE with an adapter, however other EVs cannot use Tesla EVSE, as no adapters are available.

Residential EVSE: located within a person's home, most often in a garage, residential EVSE are usually used by 1 or 2 EVs intended only for use by the home owner.

Renewable Portfolio Standard (RPS): Policies designed to increase the use of renewable energy sources for electricity generation. These policies require or encourage electricity suppliers to provide their customers with a stated minimum share of electricity from eligible renewable resources.

Standard: An agreed upon method or approach of implementing a technology that is developed in an open and transparent process by a neutral, non-profit party. Standards can apply to many types of equipment (e.g., charging connectors, charging equipment, batteries, communications, signage), data formats, communications protocols, technical or business processes (e.g., measurement, charging access), cybersecurity requirements, and so on. Most standards are voluntary in the sense that they are offered for adoption by people or industry without being mandated in law. Some standards become mandatory when they are adopted by regulators as legal requirements.

Standardization: Process where a standard achieves a dominant position in the market due to public acceptance, market forces, or a regulatory mandate.

State of Charge (SOC): The level of charge of an electric battery relative to its capacity.

Total Cost of Ownership (TCO): A financial estimate that accounts for both purchase price and continued variable operating costs of an asset.

Transportation Electrification (TE): The actions and activities related to the furthering of use of electricity as the primary fuel for the transportation sector.

Telematics: Refers to the communication of data between a data center (or cloud-based service) and an EV, including sending control commands and retrieving charging session data.

Transportation Network Company (TNC): A company that connects passengers with drivers via a mobile app or website, for example companies such as Uber and Lyft.

Time of Use (TOU) Rate: Time-of-use often refers to electricity rates that can vary by the time of day. TOU rates can also be structured to vary by season.

Uptime: Defines the amount of time an EVSE is functionally able to provide a charge when requested, as opposed to a faulted state where no charge may occur. Depending on configuration settings, networked EVSE may still be able to provide a charge and maintain uptime status when offline from the network connection.

V1G: Refers to vehicles only capable of receiving power from the electrical grid to the onboard battery. This can also commonly be referred to as demand response for EVs

V2B: Vehicle-to-Building refers to vehicles capable of sending power from the onboard battery to a building.

V2G: Vehicle-to-Grid refers to vehicles capable of receiving power to the onboard battery from the electrical grid and vice-versa.

V2H: Vehicle-to-Home refers to vehicles capable of sending power from the onboard battery to a home.

Vehicle Miles Traveled (VMT): Miles traveled over a defined time duration.

Zero Emission Vehicle (ZEV): A vehicle with no tailpipe emissions and includes battery electric vehicles and hydrogen fuel cell electric vehicles

APPENDIX B. HOUSE BILL 1521/RCW 35.92.450

Final Bill Report: SHB 1512

Brief Description: Concerning the electrification of transportation.

Sponsors: House Committee on Environment & Energy (originally sponsored by Representatives Fey, Steele, Valdez, Ortiz-Self, Fitzgibbon, Klippert, Tarleton, Mead, Pollet, Jinkins, Boehnke, Slatter, DeBolt, Dent, Chapman, Frame, Stanford, Tharinger and Macri).

House Committee on Environment & Energy

Senate Committee on Environment, Energy & Technology

Background:

Municipal Electric Utilities and Public Utility Districts.

Municipalities are authorized to operate as utilities and set the rates and charges for the provision of water, sewer, electric power, heating fuel, solid waste removal, and transportation facility services. Public utility districts (PUDs) are a type of special purpose district authorized for the purpose of generating and distributing electricity, providing water and sewer services, and providing telecommunications services. A PUD may operate on a countywide basis or may encompass a smaller jurisdiction. A PUD is governed by a board of either three or five elected commissioners.

Investor-Owned Utility Investment in Electric Vehicle Supply Equipment.

In establishing rates for privately owned gas and electrical companies, the Utilities and Transportation Commission must consider policies to improve access to, and promote fair competition in the provision of, electric vehicle supply equipment (EVSE) build-out. These policies may include, but are not limited to, allowing a rate of return on investment on capital expenditures for EVSE that is deployed for the benefit of ratepayers, provided that the capital expenditures do not increase costs to ratepayers in excess of 0.25 percent.

A rate of return on investment for EVSE build-out may only be allowed if the company chooses to pursue capital investment in EVSE on a fully regulated basis similar to other capital investments behind a customer's meter. The incentive rate of return is established by adding an increment of up to 2 percent to the rate of return on common equity permitted on the company's other investments. The incentive rate of return on investment only apples to projects installed after July 1, 2015, and which are reasonably expected at the time they are placed in the rate base to result in real and tangible benefits for ratepayers by being installed and located where electric vehicles are most likely to be parked for intervals longer than two hours.

Summary:

Municipal Electric Utilities and Public Utility Districts.

The governing body of a municipal electric utility or public utility district (PUD) may adopt an electrification of transportation plan that, at a minimum, establishes a finding that utility outreach and investment in the electrification of transportation infrastructure does not increase net costs to ratepayers in excess of 0.25 percent.

In adopting an electrification of transportation plan, the governing body may consider some or all of the following:

- the applicability of multiple options for transportation electrification across all customer classes;
- the impact of electrification on the utility's load, and whether demand response or other load management opportunities are operationally appropriate;
- system reliability and distribution system efficiencies;
- interoperability concerns, including the interoperability of hardware and software systems in electrification of transportation proposals; and overall customer experience.

Upon making a net cost determination, a municipal electric utility or a PUD may offer incentive programs in transportation electrification for its customers, including the promotion of electric vehicle adoption and advertising programs that promote the utility's services, incentives, or rebates.

Investor-Owned Utility Investment in Electric Vehicle Supply Equipment.

An investor-owned utility may submit to the Utilities and Transportation Commission (UTC) an electrification of transportation plan that deploys electric vehicle supply equipment (EVSE) or provides other electric transportation programs, services, or incentives to support electrification of transportation, provided that such EVSE programs or services do not increase costs to customers in excess of 0.25 percent above the benefits of electric transportation to all customers over a period consistent with the utility's planning horizon under its most recent integrated resource plan.

In reviewing an electrification of transportation plan by an investor-owned utility, the UTC may consider the following:

- the applicability of multiple options for electrification of transportation across all customer classes;
- the impact of electrification on the utility's load, and whether demand response or other load management opportunities are operationally appropriate;
- system reliability and distribution system efficiencies;
- interoperability concerns, including the interoperability of hardware and software systems in electrification of transportation proposals;
- the benefits and costs of the planned actions; and
- overall customer experiences.

The UTC must issue an acknowledgment of an electrification of transportation plan within six months of submittal of the plan. The UTC may establish by rule the requirements for preparation and submission of an electrification of transportation plan. An electric utility may submit an electrification of transportation plan before or during rulemaking proceedings. The UTC may allow an incentive rate of return on investment through December 31, 2030, on capital expenditures for EVSE that is deployed for the benefit of ratepayers, provided that the capital expenditures do not increase costs to ratepayers in excess of 0.25 percent. The incentive rate of return on investment applies to any EVSE project that is installed after July 1, 2015.

Votes on Final Passage:

House 64 33

Senate 36 11

Effective: July 28, 2019

RCW 35.92.450

Electrification of transportation plan—Considerations—Incentive programs.

(1) The governing authority of an electric utility formed under this chapter may adopt an electrification of transportation plan that, at a minimum, establishes a finding that utility outreach and investment in the electrification of transportation infrastructure does not increase net costs to ratepayers in excess of one-quarter of one percent.

(2) In adopting an electrification of transportation plan under subsection (1) of this section, the governing authority may consider some or all of the following: (a) The applicability of multiple options for electrification of transportation across all customer classes; (b) the impact of electrification on the utility's load, and whether demand response or other load management

opportunities, including direct load control and dynamic pricing, are operationally appropriate; (c) system reliability and distribution system efficiencies; (d) interoperability concerns, including the interoperability of hardware and software systems in electrification of transportation proposals; and (e) overall customer experience.

(3) An electric utility formed under this chapter may, upon making a determination in accordance with subsection (1) of this section, offer incentive programs in the electrification of transportation for its customers, including the promotion of electric vehicle adoption and advertising programs to promote the utility's services, incentives, or rebates.

[2019 c 109 § 2.]

NOTES:

Findings—Intent—2019 c 287; 2019 c 109: "The legislature finds that:

(1) Programs for the electrification of transportation have the potential to allow electric utilities to optimize the use of electric grid infrastructure, improve the management of electric loads, and better manage the integration of variable renewable energy resources. Depending upon each utility's unique circumstances, electrification of transportation programs may provide cost-effective energy efficiency, through more efficient use of energy resources, and more efficient use of the electric delivery system. Electrification of transportation may result in cost savings and benefits for all ratepayers.

(2) State policy can achieve the greatest return on investment in reducing greenhouse gas emissions and improving air quality by expediting the transition to alternative fuel vehicles, including electric vehicles. Potential benefits associated with electrification of transportation include the monetization of environmental attributes associated with carbon reduction in the transportation sector.

(3) Legislative clarity is important for utilities to offer programs and services, including incentives, in the electrification of transportation for their customers. It is the intent of the legislature to allow all utilities to support transportation electrification to further the state's policy goals and achieve parity among all electric utilities, so each electric utility, depending on its unique circumstances, can determine its appropriate role in the development of electrification of transportation infrastructure." [2019 c 287 § 4; 2019 c 109 § 1.]

APPENDIX C. OTHER RELATED WASHINGTON STATE LEGISLATION

State of Washington Legislation Regarding EVs

Mandatory Electric Vehicle Supply Equipment (EVSE) Building Standards

Type: Laws and Regulations | Jurisdiction: Washington

By July 1, 2021, the Washington State Building Code Council must adopt rules for EVSE installation at all new buildings that provide on-site parking. At least one parking space, or 10% of parking spaces rounded to the next whole number, must be made-ready for Level 2 EVSE. Electrical capacity must accommodate the potential to serve a minimum of 20% of the total parking spaces with Level 2 EVSE. For assembly, education, or mercantile buildings, the requirements apply only to employee parking spaces. Buildings classified as residential R-3, utility, or miscellaneous are exempt from these requirements. Additional terms and conditions apply. (Reference Revised Code of Washington 19.27.540)

Plug-In Electric Vehicle (PEV) Promotion and Infrastructure Development

Type: Laws and Regulations | **Jurisdiction:** Washington

Any regional transportation planning organization containing a county with a population greater than one million must collaborate with state and local governments to promote PEV use, invest in PEV charging infrastructure, and seek federal or private funding for these efforts. Collaborative planning efforts may include:

Developing short- and long-term plans outlining how state, regional, and local governments may construct electric vehicle supply equipment locations and ensure that the infrastructure can be electrically supported;

Supporting public education and training programs on PEVs;

Developing an implementation plan for counties with a population greater than 500,000 to have 10% of public and private parking spaces ready for PEV charging by December 31, 2018; and

Developing model ordinances and guidance for local governments for site assessment and installing PEV infrastructure.

(Reference Revised Code of Washington 47.80.090)

Plug-In Electric Vehicle (PEV) Charging Infrastructure Availability

Type: Laws and Regulations | **Jurisdiction:** Washington

Publicly and privately owned PEVs may charge at state office locations if the vehicles are used for state business, conducting business with the state, or as commuter vehicles. Additionally, contingent upon funding, the state must install electrical outlets suitable for charging PEVs in each of the state's fleet parking and maintenance facilities as well as every state-operated highway rest stop. The Washington Department of Enterprise Services may report to the governor and the legislature on the amount of electricity consumed and the number of PEVs using state-owned charging equipment if it represents a significant cost to the state. (Reference Revised Code of Washington 43.01.250, 43.19.648, and 47.38.075)

State Emissions Reductions Requirements

Type: Laws and Regulations | Jurisdiction: Washington

Washington State must limit greenhouse gas (GHG) emissions to achieve the following reductions:

- By 2020, reduce overall GHG emissions in the state to 1990 levels;
- By 2035, reduce overall GHG emissions in the state to 25% below 1990 levels; and
- By 2050, reduce overall emissions to 50% below 1990 levels or 70% below the state's expected emissions that year.

Every other year, the Washington Departments of Ecology and Commerce must report to the governor and legislature on the total GHG emissions in the state for the previous two years. For more information, see the Washington Department of Ecology Climate Change and the Environment website.

(Reference Revised Code of Washington 70.235.020)

Plug-In Electric Vehicle (PEV) and Fuel Cell Electric Vehicle (FCEV) Infrastructure and Battery Tax

Type: State Incentives | **Jurisdiction:** Washington

Public lands used for installing, maintaining, and operating PEV infrastructure are exempt from leasehold excise taxes. Additionally, the state sales and use taxes do not apply to PEV and FCEV batteries or fuel cells; labor and services for installing, repairing, altering, or improving PEV and FCEV batteries or fuel cells and PEV and hydrogen fueling infrastructure; the sale of property used for PEV and hydrogen fueling infrastructure, and the sale of zero emission buses. (Reference Revised Code of Washington 82.29A.125, 82.08.816, and 82.12.816)

Electric Vehicle Supply Equipment (EVSE) and Battery Exchange Station Regulations

Type: Laws and Regulations | **Jurisdiction:** Washington

State and local governments may lease land for installing, maintaining, and operating EVSE or electric vehicle battery exchange stations for up to 50 years for at least $1 per year. Additionally, the installation of battery charging and exchange stations is categorically exempt from the Washington Environmental Policy Act. (Reference Revised Code of Washington 79.13.100 and 43.21C.410)

Plug-In Electric Vehicle (PEV) Infrastructure Definitions

Type: Laws and Regulations | **Jurisdiction:** Washington

PEV infrastructure is defined as structures, machinery, and equipment necessary and integral to support a PEV, including battery charging stations, rapid charging stations, and battery exchange stations. A battery charging station is defined as an electrical component assembly or cluster of component assemblies designed specifically to charge batteries within a PEV. A rapid charging station is defined as an industrial grade electrical outlet that allows for faster recharging of PEV batteries through higher power levels. A battery exchange station is defined as a fully automated facility that will enable a PEV with a swappable battery to enter a drive lane and exchange the depleted battery with a fully charged battery through a fully automated process. Infrastructure must meet or exceed any applicable state building standards, codes, and regulations. (Reference Revised Code of Washington 19.28.281 and 47.80.090)

Local Government Plug-in Electric Vehicle (PEV) Infrastructure Requirements

Type: Laws and Regulations | **Jurisdiction:** Washington

Jurisdictions must develop regulations to allow the use of PEV infrastructure and battery charging stations in all areas except critical areas or areas zoned for residential or resource use. The Washington Department of Commerce included a model ordinance, development regulations, and guidance for local governments for site assessment and installing PEV infrastructure in Electric Vehicle Infrastructure: A Guide for Local Governments in Washington State(PDF). This requirement applies to jurisdictions that meet specific location criteria and is contingent upon federal funding. Additionally, cities or municipalities may adopt incentive programs to encourage retrofitting of existing structures capable of charging PEVs. (Reference Revised Code of Washington 35.63.126, 35.63.127, 35A.63.107, 36.70.695, 36.70A.695, and 43.31.970)

Electric Drive Vehicle Fee

Type: Laws and Regulations | **Jurisdiction:** Washington

Plug-in electric vehicle (PEV) owners must pay an annual fee of $150 in addition to standard registration fees. Plug-in hybrid electric vehicles with an all-electric range of at least 30 miles are subject to a fee of $75. Beginning October 1, 2019, hybrid electric vehicles are subject to a $75 hybrid vehicle fee. Fees will contribute to the state's Electric Vehicle Infrastructure Bank to deploy charging stations through public-private partnerships. (Reference House Bill 2042, 2019, and Revised Code of Washington 46.17.323)

Plug-In Electric Vehicle (PEV) Road User Assessment System Pilot

Type: Laws and Regulations | **Jurisdiction:** Washington

The Washington Transportation Commission (Commission) studied the feasibility of transitioning from a fuel tax to a road user assessment system in the state. In 2012, the Commission conducted a limited scope pilot project to test the feasibility of this new system as it applies to PEVs. For the results of this evaluation, see the Washington State Department of Transportation report (PDF). The Commission began a year-long pilot project in fall 2017. On January 13, 2020, the Commission submitted a report of findings and recommendations to the governor, state legislature, and the U.S. Department of Transportation. The governor and state legislature will decide if a road usage charge will be implemented. For more information, see the Commission Road Usage Charge Assessment website.

Plug-in Electric Vehicle (PEV) Charging Regulation Exemption

Type: State Incentives | **Jurisdiction:** Washington

An entity that offers electric vehicle supply equipment (EVSE) to the public for hire may not have their rates, services, facilities or practices regulated by the Washington Utilities and Transportation Commission (Commission). The exemption does not apply if the entity is otherwise subject to Commission jurisdiction as an electrical company, or if an entity's battery charging facilities and services are subsidized by any regulated service. A utility may offer battery charging facilities as a regulated service, subject to Commission approval. (Reference Revised Code of Washington 80.28.320)

Plug-In Electric Vehicle (PEV) Charging Signage and Parking Regulations

Type: Laws and Regulations | **Jurisdiction:** Washington

A PEV charging station must be indicated by vertical signage that properly identifies the station and indicates that it is only for PEV charging. The signage must be consistent with the U.S. Department of Transportation Federal Highway Administration's Manual on Uniform Traffic Control Devices, and the station must be indicated by green pavement markings. A PEV charging station is defined as a public or private parking space that is served by charging equipment with the primary purpose of transferring electric energy to a battery or other energy storage device in a PEV. Any person who parks a vehicle in a PEV charging station parking space and does not connect to the equipment is subject to a fine of $124. (Reference Revised Code of Washington 46.08.185)

Utility Electric Vehicle Supply Equipment (EVSE) Return on Investment Authorization

Type: State Incentives | **Jurisdiction:** Washington

Utilities may petition the Washington Utilities and Transportation Commission (UTC) for a rate of return on EVSE installed for the benefit of ratepayers through December 31, 2030. The UTC may approve an additional 2% to the standard rate of return if the utility installs EVSE on a fully regulated basis similar to other capital investments behind a customer's meter, and the expenditures do not increase ratepayer costs more than 0.25%. EVSE are subject to a depreciation schedule and may be gifted to the customer when fully depreciated. The UTC issued a report(PDF) on the use and impacts of the incentive on December 1, 2017. (Reference Revised Code of Washington 80.28.360)

Utility Electric Transportation Plan Authorization

Type: Laws and Regulations | **Jurisdiction:** Washington

The governing authority or commission of an electric utility may adopt an electric transportation plan that proves that utility outreach and investment in the electrification of transportation infrastructure does not increase net costs to ratepayers in excess of 0.025%. The governing authority or commission may consider items such as the impact of electrification on the utilities load, demand response and load management opportunities, system reliability and distribution system efficiencies, and interoperability concerns. Upon making this determination, electric utilities may offer incentive programs for customers. (Reference Revised Code of Washington 35.92.450)

Green Transportation Grant Program

Type: State Incentives | **Jurisdiction:** Washington

The Washington State Department of Transportation (WSDOT) will establish a green transportation capital grant program to fund projects to reduce the carbon intensity of the Washington transportation system, including fleet electrification, modification or replacement of facilities to facilitate fleet electrification and hydrogen fueling, upgrades to electrical transmission and distribution systems, and construction of charging and fueling infrastructure. In order to receive funding for a project, a transit authority must provide matching funding for that project that is at least equal to 20% of the total cost of the project. (Reference Revised Code of Washington 47.66.120)

Retail Sales and Use Tax Exemption

Type: State Incentives | **Jurisdiction:** Washington

The retail sales and state use tax of 6.5% does not apply to the sale or lease of new or used passenger vehicles, light-duty trucks, and medium-duty passenger vehicles that are exclusively powered by an alternative vehicle fuel or are capable of running solely on electricity for at least 30 miles. Eligible alternative fuels are natural gas, propane, hydrogen, and electricity. Vehicles must not have a selling price plus trade-in property value that exceeds $45,000 for new vehicles and $30,000 for used vehicles. The maximum eligible amount for used purchased or leased vehicles is $16,000. The maximum eligible amounts for new purchased or leased vehicles are as follows:

Year	Maximum Amount
Through July 31, 2021	$25,000
August 1, 2021 - July 31 2023	$20,000
August 1, 2023 - July 31 2025	$15,000

For more information, see the Renewable Energy/Green Incentives section of Washington Department of Revenue's Incentives Programs website.

(Reference Revised Code of Washington 82.12.9999)

Mandatory Electric Vehicle Supply Equipment (EVSE) Building Standards

Type: Laws and Regulations | **Jurisdiction:** Washington

By July 1, 2021, the Washington State Building Code Council must adopt rules for EVSE installation at all new buildings that provide on-site parking. At least one parking space, or 10% of parking spaces rounded to the next whole number, must be made-ready for Level 2 EVSE. Electrical capacity must accommodate the potential to serve a minimum of 20% of the total parking spaces with Level 2 EVSE. For assembly, education, or mercantile buildings, the requirements apply only to employee parking spaces. Buildings classified as residential R-3, utility, or miscellaneous are exempt from these requirements. Additional terms and conditions apply. (Reference Revised Code of Washington 19.27.540)

Medium- and Heavy-Duty Zero Emission Vehicle (ZEV) Deployment Support

Type: Laws and Regulations | **Jurisdiction:** Washington

California, Colorado, Connecticut, District of Columbia, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington (signatory states) signed a memorandum of understanding(PDF) (MOU) to support the deployment of medium- and heavy-duty ZEVs through involvement in a Multi-State ZEV Task Force (Task Force).

By January 2021, the Task Force will develop a multi-state action plan to support electrification of medium- and heavy-duty vehicles. The Task Force will consider actions to accomplish the goals of the MOU, including limiting all new medium- and heavy-duty vehicles sales in the signatory states to ZEVs by 2050. The signatory states will also seek to accelerate the deployment of medium- and heavy-duty ZEVs to benefit disadvantaged communities and explore opportunities to coordinate and partner with key stakeholders.

For more information, see the Multi-State Medium- and Heavy-Duty Zero Emission Vehicle MOU(PDF).

APPENDIX D. RELEVANT LOCAL, REGIONAL, STATE AND NATIONAL ORGANIZATIONS

American Public Power Association (APPA).
Offers a variety of information and webinars – some with focus on EVs
https://www.publicpower.org/topic/electric-vehicles

Bonneville Environmental Foundation (BEF)
Offers a variety of information and webinars – some with focus on EVs
http://www.b-e-f.org/

Bonneville Power Administration (BPA).
General energy efficiency and incentives – recent EV charger program/incentives
https://www.bpa.gov/EE/Policy/IManual/Pages/IM-Document-Library.aspx

Western Washington Clean Cities Coalition
Offers a variety of information and webinars – some with focus on EVs
https://cleancities.energy.gov/coalitions/western-washington

Electric Auto Association
National advocacy organization focused on transportation electrification
https://www.electricauto.org/

Electric Power Research Institute (EPRI).
Offers a variety of information and webinars – some with focus on EVs
https://et.epri.com/

Electric Vehicle Charging Association
National advocacy organization focused on electric vehicle charging
http://www.evassociation.org/

Electric Vehicle Transportation Alliance (EVITA) – Energy Northwest.

Regional organization focused on electric vehicles

https://www.energy-northwest.com/doingbusinesswithus/Pages/EVITA.aspx

Forth Mobility

Regional/national group based in Portland, OR, focused on smart transportation electrification

https://forthmobility.org/

Greenlots

National organization with local footprint focused on EV charging solutions and public private solutions

https://greenlots.com/

Plug In America

National advocacy organization focused on transportation electrification

https://pluginamerica.org/

Rocky Mountain Institute

Offers a variety of information and webinars – some with focus on EVs

https://rmi.org/our-work/mobility-transformation/ev-grid/

Smart Electric Power Alliance

Offers a variety of information and webinars – some with focus on EVs

https://sepapower.org

State of Washington Department of Commerce

State organization forwarding transportation electrification legislation, grants, and program implementation

https://www.commerce.wa.gov/growing-the-economy/energy/electric-vehicles/

State of Washington Department of Transportation

In conjunction with DOC, state organization providing input on transportation electrification legislation, grants, and program implementation

https://wsdot.wa.gov/

U.S. Department of Energy, Energy Efficiency and Renewable Energy (EERE), Alternative Fuels Data Center (AFDC)

Federal government "alternative fuels" (including transportation electrification) clearing house of information, programs, grants, and legislation

https://afdc.energy.gov/

U.S. Environmental Protection Agency

Federal government "green vehicles" (including transportation electrification) clearing house of information, programs, grants, and legislation

https://www.epa.gov/greenvehicles

Washington State Energy Office at the Washington Department of Commerce

Involved with a variety of transportation electrification efforts, program design, implementation, grants, and evaluation

https://www.commerce.wa.gov/growing-the-economy/energy/electric-vehicles/

Washington State University (WSU) Green Transportation Program

Involved with a variety of transportation electrification efforts (public fleets focus), program design, implementation, grants, and evaluation

http://www.energy.wsu.edu/GreenTransportationProgram.aspx

UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021 Agenda Category: Items of Business

Prepared By: Clint Whitney, Energy Services Director

Subject:
RES Financials and Preliminary COSA (20 Minutes)

Department:
Energy Services

Recommended Motion:
This is an informational item.

Summary:

Attached are the draft fourth quarter 2020 financial statements. The final edits are not expected to substantially change the financials.

Key points from the 4Q20 financial statements include:

- Unrestricted cash for end of year (EOY) 2020 of $6.9M is lower than EOY 2019 of $8.4M. However, the overall trend line for 2020 was higher when compared to 2019. This is seen in the Days Cash on Hand graph on page nine. The Days Cash is an important consideration for bond rating firms. EOY 2020 Days Cash was 41.8 days with a recommendation to ultimately have 90 days cash on hand.
- $4.9M of revenue bonds remain at EOY 2020 which is projected to be used by EOY 2021 between a $10.9M capital program and rate-financed capital contributions.
- Accounts Receivable (A/R) balances, shown on page 16, reflect an overall increase in 2020 compared to previous years. This is expected given Governor Inslee's Proclamation 20-23 which has prohibited utility disconnects since March 2020. More information on A/R is contained in the COVID-19 informational item.

A review of finances involved updating the Cost of Service Analysis (COSA) using 2019 financial actuals. Before COVID-19, an electric rate increase was anticipated for January 2021. With some business changes including eliminating two positions, reducing $8.7M from a six year capital plan, delayed position filling, and underfilling when available, Energy Services is able to defer a rate increase until January 2022.

Key points from the 2020 COSA include:

- A rate increase of 4.5% could be deferred until January 2022. This will maintain a debt service coverage ratio of 2.09 which is above the 1.25 bond covenant requirements and also a stronger financial position when reviewed by bond rating entities.
- A bond issuance of $4.6M is also projected for early 2022. However, it may be more beneficial for a bond issuance in 4Q21 given the bond market and support needed from other departments to prepare official statements.
- BPA's rate period 2022-2023 is assumed to have a 5% rate increase. Initial analysis from BPA and Public Power Council indicates power costs to be flat and transmission costs increasing by 11%. At this point, it is still too early to have much confidence in the BPA rate projections.

Fiscal Impact:

Attachments:

1. COSA Model Update 2021.02.08 - Summary
2. RES Dec 2020 Draft Financial Statements

City of Richland
Electric Cost of Service
Summary

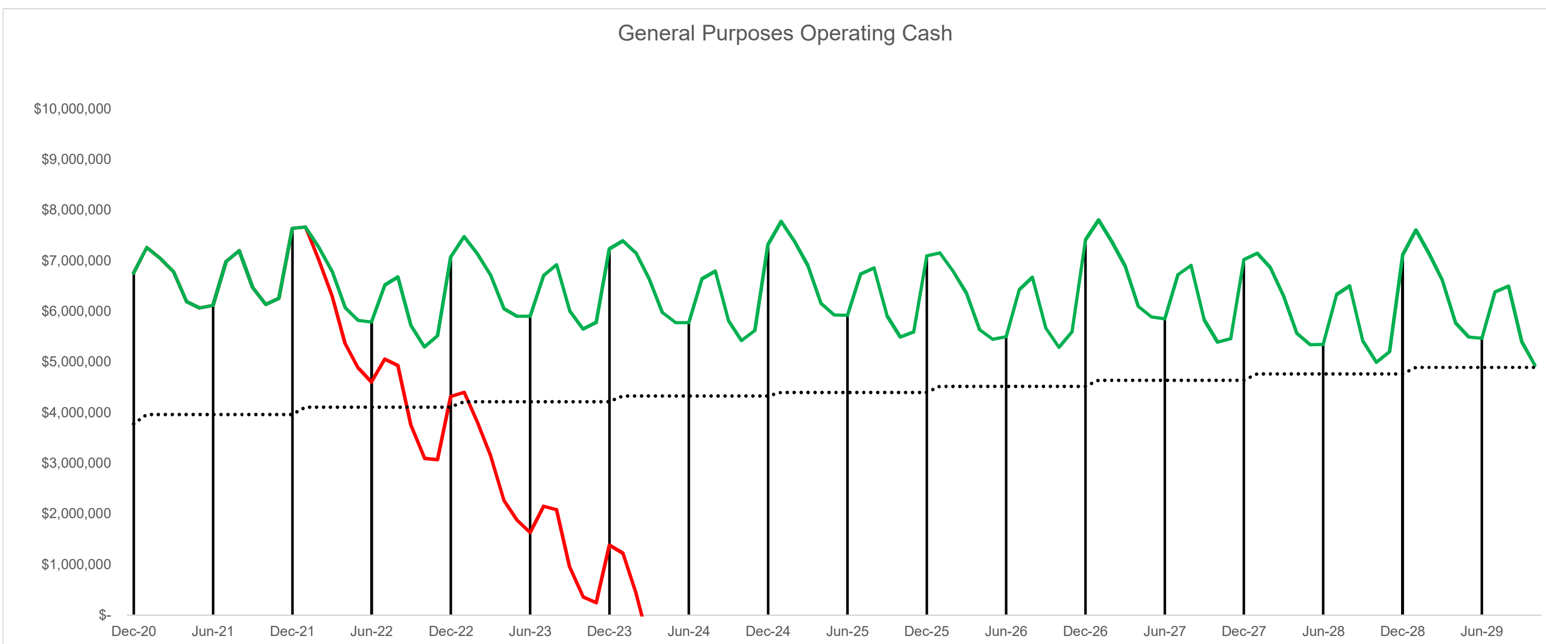
Revenue Requirement	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Revenues										
Rate Revenues Under Existing Rates	$ 65,816,342	$ 67,656,014	$ 68,253,075	$ 68,857,164	$ 69,629,337	$ 70,083,982	$ 70,707,584	$ 71,337,847	$ 72,141,499	$ 72,619,600
Non-Rate Revenues	[illegible]	2,533,476	2,543,269	2,556,671	2,577,176	2,584,196	2,605,321	2,612,737	2,630,999	
Total Revenues	**$ 68,846,893**	**$ 70,137,490**	**$ 70,786,551**	**$ 71,400,434**	**$ 72,186,009**	**$ 72,661,159**	**$ 73,291,781**	**$ 73,943,168**	**$ 74,754,237**	**$ 75,250,598**
Expenses										
Cash Operating Expenses	$ 15,324,176	$ 16,092,679	$ 16,678,260	$ 17,108,509	$ 17,566,894	$ 17,855,939	$ 18,337,354	$ 18,823,079	$ 19,341,440	$ 19,848,575
Total Power	40,379,653	41,717,435	44,292,556	45,207,789	47,573,863	48,463,545	50,641,128	51,902,692	54,800,270	55,241,297
Existing Debt Service	6,028,713	6,073,569	6,088,219	4,807,269	4,810,746	4,810,747	4,815,430	4,818,240	4,805,830	4,818,547
New Debt Service	-	-	328,811	328,811	806,117	806,117	1,050,074	1,050,074	1,219,783	1,219,783
Rate Funded System Reinvestment	[illegible]	6,664,754	6,956,179	7,235,504	7,527,929	7,785,281	8,042,634	8,299,986	8,557,339	
Total Expenses	**$ 67,235,741**	**$ 69,633,967**	**$ 74,052,600**	**$ 74,408,557**	**$ 77,993,124**	**$ 79,464,277**	**$ 82,629,267**	**$ 84,636,719**	**$ 88,467,310**	**$ 89,685,541**
Capitalized Labor, Overhead, & Engineering Expense	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Net Surplus (Deficiency)	**$ 1,611,151**	**$ 503,524**	**$ (3,266,049)**	**$ (3,008,123)**	**$ (5,807,115)**	**$ (6,803,118)**	**$ (9,337,487)**	**$ (10,693,550)**	**$ (13,713,073)**	**$ (14,434,943)**
Additions to Meet Coverage	-	-	-	-	-	-	-	-	-	-
Total Surplus (Deficiency)	**$ 1,611,151**	**$ 503,524**	**$ (3,266,049)**	**$ (3,008,123)**	**$ (5,807,115)**	**$ (6,803,118)**	**$ (9,337,487)**	**$ (10,693,550)**	**$ (13,713,073)**	**$ (14,434,943)**
% of Rate Revenue	**0.00%**	**0.00%**	**4.79%**	**4.37%**	**8.34%**	**9.71%**	**13.21%**	**14.99%**	**19.01%**	**19.88%**
Annual Rate Adjustment	**0.00%**	**0.00%**	**4.50%**	**0.00%**	**4.50%**	**0.00%**	**5.00%**	**0.00%**	**5.00%**	**0.00%**
Cumulative Annual Rate Adjustment	**0.00%**	**0.00%**	**4.50%**	**4.50%**	**9.20%**	**9.20%**	**14.66%**	**14.66%**	**20.40%**	**20.40%**
Rate Revenues After Rate Increase	$ 65,816,342	$ 67,656,014	$ 71,009,170	$ 71,955,737	$ 75,701,822	$ 76,533,461	$ 80,679,273	$ 81,797,848	$ 86,432,391	$ 87,430,916
Additional Taxes from Rate Increase	$ -	$ -	$ 106,755	$ 120,020	$ 235,212	$ 249,814	$ 386,243	$ 405,158	$ 553,543	$ 573,702
Net Cash Flow After Rate Increase	**$ 1,611,151**	**$ 503,524**	**$ (616,709)**	**$ (29,571)**	**$ 30,158**	**$ (603,454)**	**$ 247,959**	**$ (638,707)**	**$ 24,275**	**$ (197,328)**
Coverage After Rate Increases	**2.41**	**2.19**	**2.09**	**2.54**	**2.46**	**2.41**	**2.53**	**2.43**	**2.54**	**2.55**
Sample Residential Monthly Bill (1,200 kWh)	**$ 109.91**	**$ 109.91**	**$ 114.85**	**$ 114.85**	**$ 120.02**	**$ 120.02**	**$ 126.02**	**$ 126.02**	**$ 132.32**	**$ 132.32**
Monthly Average Increase ($)	$ -	$ -	$ 4.95	$ -	$ 5.17	$ -	$ 6.00	$ -	$ 6.30	$ -

Fund Balance	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
OPERATING FUND										
Beginning Balance	$ 4,123,615	$ 5,734,766	$ 6,238,290	$ 5,621,581	$ 5,592,010	$ 5,622,168	$ 5,018,714	$ 5,266,672	$ 4,627,965	$ 4,652,240
plus: Net Cash Flow after Rate Increase	1,611,151	503,524	(616,709)	(29,571)	30,158	(603,454)	247,959	(638,707)	24,275	(197,328)
less: Transfer of Surplus to Capital Fund	-	-	-	-	-	-	-	-	-	-
Ending Balance	**$ 5,734,766**	**$ 6,238,290**	**$ 5,621,581**	**$ 5,592,010**	**$ 5,622,168**	**$ 5,018,714**	**$ 5,266,672**	**$ 4,627,965**	**$ 4,652,240**	**$ 4,454,913**
Target Balance	*$ 3,778,564*	*$ 3,968,058*	*$ 4,112,448*	*$ 4,218,537*	*$ 4,331,563*	*$ 4,402,834*	*$ 4,521,539*	*$ 4,641,307*	*$ 4,769,122*	*$ 4,894,169*
Days	*137*	*141*	*123*	*119*	*117*	*103*	*105*	*90*	*88*	*82*
CAPITAL										
Beginning Balance	$ 10,537,892	$ 7,549,419	$ 3,043,696	$ 4,024,493	$ 23,974	$ 3,486,772	$ 11,281	$ 1,602,603	$ 21,170	$ 1,077,321
plus: Rate Funded System Reinvestment/ Equipment Transfers	5,503,199	5,750,283	6,664,754	6,956,179	7,235,504	7,527,929	7,785,281	8,042,634	8,299,986	8,557,339
plus: Transfers from Operating Fund	-	-	-	-	-	-	-	-	-	-
plus: Grants/ Donations/ CIAC	-	-	-	-	-	-	-	-	-	-
plus: Additional Proceeds (Costs)	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000
plus: Net Debt Proceeds Available for Projects	-	-	4,650,000	-	6,750,000	-	3,450,000	-	2,400,000	-
plus: Interest Earnings	[illegible]	38,046	50,306	300	43,585	141	20,033	265	13,467	
Total Funding Sources	**$ 16,924,684**	**$ 14,025,196**	**$ 15,046,496**	**$ 11,680,978**	**$ 14,659,777**	**$ 11,708,286**	**$ 11,896,703**	**$ 10,315,270**	**$ 11,371,421**	**$ 10,298,126**
less: Capital Expenditures	[illegible]	(11,022,003)	(11,657,004)	(11,173,005)	(11,697,005)	(10,294,100)	(10,294,100)	(10,294,100)	(10,294,100)	
Ending Working Capital Balance	**$ 7,549,419**	**$ 3,043,696**	**$ 4,024,493**	**$ 23,974**	**$ 3,486,772**	**$ 11,281**	**$ 1,602,603**	**$ 21,170**	**$ 1,077,321**	**$ 4,026**
Minimum Target Balance	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
RATE STABILIZATION										
Beginning Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
plus: Transfers In	-	-	-	-	-	-	-	-	-	-
plus: Interest Earnings	-	-	-	-	-	-	-	-	-	-
less: Transfers Out	-	-	-	-	-	-	-	-	-	-
Ending Rate Stabilization Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Notes:	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Debt-to-Net Assets Ratio	**0.51**	**0.45**	**0.43**	**0.38**	**0.39**	**0.35**	**0.34**	**0.31**	**0.30**	**0.27**
Additional proceeds (costs) consist of the following:										
Facility Fees	$ 650,000	$ 650,000	$ 650,000	$ 650,000	$ 650,000	$ 650,000	$ 650,000	$ 650,000	$ 650,000	$ 650,000
BPUD Substation Contributions	-	-	-	-	-	-	-	-	-	-
2019 Bond Proceeds	-	-	-	-	-	-	-	-	-	-
[Extra line]	-	-	-	-	-	-	-	-	-	-
[Extra line]	-	-	-	-	-	-	-	-	-	-

City of Richland
Electric Cost of Service
Dashboard

Description	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Total System Load @ Meter % Adj.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Load Adjustments @ Meter (aMW)										
1) Add'l aMW (Reduction aMW)	-	-	-	-	-	-	-	-	-	-
Direct Assignment										
2) Add'l aMW (Reduction aMW)	-	-	-	-	-	-	-	-	-	-
Direct Assignment										
3) Add'l aMW (Reduction aMW)	-	-	-	-	-	-	-	-	-	-
Direct Assignment										
aMW Deficiency	(3.3)	(6.4)	(11.5)	(12.3)	(13.2)	(14.0)	(14.9)	(15.7)	(16.6)	(17.4)
Assumed Net ARHWM Purchases	11.0	12.1	11.5	12.3	13.2	13.6	14.6	15.6	16.6	17.6
Months Effective	11	11	11	11	11	11	11	11	11	11
Policy Level Increase	0.00%	0.00%	4.50%	0.00%	4.50%	0.00%	5.00%	0.00%	5.00%	0.00%
Cumulative Increses	0.00%	0.00%	4.50%	4.50%	9.20%	9.20%	14.66%	14.66%	20.40%	20.40%
Surplus (Deficiency)	$ 1,611,151	$ 503,524	$ (616,709)	$ (29,571)	$ 30,158	$ (603,454)	$ 247,959	$ (638,707)	$ 24,275	$ (197,328)
Coverage (After Increase)	2.41	2.19	2.09	2.54	2.46	2.41	2.53	2.43	2.54	2.55
Ending Capital Balance	$ 7,549,419	$ 3,043,696	$ 4,024,493	$ 23,974	$ 3,486,772	$ 11,281	$ 1,602,603	$ 21,170	$ 1,077,321	$ 4,026
Key Factors										
BPA Power Rate Increases (FFY)	0.00%	0.00%	5.00%	0.00%	5.00%	0.00%	5.00%	0.00%	5.00%	0.00%
BPA Transmission Rate Increases (FFY)	0.00%	0.00%	5.00%	0.00%	5.00%	0.00%	5.00%	0.00%	5.00%	0.00%
O&M Adjustments	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
CIP	*$ 9,375,265*	*$ 10,981,500*	*$ 11,022,003*	*$ 11,657,004*	*$ 11,173,005*	*$ 11,697,005*	*$ 10,294,100*	*$ 10,294,100*	*$ 10,294,100*	*$ 10,294,100*
Capital Adjustments	$ 139	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Depreciation Funding (% of)	90.00%	90.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Revenue Bond Proceeds	$ -	$ -	$ 4,650,000	$ -	$ 6,750,000	$ -	$ 3,450,000		$ 2,400,000	



CITY OF RICHLAND, WASHINGTON

Electric Utility Financial Statements

For the Quarter Ended
December 31, 2020

(Unaudited)

Prepared by:
Administrative Services Department

Issued on:
March 5, 2021

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY FINANCIAL STATEMENTS
December 31, 2020

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CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
December 31, 2020

Current Financial Developments

The following comments address events impacting the Electric utility's financial position. These comments clarify certain financial activity, including the environment in which the financial transactions occur.

1st Quarter

- The first quarter gross margin was $3M higher than COSA projections due to the late winter weather providing additional retail rate revenue. The YTD variance is the result of a comparison between COSA projections and actual wholesale energy. The variance was due to actual revenues being $1.3M higher than projections while actual wholesale power costs were $95K higher than projections.
- Staff has no recommendations for a rate increase in 2020. The next rate increase is tentatively being forecasted for January of 2021.
- 2020 Capital Improvement Plan (CIP) is budgeted at $14.2M with largest investments in Advanced Metering Infrastructure (AMI) of $3.8M, Horn Rapids Solar Storage Training project (HRSST) of $3.5M, Renewal & Replacements of $1.9M, new development line extensions of $1.3M and new Gateway Substation of $1.1M.
- Capital investment expenditures through March were $2.2M.
- Financial implications from the global COVID-19 pandemic are unknown in Q1 with mandatory business closures causing lower energy consumption.

2nd Quarter

- To assist with financial impacts to utilities from COVID-19, BPA suspended its Financial Reserve Policy (FRP), effective July 1st. The FRP had started to increase BPA revenues by $30M beginning October 1, 2019. The FRP is expected to resume October 1, 2022. The costs deferred for RES are approximately $50k per month or $750k until resuming.
- With unknown financial implications from COVID-19, anticipated 2020 CIP completion was reduced to $10.2M. Capital improvement expenditures January through June were $5.2M.
- On April 6th, S&P Global, a municipal bond rating agency, inquired about the consumption and revenue implications from COVID-19. Energy consumption through March was analyzed to be 12% lower than a five-year average. However, heating degree days were also 14% lower through March. Similarly, consumption for March 2020 was 7% lower than a five-year average while heating degree days were 6% lower over a five-year average. Overall energy consumption did not appear to be impacted by COVID-19 after considering heating degree days.
- On April 15th, revenue projections from COVID-19 business closures were considered. While overall energy consumption was down 1-2% after weather considerations, consumption by each rate class was showing wide variations from normal. The largest 10 commercial users typically represent 25% of total revenues and residential consumers represent 50% of total revenues. The energy consumption for the top 10 commercial users through March showed variations of down 8% for one of the top 10 to an increase of 36% for another consumer. The office space users and manufacturing facilities energy users were down with some office employees working remotely. The WA Governor's essential businesses like food processing and nuclear fuel fabrication had increased energy consumption from recent expansions compared to previous year consumption.

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
December 31, 2020

Current Financial Developments

- On May 6th, Energy consumption only for April was analyzed as it was the first complete month of business and school closures from the WA Governor's proclamations. Degree day data was not available at the time. However, overall consumption was up 9% and mixed with each rate class. With large numbers of people working from home, residential consumption was up 30%. Small general users, like gas stations, were up 3% while medium and large general commercial consumers were down 6% and 14% respectively. Large industrial rate class, users like essential food processers were up 17%. Small industrial and irrigation rate class users were not considered as it was a seasonal transition time for irrigation and historical data was skewed by recent growth in the small industrial rate class.

3rd Quarter

- Rate Schedule 90 was revised to include small cellular electric service to the existing cable TV services and to align with energy costs of small general electrical services. In 2019, the total revenue from rate schedule 90 was $43k. The addition of small cell services could have similar revenues as 5G cellular technology is deployed.
- On August 6th, S&P Global inquired on revenue and consumption impacts from COVID-19. Year to year revenue comparisons is difficult to compare because of rate increases occurring at uneven times. However, energy consumption data through July was analyzed. After normalizing for weather, overall electrical consumption January through July was up 3% compared to a five-year average and up 10% compared to 2019.
- Also, on August 6th, the City reported to S&P Global, 1392 customers were on the pending disconnect list with a total account balance of $781k. In 2019, approximately 120 customers were disconnected per week. The 1392 customers eligible for utility disconnect represent approximately 5% of the 25k customers. While the WA Governor has a moratorium preventing utility disconnects during COVID-19, the growing number of customers and the outstanding balance is financially concerning.
- Capital improvement expenditures January through September were $7.2M.

4th Quarter

- The gross margin for this reporting period is a negative $1.0 million. A gross margin calculation is the difference of actuals to projections for retail sales revenue and wholesale power expenses. Wholesale power costs are approximately 60% of total expenses and a reasonable indicator of overall actual expenses to projected expenses. While weather has a significant impact on energy consumption, the COVID-19 pandemic continues to influence consumption.
- Staff has performed a preliminary cost of service analysis (COSA) and recommends no rate increase in 2021. The next rate increase is tentatively being forecasted for January of 2022.
- The 2020 Capital Improvement Plan (CIP) closed at $9.3M, 8% lower than what was originally projected. The largest 2020 capital investments included: Advanced Metering Infrastructure (AMI) of $3.8M, Renewal & Replacements of $1.9M, new development line extensions of $1.3M and new Gateway Substation of $1.1M. AMI and the Gateway Substation project are multi-year projects. The 2021 CIP is similarly budgeted for $11M.
- In response to the COVID-19 pandemic, Washington State's Governor Inslee issued Proclamation 23-20 on March 18, 2020 preventing, in part, utility late fees and utility

Current Financial Developments

disconnects for nonpayment. Governor Inslee has continued to amend the proclamation with the latest extension through April 30, 2021. RES has monitored the number of customers and outstanding balances throughout 2020 with amounts increasing to over 1200 accounts and outstanding balances over $950k. This represents approximately 5% of electric utility customers with outstanding balances. In November 2020, City Council approved the use of CARES funding with customers requesting $503k that was applied to utility accounts.

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
December 31, 2020

Current Business Developments

The following comments address events influencing the operations of the Electric utility. These comments provide additional information not specifically addressed or identified in the financial statement presentation.

1st Quarter

- The 2019 average number of electrical customers was 24,966. RES is expected to be greater than the 25,000 average customer count in 2020. This will begin the Energy Independence Act (EIA) requirements for obtaining the 3% of renewable energy four years later.
- Average number of customers continues to increase at 1.8% while KWh increases at 0.8%.
- Worley Group Inc. began construction for the HRSST project Monday, February 24th with projected completion date of June 2020. Worley Group is partnered with Doosan for supplying the 1MW/4MWh Lithium-ion battery system which will be owned and operated by Energy Northwest. The 4MWdc solar panel installation by Tucci Energy Systems, formerly by Potelco, may complete ahead of the energy storage portion. The City has a power purchase agreement (PPA) with Tucci Energy Systems for the renewable energy generated. The renewable energy, along with a 2.2 multiplier, will largely support the City's renewable energy requirements of EIA through 2027.
- On February 28th, US Army Corp of Engineers, Bureau of Reclamation and Bonneville Power Administration (BPA) issued the Columbia River System Operations Draft Environmental Impact Statement with a preferred alternative of maintaining the four lower Snake River dams and a modified spill on the lower eight Columbia River and Snake River Federal dam projects. Litigation is expected to continue on the Federal dam projects.
- On February 29, WA Governor issued Proclamation 20-05, proclaiming a State emergency related to the coronavirus (COVID-19). On March 25th, non-essential businesses and schools were ordered closed. The City of Richland and Energy Services (RES) were identified as essential business and modified business processes to isolate operational employees across three alternating schedules and maximum use of teleworking for "non-essential" employees.
- On March 24, WA Governor issued Proclamation 20-23.1, prohibiting late fees and disconnection of utility services for non-payment.
- PNNL is breaking ground on two new research buildings. One is an Energy Sciences Laboratory (ESL) facility and the other is a Grid Storage Laboratory (GSL). Groundbreaking will be March 17th on the west side of the Biological Sciences Facility (3300 Stevens Drive).
- Over 600 out of approximately 1000 rental high-pressure sodium (HPS) lights were replaced with LED equivalents. The LED lights provide improved color recognition, reduce energy use, and reduce O&M expenses.

2nd Quarter

- In May, National Rural Electric Cooperative Association (NRECA) projected an average 6.1% load decrease in 2020 from COVID-19 impacts and an additional 6% in 2021. However, analysis of RES electrical consumption do not appear to be following national consumption patterns at this time.

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
December 31, 2020

Current Business Developments

3rd Quarter

- Reliability data through June reflects 71 outages and an increase from a total of 83 outages in 2019. Since 2006, annual outage events have continued to decrease. Reliability metrics including: SAIFI, SAIDI, CAIDI and outage location are used to prioritize future CIP renewal and replacement projects.
- At the July 14th Utility Advisory Committee (UAC) meeting, Energy Northwest presented the results of a Northwest Energy Resource Mix study by Energy Environmental & Economics (E3) which identified the optimum generation resource mix as carbon legislation impacts closure of baseload coal generation. The study indicates renewable resources need to be overbuilt about ten times with geographic diversity to achieve a usable capacity factor. The study also indicated how small modular reactors (SMR) could be a part resource optimization as a baseload generation resource.
- Council adopted an Integrated Resource Plan (IRP) on August 4th. The IRP recommended the least cost energy resources for the City as continuing to utilize BPA's Tier 1 allocation, cost effective energy efficiency projects, and market purchases of renewable or non-federal block resources.
- On September 1st, the City did an automated meter interface (AMI) project kickoff with Itron and its subcontractors. The AMI project will be an 18-24 month implementation and integration of the electric and water meter systems. The project will provide customers with energy usage information through a customer portal and will provide data for optimum infrastructure reinvestments.

4th Quarter

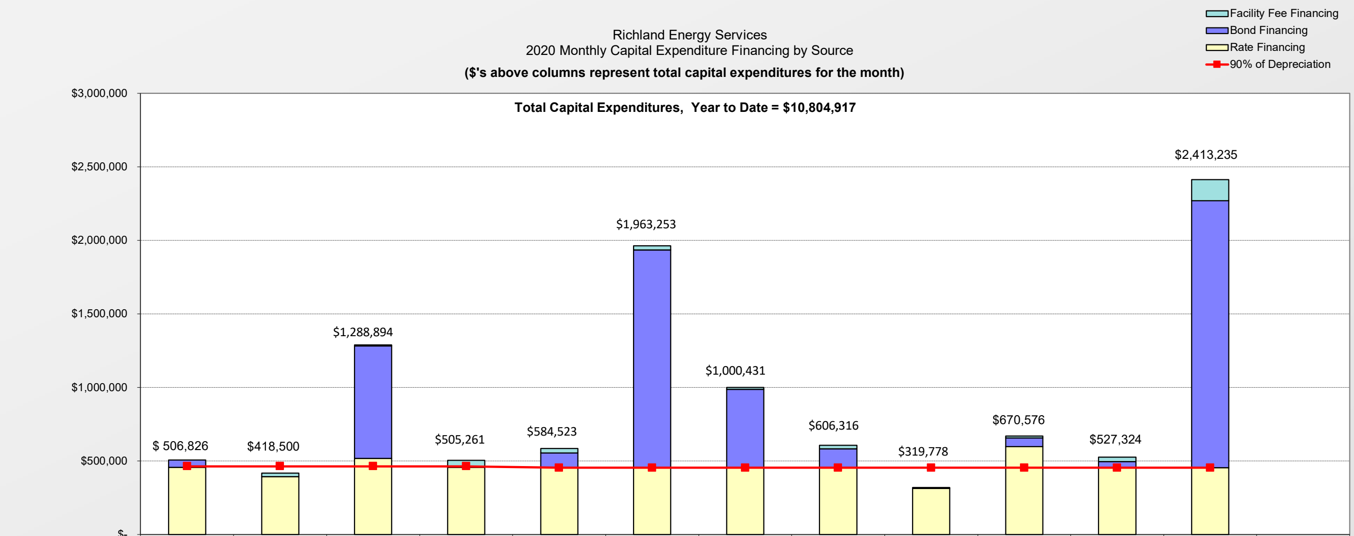
- Energy Services staff, presented to the Utility Advisory Committee (UAC) a draft energy consumption report, detailing how COVID-19 has impacted energy use and revenue. Total 2020 consumption was down 2.4% compared to the utility's five-year average. When normalized for weather, consumption was 0.6% higher than a five-year average. Consumption across customer classes was mixed with higher residential consumption and lower commercial consumption.
- Energy Services completed a 2MW block wholesale power purchase agreement on October 30, 2020 for the Federal fiscal 2022 period. The agreement transfers a purchase from Columbia REA for City of Richland use at $29.30/MW. For comparison, the forward price curve was $31.64/MW for the same period. With this agreement, the City has secured all non-Federal FY22 Tier 2 wholesale obligations at an average cost of $27.31/MW.
- Department of Energy (DOE) announced $160M of initial funding to ENW for its Advanced Reactor Demonstration Program. ENW's proposal included utility partners with TerraPower-GE Hitachi and X-energy. DOE has identified a 50/50 cost-share agreement with the goal of commercial operations by 2027. TerraPower has targeted power costs of <$40/MWh from a 336MWe facility and a salt storage option increasing capacity to 500MWe. The TerraPower project is proposed siting at ENW Site 4. The X-energy project has targeted power costs of $40-45MWh from four 80 MWe packaged reactors. The X-energy project is proposed siting at ENW Site 1.
- The Horn Rapids Solar, Storage and Training (HRSST) project had its ribbon cutting ceremony on November 10, 2020. The 4 MW solar and 1 MW energy storage project is located north of

Current Business Developments

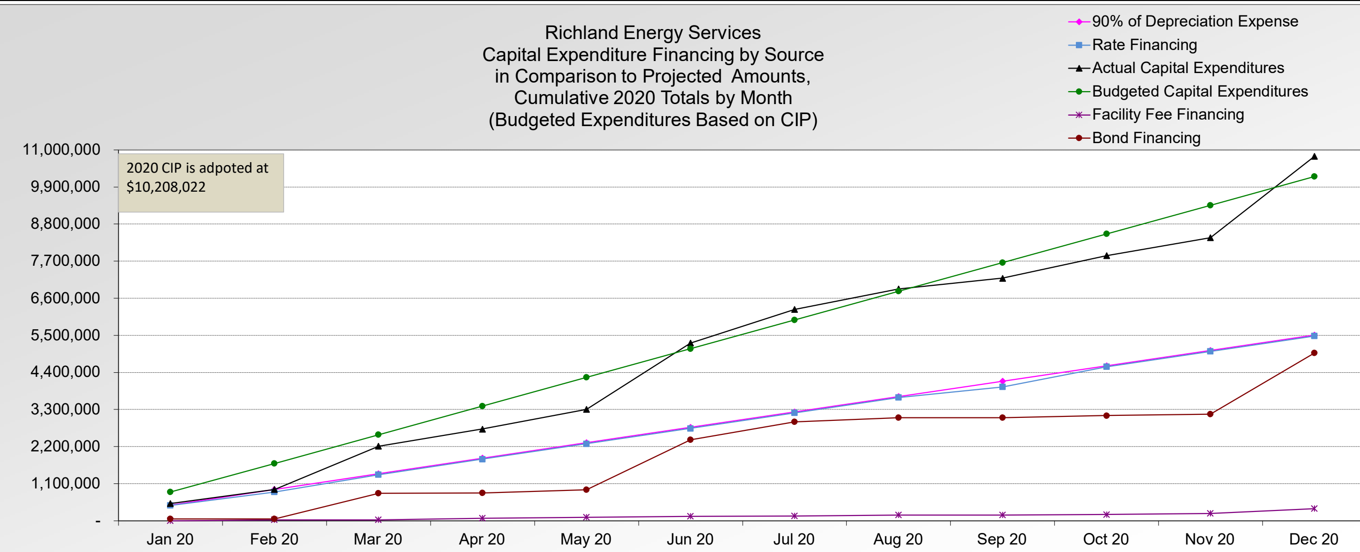
Richland and began generating October 21st. With the renewable energy obtained through a Power Purchase Agreement (PPA) with Tucci Energy, the City will meet its 3% renewable energy obligations through 2026.

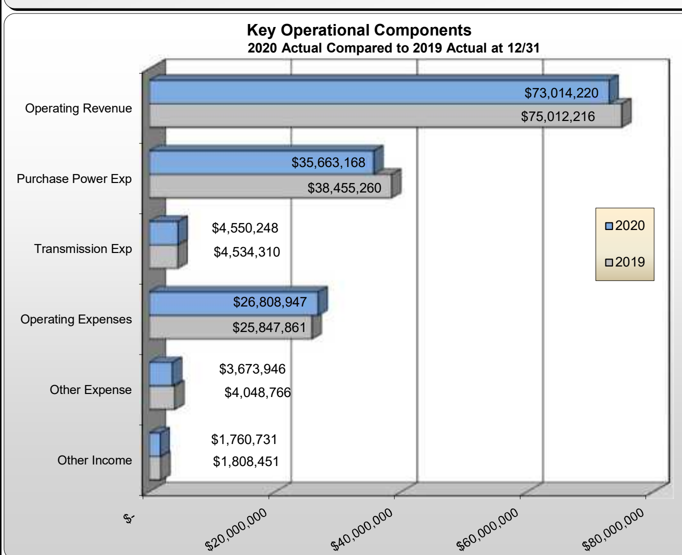
- RES is planning three new substations over the next five years. Gateway Substation will be constructed in the Horn Rapids Industrial Area to support economic development of new commercial & industrial loads and increased reliability for existing customers. Substation design started in 2020 with construction and energization planned in 2021. The second substation will be along Dallas Road to support residential and commercial growth in the Badger Mountain South area. The design stage should begin in 2023 with construction of the substation in 2024. The third substation will be to support new industrial loads in the 1,641 acres of land north of Horn Rapids Road. Design of the third substation is planned for 2024 with construction in 2025.

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY FINANCIAL TREND INFORMATION
December 31, 2020



	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	YTD
Facility Fee Financing	-	23,691	6,315	40,938	28,685	28,876	13,622	22,930	5,230	12,472	30,934	143,832	357,525
Bond Financing	50,384	-	764,505	7,881	99,396	1,477,936	530,367	126,944	-	60,588	40,768	1,813,781	4,972,550
Rate Financing	456,442	394,809	518,073	456,442	456,442	456,442	456,442	456,442	314,548	597,516	455,622	455,622	5,474,842
90% of Depreciation	464,555	464,555	464,555	464,555	455,622	455,622	455,622	455,622	455,622	455,622	455,622	455,622	5,503,196





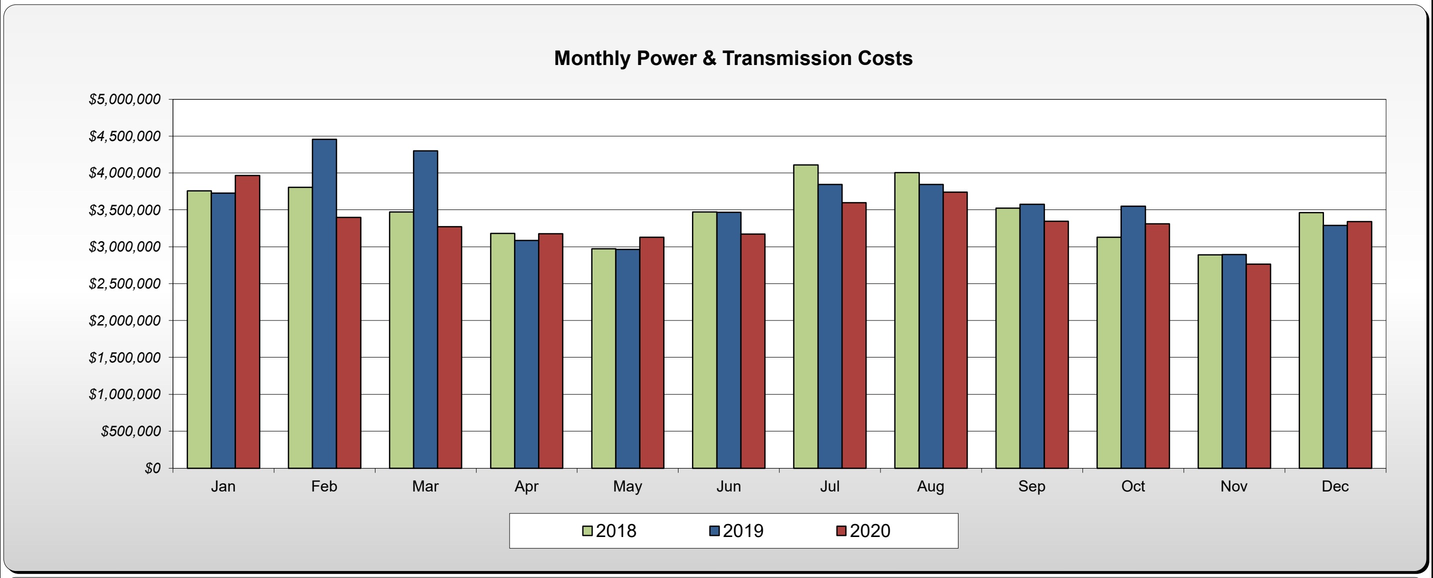
Conservation Loan Program Activity

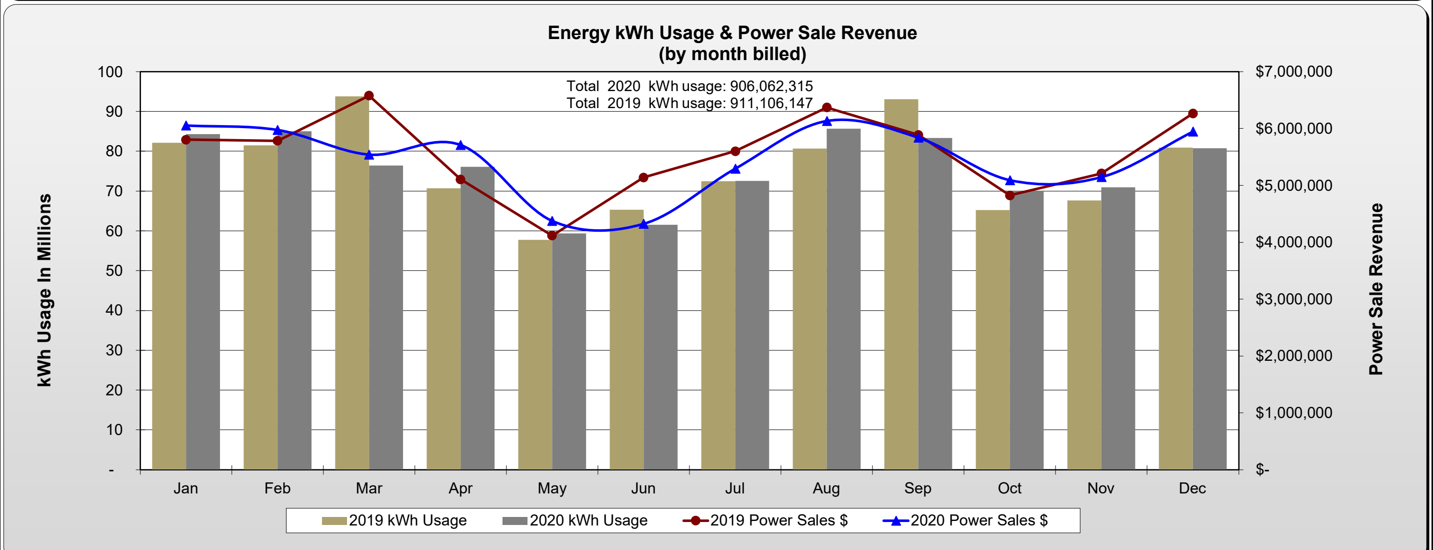
Total # Of Loans Issued Each YearThrough Current Month

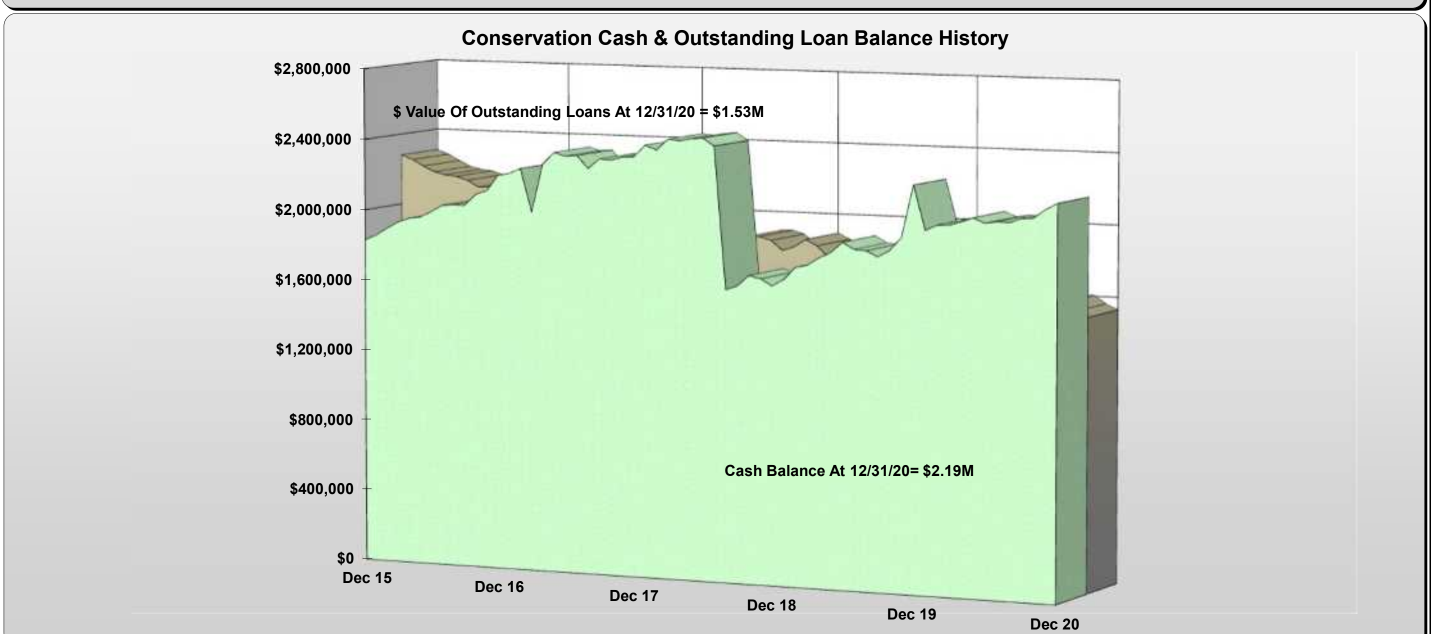
$'s represent amount of loans issued for each year as of 12/31

	2015	2016	2017	2018	2019	2020
Heat Pump	67	64	58	75	54	54
Windows	29	21	36	17	11	15
Insulation	5	5	4	5	3	3
Appliance	1	-	-	1	-	-
Total # of Loans	102	90	98	98	68	72

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY FINANCIAL TREND INFORMATION, CONTINUED
December 31, 2020

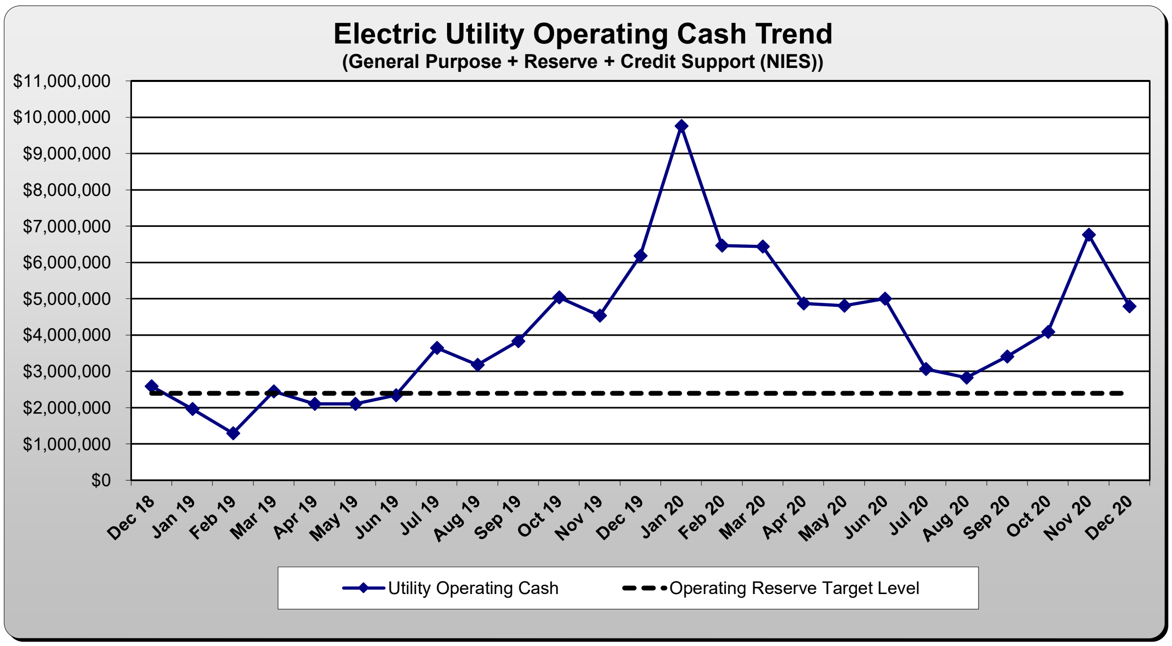


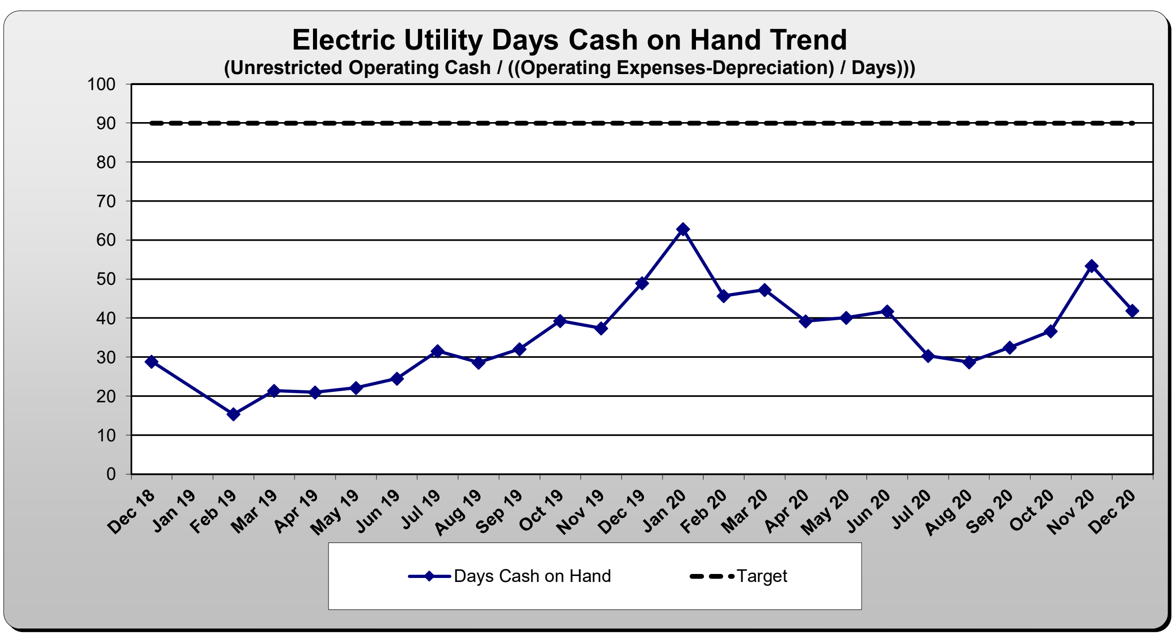




CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
CASH POSITION
December 31, 2020

	December 31, 2020	December 31, 2019
Unrestricted Cash and Investments:		
Operating Cash, General Purpose	$ 1,752,506	$ 3,145,322
Operating Cash, Reserve	2,400,000	2,400,000
Conservation Loan Cash	2,188,104	2,257,590
Credit Support Reserve Cash (NIES)	639,000	639,000
Total Unrestricted Cash and Investments:	6,979,610	8,441,912
Restricted Cash and Investments:		
Revenue Bond Proceeds	4,940,789	9,572,795
Facility Development Fees (Line Extension)	223,162	319,855
Construction Allowances Subject To Refund (Note 1)	891,642	645,242
Bond Redemption Set-Aside	1,148,908	992,523
Bond Reserve	4,963,469	5,080,677
Total Restricted Cash and Investments:	12,167,971	16,611,090
Total Cash	$ 19,147,580	$ 25,053,002





CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
COMPARATIVE BALANCE SHEET
December 31, 2020 and 2019

	2020	2019	2020 - 2019 (+/-)
ASSETS:			
Current Assets			
Cash & Cash Equivalents	$ 6,979,610	$ 7,237,352	$ (257,742)
Deposits With Third Parties	1,900	1,900	-
Investments	-	1,204,560	(1,204,560)
Receivables:			
Customer Utility Accounts, (net) (Note 8)	4,746,381	5,011,974	(265,594)
Customer Conservation Loans	2,077,480	2,178,241	(100,760)
Miscellaneous	71,083	180,430	(109,347)
Prepaid Expenses	338,028	297,503	40,525
Inventory	4,468,372	3,802,092	666,281
Total Current Assets	**18,682,854**	**19,914,051**	**(1,231,197)**
Noncurrent			
Restricted Cash	12,167,971	1,957,619	10,210,352
Restricted Investments (Note 12)	-	14,653,471	(14,653,471)
Capital:			
Land	837,428	837,428	-
Depreciable Assets (net)	728,596	733,612	(5,016)
Infrastructure	109,411,487	106,027,811	3,383,676
Construction in Progress	3,406,350	1,504,546	1,901,804
Total Capital Assets (net)	114,383,861	109,103,398	5,280,464
Total Noncurrent Assets	**126,551,832**	**125,714,488**	**837,344**
TOTAL ASSETS	**145,234,686**	**145,628,539**	**(393,853)**
DEFERRED OUTFLOWS OF RESOURCES			
Unamortized Loss - Reacquired Debt (Note 2)	212,584	244,393	(31,809)
Other Deferred Debits (Note 2)	760,500	673,007	87,493
Total Deferred Outflows of Resources	**973,084**	**917,400**	**55,684**
LIABILITIES:			
Current Liabilities			
Accounts Payable & Accrued Expenses	4,796,831	6,533,641	(1,736,809)
Due to Other Funds	-	-	-
Current Portion of Compensated Absences	384,493	331,579	52,915
Current Portion of Bond Principal Payable	3,120,000	3,045,000	75,000
Total Current Liabilities	**8,301,325**	**9,910,219**	**(1,608,895)**
Noncurrent Liabilities			
Noncurrent Portion of Compensated Absences	384,493	331,579	52,915
Revenue Bonds Payable	70,297,368	73,693,800	(3,396,432)
Unearned Revenue	835,717	781,152	54,565
Net OPEB Liability	875,687	875,687	-
Net Pension Liability	1,954,998	2,036,735	(81,737)
Total Noncurrent Liabilities	**74,348,263**	**77,718,952**	**(3,370,689)**
TOTAL LIABILITIES	**82,649,588**	**87,629,172**	**(4,979,584)**
DEFERRED INFLOWS OF RESOURCES			
Unamortized Gain - Reacquired Debt (Note 2)	5,568	5,919	(352)
Other Deferred Credits (Note 2)	802,344	1,408,287	(605,943)
Total Deferred Outflows of Resources	**807,912**	**1,414,206**	**(606,295)**
NET POSITION:			
Net Investment in Capital Assets	46,114,299	42,175,866	3,938,433
Restricted For:			
Debt Service	6,112,377	6,073,200	39,178
Capital Improvements	1,114,804	965,096	149,708
Unrestricted	9,408,790	8,288,399	1,120,390
TOTAL NET POSITION	**$ 62,750,270**	**$ 57,502,561**	**$ 5,247,709**

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
COMPARATIVE STATEMENT OF OPERATIONS
FOURTH QUARTER 2020

	Quarter Ended 12/31/2020 Actual	Quarter Ended 12/31/2019 Actual	% Variance From 2019 Actual
OPERATING REVENUES:			
Power Sales Revenue	$ 16,188,981	$ 16,299,281	-1%
Utility Occupation Tax	1,502,534	1,512,802	-1%
Other Operating Revenues (Note 3)	353,067	508,950	-31%
Total Operating Revenues	18,044,581	18,321,033	-2%
OPERATING EXPENSES:			
Power (Net of BPA REP Lookback Credit) (Note 11)	8,349,317	8,696,331	-4%
Transmission	1,067,202	1,034,525	3%
Total Purchased Power	9,416,519	9,730,856	-3%
Distribution Operations and Maintenance (O&M)			
Distribution - Operations	675,983	818,009	-17%
Distribution - Maintenance	769,872	534,951	44%
Total Distribution O&M	1,445,855	1,352,960	7%
Customer Accounting			
Meter Reading Expense	338,245	180,530	87%
Customer Records & Collections	316,211	487,551	-35%
Bad Debt Expense (Note 9)	272,109	(87,842)	410%
Total Customer Accounting	926,565	580,239	60%
Conservation & Customer Service (Note 10)	836,233	1,045,406	-20%
Administration & General	(135,956)	8,164	-1765%
Depreciation	1,518,741	1,460,888	4%
Taxes	1,858,594	1,729,104	7%
Operating Transfer to Equipment Replacement Fund	80,231	72,937	0%
Other Operating Expenses (Note 4)	1,732	2,200	-21%
Total Non-Power Operating Expenses	6,531,994	6,251,898	4%
Total Operating Expenses	15,948,513	15,982,754	0%
OPERATING INCOME (LOSS):	**2,096,068**	**2,338,279**	**-10%**
OTHER INCOME:			
Interest Income	31,461	112,502	-72%
Gain / (Loss) on Fair Market Value (FMV) Adjustment	-	147,001	-100%
Other Income (Note 5)	571,466	278,779	105%
City Shops Rental	-	-	NA
Total Other Income:	602,928	538,282	**12%**
OTHER EXPENSE:			
Interest on Long-Term Debt	743,665	738,836	1%
Debt Issuance Expense	-	243,218	-100%
Amortization of Bond Discount / Premium	(69,108)	(42,977)	-61%
Amortization of Loss on Reacquired Debt	7,864	6,682	18%
Other Expenses (Note 6)	187,495	279,594	-33%
Total Other Expense:	869,916	1,225,353	-29%
NET INCOME (LOSS) BEFORE CAPITAL CONTRIBUTIONS AND TRANSFERS	**1,829,080**	**1,651,208**	**11%**
Capital Contributions - Facility Development Fees (Note 7)	639,499	655,628	-2%
Transfers From General Fund	-	-	NA
Transfers To Broadband Fund	(7,500)	(7,500)	0%
Total of Capital Contributions and Transfers to Other Funds	631,999	648,128	-2%
CHANGE IN NET POSITION BEFORE PRIOR PERIOD ADJUSTMENTS	**2,461,079**	**2,299,335**	**7%**
Prior Period Adjustments	-	-	
CHANGE IN NET POSITION	**$ 2,461,079**	**$ 2,299,335**	**7%**

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
COMPARATIVE STATEMENT OF OPERATIONS
December 31, 2020

	12/31/2020 Actual	12/31/2019 Actual	% Variance From 2019 Actual
OPERATING REVENUES:			
Power Sales Revenue	$ 65,459,120	$ 66,690,130	-2%
Utility Occupation Tax	6,076,466	6,190,982	-2%
Other Operating Revenues (Note 3)	1,478,633	2,131,104	-31%
Total Operating Revenues	73,014,220	75,012,216	-3%
OPERATING EXPENSES:			
Power (Net of BPA REP Lookback Credit) (Note 11)	35,663,168	38,455,260	-7%
Transmission	4,550,248	4,534,310	0%
Total Purchased Power	40,213,416	42,989,570	-6%
Distribution Operations and Maintenance (O&M)			
Distribution - Operations	3,510,361	3,524,636	0%
Distribution - Maintenance	2,869,150	2,205,462	30%
Total Distribution O&M	6,379,510	5,730,099	11%
Customer Accounting			
Meter Reading Expense	882,994	564,789	56%
Customer Records & Collections	1,181,514	1,686,648	-30%
Bad Debt Expense (Note 9)	365,259	(4,952)	7476%
Total Customer Accounting	2,429,766	2,246,486	8%
Conservation & Customer Service (Note 10)	1,396,233	1,894,704	-26%
Administration & General	1,813,024	1,307,446	39%
Depreciation	6,114,666	5,878,747	4%
Taxes	8,348,663	8,491,948	-2%
Operating Transfer to Equipment Replacement Fund	320,922	291,748	10%
Other Operating Expenses (Note 4)	6,163	6,684	-8%
Total Non-Power Operating Expenses	26,808,947	25,847,861	4%
Total Operating Expenses	67,022,363	68,837,431	-3%
OPERATING INCOME (LOSS):	**5,991,857**	**6,174,785**	**-3%**
OTHER INCOME:			
Interest Income	265,409	433,934	-39%
Gain / (Loss) on Fair Market Value (FMV) Adjustment	-	147,001	-100%
Other Income (Note 5)	1,495,322	1,227,516	22%
City Shops Rental	-	-	NA
Total Other Income:	1,760,731	1,808,451	**-3%**
OTHER EXPENSE:			
Interest on Long-Term Debt	3,055,031	3,015,654	1%
Debt Issuance Expense	-	243,218	-100%
Amortization of Bond Discount / Premium	(276,432)	(171,909)	-61%
Amortization of Loss on Reacquired Debt	31,458	26,726	18%
Other Expenses (Note 6)	863,890	935,076	-8%
Total Other Expense:	3,673,946	4,048,766	-9%
NET INCOME (LOSS) BEFORE CAPITAL CONTRIBUTIONS AND TRANSFERS	**4,078,642**	**3,934,470**	**4%**
Capital Contributions - Facility Development Fees (Note 7)	1,199,067	1,149,766	4%
Transfers From General Fund	-	-	NA
Transfers To Broadband Fund	(30,000)	(30,000)	0%
Total of Capital Contributions and Transfers to Other Funds	1,169,067	1,119,766	4%
CHANGE IN NET POSITION BEFORE PRIOR PERIOD ADJUSTMENTS	**5,247,709**	**5,054,237**	**4%**
Prior Period Adjustments	-	159,609	
CHANGE IN NET POSITION	**$ 5,247,709**	**$ 5,213,846**	**1%**

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
MONTHLY STATEMENT OF OPERATIONS
CY 2020 ACTUAL

	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Total
OPERATING REVENUES:													
Power Sales Revenue	$ 6,052,935	$ 5,975,434	$ 5,543,703	$ 5,714,009	$ 4,379,436	$ 4,328,189	$ 5,297,712	$ 6,135,205	$ 5,843,517	$ 5,093,429	$ 5,147,660	$ 5,947,891	$ 65,459,120
Utility Occupation Tax	562,005	554,762	514,652	530,081	406,497	401,734	491,801	569,609	542,793	472,636	477,884	552,013	6,076,466
Other Operating Revenues (Note 3)	[illegible]	176,343	21,854	33,885	43,687	222,075	194,587	89,220	81,252	72,696	199,119	1,478,633	
Total Operating Revenues	**[illegible]**	**6,234,698**	**6,265,945**	**4,819,818**	**4,773,609**	**6,011,588**	**6,899,401**	**6,475,530**	**5,647,317**	**5,698,240**	**6,699,023**	**73,014,220**	
OPERATING EXPENSES:													
Power (Net of BPA REP Lookback Credit) (Note 11)	3,515,094	3,007,899	2,956,942	2,877,251	2,794,687	2,768,413	3,161,166	3,259,504	2,972,895	2,997,083	2,426,622	2,925,612	35,663,168
Transmission	[illegible]	316,607	300,002	333,490	404,062	437,520	479,851	372,835	313,540	338,437	415,225	4,550,248	
Total Purchased Power	[illegible]	3,273,549	3,177,253	3,128,177	3,172,475	3,598,686	3,739,355	3,345,730	3,310,623	2,765,059	3,340,837	40,213,416	
Distribution Operations and Maintenance (O&M)													
Distribution - Operations	270,656	376,851	398,021	414,805	267,866	288,428	255,763	296,474	265,514	356,485	293,216	26,282	3,510,361
Distribution - Maintenance	[illegible]	141,269	266,017	293,020	270,152	274,294	276,785	252,441	305,358	284,266	180,248	2,869,150	
Total Distribution O&M	[illegible]	539,290	680,823	560,886	558,581	530,057	573,260	517,955	661,843	577,482	206,530	6,379,510	
Customer Accounting													
Meter Reading Expense	43,275	43,338	52,611	71,806	57,959	69,271	72,477	70,414	63,596	80,897	94,298	163,051	882,994
Customer Records & Collections	136,747	152,072	135,578	107,384	104,222	(83,452)	103,980	104,182	104,589	105,107	104,164	106,939	1,181,514
Bad Debt Expense (Note 9)	10,350	10,350	10,350	10,350	10,350	10,350	10,350	10,350	10,350	10,350	251,409	365,259	
Total Customer Accounting	[illegible]	198,539	189,540	172,531	(3,831)	186,807	184,946	178,536	196,354	208,812	521,399	2,429,766	
Conservation & Customer Service (Note 10)	44,265	145,988	72,519	35,149	31,020	71,293	52,944	69,287	37,535	127,763	45,880	662,589	1,396,233
Administration & General	350,217	223,928	192,213	200,685	199,624	237,292	182,726	173,453	188,842	211,571	174,619	(522,146)	1,813,024
Depreciation	516,173	516,173	516,173	516,173	506,247	506,247	506,247	506,247	506,247	506,247	506,247	506,247	6,114,666
Taxes	807,372	810,225	850,791	775,865	585,614	582,536	706,953	825,813	544,902	474,123	583,728	800,743	8,348,663
Operating Transfer to Equipment Replacement Fund	26,744	26,744	26,744	26,744	26,744	26,744	26,744	26,744	26,744	26,744	26,744	26,744	320,922
Other Operating Expenses (Note 4)	1,474	478	477		700		410	892	364		1,368	6,163	
Total Non-Power Operating Expenses	[illegible]	2,396,746	2,425,455	2,082,664	1,979,560	2,192,476	2,360,159	2,001,652	2,205,009	2,123,511	2,203,475	26,808,947	
Total Operating Expenses	**[illegible]**	**5,670,295**	**5,602,708**	**5,210,842**	**5,152,035**	**5,791,162**	**6,099,514**	**5,347,382**	**5,515,632**	**4,888,570**	**5,544,312**	**67,022,363**	
OPERATING INCOME (LOSS):	**[illegible]**	**564,403**	**663,238**	**(391,024)**	**(378,426)**	**220,426**	**799,887**	**1,128,148**	**131,686**	**809,671**	**1,154,712**	**5,991,857**	
OTHER INCOME :													
Interest Income	43,333	46,408	41,366	25,479	13,353	22,738	15,246	14,551	11,477	15,248	6,545	9,669	265,409
Gain / (Loss) on Fair Market Value (FMV) Adjustment	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Income (Note 5)	36,335	86,599	38,454	109,919	23,082	42,734	31,548	106,780	448,404	210,828	45,943	314,695	1,495,322
City Shops Rental	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Other Income	**[illegible]**	**79,820**	**135,397**	**36,435**	**65,471**	**46,794**	**121,331**	**459,880**	**226,076**	**52,488**	**324,364**	**1,760,731**	
OTHER EXPENSE :													
Interest on Long-Term Debt	259,983	259,983	259,983	259,983	254,287	254,287	254,287	254,287	254,287	254,287	244,689	244,689	3,055,031
Debt Issuance Expense	-	-	-	-	-	-	-	-	-	-	-	-	-
Amortization of Bond Discount / Premium	(23,036)	(23,036)	(23,036)	(23,036)	(23,036)	(23,036)	(23,036)	(23,036)	(23,036)	(23,036)	(23,036)	(23,036)	(276,432)
Amortization of Loss on Reacquired Debt	2,621	2,621	2,621	2,621	2,621	2,621	2,621	2,621	2,621	2,621	2,621	2,621	31,458
Other Expenses (Note 6)	[illegible]	69,698	90,036	81,738	80,102	69,457	68,254	70,217	98,794	59,614	29,087	863,890	
Total Other Expense:	**[illegible]**	**309,266**	**329,604**	**315,610**	**313,974**	**303,329**	**302,126**	**304,089**	**332,666**	**283,888**	**253,362**	**3,673,946**	
NET INCOME (LOSS) BEFORE CAPITAL CONTRIBUTIONS AND TRANSFERS	**[illegible]**	**334,957**	**469,031**	**(670,199)**	**(626,929)**	**(36,109)**	**619,091**	**1,283,940**	**25,095**	**578,270**	**1,225,714**	**4,078,642**	
Capital Contributions - Facility Development Fees (Note 7)	39,818	46,649	36,401	81,277	17,986	122,794	67,351	12,790	134,502	24,288	3,343	611,868	1,199,067
Transfers To Broadband Fund	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(30,000)	
Total of Capital Contributions and Transfers to Other Funds	[illegible]	33,901	78,777	15,486	120,294	64,851	10,290	132,002	21,788	843	609,368		**1,169,067**
CHANGE IN NET POSITION BEFORE PRIOR PERIOD ADJUSTMENTS	**[illegible]**	**368,858**	**547,808**	**(654,713)**	**(506,635)**	**28,741**	**629,382**	**1,415,942**	**46,883**	**579,114**	**1,835,082**	**5,247,709**	
Prior Period Adjustments	-	-	-	-	-	-	-	-	-	-	-	-	-
CHANGE IN NET POSITION	**$ [illegible]**	**$ 368,858**	**$ 547,808**	**$ (654,713)**	**$ (506,635)**	**$ 28,741**	**$ 629,382**	**$ 1,415,942**	**$ 46,883**	**$ 579,114**	**$ 1,835,082**	**$ 5,247,709**	**$**

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
STATEMENT OF CASH FLOWS
December 31, 2020

	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Year To Date
Cash Flows From Operating Activities													
Receipts from power sales to customers	$ 7,265,520	$ 6,618,786	$ 6,273,325	$ 5,930,088	$ 5,642,553	$ 4,454,315	$ 4,898,639	$ 6,271,756	$ 6,115,495	$ 6,496,156	$ 5,011,996	$ 6,589,150	$ 71,567,780
Other operating cash receipts	182,154	280,171	256,156	132,647	98,900	92,217	273,829	187,903	557,770	369,760	171,882	303,534	2,906,922
Receipts from interfund rents and services	-	-	-	-	-	-	-	-	-	-	-	-	-
Other cash payments	-	-	-	-	-	-	-	-	-	-	-	-	-
Payments for power	(2,944,289)	(3,510,136)	(3,017,815)	(2,963,856)	(2,882,209)	(2,794,687)	(2,775,920)	(3,169,648)	(3,251,055)	(2,974,458)	(163,095)	(5,266,527)	(35,713,696)
Payment for transmission	(344,146)	(449,939)	(388,740)	(316,607)	(300,002)	(333,490)	(404,062)	(437,520)	(479,851)	(372,835)	-	(651,977)	(4,479,169)
Payments to suppliers	1,096,658	(4,391,321)	(1,290,442)	(2,535,028)	(794,650)	252,102	(2,081,631)	(1,221,004)	(641,619)	(846,039)	(508,357)	(897,973)	(13,859,304)
Payments for utility tax	(562,270)	(555,067)	(512,041)	(533,667)	(406,804)	(402,043)	(492,109)	(569,909)	(542,836)	(473,116)	(478,171)	(552,492)	(6,080,525)
Payments to employees	(74,472)	(85,142)	(38,408)	(80,853)	(59,341)	(41,883)	(83,224)	(77,738)	(85,665)	(179,475)	(85,725)	(158,938)	(1,050,864)
Payments for interfund services	(300,003)	(269,903)	(284,719)	(218,631)	(290,666)	11,303	(300,620)	(246,348)	(171,819)	(209,778)	(271,032)	(153,525)	(2,705,739)
Net Cash Provided (Used) by Operating Activities	**4,319,153**	**(2,362,551)**	**997,316**	**(585,906)**	**1,007,781**	**1,237,834**	**(965,098)**	**737,492**	**1,500,419**	**1,810,216**	**3,677,498**	**(788,749)**	**10,585,405**
Cash Flows From Noncapital Financing Activities													
Interfund Loan Repayments Received	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer (to) / from Broadband Fund (Note 13)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(30,000)
Transfer (to) / from General Fund (Note 13)	-	-	-	-	-	-	-	-	-	-	-	-	-
Transfer (to) / from Industrial Development (Note 13)	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash Used by Noncapital Financing Activities	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(2,500)**	**(30,000)**
Cash Flows From Capital and Related Financing Activities													
Proceeds from Issuance of Debt	-	-	-	-	-	-	-	-	-	-	-	-	-
Bond Issuance costs (Paid) Refunded	-	-	-	-	-	-	-	-	-	-	-	-	-
Unrealized Gain/(Loss) on Investments	-	-	-	-	-	-	-	-	-	-	-	-	-
Principal Paid on Long-Term Debt	-	-	-	-	-	-	-	-	-	-	(3,045,000)	-	(3,045,000)
Interest Paid on Long-Term Debt	-	-	-	-	(1,434,590)	-	-	-	-	-	(1,525,722)	-	(2,960,313)
Capital Contributions	39,818	46,649	36,401	81,277	17,986	122,794	67,351	12,790	134,502	24,288	3,343	21,654	608,854
Deferred Capital Contributions	27,600	12,000	-	-	-	118,800	-	22,200	66,000	-	-	-	246,600
Capital Contributions Refunded	-	-	-	(187,001)	-	-	-	-	-	-	-	-	(187,001)
Sale of Land	-	3,837	-	-	-	-	-	-	-	-	1,917	-	5,754
Acquisition and Construction of Capital Assets	(506,826)	(418,500)	(1,288,894)	(505,261)	(584,523)	(1,963,253)	(1,000,431)	(606,316)	(319,778)	(670,576)	(527,324)	(3,003,448)	(11,395,129)
Net Cash Provided (Used) by Capital and Related Financing Activities	**(439,408)**	**(356,014)**	**(1,252,493)**	**(610,985)**	**(2,001,127)**	**(1,721,660)**	**(933,080)**	**(571,326)**	**(119,276)**	**(646,288)**	**(5,092,786)**	**(2,981,794)**	**(16,726,236)**
Cash Flows From Investing Activities													
Interest Received on Investments	43,333	46,408	41,366	25,479	13,353	22,738	15,246	14,551	11,477	15,248	6,545	9,669	265,409
Premium Received on Investments	-	-	-	-	-	-	-	-	-	-	-	-	-
Investments Sold *	15,219,031	-	-	-	-	-	-	-	-	-	-	-	15,219,031
Investments Purchased *	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash Provided (Used) by Investing Activities	**15,262,364**	**46,408**	**41,366**	**25,479**	**13,353**	**22,738**	**15,246**	**14,551**	**11,477**	**15,248**	**6,545**	**9,669**	**15,484,440**
Net Change in Cash and Cash Equivalents	**19,139,609**	**(2,674,657)**	**(216,311)**	**(1,173,913)**	**(982,493)**	**(463,588)**	**(1,885,433)**	**178,216**	**1,390,120**	**1,176,676**	**(1,411,243)**	**(3,763,374)**	**9,313,610**
Cash and Cash Equivalents at Beginning of Period	**9,833,971**	**28,973,580**	**26,298,923**	**26,082,611**	**24,908,699**	**23,926,206**	**23,462,618**	**21,577,185**	**21,755,401**	**23,145,522**	**24,322,197**	**22,910,955**	**9,833,971**
Cash and Cash Equivalents at End of Period	**$ 28,973,580**	**$ 26,298,923**	**26,082,611**	**$ 24,908,699**	**$ 23,926,206**	**$ 23,462,618**	**$ 21,577,185**	**$ 21,755,401**	**$ 23,145,522**	**$ 24,322,197**	**$ 22,910,955**	**$ 19,147,580**	**$ 19,147,580**
												-	
Reconciliation of Operating Income to Net Cash Provided (Used) by Operating Activities													
Net Operating Income	$ 367,260	$ 921,877	$ 564,403	$ 663,238	$ (391,024)	$ (378,426)	$ 220,426	$ 799,887	$ 1,128,148	$ 131,686	$ 809,671	$ 1,154,712	$ 5,991,857
Adjustments to reconcile net operating income to net cash provided by operating activities:													
Depreciation & Amortization	516,173	516,173	516,173	516,173	506,247	506,247	506,247	506,247	506,247	506,247	506,247	506,247	6,114,666
Accrued Pension Expense	-	-	-	-	-	-	-	-	-	-	-	(775,173)	(775,173)
Other Income, Net	(32,691)	4,894	(31,244)	19,883	(58,655)	(37,368)	(37,908)	38,526	378,187	112,034	(15,587)	875,822	1,215,893
Changes in operating assets and liabilities:													
(Increase) / Decrease in Receivables	662,504	44,117	203,328	(253,771)	909,510	(328,163)	(895,740)	(538,414)	(128,202)	993,475	(564,621)	371,677	475,701
(Increase) / Decrease in Inventory	(28,930)	226,792	(235,092)	(842,911)	(82,297)	(3,653)	(209,180)	(44,856)	(4,393)	262,344	130,065	165,829	(666,281)
(Increase) / Decrease in Prepaid Expenses	(121,683)	6,122	10,874	11,081	11,740	6,122	16,039	2,599	2,655	11,081	6,067	(3,223)	(40,525)
Increase / (Decrease) in Power & Transmission AP	658,189	(558,478)	(132,800)	(103,210)	(54,034)	49,256	413,746	140,669	(388,667)	(36,630)	2,595,964	(2,577,667)	6,338
Increase / (Decrease) in Accounts Payable	2,308,809	(3,549,946)	76,536	(620,310)	67,887	1,177,326	(1,022,584)	(253,324)	(24,813)	(173,787)	163,528	(35,813)	(1,886,491)
Increase / (Decrease) in Accrued Wages	(5,208)	-	-	-	-	-	-	-	-	-	-	159,662	154,454
Increase / (Decrease) in Unearned Facility Fees	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Increase / (Decrease) in Prepaid Leases	-	-	-	-	-	-	-	-	-	-	-	(5,034)	(5,034)
(Increase) in Expired Construction Allowances (Note 1)	-	-	-	-	-	-	-	-	-	-	-	-	-
(Increase) / Decrease in Deferred Charges	(5,269)	25,898	25,137	23,921	98,407	246,493	43,856	86,158	31,257	3,767	46,164	(625,788)	0
Prior Period Adjustments	-	-	-	-	-	-	-	-	-	-	-	- -	-
Net Cash Provided (Used) by Operating Activities	**$ 4,319,153**	**$ (2,362,551)**	**$ 997,316**	**$ (585,906)**	**$ 1,007,781**	**$ 1,237,834**	**$ (965,098)**	**$ 737,492**	**$ 1,500,419**	**$ 1,810,216**	**$ 3,677,498**	**$ (788,749)**	**$ 10,585,405**
Contribution of Capital Assets	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 590,214**	**$ 590,214**

* The Electric Utility's cash is invested along with the City's cash in pooled investments. Pooled cash and investments are maintained in a separate fund for investment and are shown in individual funds as purchased on December 31 and sold on January 1
The rest of the year pooled cash and investments are shown as a component of cash and cash equivalents on interim cash flow statements.

1. The construction allowance is the portion of line extension costs paid for by the Utility, assuming the expected number of permanent connections to the system result. The developer bears the full cost of the line extension up front, and the Utility pays its portion by refunding the developer based on the number of permanent connections to the line extension over a five-year period.

   The refundable portion of fees collected is a deposit to guarantee connections to the line extension. Deposits are not characterized as revenue. Instead, a Deferred Revenue: Facility Fee Deposits account is included in the liability section of the balance sheet to offset the cash balance of these potentially refundable amounts. Five years from the date the line extension is energized, unused deposits expire and are recognized as revenue.

   Reported separately from these traditional line extension projects are large, customer requested projects, facilitating customer specific needs as opposed to improvements to the utility system as a whole. Customer payments are received in advance and are recorded as Facility Development Fees - Large Projects with an offset to Unearned Facility Fee Revenue. Cash is depleted and fees are reclassified as revenue when expenses are incurred by the Utility.

   Year-to-date facility fees collected from customers totaled $855,454 of which $608,854 was recognized as revenue and $246,600 represents refundable construction allowances recorded as unearned revenue.

2. Deferred outflows of resources represent expenses of the Utility that apply to future periods. The primary purpose of the deferred outflow of resources accounts is to accumulate expenditures that are to be recognized in future periods or allocated to more than one account number. Deferred outflow of resources includes unamortized loss on reacquired bond debt. Other Deferred Debits includes clearing accounts that are used to hold warehousing, overhead, and equipment costs pending final allocation.

   GASB Statement 68, *Accounting and Financial Reporting for Pensions*, requires reporting the fund's proportionate share the State's retirement plan net pension assets and liabilities. Other Deferred Debits also includes contributions after the State retirement plan measurement date and Other Deferred Credits include the net difference between projected and actual investments earnings on pension plan investments.

3. Other Operating Revenue includes the items listed below, with year-to-date comparisons to the prior year.

Other Operating Revenue YTD Through:	December 2020	December 2019	Difference
Permanent Service Fees	$ 262,275	$ 244,437	$ 17,838
New Account Fees	85,695	82,035	3,660
Rewire / Charges to Repair Damage	63,059	69,571	(6,512)
Delinquent Account Fees	56,699	338,353	(281,654)
Disconnect Fees	50,092	242,239	(192,147)
Pole Contracts	100,864	100,864	-
BPA - Conservation Program (EEI)	692,908	919,488	(226,580)
Other	167,042	134,117	32,925
Total Other Operating Revenue	$ 1,478,633	$ 2,131,104	$ (652,470)

4. Other Operating Expenses as reported on the Comparative Statement of Operations consist of power costs paid to Benton PUD for three customer accounts provided power through the Benton PUD system.

5. Other Income as reported on the Comparative Statement of Operations includes Federal interest subsidies received relative to 2009 Build America Bonds issued as well as the following revenue sources:

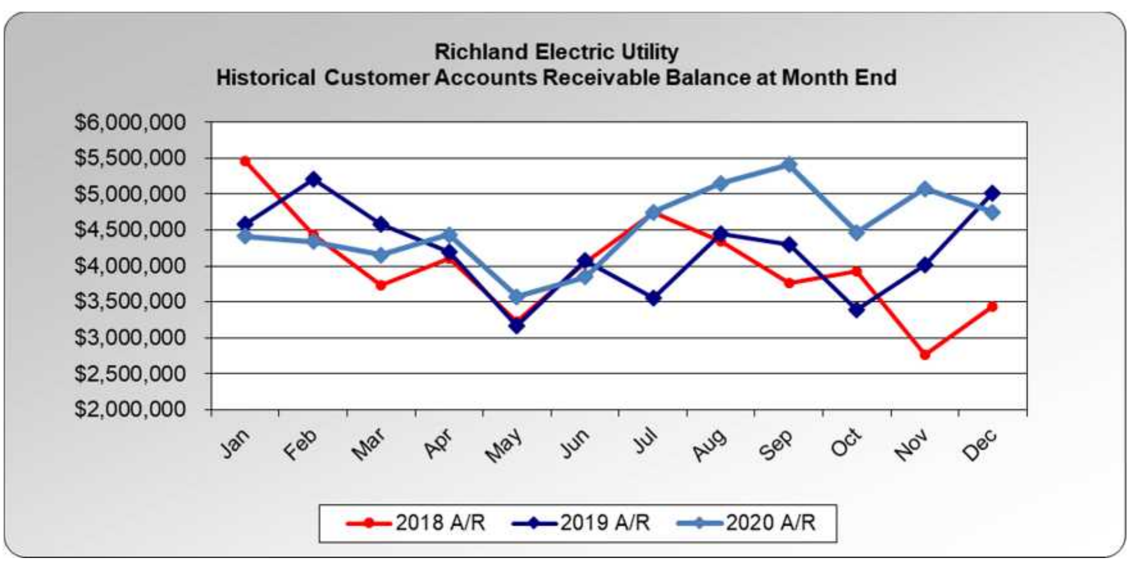
Other Income YTD Through:	December 2020	December 2019	Difference
Interest Collected on Conservation Loan Payments	$ 51,894	$ 57,290	$ (5,396)
BPA - Conservation Admin Fee	158,640	49,929	108,711
Meter Reading Revenue	244,374	280,715	(36,341)
Work Performed for City Departments	494,482	577,174	(82,691)
Gain / (Loss) on Land sales and Disposition of Assets	20,825	73,407	(52,583)
COVID Assistance	519,127	-	519,127
Other	5,981	189,001	(183,020)
Total Other Income	$ 1,495,322	$ 1,227,516	$ 267,806

Other Income also includes revenues allocated to the Electric Utility for its share of Horn Rapids Industrial Park sale proceeds. In 1982, work was undertaken by the City to develop the Horn Rapids Industrial Park, Phase One. Proceeds from the sale of land at Horn Rapids Industrial Park are allocated to City Utility Funds from the Industrial Development Fund based on each utility's proportionate share of total improvement costs. The remaining maximum reimbursement due to the Electric Utility, contingent upon sale of Horn Rapids Industrial Park Phase One property as of December 2020 is $154,960.

6. The Other Expenses reported on the Comparative Statement of Operations includes the cost of Non-Electric Utility Operations work. Some of the Non-Utility Operations costs are those charged to other City departments through the Interdepartmental Billing (IDB) process.

7. The Electric Utility recognized $49,285 in facility development fee revenue (capital contributions) in the fourth quarter of 2020. According to Governmental Accounting Standard Board (GASB) Statement No. 33, capital contributions from external sources are to be recognized as revenue in the current year rather than as a direct increase to contributed capital. Year-to-date facility development fee revenue of $608,853 is comprised of fees paid during the year.

8. The outstanding utility accounts receivable balance, net of allowance for doubtful accounts at December 31, 2020, is $4,746,381. This represents a $665,952 decrease from the previous quarter. The following graph presents month-end customer accounts receivable balances during the last three calendar years.



Write-offs, recoveries, and accounts receivable balances for the year-to-date, with prior year comparisons are as follows:

Accounts Receivable YTD Through:	December 2020	December 2019	Difference
Write-Offs	$ 216,422	$ 70	$ 216,353
Recoveries	12,573	8,259	4,314
Balance	$ 4,746,381	$ 5,011,974	$ (265,594)

9. Customer Accounting Expense includes bad debt expense. Customer accounts receivable are written off using the allowance method as prescribed by generally accepted accounting principles. Under this method, the projected uncollectible portion of customer accounts receivable is presented on the balance sheet based on a study of prior years' actual write-offs. Uncollectible accounts are written off against this estimated allowance rather than to bad debt expense. The monthly expense is 1/12 of the estimated annual allowance. Periodically, actual write-offs as a percentage of billings are analyzed, and the allowance is adjusted with an offset to bad debts expense, or the monthly entry may be temporarily suspended if the allowance becomes too high.

10. Conservation expenses may vary greatly from month-to-month and from budgeted amounts, as expenses for conservation supplies, educational materials, and payment of incentives to customers do not follow a regular schedule. In the fourth quarter of 2020, a total of $769,280 was spent on ductless heat pumps, windows, insulation and conservation programs. Year-to-date expenses on conservation measures total $1,186,296.

11. In 2008, the Electric Utility received Residential Exchange Program (REP) payments totaling $3,662,901 from the Bonneville Power Administration (BPA) as part of a return to public utilities of wholesale power overcharges during fiscal years 2007-2008. An additional payment of $204,686 was received in November 2009. Between May 2009 and June 2010 $3,740,631 of the proceeds were utilized to reduce customers' bills through a monthly billing credit program. Due to the nature of the billing schedule and billing software design, an exact cutoff of the credit sufficient to bring the balance to zero was not possible.

    In addition to the above payments, BPA applies a "look-back" credit to Richland's monthly wholesale power bills. This is a return of overcharges related to the REP program in years prior to 2007. These billing credits reimburse for overcharges during fiscal years 2001-2006. Following recent industry negotiations, the monthly credit changed from $98,575 to $98,427 and should remain at this level through September 2020. The related settlement agreement resolves issues associated with overcharge reimbursement while limiting the amount of REP payments to Investor Owned Utilities (IOUs). The look-back credit is reported as a net of purchased power to be consistent.

12. Bond ordinances require either maintenance of a cash Bond Reserve or purchase of bond insurance with an AAA rated provider in order to ensure debt is serviced in the event of financial hardship. The utility has historically purchased bond sureties to fulfill this requirement. However, due to the current economic climate, none of the surety companies currently enjoy an AAA rating. As a result, the utility funded a Bond Reserve, in 2008, in order to stay in compliance until the bond surety companies' ratings recover. The bond reserve was initially funded using $993,000 in Facility Fee cash and $2,111,575 in unrestricted cash. The amount of the bond reserve is adjusted annually and when additional debt is issued.

13. Monthly transfers to the Broadband Fund are presented in the financial statements as non-operating transfers to other funds.

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
COMPARATIVE MONTHLY ENERGY ACTIVITY
FOR THE PERIOD ENDED
December 2020

REVENUES: (Net of Utility Tax)	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Total To Date	Budget	Variance	% Budget Variance
Residential	$ 3,430,344	$ 2,937,380	$ 2,890,161	$ 2,895,011	$ 1,932,574	$ 1,768,945	$ 2,490,279	$ 3,070,007	$ 2,616,087	$ 2,263,776	$ 2,317,219	$ 3,195,076	$ 31,806,860	$ 26,047,015	$ 5,759,845	22%
Small General Service	587,653	596,507	525,053	500,706	391,243	422,708	491,882	524,201	545,079	475,115	506,275	539,050	6,105,472	5,818,247	287,225	5%
Medium General Service	660,748	863,164	720,437	707,694	615,552	595,517	697,431	774,898	810,409	697,322	716,429	725,549	8,585,150	7,034,617	1,550,533	22%
Large General Service	585,853	728,307	626,638	659,880	629,591	657,873	704,533	836,422	861,795	754,802	744,938	725,602	8,516,233	7,786,138	730,095	9%
Small Industrial	228,599	259,975	251,170	322,926	241,770	236,154	280,313	219,768	314,416	282,411	253,983	261,970	3,153,454	1,280,552	1,872,902	146%
Large Industrial	508,741	541,246	482,276	513,203	408,380	447,693	392,020	442,138	426,319	399,525	465,743	438,328	5,465,610	5,075,600	390,010	8%
Small Irrigation	1,672	975	652	13,975	11,378	11,541	16,321	18,107	19,250	18,410	9,139	3,045	124,464	125,080	(616)	0%
Large Irrigation	1,198	1,265	1,410	52,479	102,446	143,112	178,747	202,153	203,036	151,033	85,252	7,129	1,129,259	807,089	322,170	40%
Cable TV Amp	3,602	3,602	3,602	3,602	3,602	3,602	3,602	3,602	3,602	5,620	3,602	5,620	47,257	52,454	(5,197)	-10%
Street Lighting	30,446	28,482	27,927	29,860	29,777	28,298	29,241	29,558	30,210	31,250	31,269	31,538	357,855	358,232	(377)	0%
Rental Lighting	10,947	10,737	10,884	11,451	9,858	9,850	10,457	11,441	10,308	10,935	10,402	11,192	128,462	126,863	1,599	1%
Traffic Lights	[illegible]	3,493	3,224	3,264	2,896	2,886	2,913	3,007	3,229	3,410	3,792	39,326	28,153	11,173	40%	
TOTAL REVENUES	$ [illegible]	$ 5,543,703	$ 5,714,009	$ 4,379,436	$ 4,328,189	$ 5,297,712	$ 6,135,205	$ 5,843,517	$ 5,093,429	$ 5,147,660	$ 5,947,891	$ 65,459,403	$ 54,540,040	$ 10,919,363	$ 20%	
CONSUMPTION (kWh):													Total To Date	Budget	Variance	% Budget Variance
Residential	38,935,267	33,391,001	32,026,840	30,053,283	19,718,645	19,423,100	26,873,074	34,593,924	28,873,241	23,502,098	24,628,883	36,059,784	348,079,140	351,511,672	(3,432,532)	-1%
Small General Service	7,922,069	7,873,541	6,785,986	6,098,899	4,868,686	5,097,523	5,986,353	7,517,741	7,006,880	6,158,758	6,446,476	6,724,282	78,487,194	87,230,089	(8,742,895)	-10%
Medium General Service	11,981,289	14,945,342	12,184,535	11,649,312	10,181,464	10,224,047	11,570,896	13,356,128	13,627,983	11,466,564	11,744,235	11,826,692	144,758,487	164,360,216	(19,601,729)	-12%
Large General Service	11,477,460	13,461,220	11,357,660	12,005,980	11,191,560	11,811,640	12,659,220	14,427,140	16,242,360	13,425,600	13,387,580	12,653,440	154,100,860	181,919,109	(27,818,249)	-15%
Small Industrial	3,868,600	4,583,600	4,541,600	5,963,200	4,181,600	3,903,200	4,886,400	3,735,400	5,810,000	5,149,600	4,522,400	4,705,600	55,851,200	29,919,470	25,931,730	87%
Large Industrial	9,568,800	10,219,200	8,959,200	9,716,400	7,278,000	8,372,400	7,125,600	7,981,200	7,704,000	7,100,400	8,516,400	7,970,400	100,512,000	119,990,562	(19,478,562)	-16%
Small Irrigation	25,840	14,998	10,035	20,824	110,048	188,869	251,090	274,364	288,970	290,624	140,492	46,807	1,662,961	1,924,283	(261,322)	-14%
Large Irrigation	18,246	20,251	108,912	163,069	1,370,968	2,098,460	2,758,538	3,323,710	3,299,247	2,347,097	981,071	56,975	16,546,544	18,857,246	(2,310,702)	-12%
Cable TV Amp	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	107,092	74,613	107,092	960,314	948,524	11,790	1%
Street Lighting	303,597	303,597	303,597	303,597	303,597	303,597	303,597	303,597	303,597	387,102	422,742	466,167	4,008,384	4,191,217	(182,833)	-4%
Rental Lighting	89,311	72,822	65,550	48,568	42,476	42,090	42,090	46,658	53,479	64,109	69,997	76,866	714,016	812,708	(98,692)	-12%
Traffic Lights	[illegible]	35,212	31,086	31,698	26,067	25,910	26,001	27,452	30,845	33,623	39,461	381,215	431,118	(49,903)	-12%	
TOTAL CONSUMPTION (kWh):	[illegible]	76,453,740	76,128,831	59,353,355	61,565,606	72,557,381	85,660,476	83,311,822	70,029,889	70,968,512	80,733,566	906,062,315	962,096,214	(56,033,899)	-6%	
METERS: (Active meters at month end)													Monthly Avg	Budget	Variance	% Budget Variance
Residential	24,822	24,839	24,855	24,870	24,856	24,866	24,870	24,894	24,897	24,889	24,880	24,870	24,867	25,067	(199)	-1%
Small General Service	2,385	2,385	2,387	2,390	2,392	2,387	2,393	2,397	2,411	2,418	2,427	2,434	2,401	2,482	(81)	-3%
Medium General Service	313	315	318	319	318	318	314	311	306	305	302	302	312	324	(13)	-4%
Large General Service	54	54	54	56	55	54	55	57	57	54	53	54	55	65	(10)	-15%
Small Industrial	9	9	9	9	8	9	8	6	6	6	6	7	8	3	4	122%
Large Industrial	3	3	3	3	3	3	3	3	3	3	3	3	3	3	(0)	-6%
Small Irrigation	83	84	84	84	84	84	85	85	85	85	85	85	84	85	(1)	-1%
Large Irrigation	21	21	20	20	20	21	21	21	21	21	22	22	21	26	(5)	-18%
Cable TV Amp	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	0%
Street Lighting (unmetered)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	0%
Rental Lighting (Accounts)	400	400	400	400	400	400	400	400	400	400	400	400	400	400	-	0%
Traffic Lights	55	55	55	55	55	55	56	56	56	56	56	55	58	(2)	-4%	
TOTAL ACTIVE METERS:	[illegible]	28,187	28,208	28,193	28,199	28,206	28,232	28,244	28,239	28,236	28,235	28,208	28,515	(307)	-1%	
METERED DEMAND (kW):													Total To Date	Budget	Variance	% Budget Variance
Residential	310	280	268	275	238	283	272	287	11,031	303	359	305	14,211	-	14,211	
Small General Service	18,049	19,288	17,867	17,695	15,060	14,182	16,626	21,836	19,073	16,934	18,445	17,864	212,919	-	212,919	
Medium General Service	30,084	36,646	33,355	33,009	29,646	28,102	32,795	37,110	36,832	33,199	35,534	33,593	399,905	475,590	(75,685)	-16%
Large General Service	22,030	25,709	23,863	24,609	25,006	25,368	26,874	30,048	33,387	28,839	28,548	25,838	320,119	396,763	(76,644)	-19%
Small Industrial	9,233	10,022	8,664	10,318	9,617	10,619	10,833	7,874	11,264	9,489	9,262	9,294	116,489	54,203	62,286	115%
Large Industrial	18,512	19,333	18,348	18,140	17,744	16,451	20,100	17,977	17,521	17,404	18,490	17,920	217,940	256,530	(38,590)	-15%
Small Irrigation	97	82	80	227	520	583	630	641	650	756	607	334	5,207	-	5,207	
Large Irrigation	[illegible]	86	3,194	5,667	7,089	7,984	8,165	8,251	6,721	5,752	553	53,552	62,761	(9,209)	-15%	
TOTAL METERED DEMAND (kW):	[illegible]	102,531	107,467	103,498	102,677	116,114	123,938	138,009	113,645	116,997	105,701	1,340,342	1,245,847	94,495	8%	
ELECTRIC UTILITY CUSTOMERS:	25,248	25,283	25,398	25,462	25,650	25,641	25,711	25,628	25,888	25,510	25,600	26,339				

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
COMPARATIVE REVENUE AND CONSUMPTION
FOR THE PERIOD ENDED
December 2020

POWER SALE REVENUE (Net of City Utility Tax):	CURRENT QUARTER	BUDGET	VARIANCE FROM FROM BUDGET	% VARIANCE CURRENT [illegible] BUDGET	2020 - 2019 TO YTD (+/-)	2020 YEAR DATE	2020 - 2019 (+/-)
Residential	$ 7,776,072	$ 6,262,551	$ 1,513,521	24%	$ 124,223	$ 31,806,860	$ (323,848)
Small General Service	1,520,441	1,499,614	20,827	1%	(30,420)	6,105,472	(282,366)
Medium General Service	2,139,300	1,815,456	323,844	18%	(192,673)	8,585,150	(312,152)
Large General Service	2,225,342	2,105,472	119,870	6%	77,501	8,516,233	(782,818)
Small Industrial	798,364	369,451	428,913	116%	95,689	3,153,454	760,431
Large Industrial	1,303,595	1,375,263	(71,668)	-5%	(215,176)	5,465,610	(386,023)
Small Irrigation	30,593	35,277	(4,684)	-13%	(962)	124,464	(420)
Large Irrigation	243,414	169,021	74,393	44%	24,481	1,129,259	100,933
Cable TV Amp	14,843	14,338	505	4%	4,038	47,257	4,038
Street Lighting	94,057	90,294	3,763	4%	3,793	357,855	(3,408)
Rental Lighting	32,529	33,700	(1,171)	-3%	(1,239)	128,462	(6,016)
Traffic Lights	[illegible]	2,509	32%		[illegible]	921	
TOTAL POWER SALE REVENUE:	$ [illegible]	$ 2,410,622	$ 17%		$ [illegible]	$ (1,230,727)	$

CONSUMPTION (kWh):	CURRENT QUARTER	BUDGET	VARIANCE FROM FROM BUDGET	% VARIANCE CURRENT [illegible] BUDGET	2020 - 2019 TO YTD (+/-)	2020 YEAR DATE	2020 - 2019 (+/-)
Residential	84,190,765	84,514,859	(324,094)	0%	1,515,381	348,079,140	(18,985,131)
Small General Service	19,329,516	22,482,961	(3,153,445)	-14%	(543,878)	78,487,194	(7,912,766)
Medium General Service	35,037,491	42,417,190	(7,379,699)	-17%	(3,441,034)	144,758,487	(10,687,473)
Large General Service	39,466,620	49,193,262	(9,726,642)	-20%	(915,000)	154,100,860	(19,529,210)
Small Industrial	14,377,600	8,632,023	5,745,577	67%	2,729,600	55,851,200	12,718,200
Large Industrial	23,587,200	32,512,125	(8,924,925)	-27%	7,939,200	100,512,000	37,772,400
Small Irrigation	477,923	542,716	(64,793)	-12%	(7,423)	1,662,961	5,980
Large Irrigation	3,385,143	3,949,081	(563,938)	-14%	347,935	16,546,544	1,373,594
Cable TV Amp	288,797	259,283	29,514	11%	64,958	960,314	64,958
Street Lighting	1,276,011	1,427,940	(151,929)	-11%	275,938	4,008,384	189,305
Rental Lighting	210,972	277,501	(66,529)	-24%	(36,475)	714,016	(46,468)
Traffic Lights	[illegible]	(17,380)	-14%		[illegible]	(7,221)	
TOTAL CONSUMPTION (kWh):	[illegible]	(24,598,283)	-10%		[illegible]	(5,043,832)	

METERED DEMAND (kW):	CURRENT QUARTER	BUDGET	VARIANCE FROM FROM BUDGET	% VARIANCE CURRENT [illegible] BUDGET	2020 - 2019 TO YTD (+/-)	2020 YEAR DATE	2020 - 2019 (+/-)
Residential	967	-	967		(620)	14,211	10,125
Small General Service	53,243	-	53,243		(2,952)	212,919	(21,394)
Medium General Service	102,326	128,419	(26,093)		(8,964)	399,905	(27,435)
Large General Service	83,225	112,974	(29,749)		(3,122)	320,119	(48,590)
Small Industrial	28,045	16,581	11,464		(3,369)	116,489	26,078
Large Industrial	53,814	68,284	(14,470)		20,729	217,940	86,094
Small Irrigation	1,697	-	1,697		46	5,207	85
Large Irrigation	[illegible]	(1,073)	1,291		53,552	4,645	
TOTAL METERED DEMAND (kW):	[illegible]	(4,014)	3,039		1,340,342	29,608	

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
COMPARATIVE REVENUE AND CONSUMPTION
FOR THE PERIOD ENDED
December 2020

	CURRENT QUARTER	QUARTERLY BUDGET	% VARIANCE FROM BUDGET	MONTHLY AVERAGE Y-T-D ACTUAL	MONTHLY AVERAGE Y-T-D BUDGET	% VARIANCE FROM BUDGET
POWER SALE REVENUE PER METER:						
(Net of Utility Tax)						
Residential	$ 313	$ 248	21%	$ 107	$ 87	19%
Small General Service	627	600	4%	212	195	8%
Medium General Service	7,061	5,586	21%	2,295	1,807	21%
Large General Service	41,470	33,693	19%	12,962	10,035	23%
Small Industrial	126,823	93,039	27%	34,277	30,876	10%
Large Industrial	434,532	432,484	0%	151,822	133,012	12%
Small Irrigation	360	413	-15%	123	122	1%
Large Irrigation	11,391	6,596	42%	4,499	2,634	41%
Cable TV Amp	14,843	14,338	3%	3,938	4,371	-11%
Street Lighting	94,057	90,294	4%	29,821	29,853	0%
Rental Lighting	81	84	-4%	27	26	1%
Traffic Lights	[illegible]	25%		[illegible]	31%	
System Average Per Meter	$ [illegible]	2%		$ [illegible]	$ 18%	
POWER SALE REVENUE PER KILOWATT HOUR:	($/kWh)	($/kWh)		($/kWh)	($/kWh)	
(Net of Utility Tax)						
Residential	$ 0.2790	$ 0.2223	20%	$ 0.0914	$ 0.0741	19%
Small General Service	0.2358	0.2001	15%	0.0778	0.0667	14%
Medium General Service	0.1832	0.1284	30%	0.0593	0.0428	28%
Large General Service	0.1692	0.1284	24%	0.0553	0.0428	23%
Small Industrial	0.1667	0.1284	23%	0.0565	0.0428	24%
Large Industrial	0.1660	0.1269	24%	0.0544	0.0423	22%
Small Irrigation	0.1934	0.1950	-1%	0.0748	0.0650	13%
Large Irrigation	0.2764	0.1284	54%	0.0682	0.0428	37%
Cable TV Amp	0.1532	0.1659	-8%	0.0492	0.0553	-12%
Street Lighting	0.2223	0.1959	12%	0.0893	0.0855	4%
Rental Lighting	0.4648	0.3744	19%	0.1799	0.1561	13%
Traffic Lights	[illegible]	35%		[illegible]	37%	
System Average Per Meter	$ [illegible]	$ 23%		$ [illegible]	$ 22%	
KILOWATT HOURS PER METER:	(kWh)	(kWh)		(kWh)	(kWh)	
Residential	3,384	3,353	1%	1,166	1,169	0%
Small General Service	7,966	9,003	-13%	2,725	2,929	-8%
Medium General Service	115,645	130,507	-13%	38,695	42,228	-9%
Large General Service	735,541	787,215	-7%	234,552	234,462	0%
Small Industrial	2,284,229	2,173,803	5%	607,078	721,407	-19%
Large Industrial	7,862,400	10,224,205	-30%	2,792,000	3,144,489	-13%
Small Irrigation	5,623	6,354	-13%	1,642	1,877	-14%
Large Irrigation	158,950	154,114	3%	65,922	61,540	7%
Cable TV Amp	288,797	259,283	10%	80,026	79,044	1%
Street Lighting	1,276,011	1,427,940	-12%	334,032	349,268	-5%
Rental Lighting	527	694	-32%	149	169	-14%
Traffic Lights	[illegible]	-16%		[illegible]	-9%	
System Average Per Meter	[illegible]	-8%		[illegible]	-5%	

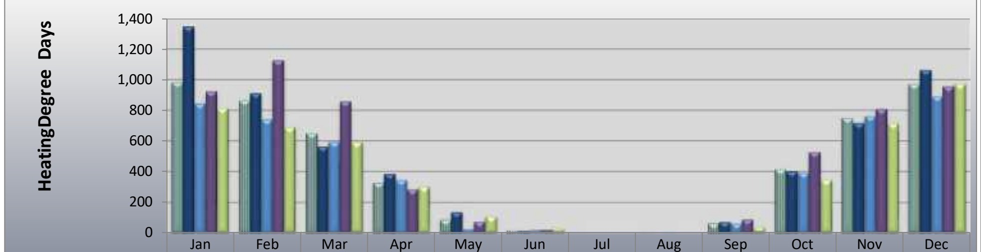
CITY OF RICHLAND, WASHINGTON
KWH SALES
MONTHLY ACTIVITY
December 31, 2020

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Residential	**2016**	46,687,001	31,990,311	28,329,332	23,137,896	18,559,767	23,122,534	26,060,303	27,420,357	27,570,185	16,921,902	20,518,395	30,012,357	320,330,340
	2017	62,048,398	47,914,464	35,158,691	24,005,005	22,086,610	23,313,198	30,040,964	31,916,160	25,818,412	19,779,494	22,955,082	30,937,579	375,974,057
	2018	44,374,772	31,993,720	34,871,383	25,266,717	19,017,436	23,993,782	28,296,950	31,865,796	25,663,042	19,633,583	21,153,863	32,499,588	338,630,632
	2019	39,597,871	38,129,336	49,830,822	28,493,781	19,279,665	23,183,854	27,717,749	31,968,874	26,186,935	19,605,925	24,790,993	38,278,466	367,064,271
	2020	38,935,267	33,391,001	32,026,840	30,053,283	19,718,645	19,423,100	26,873,074	34,593,924	28,873,241	23,502,098	24,628,883	36,059,784	348,079,140
Small General Service	**2016**	7,941,621	7,302,417	6,404,904	5,916,263	5,619,778	6,425,308	6,865,150	7,475,499	7,275,578	6,350,273	5,411,334	6,754,662	79,742,787
	2017	9,516,305	9,620,357	7,665,378	5,943,461	6,074,129	6,364,762	6,955,841	8,097,137	7,076,428	6,809,698	6,227,992	6,864,170	87,215,658
	2018	8,282,479	7,819,252	7,116,595	6,473,358	6,110,969	6,809,052	7,084,700	8,231,129	7,717,449	6,561,513	6,346,530	7,322,110	85,875,136
	2019	8,130,451	7,935,304	9,050,455	7,192,512	5,743,845	6,419,529	6,990,012	7,704,998	7,359,460	6,192,677	6,580,247	7,100,470	86,399,960
	2020	7,922,069	7,873,541	6,785,986	6,098,899	4,868,686	5,097,523	5,986,353	7,517,741	7,006,880	6,158,758	6,446,476	6,724,282	78,487,194
Medium General Service	**2016**	13,791,916	13,949,465	12,240,969	15,431,857	8,899,139	12,480,361	13,396,265	14,124,792	14,516,173	13,141,280	11,535,941	11,747,734	155,255,892
	2017	14,498,561	16,065,806	13,455,268	12,017,254	11,697,162	12,516,825	13,720,718	15,680,702	14,813,311	13,421,127	12,265,681	12,288,448	162,440,863
	2018	14,411,016	13,579,218	11,530,411	11,809,374	11,208,347	12,781,338	13,002,108	14,762,239	14,539,444	12,562,350	11,880,108	11,934,156	154,000,109
	2019	12,583,823	12,900,908	13,137,528	12,793,248	11,301,161	12,017,764	12,753,141	13,546,771	15,933,091	12,978,479	12,569,284	12,930,762	155,445,960
	2020	11,981,289	14,945,342	12,184,535	11,649,312	10,181,464	10,224,047	11,570,896	13,356,128	13,627,983	11,466,564	11,744,235	11,826,692	144,758,487
Large General Service	**2016**	12,865,040	13,088,760	12,237,527	12,302,509	12,963,420	13,207,760	13,564,440	14,454,320	14,586,880	12,790,920	12,521,900	11,358,160	155,941,636
	2017	13,636,920	13,685,920	12,525,427	12,599,360	11,867,240	13,875,580	13,946,060	15,888,520	15,981,960	14,894,600	15,821,600	14,629,520	169,352,707
	2018	15,686,900	15,428,040	11,964,760	18,052,600	14,250,080	16,637,480	17,241,620	15,692,000	18,372,360	16,688,460	15,502,420	14,253,100	189,769,820
	2019	14,179,400	14,566,240	14,378,780	14,352,800	14,082,660	14,663,810	15,265,520	13,721,600	18,037,640	15,659,300	12,704,360	12,017,960	173,630,070
	2020	11,477,460	13,461,220	11,357,660	12,005,980	11,191,560	11,811,640	12,659,220	14,427,140	16,242,360	13,425,600	13,387,580	12,653,440	154,100,860
Small Industrial	**2016**	1,893,800	1,951,200	2,153,000	1,974,200	2,133,000	2,449,400	3,084,300	3,221,400	3,311,600	3,027,600	3,920,200	2,462,400	31,582,100
	2017	2,020,400	2,100,200	2,007,400	2,139,000	1,977,000	2,176,800	2,256,400	6,286,200	(209,400)	2,291,400	2,037,400	1,909,400	26,992,200
	2018	2,751,400	1,976,400	1,817,200	2,023,800	1,883,800	2,080,600	2,087,400	2,352,800	2,466,400	2,216,000	2,229,000	2,236,000	26,120,800
	2019	1,498,800	1,509,000	1,319,400	1,537,200	1,412,400	1,363,800	1,493,400	4,682,400	16,668,600	2,940,800	4,021,600	4,685,600	43,133,000
	2020	3,868,600	4,583,600	4,541,600	5,963,200	4,181,600	3,903,200	4,886,400	3,735,400	5,810,000	5,149,600	4,522,400	4,705,600	55,851,200
Large Industrial	**2016**	10,052,400	10,635,600	9,062,400	8,089,200	9,159,600	9,088,800	10,009,200	9,100,800	9,627,600	9,139,200	9,571,200	8,650,800	112,186,800
	2017	9,616,800	10,699,200	8,971,200	9,086,400	8,995,200	9,428,400	8,878,800	5,421,600	12,558,000	9,220,800	9,660,000	8,791,200	111,327,600
	2018	9,766,800	10,026,000	9,039,600	9,325,200	7,748,400	8,210,400	9,072,000	9,872,400	9,625,200	9,250,800	9,825,600	8,470,800	110,233,200
	2019	5,408,400	5,833,200	5,516,400	5,796,000	4,767,600	4,852,800	4,741,200	5,331,600	4,844,400	4,980,000	5,392,800	5,275,200	62,739,600
	2020	9,568,800	10,219,200	8,959,200	9,716,400	7,278,000	8,372,400	7,125,600	7,981,200	7,704,000	7,100,400	8,516,400	7,970,400	100,512,000
Small Irrigation	**2016**	46,928	32,145	20,976	40,225	122,677	235,022	275,166	309,514	322,085	278,974	169,692	68,170	1,921,574
	2017	19,522	29,705	165,519	(30,862)	(11,077)	203,830	272,632	284,799	322,849	270,502	155,614	57,261	1,740,294
	2018	30,131	24,302	34,936	21,708	77,967	207,491	287,611	323,463	331,831	239,926	193,005	48,773	1,821,144
	2019	23,238	22,794	25,687	17,563	50,723	163,292	270,616	290,701	307,021	258,217	168,801	58,328	1,656,981
	2020	25,840	14,998	10,035	20,824	110,048	188,869	251,090	274,364	288,970	290,624	140,492	46,807	1,662,961
Large Irrigation	**2016**	19,800	19,960	24,040	224,200	1,768,700	2,279,346	3,094,504	3,392,342	3,321,212	1,968,667	934,753	71,907	17,119,431
	2017	19,222	22,361	21,361	102,846	769,215	2,285,135	3,226,036	4,407,551	3,047,384	2,940,334	1,325,655	79,290	18,246,390
	2018	26,048	25,242	21,682	333,680	1,031,450	2,728,856	3,337,388	4,139,524	3,731,862	2,347,586	1,464,697	59,173	19,247,188
	2019	20,621	16,831	15,302	30,940	735,144	2,242,361	2,876,605	2,989,637	3,208,301	2,084,431	902,754	50,023	15,172,950
	2020	18,246	20,251	108,912	163,069	1,370,968	2,098,460	2,758,538	3,323,710	3,299,247	2,347,097	981,071	56,975	16,546,544
Cable	**2016**	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	895,356
	2017	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	895,356
	2018	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	895,356
	2019	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	895,356
	2020	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	74,613	107,092	74,613	107,092	960,314
Street Lighting	**2016**	457,444	372,993	444,139	284,758	259,528	225,234	253,588	287,176	329,536	396,331	432,740	475,443	4,218,910
	2017	460,269	375,296	365,180	298,416	260,988	226,594	246,826	289,485	331,223	395,949	434,446	477,325	4,161,997
	2018	462,136	375,583	364,920	298,085	260,289	226,269	246,456	288,889	329,117	393,028	428,748	471,381	4,144,901
	2019	455,089	370,412	359,994	294,148	257,166	223,276	244,547	286,641	327,733	392,879	303,597	303,597	3,819,079
	2020	303,597	303,597	303,597	303,597	303,597	303,597	303,597	303,597	303,597	387,102	422,742	466,167	4,008,384
Security Lighting	**2016**	86,054	70,193	68,251	55,731	55,879	42,430	45,974	53,659	61,352	72,136	78,761	86,489	776,909
	2017	83,729	67,678	65,828	53,793	47,046	40,846	44,493	52,152	59,628	71,481	78,046	85,737	750,457
	2018	89,248	67,578	65,684	53,675	46,943	40,757	44,371	52,009	59,465	71,285	77,062	84,450	752,527
	2019	83,149	67,628	65,552	53,567	46,849	40,675	44,306	51,933	59,378	71,181	84,011	92,255	760,484
	2020	89,311	72,822	65,550	48,568	42,476	42,090	42,090	46,658	53,479	64,109	69,997	76,866	714,016
Traffic Lights	**2016**	40,028	43,215	36,859	36,263	32,109	27,315	29,228	28,926	31,563	34,959	33,597	37,911	411,973
	2017	38,732	41,487	35,428	37,418	32,159	30,207	32,024	28,411	22,338	32,217	35,001	36,281	401,703
	2018	37,503	37,305	35,392	35,074	28,008	29,053	28,739	28,764	29,586	31,496	35,325	36,589	392,834
	2019	37,845	39,800	39,852	31,278	29,546	27,772	26,305	27,225	30,744	28,229	31,421	38,419	388,436
	2020	34,040	39,820	35,212	31,086	31,698	26,067	25,910	26,001	27,452	30,845	33,623	39,461	381,215
Total System	**2016**	93,956,645	79,530,872	71,097,010	67,567,715	59,648,210	69,658,123	76,752,731	79,943,398	81,028,377	64,196,855	65,203,126	71,800,646	880,383,708
	2017	112,033,471	100,697,087	80,511,293	66,326,704	63,870,285	70,536,790	79,695,407	88,427,330	79,896,746	70,202,215	71,071,130	76,230,824	959,499,282
	2018	95,993,046	81,427,253	76,937,176	73,767,884	61,738,302	73,819,691	80,803,956	87,683,626	82,940,369	70,070,640	69,210,971	77,490,733	931,883,647
	2019	82,093,300	81,466,066	93,814,385	70,667,650	57,781,372	65,273,546	72,498,014	80,676,993	93,037,916	65,266,731	67,624,481	80,905,693	911,106,147
	2020	84,299,132	85,000,005	76,453,740	76,128,831	59,353,355	61,565,606	72,557,381	85,660,476	83,311,822	70,029,889	70,968,512	80,733,566	906,062,315

City of Richland, Washington
Electric Utility
December 31, 2020

Climatological Data From Hanford Meteorology Station Located 25 Miles N.W. of Richland, WA

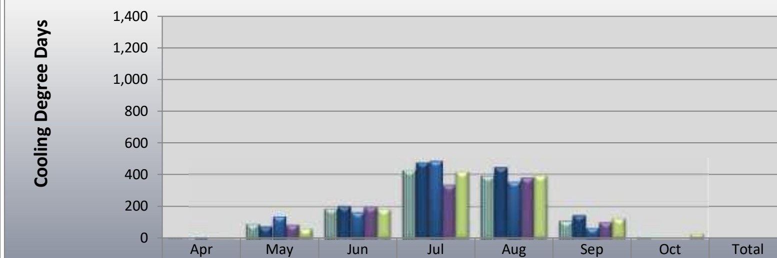
Heating Degree Days By Month



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Four Year Avg	981	866	651	327	85	19	-	1	63	416	750	970
2017 Degree Days	1,347	912	565	386	137	15	-	-	72	404	716	1,064
2018 Degree Days	843	740	593	344	25	20	-	2	60	391	761	889
2019 Degree Days	923	1,127	857	282	71	18	-	-	85	524	807	954
2020 Degree Days	811	686	590	297	105	24	-	-	33	345	714	971

Four Year Avg 2017 Degree Days 2018 Degree Days 2019 Degree Days 2020 Degree Days

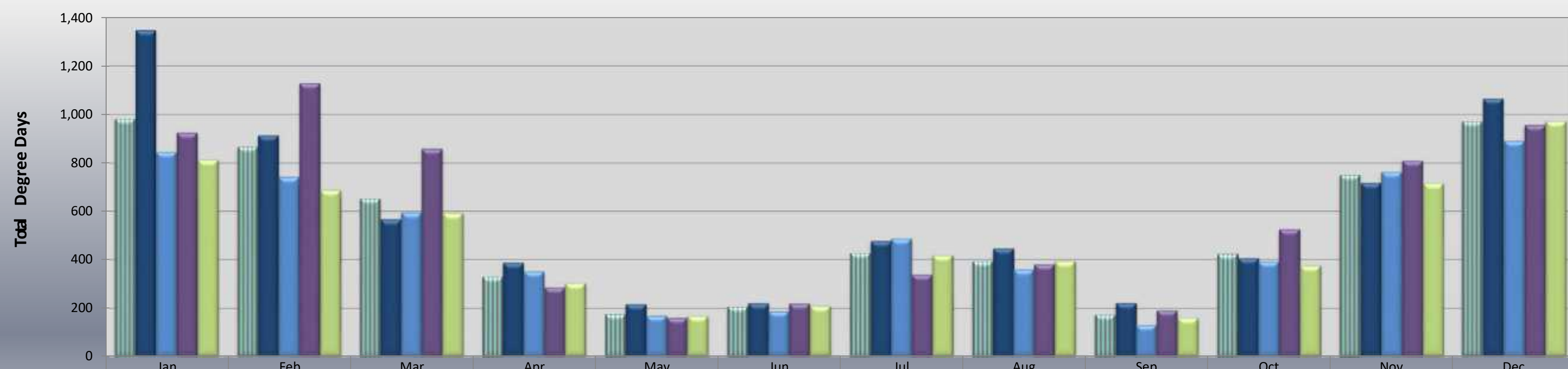
Cooling Degree Days By Month



	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
Four Year Avg	3	92	188	429	393	111	7	
2017 Degree Days	-	77	203	475	445	147	-	
2018 Degree Days	6	141	165	485	356	68	-	
2019 Degree Days	2	88	200	337	380	105	-	
2020 Degree Days	4	60	183	417	392	125	28	

Four Year Avg 2017 Degree Days 2018 Degree Days 2019 Degree Days 2020 Degree Days

Total Degree Days By Month



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Four Year Avg	981	866	651	330	176	207	429	394	174	423	750	970
2017 Degree Days	1,347	912	565	386	214	218	475	445	219	404	716	1,064
2018 Degree Days	843	740	593	350	166	185	485	358	128	391	761	889
2019 Degree Days	923	1,127	857	284	159	218	337	380	190	524	807	954
2020 Degree Days	811	686	590	301	165	207	417	392	158	373	714	971

Four Year Avg 2017 Degree Days 2018 Degree Days 2019 Degree Days 2020 Degree Days

Degree days are indicators of how much energy a typical household w ill use for heating or cooling. Degree days are based on the assumption that when the outside temperature is 65° F, a household would not need heating or cooling to be comfortable. An increase in heating or cooling degrees days correlates with increased energy consumption. Degree days are the difference between the average daily temperature and 65° F. Cooling degree days result when the daily temperature average is above 65°F. Heating degree days result when the daily temperature average is below 65°F.

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
DETAILED BALANCE SHEET
As of December 31, 2020

Acct. No.	Account Title	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
ASSETS														
12810	Cash - Bond Redemption	992,522.90	1,511,172.32	2,029,821.74	2,548,471.16	3,067,120.58	2,145,483.88	2,658,437.57	3,171,391.26	3,684,344.95	4,197,298.64	4,710,252.33	644,219.31	1,148,908.42
12812	Cash - 2015 Bond (LGIP)	-	-	-	-	-	-	-	-	-	-	-	-	-
12813	Cash - Conservation Loan (LGIP)	-	306,085.64	306,493.89	306,830.37	307,035.59	307,165.39	307,258.74	307,339.79	307,406.67	307,458.66	307,507.35	307,548.07	307,588.83
12814	Cash - Bond Reserve (LGIP)	-	5,087,520.78	5,093,524.38	5,098,440.87	5,101,451.60	5,103,555.60	5,105,068.83	5,106,382.70	5,107,466.74	5,108,309.57	5,109,098.79	4,962,814.15	4,963,469.03
12840	Cash - Operating Reserve	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00	2,400,000.00
12845	Cash - 2018 Bonds	-	523,283.78	527,408.79	-	-	-	-	-	-	-	-	-	-
12847	Cash - 2019 Bonds	-	9,018,887.77	9,031,278.23	8,814,955.74	8,813,294.13	8,804,400.38	7,329,215.58	6,801,237.24	6,676,264.11	6,677,768.40	6,646,615.80	6,753,682.34	4,940,789.28
12857	Investments - Bond Reserve	5,080,676.65	-	-	-	-	-	-	-	-	-	-	-	-
12860	Conservation Loan Invested	565,560.01	-	-	-	-	-	-	-	-	-	-	-	-
12861	Investments - Bond Proceeds	9,572,794.59	-	-	-	-	-	-	-	-	-	-	-	-
12870	Cash - Facility Fees	319,854.63	387,272.66	421,749.63	450,566.29	303,540.98	292,842.49	505,260.39	557,079.92	567,886.84	762,710.77	774,326.96	746,364.87	223,162.41
12870	Cash - Facility Fees - Large Projects	-	-	-	-	-	-	-	-	-	-	-	-	-
12870	Cash - Facility Fees Subject To Refund	645,241.70	672,841.70	684,841.70	684,841.70	684,841.70	684,841.70	803,641.70	803,641.70	825,641.70	891,641.70	891,641.70	891,641.70	891,641.70
13100	Cash - Unrestricted	3,145,321.82	6,721,009.87	3,427,511.65	3,400,160.93	1,832,354.09	1,764,506.98	1,957,813.03	21,887.47	(217,477.66)	371,099.50	1,049,491.86	3,722,190.14	1,752,505.85
13100	Cash - Credit Support Reserve (NIES)	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00	639,000.00
13130	Cash - Conservation Loan	1,692,029.75	1,706,505.44	1,737,292.73	1,739,344.35	1,760,060.08	1,784,409.11	1,756,921.70	1,769,224.95	1,764,867.87	1,790,234.27	1,794,262.63	1,843,494.03	1,880,514.91
14100	Energy Conservation Loans	1,490,659.45	1,485,497.00	1,480,343.32	1,465,249.34	1,449,451.53	1,429,948.50	1,463,320.89	1,455,396.32	1,465,832.90	1,447,166.84	1,449,486.02	1,403,922.89	1,374,040.57
14101	Energy Conservation Loans Billed Monthly	157,045.79	152,629.90	130,674.40	152,635.28	153,202.88	153,222.52	155,326.70	156,340.14	156,099.46	154,223.14	155,083.66	156,415.83	155,620.19
14200	A/R - Customer Billings	5,063,480.66	4,241,637.55	4,199,458.06	4,024,860.18	4,319,115.95	3,467,616.33	3,751,832.21	4,664,480.87	5,081,486.26	5,351,057.75	4,417,782.86	5,038,668.83	4,959,655.17
14300	A/R - Misc.	180,429.99	97,033.96	167,177.05	136,363.90	106,952.92	107,369.37	100,275.45	113,444.11	229,154.47	143,464.29	79,358.31	78,721.11	71,083.05
14310	A/R - Pole Contracts	-	-	-	-	-	-	-	-	-	-	-	-	-
14320	Due from Other Funds	-	-	-	-	-	-	-	-	-	-	-	-	-
14400	Provision for Uncollectible	(51,506.36)	153,852.39	141,652.55	128,805.50	118,455.65	104,117.67	93,731.85	82,767.05	71,794.71	61,275.10	50,576.59	38,832.51	(213,274.65)
15400	Materials and Supplies	3,795,688.81	3,824,618.66	3,597,826.19	3,832,918.45	4,675,829.73	4,758,126.39	4,761,779.05	4,970,958.86	5,015,814.56	5,020,207.77	4,757,863.93	4,627,798.46	4,461,969.63
15410	Exempt Materials and Supplies	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69	6,402.69
16300	Stores Expense - Clearing	-	54,059.86	108,415.91	161,736.83	215,809.09	270,676.79	176,296.04	229,847.53	283,878.07	338,315.57	390,005.01	450,120.19	-
16500	Prepaid Expenses	297,503.00	419,185.53	413,063.10	402,188.87	391,108.04	379,368.21	373,245.78	357,206.55	354,607.32	351,952.49	340,871.66	334,804.83	338,028.00
16512	WCIA Insurance Deposit	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00	1,900.00
18171	Unamortized Prem - 2013 Rev Ref Bonds	(1,537,591.00)	(1,531,999.76)	(1,526,408.52)	(1,520,817.28)	(1,515,226.04)	(1,509,634.80)	(1,504,043.56)	(1,498,452.32)	(1,492,861.08)	(1,487,269.84)	(1,481,678.60)	(1,476,087.36)	(1,470,496.12)
18172	Unamortized Prem - 2015 Bonds	(1,750,142.75)	(1,744,497.13)	(1,738,851.51)	(1,733,205.89)	(1,727,560.27)	(1,721,914.65)	(1,716,269.03)	(1,710,623.41)	(1,704,977.79)	(1,699,332.17)	(1,693,686.55)	(1,688,040.93)	(1,682,395.31)
18173	Unamortized Prem - 2018 Bonds	(1,031,686.32)	(1,028,597.44)	(1,025,508.56)	(1,022,419.68)	(1,019,330.80)	(1,016,241.92)	(1,013,153.04)	(1,010,064.16)	(1,006,975.28)	(1,003,886.40)	(1,000,797.52)	(997,708.64)	(994,619.76)
18174	Unamortized Prem - 2019 Bonds	(2,604,380.05)	(2,595,669.75)	(2,586,959.45)	(2,578,249.15)	(2,569,538.85)	(2,560,828.55)	(2,552,118.25)	(2,543,407.95)	(2,534,697.65)	(2,525,987.35)	(2,517,277.05)	(2,508,566.75)	(2,499,856.45)
18400	Clearing Account - Overhead	-	(81,896.08)	(173,232.96)	(251,112.44)	(362,927.24)	(530,986.02)	(700,090.27)	(826,550.20)	(981,458.41)	(1,084,418.06)	(1,145,579.26)	(1,274,145.09)	0.00
18410	Clearing Account - Equipment	-	39,374.25	58,751.12	78,841.33	111,124.99	130,790.20	150,881.43	184,271.31	208,891.25	233,356.76	237,231.94	254,473.11	-
18500	Deferred Debits - Temp. Facilities	-	(8,325.00)	(17,775.00)	(38,443.22)	(40,468.22)	(46,543.22)	(53,293.22)	(63,643.22)	(73,543.22)	(80,743.22)	(88,618.22)	(95,368.22)	-
18610	Deferred Debits - Damages & Claims	-	2,055.88	3,212.11	3,212.11	6,774.63	7,968.69	11,619.93	17,632.39	17,632.39	17,632.39	27,337.23	39,132.29	-
18620	Deferred Debits - Pension	554,221.00	554,221.00	554,221.00	554,221.00	554,221.00	554,221.00	554,221.00	554,221.00	554,221.00	554,221.00	554,221.00	554,221.00	641,714.00
18630	Deferred Debits - OPEB	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92	118,785.92
18640	Conservation Programs	530,535.33	577,490.12	544,718.18	552,781.02	567,286.88	542,681.37	568,631.80	556,430.76	562,905.89	538,288.09	549,712.56	550,059.74	547,819.43
18916	Unamortized Loss on 2001 Refunded	60,103.40	58,386.16	56,668.92	54,951.68	53,234.44	51,517.20	49,799.96	48,082.72	46,365.48	44,648.24	42,931.00	41,213.76	39,496.52
18925	Unamort Loss 2003 Rev & Rev Ref Bonds	90,053.08	89,513.84	88,974.60	88,435.36	87,896.12	87,356.88	86,817.64	86,278.40	85,739.16	85,199.92	84,660.68	84,121.44	83,582.20
18926	Unamort Loss 2009 Rev & Rev Ref Bonds	94,236.77	93,842.47	93,448.17	93,053.87	92,659.57	92,265.27	91,870.97	91,476.67	91,082.37	90,688.07	90,293.77	89,899.47	89,505.17
	SUBTOTAL ASSETS	30,518,741.46	33,953,081.98	30,995,880.03	30,795,707.08	30,703,859.36	28,804,391.37	28,440,389.48	27,620,367.06	28,313,481.69	29,822,670.50	29,749,065.05	28,740,531.69	25,176,540.68
CWIP														
10200	Electric Plant Purchased	-	-	-	-	-	-	-	-	-	-	-	-	-
10700	Utility Plant Work in Progress	-	-	-	-	-	-	-	-	-	-	-	-	-
10710	Utility Plant Work in Progress	1,504,545.72	1,620,875.08	1,750,445.56	1,897,583.58	2,154,834.81	2,305,050.94	2,467,435.06	2,616,610.80	2,748,584.81	2,892,418.53	3,091,551.43	3,244,943.48	3,406,349.83
10720	Construction W I P Ret	-	-	-	-	-	-	-	-	-	-	-	-	-
	TOTAL CWIP	1,504,545.72	1,620,875.08	1,750,445.56	1,897,583.58	2,154,834.81	2,305,050.94	2,467,435.06	2,616,610.80	2,748,584.81	2,892,418.53	3,091,551.43	3,244,943.48	3,406,349.83

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
DETAILED BALANCE SHEET
As of December 31, 2020

Acct. No.	Account Title	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
FIXED ASSETS														
34100	Leasehold Structures & Improve - Solar Gen	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88	8,092.88
35000	Land and Land Rights	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87	586,985.87
35300	Station Equipment	14,571.36	14,571.36	14,571.36	14,625.16	14,625.16	14,625.16	14,625.16	16,432.02	16,432.02	16,432.02	16,432.02	16,432.02	16,928.56
35400	Towers & Fixtures	15,830.61	15,830.61	15,830.61	15,830.61	15,830.61	16,210.98	16,210.98	16,210.98	16,210.98	16,210.98	16,360.40	16,360.40	16,360.40
35500	Poles & Fixtures	2,599,305.94	2,603,171.17	2,603,707.43	3,533,767.88	3,546,753.36	3,550,156.34	4,373,025.97	4,375,559.50	4,375,858.36	4,377,477.22	4,378,047.78	4,380,330.02	5,749,611.63
35600	Conductor - Overhead	753,312.25	755,098.16	755,701.71	757,456.68	758,855.60	761,221.96	769,178.38	769,652.74	771,772.19	773,053.62	776,594.03	777,680.81	777,816.66
35700	U/G Conduit	80,473.77	81,223.54	81,923.00	81,923.00	81,923.00	81,923.00	82,819.59	83,036.95	83,335.81	83,743.35	86,242.95	87,193.88	89,530.46
35800	Conductor - Underground	539,154.52	551,140.10	564,822.53	577,580.30	589,357.07	601,433.43	614,006.47	627,997.28	640,332.27	653,360.62	659,840.55	669,708.69	1,112,572.79
36000	Land and Land Rights	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42	222,252.42
36100	Structures & Improvements	1,345,172.37	1,345,172.37	1,345,172.37	1,345,172.37	1,345,172.37	1,345,172.37	1,347,625.43	1,347,625.43	1,347,625.43	1,347,625.43	1,347,625.43	1,347,625.43	1,347,625.43
36200	Station Equipment	5,633,345.38	5,635,339.48	5,637,242.16	5,638,717.68	5,647,923.32	5,665,975.13	5,666,003.69	5,668,817.25	5,676,766.42	5,678,530.39	5,679,411.42	5,683,845.32	5,677,994.72
36210	1st Street Substation	1,960,264.85	1,983,815.87	1,983,815.87	1,984,175.70	1,984,175.70	1,993,018.08	1,993,018.08	1,993,018.08	1,993,018.08	1,993,018.08	1,993,018.08	1,993,018.08	1,993,018.08
36211	1st Street Substation - SCADA	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15	50,821.15
36212	SCADA System - Wide	588,834.60	590,590.77	591,253.47	593,175.31	595,984.96	595,984.96	596,018.10	596,250.05	600,921.61	601,816.26	602,081.34	602,942.86	603,112.26
36220	Tapteal Substation	749,777.35	749,777.35	750,090.21	750,090.21	750,090.21	750,090.21	750,090.21	750,117.12	750,688.32	751,859.28	752,886.49	769,833.45	791,701.40
36221	Tapteal Substation - SCADA	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03	66,140.03
36230	Richland SW Sub-Stn Expa	1,480,410.34	1,480,410.34	1,480,566.78	1,480,566.78	1,481,137.98	1,481,309.34	1,481,475.02	1,508,383.31	1,508,383.31	1,508,383.31	1,508,383.31	1,509,675.81	1,509,675.81
36231	Richland SW Sub-Stn SCADA	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86	76,309.86
36250	Sub Stn Equip - Snyder St	3,626,089.81	3,626,089.81	3,626,246.25	3,626,246.25	3,626,246.25	3,626,246.25	3,626,246.25	3,626,259.70	3,626,524.78	3,626,524.78	3,626,524.78	3,626,524.78	3,626,524.78
36251	Snyder - SCADA	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45	125,836.45
36260	Stevens Sub	2,101,000.21	2,101,000.21	2,101,313.08	2,101,313.08	2,101,313.08	2,101,313.08	2,101,313.08	2,101,339.99	2,101,339.99	2,101,339.99	2,101,367.58	2,105,149.25	2,105,149.25
36261	Stevens Sub - SCADA	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50	178,159.50
36265	Leslie Sub	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84	4,363,563.84
36266	Leslie Sub - SCADA	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64	3,577.64
36270	Thayer Sub	3,936,222.96	3,936,222.96	3,936,379.40	3,936,379.40	3,937,036.28	3,937,486.45	3,941,371.73	3,964,182.26	3,964,182.26	3,964,182.26	3,964,182.26	3,965,277.26	3,965,277.26
36271	Thayer Sub - SCADA	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73	124,852.73
36275	Sandhill Crane Substation	2,920,333.59	2,920,333.59	2,920,646.46	2,920,646.46	2,920,646.46	2,921,116.97	2,925,502.94	2,926,966.07	2,928,158.94	2,929,583.75	2,930,990.67	2,931,090.08	2,931,293.36
36276	Sandhill Crane - SCADA	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08	69,132.08
36281	SCADA Master - Shop	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51	51,135.51
36285	City View Substation	2,336,984.79	2,336,984.79	2,337,141.23	2,337,141.23	2,337,141.23	2,337,141.23	2,337,141.23	2,337,154.71	2,337,154.71	2,337,154.71	2,337,154.71	2,337,154.71	2,337,154.71
36290	SE Richland Substation	602,734.61	602,734.61	602,734.61	603,732.61	616,994.11	660,713.11	722,762.97	780,966.82	845,793.57	894,672.57	926,664.82	962,699.82	1,007,489.82
36292	Dallas Substation	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00
36300	Storage Battery Equipment	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64	11,323.64
36400	Poles, Towers, Fixtures	8,230,599.45	8,430,165.45	8,445,568.31	8,468,495.28	8,484,443.23	8,530,334.46	8,548,703.78	8,558,375.03	8,579,997.49	8,592,420.02	8,606,010.04	8,623,707.18	8,591,595.76
36500	Conductor - Overhead	8,623,548.81	8,631,350.45	8,649,804.75	8,652,053.60	8,655,704.94	8,660,844.80	8,661,572.13	8,662,634.33	8,662,634.33	8,664,985.54	8,666,916.40	8,668,472.69	8,664,659.70
36600	Conduit - Underground	40,702,276.17	40,709,428.11	40,718,883.21	40,729,393.78	40,734,368.23	40,740,088.07	41,085,454.79	41,470,271.38	41,673,906.53	41,713,949.90	41,725,905.38	41,749,675.75	42,310,185.55
36700	Conductor - Underground	39,903,846.39	39,931,791.71	40,100,105.01	40,168,174.77	40,317,560.63	40,453,274.53	40,758,543.89	40,832,831.75	40,864,141.34	40,879,604.81	41,072,841.72	41,243,898.51	41,304,620.47
36710	Underground Cond and Dev	14,215,362.33	14,263,075.66	14,264,472.50	14,267,909.84	14,269,455.30	14,271,428.60	14,393,091.49	14,537,720.95	14,635,076.31	14,640,711.07	14,716,414.66	14,772,776.98	14,858,000.85
36800	Line Transformers	9,685,539.23	9,691,703.05	9,691,703.05	9,691,703.05	9,691,703.05	9,691,703.05	9,691,857.84	9,691,857.84	9,691,888.40	9,691,888.40	9,692,010.65	9,692,010.65	9,784,302.03
36810	Line Transformers - Overhead	1,985,836.05	1,988,163.36	1,988,163.36	1,991,350.50	1,991,350.50	1,994,349.70	1,994,920.26	1,995,246.22	1,995,246.22	1,995,925.46	1,996,056.10	1,996,816.85	1,997,212.93
36820	Line Transformers - Underground	11,968,035.40	11,980,960.58	11,995,904.82	12,022,990.85	12,025,730.33	12,059,690.41	12,123,028.57	12,185,952.52	12,187,015.30	12,187,901.66	12,261,306.38	12,262,430.51	12,427,251.99
36840	Dist Plant Line Transform	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35	50,051.35
36900	Services	6,478,604.27	6,479,513.87	6,480,038.28	6,484,138.54	6,487,312.67	6,493,878.84	6,498,541.84	6,505,137.13	6,510,380.19	6,514,722.68	6,532,918.96	6,540,242.22	6,540,999.97
36910	Services - Overhead	712,248.47	712,848.48	713,845.27	714,168.10	714,168.10	714,168.10	714,331.12	714,501.70	714,610.38	715,411.61	717,401.38	718,479.97	718,958.27
36920	Services - Underground	4,367,265.66	4,392,989.84	4,409,806.45	4,428,436.73	4,439,457.56	4,456,983.98	4,476,011.47	4,494,646.56	4,509,902.73	4,521,700.82	4,537,946.27	4,547,593.96	4,474,038.50
37000	Meters	4,408,539.08	4,414,411.77	4,437,385.24	4,469,238.73	4,472,143.05	4,474,350.53	4,478,378.97	4,490,034.17	4,494,058.39	4,505,110.08	4,519,812.03	4,524,632.39	4,523,995.92
37100	Installation Cust. Premises	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08	119,716.08
37200	Leased Pr. Cust. Premises	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82	1,039,967.82
37300	Lighting and Signal System	3,588,388.14	3,588,388.14	3,588,388.14	3,588,388.14	3,588,388.14	3,588,388.14	3,588,496.82	3,588,810.59	3,588,810.59	3,588,810.59	3,589,605.01	3,589,605.01	3,589,605.01
37320	Traffic Signals	804,915.87	805,023.48	805,023.48	805,023.48	805,023.48	805,023.48	805,145.73	805,145.73	805,145.73	805,145.73	805,746.09	805,746.09	805,746.09
37330	Distr Plant Tone Control	144.60	144.60	144.60	144.60	144.60	144.60	144.60	144.60	144.60	144.60	144.60	144.60	144.60
38900	Land and Land Rights	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17	20,097.17
39000	Structures & Improvements	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49	300,991.49
39010	S & I - City Shops Elec	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18	8,052,810.18
39020	S & I - City Shops Non-Elec	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00	4,032,582.00
39100	Office Furniture & Fixtures	473,346.10	473,346.10	473,346.10	473,346.10	473,346.10	560,023.97	560,023.97	564,657.11	564,657.11	564,657.11	564,657.11	564,657.11	564,657.11
39200	Transportation Equipment	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05	66,100.05
39300	Stores Equipment	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99	33,274.99
39400	Tools, Shop & Garage Equip	242,009.17	242,009.17	242,009.17	242,009.17	242,009.17	242,009.17	242,009.17	242,009.17	242,174.68	242,174.68	242,174.68	242,174.68	242,174.68
39500	Laboratory Equip	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23	707,912.23
39600	Power Operated Equip	542,335.93	542,335.93	542,335.93	542,335.93	542,335.93	542,335.93	542,335.93	542,335.93	542,335.93	542,335.93	542,335.93	542,335.93	542,417.44
39700	Communication Equip	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,775,172.23	2,827,733.02
39710	Communication Equip - Shops	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33	216,102.33
39712	Communication Equip - GEMS Software	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22	344,747.22
39713	Work Order System	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51	262,799.51
39800	Miscellaneous Equipment	463,892.82	463,892.82	463,892.82	463,892.82	463,892.82	463,892.82	463,892.82	463,892.82	463,892.82	463,892.82	463,892.82	463,892.82	521,913.56
	TOTAL FIXED ASSETS	212,691,061.50	213,081,557.91	213,370,487.27	214,512,242.97	214,760,252.83	215,194,559.48	216,995,428.72	217,846,684.04	218,321,026.37	218,496,970.38	218,968,413.08	219,342,344.82	222,184,386.85

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
DETAILED BALANCE SHEET
As of December 31, 2020

Acct. No.	Account Title	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
ACCUMULATED DEPRECIATION														
10810	Accum Depr - Transmission	(744,059.26)	(753,571.86)	(763,084.45)	(772,597.05)	(782,109.64)	(791,622.24)	(801,134.83)	(810,647.43)	(820,160.02)	(829,672.62)	(839,185.21)	(848,697.81)	(858,210.40)
10812	Accum Depr - Distribution	(86,854,491.80)	(87,343,888.96)	(87,833,286.10)	(88,322,683.26)	(88,812,080.39)	(89,291,551.68)	(89,771,022.95)	(90,250,494.24)	(90,729,965.51)	(91,209,436.81)	(91,688,908.08)	(92,168,379.38)	(92,647,850.64)
10814	Accum Depr - General Plant	(5,695,071.88)	(5,712,334.89)	(5,729,597.88)	(5,746,860.89)	(5,764,123.88)	(5,781,386.89)	(5,798,649.88)	(5,815,912.89)	(5,833,175.88)	(5,850,438.88)	(5,867,701.87)	(5,884,964.87)	(5,902,227.86)
10816	Accum Depr - City Shops	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)	(12,085,392.18)
10820	Cost of Property Retired	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22	212,055.22
10830	Ut Plant - Cost of Removal	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74	446,791.74
10840	Utility Plant - Salvage	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)	(372,041.41)
	TOTAL ACCUMULATED DEPR	(105,092,209.57)	(105,608,382.34)	(106,124,555.06)	(106,640,727.83)	(107,156,900.54)	(107,663,147.44)	(108,169,394.29)	(108,675,641.19)	(109,181,888.04)	(109,688,134.94)	(110,194,381.79)	(110,700,628.69)	(111,206,875.53)
LIABILITIES														
22143	Cur Ptn LTD - 2009 Bonds	-	-	-	-	-	-	-	-	-	-	-	-	-
22148	Cur Ptn LTD - 2013 Rev Ref Bonds	(980,000.00)	(980,000.00)	(980,000.00)	(980,000.00)	(980,000.00)	(980,000.00)	(980,000.00)	(980,000.00)	(980,000.00)	(980,000.00)	(980,000.00)	(635,000.00)	(635,000.00)
22152	Cur Ptn LTD - 2015 Bonds	(385,000.00)	(385,000.00)	(385,000.00)	(385,000.00)	(385,000.00)	(385,000.00)	(385,000.00)	(385,000.00)	(385,000.00)	(385,000.00)	(385,000.00)	(455,000.00)	(455,000.00)
22153	Cur Ptn LTD - 2018 Bonds	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,385,000.00)	(1,775,000.00)	(1,775,000.00)
22154	Cur Ptn LTD - 2019 Bonds	(295,000.00)	(295,000.00)	(295,000.00)	(295,000.00)	(295,000.00)	(295,000.00)	(295,000.00)	(295,000.00)	(295,000.00)	(295,000.00)	(295,000.00)	(255,000.00)	(255,000.00)
22160	2009 BAB Rev Bonds Outstanding	-	-	-	-	-	-	-	-	-	-	-	-	-
22161	2013 Rev Ref Bonds Outstanding	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(15,465,000.00)	(14,830,000.00)	(14,830,000.00)
22162	2015 Rev Bonds Outstanding	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,835,000.00)	(18,380,000.00)	(18,380,000.00)
22163	2018 Rev Bonds Outstanding	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(17,095,000.00)	(15,320,000.00)	(15,320,000.00)
22164	2019 Rev Bonds Outstanding	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,375,000.00)	(15,120,000.00)	(15,120,000.00)
22830	Net Pension Liability	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(2,036,735.00)	(1,954,998.00)
22840	Net OPEB Liability	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)	(875,686.65)
23200	A/P - Accrued Power Bills	(3,175,540.00)	(3,833,728.82)	(3,275,250.82)	(3,142,450.82)	(3,039,241.09)	(2,985,207.09)	(3,034,463.09)	(3,448,209.26)	(3,588,878.26)	(3,200,211.09)	(3,163,581.09)	(5,759,545.26)	(3,181,877.81)
23209	Accts Pay - Inventory	-	2,237.56	5,760.07	5,760.07	5,760.07	5,760.07	5,760.07	8,236.15	8,236.15	7,966.15	11,193.92	11,193.92	10,958.66
23210	Accts Pay - Payroll	(201,835.12)	(196,626.82)	(196,626.82)	(196,626.82)	(196,626.82)	(196,626.82)	(196,626.82)	(196,626.82)	(196,626.82)	(196,626.82)	(196,626.82)	(196,626.82)	(250,459.87)
23211	Accts Pay - Excise Tax	(6.78)	(245,263.61)	(255,319.54)	(231,580.85)	(244,299.71)	(179,568.65)	(181,914.80)	(214,831.02)	(262,325.43)	(7,977.00)	(6,910.77)	(105,410.88)	126.19
23212	Accounts Payable	(2,670,402.54)	(4,736,191.87)	(1,179,712.26)	(1,279,987.17)	(646,957.92)	(779,576.12)	(1,954,556.27)	(901,532.56)	(600,713.97)	(829,979.72)	(660,486.61)	(725,514.61)	(795,003.40)
23214	Deferred Revenue - Fac Fee Deposit	(645,241.70)	(672,841.70)	(684,841.70)	(684,841.70)	(497,840.70)	(497,840.70)	(616,640.70)	(616,640.70)	(638,840.70)	(704,840.70)	(704,840.70)	(704,840.70)	(704,840.70)
23215	Deferred Revenue - Fac Fee Large Projects	-	-	-	-	-	-	-	-	-	-	-	-	-
23216	Due to Other Funds	-	-	-	-	-	-	-	-	-	-	-	-	-
23217	Retainage Payable	-	-	-	-	-	-	-	-	-	-	-	-	-
23750	Accrued Interest - Bonds	(485,856.33)	(745,839.08)	(1,005,821.83)	(1,265,804.58)	(1,525,787.33)	(345,483.96)	(599,770.98)	(854,058.00)	(1,108,345.02)	(1,362,632.04)	(1,616,919.06)	(335,886.04)	(580,575.15)
24200	Accrued Sick and Vacation	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(663,157.40)	(768,986.84)
25300	Deferred Credit - Pension	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(1,335,108.00)	(729,165.00)
25310	Deferred Credit - OPEB	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)	(73,178.98)
25402	Prepaid Lease - BPUD	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(135,910.09)	(130,876.38)
25700	Unamortized Gain on 2007 Refunded	(5,919.16)	(5,889.86)	(5,860.56)	(5,831.26)	(5,801.96)	(5,772.66)	(5,743.36)	(5,714.06)	(5,684.76)	(5,655.46)	(5,626.16)	(5,596.86)	(5,567.56)
	TOTAL LIABILITIES	(82,119,577.75)	(85,368,920.32)	(81,532,449.58)	(81,736,139.25)	(81,085,571.58)	(79,919,092.05)	(81,518,732.07)	(81,164,152.39)	(81,327,954.93)	(81,234,732.80)	(81,278,573.41)	(79,712,003.37)	(76,810,131.49)
NET INCOME & FUND EQUITY														
NI	Net Income - Year to Date	(5,054,236.55)	(175,650.95)	(957,246.86)	(1,326,105.19)	(1,873,913.52)	(1,219,200.94)	(712,565.54)	(741,306.96)	(1,370,688.54)	(2,786,630.31)	(2,833,513.00)	(3,412,626.57)	(5,247,708.98)
21500	Ret Earnings - Ins Set Aside	-	-	-	-	-	-	-	-	-	-	-	-	-
21600	Unappro Retained Earnings	(40,952,577.82)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)	(46,006,814.37)
27150	Contributed Capital	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)	(16,564,772.63)
27160	Contributed Capital	-	-	-	-	-	-	-	-	-	-	-	-	-
43910	Residual Equity Transfer	-	-	-	-	-	-	-	-	-	-	-	-	-
43900	Adjust to Retained Earnings	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64	5,069,025.64
	TOTAL NET INCOME & FUND EQUITY	(57,502,561.36)	(57,678,212.31)	(58,459,808.22)	(58,828,666.55)	(59,376,474.88)	(58,721,762.30)	(58,215,126.90)	(58,243,868.32)	(58,873,249.90)	(60,289,191.67)	(60,336,074.36)	(60,915,187.93)	(62,750,270.34)
	TOTAL ASSETS	139,622,139.11	143,047,132.63	139,992,257.80	140,564,805.80	140,462,046.46	138,640,854.35	139,733,858.97	139,408,020.71	140,201,204.83	141,523,924.47	141,614,647.77	140,627,191.30	139,560,401.83
	TOTAL LIABILITIES & FUND EQUITY	(139,622,139.11)	(143,047,132.63)	(139,992,257.80)	(140,564,805.80)	(140,462,046.46)	(138,640,854.35)	(139,733,858.97)	(139,408,020.71)	(140,201,204.83)	(141,523,924.47)	(141,614,647.77)	(140,627,191.30)	(139,560,401.83)
		-	-	-	-	-	-	-	-	-	-	-	-	-

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
DETAILED REVENUE SHEET
CY 2020 ACTUAL

REVENUES

Acct. No	Account Title	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Year To Date
41900	Interest Income	(42,681.07)	(45,829.89)	(40,929.68)	(25,273.34)	(12,728.28)	(22,579.58)	(15,097.74)	(14,424.42)	(11,386.88)	(11,106.74)	(6,437.31)	(9,474.88)	(257,949.81)
41900	(Gain)/Loss on Fair Market Value (FMV) Adjustment	-	-	-	-	-	-	-	-	-	-	-	-	-
41910	Interest (Consv Loan Int Payments)	(4,547.38)	(1,385.78)	(6,917.93)	(4,402.67)	(4,259.02)	(4,415.90)	(4,414.77)	(4,365.47)	(4,334.02)	(4,382.06)	(4,287.09)	(4,181.92)	(51,894.01)
41911	Interest on Conservation Loan Investment	(447.27)	(408.25)	(336.48)	(205.22)	(129.80)	(93.35)	(81.05)	(66.88)	(51.99)	(48.69)	(40.72)	(40.76)	(1,950.46)
41912	Other Interest Thru Collection Agency	(204.17)	(169.50)	(99.34)	-	(494.88)	(64.71)	(66.76)	(59.41)	(37.70)	(4,092.73)	(66.69)	(152.93)	(5,508.82)
41920	BPA - Conservation Admin Fee	-	(45,507.23)	(9,863.33)	(2,953.80)	-	-	(8,820.17)	(38,122.02)	(39,659.39)	(3,519.22)	(6,333.26)	(3,861.21)	(158,639.63)
41921	BPA - Conservation Program (EEI)	(560.00)	(147,068.04)	(89,580.05)	(31,689.83)	(2,400.00)	(9,061.90)	(150,371.55)	(72,737.00)	(62,914.54)	(45,961.95)	(31,666.32)	(48,896.46)	(692,907.64)
41922	LSO Lighting	-	-	-	-	-	-	-	-	-	-	-	-	-
42100	Miscellaneous Revenue	-	(1,440.61)	(14,937.23)	(1,547.55)	(403.41)	-	(13,931.63)	(131.82)	(3,137.73)	(160.40)	-	(300.57)	(35,990.95)
42100	Other Operating Revenue	-	-	-	-	-	-	-	-	-	-	-	-	-
42100	Transfers From General Fund	-	-	-	-	-	-	-	-	-	-	-	-	-
43400	Insurance Recovery	-	-	-	-	-	-	-	-	-	-	-	-	-
43401	Bonneville Power Admin. REP Agreement	-	-	-	-	-	-	-	-	-	-	-	-	-
43902	Prior Period Adjustment	-	-	-	-	-	-	-	-	-	-	-	-	-
44000	Electric Utility Tax	(562,004.71)	(554,761.62)	(514,652.17)	(530,081.36)	(406,497.16)	(401,733.57)	(491,800.79)	(569,608.99)	(542,792.53)	(472,636.09)	(477,884.17)	(552,013.27)	(6,076,466.43)
44010	Energy: Residential	(3,430,343.78)	(2,937,380.23)	(2,890,160.70)	(2,895,011.13)	(1,932,574.23)	(1,768,945.26)	(2,490,279.02)	(3,070,007.05)	(2,616,086.64)	(2,263,776.17)	(2,317,218.95)	(3,195,076.46)	(31,806,859.62)
44210	General Service	282.52	-	-	-	-	-	-	-	-	-	-	-	282.52
44211	Small Gen Service	(587,652.55)	(596,506.93)	(525,053.04)	(500,705.52)	(391,242.92)	(422,708.37)	(491,882.02)	(524,200.56)	(545,079.37)	(475,115.41)	(506,275.19)	(539,050.15)	(6,105,472.03)
44212	Medium Gen Service	(660,747.90)	(863,163.66)	(720,437.17)	(707,694.30)	(615,551.66)	(595,516.90)	(697,430.88)	(774,898.01)	(810,409.27)	(697,322.42)	(716,428.94)	(725,548.74)	(8,585,149.85)
44213	Large Gen Service	(585,852.59)	(728,307.12)	(626,638.04)	(659,879.86)	(629,590.92)	(657,872.90)	(704,533.01)	(836,421.67)	(861,794.65)	(754,802.36)	(744,937.60)	(725,602.01)	(8,516,232.73)
44215	Cable TV Amp	(3,601.65)	(3,601.65)	(3,601.65)	(3,601.65)	(3,601.65)	(3,601.65)	(3,601.65)	(3,601.65)	(3,601.65)	(5,620.47)	(3,601.65)	(5,620.47)	(47,257.44)
44220	Large Commercial	-	-	-	-	-	-	-	-	-	-	-	-	-
44221	Small Industrial	(228,598.56)	(259,974.71)	(251,170.26)	(322,925.70)	(241,770.33)	(236,154.48)	(280,312.83)	(219,767.69)	(314,415.57)	(282,411.18)	(253,983.06)	(261,970.12)	(3,153,454.49)
44222	Large Industrial	(508,740.76)	(541,246.20)	(482,275.96)	(513,202.53)	(408,380.19)	(447,692.57)	(392,019.98)	(442,137.63)	(426,318.51)	(399,524.59)	(465,742.69)	(438,328.08)	(5,465,609.69)
44225	Large Irrigation	(1,197.50)	(1,264.52)	(1,409.60)	(52,479.04)	(102,446.28)	(143,111.88)	(178,746.85)	(202,152.96)	(203,036.37)	(151,032.72)	(85,251.84)	(7,129.11)	(1,129,258.67)
44230	Small Irrigation	(1,672.25)	(974.96)	(652.34)	(13,974.95)	(11,378.12)	(11,540.79)	(16,321.02)	(18,106.86)	(19,250.11)	(18,409.71)	(9,138.62)	(3,044.51)	(124,464.24)
44410	Street Lighting	(30,446.34)	(28,482.06)	(27,926.71)	(29,859.60)	(29,777.10)	(28,297.80)	(29,241.06)	(29,557.57)	(30,210.00)	(31,250.48)	(31,269.08)	(31,537.54)	(357,855.34)
44420	Traffic Lighting	(3,416.95)	(3,794.38)	(3,493.48)	(3,224.05)	(3,264.02)	(2,896.31)	(2,886.06)	(2,912.70)	(3,007.45)	(3,229.01)	(3,410.42)	(3,791.64)	(39,326.47)
44700	Sales for Resale	-	-	-	-	-	-	-	-	-	-	-	-	-
45100	Misc Service Revenue	(675.00)	(450.00)	(675.00)	-	(225.00)	-	(900.00)	(675.00)	(675.00)	(450.00)	(900.00)	(106,843.22)	(112,468.22)
45110	New Accounts	(6,090.00)	(6,675.00)	(8,820.00)	(4,590.00)	(9,630.00)	(7,425.00)	(6,990.00)	(2,670.00)	(9,810.00)	(2,010.00)	(7,455.00)	(13,530.00)	(85,695.00)
45112	Accounts Transfer Fee	-	-	-	-	-	-	-	-	-	-	-	-	-
45120	Reimb Loan Service Fees	(351.00)	(2,313.00)	(1,993.00)	(1,083.00)	(611.00)	(3,584.00)	(980.00)	(1,477.00)	(490.00)	(2,826.00)	(714.00)	(2,161.00)	(18,583.00)
45121	Temp Service Fees	-	-	-	-	-	-	-	-	-	-	-	-	-
45122	Permanent Service Fees	(24,893.11)	(27,077.65)	(23,879.31)	(3,008.73)	(17,250.12)	(20,175.00)	(30,617.87)	(28,190.00)	(18,620.00)	(20,575.00)	(20,126.61)	(27,861.30)	(262,274.70)
45123	Damages & Claims	-	(1,109.22)	-	-	(3,891.47)	-	-	-	-	(7,321.68)	-	12,322.37	-
45124	Rewires & Underground Conversion	-	(37,818.24)	(1,304.49)	(670.16)	(404.54)	-	-	(1,009.82)	(1,024.81)	(1,869.27)	(8,348.57)	(10,609.21)	(63,059.11)
45125	Facilities Fees	(39,818.03)	(46,648.83)	(36,401.18)	(81,277.18)	(17,986.10)	(122,793.86)	(67,350.74)	(12,790.24)	(134,502.04)	(24,287.83)	(3,343.27)	(21,654.38)	(608,853.68)
45126	Contributed Capital (NonCash)	-	-	-	-	-	-	-	-	-	-	-	(590,213.68)	(590,213.68)
45150	Disconnect/Reconnect Fees	(21,925.00)	(16,225.00)	(9,700.00)	200.00	(50.00)	(150.00)	(100.00)	-	(200.00)	100.00	(100.00)	(150.00)	(48,300.00)
45152	Operations Disconnect/Rec Fees	-	(1,692.19)	-	-	-	(100.00)	-	-	-	-	-	-	(1,792.19)
45154	Delinquent Account Fees	(20,828.35)	(26,722.64)	(25,454.00)	20,534.80	980.20	(5,142.80)	(18,184.40)	15,119.00	7,651.80	(177.81)	(3,385.20)	(1,089.40)	(56,698.80)
45160	Rental Lights Contract	(10,946.97)	(10,737.27)	(10,883.92)	(11,450.94)	(9,858.09)	(9,849.75)	(10,457.40)	(11,440.65)	(10,307.86)	(10,934.59)	(10,402.22)	(11,192.46)	(128,462.12)
45170	Land Sales	-	(3,836.89)	-	-	-	-	-	-	-	-	(1,916.64)	-	(5,753.53)
45440	Pole Contacts-Telecable	-	-	-	-	-	1,952.00	-	(102,815.50)	-	-	-	-	(100,863.50)
45601	EECBG/ARRA Grant Funds	-	-	-	-	-	-	-	-	-	-	-	-	-
45602	BAB ederal Interest Subsidy	-	-	-	(947.11)	-	-	-	-	-	-	-	-	(947.11)
45603	COVID Assistance	-	-	-	-	-	-	-	-	(271,157.92)	(132,196.52)	-	(115,772.22)	(519,126.66)
45610	Gain/Loss on Sale of Scrapped Assets	(5,162.32)	(1,551.47)	-	(733.14)	(496.65)	-	(312.62)	(1,524.67)	(969.88)	-	-	(4,320.32)	(15,071.07)
45629	Meter Reading Revenue	(26,625.36)	(22,086.38)	(21,672.98)	(17,190.99)	(18,326.75)	(25,916.80)	(18,000.91)	(18,352.05)	(15,001.54)	(20,365.29)	(21,038.55)	(19,796.32)	(244,373.92)
45630	Work For City Depts	-	(12,231.13)	-	(83,691.15)	-	(12,401.15)	-	(44,415.75)	(117,281.05)	(50,364.54)	(12,367.86)	(161,729.76)	(494,482.39)
45653	City Shops Rental	-	-	-	-	-	-	-	-	-	-	-	-	-
45654	Land Lease	-	-	-	-	-	-	-	-	-	-	(5,033.71)	(5,033.71)	
	TOTAL REVENUES	[illegible]	(6,350,919.04)	(6,482,619.70)	(4,874,239.49)	(4,961,874.28)	(6,125,732.78)	(7,033,522.04)	(7,069,912.67)	(5,897,680.93)	(5,754,071.52)	(7,635,255.44)	(75,974,018.19)	

CITY OF RICHLAND, WASHINGTON
ELECTRIC UTILITY
DETAILED EXPENSE SHEET
CY 2020 ACTUAL

EXPENSES

Acct. No	Account Title	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Year To Date
40300	Depr Exp Transmission	8,691.85	8,691.84	8,691.85	8,691.84	8,691.85	8,691.84	8,691.85	8,691.84	8,691.85	8,691.84	8,691.85	8,691.84	104,302.14
40302	Depr Exp Distribution	490,217.91	490,217.89	490,217.91	490,217.88	480,292.04	480,292.02	480,292.04	480,292.02	480,292.05	480,292.02	480,292.05	480,292.01	5,803,207.84
40304	Depr Exp Misc	17,263.01	17,262.99	17,263.01	17,262.99	17,263.01	17,262.99	17,263.01	17,262.99	17,263.00	17,262.99	17,263.00	17,262.99	207,155.98
40306	Depr Exp City Shops	-	-	-	-	-	-	-	-	-	-	-	-	-
40310	Transfer To Equip Replacement Fund	26,743.50	26,743.50	26,743.50	26,743.50	26,743.50	26,743.50	26,743.50	26,743.50	26,743.50	26,743.50	26,743.50	26,743.50	320,922.00
40311	Transfer To Broadband Fund	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	30,000.00
40810	Taxes-City Occupation	562,269.90	555,066.60	512,041.37	533,666.52	406,804.28	402,043.39	492,108.57	569,909.19	542,836.35	473,115.54	478,171.28	552,491.89	6,080,524.88
40830	Taxes-Social Security	-	-	-	-	-	-	-	-	-	-	-	-	-
40910	Taxes-State B&O	1,923.47	1,292.62	1,498.22	1,721.97	946.56	5,641.99	(544.58)	1,417.88	2,065.46	1,007.54	819.84	1,308.18	19,099.15
40920	Taxes-State Public Utility	243,178.54	253,865.32	337,251.18	240,476.31	177,862.80	174,850.43	215,388.83	254,486.10	-	-	104,736.61	246,943.08	2,249,039.20
41600	Contract Work Locator	-	-	-	-	-	-	-	-	-	78.17	-	-	78.17
41710	Non-Utility Operations	69,026.27	77,868.38	69,697.85	90,035.62	81,317.37	80,101.95	69,456.59	68,253.61	70,216.62	98,715.86	59,613.79	29,086.95	863,390.86
41711	Non-Billable Work For Other Depts	-	-	-	-	420.53	-	-	-	-	-	-	-	420.53
42750	Accrued Interest Bonds	259,982.75	259,982.75	259,982.75	259,982.75	254,287.02	254,287.02	254,287.02	254,287.02	254,287.02	254,287.02	244,689.11	244,689.11	3,055,031.34
42756	Interest Exp-1999 Bonds	-	-	-	-	-	-	-	-	-	-	-	-	-
42765	Interest Exp-Notes	-	-	-	-	-	-	-	-	-	-	-	-	-
42800	Amort of Debt Discount	-	-	-	-	-	-	-	-	-	-	-	-	-
42800	Debt Issuance Expense	-	-	-	-	-	-	-	-	-	-	-	-	-
42810	Amort of Loss on Reacquired Debt	2,621.48	2,621.48	2,621.48	2,621.48	2,621.48	2,621.48	2,621.48	2,621.48	2,621.48	2,621.48	2,621.48	2,621.48	31,457.76
42900	Amort of Debt Premium	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(23,036.04)	(276,432.48)
43901	Prior Period Adjustment	-	-	-	-	-	-	-	-	-	-	-	-	-
55500	Purchased Power	3,361,384.00	2,864,105.00	2,803,438.00	2,728,499.00	2,640,977.00	2,619,661.00	3,007,456.00	3,105,794.00	2,812,226.00	2,834,891.00	2,269,444.00	2,743,277.00	33,791,152.00
55520	Purchased Power WPPSS	-	-	-	-	-	-	-	-	-	-	-	-	-
55550	Purchased Power For Resale	-	-	-	-	-	-	-	-	-	-	-	-	-
55501	BPUD Energy Charges For City Customers	-	1,474.12	477.55	476.95	-	699.81	-	410.01	891.98	364.03	-	1,368.19	6,162.64
55503	Purchased Power - Non Federal	153,710.40	143,793.60	153,503.80	148,752.00	153,710.40	148,752.00	153,710.40	153,710.40	160,668.83	162,192.00	157,178.00	162,192.00	1,851,873.83
55504	Purchased Power - Renewable	-	-	-	-	-	-	-	-	-	-	-	20,142.55	20,142.55
56500	Transmission Expense	449,939.00	388,740.00	316,607.00	300,002.00	333,490.00	404,062.00	437,520.00	479,851.00	372,835.00	313,540.00	338,437.00	415,225.00	4,550,248.00
58000	Oper-Supervision & Engineering	126,958.10	125,968.81	126,288.33	180,751.18	102,748.22	102,959.78	102,571.36	110,253.37	98,924.10	145,595.12	103,695.56	(59,088.59)	1,267,625.34
58100	Oper-Load Dispatching	14,753.85	14,678.79	14,876.02	21,167.72	16,137.02	17,805.37	19,405.61	20,431.06	18,245.13	25,804.58	17,902.00	(21,822.24)	179,384.91
58200	Oper-Station Expense	631.57	547.16	-	3,200.72	6,194.38	4,846.58	-	-	412.62	1,757.49	9,391.00	-	26,981.52
58300	Oper-Overhead Line	11,689.57	57,217.44	48,252.48	16,623.51	17,008.23	16,666.25	23,595.98	52,864.97	59,839.63	35,894.86	44,843.57	36,630.00	421,126.49
58350	Oper-PCB Expense	-	-	-	-	-	-	-	-	-	-	-	-	-
58400	Oper-Underground Line	-	15,130.25	571.79	3,015.32	20,376.51	19,108.22	5,010.55	6,810.12	415.05	5,810.33	3,968.16	20,551.82	100,768.12
58500	Oper-Street Light & Signal	432.36	404.71	-	699.46	1,249.04	-	-	-	-	244.53	436.66	(269.02)	3,197.74
58510	Oper-Street Lights	43,793.19	76,025.58	29,804.33	55,018.05	30,256.19	48,885.89	28,549.03	35,072.04	16,055.24	47,751.99	54,264.10	(12,132.69)	453,342.94
58520	Oper-Telemeter Systems	113.00	-	1,880.94	1,797.53	96.58	-	156.45	75.96	135.65	-	-	836.41	5,092.52
58530	Oper-Traffic Signals	-	-	-	-	-	-	-	-	-	454.13	-	-	454.13
58550	Oper-Rental Lighting	-	457.34	816.68	-	-	-	-	-	-	-	-	-	1,274.02
58600	Oper-Meter Expense	1,707.12	16,723.57	2,142.98	3,036.76	3,050.85	3,984.07	-	1,272.57	10,786.12	9,346.15	-	(2,375.81)	49,674.38
58700	Oper-Customer Install	-	-	-	-	-	-	-	-	-	-	-	-	-
58800	Oper-Misc Distribution	69,859.86	68,262.62	172,670.26	128,777.72	70,748.83	72,737.80	76,473.56	68,976.93	59,266.16	83,825.52	57,997.74	63,235.17	992,832.17
58900	Oper-Rents	717.21	1,434.42	717.21	717.21	-	1,434.41	-	717.22	1,434.39	-	717.17	717.22	8,606.46
59000	Maint-Supervision & Engineering	2,816.71	6,045.33	7,687.59	11,882.28	5,174.80	4,308.60	2,892.49	1,783.39	3,100.43	3,805.64	3,776.94	(9,748.21)	43,525.99
59100	Maint-Structures	-	167.61	-	-	152.71	-	-	-	470.00	-	-	375.53	1,165.85
59200	Maint-Station Equip	3,286.10	2,173.70	2,235.62	894.93	298.52	3,371.35	9,177.02	5,527.84	3,463.96	2,919.45	20,670.42	(7,833.39)	46,185.52
59300	Maint-Overhead Lines	2,053.36	1,911.60	8,468.66	13,590.41	20,139.10	11,878.96	6,696.89	9,681.53	55.84	16,390.79	6,482.58	(11,704.51)	85,645.21
59400	Maint-Underground Lines	1,917.51	13,454.10	5,666.51	4,690.71	18,392.29	21,867.73	20,706.29	29,481.03	31,313.27	23,587.00	20,951.15	(10,613.57)	181,414.02
59500	Maint-Line Transformers	6,285.51	3,061.34	4,723.88	16,967.01	13,106.47	9,396.86	6,084.80	417.72	3,875.33	3,134.48	7,046.51	10,730.17	84,830.08
59510	Maint-Line Transformers OH	-	503.46	144.12	-	-	2,214.54	1,197.36	-	91.69	257.94	1,102.37	-	5,511.48
59520	Maint-Line Transformers Underground	-	1,857.67	3,483.05	4,265.23	1,378.00	2,223.16	344.27	122.25	825.19	17,123.38	219.58	4,006.50	35,848.28
59600	Maint-Street Lighting	-	-	-	1,846.88	2,359.97	542.05	675.06	764.07	58.95	1,581.11	873.32	605.50	9,306.91
59620	Other Maintenance	-	-	3,059.92	97.54	-	-	268.57	-	-	38.42	378.44	-	3,842.89
59700	Maint-Meters	787.64	55.00	85.80	461.65	4,113.82	1,343.54	1,422.25	1,311.74	1,196.47	4,410.81	1,814.66	3,277.59	20,280.97
59800	Maint-Misc Distr Plant	135,022.92	143,899.41	105,713.90	211,320.74	227,903.98	213,005.39	224,829.03	227,695.86	207,989.53	232,109.19	220,949.88	200,366.58	2,350,806.41
59810	Maint-Vehicles	-	-	-	-	-	-	-	-	-	-	-	785.90	785.90
90200	Meter Reading Expense	43,275.46	43,338.46	52,611.20	71,806.06	57,959.04	69,271.23	72,476.92	70,413.78	63,596.21	80,896.57	94,297.74	163,050.94	882,993.61
90300	Customer Records & Collections	136,747.38	152,072.38	135,578.16	107,384.26	104,221.75	(83,452.48)	103,980.10	104,182.11	104,589.41	105,107.17	104,164.06	106,939.34	1,181,513.64
90400	Uncollectible Accounts	10,350.00	10,350.00	10,350.00	10,350.00	10,350.00	10,350.00	10,350.00	10,350.00	10,350.00	10,350.00	10,350.00	251,408.97	365,258.97
90840	Customer Assistance Cons Program	44,265.20	145,987.88	72,519.23	35,148.82	31,019.64	71,292.59	52,943.54	69,287.30	37,535.37	127,763.46	45,880.10	662,589.46	1,396,232.59
90841	BPA reimbursement	-	-	-	-	-	-	-	-	-	-	-	-	-
92000	Admin & General Salaries	48,785.09	38,665.86	42,778.57	53,154.72	43,692.11	48,293.42	42,328.87	40,961.78	47,148.85	65,098.72	39,272.50	83,185.36	593,365.85
92100	Office Supplies & Expense	1,668.99	18,698.87	1,181.30	1,283.09	733.07	220.41	2,308.05	1,305.54	(143.45)	1,211.27	3,123.08	4,351.43	35,941.65
92300	Outside Service Employees	33,775.79	45,976.37	43,053.63	39,637.04	38,351.75	63,342.25	41,756.10	34,768.67	44,142.40	41,152.49	37,468.17	61,253.61	524,678.27
92301	Service Territory Relations	-	-	-	-	-	-	-	-	-	-	-	-	-
92400	Insurance	11,080.87	11,080.83	11,080.83	11,080.83	11,080.83	11,080.83	11,080.83	11,080.83	11,080.83	11,080.83	11,080.83	11,080.83	132,970.00
92500	Injuries & Damages	-	-	-	-	-	-	-	-	-	-	-	-	-
92600	Employee Pension & Benefits	25,660.03	22,031.09	22,153.56	26,462.79	22,149.49	22,000.61	22,010.27	22,178.78	22,179.50	24,011.77	20,157.06	(752,331.97)	(501,337.02)
93000	Misc General Expenses	2,662.50	14,212.47	9,252.56	6,354.26	5,652.58	483.24	529.27	444.83	1,721.76	6,097.93	804.96	2,040.44	50,256.80
93021	Organizational Dues	163,872.00	10,550.00	-	-	15,252.33	397.48	-	-	-	206.00	-	5,562.40	195,840.21
93022	Information Systems Services	62,712.17	62,712.17	62,712.17	62,712.17	62,712.17	91,474.17	62,712.17	62,712.17	62,712.17	62,712.17	62,712.17	62,712.13	781,308.00
93100	Rents	-	-	-	-	-	-	-	-	-	-	-	-	-
93200	Maint Of General Plant	-	-	-	-	-	-	-	-	-	-	-	-	-
	TOTAL EXPENSES	[illegible]	5,982,060.71	5,934,811.37	5,528,952.07	5,468,509.68	6,096,991.36	6,404,140.46	5,653,970.90	5,850,798.24	5,174,957.95	5,800,173.03	70,726,309.21	
	Net Income	[illegible]	368,858.33	547,808.33	(654,712.58)	(506,635.40)	28,741.42	629,381.58	1,415,941.77	46,882.69	579,113.57	1,835,082.41	5,247,708.98	

UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021 Agenda Category: Items of Business

Prepared By: Tom Huntington, Fire & Emergency Services Director

Subject:
Medical Service Utility Update and Recommendation (30 Minutes)

Department:
Fire & Emergency Services

Recommended Motion:
This is an informational item.

Summary:
Chief Huntington will provide an overview of the Draft Ambulance Utility Strategic Plan.

Fiscal Impact:

Attachments:

UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021 | Agenda Category: Other Informational Items

Prepared By: Clint Whitney, Energy Services Director

Subject:
Capital Work Plan Through December 2020

Department:
Energy Services

Recommended Motion:
This is an informational item.

Summary:
The attached is Energy Services Capital Working Plan (CWP) monthly report includes data through December 2020.

Fiscal Impact:

Attachments:
1. RES CWP REPORT-December2020

Richland Energy Services
Capital Work Plan
December 2020

CWP Costs for December

	Approved 2020 Budget	Total Project Costs	Actual	Sum of Remaining	December
Line Extensions	$ 1,288,000	$ 1,288,000	$ 1,286,367	$ 1,633	$104,651
Smart Grid - Advanced Metering Infrastructure	$ 3,771,000	$ 1,176,312	$ 629,572	$ 546,740	$81,791
System Improvements	$ 4,384,000	$ 3,730,352	$ 4,379,629	$ (649,277)	$1,394,718
Renewal and Replacement	$ 1,884,200	$ 3,091,658	$ 2,719,312	$ 372,346	$58,457
Gateway Substation	$ 1,112,000	$ 562,700	$ 356,788	$ 205,912	$34,965
Purchase Southwest Service Area Infrastructure	$ 359,000	$ 359,000	$ 613,532	$ (254,532)	$542,441
Grand Total	$ 14,220,100	$ 10,208,022	$ 9,985,340	$ 222,682	$2,217,022

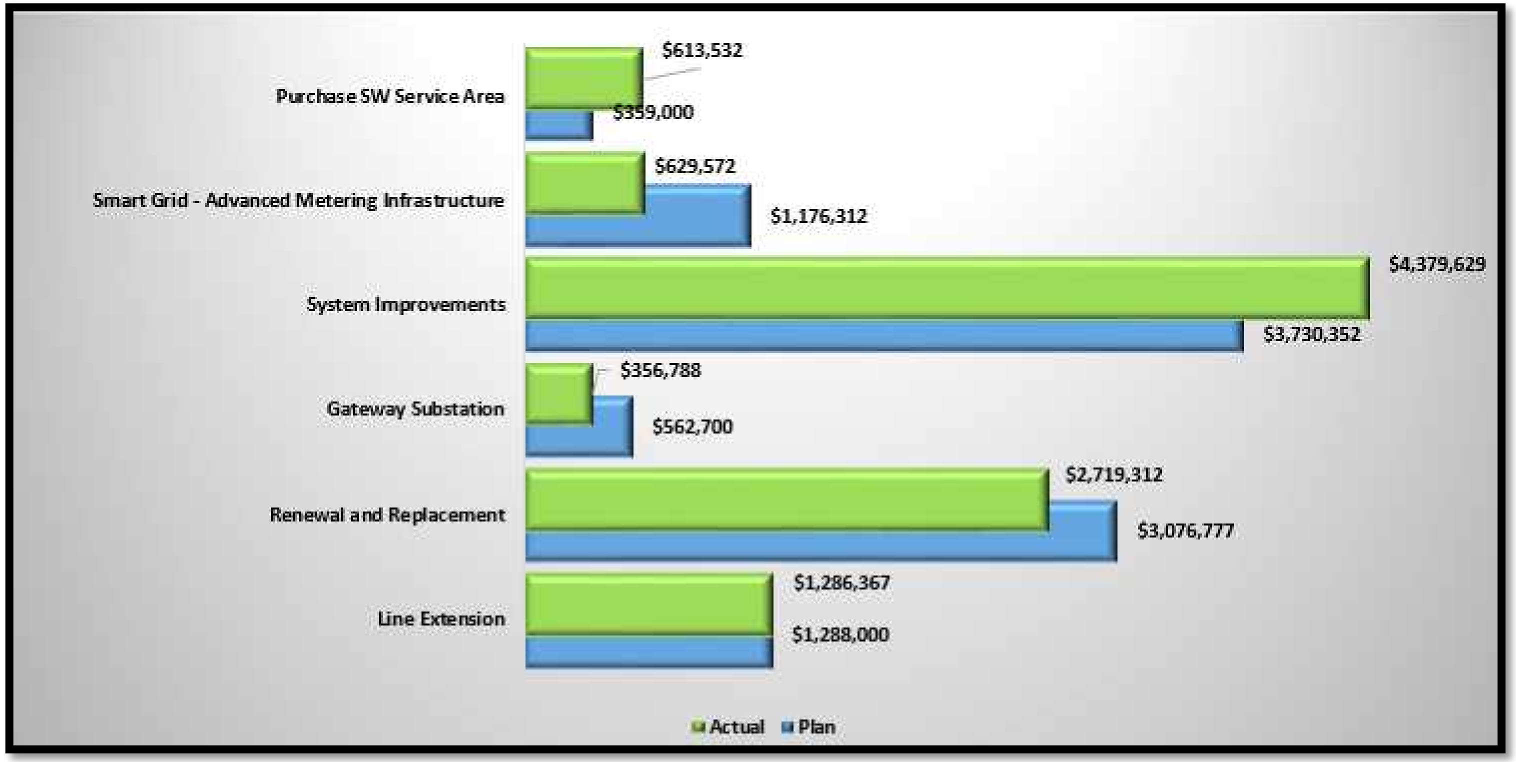
Cost Performance YTD:	$9,985,340
Cost Performance remaining:	$222,682
YTD % Complete	98%

CITY OF RICHLAND WASHINGTON

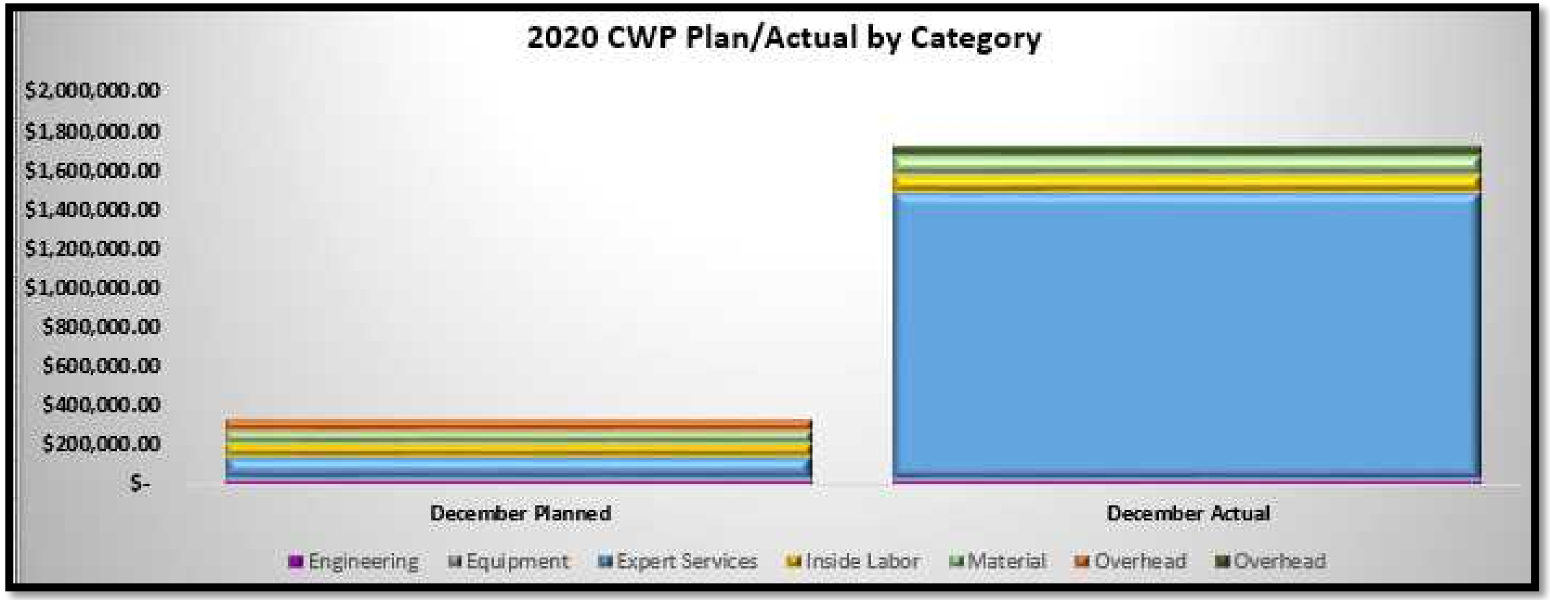
CWP Monthly Spend Vs. Actuals

% Complete of Overall Spend Plan		
To-Date Projected	$	10,208,022
To-Date Actual	$	9,985,340
Variance	($222,682)	98%

Costs by Category



CWP Cost Types



Cost Type	December Planned	December Actual
Engineering	$ 21,461.22	$ 22,621.99
Equipment	$ 9,283.73	$ -
Expert Services	$ 112,140.77	$ 2,018,283.05
Inside Labor	$ 65,661.78	$ 87,383.95
Material	$ 67,940.70	$ 102,563.48
Overhead	$ 45,767.79	$ 36,111.73
Total	$ 322,256.00	$ 2,217,021.00

CITY OF RICHLAND WASHINGTON

Richland

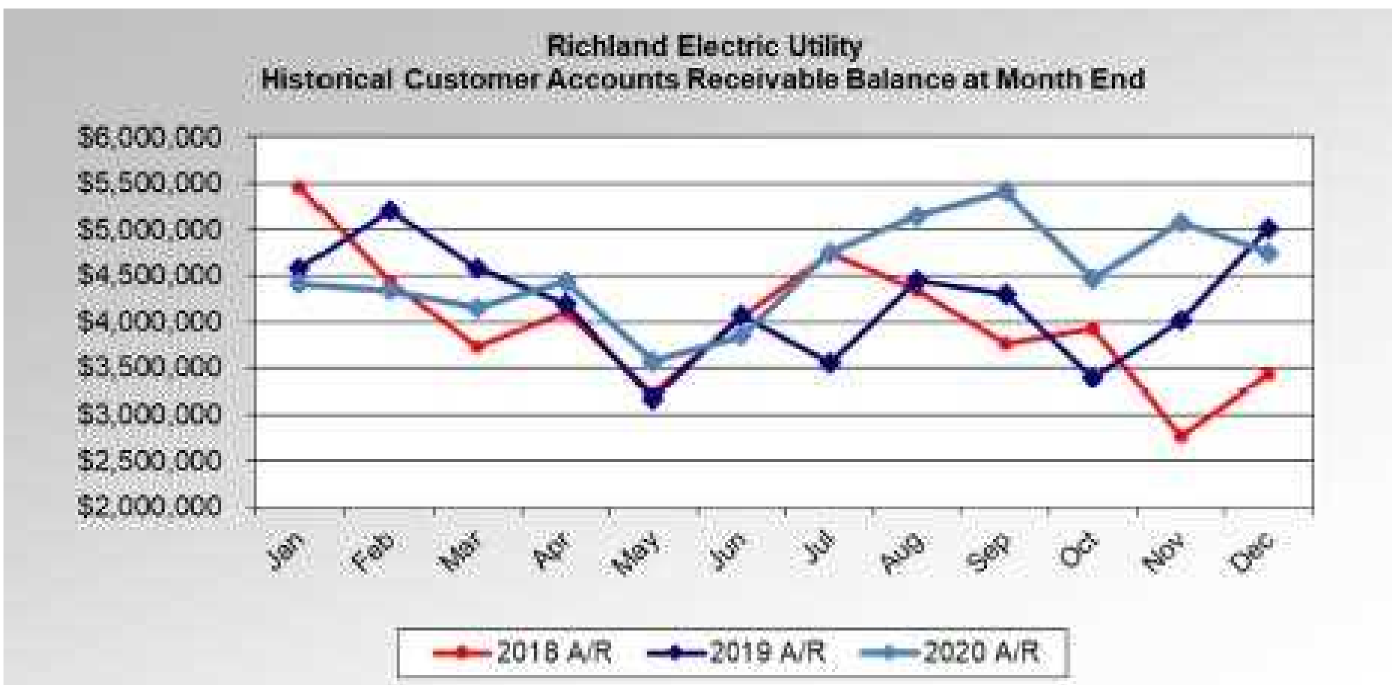
CWP Project Costs for December

	Approved 2020 Budget	Total Project Costs	Actual	Sum of Remaining	December
⊞ Line Extensions	$ 1,288,000	$ 1,288,000	$ 1,286,367	$ 1,633	$104,650.98
⊞ Smart Grid - Advanced Metering Infrastructure	$ 3,771,000	$ 1,176,312	$ 629,572	$ 546,740	$81,790.64
⊟ System Improvements	$ 4,384,000	$ 3,730,352	$ 4,379,629	$ (649,277)	$1,394,718.00
⊟ System Improvements					
⊞ M&O Horn Rapids Solar Storage and Training project.	$ 3,500,000	$ 2,500,000	$ 2,554,666	$ (54,666)	$1,314,980.45
⊞ METER INSTALLATION MATERIALS	$ 74,000	$ 74,000	$ 210,276	$ (136,276)	$15,599.08
⊞ NEW & ALT SVCS - UNDERGROUND	$ 405,000	$ 405,000	$ 525,416	$ (120,416)	$52,014.88
⊞ Relocation of electrical facilities for the Duportail Bridge Project	$ 112,000	$ 311,352	$ 376,330	$ (64,978)	$777.15
⊞ Synergi - Development of ESRI Based Model	$ -	$ 48,000	$ 12,220	$ 35,780	$0.00
⊞ Relay Replacement	$ 293,000	$ 293,000	$ 132,932	$ 160,068	$1,494.21
⊟ Renewal and Replacement	$ 1,884,200	$ 3,091,658	$ 2,719,312	$ 372,346	$58,456.69
⊟ Renewal and Replacement					
⊞ Areva Riser/Cable Replacement	$ 227,000	$ -	$ -	$ -	$0.00
⊞ R&R FDR 23 FROM 500MCM TO 750MCM	$ -	$ 115,000	$ 125,125	$ (10,125)	$0.00
⊞ Replacement of Rental lights to LED	$ -	$ 278,000	$ 340,385	$ (62,385)	$0.00
⊞ Substation PLC Replacement	$ 68,200	$ 68,200	$ 5,108	$ 63,092	$76.30
⊞ CANYON TERRACE 2, UG R&R	$ 514,000	$ 173,890	$ -	$ 173,890	$0.00
⊞ Pole Replacement Program	$ 864,000	$ 257,000	$ -	$ 257,000	$0.00
⊟ 2020 Boring					
⊞ Quailwood Apartment Complex-R&R~750	$ -	$ 196,604	$ 164,713	$ 31,891	$0.00
⊞ MAPLE RIDGE/WINDSONG UG R&R	$ -	$ 709,573	$ 640,080	$ 69,493	$0.00
⊞ GARDEN PARK #3-UG R&R	$ 211,000	$ 472,139	$ 393,338	$ 78,801	$0.00
⊟ Dock Crew					
⊞ RIVERCREST UG R&R	$ -	$ 261,248	$ 146,313	$ 114,935	$0.00
⊞ WASHINGTON PARK 2&3 UG R&R	$ -	$ 216,350	$ 178,645	$ 37,705	$0.00
⊞ LYNNWOOD TERRACE - UG R&R	$ -	$ 297,640	$ 276,162	$ 21,478	$0.00
⊞ THAYER/MC MURRY, UG R&R	$ -	$ 46,014	$ 5,895	$ 40,119	$0.00
⊞ Gateway Substation	$ 1,112,000	$ 562,700	$ 356,788	$ 205,912	$34,964.78
⊞ Purchase Southwest Service Area Infrastructure	$ 359,000	$ 359,000	$ 613,532	$ (254,532)	$542,440.62
Grand Total	$ 14,220,100	$ 10,208,022	$ 9,985,340	$ 222,682	$2,217,021.71

On March 24, 2020, Governor Inslee expanded a moratorium on utility disconnects and late fees through Proclamation 20-23. Since then, the proclamation has been amended several times with the moratorium now extending through April 30, 2021. The latest Proclamation can be found at: https://www.governor.wa.gov/sites/default/files/proclamations/proc_20-23.14.pdf. While the City is not subject to oversight regulations of the WA Utilities Transportation Commission (UTC), they have extended the utility disconnect moratorium through July 2021. City Staff anticipates that Governor Inslee is to likely match the UTC time period.

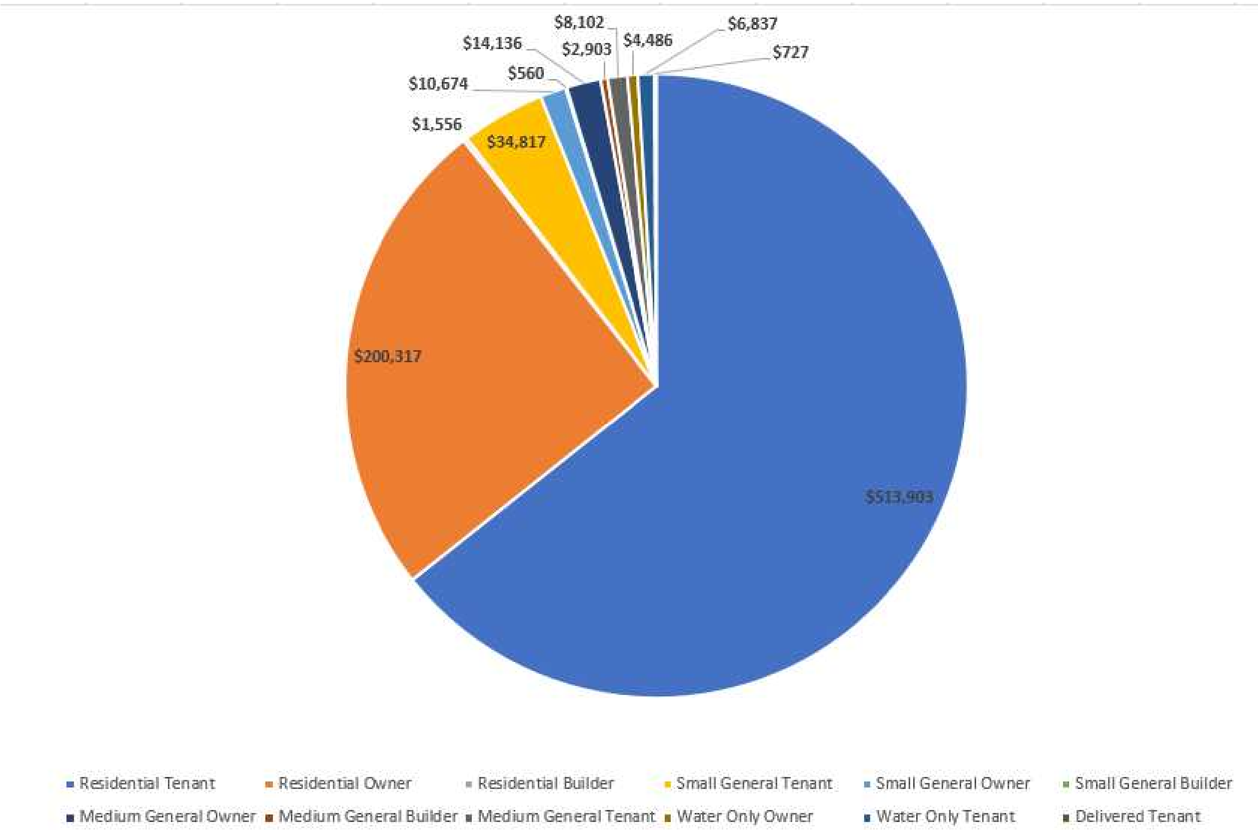
Outstanding utility balances have continued to increase since the proclamation was issued. The Coronavirus Aid, Relief, and Economic Security (CARES) Act of 2020 provided funding for City utility customers with Council authorizing up to $750,000 to be utilized before 11/30/2020. In total, 1,145 customers applied with 864 approved for a total of $503,000 applied to utility accounts.

As of March 1, the outstanding utility balances have increased to $1.2M across 1,499 customers. This represents 5.6% of electric customers who have overdue balances and will be subject to a utility disconnect once the Governor's proclamation expires. The outstanding balance is reflected in higher Accounts Receivable (A/R) balances for 2020 compared to 2019 financial statements. The A/R balances from the 4Q20 financial statements for Energy Services are shown in the following table:



A breakdown of outstanding utility balances across customer classes are as follows:

Average/Customer	$ 533.03	$ 864.90		
Row Labels	Overdue Balance	Account Balance	% of Total	Count
⊟ Residential	$715,776	$1,157,545	89%	1436
⊞ Tenant	$513,903	$835,705	64%	1114
⊞ Owner	$200,317	$319,363	25%	319
⊞ Builder	$1,556	$2,477	0%	3
⊟ Small General	$46,051	$74,104	6%	40
⊞ Tenant	$34,817	$51,578	4%	26
⊞ Owner	$10,674	$21,206	2%	13
⊞ Builder	$560	$1,320	0%	1
⊟ Medium General	$25,141	$46,971	4%	4
⊞ Owner	$14,136	$24,913	2%	2
⊞ Builder	$2,903	$8,888	1%	1
⊞ Tenant	$8,102	$13,170	1%	1
⊟ Water Only	$11,323	$16,941	1%	18
⊞ Owner	$4,486	$5,564	0%	13
⊞ Tenant	$6,837	$11,377	1%	5
⊟ Delivered	$727	$922	0%	1
⊞ Tenant	$727	$922	0%	1
Grand Total	$799,019	$1,296,483	100%	1499



UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021

Agenda Category: Other Informational Items

Prepared By: Clint Whitney, Energy Services Director

Subject:
Idaho US Representative Simpson's Columbia Basin Funding Concept

Department:
Energy Services

Recommended Motion:
This is an informational item.

Summary:
On February 7, 2021, Idaho Representative Mike Simpson released an energy and salmon funding concept for the Columbia Basin. The framework of the concept is to resolve conflicts between salmon and energy by providing funding and legal moratoriums to impacts of bypassing the four lower Snake River Dams. The funding concept is estimated at $34B with a timeframe of bypassing the four dams by 2031. Attached are areas where US Representative Simpson proposes to fund for mitigating impacts. Additional details of the proposal are available at: https://simpson.house.gov/salmon/

On February 5, 2021, WA Representative Dan Newhouse joined Northwest Representatives Cathy McMorris Rodgers, Jaime Herrera Beutler, and Russ Fulcher to reaffirm their support for hydropower in the Pacific Northwest. Idaho Representative Simpson had been circulating an energy and salmon funding concept to groups prior to his February 7th news release.

The City of Richland City Council expressed its support for the Federal Columbia River Power System (FCRPS), including the four lower Snake River Dams, through a 2019 resolution.

There are many unanswered questions for the concept proposed that will continue to be discussed, including:

- Realistic timeframes for firm energy replacement
- Legality of truly implementing a 35 year moratorium for legal protection on remaining FCRPS
- Funding ability

In summary, Representative Simpson's proposal has provided new energy for both sides of the four lower Snake River Dams without any definitive solutions in the near term.

Fiscal Impact:

Attachments:

UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021 Agenda Category: Other Informational Items

Prepared By: Clint Whitney, Energy Services Director

Subject:
PPC Legislative Talking Points for BPA Competitiveness

Department:
Energy Services

Recommended Motion:
This is an informational item.

Summary:
Attached is a summary of issues impacting Bonneville Power Administration (BPA) compiled by Public Power Council (PPC). As a representative of public power entities, PPC is focusing on ways to sustain benefits of the Federal Columbia River Power System (FCRPS) by improving BPA's competitiveness through cost control and revenue enhancement areas. Several of these issues are multi-year and multinational efforts. With City wholesale power costs of $40-45M per year, even a 1% movement in BPA competitiveness results in considerable improvement for ratepayers.

Fiscal Impact:

Attachments:
1. PPC Legislatiive Talking Points 2.19.21 FINAL

PPC PUBLIC POWER COUNCIL
Bringing public power together

650 NE Holladay St, Suite 810
Portland, OR 97232
(503) 595-9770
www.ppcpdx.org

Competitiveness for the Bonneville Power Administration: Looking Ahead

February 2021

The Challenge of BPA Competitiveness

- Public Power Council (PPC) members buy much or all their power and transmission from the Bonneville Power Administration (BPA).
- BPA's role as an essential economic engine is all the more important as individuals, businesses, communities and public power systems grapple with the impact of the COVID-19 pandemic.
- With low natural gas prices and a surge of renewable energy suppressing market prices, BPA's position as the supplier of choice is less secure, and public power customers will have other supply options when their BPA contracts expire in 2028.
- While BPA has taken positive steps to improve its outlook, more is needed to restrain BPA costs, increase revenues, and improve the agency's operations.
- In light of BPA's recent rate trajectory, customers are weighing their options and will need to see sustained commitment to top-down budget prioritization, firm cost control at BPA, and a more equitable distribution of escalating fish expenditures.

Fish and Wildlife Costs

- BPA power customers remain committed to fulfilling our fish and wildlife obligations, and PPC is not seeking changes in any current or future fish measure.
- Rather, we seek proper sharing of those costs.
- Targeted steps are needed to properly align cost responsibilities for regional fish mitigation efforts.
- Under existing law (Section 4(h)(10)(C) of the Northwest Power Act), BPA receives a credit against its Treasury repayment obligation for those fish and wildlife expenditures it makes on behalf of other project purposes (such as flood control and navigation).
- The cost inputs for this credit have not been updated in decades – and fail to reflect many of the ways that BPA ratepayers fund fish mitigation efforts, such as the direct and indirect costs of fish-mandated spill.
- PPC believes that the time is right for a bipartisan effort to update this Treasury repayment provision to properly capture all relevant fish expenditures and align these costs with program responsibilities.

Update Project Cost Allocations to Reflect Actual Use and Operations

- 75% of the "joint costs" of the Columbia and Snake River dams are assigned to power customers for repayment.
- In the decades since the projects were authorized and the costs allocated, the amount of federal hydropower production has been substantially reduced and the operational flexibility and value of the remaining power output has been constrained.
- By contrast, the value of other authorized purposes has increased significantly.
- Despite these shifts in benefits – and a statutory assumption that the costs would be reviewed and realigned – the cost allocation for these projects have remained static.
- Congress took an important step in the past two appropriations bills directing the Corps of Engineers, Bureau of Reclamation and BPA to develop a plan for redressing project cost allocation – but more is still needed.
- PPC urges action that ensures cost reallocation efforts are prioritized, completed in a timely fashion, and utilize accurate inputs in the analysis.

Willamette Project Deauthorization

- The 2020 Water Resources Development Act (WRDA) included language directing the Corps to complete a two-year study on whether to deauthorize Cougar, Detroit and Big Cliff dams in the Willamette Basin.
- PPC supports this provision, since these projects are the most expensive and least valuable resources in the BPA system – and significant additional capital expenditures are anticipated.
- PPC urges Congress to ensure the Corps completes this study on time and objectively and defers any major expenditures that could be impacted if power is deauthorized.

Columbia River Treaty

- The Columbia River Treaty with Canada has created a large inequity, with Northwest electricity consumers losing approximately $1 million every three days, as the U.S. overpays Canada 70-90% for the presumed downstream power benefits.
- We continue to support the Regional Recommendation for the Treaty.
- The process for renegotiating the Treaty and reestablishing equity has dragged on for years, with little to show for it.
- It is time to provide Canada with the 10-year notification of termination of the Treaty's power provision. After years of discussion without progress, this is a necessary first step towards equitable resolution.
- Flood control costs must be addressed through federal appropriations and not borne by BPA customers.

Columbia Basin Fund Proposal

- The four LSRD hydroelectric projects are a crucial component of BPA's low-cost, carbon-free power supply to public power and the Northwest as a whole. Every thorough study on this topic has shown uniformly that removal of the LSRDs would result in some combination of massive increases to regional power supply costs, increases in carbon emissions, impacts on other critical areas of the economy and increased risk of blackouts.

- Rep. Mike Simpson (R-ID) has proposed a concept that would provide significant direct federal funding to offset the impacts of breaching the four Lower Snake River Dams.
- PPC's Executive Committee have directed staff, in consultation with subject matter experts from member utilities, to analyze the Simpson proposal with a focus on economics, power system resources, legal, and legislative elements.

UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021 Agenda Category: Other Informational Items

Prepared By: Sandi Edgemon, Energy Services Business Services Manager

Subject:
Washington 2021 State Energy Strategy

Department:
Energy Services

Recommended Motion:
This is an informational item.

Summary:
The Washington State Department of Commerce published the 2021 State Energy Strategy in December 2020. The Strategy is designed to provide a roadmap for meeting the State's greenhouse gas emission limits. It represents the next step — to find the policies and actions that will achieve the State's climate protection goals, putting it on the road to reducing emissions to net zero by 2050 and improving quality of life and economic vitality. Enacted in 2020, state law commits Washington to greenhouse gas emission limits of 45% below 1990 levels by 2030, 70% below 1990 levels by 2040 and 95% below 1990 levels with net zero emissions by 2050.

The path to a clean energy economy outlined in the Strategy requires rethinking virtually every aspect of energy use in Washington. The State needs more efficient buildings, smarter appliances, vehicles using new sources of energy, investments in industrial processes, a stronger electricity grid, and significant innovation.

Staff is making the UAC members aware of the strategy since it will guide policy and actions that affect Richland Energy Services and the City. The full Strategy, Key Actions Summary, and 2050 Vision infographic are attached, and Commerce's News Briefing can be accessed at http://bit.ly/WA_SES_TVW.

Fiscal Impact:

Attachments:
1. Washington-2021-State-Energy-Strategy-December-2020 - Final
2. Key-Actions-2021-State-Energy-Strategy - Final
3. WA 2050 Vision Infographic Final

Washington State Department of Commerce

We strengthen communities

Washington 2021 State Energy Strategy

Transitioning to an Equitable Clean Energy Future

DECEMBER 2020

Cover: Engineer on top of a wind turbine.

This page: Wind turbine, Goldendale, WA. Clean Energy Transition Institute

Letter of Transmittal

Lisa Brown, Ph.D.
Director,
Washington State
Department of
Commerce

December 31, 2020

The Honorable Jay Inslee Governor of Washington
Brad Hendrickson Secretary of the Senate
Bernard Dean Chief Clerk of the House
Olympia, WA 98504

Dear Governor Inslee and Members of the Washington State Legislature:

I am pleased to deliver to you, and to the families and communities of our state, the Washington 2021 State Energy Strategy. This strategy looks ahead — beyond the very difficult current conditions of pandemic and recession — to the future of Washington.

Much like the pandemic, climate change is a global emergency that can be solved by a combination of individual action and government leadership. The longer we delay necessary action, the harder it will be to contain and mitigate the harm. This strategy offers a blueprint for how, by 2050, we can nearly eliminate the use of climate-threatening fossil fuels while continuing to maintain and grow a prosperous economy.

We have already shown how to reduce energy use and grow our economy. As our state's population and economy have increased over the past decade, we've adopted efficiencies and clean energy policies to bring down per-capita emission levels, creating thousands of jobs at the same time. Still, Washington remains far from the overall reductions necessary to combat climate change. Last year's historic slate of energy policies and investments help set the stage for emissions reductions. We have more to do.

In developing the strategy, the Department of Commerce engaged with community and industry leaders. The outcome reflects objectives you established: maintaining affordable and reliable energy supplies, supporting the economy and meeting our state's climate goals. You encouraged us to develop a strategy that achieves the science-based limits on greenhouse gas emissions. We did that.

The strategy also reflects your concern about disproportionate impacts on vulnerable populations and highly impacted communities. The recommendations in the strategy ensure that Tribes, rural communities and low-income households are partners and benefactors in our state's clean energy transition.

This strategy could not have been developed without the dedication of our advisory committee members, a host of technical experts, the staff at the Department of Commerce, professionals at other state agencies and the many residents who urged us to identify steps to protect future generations of Washingtonians. This participation was especially meaningful given the difficult circumstances resulting from the COVID-19 pandemic.

Continued

Just as development of the strategy required extensive collaboration and cooperation, so will implementation of the recommendations. The emission reductions are challenging. Meeting them will require innovation and investment. Moving forward, the process must include leaders in local, state and Tribal governments, regional organizations, utilities, private sector businesses and public interest advocates.

To achieve an equitable transition to a clean energy future, Washington will need to adopt a coordinated "whole-system" approach. We must encourage the contributions and technical support of the many players involved and the importance of community voices. This will require significant institutional, economic and personal commitment from our state and its leaders.

The Department of Commerce and the dedicated professionals who serve within the agency stand ready to support you as we realize the transition to a clean energy future on behalf of our state and our planet.

Sincerely,

Lisa J. Brown

Lisa Brown, Ph.D.
Director

Columbia River. Clean Energy Transition Institute

Acknowledgments

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Brian Young

Additional assistance was provided by these state agencies:
Washington State Departments of Ecology, Fish and Wildlife, Natural Resources, and Transportation, the Washington Utilities and Transportation Commission, the Energy Facility Site Evaluation Council, the Office of Governor Jay Inslee, and the Washington State University Energy Program.

Numerous individuals and organizations provided expertise and are acknowledged in the Technical Advisory Process section.

Washington State Department of Commerce

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For people with disabilities, this report is available on request in other formats.
To submit a request, please call 360.725.4000 (TTY 360.586.0772)

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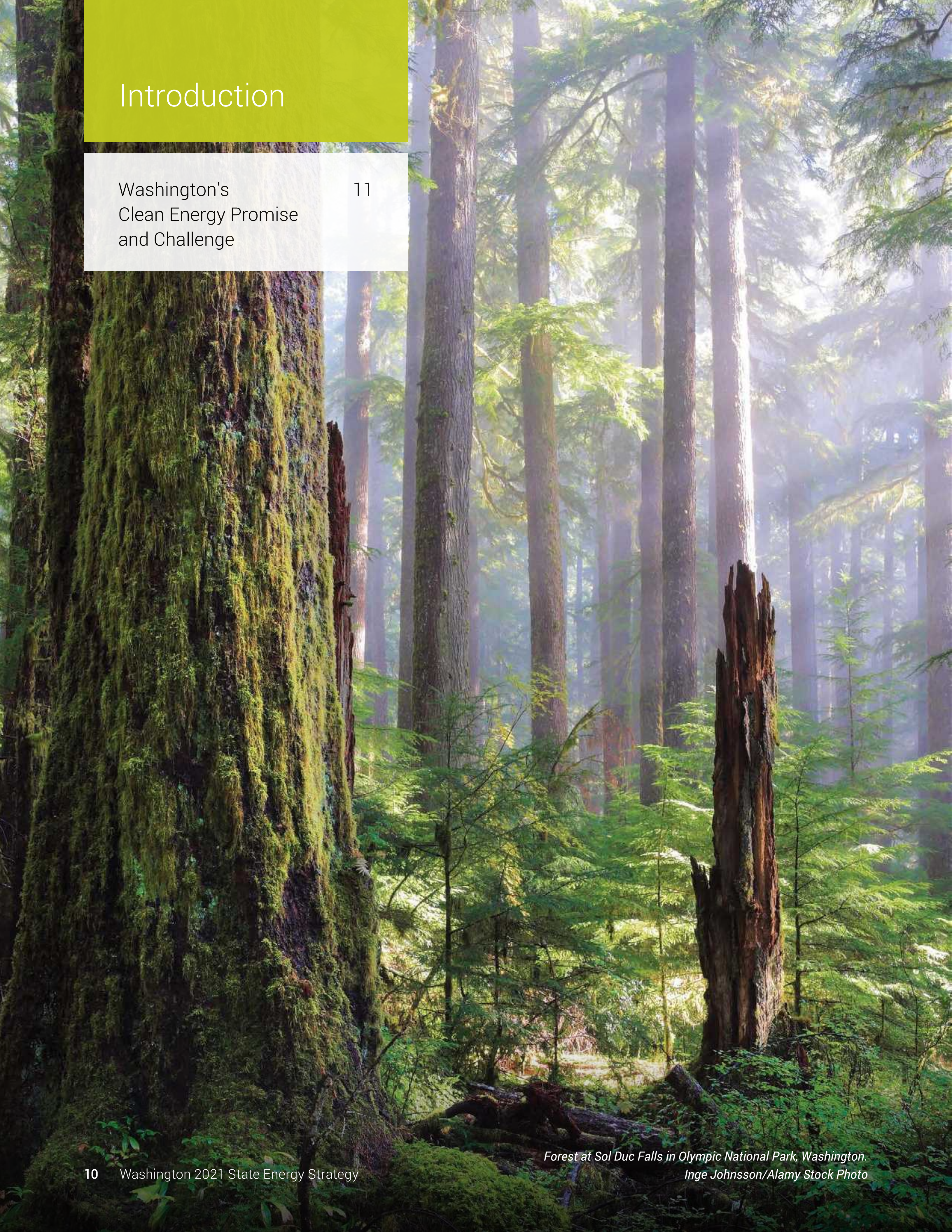
Introduction



Forest at Sol Duc Falls in Olympic National Park, Washington.
Inge Johnsson/Alamy Stock Photo

Introduction

Washington's Clean Energy Promise and Challenge

As we work together to recover from the economic impacts of the COVID-19 pandemic, climate change continues to threaten the health and economic security of Washingtonians. Rural and low-income communities are disproportionately exposed to this threat. Avoiding the worst impacts of climate change requires an aggressive, comprehensive commitment to decreasing greenhouse gas emissions rapidly and equitably across all of Washington State's energy sectors: transportation, buildings, electricity and industry. The longer we delay in taking definitive action, the greater the threat to current and future generations, and the more costly it will be.

In 2019, the Washington State Legislature directed the Department of Commerce to revise the State Energy Strategy, last updated in 2012, to align the strategy with the requirements of the Energy Independence Act,[1] the Clean Energy Transformation Act[2] and the state's greenhouse gas emission reduction limits.[3] State law declares that a successful state energy strategy balances three goals:[4]

1. Maintaining competitive energy prices that are fair and reasonable for consumers and businesses and support our state's continued economic success;
2. Increasing competitiveness by fostering a clean energy economy and jobs through business and workforce development; and
3. Meeting the state's obligations to reduce greenhouse gas emissions.

To meet those goals the Legislature further lays out nine principles to guide strategy development and implementation.[5]

Family boating on the Puget Sound. Sheri Hooley

The Department of Commerce developed the 2021 State Energy Strategy collaboratively with stakeholders and members of the public. The Legislature established a 27-member advisory committee made up of legislators, government officials, and representatives of civic organizations, energy and utility businesses, as well as public interest advocates.[6] (See the list of Advisory Committee members, page 135.) The committee met multiple times between January and December 2020, weighing in on the emerging analysis, findings and potential policies.

The public also had opportunities to be involved throughout the development of the 2021 State Energy Strategy. General outreach efforts included communication through an email sign-up list, creating awareness at existing venues and events and implementing opportunities for public listening and comment in meetings and online.

Toward the end of the process, there was a public hearing to provide a forum for the Department of Commerce to gather formal input on the draft strategy. Whenever possible, advisory committee meetings and discussions were open to the public, accessible remotely and included an opportunity for public comment.

1 Chapter 19.285 RCW.
2 Chapter 19.405 RCW.
3 Chapter 43.21F.090 RCW.
4 Chapter 43.21F.010 RCW.
5 Chapter 43.21F.088 RCW.
6 Chapter 43.21F.090 RCW.

While the strategy was developed transparently and collaboratively, there is more outreach to be done to guide implementation of the identified recommendations. Moving forward, Washington's communities and families must have the opportunity to inform strategy implementation. There must be additional technical, financial and human resources for community participation in the clean energy transition. This includes planning, evaluating and implementing energy and resilience projects that meet the needs of communities in all parts of the state.

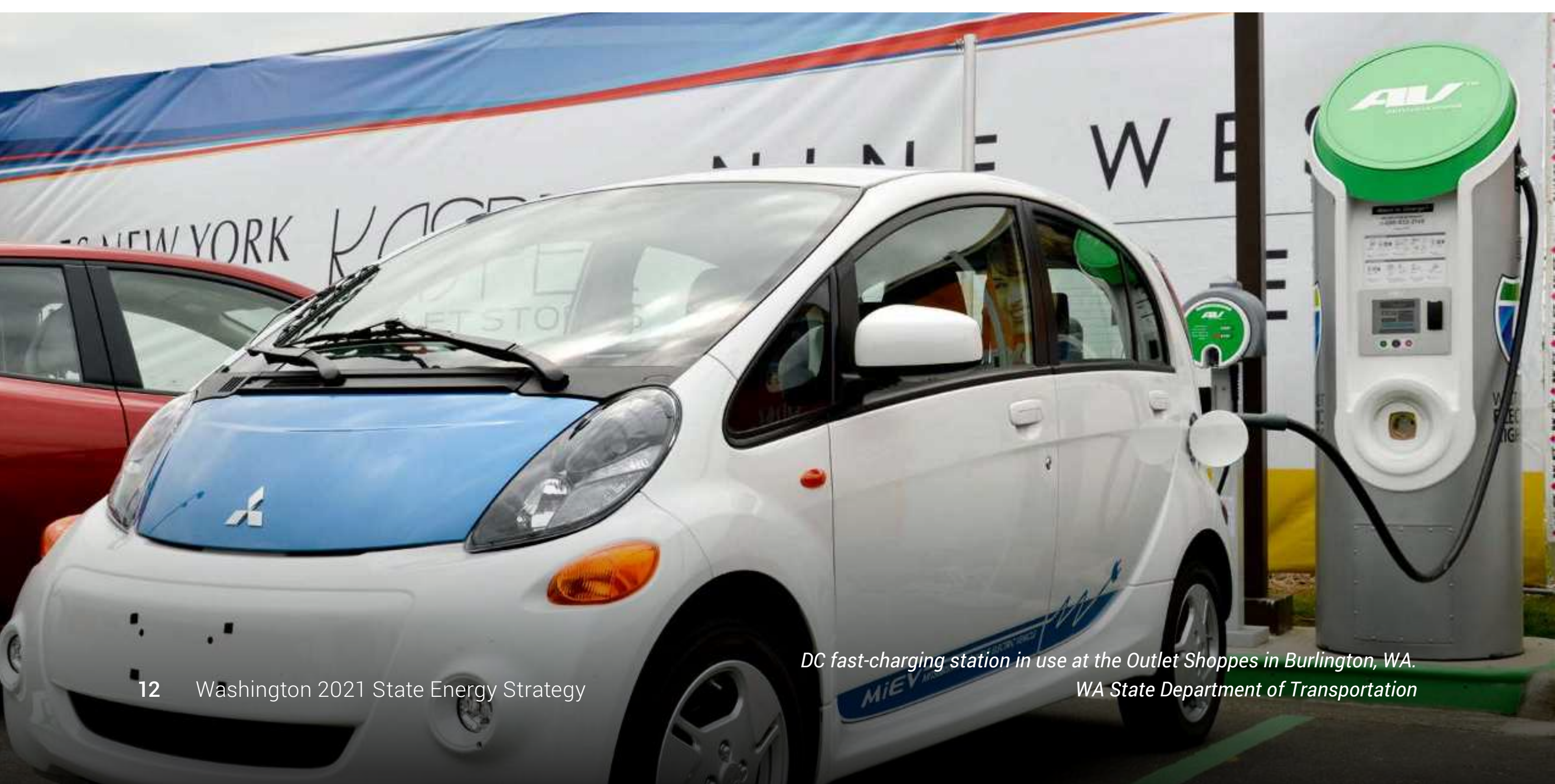
At the same time, we must identify and amend laws and rules, remove barriers and change systems that prevent equitable and just participation in our policy choices and the costs and benefits of implementing them, while also evaluating progress, building information (e.g., technical, social and political) and learning from engagement efforts. Explicitly including an adaptive management approach in implementation will strengthen and make the state energy strategy more relevant into the future.

Steps must be taken to coordinate and collaborate among policy makers in local governments, in Tribal governments, across state government and in regional organizations. All of those actors are engaged in decarbonization at some level, creating a patchwork of goals, standards, programs and outcomes around the state. To achieve a dramatic turnaround in outcomes and a more equitable transition, Washington will need to adopt a more coordinated "whole-system" approach that emphasizes the contributions and technical support of the many players involved.

Washingtonians feel the impacts of climate change and the lack of a cohesive and forward-looking approach every day. Examples include the burden of heating costs for those who live in drafty and inefficient homes; the cost of moving communities and infrastructure out of harm's way due to rising sea level; the costs to families dealing with asthma, heart conditions and other health impacts due to poor air quality; the loss of food availability, jobs and livelihoods due to ocean acidification; and much more. These examples illustrate the cost of inaction.

The 2021 State Energy Strategy offers a path forward for Washington to transform its economy to be vital and productive without relying on fossil fuels and their pollution. This transformation — deep decarbonization — requires significant public and private commitment. It requires investment in equipment and infrastructure, innovation and workforce development.

At the same time, there will be savings with less spending on fossil fuels imported from outside the state. Implementing the strategy will result in job creation, economic development, environmental protection and improved public health. Solutions are all around us in the choices we make — from the cars we buy, to how we heat our homes, to the way we train our workforce.



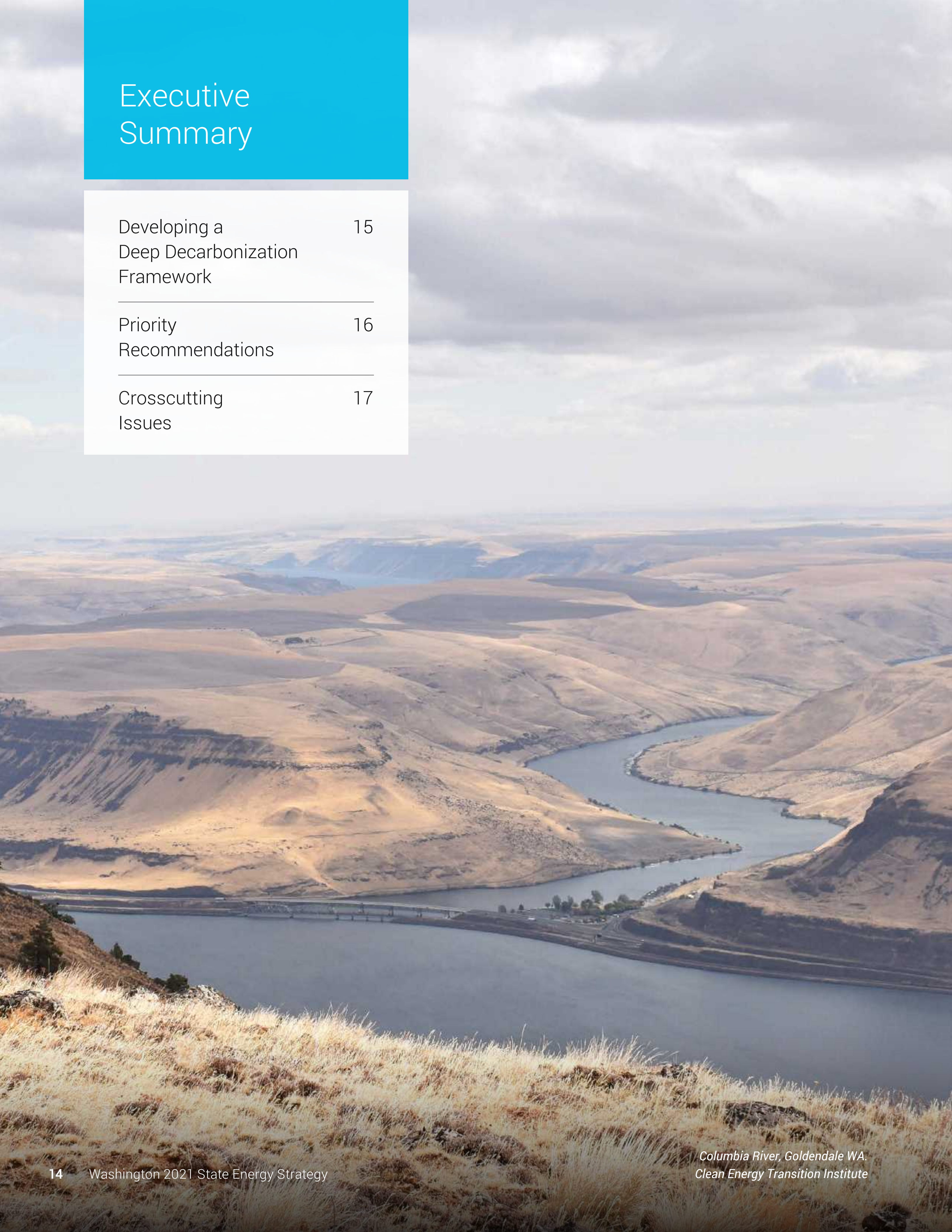
DC fast-charging station in use at the Outlet Shoppes in Burlington, WA.
WA State Department of Transportation

2018 Avista Solar Select Celebratory Ribbon Cutting. Office of the Governor

"We can achieve this transformation in a way that supports our other public policy goals for economic development, reliable and affordable energy supply, good-paying jobs social equity and environmental justice. We can make this transition in a way that both cleans up our air and jumpstarts our economy. We know it's possible because it's happening right now all over our state. Washington's culture of innovation, our skilled workforce and competitive advantage are our greatest assets, and they are the reasons we are a global leader in the clean energy transition."

GOVERNOR JAY INSLEE

Executive Summary



Columbia River, Goldendale WA.
Clean Energy Transition Institute

Executive Summary

Avoiding the worst impacts of climate change requires a comprehensive commitment to decreasing greenhouse gas emissions. Washington launched initial efforts with legislation to require clean electricity and efficient buildings. Much more is required in the near term to realize the transition to a clean economy. The path forward requires investment and action and promises a stronger and more just economy.

The 2021 State Energy Strategy is designed to provide a roadmap for meeting the state's greenhouse gas emission limits. Enacted in 2020, the law commits Washington to limits of 45% below 1990 levels by 2030, 70% below 1990 levels by 2040 and 95% below 1990 levels with net zero emissions by 2050.[7]

The path to a clean energy economy outlined in this strategy requires rethinking virtually every aspect of energy use in Washington. The state needs more efficient buildings, smarter appliances, vehicles using new sources of energy, investments in industrial processes, a stronger electricity grid and significant innovation.

Washington is known for innovation and environmental stewardship — as illustrated by its commitment to a 100% clean electricity grid. This strategy represents the next step — to find the policies and actions that will achieve the state's climate protection goals, put it on the road to reducing emissions to net zero by 2050 and improve quality of life and economic vitality. Particularly in light of COVID-19's devastating economic impacts, a just and equitable state energy strategy is a necessary condition for success. The strategy must benefit people, businesses, and rural, urban, highly impacted and indigenous communities throughout the state.

Developing a Deep Decarbonization Framework

The analytical framework for the 2021 State Energy Strategy is a comprehensive assessment of the options for achieving the state's emissions limits. This "deep decarbonization pathway" analysis searches for the lowest cost path to reduce emissions based on what we know today about technologies, costs and markets. By exploring multiple pathways, the analysis illuminates tradeoffs for decision makers.

Washington's legislatively mandated emissions limits decrease steeply over the next nine years and eventually require the replacement of virtually all fossil fuels. The range of feasible pathways is smaller than studies have found when analyzing less ambitious limits. To meet the current limits, Washington needs to move aggressively on multiple fronts, especially to meet the 2030 limit.

TRANSPORTATION, at 45% of the state's 2018 emissions, Washington must embrace a multi-pronged strategy in this sector of electrifying as many passenger, truck and freight vehicles as possible; investing immediately in the infrastructure required to support massive vehicle electrification; and developing incentives and land-use plans to reduce miles traveled and increase other modes of transport, such as transit, cycling and walking.

BUILDINGS, with 23% of the state's emissions, require a 10-year market transformation approach that combines transitioning from fossil gas to electrification, with deep levels of efficiency for new and existing buildings, and smart building demand management.

ELECTRICITY, at 16% of the state's emissions, must be 100% clean by 2030 and by 2050 must roughly double its output, while continuing to provide reliable power.

[7] Chapter 19.285 RCW.

INDUSTRY must be a focus of policy makers to reduce emissions where possible; develop clean fuels and carbon capture; work with energy-intensive, trade-exposed (EITE) businesses to mitigate the impacts of the clean energy transition; and develop a clean energy industrial policy to guide the state's low-carbon future.

Figure 1 below shows the state's total historical gross greenhouse gas emissions from 1990 to 2018 and projected gross emissions from 2020 to 2050 by source.

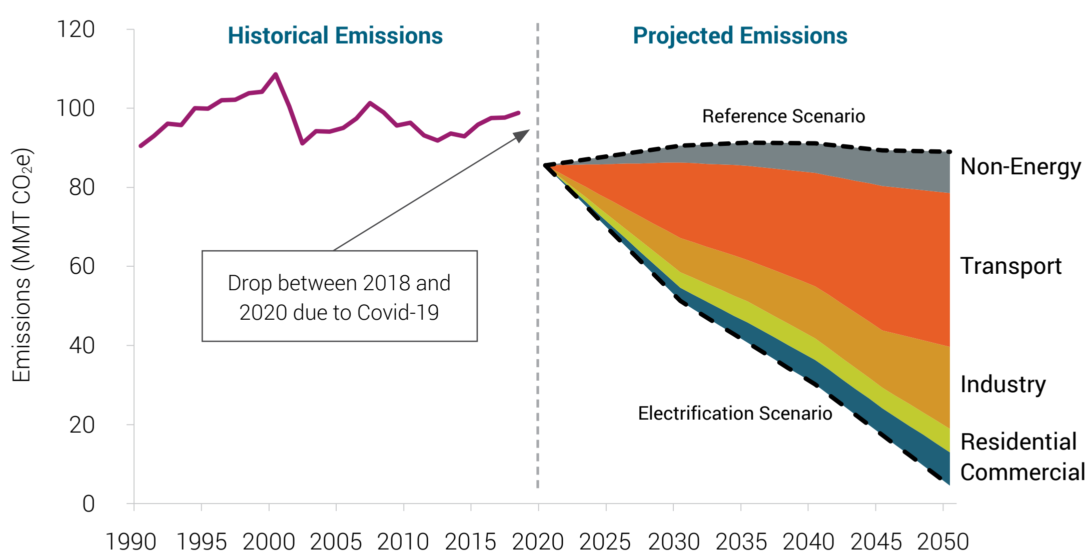
The deep decarbonization approach of looking at multiple sectors of the economy simultaneously yields insights that could easily be missed in a sector-by-sector approach. For example, an important cross-sector finding is that clean fuels, such as renewable hydrogen and clean synthetic or biogenic fuels, will be key to decarbonization. Washington can produce these products using clean, renewable or non-emitting electricity, carbon captured from industrial processes and fuels derived from biomass and other biogenic feedstocks (see Figure 23). Doing so can improve the flexibility of the electric system to manage high levels of intermittent renewable power generation. These fuels will replace fossil fuels in uses that cannot be quickly or completely converted to direct use of electricity.

The economic analysis demonstrates that the state can make this transition to clean energy and still maintain its economic vitality. The total amount spent on energy is within the historical range — 5-7% of gross state product — but the money is spent on equipment and infrastructure instead of imported fossil fuels. The clean energy investments in houses, factories, the power grid and the transportation system create demand for additional skilled workers and managers. The largest employment increase is in the construction sector and involves occupations that typically require less than a four-year undergraduate degree. The long-term financial payoff for these investments includes increased employment and income and economic activity, with businesses and households spending significantly less on the direct costs of energy.

Priority Recommendations

The Washington 2021 State Energy Strategy identifies policies and actions to achieve the state's greenhouse gas limits and transition to 100% clean energy. This represents a significant and intentional transition for the state's economy. Highly impacted communities and vulnerable populations must gain the most from this transition as they are most at risk from worsening climate impacts. At the

FIGURE 1. HISTORICAL AND PROJECTED GROSS GREENHOUSE GAS EMISSIONS IN WASHINGTON STATE



Source: Washington State Department of Ecology for historical emissions (2018 value is preliminary).
Appendix A – Deep Decarbonization Pathways Modeling Technical Report, December 11, 2020 (p. 26).

same time, decarbonization also presents many opportunities for addressing inequities among the residents and communities in our state including:

- **Enhancing resilience in rural Washington** by strengthening the electric grid to deliver clean energy and using universal broadband access to support a smart grid and remote work;
- **Growing and diversifying Washington's economy**, and increasing the prevalence of good, family-sustaining jobs by expanding access to education and training for workers;
- **Improving health outcomes** with more deliberative siting processes, upgrades to aging housing stock and cleaner transit options; and
- **Improving the comfort of homes**, **growing neighborhood businesses and ensuring basic necessities are accessible and affordable** to more Washingtonians, including those without an automobile or living in our most remote communities.

The strategy is organized by broad sectors of the state's economy, where similar technological and policy issues are present. It includes dozens of individual recommendations for action by policy makers, government agencies, utilities, the private sector and individual households. Please see the Key Actions List on page 19.

Crosscutting Issues

While the strategy is primarily organized along the ways that energy is used in the economy — by end-use sectors — several cross-cutting issues arise in more than one sector. In many cases, these issues will not be addressed effectively within any one sector or would best be resolved at a higher level. These include:

1. Increased Resources for Planning, Data Analysis and Outreach

A common theme across the strategy is the lack of adequate capabilities in government to evaluate, communicate and plan for the clean energy transition. In the industrial sector, policy makers lack basic information about manufacturing processes, opportunities for efficiency and conversion to clean energy and the effects of potential carbon reduction.

Planning and accountability in the transportation sector is shared across multiple jurisdictions with inadequate coordination and unclear policy direction. Progress in the building sector will require more staff resources to develop a net-zero energy code and benchmark the energy performance of existing buildings. The transition also requires more effort by the state to provide technical assistance and outreach to industry, local government, highly impacted communities and consumers.

2. Role of Investment in an Equitable and Inclusive Transition.

Throughout the strategy there is a common pattern over time where aggressive climate action requires substantial initial investment in equipment and infrastructure. This upfront cost yields a payoff in later years in reduced purchases of fossil fuels while providing an immediate opportunity for skilled workers and businesses. It also requires access to capital on reasonable terms.

For example, the electricity sector must invest in transmission capacity and grid enhancements to capture the benefits of fossil-free clean electricity. Transportation needs charging and fueling stations. Housing needs retrofits. High-efficiency consumer equipment and vehicles are often more expensive to purchase but much less expensive to operate.

Because the strategy relies so heavily on investments and infrastructure, the risk is high that the clean energy transition will exacerbate the inequitable distribution of wealth and prosperity. Those with access to capital, such as home equity or savings, could make the upfront investments to shift to less expensive clean energy. This could leave those without resources paying for expensive fossil fuels and the infrastructure used to produce and deliver them. Public sector mechanisms to finance the transition are necessary to avoid this result.

3. Universal Broadband Access as a Foundation for Energy Transition

The need for universal broadband access is outside the customary ambit of energy policy, but this need emerges across sectors. There are multiple examples where universal, reliable Internet access is required to capture energy efficiency improvements and increase access to fossil-free energy resources. Perhaps the most obvious is to reduce travel by enabling work from remote locations. This is another area with great risk of injustice. Without universal broadband access, many of the clean energy benefits identified in the strategy will be realized only by wealthier households and those outside rural areas.

4. Transition of the Fossil Natural Gas Industry

Natural gas is an important part of the state's economy, with billions of dollars invested in distribution infrastructure, millions of customers using its product and thousands of people employed in the industry. Fossil natural gas has lower direct emissions than either coal or petroleum. As a result, in some contexts past policies have identified natural gas as a clean source of energy.

However, the state's long-term greenhouse gas emissions limits cannot be achieved while continuing current uses of this fuel. Some uses will be replaced by clean electricity. Another option is to substitute renewable natural gas or a synthetic gas made using clean electricity. A well-planned transition, with clear legislative and regulatory direction, is required to protect the interests of all concerned.

5. Valuable Role of Comprehensive Pricing Mechanisms

This strategy includes, in addition to recommendations targeted at specific energy uses or economic sectors, the need for broad-based mechanisms to ensure that energy prices are not distorted by ignoring the costs of pollution. In the transportation and industrial sectors, the recommended approach is a low carbon fuel standard, which creates a price premium for fossil fuels and rewards electricity, biofuels and other clean fuels for their emissions benefits.

The market recommendations for the electricity sector can help power generators and utilities identify clean power and realize appropriate value for it. More accurate pricing of energy, as a standalone policy, is unlikely to achieve emissions reduction limits. Specific policies will be more successful when energy prices properly align with environmental and other costs.

6. Benefits of Research, Development and Early Deployment

The 2021 State Energy Strategy avoids reliance on yet-to-be-invented technologies, but it embraces many solutions that are not yet widely deployed, such as electric and hydrogen vehicles, advanced building techniques, green hydrogen production and intelligent grid devices. The emphasis on advanced technology is unavoidable given the ambition of the state's emissions reduction limits. It presents an opportunity to make even more and faster progress through research and innovation, and to boost the state's economy.

These efforts might yield efficiency gains or cost reductions for energy storage, nuclear power generation, geothermal energy, offshore wind, power grid control or many other technologies. This calls for collaboration with research universities, national laboratories, federal agencies and private sector innovators.

7. Development of Green Hydrogen and Clean Fuels

The deep decarbonization modeling and the state energy strategy identify an important role for clean fuels in every sector of the energy economy. Green hydrogen is of particular significance, because it could serve both as a flexible use of electricity when generation exceeds demand and as a feedstock for production of synthetic fuels. This could create new jobs and businesses in the state and help the transportation sector to transition to electricity.

Production of biofuels and renewable natural gas will support the agriculture and forest sectors and provide valuable substitutes for fossil natural gas and petroleum (see Figure 23). As these examples illustrate, the development of clean fuels involves complex production and distribution processes crossing multiple sectors of the economy. There is worldwide interest in these low-carbon fuels and therefore ample opportunity to work with other states and countries in their development.

Key Actions

Communities

Climate change will inflict its greatest harm on highly impacted communities, Tribes, rural areas and low-income households, just as the economic and health impacts of COVID-19 are now disproportionately affecting those same populations. Absent deliberate and committed efforts, the envisioned clean energy transformation could easily leave these communities worse off.

- Adopt state policies to achieve universal broadband access.
- Examine clean energy policies for equity impacts in development and during implementation.
- Provide needed funding for communities to participate in the clean energy transformation.
- Support workers to ensure they have the skills for clean energy jobs and adopt policies to protect workers in transition.

Transportation

No sector is as important as transportation to achieving decarbonization, nor as complex in its operation and governance.

- Establish specific targets for vehicle sales, transportation demand and emissions with accountability measures for meeting those targets.
- Adopt a low carbon fuel standard – a comprehensive mechanism to replace fossil fuels with electricity, hydrogen and clean synthetic or biogenic fuels.

Buildings

There is great potential to reduce and eventually eliminate the use of fossil fuels to heat and power Washington's residences, offices, warehouses, shops and other buildings.

- Replace the direct consumption of fossil fuels, primarily natural gas, with high-efficiency electric heat pumps for space and water heating.
- Strengthen and deepen energy efficiency programs and standards to focus on avoiding and reducing emissions.
- Adopt specific targets and accountability for greenhouse gas emissions in the built environment.

Industry

Policy makers and the private sector would benefit from more information, technology and coordination.

- Conduct a thorough assessment of opportunities to transition to low-emission industrial production and collect information about the use of fossil fuels in industrial processes and the opportunities to increase efficiency and switch to electricity.
- Coordinate with other jurisdictions to adopt consistent policies that recognize and reward lower emission in-state production.
- Enhance research and development programs and state agencies' data and analytical resources.
- Promote development of green hydrogen production, clean fuels refining and carbon capture.

Electricity

Washington is on its way to eliminating greenhouse gas emissions from electricity with the implementation of the Clean Energy Transformation Act (CETA). Structural changes are needed to ensure the capacity to provide electricity to replace fossil fuels in transportation, buildings and industry.

- Invest in new transmission capacity and renewable generation, coordinating with other states.
- Develop distributed energy resources with smart grid capabilities and in consumer equipment to ensure reliability and flexibility.
- Strengthen market mechanisms to ensure resource adequacy and efficient electricity markets.

A. Build an Equitable, Inclusive, Resilient Clean Energy Economy

Solar installer on roof.
Shawn O'Connor/Alamy Stock Photo

A. Build an Equitable, Inclusive, Resilient Clean Energy Economy

Climate change threatens human health and access to clean air, safe drinking water, nutritious food and shelter. The Governor's Interagency Council on Health Disparities' Environmental Justice Taskforce (EJTF)[8] found that vulnerable populations and overburdened communities experience disproportionate, cumulative risk from environmental burdens, including climate change. Low-income communities are disproportionately more likely to experience the environmental and health disparities associated with climate change (Figure 2 and 3).[9,10]

The EJTF analysis found that "census tracts with the lowest environmental health disparities (EHD) rank are 83.2% white, 0.9% Black, and 6.2% Hispanic or Latino, while census tracts with the highest EHD rank are 45.6% white, 10.5% Black, and 22.7% Hispanic or Latino. Black Washingtonians were 10 times more likely to live in the highest ranked census tract than the lowest ranked census tract. If race was not associated with EHDs, one would expect the census tracts to have similar racial proportions." (See Figure 2)

The EJTF analysis further showed that the poverty rate in the highest EHD ranked census tract (rank 10) is more than double that of the lowest EHD ranked census tract (rank 1). (See Figure 3). This means that low-income communities are disproportionately more likely to experience the environmental and health disparities associated with climate change

FIGURE 2. RACE AND ETHNICITY

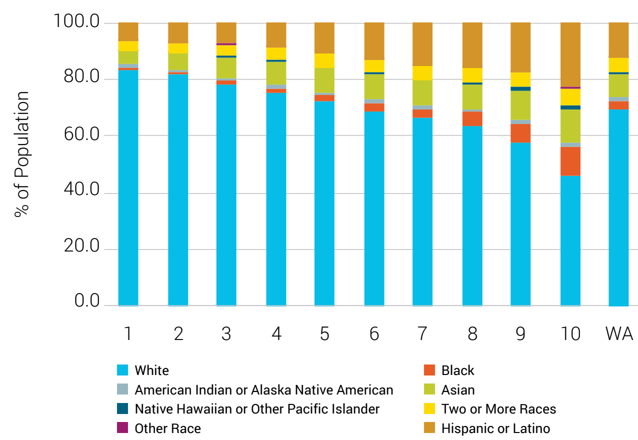
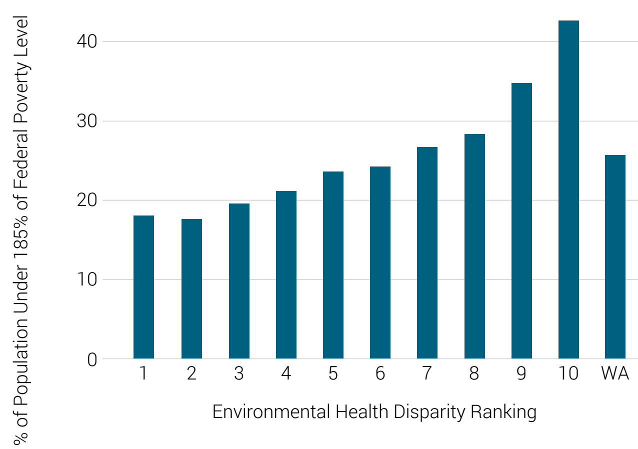


FIGURE 3. POVERTY BY ENVIRONMENTAL HEALTH DISPARITY RANK



Source: Environmental Justice Task Force: Recommendations for Prioritizing EJ in Washington State Government. Figure 2, page 14; Figure 4, p. 16.

8 "Environmental Justice Task Force," Governor's Interagency Council on Health Disparities, accessed November 1, 2020, https://healthequity.wa.gov/TheCouncilsWork/EnvironmentalJusticeTaskForceInformation.

9 "Environmental Justice Task Force: Recommendations for Prioritizing EJ in Washington State Government," Fall 2020, https://healthequity.wa.gov/Portals/9/Doc/Publications/Reports/EJTF%20Report_FINAL.pdf.

10 Joe Casola et al., "An Unfair Share Washington State: Exploring the Disproportionate Risks from Climate Change Facing Washington State Communities" (UW Climate Impacts Group, UW Department of Environmental and Occupational Health Sciences, Front and Centered and Urban@UW, 2018).

Environmental disparities include increased air pollution, water contamination, flooding and wildfires. Health disparities include increased rates of asthma, cancer, heart attacks, infectious disease, infant mortality and heat stress. Communities at the greatest risk of these hazards are also more likely to be under 185% of the federal poverty level.[11]

Communities and families experiencing environmental health disparities and other burdens created by the disproportionate impacts of pollution are less able to adapt to or recover from climate change impacts. Environmental equity will be achieved when no single group or community faces disadvantages in dealing with the effects of the climate crisis, pollution, environmental hazards or environmental disasters.

Addressing these disparities requires acknowledging the inequities that have led to them. This transition is underway. As the EJTF's *Recommendations for Prioritizing EJ in Washington State Government* report details, Washington has become an international leader in environmental justice over the last two decades. This focus is reflected in the priorities laid out in Governor Inslee's December 2020 Climate Policy Brief and in legislative actions.

The Clean Energy Transformation Act of 2019 (CETA) requires that the state's transition to a 100% renewable or non-emitting electric grid includes the equitable distribution of clean energy benefits and reduction of burdens to communities highly impacted by climate change. The law provides tax preferences for clean energy projects meeting protective labor and contracting standards and requires Commerce and the state's utilities to assess energy assistance available to low-income households across the state.[12]

Among other factors, under CETA utilities must consider energy and non-energy benefits for and costs to vulnerable populations and highly impacted communities in their resource and clean energy planning. They must mitigate energy burdens and consider the adequacy of energy assistance programs.

CETA is a foundation for Washington's equitable, inclusive and resilient clean energy economy. Implementation of the 2021 State Energy Strategy should build on this. Experience tells us and data confirm that the costs and benefits of our energy future will not be shared equitably without intentional action. Policy makers must embed equity, resiliency and inclusivity into policy design and implementation.

Equitable energy policy design addresses inequities, while creating environmental and economic opportunities for all. It can strengthen the economy by supporting good, family-sustaining jobs for both urban and rural workers of all levels of educational attainment. It can mitigate the hazards of rising sea levels and ocean acidification on Washington's coasts and heat stress and wildfires in the eastern parts of the state. It can also offer the opportunity to improve democratic participation across state and local government and create public confidence in government.

The state must empower and provide opportunity for active participation by all of Washington's communities and residents. Equitable policy design will allow communities across the state to take advantage of the clean energy transition's economic and technological advancements.

[11] Charles Lee, "Identifying and Prioritizing Environmentally Impacted and Vulnerable Communities," https://www.epa.gov/sites/production/files/2019-08/documents/state_ej_webinar_1-identifying_and_prioritizing_communities_ppt_resources_04.16.19.pdf. p. 45.

[12] "Supporting Washington's Clean Energy Economy and Transitioning to a Clean, Affordable, and Reliable Energy Future," Pub. L. No. SB 5116 (2019), https://app.leg.wa.gov/billsummary?BillNumber=5116&Initiative=false&Year=2019.

1. Recognize that No Single Definition of Equity May be Satisfactory

Many definitions of equity exist, and no single definition can perfectly capture the expectations and goals of all communities and populations. The EJTF developed a recommended statewide definition for environmental justice, building on the U.S. Environmental Protection Agency's definition by adding outcomes for Washington.[13] This definition provides a starting point to identify and address current injustices and to inform future decisions and actions:

The fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies. This includes using an intersectional lens to address disproportionate environmental and health impacts by prioritizing highly impacted populations, equitably distributing resources and benefits and eliminating harm.

The equity discussion woven throughout this strategy leans on this definition, in particular its use of "highly impacted populations" to name the priority communities whose inequities need to be identified and addressed. Highly impacted populations have connections across race and ethnicity, income, housing status, immigration status and heath disparities.

This definition has its limitations. Highly impacted populations are not a monolith and it is important to hold space for community members and advocates to come forward and weigh in on process and policy development. Each community, family and individual will have different histories and needs. There is no one-size-fits-all approach when it comes to equitable policy design. For instance, the inequities that exist in urban areas may well differ from those of rural areas. Policy needs to recognize and include elements that address the full spectrum of impacted interests.

ACTION

- Policy makers, stakeholders and the public must recognize the different perspectives of highly impacted populations and the limitations of any single definition when writing, enacting, implementing and analyzing energy policy.

2. Break from Historical Patterns and Narratives

CETA and the recent law revising Washington's greenhouse gas reduction limits[14] acknowledge that it is in the public interest to embed equity in our state's energy policy. Yet historical conversations and solutions in energy policy tended to focus on energy price, assuming low costs for all are equitable and that local participation will occur without direct and specific outreach and inclusion. Much of the conversation on equity by policy makers ignores the role of history in shaping the lived experiences of highly impacted populations. This results in the perpetuation of exclusion and inequities.

- **Equity must consider the price of energy but also energy sufficiency and the health and economic impacts from energy production.** It is not an equitable result if everyone receives low electricity rates and gas prices, while highly impacted populations disproportionately bear the health and economic costs of our energy system or lack sufficient energy to live healthy, productive lives.
- **Equity is not in and of itself assured through fair and open public meetings.** Fair and open public comment sessions do not invite comments from those historically excluded. These voices must be intentionally sought out, respected, empowered and privileged.
- **The clean energy transition will not be equitable if it benefits only a few or if the costs are not fairly distributed across communities.** The institutions largely responsible for our current inequities share a common responsibility to assist highly impacted populations and ensure their participation in the clean energy transition.

ACTION

- Recognize that historical energy policy has been based on incomplete understanding of equity and offer more holistic, historically informed context for ensuring an equitable outcome.

[13] "Environmental Justice Task Force: Recommendations for Prioritizing EJ in Washington State Government."

[14] Chapter 70A 454.020 RCW.

Makah Bay at sunset. This beach is four miles southwest of Neah Bay on the Makah Reservation at the Northwest tip of Washington State. catsandotcom/iStock

3. Ensure Public Participation and Inclusion of Historically Marginalized Voices

Public and community participation is important to ensure energy policy is informed by local knowledge, meets local needs and is viewed as legitimate by the local community. Whenever possible, enhanced technical assistance should be provided to facilitate the involvement of smaller communities, organizations, utilities and companies. The system must have capacity to consult with and include communities and community members must have a seat at the table in designing programs and selecting projects.

Examples of successful, robust community outreach in our state, include Puget Sound Sage's climate equity community-based participatory research,[15] the Climate Equity Task Force and public participation for the King County Strategic Climate Action Plan 2020 Update.[16]

There are emerging frameworks from statewide environmental justice efforts, such as the newly released report from Front and Centered, "Accelerating a Just Transition in Washington State,"[17] exploring the intersection of governance, regenerative economics and community power.

The EJTF developed a detailed set of public participation guidelines and recommendations. There must be a commitment to fully fund and develop the enabling tools and strategies and take a ground-up approach to the design, adoption and implementation of our state's energy policies.

In addition, state and local governments must continue intentional and thoughtful engagement with Tribal governments to understand the different ways Tribes approach their relationship with energy. Steps must be taken to ensure meaningful outreach and opportunity for participation by all of Washington's Tribes. In addition to direct engagement with Tribal staff and leaders, organizations such as the Affiliated Tribes of Northwest Indians, the Association of Washington Tribes and the National Congress of American Indians are valuable entities with which to collaborate on climate and energy issues.

Among other factors, for Tribes the design and implementation of Washington's energy policy must strengthen sovereignty. Planning efforts conducted by Tribes can help inform the actions of other governments. Examples include the Spokane Tribe's climate action plan,[18] the Makah Tribe's renewable energy plan[19] and climate resilience plan[20] and the Quinault Indian Nation's climate resilience plan.[21]

A crucial component of ensuring meaningful engagement in the clean energy transition is providing the technical, financial and human resources for community participation. This includes planning, evaluating and implementing energy and resilience projects that meet the unique needs

15 "Powering the Transition: Community Priorities for a Renewable and Equitable Future" (Puget Sound Sage, 2020), https://www.pugetsoundsage.org/wp-content/uploads/2020/06/PugetSoundSage_PoweringTransition_June2020-1.pdf.

16 Matt Kuharic, Jamie Stroble, and Lara Whitley Binder, "King County 2020 Strategy Climate Plan" (King County, 2020).

17 "Front and Centered Approach to Equitable Greenhouse Gas Reduction in Washington State" (Front and Centered, 2020), https://frontandcentered.org/accelerating-just-transition-in-wa-state/.

18 "Sustainable Community Master Plan" (Spokane Tribe of Indians, 2013), https://spokanetribe.com/wp-content/uploads/2020/03/FINAL_2015_SCMP.pdf.

19 RobertLynette, John Wade, and Larry Coupe, "Comprehensive Renewable Energy Feasibility Study for the Makah Indian Tribe," March 31, 2005, https://doi.org/10.2172/850362.

20 "Makah Tribe – 2017 Project," accessed November 1, 2020, https://www.energy.gov/indianenergy/makah-tribe-2017-project.

21 "DOE Assists Quinault Indian Nation with Plans for a Climate-Resilient Community," Energy.gov, 2016, https://www.energy.gov/indianenergy/articles/doe-assists-quinault-indian-nation-plans-climate-resilient-community.

of the state's diverse communities. Policy makers must identify and amend laws and rules, remove barriers and change systems that prevent equitable and just participation in policy choices and be comprehensive in determining the costs and benefits of implementing those policies.

The process to develop the recommendations in the 2021 State Energy Strategy was conducted with stakeholder and public engagement and input. Most notably, the process was informed by consultation with many technical experts and a 27-person Advisory Committee designated by the Legislature and including, among others, legislators, government officials and representatives of civic organizations, energy and utility businesses, as well as public interest advocates. Meaningful community outreach and participation was limited due to a compressed schedule and limited in-person opportunities due to the global pandemic. More robust participation needs to occur in the implementation of the strategy.

ACTION

- Incorporate community participation as a part of the design, adoption and implementation of policies flowing from the state energy strategy across all levels of government, ensuring the availability of the financial, technical and human resources necessary to meaningful involvement by those historically underrepresented.

TABLE 1. SEVEN-STEP PROCESS FOR BUILDING EQUITY INTO CLEAN ENERGY POLICIES[22]

Equitable Policy Design	Highlights and Priorities
1. Ensure equitable access to economic benefits and opportunity by empowering communities.	Support participatory processes, direct funding, removal of barriers to autonomy and independence and greater access to processes and decisions.
2. Ensure universal and equitable access to affordable remote service options.	Efforts must be expanded to develop affordable, quality broadband, including in rural and under-resourced areas.
3. Center program design on reduction of energy cost burdens.	Reduce home energy and transportation costs for highly impacted populations by focusing on cost burden as a metric in planning.
4. Incorporate health disparity metrics into energy planning.	Improve health and safety, safeguard against health and safety risks and improve access to the physical, service and social conditions linked to health and well-being by operationalizing a health disparity metric in energy planning.[23]
5. Increase resilience and energy sovereignty for Tribes and energy independence for vulnerable communities.	Support the efforts of communities especially prone to instability from climate change and other natural disasters, such as communities located in the Cascadia Subduction Zone and wildfire prone areas and communities impacted by fossil fuels.[24]
6. Address procedural inequities in program design and prioritize equitable development.	Perhaps the most significant combined equity-and-energy gains can be made through planning. The state has an opportunity to help guide clean and equitable development of programs and funding that support development.
7. Address nexus issues of affordable housing, livable communities and displacement in energy policy.	Work with housing policy experts to address unhoused and displaced communities through energy policy design, especially focusing on cost burdens.

Source: Washington State Department of Commerce

[22] Kuharic, Stroble, and Binder, "King County 2020 Strategy Climate Plan." p. 173.

[23] "How Do Neighborhood Conditions Shape Health? An Excerpt from Making the Case for Linking Community Development and Health" (Center on Social Disparities in Health, Build Healthy Places Network, Robert Wood Johnson Foundation, 2015), https://www.buildhealthyplaces.org/content/uploads/2015/09/How-Do-Neighborhood-Conditions-Shape-Health.pdf.

[24] "Resilient Washington Subcabinet Report" (Washington Military Department's Emergency Management Division, 2017), https://mil.wa.gov/asset/5ba420648fb16.

4. Prioritize Energy Resiliency as Part of Energy Policy and Planning

Climate change exacerbates and worsens the impacts of natural disasters: sea-level rise, floods, heat waves, extreme weather, increased wildfires and infectious diseases. Planning for these events goes hand-in-hand with clean energy planning. Both involve the siting and construction of new transportation and energy infrastructure and investments in the social infrastructure and social safety net.

These investments make public and community institutions resilient. However, there is always the temptation to wait until a crisis happens before doing anything about it. Preparation should be by design, not in response to disaster. Resiliency must be prioritized as part of upfront energy planning. Communities must be sufficiently resourced to design, plan, prepare and implement resiliency measures.

ACTION

- Incorporate energy resiliency in policy design and energy planning.

> Energy policy must be informed by local knowledge, meet local needs and be accepted as legitimate by local communities.

5. Embed Equity in the Design of Clean Energy Policies and Programs

Figure 5 and Table 1 outline a seven-step process for building equity into clean energy policies and programs. The applicability of each step to any one particular energy policy or program may vary. However, it is useful to evaluate every clean energy policy and program using these metrics to ensure equitable policy and programmatic design.

Another way to ensure that a policy or program is equitably designed is to evaluate it by the three dimensions of energy and environmental justice: 1) structural equity; 2) procedural equity; and 3) distributional equity as described in Figure 4.[25] These three dimensions are foundational to environmental justice work and help focus policy design on equitable outcomes for communities. Each dimension requires distinct strategies to be achieved.

ACTION

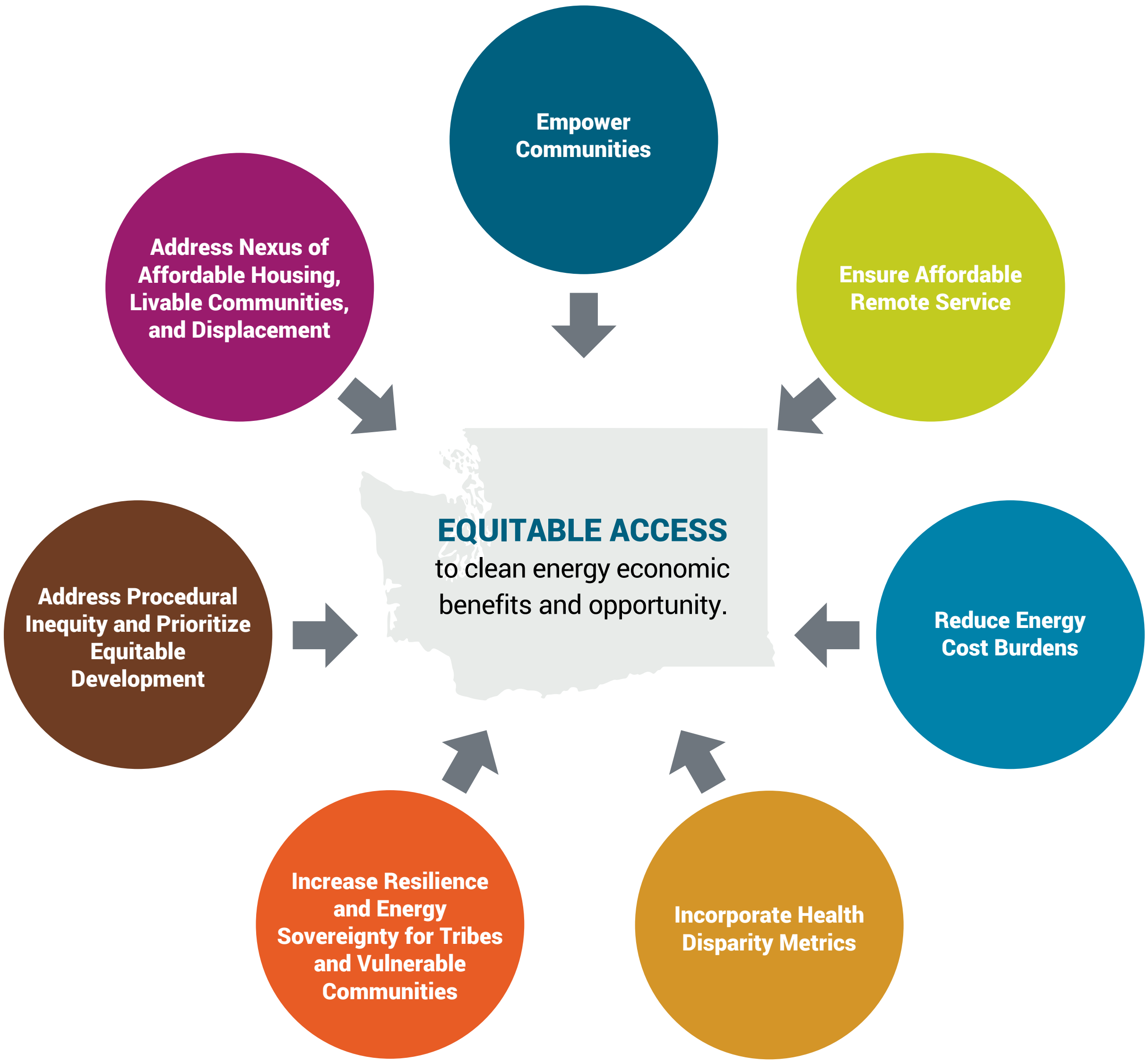
- Governments need to evaluate proposed and existing policies using a framework for equitable policy design and ensuring meaningful engagement in policy design and implementation by those affected. Local communities and advocacy organizations in turn need to hold policy makers and government officials accountable when policies fail to meet these criteria.

FIGURE 4. THREE DIMENSIONS OF ENVIRONMENTAL JUSTICE WORK

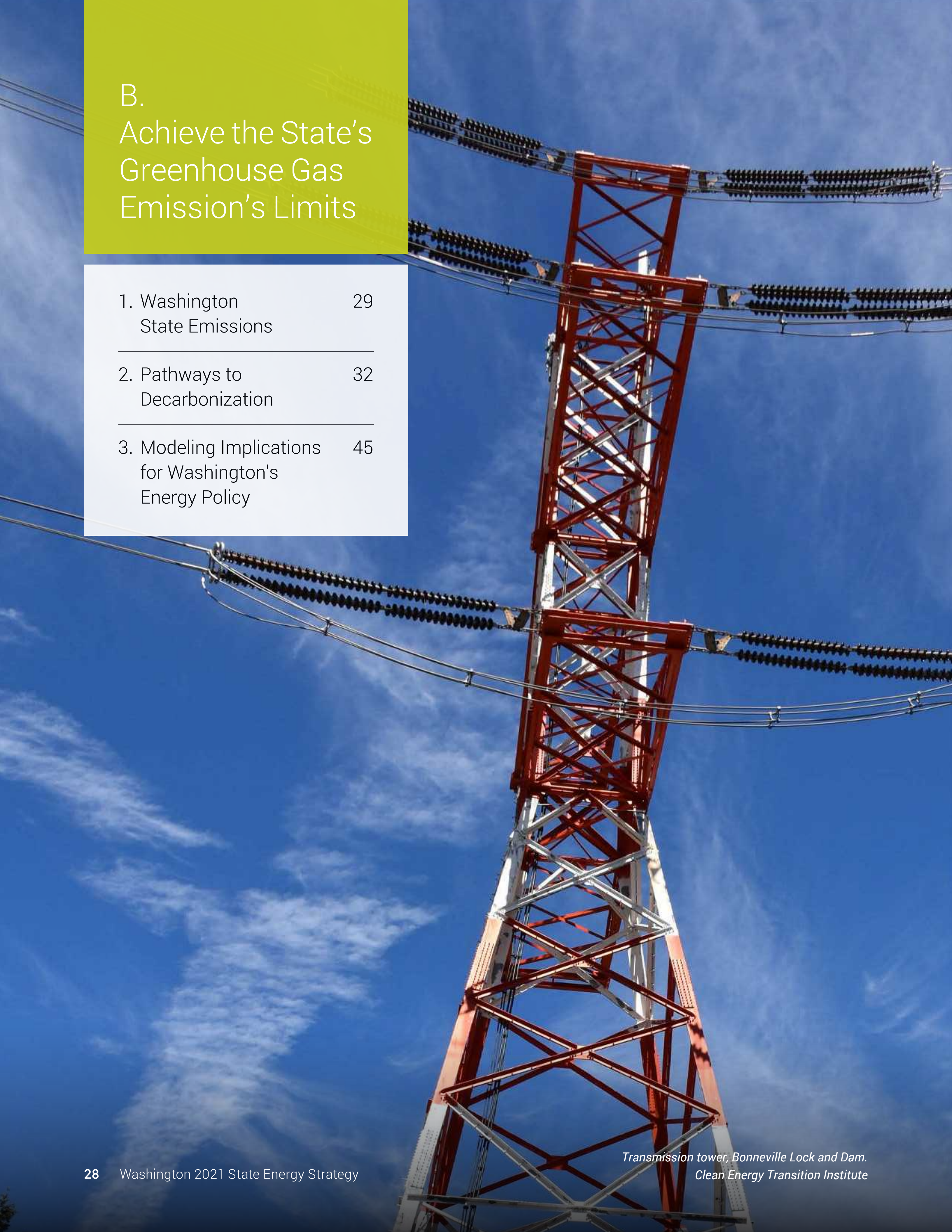
PROCEDURAL	▪ Create processes that are transparent, fair and inclusive in developing and implementing any program, plan or policy ▪ Ensure that all people are treated openly and fairly ▪ Increase the civic engagement opportunities of communities that are disproportionately impacted by climate change
DISTRIBUTIONAL	▪ Fairly distribute resources, benefits and burdens ▪ Prioritize resources for communities that experience the greatest inequities, disproportionate impacts and have the greatest unmet needs
STRUCTURAL	▪ Make a commitment to correct past harms and prevent future unintended consequences ▪ Address the underlying structural and institutional systems that are the root causes of social and racial inequities

[25] Tina Yuen et al., "Guide to Equitable, Community-Driven Climate Preparedness Planning" (Urban Sustainability Directors Network, RAIM + Associates, May 2017), https://www.usdn.org/uploads/cms/documents/usdn_guide_to_equitable_community-driven_climate_preparedness-_high_res.pdf.

FIGURE 5. BUILD AN EQUITABLE AND INCLUSIVE CLEAN ECONOMY



Source: Washington State Department of Commerce



B. Achieve the State's Greenhouse Gas Emission's Limits

Transmission tower, Bonneville Lock and Dam. Clean Energy Transition Institute

B. Achieve the State's Greenhouse Gas Emission's Limits

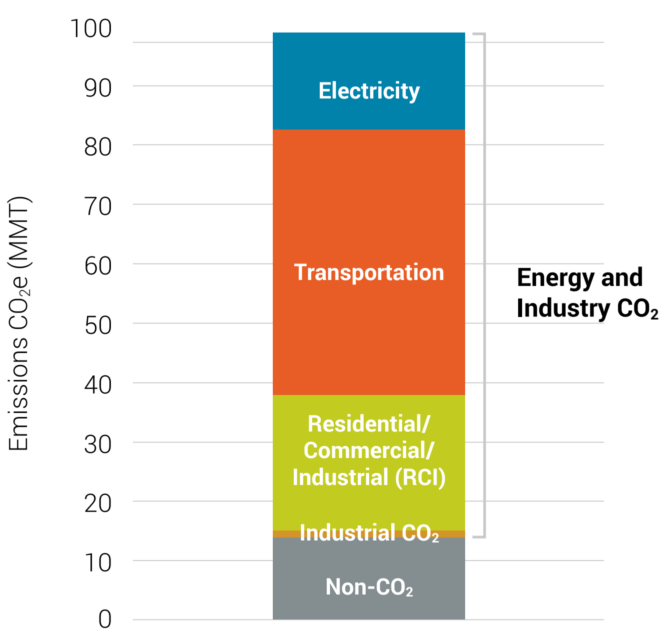
1. Washington State Emissions

Washington's residents and businesses were responsible for 98.9 million metric tons of greenhouse gas emissions in 2018, the year of the most recent state emissions inventory. Nearly half (45%) of the emissions were from transportation. The state's transportation emissions approximate the U.S. average per capita: compared to other states, Washingtonians drive slightly less per capita[26] but consume more fuel for freight, air and ship travel.

The reason transportation is dominant in Washington's greenhouse gas emissions profile is due to the state's relatively clean electricity supply. Only 16% of Washington's greenhouse gas emissions in 2018 were from the electricity sector. Buildings and industry comprised nearly a quarter of emissions, and non-energy/non-CO_2 emissions were approximately 15%. (See Figure 6.)

Washington's greenhouse gas emissions have grown by roughly 10% since 1990, the baseline year from which to calculate the state's emissions limits. Consequently, the 2030 emissions target of a 45% reduction relative to 1990 translates to a 53% reduction relative to emissions in 2018. (See Figure 8.)

FIGURE 6. WASHINGTON STATE 2018 GREENHOUSE GAS EMISSIONS INVENTORY BY SECTOR



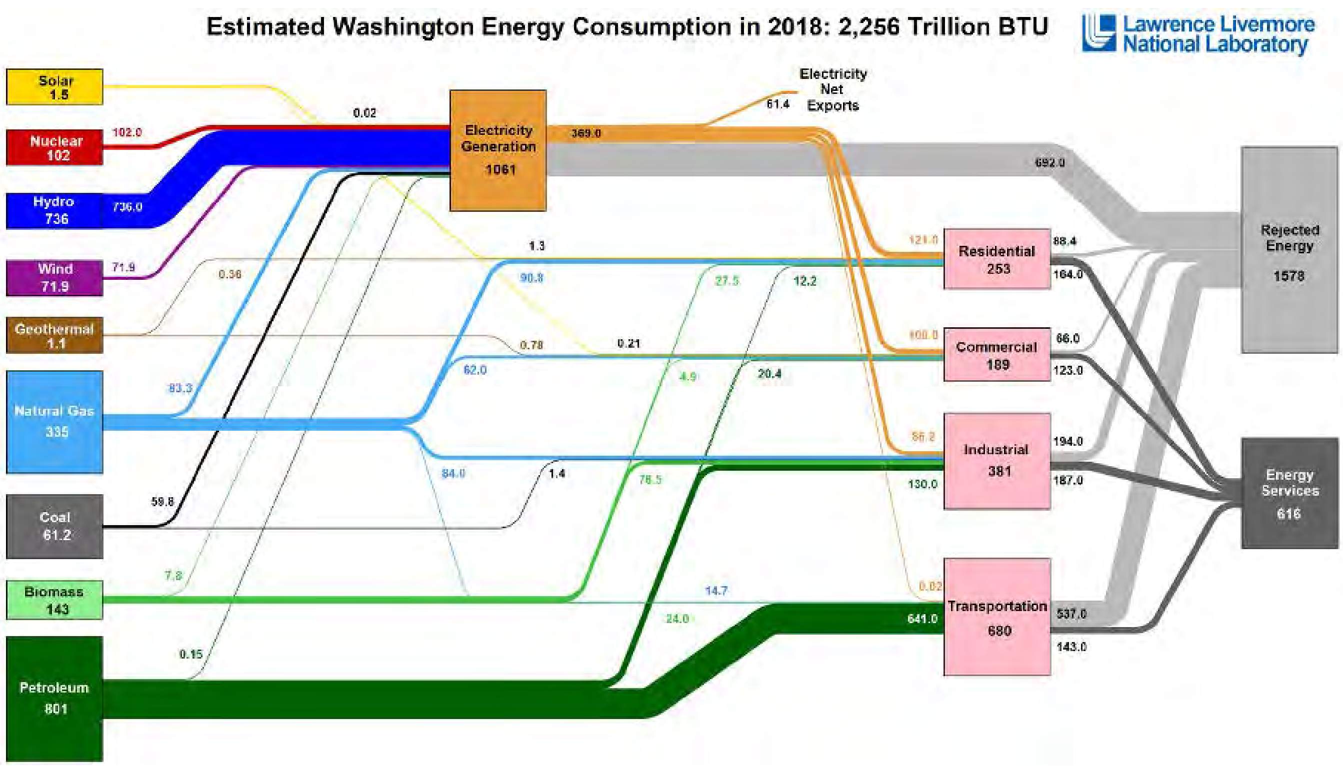
Source: Washington State Department of Ecology Greenhouse Gas Inventory.

[26] U.S. VMT Per Capita By State, 1981-2017," 2019, https://www.enotrans.org/eno-resources/u-s-vmt-per-capita-by-state-1981-2017/.

The state's 2018 emissions result from energy consumption as depicted in Figure 7 below, which shows an estimate of Washington's energy consumption in 2018 using Energy Information Agency data.[27]

Washington's emissions have grown roughly 10% since 1990, the baseline year from which reductions are calculated.

FIGURE 7. ESTIMATED WASHINGTON ENERGY CONSUMPTION IN 2018



Source: LLNL June, 2020. Data is based on DOE/EIA SEDS (2019). Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is the estimated as 65% for the residential sector, 65% for the commercial sector, 49% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent Rounding. LLNL-MI-410527.
https://flowcharts.llnl.gov/commodities/energy

[27] "Estimated Washington Energy Consumption in 2018," Lawrence Livermore National Laboratory, accessed December 1, 2020, https://flowcharts.llnl.gov/content/assets/images/charts/Energy/Energy_2018_United-States_WA.png.

1.1. Pathway to Zero Net Emissions in 2050

The objectives of the 2021 State Energy Strategy are directly linked to the revised greenhouse gas emissions reductions limits established by the Legislature in 2020. Updating limits set in 2008, the Legislature established ambitious economy-wide goals: a 95% reduction below 1990 levels by 2050, with interim economy-wide emissions limits of 45% below 1990 levels by 2030 and 70% below 1990 levels by 2040.

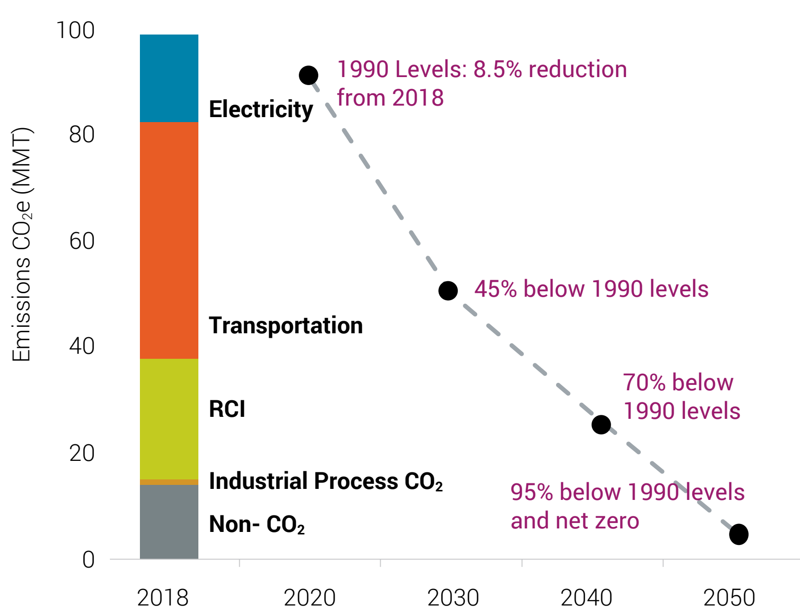
In addition, the state committed to net zero emissions by 2050, which means that the residual 5% (or 5 $MMTCO_2$ e) of emissions in 2050 will need to be balanced by an equivalent amount of biological or geological emissions removal from the atmosphere. These limits are established in statute[28] and are based on scientific assessment of the pace of emissions decline needed globally to keep warming to within 1.5 degrees Celsius above pre-industrial levels.

This strategy focuses on the CO_2 emissions that result from energy use, but the statewide emissions limits cover all types of greenhouse gas emissions, including non-CO_2 emissions, such as methane from agriculture, waste, and natural gas leakage, and perfluorocarbons in aluminum production. While reductions in non-CO_2 emissions are possible, the solutions are highly uncertain.

For the purpose of modeling for this strategy, we assume that all of the non-CO_2 greenhouse gas emissions in 2050 will be offset by biological or geological sequestration, thereby achieving the net zero limit of state law. This means that, in 2050, energy and industrial CO_2 emissions (referred to as energy emissions in the rest of this section) must be zero. This allows for the use of carbon-neutral fuels, including zero net emissions biofuels and synthetic fuels that capture carbon from the atmosphere and release it again. Figure 8 shows the trajectory of limits to be achieved by 2050 based on Washington State's 2018 greenhouse gas emissions.

FIGURE 8. WASHINGTON STATE 2030-2050 GREENHOUSE GAS EMISSION LIMITS

(Assumes residual 5% of 1990 emissions remaining in 2050 will be offset by biological or geological sequestration)



Source: Washington State Department of Ecology and Washington State.[29]

Appendix A –Deep Decarbonization Pathways Modeling Technical Report, December 11, 2020 (p. 15).

[28] Chapter 70A.45.020 RCW.

[29] Chapter 70A.45.020 RCW.

Beakers with algae used to create biofuels. liloh

1.2. Washington's 2030 Emissions Challenge: Cutting Energy Emissions in Half

Meeting the state's emission reduction limit for 2030 is at least as challenging as reaching the deeper 2050 limit and will require all sectors of the economy to reduce emissions at a rapid pace.

Translated proportionately to the energy emissions, the 2030 limit is equivalent to removing 45 million tons of the 85 million tons of CO_2 emitted from energy in 2018. The state starts from a 69% clean electricity grid that contributed 16 million tons of CO_2 in 2018. If all electricity emissions were removed, Washington's 2018 emissions would have to drop a further 29 million tons to meet the 2030 state limit.

Additional emission reductions will need to come from measures other than decarbonizing electricity. These measures include electrification and efficiency improvements to energy-using technologies in buildings, transportation and industry and displacing fossil fuel use, primarily in transportation, with clean fuels.

The challenge for Washington will be implementing a decarbonization strategy integrated across all sectors of the economy that reduces energy-related greenhouse gas emissions in half by 10 years.

2. Pathways to Decarbonization

To examine potential paths to meet the 2030 and 2050 emissions limits, the Department of Commerce commissioned deep decarbonization pathways modeling. This effort analyzed alternative decarbonization scenarios within a modeling framework to inform the selection of policies and actions to decarbonize the state's energy sector over the coming decades.

Evolved Energy Research conducted this analysis using the EnergyPATHWAYS and RIO modeling suite. Earlier versions of these models supported decarbonization modeling for the region and the state.[30, 31] The modeling for the state energy strategy incorporates current technology and economic data; the state's clean electricity and emissions limits; state and regional assumptions developed in consultation with stakeholders; and a set of scenarios that capture the effect of potential strategies. The full technical report for the 2021 State Energy Strategy deep decarbonization modeling can be found in Appendix A. In this section, we address the modeling's key conclusions.

2.1. Decarbonization Scenarios

The deep decarbonization modeling explores one Reference Scenario and five decarbonization scenarios described in Table 2. The results tease out the key opportunities and challenges in decarbonizing all sectors of the energy economy at the pace indicated by the state's emissions limits. All five decarbonization scenarios modeled meet those limits.

[30] "Deep Decarbonization," accessed November 2, 2020, https://www.governor.wa.gov/issues/issues/energy-environment/deep-decarbonization.

[31] Northwest Deep Decarbonization Pathways Study", 2019, accessed December 1, 2020, https://tinyurl.com/y42w3a6v.

TABLE 2. REFERENCE AND FIVE DECARBONIZATION SCENARIOS ANALYZED

Scenario	Summary	Key Questions	Policy Mandates
Reference	Business as usual	Assumes no emissions target and that current policy is implemented	No constraints on emissions
Electrification	Investigates a rapid shift to electrified end uses	What if energy systems achieve aggressive electrification and aggressive efficiency, and relatively unconstrained in-state and out-of-state technology were available?	Meets 2050 net zero emissions target
Transport Fuels	Investigates reaching decarbonization targets with reduced transportation electrification	What alternative investments are needed when larger quantities of primary fuels remain in the economy?	
Gas in Buildings	Investigates reaching decarbonization targets by retaining gas use in buildings	What is the difference in the cost of decarbonization if gas appliances are retained in buildings?	
Constrained Resources	Investigates a future that limits potential for transmission expansion into Washington	What alternative investments in in-state resources would Washington make if transmission expansion is limited due to siting/permitting challenges?	
Behavior Changes	Investigates how lower service demands could impact decarbonization	What if policy-driven or natural behavior changes (i.e., more telecommuting post COVID-19) lower service demands?	

Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020 (p. 21).

In each decarbonization scenario, the model finds the lowest cost way of supplying energy to meet the 2030 and 2050 emissions limits. Technology costs are based on the best publicly available projections. Actions to reduce emissions cross the sectors of the economy. Comparing the scenarios provides useful information about the best strategies for decarbonization, targeting the lowest cost actions first. Projected Reference Scenario emissions from energy use and the energy emissions limits for the decarbonization scenarios are shown in Figure 9.

The Reference Scenario reflects future developments consistent with the U.S. Department of Energy's Annual Energy Outlook's Reference Scenario, as well as current policy in the region. For example, the state's 100% clean electricity law (CETA) is reflected in the Reference Scenario. Even with the elimination of emissions from electricity under CETA, Washington's overall emissions do not decrease in the Reference Case because without new policies fossil fuel consumption will increase as fast as the electricity sector phases out fossil fuels.

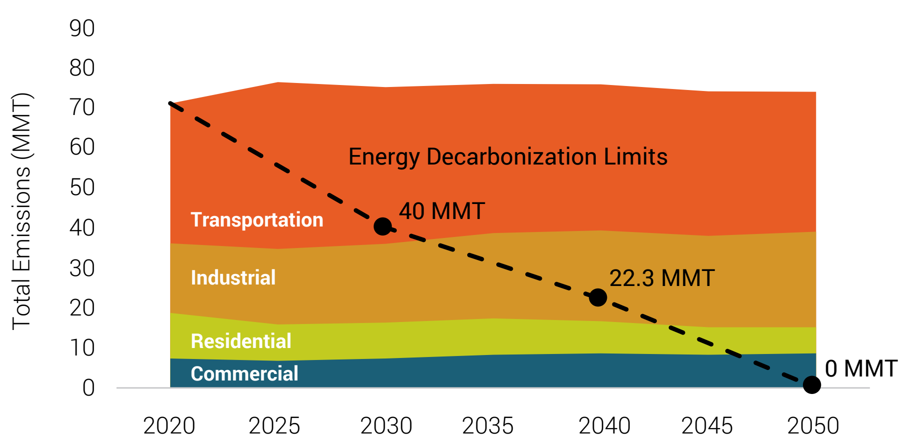
The decarbonization scenarios investigate different pathways toward reaching the state's greenhouse gas emission limits, with each scenario reflecting different policy priorities and/or uncertainties in future outcomes. Comparisons between and among the different investments and overall costs of decarbonizing the economy in each scenario inform the policy choices in the 2021 State Energy Strategy.

The Electrification Scenario explores the impacts of a rapid shift to electrified end uses. The Transport Fuels Scenario models a slower transition to electrification in transportation, either due to policy driving a more gradual shift, or because of slower than expected electric vehicle adoption.

The Gas in Buildings Scenario models a future where demand for gas in the built environment, such as for heating and cooking, remains through 2050. Gas supplied through the pipeline can include a blend of different types of gas. This blend is referred to as "pipeline gas" throughout the remainder of the strategy. Pipeline gas can be partially or even fully decarbonized by replacing fossil gas with cleaner alternatives such as biogas, synthetic gas or hydrogen.

The Constrained Resources Scenario models the impact if Washington were unable to expand transmission interties to other states. Finally, the Behavior Change Scenario evaluates the impact of consumer choices to decrease their energy consumption by driving less and reducing their demand for energy services in buildings.[32]

FIGURE 9. WASHINGTON STATE TRAJECTORY TO 2050, BY ENERGY CONSUMPTION IN EACH SECTOR



Source: Appendix A – Washington State Energy Decarbonization Modeling 2020, Evolved Energy Research (p.17).

[32] For the assumptions behind all six scenarios, please see Appendix A – Deep Decarbonization Modeling Technical Report, December 11, 2020. Appendix B – Data accompanying Deep Decarbonization Modeling Technical Report, December 11, 2020.

2.2. Changes in Energy Demand

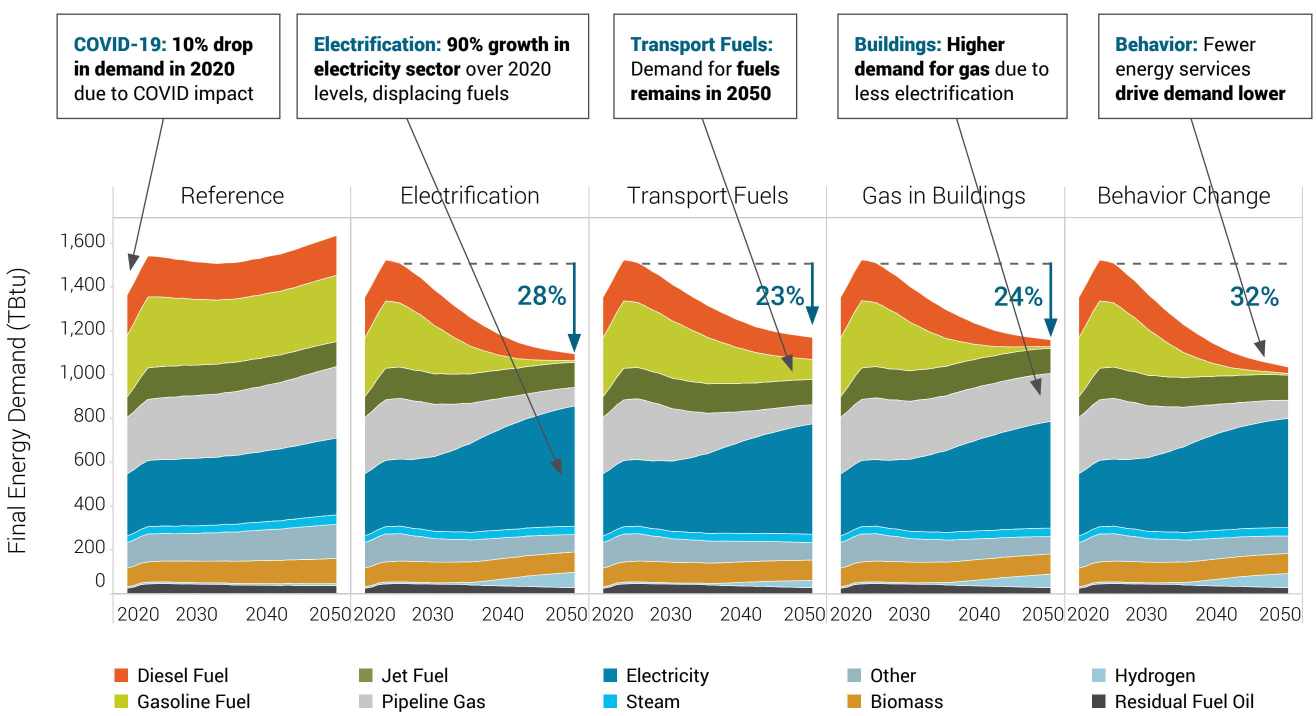
In all five decarbonization scenarios, electrification and efficiency drive lower total final energy demand than in the Reference Scenario, where energy demand in 2050 increases by 6% relative to 2023, the year we assume the economy has recovered from the COVID-19 pandemic (see Figure 10). In all scenarios other than Behavior Change, customers have the same demand for energy services. For example, they heat their homes to the same temperature and drive the same number of miles.

Final energy demand varies because of differences in the energy efficiency of the different types of equipment customers can use to provide these services. For example, a battery electric vehicle requires less energy per mile than an internal combustion engine fueled by gasoline.

However, improvements in efficiency cannot happen overnight. Retiring existing equipment — a late model gasoline vehicle for example — is expensive. Replacing equipment on that scale would be infeasible all at once. Therefore, we assume, conservatively, that customers invest in more efficient equipment only at the end of the useful life of their existing equipment, a time when they would have bought new equipment anyway. The total stocks of equipment in homes, businesses and on the road is of varying age at any given time. It takes time to roll over total stocks of equipment to more efficient and cleaner versions.

Using energy more efficiently through electrification and other measures reduces overall demand and the investment needed in energy supply infrastructure and fuels. The costs of the new equipment necessary to lower final

FIGURE 10. FINAL ENERGY DEMAND 2020-2050



Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020 (p. 28).

energy demand is likely greater than the cost of less efficient equipment. However, reducing supply infrastructure and fuel investments saves money. How a scenario compares in total cost to any other depends on its relative demand- and supply-side costs. Differences in the pace of electrifying transportation accounts for the largest differences in demand across all the scenarios.[33]

In the Electrification Scenario, total energy demand drops 28%. Electricity demand grows 90% over 2020 levels by 2050, displacing fossil fuels in buildings and transportation through assumptions that drive replacement of existing equipment with electrified appliances and vehicles at the end of their useful lives. The Constrained Resources Scenario shares the same final energy demand as the Electrification Scenario and is therefore not shown in Figure 10.

Total energy demand drops the least in the Transport Fuels Scenario (23%). Demand for fuels is still significant in 2050 because greater numbers of internal combustion engines will remain on the roads. These vehicles have lower energy efficiency than electric alternatives.

The Gas in Buildings Scenario sees a 24% drop in total energy demand by 2050. In contrast to the Electrification Scenario, customers replace gas-consuming appliances with more efficient modern gas appliances.

The Behavior Change Scenario achieves the greatest drop in demand for energy (32%) with less use of the services that energy provides in transport and buildings. This scenario illustrates the benefits if policy makers act to encourage driving cars less and using fewer energy services in buildings. As we will see, achieving the levels of electrification required to hit the 2030 emission reduction limit presents several technical and economic challenges.

> Greater interconnection among the 11 Western states is a key part of all scenarios and points to the importance of expanded regional coordination and transmission to lower overall decarbonization costs.

This puts an even finer point on the need to encourage less energy use wherever possible.

2.3. Modeling the Supply Side

The previous section presents the demands for energy in Washington with different assumptions about the types of equipment customers would adopt on the demand side. The next step of the modeling determined the least-cost way of providing that energy through investments in and operations of Washington's energy supply. This includes the infrastructure to produce, store and transport fuels and electricity.

Section 1.2 introduced the challenge of reducing emissions by 2030. The relatively small amount of emissions from electricity in Washington means that if we were to decarbonize all electricity production, additional emissions reductions in other forms of energy use would still be needed. By 2030, the system will look different, depending on the scenario, as described in the previous section.

Adopting electrified energy uses and more efficient equipment means electricity demand will increase as a share of the total demand, but overall total energy demand will be less. Due to the limits on how fast equipment can be replaced with these more efficient options, reaching the target also requires reducing emissions by using clean fuels. Clean fuels in this section refers to fuels produced from biogenic feedstocks (biofuels) and fuels derived from hydrogen production through electrolysis (synthetic fuels), including hydrogen itself.

This section explores these two top-line strategies in energy supply:

1. Building a clean electricity sector to supply expanding electric loads
2. Decarbonizing fuels to meet the short-term emission limits

2.3.1. Building a Clean Electricity Sector to Supply Expanding Electric Loads

Total demand for electricity nearly doubles by 2050 in the Electrification Scenario and expands significantly in the other scenarios. Supplying this electricity from clean

[33] See Appendix A – Deep Decarbonization Modeling Technical Report, p. 29

electricity sources is cheaper than other alternatives, such as decarbonizing fuels. Washington's electricity supply is already 69% clean because of the state's significant hydro resource, however we assume there is no opportunity to expand hydroelectricity supply in the future, so wind and solar resources provide the additional energy needed.

In 2020, Washington is a net exporter of energy. As renewable generation fills the state's additional energy needs, Washington becomes a net importer, bringing in 43% of its electricity by 2050 in the Electrification Scenario, 36% of which comes from Montana and Wyoming wind. To understand where imports into Washington derive from throughout the West, please see page 39 of the technical report in Appendix A. The lower relative cost of these out-of-state resources versus in-state opportunities limits the growth of new renewable capacity in state until 2040 when Washington starts to build solar and offshore wind.[34]

Quantities of resources built in Washington are relatively similar across the decarbonization scenarios with the exception of the Constrained Resources Scenario. By constraining transmission expansion into Washington, more clean electricity must come from in-state resources. Prior to 2040, electricity needs are largely met with increased imports of renewable energy from other states as in the other decarbonization scenarios. However, in 2040 to 2050, significantly more in-state solar and offshore wind are built as the capacity to import more from elsewhere is exhausted. In-state solar capacity in 2050 is 18 GW versus 12 GW in the Electrification Scenario, and offshore wind capacity is 10 GW versus 4 GW in the Electrification Scenario.[35]

In all decarbonization scenarios, wind is the dominant form of energy in the Western U.S. by 2050, followed by solar. This drives expansion of transmission across the West to take advantage of both renewable and geographic resource diversity. Northwest wind and Southwest solar are relatively complementary resources, and energy flows across the West increase to take advantage of this diversity to lower total system costs. Greater interconnection among the 11 Western states is a key part of all scenarios and points to the importance of expanded regional coordination and transmission to lower overall decarbonization costs. Six GW of new transmission (the maximum permitted in the model) are added between Montana and Washington and 5 GW between Idaho and Washington by 2050.[36]

Wind turbines seen from Steptoe Butte State Park, WA.

Part of the increase in electric loads in all scenarios comes from new flexible loads, including from electrolysis and electric boilers. Synthetic fuels derived from hydrogen, such as clean diesel, gasoline and jet fuel, can be cheaply stored. This allows electrolysis loads to ramp up during periods of plentiful renewable energy production and reduce or go offline during times of lower renewable output. This novel, large flexible load helps balance the grid and shore up reliability.

[34] Ibid, p. 29.

[35] Ibid, p. 36.

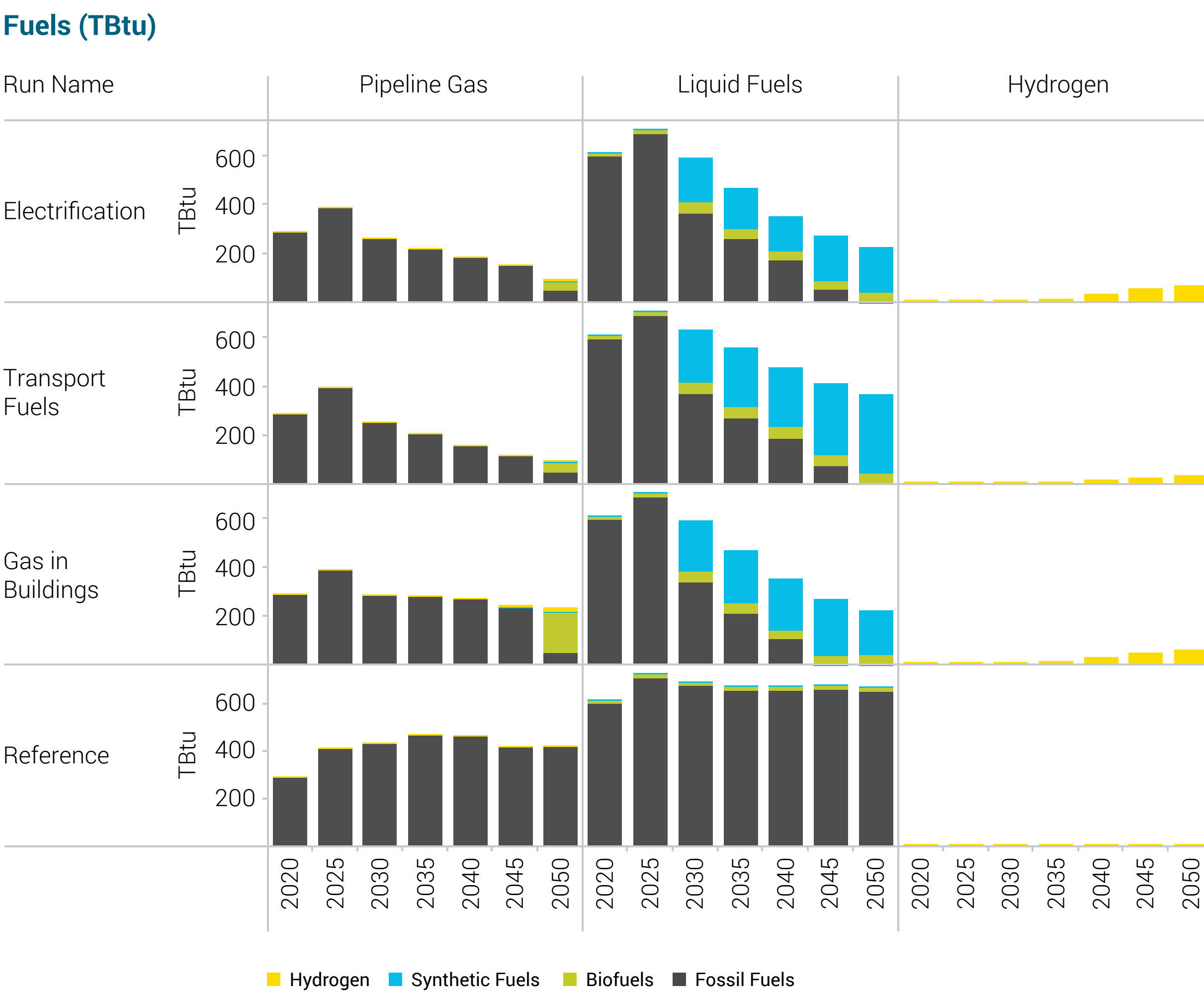
[36] Ibid, p. 40.

2.3.2. Decarbonizing Fuels to Meeting the Emissions Limits

Another critical finding is the importance of clean fuels to achieving the 2030 and 2050 greenhouse gas reduction limits. In all decarbonization scenarios, liquid fuels are not eliminated, but they are fully decarbonized by 2050 with a combination of synthetic fuels, biofuels and hydrogen. These fuels are produced using renewable electricity, biomass or other biogenic feedstocks and, in some cases, carbon captured from industrial processes. Clean fuels substitute for fossil-based gasoline, diesel and jet fuel.

The need for clean liquid fuels to meet the 2030 emissions limits is driven in part by restrictions on the rate at which the transportation fleet can be converted to battery electric or hydrogen vehicles and the rate that end uses in buildings can be electrified. The 2030 limit requires significant expansion of the clean fuels industry to reduce emissions from transportation. Figure 11 shows how fossil fuels are decarbonized in three of the decarbonization scenarios compared to the Reference Scenario.

FIGURE 11. CLEAN FUELS ARE IMPORTANT TO REACH DECARBONIZATION LIMITS



Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020 (p. 42).

2.4. Costs and Benefits of Decarbonization

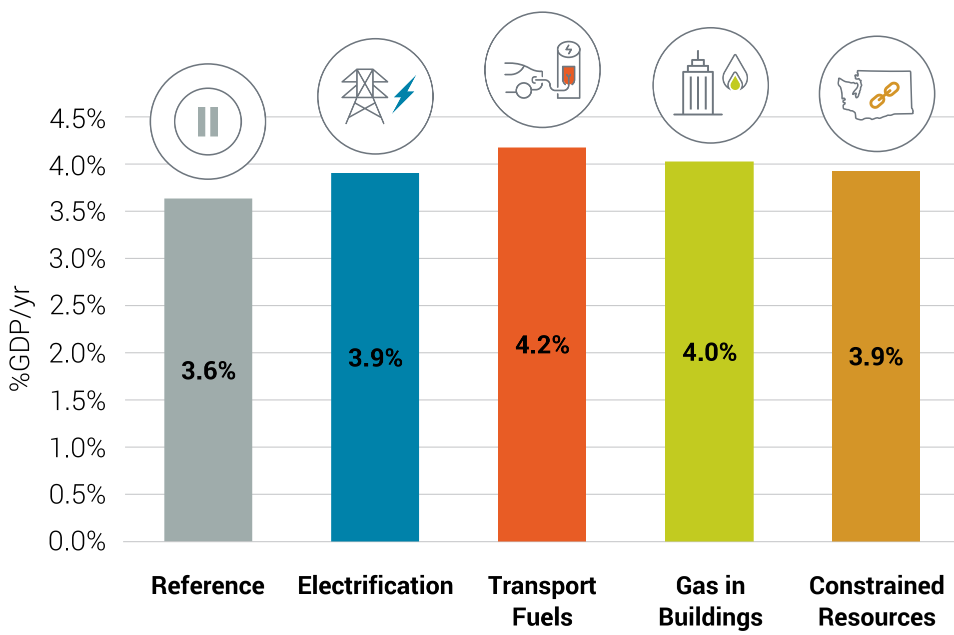
Energy costs include investments in supply-side equipment, such as wind and gas turbines, transmission and clean fuels production infrastructure, and operating costs of the equipment, such as operations and maintenance and fuel. In the decarbonization scenarios, energy costs also include investments in more efficient or electrified demand-side equipment, such as electric vehicles and heat pumps.

The costs of decarbonization include investments in these categories that are greater than in the Reference Scenario. For example, expanding the electricity sector with rapid electrification of end uses requires more investment than in the Reference Scenario, where loads stay relatively consistent.

Additional equipment costs for decarbonization are largely offset by savings from the avoided purchase of fossil fuels. The decarbonization costs are the net difference in costs between the decarbonization scenarios and the Reference Scenario. There are additional costs and benefits not included in this calculation — the analysis considers only direct infrastructure and operating costs and does not include other categories, such as growth in jobs. Health benefits to Washington residents from improved air quality are also not included in these totals.

Annual energy spending[37] as a percentage of GDP averaged over the 30-year period from 2020 to 2050 is only slightly higher than the Reference Scenario for the decarbonization scenarios as Figure 12 shows. Rapid electrification and efficiency measures, transmission expansion and access to out-of-state resources achieve the lowest costs in the Electrification Scenario.

FIGURE 12. AVERAGE ANNUAL ENERGY EXPENDITURE (%GDP/YR)



Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020 (p. 52).

[37] Annual energy spending is reported in this section as the levelized investment in infrastructure plus operating costs, such as for fuels and operations and maintenance.

The Transport Fuels Scenario, where fewer vehicles are electrified or transition to hydrogen, requires more clean fuels, which drives higher costs. But the slower transition to EVs means fewer demand-side equipment costs. Not pursuing building electrification in the Gas in Buildings Scenario avoids investments in electricity distribution but relies on higher consumption of more costly clean fuels. Leaving gas in buildings in the short term will require even more clean fuel investment in the future.

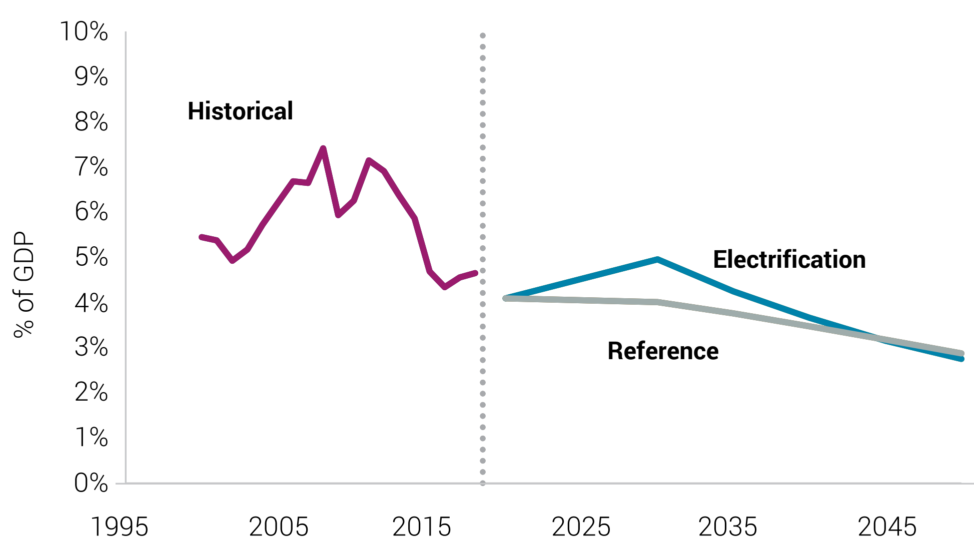
The Constrained Resources Scenario yields cost results that are approximately the same as the Electrification Scenario, albeit with different investments in different locations. The Electrification Scenario invests in new transmission capacity to access high-quality wind and solar resources in other states. The Constrained Resources Scenario invests less in transmission but spends more to build renewable resources in and off-shore from Washington.

Even in the Constrained Resources Scenario, Washington relies on large quantities of imported energy. Based on forecasted prices additional investments in offshore wind in 2045 and 2050 are reasonably competitive against out-of-state onshore wind and the investment in transmission to access it.

2.4.1. Decarbonization Spending across the Scenarios

Net direct economic benefits exceed costs by the 2040s relative to the Reference Scenario, based on the assumed resource prices used in the model. Decarbonization requires a significant investment between 2020 and 2030 to reach the stringent 2030 emissions reductions target, but energy spending in the lowest cost Electrification Scenario drops below the Reference Scenario in the 2040s (Figure 13).

FIGURE 13. TOTAL LEVELIZED ENERGY SYSTEM COST AS A PERCENTAGE OF WASHINGTON GDP RELATIVE TO HISTORICAL



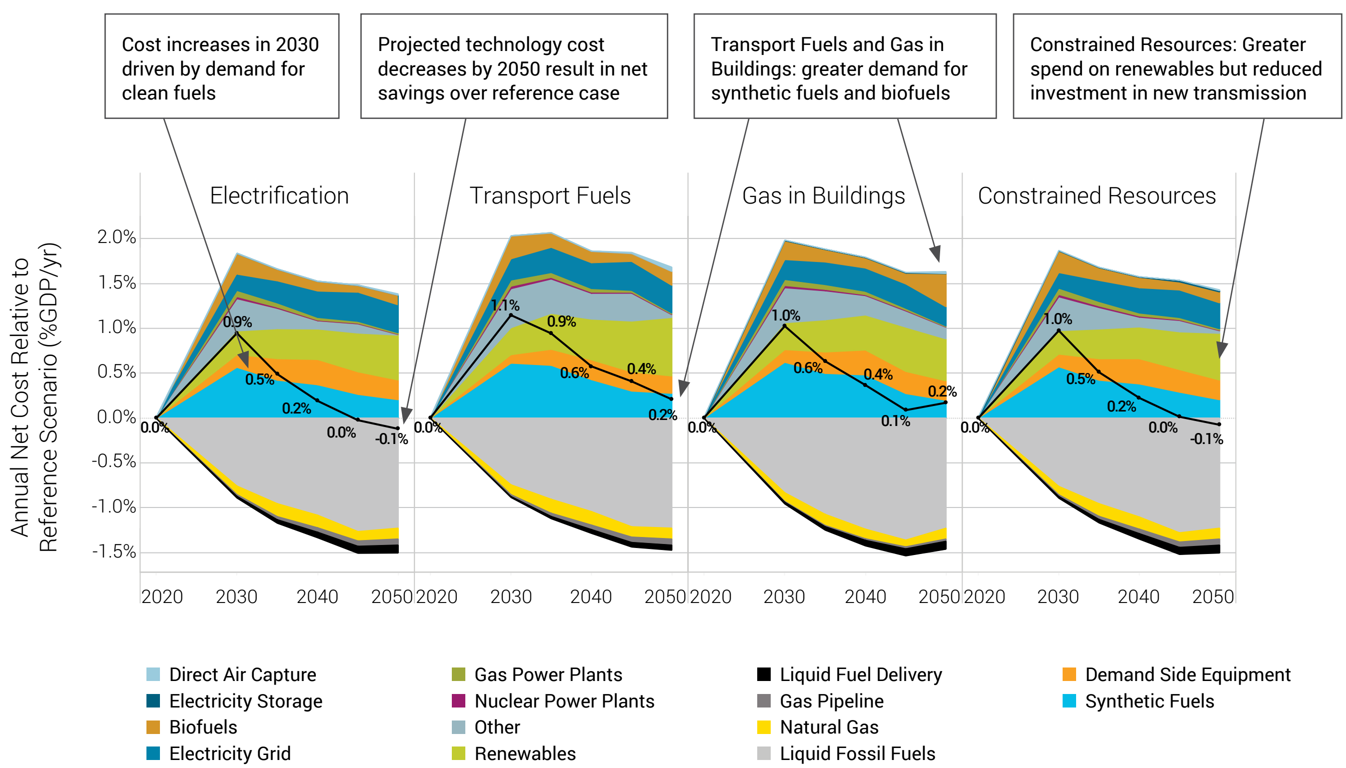
Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020 (p. 55).

Demand for clean fuels drives cost increases in the short term, but the projected decrease in decarbonization technology costs results in savings over the Reference Scenario in 2050 as seen in Figure 14. Decarbonization costs are projected to remain below the historical average of energy spending.

The economy is forecasted to grow at a faster rate than energy consumption between 2020 and 2050 lowering energy costs as a share of total GDP. Price spikes in energy spending in the last two decades are caused by fuel price volatility and the 2008-2009 recession. Decarbonizing the economy acts as a hedge against future fuel price volatility by reducing the fraction of energy spending on fossil fuel imports and therefore reducing exposure.

> Clean fuels are the key to achieving the 2030 and 2050 greenhouse gas reduction limits. The rate at which vehicles can be converted to battery electric and building energy usage can be electrified is the critical factor.

FIGURE 14. COST COMPONENTS OF DECARBONIZING RELATIVE TO REFERENCE SCENARIO



Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020 (p. 54).

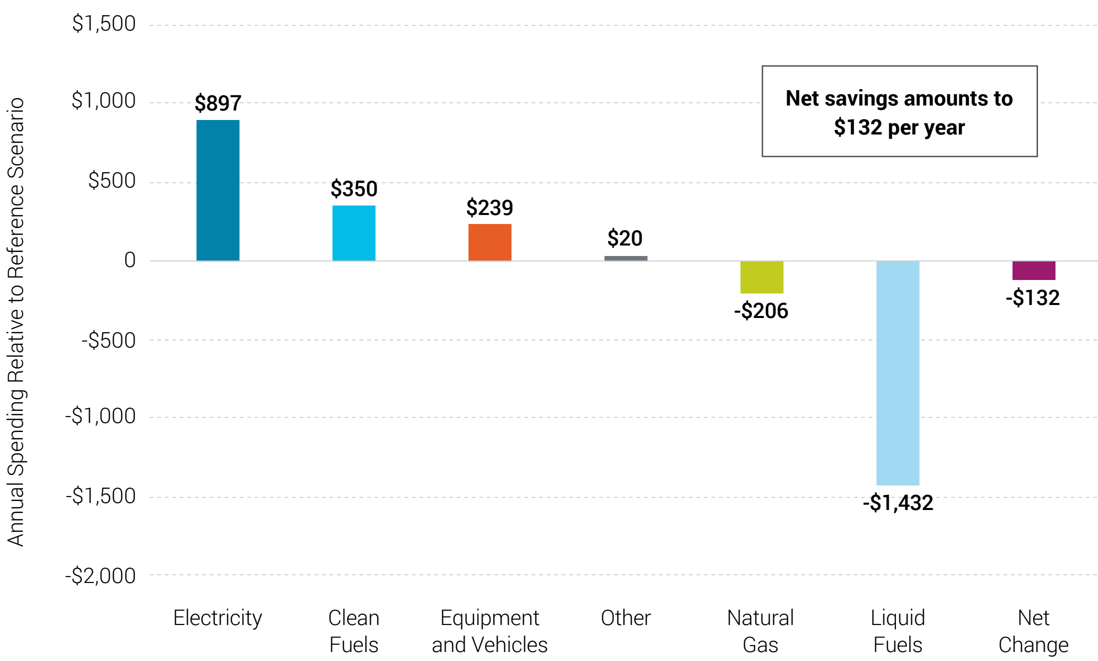
Relative to the Electrification Scenario, spending in the other decarbonization scenarios is higher, as shown in Figure 15. Retaining fuel use in transportation or in buildings requires greater investment in clean fuel production, which is more costly than the electrification of end uses in the Electrification Scenario. Restricting the expansion of Washington's interties in the Constrained Resources Scenario is also more expensive.

The Behavior Change Scenario points to significant savings with actions that incentivize people to use less energy. Behavior changes might include choosing housing with a shorter commute distance or operating a building at a lower thermostat setting. However, a lack of information about the costs to achieve changes in behavior hampers full understanding of the savings. It is recommended that the state further study options for cost-effective behavioral measures that would decrease demand for energy.[38]

On a per capita basis, by 2050 the Electrification Scenario would save the average energy customer in Washington approximately $132 per year, and the Constrained Resources would save about $83 per year, as seen in Figure 15, based on forecasted technology costs and fuel prices.

The costs reported above include investments in energy demand and supply-side equipment, fuels and other operating costs. Beyond these direct costs, Washington will experience benefits from decarbonization, including reduced impacts from the changing climate if the rest of the world also decarbonizes and improved air quality.[39] Displacing fossil power generation with renewables and electrifying the vehicle fleet both contribute to cleaner air for Washingtonians.

FIGURE 15. CHANGE IN AVERAGE SPENDING PER PERSON IN THE ELECTRIFICATION SCENARIO (2050)



Source: Appendix E – Economic Impacts of Decarbonization Modeling, December 31, 2020 (p. 16).

38 Ibid, p. 57.

39 Global Co-Benefits of Decarbonisation" (University of Cambridge, Centre for Climate Change Mitigation Research), accessed November 30, 2020, https://www.4cmr.group.cam.ac.uk/filecab/global-co-benefits.pdf.

Figure 16 summarizes the air quality improvements associated with decarbonization from 2020 compared to 2050, which include elimination of mercury emissions and over 90% reductions in nitrogen (NO_x) and sulfur dioxide (SO_2) emissions from power generation, as well as significant reductions in particulate matter and NO_x emissions from transportation.

Figure 17 shows how decarbonization would greatly improve Washington's air quality.

> Significant savings in both emissions and costs could occur if people were incentivized to use less energy.

EV charging station. stanvpetersen

FIGURE 16. SUMMARY OF WASHINGTON AIR QUALITY IMPROVEMENTS FROM DECARBONIZATION

Sector Source	Pollutant	Emissions in 2020	Emissions in 2050	Percent Change
Power Generation	Mercury (kilograms)	21.1	0.0	**-100.0%**
Power Generation	NO_x[40] (metric tons)	8.959	0.739	**-91.8%**
Power Generation	SO_2[41] (metric tons)	8.985	0.024	**-99.7%**
Transportation	$PM_{2.5}$[42] (metric tons)	0.635	0.354	**-44.2%**
Transportation	NO_x (metric tons)	21.839	10.165	**-53.5%**

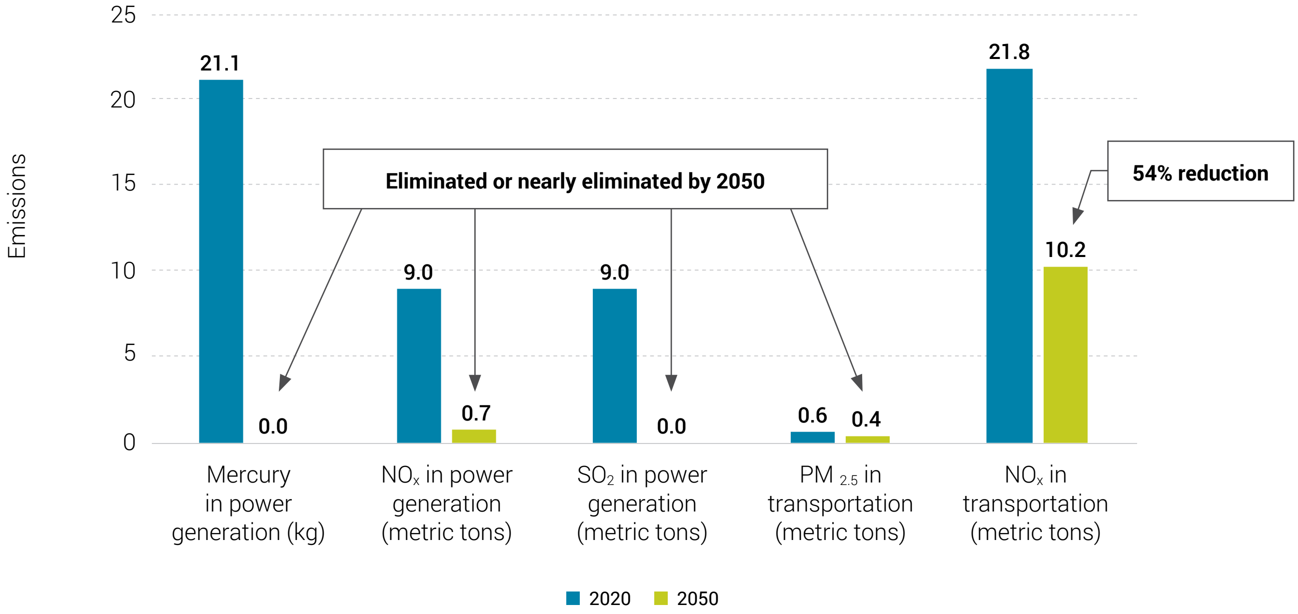
Source: Appendix E – Economic Impacts of Decarbonization Modeling, December 31, 2020 (p. 17).

40 Various nitrogen oxides, which have negative respiratory and cardiovascular effects.

41 Sulfur dioxide, which has negative respiratory effects and is a component of acid rain.

42 Particulate matter generally smaller than 2.5 micrometers, which can cause lung and cardiovascular disease.

FIGURE 17. DECARBONIZATION GREATLY IMPROVES WASHINGTON'S AIR QUALITY



Source: Appendix E – Economic Impacts of Decarbonization Modeling, December 31, 2020 (p. 18).

EV in the mountains. Jessica Plumb

2.4.2. Addressing Uncertainties

The costs and benefits presented here are subject to the uncertainties inherent in future technology price forecasts, fuel price forecasts, technology availability and many other factors. Uncertainty increases further into the future and the cost of decarbonization is more sensitive to some costs than others.

For example, electric vehicle forecasts have one of the largest impacts on decarbonization costs. Vehicles are the largest energy-consuming infrastructure purchase that many customers and businesses make. Small changes in vehicle cost projections have large impacts on forecasted decarbonization costs. A 10% change in electric vehicle prices impacts decarbonization costs by 0.25% of GDP in 2030 and 0.2% of GDP in 2050. In recent years, forecasts for electric vehicle costs have dropped year to year. If this trend continues and electric vehicles are cheaper in the future than current forecasts suggest, total decarbonization costs will be reduced.

3. Modeling Implications for Washington's Energy Policy

The modeling offers insights for pathways to achieve the state's emissions reductions limits. Meeting these limits will require a clean electricity grid by 2030, doubling down on energy efficiency to reduce energy use and electrifying as many energy end uses as practical. These actions alone do not achieve the 2030 emissions target in any of the modeled scenarios. To further reduce emissions and meet the limits, clean fuels must displace a portion of fossil fuel use in the economy.

Energy efficiency and electrification require significant investments in new technology and infrastructure. They are dependent on customers replacing inefficient appliances, processes and vehicles with efficient or electrified options.

The process of replacing technologies, such as appliances and vehicles, takes time and meanwhile cleaner fuels will reduce emissions from gasoline and diesel vehicles that remain on the road. Accelerating development of a clean fuels industry in the next 10 years is critical to meeting Washington's 2030 limits. In the Electrification Scenario, by 2030 a third of all liquid fuels in Washington are from clean sources, either bio or synthetic replacements for conventional fossil fuels.

Accelerating development of a clean fuels industry in the next 10 years is critical to meeting Washington's 2030 limits.

In the longer run, as more of the vehicle fleet electrifies, clean fuels may play a diminished role in decarbonization in Washington but will remain key to decarbonizing air travel and other applications where electrification is more challenging.

Additional sector-specific insights from the modeling include:

3.1. Transportation Sector-Specific Results

Key conclusions from the modeling regarding the transportation sector are:

- The Transport Fuels Scenario with lower levels of transport electrification is more costly than the Electrification Scenario with higher levels of transport electrification. Pursuing faster rates of transportation electrification should lower the cost of meeting the state's greenhouse gas limits.
- While electrifying passenger vehicles is a cost-effective strategy to achieve economy-wide net zero emissions by 2050 and helps reduce the need to invest in clean energy technologies for economy-wide decarbonization, demand for fuels remains high in 2030 even in the Electrification Scenario. In 2030, 73% of vehicles on the road are still internal combustion engines using gasoline in the Electrification Scenario. This is because it takes time for long-lived assets, such as cars and trucks, to come to the end of their useful lives and be replaced by new electric vehicles.[43]

[43] Appendix A – Deep Decarbonization Modeling Technical Report, December 11, 2020, p. 30.

Insulation worker.

- For heavy-duty trucks, we assume demand for hydrogen for long-distance hauling by 2050, including electric trucks. This drives the need for hydrogen refueling and delivery infrastructure. Whether hydrogen fuel cells are favored for some transportation applications in the future will depend on the relative development of propulsion technologies. For short-haul trucks, we assume a transition to 100% electric.[44]

3.1.1. Implications for State Energy Policy

- Transportation electrification is key to cost effectively decarbonize Washington's economy. The sooner the state can electrify vehicles, the greater the avoided investment in more expensive clean fuels, including their associated infrastructure and feedstocks. The more the state can reduce VMT and encourage sustainable mobility, the less scale will be required in expanding the clean fuels industry, which is still in early stages of development. Taking early action now to reduce the 2030 need for clean fuels has significant cost benefits. Costs are on average 0.2% lower as a percentage of GDP in the Electrification Scenario than in the Transport Fuels Scenario, where less electrification is achieved.

- Because there are fewer current low-carbon alternatives for aviation — electrification technology is still nascent — clean fuel production for air travel could provide both a near-term and long-term strategy, given that significant demand for jet fuel is likely to remain through 2050.

3.2. Building Sector-Specific Results

Key conclusions from the modeling regarding the building sector are:

- The Gas in Buildings Scenario is more costly than the Electrification Scenario in 2030 and beyond, particularly when approaching net zero emissions in 2050. This is because greater quantities of clean fuels are required to offset the emissions from gas in the Gas in Buildings Scenario. The cost of those additional clean fuels is higher than the cost of the electrification measures in the Electrification Scenario.
- Decarbonizing liquid fuels rather than pipeline gas is more cost effective because fossil liquid fuels are more costly. This means higher savings from clean liquid fuels alternatives.
- Building electrification and efficiency measures drive a 26% reduction in final energy demand in the Electrification Scenario and a 13% reduction in the Gas in Buildings Scenario versus the Reference Scenario in 2050 in the building sector. However, the pace of stock rollover to new efficient technologies limits action by 2030, with reductions of 6.5% in final energy demand in the Electrification Scenario and 3.5% in the Gas in Buildings Scenario versus the Reference Scenario in the building sector.

3.2.1. Implications for State Energy Policy

- Converting building end uses to electricity is less expensive and more energy efficient than a strategy focused on creating synthetic pipeline gas, even if buildings convert to high-efficiency gas equipment. To decarbonize the economy while retaining fossil gas use in buildings, clean gas would need to displace fossil gas in the pipeline. Producing clean gas requires investment in infrastructure and feedstocks. At present fore-

[44] Ibid, p. 31.

casted prices for these processes versus electrification of appliances, the electrification option results in a 0.3% of GDP savings annually by 2050 when comparing the Electrification Scenario to the Gas in Buildings Scenario.

- The benefits of measures in buildings that reduce energy use are high in both the near term and long term. This points to the value of early and aggressive action to improve energy efficiency, including electrification and other efficiency measures in buildings.
- Many more energy efficiency measures will be cost effective in a decarbonizing world. By reducing energy use through energy efficiency, the state will reduce the need for investment in infrastructure resulting in cost savings.

3.3. Industry Sector-Specific Results

Key conclusions from the modeling regarding the industrial sector are:

- All the decarbonization scenarios included the same assumptions for the industrial sector, therefore we cannot draw any direct conclusions about one industrial strategy versus another. When comparing the Electrification Scenario to the Transport Fuels and Gas in Buildings Scenarios, we know that lowering energy consumption through electric vehicle purchases or electrified building end uses lowers total costs by avoiding expensive clean fuels. Lowering energy consumption in industry will also avoid expensive clean fuels with significant cost savings. Electrification and other efficiency measures in industry will be cost effective so long as their implementation is cheaper than the production of the clean fuels they avoid.

3.3.1. Implications for State Energy Policy

- As with the other sectors, cost-effective electrification and/or efficiency measures will lower total decarbonization costs by avoiding expensive infrastructure investments.
- Industrial carbon capture can provide a significant fraction of the carbon stream used to produce synthetic fuels, which points to the need for determining how much carbon capture potential exists in Washington state.
- Industrial flexible loads could be a major new industry in the future, producing hydrogen through electrolysis that is used in production of clean fuels.

Renewable energy storage: hydrogen gas-to-clean electricity facility.

3.4. Electricity Sector-Specific Results

Key conclusions from the modeling regarding the electricity sector are:

- Increasing electricity demand through electrification and expanding the electricity system to serve those demands with clean electricity is a cost-effective decarbonization strategy. Comparing the Electrification Scenario to the Transport Fuels and Gas in Buildings Scenarios shows that the greater levels of electrification in the Electrification Scenario result in cost savings.
- Washington imports 43% of its clean energy from inland wind-rich states (Montana and Wyoming) in the Electrification Scenario in 2050. The increased energy flows across multiple states and balancing areas will require investment in new transmission and the efficient use of imports as a balancing resource. Efficient dispatch, akin to a single balancing authority for western grid operations, is assumed in the model.
- Transmission expansion across the West is a key part of lowering costs in the model results. Expanding transmission, however, is a long, difficult process with many hurdles to overcome. Early planning and determination of feasible projects and project costs should begin now to prepare for transmission in the future. Updated feasible path expansions and associated costs can be used in future state energy strategies to reevaluate the economics. While the additional costs resulting from no transmission expansion into Washington in the Constrained Resource Scenario are relatively small ($0.5B/yr by 2050), expansion in the rest of the western states still occurs in that scenario.
- Washington has limited build of in-state renewable resources in all decarbonization scenarios until 2040. Prior to that, it is more cost effective to import clean energy from cheaper out-of-state sources. Between 2040 and 2050, Washington adds solar and offshore wind (12 GW and 4 GW, respectively, in the Electrification Scenario).
- Synthetic fuels produced through electrolysis will play a major role in decarbonizing the Washington economy, increasing electricity demand and providing long-term balancing capabilities for the electricity grid.
- Absent technology breakthroughs in zero-carbon alternatives, the Northwest builds 11 GW of gas plants, 3 GW of which are in Washington, for reliability by 2050. Gas generators in Washington burn de minimis quantities of gas after 2030 because of the need to reduce emissions and the large balancing capabilities of both the hydro system and electrolysis built for fuels production by 2030. However, these gas generators provide capacity during infrequent reliability events. CETA requires 100% clean electricity delivered to loads by 2045 in Washington. By 2045, all gas burned during these events is clean gas.

> Early planning and determination of feasible projects and project costs should begin now to prepare for transmission in the future.

3.4.1. Implications for State Energy Policy

The twin challenges of decarbonization in Washington are pace (to reach 2030) and scale (to reach 2050). Rapid change across all sectors of the economy is required to meet the 2030 challenge. Pace applies to the electricity sector in two ways. The first is to meet the need for new infrastructure to support electrification of end uses with clean electricity. The second is production of synthetic fuels that may be a component of providing clean fuels to reach 2030 targets.

Scale over a longer time period requires infrastructure investments supporting a doubling of electric load in Washington. Resource availability across the West will drive Washington from being a net exporter of electricity to importing a significant fraction of resources (43% in the Electrification Scenario).

- Rapidly electrifying end uses, wherever possible, will drive down the need for clean fuels production and reduce the investment in the infrastructure needed to produce them. This will drive expansion of the electricity sector.
- Planning for transmission expansion at the distribution and transmission levels is key to enabling this shift in the power sector. Distribution planning will support the

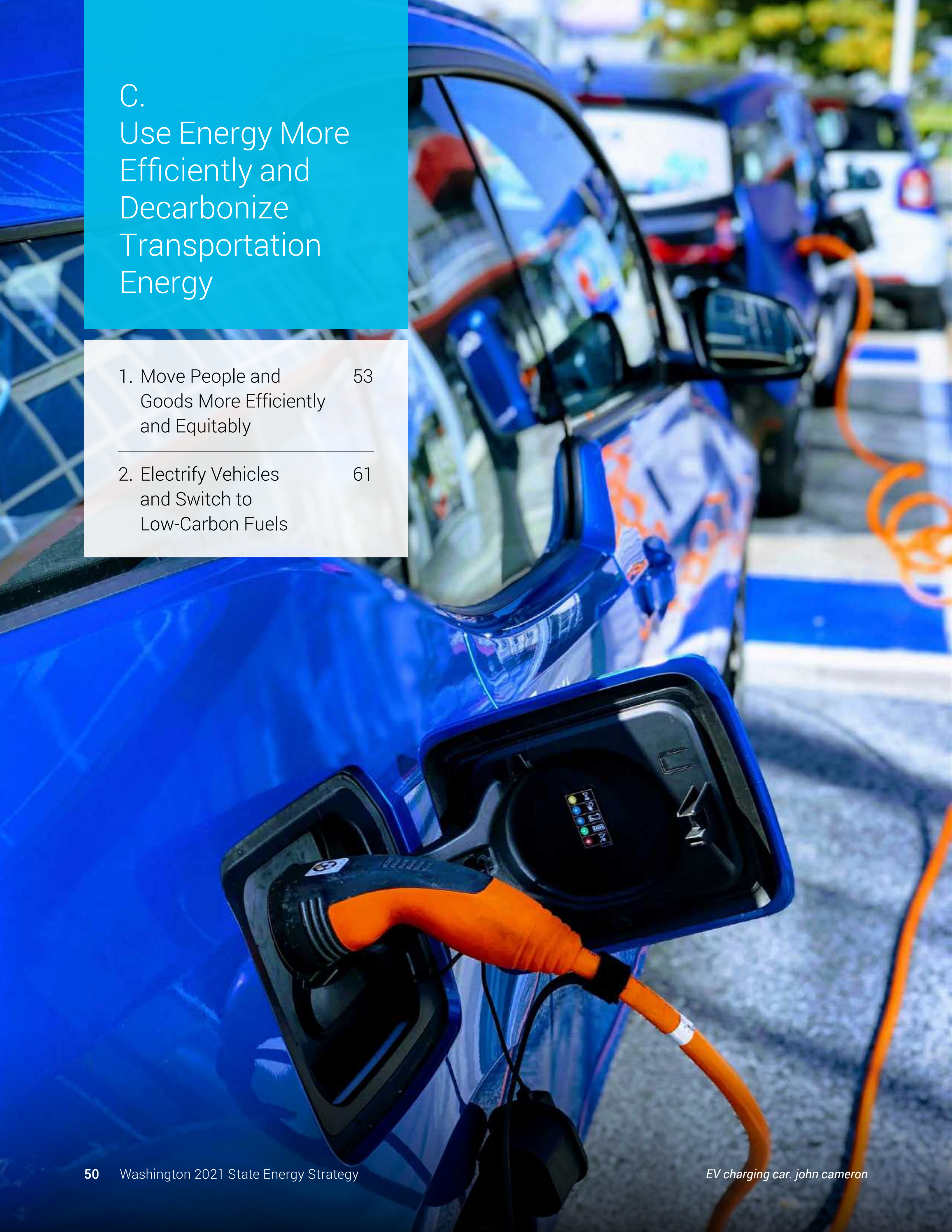
Engineer installing solar panel.

shift to electric vehicles and electrified end uses in buildings. Pursuing transmission expansion of interties now allows Washington to maintain the option of importing additional low-cost renewables in future. While the savings from expanding Washington's interties are relatively low ($0.5B/yr by 2050), planning to expand interties ensures Washington retains multiple decarbonization pathway options. By doing so the state reduces the risk that future challenges to implementation in any one pathway jeopardize achieving Washington's emission limits.

- The model determines resource adequacy as if the West were a single balancing area. While not a replacement for detailed resource adequacy studies, the model shows greater coordination and energy flows will require resource adequacy determination on a regional rather than local basis. Resource adequacy modeling will also have to evolve to incorporate energy-constrained, as well as capacity-constrained, conditions to ensure reliability during periods of low energy availability. This includes treatment of large industrial flexible loads as resources for reliability.
- Furthermore, transmission expansion and greater interregional energy flows — taking advantage of geographic and renewable resource diversity, and interregional balancing using large new flexible loads found in the modeling results — will only be possible with better regional coordination. The benefits of regional integration will increase in the future as the emissions limits become tighter and electricity loads grow through electrification and electrolysis.

The modeling results determine in-state investments in new resources. However, the model does not have a representation of the distribution system and the potential benefits from deferral of investment in distribution infrastructure from locating resources close to load. Renewable potential assessments will determine how in-state resources should be sited to maximize net benefits, including indirect benefits such as equity, job growth and environmental protection.

The benefits of regional integration will increase in the future as the emissions limits become tighter and electricity loads grow through electrification and electrolysis.



C.
Use Energy More Efficiently and Decarbonize Transportation Energy

EV charging car. john cameron

C. Use Energy More Efficiently and Decarbonize Transportation Energy

Transportation is the state's number one source of greenhouse gas emissions. To meet emission reduction limits, vehicles will need to operate on renewable fuels, such as biofuels, electricity and hydrogen, and communities must reduce miles traveled, as well as increase transit, cycling and walking.

Transportation is a major source of local air pollution that disproportionately impacts the health of people living near roadways, port facilities, industrial activity and railways — communities where vulnerable populations often reside. These populations are particularly sensitive to transportation pollution due to health, economic and other environmental factors.

Structural issues regarding existing transportation systems must be addressed along with the required reduction in greenhouse gas emissions. To create accessible, affordable, safe and sustainable mobility opportunities that work for all Washingtonians — particularly highly impacted populations which often lack historical mobility investments — our transportation system must prioritize efficiency and equity improvements.

The approach outlined here uses multiple policies to achieve comprehensive benefits, including improved public health due to reduced co-pollutants, increased physical activity, reductions in traffic-related injuries,[45] greater economic opportunities due to lower costs and more mobility choices and increases in quality of life in both urban and rural areas. A balanced approach holds the most promise to achieve the necessary outcomes — aggressive reductions in emissions and meaningful improvement in environmental and economic benefits for communities.[46]

Washington State ferry. Clean Energy Transition Institute

This balanced approach includes two complementary elements: using energy more **efficiently** and **decarbonizing** the energy that is used. Pursuing one without the other will result in a costlier and less efficient transition. The first element, transportation system efficiency, can be addressed by reducing the number of vehicle-miles required to meet people's needs and support economic activity.

The second element — decarbonizing — requires vehicles use zero-emission fuel, which will need accessible and affordable charging and refueling infrastructure; sufficient incentives to support rapid adoption; and education and outreach so that Washingtonians can choose their mobility future.

[45] Particulate emissions from tire wear, for example, can present a health hazard on par with car exhaust: "Non-Exhaust Emissions from Road Traffic" (Department for Environment, Food and Rural Affairs; Scottish Government; Welsh Government; and Department of the Environment in Northern Ireland, 2019), https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1907101151_20190709_Non_Exhaust_Emissions_typeset_Final.pdf.

[46] Harvard Chan C-CHANGE, "New TRECH Project Research Update on Health Benefits of TCI Policy Scenarios," October 6, 2020, https://www.hsph.harvard.edu/c-change/news/trechstudy/.

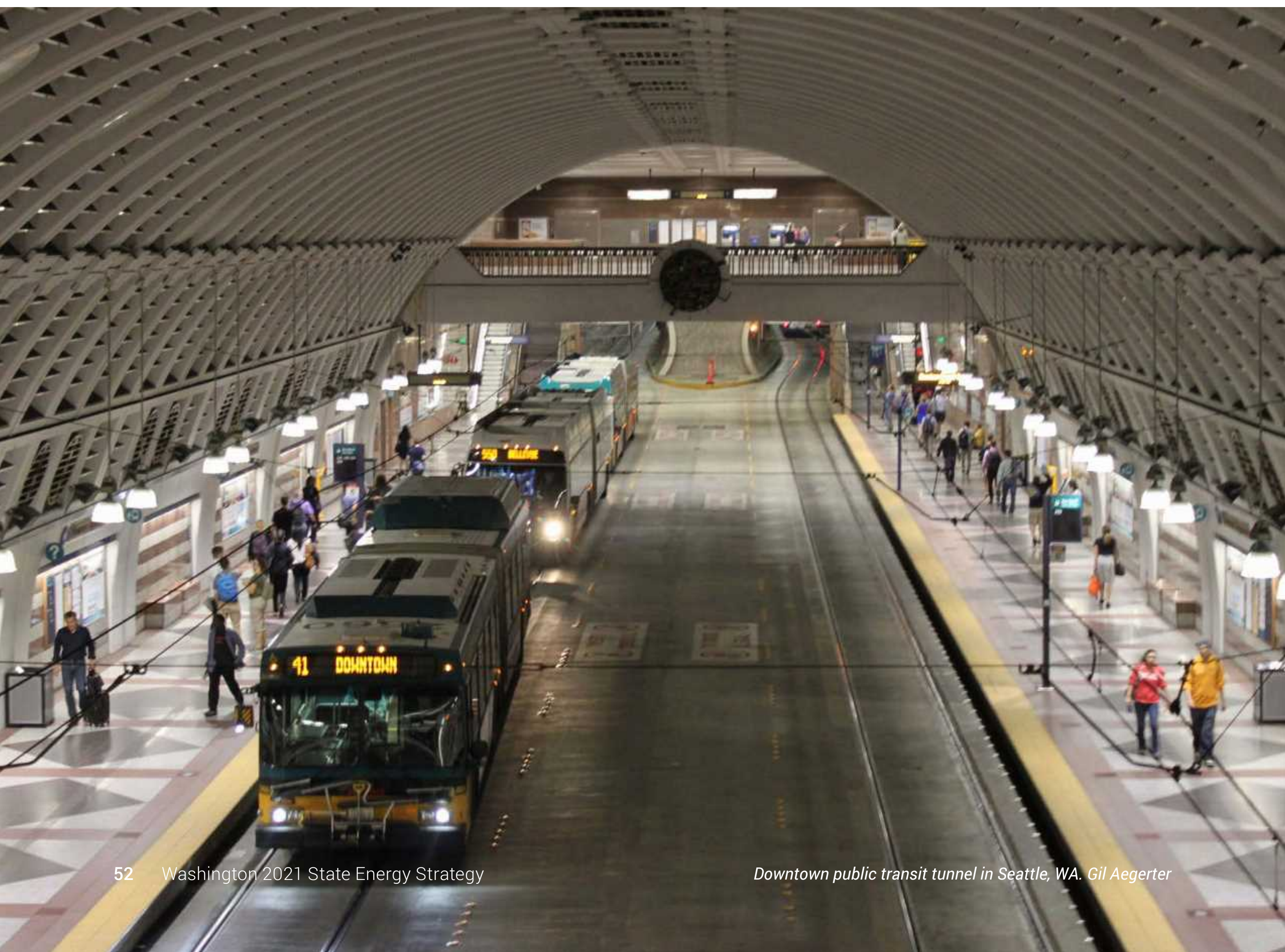
Transportation efficiency can be implemented in two basic ways. The first is to *reduce the need for travel*, which means either shortening the distance that people and goods have to travel (e.g., through improved urban design) or avoiding the need for trips altogether (e.g., via telemedicine).

The second way is to *shift travel to more efficient modes*, such as public transit or maritime freight transport, which can move more passengers or goods per trip. Although certain approaches may be more relevant in an urban, suburban or rural environment, comprehensive implementation will result in both equity and efficiency benefits. Nearly all of these approaches require coordination across multiple jurisdictions.

Any single approach, if pursued in isolation, is likely to have limited effectiveness. King County, for example, has found that to achieve its VMT reduction goals, the most effective and lowest-cost strategy is to combine land-use policy (focusing on compact, transit-oriented development (TOD)), enhancement of transit service and travel-demand management policies including vehicle usage charges.[47]

An important goal of state policy, therefore, should be to promote complementary approaches in local and regional transportation planning, development and operation. A key first step for transportation sector strategies is to provide a roadmap — with clearly defined targets — describing how the state will achieve an equitable transition to a zero-carbon transportation sector.

[47] Kuharic, Stroble, and Binder, "King County 2020 Strategy Climate Plan."



Downtown public transit tunnel in Seattle, WA. Gil Aegerter

1. Move People and Goods More Efficiently and Equitably

People and goods are often transported across the same roads. Land-use policies and road system designs influence both passenger and freight travel. Cost, efficiency and accessibility determine whether people and goods travel by road, rail, sea or air.

Moving people and goods more efficiently, therefore, requires a holistic, integrated approach across modes, taking into account different transportation needs and purposes. An integrated approach also means understanding the basis for different types of travel, including commuting, regional and long-distance passenger travel, commercial services, shopping and leisure trips, short-haul freight transfer and delivery and long-haul freight.

Strategies for improving transportation efficiency and equity fall into two categories:

- **Improving the design and operation of Washington's transportation networks.** State government has considerable leverage over how Washington's transportation systems are developed, operated and connected for all users. Although responsibilities for different aspects of the systems are spread across multiple jurisdictions, the state can take important steps to improve coordination, set priorities and enable local and regional actions.
- **Improving vehicle fuel economies.** Here, state government has less direct influence, but can drive improvements by continuing to require vehicles to meet California emission standards, and by establishing programs to accelerate the retirement of inefficient vehicles.

1.1. Set Clear and Ambitious Targets

An important first step in increasing the efficiency of the transportation system is for the state to establish targets and milestones that provide clear direction and authority for action. In the case of transportation, the actors are state agencies, regional and metropolitan planning organizations, developers, county and local governments and private sector organizations, such as logistics companies.

Amtrak Cascades passenger train in Puyallup, WA.
WA State Department of Transportation

In addition, direction is needed regarding land-use planning and infrastructure investments to reduce the need for, and shift modes of, travel. Two elements are essential here: updating the state's existing VMT reduction targets and establishing new, explicit targets for transportation systems, such as transit and bicycling, and broadband infrastructure.

The decentralized structure of Washington's transportation system makes the development and oversight of common targets both challenging and important. As the legislature's Joint Transportation Committee (JTC) has noted: "What is sometimes referred to as the 'state transportation system' is actually a decentralized network managed by a variety of jurisdictions, including the state, Tribal nations, counties, cities, port districts and public transit authorities."[48] Transportation system needs are largely defined from the "bottom up," with each jurisdiction identifying specific requirements for maintenance and new capital expenditures based on local circumstances.

The state already engages in discrete planning exercises to consolidate information about local transportation needs. This information informs certain decisions about state-level policies and investments. WSDOT's Active Transportation Plan,[49] for example, is soliciting input from local communities about walking and cycling infrastruc-

[48] BERK Consulting, "Statewide Transportation Needs Assessment: July 2020 Phase I Report" (Joint Transportation Committee, 2020), http://leg.wa.gov/JTC/Documents/Studies/Statewide%20Needs%202019/FinalReport_StatewideNeeds.pdf.

[49] Washington State Department of Transportation, "WSDOT Active Transportation Plan 2019," October 23, 2020, https://wsdot.wa.gov/travel/commute-choices/bike/plan.

ture needs with a goal to coordinate efforts to meet these needs. Going forward it will be increasingly important to align local transportation planning efforts with statewide VMT reduction goals.

Enhancing statewide VMT reduction goals will not — in and of itself — achieve Washington's transportation accessibility and sustainability goals. Carefully designed efficiency metrics will enable communities to monitor desired mobility outcomes. Efficiency metrics may include, but are not limited to, energy intensity per passenger-mile, travel time for trips, availability of mobility choices or completion of mobility projects.

ACTIONS

- The Legislature, in consultation with WSDOT and local transportation organizations, should adjust and update state VMT reduction targets to reflect existing VMT levels and the state's greenhouse gas emission limits. See Appendix C for detailed VMT background and recommendations.
- The Legislature should consider transportation efficiency and emission targets to accompany updates to VMT reduction targets. (See Appendix C.)
- The Legislature should direct WSDOT and Commerce - in consultation with local and regional jurisdictions, as well as highly impacted populations - to adopt new, discrete, near- and long-term targets for transit and active transportation and to recommend new targets for broadband access.

1.2. Improve Transportation System Planning and Coordination, Prioritizing VMT Reduction

In assessing statewide transportation needs, the JTC found that there is no consistent, statewide approach to identifying needs and planning for improvements, nor are there consistent standards for levels of service. To improve the efficiency and equity of Washington's transportation system, the state must take steps to set statewide priorities for land-use planning, infrastructure development and service improvements. Resources must be provided to enhance the capacity of local jurisdictions and local community groups to pursue those priorities. Strategy, design and deployment should reflect the needs of each community.

To achieve transportation efficiency targets, the state must set clear priorities for local jurisdictions to follow. One approach is for the Legislature to adopt evaluation metrics for funding proposals. Metrics should be developed and prioritized through collaboration with multiple stakeholders, including relevant state agencies, local governments, planning authorities, Tribal nations, port districts, transit authorities, business groups and frontline and community groups.

Effective inter-jurisdictional coordination is essential for the success of VMT-reducing measures, including the development of transit systems, walking and cycling infrastructure and intermodal connections. Existing planning tools for transportation systems, such as the Statewide Human Services Transportation Plan, the State Public Transportation Plan and the State Active Transportation Plan, support this coordination and identify gaps in infrastructure and service throughout the state. As discussed in subsection 1.3, additional funding can address these gaps.

Coordination among organizations is key: funding and resourcing is needed where it is lacking, and evaluation of existing coordination must occur where results are slow or absent. Although effective cross-jurisdictional coordination is a key goal of the state's regional transportation planning organizations (and federally funded metropolitan planning organizations), the state could amplify these efforts by expanding funding criteria to include elements such as transit and alternative mobility projects.

In addition, while building out transit and active transport infrastructure is an important goal, there must be active local engagement to ensure build out happens and meets community needs. Funding should be made available to support participation in equity advisory groups involved in transportation planning and implementation.

The siting of housing developments near services, amenities and transportation services can result in a 20-40% reduction in VMT, and a corresponding decline in greenhouse gas emissions and congestion.[50] A study conducted in King County found that residents of the most walkable neighborhoods drive 26% fewer miles than those living in the most sprawling areas.[51] Similar studies elsewhere find a 33% reduction in VMT for households living in more dense developments with a diversity of uses, accessible destinations and interconnected streets when compared to households in low-density areas.[52]

Smaller communities may lack resources to engage in the land-use planning exercises and infrastructure development that would maximize transportation system efficiency and equity, especially where inter-jurisdictional coordination is required. For all jurisdictions, one way to address such gaps is to provide model code and rules for local jurisdictions to incorporate into their transportation and land-use planning. Materials should facilitate coordination around transit-oriented corridor planning, development of transit and active transport infrastructure and zoning for transit-oriented, mixed use and compact development, including elements related to implementation, administrative procedures and community engagement.

For example, a standard checklist for lane-widening proposals could facilitate evaluation of alternatives and ensure consistency and coordination with other transportation system elements. Similarly, investment in and preservation of low-income housing, community-serving businesses and cultural centers near transit create more opportunities for those with the fewest choices. Sound Transit, is developing a model rule for corridor planning that will help to align local efforts with regional objectives.[53] The Puget Sound Regional Council has developed similar model codes and policies.

> Targets for EVs, low-carbon fuel adoption and associated infrastructure development will send an important signal to regulatory agencies.

ACTIONS

- The Legislature, in collaboration with WSDOT and other agencies, should adopt and apply metrics for state transportation funding linked to key efficiency and equity outcomes.
- The Legislature, state agencies and local governments should take steps to incentivize and remove barriers that restrict TOD. (See Appendix C.)
- The Legislature, in consultation with state agencies and local governments, should link cross-jurisdictional coordination and community engagement with funding related to the planning and implementation of land-use policies, TOD, transportation demand management (TDM) measures (including vehicle usage charges or similar policies), transit and active transport infrastructure development and other measures designed to reduce VMT and enhance accessibility and mobility.
- The Legislature should direct and fund WSDOT and Commerce to establish and manage a clearinghouse of model code, model rules, policy packages and standardized checklists as a resource for local jurisdictions engaged in transportation system planning and development, including to help inform comprehensive plans and development codes.
- The Legislature should fund WSDOT and Commerce to provide centralized assistance for jurisdictions to support development and implementation of model code related to corridor planning, "smart growth" zoning and land-use policies, TOD and related infrastructure development

[50] "Housing and Climate Change" (California Department of Housing & Community Development, 2013), https://www.hcd.ca.gov/policy-research/plans-reports/docs/pb04housing_climate_change0214.pdf.

[51] "A Study of Land Use, Transportation, Air Quality, and Health (LUTAQH) in King County, WA: Executive Summary" (Lawrence Frank and Company, Inc., 2005), http://urbandesign4health.com/wp-content/uploads/2012/03/LUTAQH_exec_summary_092705.pdf.

[52] Reid Ewing et al., "Growing Cooler: The Evidence on Urban Development and Climate Change" (Urban Land Institute, 2007), https://www.nrdc.org/sites/default/files/cit_07092401a.pdf.

[53] "Federal Transit Administration Awards Sound Transit $2 Million for Everett Link Transit-Oriented Development Pilot," Sound Transit, June 15, 2020, https://www.soundtransit.org/get-to-know-us/news-events/news-releases/federal-transit-administration-awards-sound-transit-2.

Spokane Transit GILLIG Hybrid Electric bus. Atomic Taco

1.3. Expand and Align Transportation Funding with Emissions and Equity Goals

Building a more efficient and equitable transportation system in Washington will require investment to develop and maintain new infrastructure and to ensure that existing infrastructure continues to be safe and functional. It will also require a reprioritization of funding to align investments with VMT reduction and equity targets.

In its 2020 Statewide Transportation Needs Assessment, the JTC found that jurisdictions at all levels lack sufficient funding to meet current transportation needs.[54] Current state transportation funding derives from revenue sources that fluctuate with macroeconomic conditions. Gas taxes and vehicle fees collected by the state account for a large portion of the transportation budget.

Gas taxes are subject to the 18th Amendment of the Washington State Constitution, which requires that revenue collected through gas taxes and some vehicle fees only be used for "highway purposes."

Vehicle fees, some of which are not subject to constitutional limitations, mostly fund the multimodal account. The JTC report explores a range of alternative revenue sources that could be adopted to fund the state's transportation system while providing stable and diverse funding, including and in addition to the more limited gas tax and vehicle fees.

With decarbonization, one important funding consideration is the replacement of gas tax revenues that decline as more drivers adopt electric vehicles. The Washington State Transportation Commission (WSTC) recently identified a road usage charge (RUC) as one possible substitute for the gas tax and provided a series of recommendations to support implementing a RUC.[55] The WSTC continues to study this concept, including conducting an analysis of potential equity impacts of a RUC and developing frameworks for various types of vehicles.

Current transportation system policy goals for Washington include economic vitality, preservation, safety, mobility, environmental impacts and stewardship.[56] Although several of these goals intersect with reducing emissions, improving transportation efficiency, reducing VMT and enhancing equity, none explicitly call for action to equitably achieve Washington's greenhouse gas limits.

Greater statutory clarity on the expectations for the transportation sector regarding greenhouse gas emissions reductions would help steer investment where it is most needed. Any statutory effort should address safe, complete and welcoming active transportation and transit networks integrated with compact land-use patterns that put frequently visited destinations within a short distance of most Washingtonian's homes.

As noted in section 1.2, inter-jurisdictional coordination and community engagement are essential for the success of VMT-reducing measures and infrastructure projects. In conjunction with making funding contingent on effective coordination and local engagement, funding should be sufficient to cover these requirements. Existing state and federal funding mechanisms often emphasize upfront planning and project or policy design, and may provide insufficient support for full implementation.

[54] BERK Consulting, "Statewide Transportation Needs Assessment: July 2020 Phase I Report."

[55] Washington State Transportation Commission, "Washington State Road Usage Charge Assessment Final Report," 2020, https://waroadusagecharge.org/wp-content/uploads/2020/01/WSTC-Final-Report-Vol-1-WEB-2020_01.pdf.

[56] Chapter 47.04.280 RCW.

Processes behind state and federal funding can result in some project "legs" that are unfunded and disconnected from the entire project and other modes. In some cases, important "last mile" connections between transportation network elements go unfinished (e.g., street designs accommodating pedestrian or bicycling access to transit systems).

The state should adjust and expand transportation funding to ensure successful "back end" implementation and evaluation. Where relevant, funding could be allocated separately for the implementation of approved plans rather than in a single tranche covering planning and implementation. Funding should also expressly target evaluation efforts that inform and improve subsequent project stages or policy revisions.

Washington's current transportation planning and funding models make it too easy for responsible jurisdictions to overlook or ignore synergies or overlaps with other types of infrastructure, or connections with other elements of the transportation system. For example, common use rights-of-way for transit projects may also accommodate electrical or communications infrastructure.

In the development stage, transit corridors can more easily be expanded to include pedestrian and cycling amenities, improving connections between different modes. Allocating more funding to implementation efforts could help to address these gaps, but funding restrictions can limit jurisdictions from considering indirect "external benefits" in both the planning and implementation phases.

ACTIONS

- The Legislature should identify and establish stable funding mechanisms for maintenance, preservation and system improvements across all transportation modes. The funding must be stable, equitable and accessible to all jurisdictions and sufficient to cover programmatic and capital needs.
- The Legislature should expand transportation system policy goals to expressly address VMT reduction, efficiency, greenhouse gas emissions reductions and equity as a means to achieve accessibility and environmental stewardship objectives.
- The Legislature should fully fund inter-jurisdictional coordination and community engagement as part of transportation system improvements.
- The Legislature should establish a fund to support opportunistic consideration — and incorporation — of connections between transportation system elements, and between these systems and other beneficial infrastructure.

1.4. Remove Barriers to Transit, Walking and Cycling

Boosting transit ridership and use of active transport options requires a comprehensive approach involving land-use change, transit service expansion and appropriate travel-demand management measures implemented at local and regional levels. The state can play a key role in assisting these efforts.

Public transit service is a universal need across the state. Rural and Tribal communities benefit from public transit, as well as van pools,[57] paratransit and ridesharing programs that typically operate on minimal budgets. These services should be enhanced and expanded and encouraged to transition to EVs.[58] Washington's public transit providers face budget challenges under their current funding models. Stabilizing and expanding transit funding with more direct and consistent state funding would help to expand access and maximize the public benefit value of transit services in urban, suburban and rural communities.

[57] "Farmworkers," accessed October 23, 2020, https://calvans.org/farmworkers.

[58] Shared-use Mobility Center, "SUMC Celebrates Launch of New EV Rideshare 'Green Raiteros,'" accessed October 23, 2020, https://sharedusemobilitycenter.org/sumc-celebrates-launch-of-new-ev-rideshare-green-raiteros/.

In Washington State, 28% of people live in or near poverty. Among this group of households, the percentage who do not own a vehicle is 6.8 times higher than among other households.[59] On average, light rail systems produce 62% less and bus transit 33% less greenhouse gas emissions per passenger mile than private vehicles.[60] Making public transit safer, more convenient and more accessible will increase ridership and reduce emissions.

Electric bicycles (e-bikes) and scooters can reduce transportation-related congestion, local air pollution and greenhouse gas emissions. However, e-bikes typically cost more than traditional bikes and can be unaffordable for many people. Many countries, states and cities have adopted incentives for e-bikes to reduce their upfront costs and accelerate adoption, including state-funded rebates or discounts offered through electric utilities.[61]

WSDOT oversees a longstanding, statewide commute trip reduction (CTR) program that encourages employers to promote alternatives to commuting via single-occupancy vehicles.[62] After the law and funding allocations were last amended by the 2006 Commute Trip Reduction Efficiency Act,[63] implementation shifted, and the state's primary role became assisting local jurisdictions in establishing and maintaining their CTR programs.

This has led, in part, to uneven application of transit and active transportation options in urban growth areas.[64] Engagement efforts are underway with state legislators and other stakeholders to provide program flexibility that would allow CTR participants to focus on a variety of trip purposes beyond commuting (e.g., education, shopping, medical services). To further influence program success, additional funding beyond the 2006-dollar allocations must be considered.

ACTIONS

- The Legislature and local governments should adopt incentive programs that offset the relative cost of transit and other alternative travel modes.
- Along with increasing and stabilizing transportation funding, the Legislature, local governments and transit agencies should explore options to make transit universally affordable, including creating a statewide transit pass option and means-tested transit subsidies for low- and no-income riders, or establishing fare-free transit statewide.
- Urban and rural transit improvements, funded by the Legislature and local governments, should directly benefit highly impacted populations and people with disabilities.[65]
- Transit agencies should invest in transit infrastructure including lighting, covered stops and pedestrian crossings.
- The Legislature, local governments and businesses should explore options for providing incentives for e-bikes and other electric transportation devices.
- WSDOT, in partnership with the Legislature, transit agencies and the private sector, should expand the reach of and funding for Washington's CTR program.

[59] "2016 Washington State Public Transportation Plan" (Washington State Department of Transportation, 2016), https://wsdot.wa.gov/sites/default/files/2019/10/15/PT-Report-WashingtonStatePublicTransportationPlan-2016.pdf. p. 33

[60] "2016 Washington State Public Transportation Plan." p. 35

[61] Portland State University et al., "How E-Bike Incentive Programs Are Used to Expand the Market" (Transportation Research and Education Center (TREC), May 2019), https://doi.org/10.15760/trec.223.

[62] Washington State Department of Transportation, "Commute Trip Reduction," October 23, 2020, https://wsdot.wa.gov/transit/ctr/home.

[63] Zachary James Wieben, "What Contributes to Successful Commute Trip Reduction in the State of Washington? A Focus on Transit Accessibility" (University of Washington, 2017), https://digital.lib.washington.edu/researchworks/handle/1773/40307

[64] Ibid.

[65] Puget Sound Sage and Transportation Choices, "More Places, Better Connections: Transit Priorities for Residents of South Seattle and South King County," 2020, https://www.pugetsoundsage.org/research/research-equitable-development/more-places-better-connections/.

Big rig semi truck transporting refrigerated cargo.

1.5. Support Measures to Optimize Freight VMT

Freight includes a wide variety of goods movement, from international transport and long-haul trucking to delivery to individual homes and businesses. Goods move through a multimodal freight system made up of a collection of public and private infrastructure with operational decisions largely made by the private sector. Freight operators rely on and generate extensive data; however, this data is not typically available to the public sector for proprietary reasons.

Growth in freight demand, including the associated demand for digital commerce, is expected to increase alongside population growth. In light of this, the state should work with the freight industry to support the efficient movement of goods by ensuring that all available options are pursued to mitigate the number of vehicle-miles needed for transport and delivery.

Some freight optimization policies are best implemented at the national level. For example, policies that encourage more efficient handling of long-haul freight using rail instead of trucks. State and local policy should address freight congestion and bottlenecks and improve first-last mile connections. The specific types of strategies needed will depend on the locale. Strategies for reducing freight VMT also need to consider the pollution and health impacts on highly impacted populations.[66]

The state's options to affect long-haul freight mode choice and efficiency are more limited but should support national and regional efforts through in-state land-use planning and infrastructure development. This includes optimizing local connections to improve the economics of rail and shipping transport.

[66] University of Washington, "Supply Chain Transportation & Logistics Center," October 23, 2020, https://depts.washington.edu/sctlctr/.

ACTIONS

- To further optimize freight movement and logistics and reduce environmental impacts in communities, the Legislature should provide WSDOT funding to assess how to effectively mitigate freight VMT and greenhouse gas emissions.
- State and local governments should have access to sufficient resources, including data, to conduct planning and implement strategies for reducing VMT and greenhouse gas emissions in freight operations.
- The Legislature, state agencies and local governments should explore ways to incentivize VMT and greenhouse gas reductions in freight operations.
- The state, in coordination with the freight industry, should develop a freight VMT and greenhouse gas emission action plan to help meet the state's emission reduction limits.

1.6 Continue to Support Vehicle Fuel Economy Improvements

Fuel economies for passenger and freight vehicles are largely determined by federal standards. Washington has limited authority to unilaterally increase average fuel economies. However, by continuing to join with other states and follow California's "clean car rule"[67] regulating greenhouse gas tailpipe emissions for passenger vehicles and "clean truck rule"[68] setting targets for sales of medium- and heavy-duty zero-emission vehicles, the state can significantly reduce energy consumption, save on fuel costs and lower greenhouse gas emissions.[69] Continuing to follow California vehicle emission standards, as allowed under federal law, will be critical to reducing statewide transportation greenhouse gas emissions over the next 10 years.

> Continuing to follow California's vehicle emission standards will be critical to reducing emissions from transportation over the net 10 years.

The state may also be able to accelerate fuel economy improvements through vehicle purchase and retirement programs or similar measures. Vehicle buyback programs can help improve cumulative fuel economies by taking older, less efficient vehicles off the road, including trucks and drayage vehicles. A buyback program could be a cost-effective way to reduce the need for costly synthetic fuels if adoption of zero-emission vehicles (ZEVs) fails to keep pace with what is needed to meet state greenhouse gas reduction limits (see Chapter B - Achieving Our Carbon Emissions Goals).

A vehicle buyback program could help low-income residents purchase a new vehicle. A buyback program in British Columbia called "BC-Scrap It" also allows participants to opt for payments toward transit passes, car share and ride share services, or e-bikes.[70]

ACTIONS

- The Department of Ecology must continue to implement California's "advanced clean car" emissions standards and follow through with implementation of measures needed to match California's ZEV sales targets for medium- and heavy-duty trucks.
- The Legislature, in consultation with Commerce and Ecology, should explore whether a state-run vehicle buyback program could cost-effectively and equitably contribute to near-term greenhouse gas reductions, and, if feasible and appropriate, adopt such a program.

[67] California Air Resources Board, "Advanced Clean Cars Program," accessed October 23, 2020, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/about.

[68] California Air Resources Board, "15 States and the District of Columbia Join Forces to Accelerate Bus and Truck Electrification," October 23, 2020, https://ww2.arb.ca.gov/news/15-states-and-district-columbia-join-forces-accelerate-bus-and-truck-electrification.

[69] Federal law grants California a waiver allowing the adoption of more stringent emissions standards, which other states are free to follow. See https://ww2.arb.ca.gov/resources/fact-sheets/pollution-standards-authorized-california-waiver-crucial-tool-fighting-air.

[70] "Scrap Vehicle Rebates and Incentives for BC Residents," accessed October 14, 2020, https://scrapit.ca.

2. Electrifying Vehicles and Switching to Low-Carbon Fuels

Rapid advancements are being made for electric vehicles (EV) technologies that use batteries (BEVs) or fuel cells (FCVs), and development of low-carbon liquid and gaseous fuels. BEVs, in particular, are already making strong inroads in the passenger vehicle market and to a lesser extent the freight vehicle market. Upfront costs are rapidly declining, driving range is increasing and more options are becoming available across vehicle classes. BEVs are expected to reach cost parity across passenger vehicle classes by the mid-2020s.[71]

BEVs provide consumers with numerous advantages over gasoline-powered vehicles, including per-mile cost savings when substituting electricity for gasoline, and cheaper, less frequent maintenance. Electric vehicle adoption will improve local air quality in Washington communities through the reduction of co-pollutants like $PM_{2.5}$ and NO_x. Vehicle exhaust is currently the largest source of air pollution in the state, contributing to asthma and other respiratory and cardiovascular diseases.[72]

Moreover, the deep decarbonization modeling shows that accelerating vehicle electrification will yield substantial cost savings by reducing the need to produce synthetic liquid fuels for use in conventional vehicles. Despite these advantages, market forces alone will not achieve the pace of BEV and FCV adoption that is needed to meet Washington's greenhouse gas reduction limits.

Universal access to charging and fueling infrastructure is crucial for accelerating the pace of transportation decarbonization, but other policies are required as demonstrated by the decarbonization modeling discussed in Chapter B. These policies must synchronize with broader clean and accessible mobility policies, such as increasing public transit and active transportation. As in other states, Washington should set clear near- and long-term targets for BEV and FCV sales and adoption.

Bike share in Ravenna Park, Seattle, WA. Clean Energy Transition Institute

> As in other states, Washington should set clear near- and long-term targets for battery electric and fuel cell vehicle sales and adoption.

BEVs, and increasingly FCVs, also provide opportunities to reduce emissions and costs for rail and off-road transportation (e.g., construction equipment, farm equipment and warehouse and port vehicles). Shore power, in particular, could dramatically reduce in-port emissions from international shipping. Efforts are already underway to electrify marine vessels, including conversion of Washington's ferries to diesel-electric hybrid operation and development of shore power facilities at Washington's ports.

In 2019, Washington State Ferries submitted their 2040 Long Range Plan to the Governor and the Legislature.[73] The plan recommends that WSF leverage the need for new vessels to meet and exceed carbon dioxide emissions reduction requirements under state law. To accomplish this and to cut fuel consumption, the plan recommends building new vessels to use hybrid propulsion technology instead of full diesel engines, a large investment in the electrification of the fleet by 2040, and the electrification of 17 terminals.

71 Nick Albanese, "BNEF Electric Vehicle Outlook 2020," https://efiling.energy.ca.gov/getdocument.aspx?tn=233410.

72 Washington State Department of Health, "Sources of Outdoor Air Pollution and Health Impacts," October 23, 2020, https://www.doh.wa.gov/CommunityandEnvironment/AirQuality/OutdoorAir.

73 "Washington State Ferries Long Range Plan," Washington State Department of Transportation, accessed December 1, 2020, https://wsdot.wa.gov/ferries/about-us/planning/long-range-plan/the-plan.

Poplar harvesting for biofuels. Marcus Kauffman

Electrification is also a promising option for decarbonizing short-haul air travel. Policies to accelerate BEV and FCV adoption generally should include measures, such as charging and fueling infrastructure development, to address these transportation segments as well.

Not all segments of the transportation sector can be readily electrified through onboard battery storage. As the deep decarbonization modeling results suggest, long-haul freight trucks, some off-road vehicles, and long-distance rail, shipping and aviation will likely need to rely on liquid or gaseous fuels for the foreseeable future. This limitation is mainly due to range and energy density requirements, as well as the fact that many vehicles in these segments have long service lifetimes.[74] Part of Washington's strategy should be to expand clean fuels production and, where needed, encourage the development of associated transport and fueling infrastructure (e.g., hydrogen for FCVs). (Chapter E - Promote Clean and Competitive Industries discusses policy approaches for fostering the development of an in-state clean fuels industry.)

> One way for Washington to advance its energy and climate goals in a market-friendly and technology-neutral way would be to adopt a low carbon fuel standard.

One way for Washington to advance its energy and climate goals in a market-friendly and technology-neutral way would be to adopt a low carbon fuel standard (LCFS). In British Columbia, California and Oregon, LCFS policies have incentivized clean fuel production and development of charging and fueling infrastructure and accelerated adoption of EVs and low carbon fuels across all transportation segments (on-road, off-road, rail, marine and aviation).

A similar standard in Washington could accelerate decarbonization of the transportation sector throughout the West Coast and result in an in-state clean fuel industry that is both domestically and internationally competitive (see Chapter E - Promote Clean and Competitive Industries for discussions of an LCFS).

[74] International Energy Agency, *Energy Technology Perspectives 2020*, Energy Technology Perspectives (OECD, 2020), https://doi.org/10.1787/d07136f0-en.

2.1. Set Clear and Ambitious Statewide Targets

Setting and achieving targets that are consistent with the state's emissions limits will be challenging. These targets will need to be realistic in light of market and legal constraints. As difficult as the transition will be, the need for specific targets is clear, as is the need to establish accountability and responsibility. Phasing out the use of gasoline- and diesel-powered vehicles by mid-century is key to achieving Washington's emissions limits at minimum cost.

Targets for EVs, low-carbon fuel adoption and associated infrastructure development will send an important signal to regulatory agencies, the public and the private sector, allowing for better planning and coordination. Ongoing tracking of progress will increase accountability and allow policy efforts to adapt over time.

For passenger cars to be fully zero-emissions by mid-century, nearly all new car sales will need to be EVs by 2035.[75] The faster this transition occurs, the less costly it will be to meet the state's greenhouse gas emissions limits. Explicit near- and long-term targets for BEV and FCV adoption will help keep the state on track. Vehicle replacement targets should be especially aggressive for diesel-fueled, short-haul vehicle classes (e.g., school and transit buses, utility and service vehicles, local freight delivery, drayage and off-road vehicles) that contribute disproportionately to local air pollution, especially in frontline communities.

Targets are also required for charging and hydrogen fueling infrastructure, since adequate charging is required for market acceptance of BEVs and FCVs. Infrastructure must be widely available, affordable and accessible to communities and the full range of vehicle classes. Rural areas outside the reach of mass transit systems will require BEV and FCV options to achieve low-carbon transportation.[76] The potential economic benefits to rural drivers are substantial because rural drivers spend up to twice as much on fuel as urban drivers.[77, 78]

In addition, the state should explore options for increased community-scale air quality monitoring,[79] especially in areas close to major roadways, freight depots, ports and other facilities that produce substantial amounts of transportation-related air pollutants. Improved access to air quality data will empower communities and measure whether the areas with the highest pollution burden are realizing the health benefits of vehicle electrification and clean fuels.

ACTIONS

- The Legislature, in consultation with state agencies, should set targets for EV and FCV adoption, differentiated by vehicle class. These targets must be aligned with ambitious targets in existing agreements with other states.[80] (See Appendix C for detailed target recommendations and additional information on California's various rules.)
- The Legislature should direct and fund a comprehensive BEV charging and FCV fueling infrastructure needs assessment. (See Appendix C for additional details.)
- The Legislature, in consultation with state agencies and upon completion of the infrastructure needs assessment, should set explicit targets for charging and refueling infrastructure deployment and provide state funding for infrastructure deployment.
- The Department of Licensing must continue to publicly track annual metrics on BEV and FCV adoption; Commerce should develop and track metrics for infrastructure deployment.
- The Legislature, in consultation with the Department of Ecology and local clean air agencies, should fund expanded deployment of community-scale air quality monitoring in highly impacted populations.

75 The typical lifetime for light-duty vehicles is around 15 years.

76 Sarah White, Laura Dresser, and Joel Rogers, "Greener Reality: Jobs, Skills, and Equity in a Cleaner U.S. Economy" (University of Wisconsin-Madison, 2012), http://repository.law.wisc.edu/s/uwlaw/item/27119.

77 "The Clean Energy Future Protecting the Climate, Creating Jobs and Saving Money" (Labor Network for Sustainability & Synapse Energy Economics, 2015), https://www.synapse-energy.com/project/clean-energy-future-protecting-climate-creating-jobs-and-saving-money.

78 "Electric Vehicle Benefits for Washington" (Union of Concerned Scientists, 2019), https://www.ucsusa.org/sites/default/files/attach/2019/04/State-Benefits-of-EVs-WA.pdf.

79 Elena Craft et al., "Making the Invisible Visible: A Guide for Mapping Hyperlocal Air Pollution to Drive Clean Air Action" (Environmental Defense Fund, 2019), https://www.edf.org/sites/default/files/content/making-the-invisible-visible.pdf.

80 For example, Washington is a signatory to a 15-state memorandum of understanding to work collaboratively to advance and accelerate the market for electric trucks and buses: California Air Resources Board, "15 States and the District of Columbia Join Forces to Accelerate Bus and Truck Electrification," accessed October 23, 2020, https://ww2.arb.ca.gov/news/15-states-and-district-columbia-join-forces-accelerate-bus-and-truck-electrification.

2.2. Improve Planning and Oversight of BEV Charging and FCV Fueling Infrastructure

In addition to the targets and assessment described in section 2.1, the envisioned deployment of adequate charging and fueling infrastructure would be well-served by creating a state-level planning and development entity. By providing needed accountability and communication, this entity would help ensure the equitable, efficient, coordinated and timely implementation of capital projects needed to deploy BEV charging and FCV fueling infrastructure at a rapid pace. The entity should lead efforts to conduct statewide needs assessments (section 2.1) and work with state agencies and the Legislature to cover infrastructure gaps that other public entities and the private sector may not address.

The planning entity should clearly identify roles and responsibilities for stakeholders and jurisdictions involved in infrastructure planning and development, including public and private utilities, RTPOs and MPOs, local and tribal governments, public and private vehicle fleet owners, equity advisors, frontline community groups and others. Planning and development criteria should prioritize projects in communities underserved by existing infrastructure and reduce air pollution in highly impacted populations, especially around ports and distribution centers identified through a cumulative impacts analysis tool.

The private sector can drive some of the investment needed to serve growing BEV and FCV infrastructure demand.[81] Typically, however, private providers target electric vehicle supply equipment (EVSE) investments only in more lucrative areas. Direct public funding may be needed for major capital projects, especially those involving large capacity installations serving ports, fleets, rail, on-road freight and aviation. Public support may also be needed to support EVSE investment in areas underserved by private actors across the state. The state's electric utilities should also be encouraged to make investments in EVSE that in the near term would not be supported by private investment.

Rapid adoption of electric vehicles will require widespread access to charging equipment. Ensuring adequate capacity and infrastructure to incorporate EVSE in new buildings and in building retrofits is essential for expanding access and making EVs a desirable option for businesses and households.

ACTIONS

- The Legislature should establish a permanent BEV charging and FCV fueling infrastructure planning and development entity responsible for setting near- and long-term priorities, coordinating among different stakeholders and jurisdictions, and helping to secure funding.
- To enable widespread access to EV-charging equipment, the Legislature should establish — and promote enforcement of — building codes that require installation of conduit, wiring and panel capacity needed to support EVSE in new and retrofitted buildings, including commercial buildings, office buildings and multi-family dwelling units. (See Chapter D – Decarbonizing the Built Environment.)
- The Legislature, in consultation with state agencies, local governments and transit agencies, should identify major BEV charging and FCV fueling infrastructure projects with significant public benefit and provide these with direct public investment.
- The Legislature and state agencies should directly support, and further enable electric utilities to support, EVSE in underserved urban and rural communities.

Planning and development criteria should prioritize projects in communities underserved by existing infrastructure and reduce air pollution in highly impacted populations.

[81] Conner Smith, "Investment in Public EV Charging in the United States" (Atlas Public Policy, Alliance for Transportation Electrification, n.d.), https://www.atlasevhub.com/wp-content/uploads/2020/02/Investment-in-Public-EV-Charging-in-the-United-States.pdf.

2.3. Accelerate the Market for BEVs and FCVs

The market for BEVs and FCVs is developing quickly, particularly for passenger vehicles. Still, the pace of adoption will need to accelerate to meet greenhouse gas reduction limits. A range of parallel and complementary actions will push the market further and ensure equitable and affordable access.

An opportunity for immediate progress is converting public and private vehicle fleets to BEVs and FCVs. Fleet owners can achieve economies of scale when purchasing new BEVs and FCVs, helping to drive greater market demand and potentially lowering costs across the market. The same dynamic can work for infrastructure to support BEV charging and FCV fueling.

EVs offer significant operational savings over internal combustion engine vehicles, but the initial purchase price can be prohibitive for many buyers. To accelerate market penetration of EVs, Washington should continue to provide and expand financial incentives. In doing this, policy makers should ensure equitable outcomes by prioritizing residents who cannot afford to purchase or finance a new car.

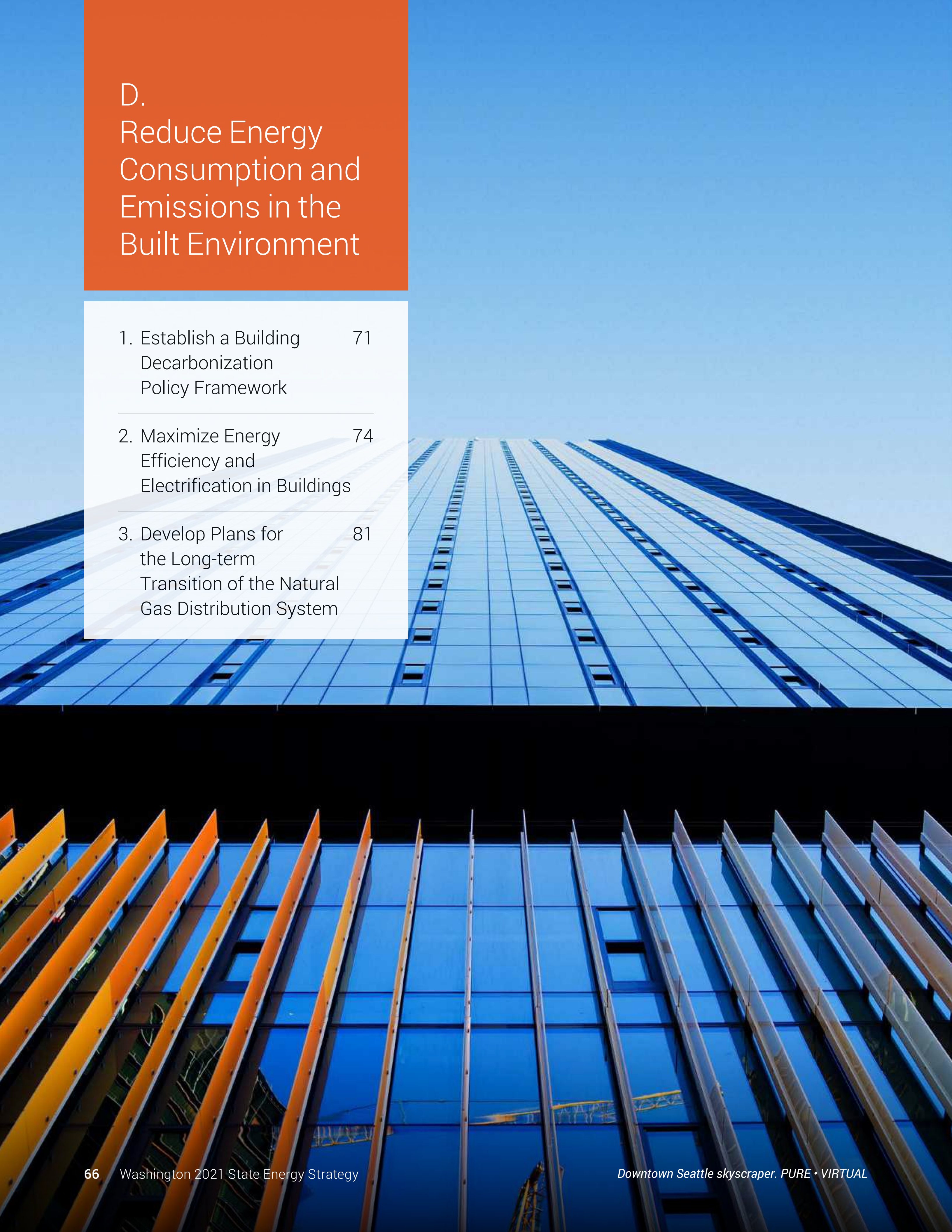
Rapidly accelerating EV adoption in the near-term will require acquainting as many consumers as possible with the features and advantages of EVs. At the same time policies must address potential concerns such as "range anxiety" issues related to maximum travel distance and availability of charging and fueling options. State-supported education and outreach efforts could help achieve these aims. As with rebate programs, the state's electric utilities should be enlisted in these efforts.

ACTIONS

- The Department of Enterprise Services, with support from the Legislature and other state agencies, should continue efforts to convert state-owned vehicle fleets to EVs and expand the current goal beyond 50% of new state passenger vehicle purchases.
- The Legislature should pursue accelerative policies, including financial incentives, loan programs, fleet targets and outreach campaigns for public and private fleets. Priority for assistance should be given to vehicle owner/operators. (See Appendix C for detailed fleet conversion recommendations.)
- The Legislature should enhance existing and restore expired electric vehicle and low carbon fuel incentives and reduce disincentives. (See Appendix C for expanded discussion of these incentives and disincentives.)
- The Legislature should provide resources for robust, comprehensive and accessible EV outreach and education. (See Appendix C for expanded discussion of outreach and education opportunities.)

EV charging. Ziga Plahutar/iStock

D. Reduce Energy Consumption and Emissions in the Built Environment



Downtown Seattle skyscraper. PURE • VIRTUAL

D. Reduce Energy Consumption and Emissions in the Built Environment

Buildings represent approximately one-fifth of Washington's greenhouse gas emissions. This includes emissions related to electric generation. The greatest portion of the sector's emissions come from the direct combustion of natural gas and other fossil fuels in buildings for space heating, water heating and cooking.

The deep decarbonization modeling analysis described in Chapter B-Achieve the State's Greenhouse Gas Emission Limits identified a combination of energy efficiency and electrification as the least-cost strategy to meet the state's greenhouse gas emissions limits for buildings. Consistent with this finding, this chapter recommends policies and actions required to implement an electrification strategy in Washington buildings.

Rooftop gardens in Seattle, WA. Danita Delimont/Alamy Stock Photo

A buildings electrification strategy presents a suite of opportunities and challenges. Increasing the adoption of energy efficiency and converting space and water heating to high efficiency heat pumps[82] requires refocusing energy efficiency policies to carbon reduction policies. Market transformation efforts will be required to prepare contractor infrastructure, pilot innovations and drive consumer acceptance. Capital investments must be made with full consideration of equity and distributional cost impacts. Building upgrades will need to be scheduled to avoid housing or business disruptions.

The buildings sector relies on and creates opportunities to support policies from other sections of the state energy strategy. Decarbonizing buildings depends on the electricity sector to provide clean electricity, requires the industrial sector to provide low-carbon building materials and refrigerants and supports deploying distributed energy resources, including renewables and load control services, such as solar and battery storage systems. Buildings will also serve as a distribution hub for electric vehicle charging.

Decarbonizing the building sector requires the state to:

- Maximize energy efficiency
- Maximize electrification
- Optimize buildings as grid resources
- Minimize embodied carbon and refrigerant emissions

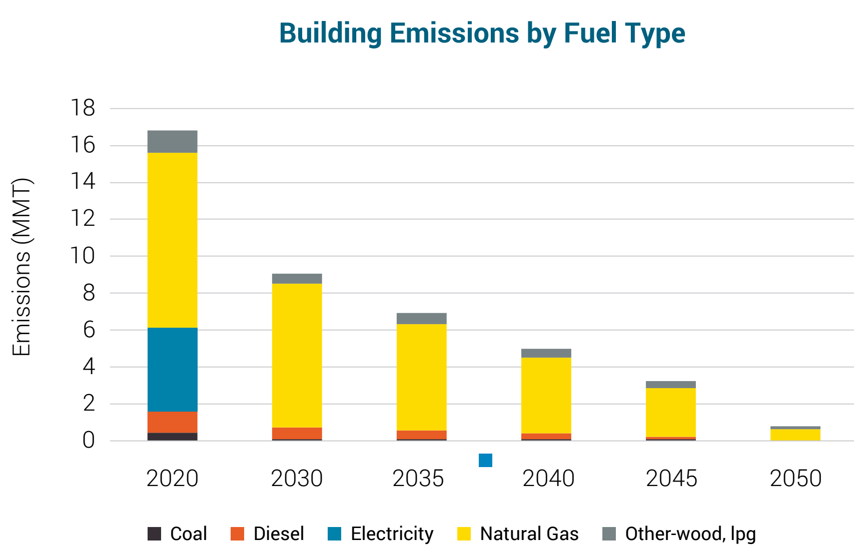
[82] A description of the wide range of heat pump and chiller applications for buildings and district heating systems is included in Appendix D – Heat Pumps.

Construction workers. Cineberg/iStock

The following three figures illustrate the challenge and pace of implementing the Electrification Scenario in buildings. Currently, electricity contributes 27% of building energy greenhouse gas emissions, natural gas contributes 56% and a combination of diesel oil, propane and other fuels contribute the remaining 17%. Implementing CETA will reduce emissions from electricity generation to carbon neutral by 2030. To meet the state's greenhouse gas reduction limits, emissions from gas in buildings must decline 14% by 2030 and continue to decline at an increasing rate through 2050 (Figure 18).

To meet the 2030 limits, high-efficiency electric strategies will need be implemented at every available opportunity. Ideally, this would mean every time fossil fuel or electric resistance equipment is scheduled for renewal, it would be replaced with high-efficiency electric equipment. All new construction would need to be designed and constructed to meet low-energy, zero-carbon standards.

FIGURE 18. ELECTRIFICATION SCENARIO: BUILDING SECTOR EMISSIONS BY FUEL TYPE



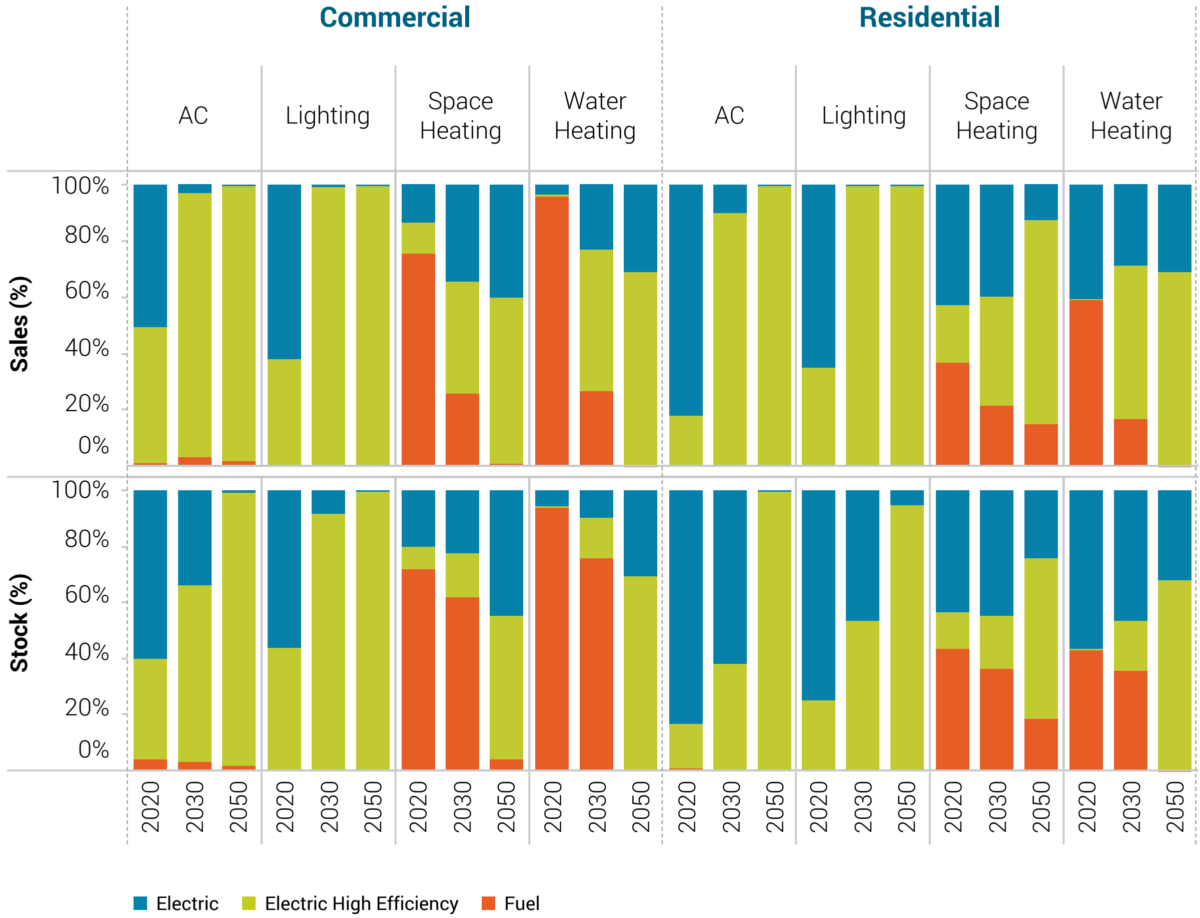
Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020.

Buildings represent approximately one-fifth of Washington's greenhouse gas emissions with the greatest proportion coming from direct combustion of natural gas and other fossil fuels in buildings for space heating, water heating and cooking.

Attic insulation with Weather Assistance Program. Department of Commerce

Figure 19 demonstrates how the shift in equipment sales in the Electrification Scenario drives energy and emission reductions in the decarbonization modeling described in Chapter B.

FIGURE 19. BUILDING EQUIPMENT SALES AND STOCK SHARES DRIVING ENERGY AND EMISSIONS REDUCTIONS IN THE ELECTRIFICATION SCENARIO



Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020.

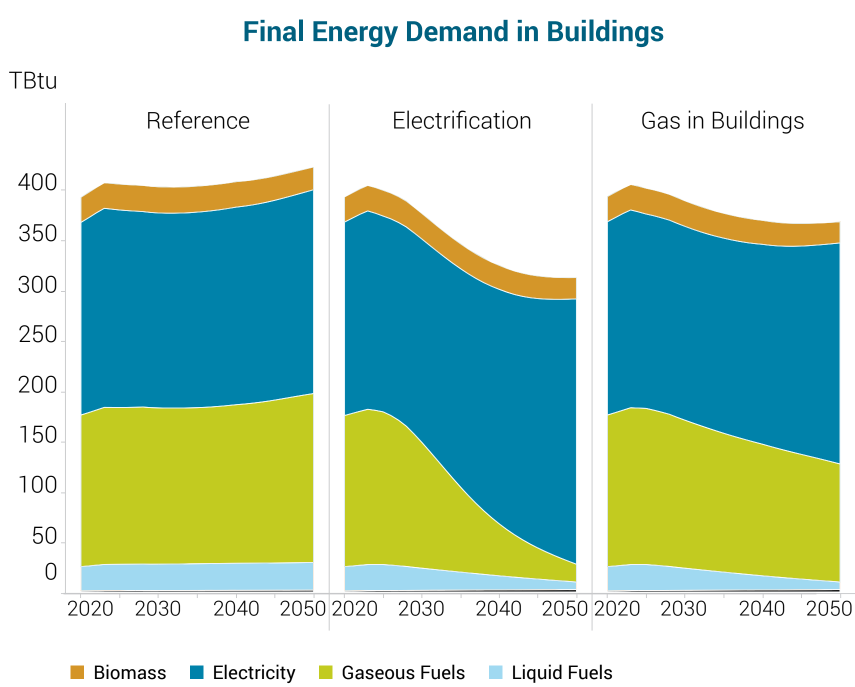
In Figure 20, the Electrification Scenario results in the building sector reducing all energy loads by 26% in 2050 with energy efficiency actions. This will be a combination of building improvements and conversion of existing electric resistance space and water heating to heat pump technologies. The loads currently served by fossil fuels must be converted to high efficiency electricity. This results in an increase in electricity requirements of 30% compared to the Reference Scenario.

In addition to energy use, buildings contribute to greenhouse gas emissions through the manufacturing of construction materials and carbon embedded in refrigerants used in heat pumps and cooling systems.

Embodied carbon — carbon emissions attributed to construction materials — accounts for 11% of annual global emissions.[83] Furthermore, Hydrofluorocarbon (HFC) refrigerants are a very potent greenhouse gas. Building policies and programs must drive demand for lower carbon building materials and encourage the transition to less harmful refrigerants.

> A building decarbonization policy framework must be fast-tracked to meet the 2030 greenhouse gas emissions limits.

FIGURE 20. SCALE AND PACE OF ENERGY USE REDUCTIONS REQUIRED TO MEET ECONOMY-WIDE EMISSIONS LIMITS



Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020.

[83] "Why the Building Sector?" (Architecture 2030, n.d.), https://architecture2030.org/buildings_problem_why/.

1. Establish a Building Decarbonization Policy Framework

Washington's building policies need to directly address the state's greenhouse gas emissions limits. Over the last 40 years, Northwest states and utilities have developed a robust regional power and energy efficiency planning and delivery system. However, this system does not address greenhouse gas emissions directly. The central elements of a building decarbonization policy framework must be fast-tracked to meet the 2030 greenhouse gas emissions limits. At the same time, institutional and market capacity development is needed to meet the 2050 limits.

Building up manufacturing and retrofitting capacity to transform the building stock is a significant task requiring market predictability and longer lead times. It is critical that the state adopts the basic structure of the building sector transition now, so policies, codes and standards can be put in place on a timeline that provides predictability in the form of clear signals that building owners and market forces can respond to.

The state needs a new policy framework harmonizing and delivering deep energy and greenhouse gas savings. Optimizing energy use, rather than just reducing it, will decarbonize the building sector. This means switching away from programs based solely on reducing energy use to programs that value outcomes based on energy utilization and greenhouse gas emissions limits. There needs to be a shift to standardized performance-based metrics and labeling across all policies and programs.

The transition to a more efficient, decarbonized building stock will succeed only if all Washingtonians have a stake in its success and the transition benefits all Washington communities. Energy efficiency programs have focused primarily on reducing energy use or costs, while in many cases ignoring the co-benefits of improved resiliency, public health and climate adaptability. Building electrification and energy efficiency policies and programs should enable equitable outcomes for low-income communities, including improvements in public health outcomes, increases in energy affordability and making homes more comfortable.

1.1. Expand Building Decarbonization Leadership Capacity

State government will need to increase its role in energy planning, energy code development and program implementation for the state to meet its greenhouse gas reduction limits in the building sector. Much of the leadership, research, analysis and planning for the current Northwest energy efficiency industry is conducted at the regional level as part of the power planning process required by the 1980 Northwest Power Act.[84]

Energy efficiency in buildings is evaluated as a least-cost resource rather than a decarbonization imperative that must be accelerated. Washington state government will need to build off of the infrastructure currently supporting efficiency and provide the resources and policies necessary to support decarbonization efforts in the building sector.

ACTIONS

- Expand and clarify the roles and responsibilities for the state energy office and other state agencies to provide analytical and planning capabilities that directly support building decarbonization.
- Work with regional organizations to align energy efficiency research, planning and market transformation efforts. Create situational awareness with data resources supporting policy development and implementation plans.
- The state should strategically amplify, fund and align with efforts of existing organizations and alliances, including workforce development and community organizations, ensuring the availability of necessary financial, technical and human resources.

[84] "Northwest Power Act" (Northwest Power and Conservation Council, n.d.), https://www.nwcouncil.org/reports/columbia-river-history/northwestpoweract.

1.2. Develop a Detailed Washington Building Decarbonization Plan

This state energy strategy lays out a high-level roadmap and set of policy recommendations for the building sector. The state needs to further develop a more detailed building decarbonization plan. California's Assembly Bill 3232[85] requires the California Energy Commission to develop a detailed plan to reduce building sector emissions by 50% by 2030. The California plan must include detailed building characterization, segmentation, technical and fiscal analysis and set emissions reduction targets.

Washington needs to develop a comparable plan with the expectation that it will be reviewed periodically to assure continued effectiveness. A wide-ranging group of stakeholders will need to be brought into the effort to assure success. Planning should uniquely address the challenges that the clean energy transition poses for single and multi-family residences, various sizes of commercial buildings, campus or district configurations, private and public owners, rural and urban locations, highly impacted populations and low-income communities.

Washington's building decarbonization strategy must couple non-energy policy with energy policy, such as energy efficiency mandates that protect against increases in rent leading to displacement, and support for workforce development efforts to ensure equitable access to career-track jobs in and beyond building decarbonization.

ACTIONS

- Develop a state decarbonization plan for buildings covering each part of the buildings sector in every region of the state.
- Within the plan, establish clear energy utilization targets and greenhouse gas emissions limits for buildings by type, including interim and final targets. Include methods for incorporating campus or district thermal distribution systems. Use these targets to guide adoption of mandatory energy codes, building performance standards and utility program designs.
- Develop an electrification and heat pump program to electrify the building sector using the least cost and

[85] "Zero-Emissions Buildings and Sources of Heat Energy," Pub. L. No. AB-3232 (2018), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3232.Zero-emissions buildings and sources of heat energy (Chapter 373). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3232.

Houseboat with solar on Lake Union, Seattle, WA. PhilAugustavo/iStock most strategic approach, while addressing equity, consumer access and market capacity considerations.

- Develop market transformation roadmaps to identify the interventions required in technology, supply chain delivery, contractor education and consumer marketing.
- Explore increasing consumer and business financing options. For example, develop residential PACE financing programs similar to the recently adopted CPACER option.[86] Consider on-bill financing administered by utilities or other mechanisms.
- The plan should be developed with an inclusive public process addressing specific needs of communities, with focus on equity and inclusion.
- The plan should be developed in consultation with industry professionals to assure plans address technical, design and construction applicability specific to building end uses.

1.3. Align Utility Ratepayer Programs around Decarbonization Performance Outcomes

Utilities will play a significant role in taking building decarbonization to scale. Utilities work within an existing energy and conservation planning framework and have programmatic mechanisms for reducing energy use. By virtue of their customer base, they have direct relationships with every residential and commercial building owner in the state.

Energy conservation potential is developed in the context of each utility resource plan. Conservation is chosen when it provides the least-cost resource. The social cost of carbon has recently been added as a consideration during this planning, increasing the value of conservation compared with alternate approaches, which can result in continued greenhouse gas emissions.

The existing framework may lead to increased utility participation in conservation acquisition, although these impacts will not be uniform across all utility service territories or across all buildings in the state. Utility planning and efficiency efforts also need to be structured to achieve building performance energy utilization targets and greenhouse gas emissions limits.

ACTIONS

- Structure performance-based mandates as the critical path for each building segment to meet the state's low-energy and zero-carbon building targets. Utility programs and market transformation efforts should then be required to directly align with and support the success of the mandates in drawing down energy use and emissions.
- Adopt policies and programs for determining baselines, attribution, energy and greenhouse gas emission reductions and the determination of least-cost approaches.
- Develop structures that assure funding allocations respond to the needs of low-income and other vulnerable customers.
- Identify utility regulation or utility performance incentives required to assure outcomes.

1.4. Accelerate Adoption of Low Greenhouse Gas Emissions Refrigerants and Equipment

In addition to energy use, buildings contribute to greenhouse gas emissions through the manufacturing of construction materials as well as refrigerants used in heat pumps and cooling systems. Manufacturing techniques have been developed to control or reduce these emissions. Businesses can now manufacture concrete with reduced environmental impacts. Cross-laminated timber provides a zero-carbon wood product that can be used in building construction. Regulations to control and eventually eliminate HFCs are being developed and implemented.[87] Meanwhile, a global initiative to reduce the impacts of refrigerants has been adopted under the Montreal Protocol,[88] which continues to spur chemical and equipment manufacturers to develop products that use less harmful constituents.

[86] "Concerning Commercial Property Assessed Clean Energy and Resilience.," Pub. L. No. HB 2405 (2020), https://app.leg.wa.gov/billsummary?BillNumber=2405&Year=2019.

[87] Chapter 173-443 WAC.

[88] "About Montreal Protocol," UN Environment Programme, n.d., https://www.unenvironment.org/ozonaction/who-we-are/about-montreal-protocol.

Washington adopted regulations to reduce the impacts of refrigeration chemicals through HB 1112 (2019).[89] The statute requires less damaging HFCs, or suitable substitutes to be used in various equipment applications, and implements refrigerant management processes. Relatedly, the Washington State Building Code Council has voted to adopt a reference standard that will allow the use of A2L refrigerants in refrigeration and air-conditioning including the use in occupied dwellings.[90] The scope of these efforts is limited but encouraging. As new equipment is developed and made available, Washington's laws and rules will need to take advantage of new opportunities while continuing to manage refrigeration systems.

ACTIONS

- The State Building Code Council should adopt the most recent editions of national equipment standards allowing installation of low emissions refrigerants in buildings.
- The State Energy Office should incorporate low emissions refrigeration opportunities as they become available as part of market transformation efforts.
- The State Board of Community and Technical Colleges should incorporate application of state regulations for refrigerant management in industry-related coursework. The board should support training programs related to new equipment as they become available. Capacity building and training for minority- and women-owned construction businesses and contractors should be prioritized for development.

> Washington's energy code and performance standards should be revised or adopted to incorporate the state's greenhouse gas emissions limits.

2. Maximize Energy Efficiency and Electrification in Buildings

Washington's core strategy for meeting its greenhouse gas limits must focus on retiring and replacing equipment in buildings with high-efficiency electric systems and achieving deep energy efficiency savings to reduce electric loads. The existing utility programs, energy code and building energy performance standards provide a good foundation for this transition. However, these policies and programs cannot deliver the increased sales share of high-efficiency technologies and electrification needed to meet the 2030 and 2050 greenhouse gas emissions reduction limits.

To meet these limits, Washington will need a comprehensive suite of revamped and new policies that put the building sector on a path to meet the 2030 and 2050 limits. Consideration should be given to the challenges posed for single-family, multifamily, various sizes of commercial buildings, campus or district, private and public ownership, rural and urban locations and highly impacted populations. To increase the resiliency of the building stock for occupants, energy policy must be coupled with affordable housing, public health and anti-displacement policies.

This strategy flows from the proposed building decarbonization policy framework described above. It is designed to reduce the risk of locking in carbon-emitting technologies and practices that will hold back Washington's ability to meet greenhouse gas limits. The strategy includes the following components to support the development of a robust policy and market for each building type and size: performance disclosure, mandates, complementary utility programs, accelerated market transformation and financing.

Energy efficiency and electrification programs need to be focused on metrics, such as public health outcomes to track progress toward increasing equitable outcomes, as there is a known gap in the data available regarding the efficacy of building electrification efforts for low-income communities.

[89] "Hydrofluorocarbon Greenhouse Gas Emissions," Pub. L. No. House Bill 1112 (2019), http://lawfilesext.leg.wa.gov/biennium/2019-20/Pdf/Bills/Session%20Laws/House/1112-S2.SL.pdf?q=20201129212221.

[90] Alex Ayers, "WA Code Council Paves the Way for Use of A2L Refrigerants," November 13, 2019, https://blog.hardinet.org/wa-code-council-refrigerants.

2.1. Strengthen and Expand Energy Codes and Standards

Washington's energy code and performance standards should be revised or adopted to incorporate the state's greenhouse gas emissions limits. The Washington State Energy Code[91] regulates the construction of new residential and nonresidential buildings, additions and major renovations and establishes equipment replacement efficiency criteria.

The state building energy performance standard[92] (BPS) implements a strategic energy management program to improve the energy performance of existing nonresidential buildings greater than 50,000 square feet in floor area. Both the energy code and the BPS are structured primarily as energy efficiency standards rather than as explicit carbon emissions standards. Washington has not adopted a residential building performance standard.

Codes are an important element of providing broad benefits to all housing types and are the least-cost approach to implementing energy efficiency and carbon reduction in buildings. Codes and standards will also be important elements of deploying EV charging infrastructure and distributed energy resources (DER) technologies. The state building code already includes requirements to develop EV charging infrastructure, including in apartments[93] and incentives for renewable energy generation. But other DER features, such as load control, are not similarly incentivized.

ACTIONS

- The Legislature should revise the energy code to require the state Building Code Council to adopt zero-carbon and all-electric construction and efficiency mandates no later than the 2027 code, fully achieving incremental improvements each code cycle from 2021 to 2027. Funding for technical development, code implementation and evaluation of progress should be provided.
- Consider additional energy code provisions to expand deployment of DER technologies, such as on-site generation and utility-integrated load control.

Zero-net energy townhomes in Issaquah, WA. Chuck Murray

- Continue to evaluate the role of net zero energy buildings[94] as a resource in the context of building and DER policies.
- Continue to evaluate the implementation of standards that lead to increased use of building materials with low embodied carbon emissions.
- Expand the scope of the BPS to include buildings with less than 50,000 square feet with a stepped path to low energy and zero carbon by 2050. Modify the BPS with provisions specific to smaller buildings.
- Adopt a mandatory residential performance standard to scale up the residential retrofit market. Include comprehensive equity and workforce provisions for both rental and owner-occupied homes and identify the unique opportunities and challenges faced by all residential segments including single family, multifamily and manufactured housing.
- Dissemination of information should be operationalized at the state level through training programs.

[91] Chapter 19.27a.020 RCW.
[92] Chapter 19.27a.210 RCW.
[93] Chapter 51-50-0427 WAC, Section 429.
[94] Net zero energy buildings use very little energy and include renewable onsite generation resulting in annual net zero energy consumption on site.

Technician measuring air conditioning equipment.

- To ensure affordable housing units in Washington are able to comply with the building performance disclosure policies, there should be flexibility in compliance timelines and targeted education and training programs in multiple languages.
- Capacity building and training for minority- and women-owned construction businesses and contractors should be prioritized during policy development. Design training programs for energy audits with incentives or requirements to hire from low-income and frontline communities.
- Customize performance standards for affordable housing and rent-stabilized units to reduce displacement and enable streamlined compliance. Integrate benchmarking requirements into qualified allocation plans (QAPs) that determine low-income housing tax credit (LIHTC) allocations.[95]
- Ensure inclusion of local and Tribal government representatives during the process of developing the energy code and building performance standards framework and strategy.

2.2. Lead by Example with Public Capital Projects and Energy Management

The state capital budget provides funding for new construction, major renovations and minor works projects in the public sector. This includes projects for state, local and Tribal government, higher education and K-12 schools, low-income housing and nonprofit institutions. Given their long service life, the allocation of capital funds for these public projects should include requirements for planning, construction and operation consistent with achieving the state's greenhouse gas emissions limits and build on existing efforts to lead by example.

Participation of multiple state agencies and coordination with local governments would support the transition. The State Efficiency and Environmental Performance (SEEP) Office[96] coordinates with partners across the state government to reduce greenhouse gas emissions, reduce energy costs and eliminate solid waste and toxic materials from state agency operations. The Energy Savings Performance Contracting program at the Department of Enterprise Services and financing provided by the State Treasurer's Office support state and local government efficiency programs. The Housing Trust Fund and Office of Superintendent of Public Instruction (OSPI) manage allocations to low-income housing and K-12 education.

ACTIONS

- Update Office of Financial Management requirements for capital budget requests to include electrification in all applicable projects.
- Require all new public buildings funded by the capital budget to be all-electric and zero-carbon.
- Require existing public buildings to minimize building energy loads and convert carbon-based fuel systems to all electric high-efficiency systems.
- Require implementation of standards that lead to increased use of building materials with low embodied carbon emissions.

[95] Andrea Krukowski and Andrew Burr, "Energy Transparency in the Multifamily Housing Sector: Assessing Benchmarking and Disclosure Policy" (Institute for Market Transformation, 2012).
[96] SEEP was initiated by EO 20-01. For program details see: https://www.commerce.wa.gov/growing-the-economy/energy/state-efficiency-and-environmental-performance-seep/.

- Transition campus district heating and cooling systems to zero-carbon by reducing total heating demand, reducing or eliminating peak demands, converting district steam to hot water or electrifying central heating systems.
- Implement robust energy management and operations and maintenance programs for each public building or site consistent with the state BPS and to work towards low or zero greenhouse gas emissions.
- Prioritize decarbonization of public buildings in low-income communities, specifically public schools and hospitals.
- Ensure funding is available for building efficiency projects in all communities.
- Continue to coordinate state efforts through SEEP and consider additional support to align all projects funded through the state capital budget with the state's greenhouse gas emissions limits.
- Ensure decarbonization for rural public buildings through funding allocations.

2.3. Align Utility Programs with State Mandates

This strategy would expand the share of Washington's building stock covered by state mandates before 2030. State mandates consist of the energy code and the BPS, including performance disclosure requirements. The mandates will be structured to progressively reduce energy use and carbon in buildings with the ultimate goal of low-energy, zero-carbon buildings by 2050.

Utility programs and regulation must be similarly structured to reduce energy and emissions consistent with meeting the 2030 and subsequent greenhouse gas emissions limits. The energy code should be strengthened to hit low-energy zero-carbon. This must be done in the three remaining three-year code cycles (2021, 2024 and 2027).

Utilities and the Northwest Energy Efficiency Alliance have been key partners in encouraging technology development and adoption to improve energy efficiency. Strategic energy management has also been deployed. These strategies are structured to achieve incremental savings compared to the code or existing building baseline. Utilities can continue to drive and accelerate achieving building-specific energy and greenhouse gas emission limits to be developed further during the detailed energy planning described above in section 1.2.

ACTIONS

- Utility building efficiency programs should be designed to achieve energy utilization and greenhouse gas emission limits as is already recognized in utility conservation potential assessments and conservation program implementation plans.
- The Utilities and Transportation Commission (UTC), State Energy Office and interested participants should develop targets and processes to support utility efforts, including revisions of utility conservation planning and cost recovery mechanisms.

2.4. Create and Fund a High Efficiency Electrification Program

To reach building electrification targets, an electrification program should be developed and implemented. The program should provide funding generated from all building energy end uses, including electric, gas and liquid petroleum through a public benefits charge, carbon fee or economy-wide cap and trade program. Funds would be allocated to end-use customers who install high-efficiency heat pumps for space and water heating, convert gas cooking to electric cooking and/or choose other identified electrification opportunities.

Current utility efficiency programs are often siloed by fuel source and may be constrained by regulations that limit funding cross-sector fuel conversions. Liquid petroleum and transportation-only electric and gas customers fall outside of the scope of utility efficiency programs. A crosscutting electrification program would overcome these constraints and could be operated as an independent customer distribution plan, or through existing utility programs.

The program should include mechanisms to ensure participation by low-income households, based on input from organizations that represent their interests and communities. Implementation should involve utilities, market transformation experts and heating, ventilation and air conditioning (HVAC) professionals.

A program that implements high-efficiency electric space and water heating will impact most building energy customers in the state, given that the majority of electric heating still uses electric resistance heating equipment. Gas and oil heating and hot water systems will need to be replaced by heat pumps.

ACTIONS

- The State Energy Office should develop and implement a high-efficiency electrification program to incentivize adoption of heat pump technology in existing residential and nonresidential buildings, including marketing, workforce development and certification and equitable distribution of incentives.
- In anticipation of increased workforce demand, the State Board of Community and Technical Colleges should develop a heat pump training and certification program for contemporary heat pump installation and maintenance. Training will need to be broadly distributed throughout the state and designed to assure opportunities are provided to highly impacted populations.

2.5. Broaden the Scope and Scale of the Low-Income Household Energy Programs

Low-income households bear a disproportionate housing and energy cost burden relative to other households. Existing sources of energy assistance, including both federally-funded and utility-funded assistance, do not adequately address the home energy affordability gap in Washington.

The number of Washington households participating in the state's Weatherization Assistance Program (WAP) each year represents just a fraction of eligible households. According to the 2019 Home Energy Affordability Gap data, there are 749,112 households living at or below the income qualification threshold to receive WAP services.[97] Public funding at existing levels is insufficient to provide the scale and scope of services needed.

Commerce administers the state's WAP services with funding from U.S. Department of Energy's WAP, the U.S. Department of Health and Human Services' Low Income Home Energy Assistance Program (LIHEAP), the Bonneville Power Administration (BPA) and the state-funded Weatherization Plus Health Matchmaker Program. These four funding sources are highly leveraged with utility conservation funds from many, but not all, utilities in the state.

Services provided by WAP, while important to reduce energy burden, are insufficient to address the statewide needs from deferred maintenance in affordable housing stock and the negative health impacts of substandard housing. The program is not currently structured to allow for broad electrification, or to increase access to renewable energy resources that would lower household energy burden and energy inefficiency.[98]

The state has made two important changes to broaden the scope of the weatherization program in recent years. In 2015, House Bill 1720[99] allowed funding to include healthy housing improvements. In 2017, Senate Bill 5647[100] created a home rehabilitation revolving loan program for low-income owner-occupied households in rural communities. There is more work remaining to expand the scope and funding scale for these critical services.

In addition to a lack of access to energy assistance and weatherization programs, low-income and rural communities often lack access to high-quality broadband services, which acts as a barrier to participation in energy efficiency benefits.

[97] "Home Energy Affordability Gap" (Fisher, Sheehan & Colton: Public Finance & General Economics, n.d.), http://www.homeenergyaffordabilitygap.com/03a_affordabilityData.html.

[98] "2019 Biennial Energy Report: Issues, Analysis and Updates" (Washington State Department of Commerce, December 2018), https://www.commerce.wa.gov/wp-content/uploads/2013/01/COMMERCE-Biennial-Energy.pdf.

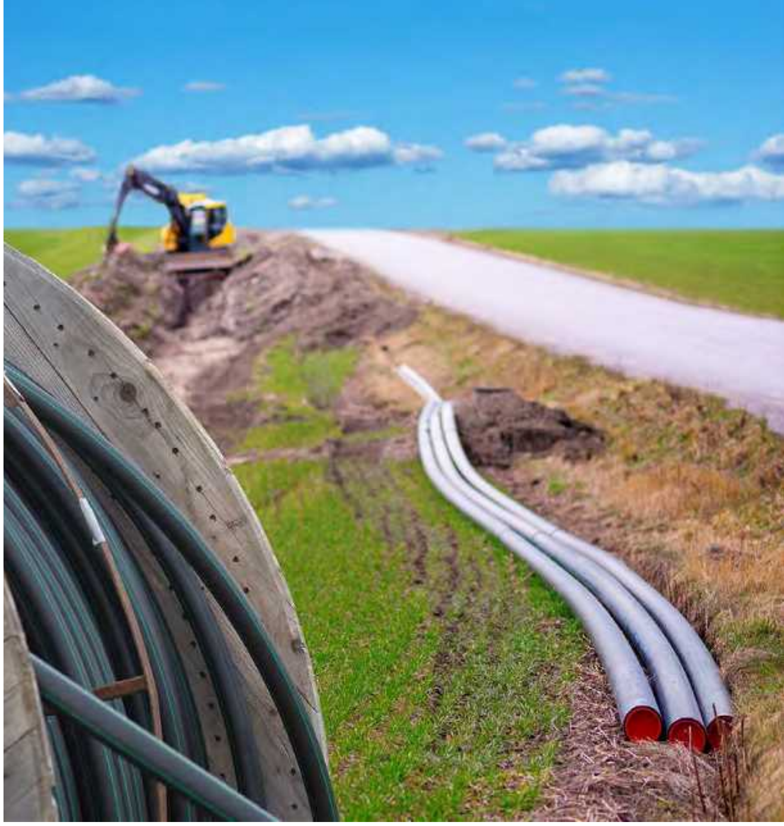
[99] "HB 1720: Concerning Healthy Housing" (2015), https://app.leg.wa.gov/billsummary?year=2015&billnumber=1720&initiative=false.

[100] "SB 5647: Creating a Low-Income Home Rehabilitation Revolving Loan Program" (2017), https://app.leg.wa.gov/billsummary/?BillNumber=5647&Year=2017&Initiative=false.

ACTIONS

- Increase funding for low-income weatherization to address a minimum 10% of eligible households annually and continue decoupling the program's eligibility requirements from federal requirements to increase flexibility, allow for re-weatherization and include households that fall just above the income threshold to receive low-income services.
- Facilitate meaningful participation by highly impacted populations to explore solutions to address historic barriers to accessing the limited resources currently available for weatherization.
- Conduct ongoing engagement with Tribal Governments to explore approaches to systematically expand services to and within Tribal communities. Invest in and leverage workforce capacity within these communities.
- Address the breadth of need for deferred maintenance to make households ready for weatherization by expanding the home rehabilitation revolving loan program statewide and beyond owner-occupied single-family homes. This expansion should include Tribal communities, rental housing and manufactured housing.
- Prioritize services to underserved households within highly impacted populations, including rental housing, multifamily housing, non-electrically heated housing and high-energy burden households.
- Provide innovative financing models that can be used to provide low-income households the access to capital needed to decarbonize their homes.

> Low-income and rural communities lack access to high-quality broadband services, which prevents participation in energy efficiency benefits.



Digging for broadband.

- Expand funding for the state's successful Weatherization Plus Health program as part of a broader strategy to reduce energy burden and improve health outcomes for low-income households impacted by the COVID-19 pandemic.
- The Legislature should provide universal access to high quality broadband to enable grid integration of appliances and equipment, optimizing buildings and managing load.

2.6. Create Market Transformation in Support of Eliminating Greenhouse Gas Emissions

Market transformation is the strategic process of intervening in a market to create lasting change.[101] As shown in the deep decarbonization modeling, meeting 2030 building energy and emissions reductions goals will require a shift to 100% sales of high-efficiency electric equipment by 2030. High-efficiency electric space and water heating equipment currently holds a relativity small share of market sales compared to fossil and electric resistance equipment, which needs to change, as does market adoption of other products and practices that improve the energy efficiency of buildings.

Efforts to increase market penetration include interventions, such as product standards, pilot programs, training for design, sales and installation contractors and incentives for end users. In some cases, market transformation requires earlier interventions that bring new products to the market. Market transformation efforts bring competence, scale and competition to the market, delivering quality services at least cost.

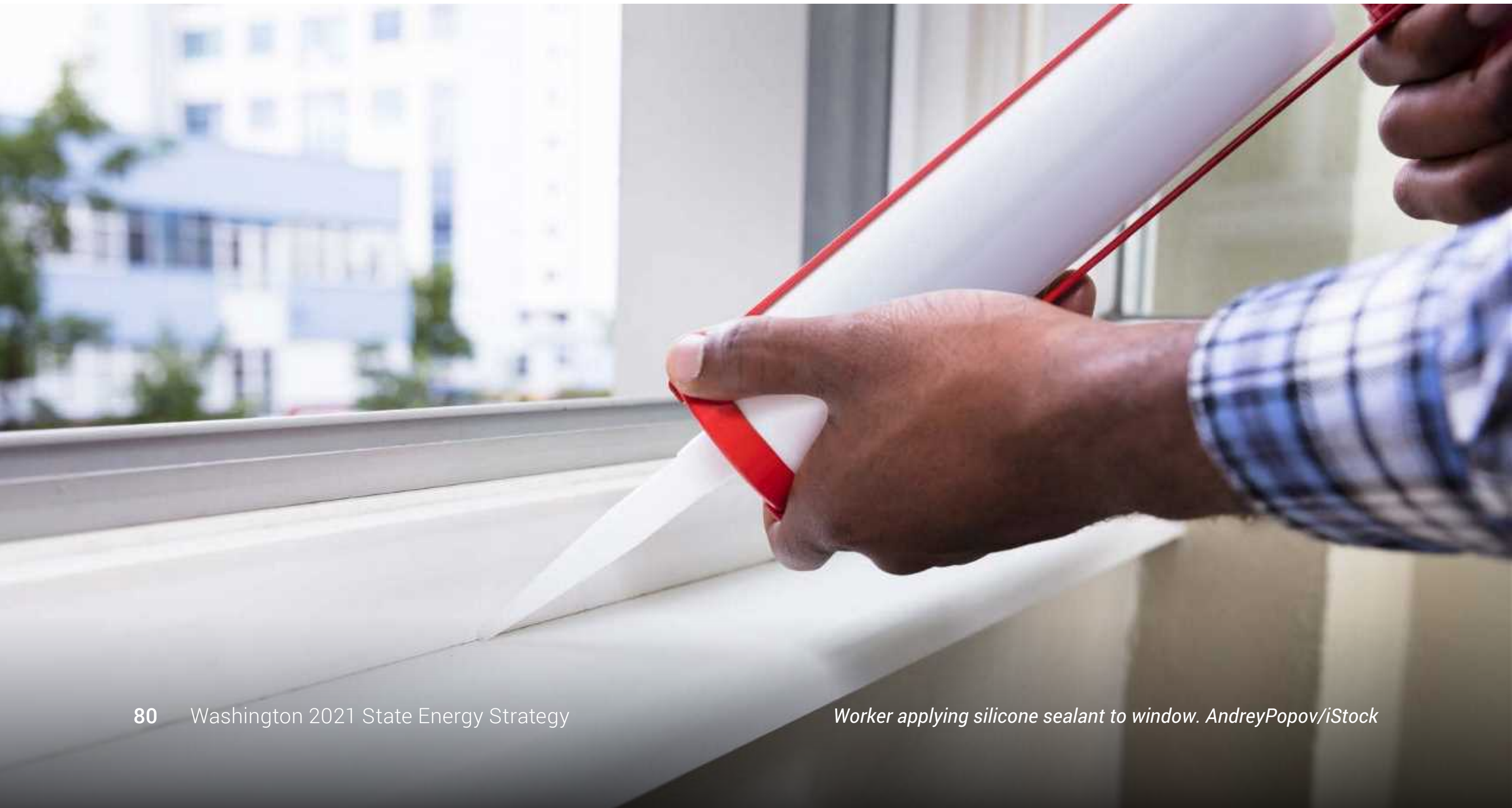
The Northwest Energy Efficiency Alliance, which is funded by the region's gas and electric utilities, has led the energy efficiency market transformation efforts in the region for more than two decades. This organization could be a primary collaborator.

Developing a state market transformation effort is proposed to reflect the electrification outcomes recommended in this strategy. Market transformation must explicitly focus on decarbonization strategies to meet the greenhouse gas emissions limits. The project objective should ensure that each state mandate has a clear and funded market transformation plan for building market capacity and removing technical and financial barriers. In addition, the strategy should identify and create the numerous collaborations required to implement a market transformation effort and a clear funding plan.

ACTIONS

- The state should develop a market transformation team within the State Energy Office. The office will be charged with guiding the collaborations required to implement a market transformation intervention.
- Ensure market transformation programs have carve-outs and direct funding for low- and moderate- income households and Tribal nations.

[101] "NEEA Standard Definitions," NEEA, n.d., https://neea.org/definitions.



Worker applying silicone sealant to window. AndreyPopov/iStock

3. Develop Plans for the Long-term Transition of the Natural Gas Distribution System

Most of the greenhouse gas emissions in residential and commercial buildings are from combustion of natural gas, so emissions reductions in this sector raise important questions about the future of the natural gas distribution system. Fossil natural gas accounts for 80% of the non-electric emissions in the residential and commercial sectors.[102] The uses account for 63% of the non-electric consumption of fossil natural gas.[103]

As Figure 18 illustrates, the mix of energy used in buildings is expected to shift dramatically as the state reduces its greenhouse gas emissions with greater use of clean electricity in place of fossil natural gas. This could result in a substantial change in the role of the natural gas distribution system that currently provides energy to 1.2 million residential and 107,000 commercial customers.[104] Four natural gas distribution utilities deliver fossil natural gas to these customers, who use the fuel for space heating, water heating, cooking and a variety of commercial purposes. Emissions from natural gas used by residential and commercial customers account for 7.2% of the state's total emissions.[105]

The deep decarbonization modeling analysis considered two scenarios for reducing emissions in the buildings sector to meet the state's overall emissions limits. The Electrification Scenario assumes gas-consuming appliances in buildings are replaced with electric equipment as they are retired. The Gas in Buildings Scenario would retain use of pipeline gas to heat air and water in buildings, maintaining use of gas in appliances at the levels they are at today. Both scenarios assume the same levels of appliance efficiency by technology.[106]

To retain use of fossil natural gas and still meet the emissions targets, the Gas in Buildings Scenario makes greater use of synthetic fuels and biofuels in transportation. Starting in 2045, fossil gas is replaced with biogas in the buildings sector. The projected overall cost is higher in the scenario that retains gas pipelines as a means of delivering energy to residential and commercial customers. Under either scenario, the amount of fossil natural gas delivered in 2050 is about 90% lower than in the Reference Scenario.

These two scenarios present a balanced analysis of the options to reduce greenhouse gas emissions from fossil natural gas. The model evaluates alternative solutions using the best available information about costs and technology and it looks at all sectors of the economy together to arrive at an overall result. The results indicate that conversion from fossil natural gas to electricity results in lower costs. The analysis assumes energy efficiency improvements by technology across all scenarios are the same, where newly installed appliances are highly efficient. With these efficiency assumptions, the Gas in Buildings Scenario yields a 45% reduction in gas consumption compared to the Reference Scenario.

These two scenarios are also consistent in their consideration of the cost of investments already made in distribution system infrastructure. These investments are substantial: The four distribution companies have invested $6.2 billion in gas utility infrastructure and the undepreciated portion is $4 billion.[107] The latter amount represents an average investment of about $3,000 per customer. The deep decarbonization analysis does not assume that these costs could be avoided under any scenario. They are sunk costs that exist under every scenario.

The 2021 State Energy Strategy does not call for any specific outcome concerning the long-term use of the existing gas distribution system. It does, however, identify benefits in shifting over time from fossil natural gas

[102] Figure 7, "Washington State Greenhouse Gas Emissions Inventory: 1990-2015" (Washington State Department of Ecology, December 2018), https://fortress.wa.gov/ecy/publications/documents/1802043.pdf.

[103] "Natural Gas Consumption by End Use," U.S. Energy Information Administration, n.d., https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_swa_a.htm.

[104] "Number of Natural Gas Customers," U.S. Energy Information Administration, n.d., https://www.eia.gov/dnav/ng/ng_cons_num_a_EPG0_VN5_Count_a.htm.

[105] Figure 7, "Washington State Greenhouse Gas Emissions Inventory: 1990-2015."

[106] The initial specification of the Gas in Buildings Scenario reflected a lower level of energy efficiency, consistent with historical differences in energy efficiency programs between electric and gas utilities. Electric utilities in Washington achieved efficiency savings, as a percent of delivered energy, five times the rate achieved by natural gas utilities. See tables 7 and 9 in: Weston Berg et al., "The 2019 State Energy Efficiency Scorecard" (American Council for an Energy-Efficient Economy (ACEEE), 2019), https://www.aceee.org/sites/default/files/publications/researchreports/u1908.pdf.

[107] Calculated using reports submitted to the UTC and available at: https://www.utc.wa.gov/regulatedIndustries/utilities/energy/Pages/CompanyAnnualReports.aspx.

to electricity. This approach appears to serve the state's consumers and businesses better than one where non-fossil gas is manufactured and delivered by pipeline to end users. Retaining gas as an energy form requires more overall energy, both the energy used in the gas production process and the energy lost in combustion at the point of use. Delaying the transition from fossil gas also requires greater and more costly emissions reductions in the transportation sector to meet the overall emissions limits.

The near-term actions suggested in this strategy would result in a gradual transition, over two to three decades, from fossil natural gas as a fuel source. The natural gas industry has advocated for an approach closer to the Gas in Buildings Scenario, and there is opportunity in the near term for the industry to pursue actions consistent with its preferred approach:

- Increase energy efficiency to match or exceed the levels assumed in the Gas in Buildings Scenario. This would include both the efficiency of end-use equipment and the efficiency of the building stock.
- Reduce the greenhouse gas content of its product by incorporating hydrogen and renewable natural gas, using the authority provided by the Legislature two years ago.[108]
- Invest in research and development of green hydrogen and other clean fuels, with the aim of improving the financial viability of gas as a non-emitting energy form.
- Proactively support customers converting to zero-emission heating options, such as solar thermal and geothermal.

These actions make sense under either an electrification approach or a long-term approach that uses non-fossil gas, and they would help test the feasibility of decarbonizing pipeline gas as a long-term solution.

In the meantime, the Legislature should consider whether to restrict growth of the natural gas system and the use of fossil natural gas where zero-emission options are available. Residential and commercial natural gas customer growth has slowed in the past decade, but this trend could reverse absent policy action.

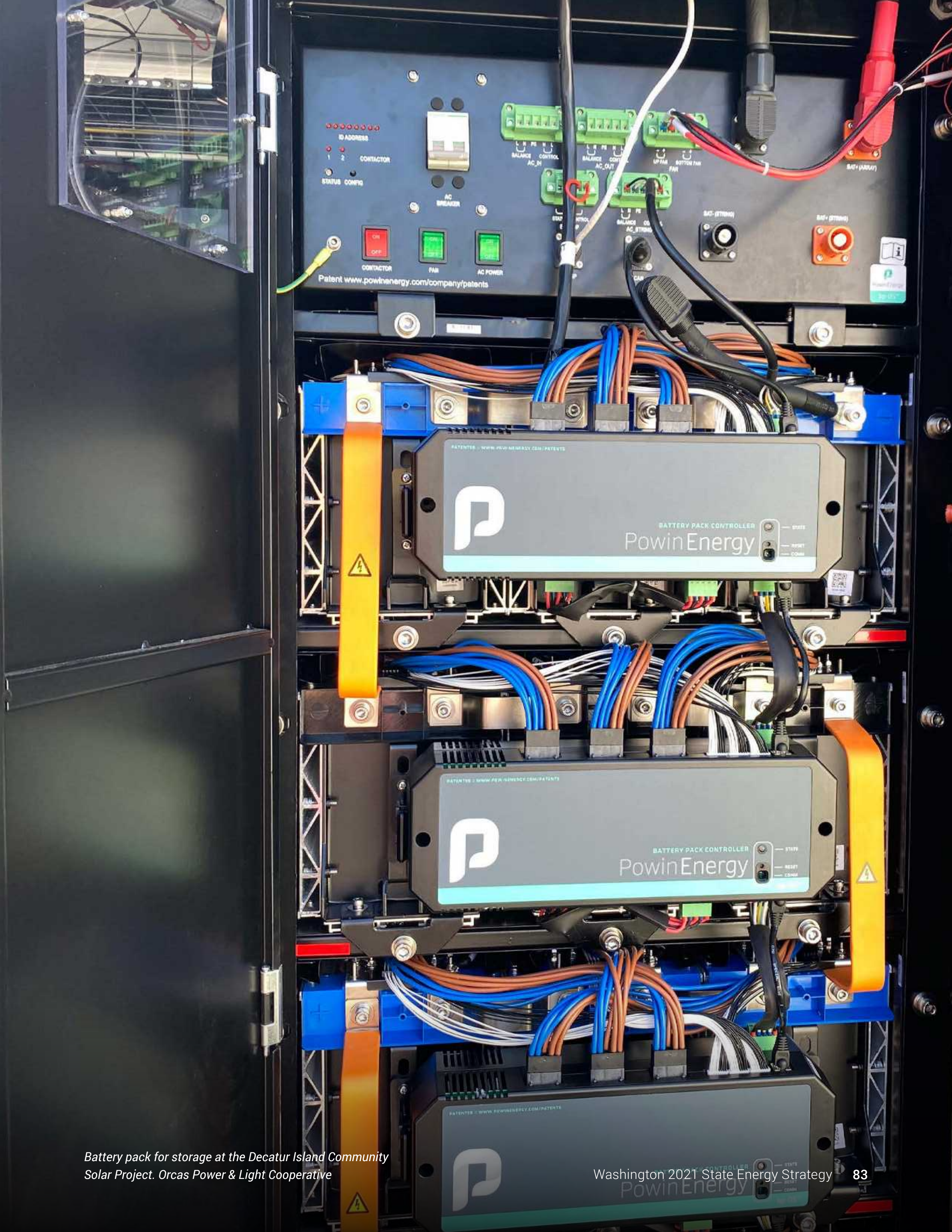
A limit on growth would provide the industry, regulators and customers the time needed to clarify public policy concerning the use of natural gas and develop a long-term transformation approach that is consistent with the state's climate and economic policies. A transition plan could be developed as part of the utility's integrated resource plan and should consider multiple approaches to emissions reduction, including:

- Financing, incentives and other mechanisms to protect members of highly impacted populations.
- Energy efficiency measures evaluated to reflect the cost of non-fossil gas in the future.
- Conversion from gas to electric when equipment is replaced, including geographically targeted conversions.
- Limitations on service area expansion and line extension.
- Rate structures to align customer decisions with expected future costs of pipeline gas.
- Use of hydrogen and renewable natural gas to reduce the greenhouse gas content of the gas product delivered to customers.
- Measures to support gas company workforce transition.
- Accelerated depreciation of gas distribution plants to reduce stranded assets.

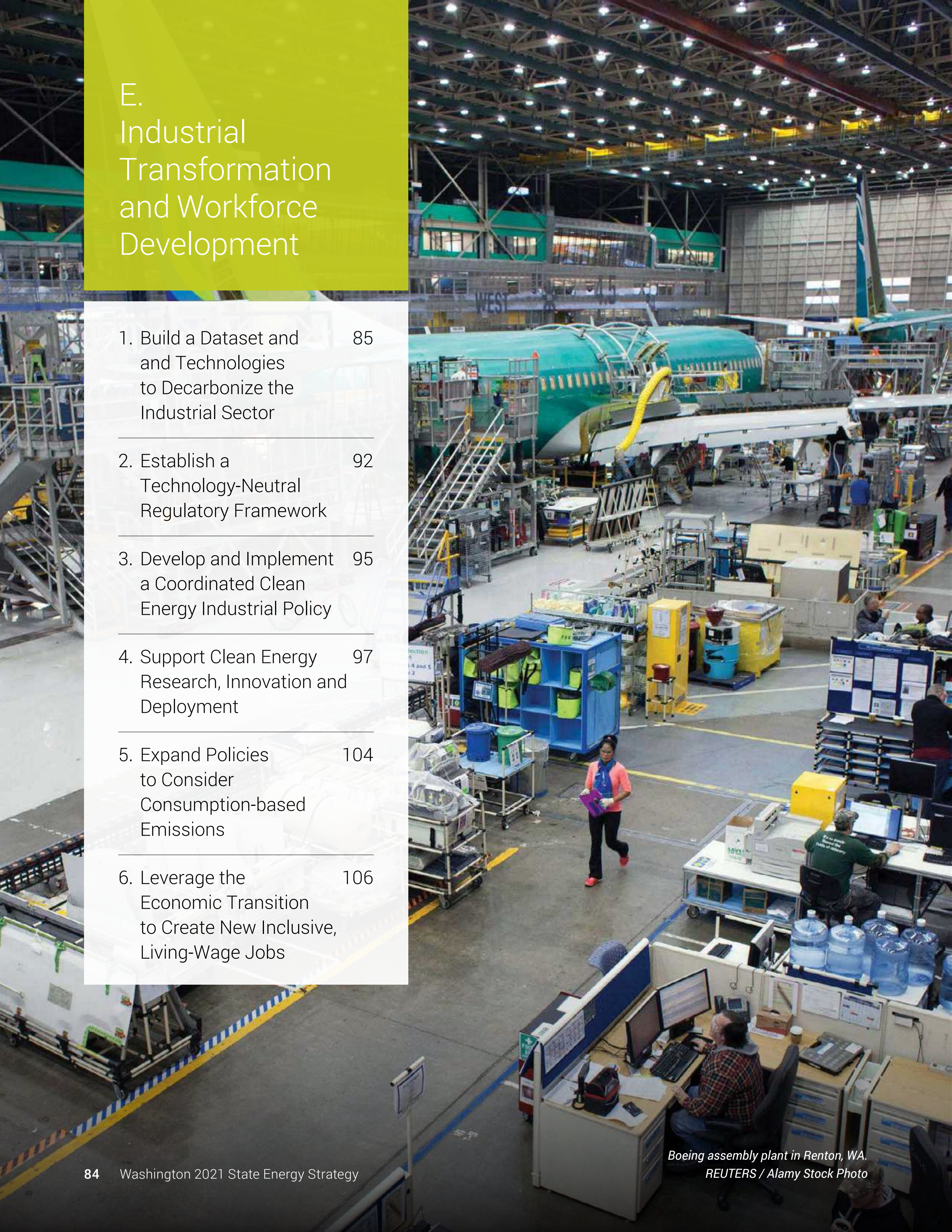
ACTIONS

- Natural gas distribution companies should increase energy efficiency and use of hydrogen and renewable natural gas to achieve near-term reductions in greenhouse gas emissions from fossil natural gas.
- The Legislature and the UTC should ensure that the state's climate policy and emissions limits are reflected in the regulation of natural gas companies and explore legislative and regulatory actions to restrict growth of the natural gas system and the use of fossil natural gas where zero-emission options are available.
- Natural gas distribution companies should work with regulators and stakeholders to develop comprehensive and equitable plans to transition from the use of fossil natural gas.

[108] Chapter 80.28.390 RCW.



Battery pack for storage at the Decatur Island Community Solar Project. Orcas Power & Light Cooperative



E. Industrial Transformation and Workforce Development

Boeing assembly plant in Renton, WA.
REUTERS / Alamy Stock Photo

E. Industrial Transformation and Workforce Development

In pursuing a wholistic approach to industrial decarbonization, Washington can focus on areas in which it enjoys a strong competitive advantage. With low-carbon electricity, a highly skilled workforce and established advanced manufacturing industries, Washington can gain early traction in the global race to reduce the carbon intensity of products and materials.

A successful clean industrial energy policy is one that supports Washington's entire industrial sector and that takes advantage of the state's existing assets and strengths. Industrial transformation requires better information about how industry uses energy, coordination of climate policy with other jurisdictions, more attention to industrial policy and deliberate efforts to develop the skills of the state's workforce.

Energy efficient factory built housing. Chuck Murray

1. Build a Dataset and Technologies to Decarbonize the Industrial Sector

Washington's industrial sector accounts for 28% of the state's retail electricity demand[109] and about 28% of the state's greenhouse gas emissions.[110] The highest energy-consuming industries are:

- Agriculture
- Cement & Glass
- Computing Services
- Food Processing
- Forest Products
- Manufacturing/Aerospace
- Petroleum Refining

Every industrial facility and business has some potential to increase energy efficiency and reduce greenhouse gas emissions.

Industry creates greenhouse gas emissions in three ways. *Direct emissions* are the result of fossil fuel combustion for process heat, steam and hot water, on-site electric generation or space heating and are the most dominant. *Indirect emissions* derive from grid electricity consumption. *Process emissions* come from the materials in the industrial processes themselves.

Examples of process emissions in Washington include fluorinated gases used to etch semiconductors; CO_2 released from calcium carbonate during cement manufacture; and nitrous oxide emissions from degradation of fertilizers used in agriculture. These three sources of greenhouse gas — direct, indirect and process — are interdependent. Managing them presents challenges unique to each industry.

[109] "Washington Electricity Profile 2019, Table 8. Retail Sales, Revenue, and Average Retail Price by Sector, 1990 through 2019," U.S. Energy Information Administration, accessed December 1, 2020, https://www.eia.gov/electricity/state/Washington/.

[110] Washington State Department of Ecology Greenhouse Gas Emissions Inventory.

Solar power system on the new Parks, Recreation and Senior Center building in Pullman, WA. Funded in part by a grant from Commerce's Energy Efficiency and Solar Grant program. Department of Commerce

The industrial sector presents a dual opportunity for the clean energy transition: (1) efficiency and greenhouse gas reduction strategies for large-scale industrial energy consumers, and (2) development of clean technology and domestic job growth. Balancing these two, sometimes competing, opportunities will require creativity and commitment.

Industrial decarbonization roadmaps that can inform Washington's efforts include:

- **Decarbonization of the industrial sectors: the next frontier** (McKinsey & Co.)[111] *An examination that treats industrial decarbonization on a global scale and details technology options in four focus sectors — cement, steel, ammonia and ethylene — with qualitative descriptions of options without quantification of targets or potential.*
- **Transforming Industry: Paths to Industrial Decarbonization in the United States** (American Council for an Energy-Efficient Economy (ACEEE).[112] *Qualitative descriptions of options without quantification of targets or potential that includes some policy discussion*.
- **Manufacturing Agenda: A National Blueprint for Clean Technology Manufacturing Leadership and Industrial Transformation** (BlueGreen Alliance).[113] *A U.S.-focused policy analysis that includes substantial consideration of equity concerns but no technical analysis.*
- **Optionality, Flexibility & Innovation: Pathways for Deep Decarbonization in California** (Energy Futures Initiative).[114] *Economy-wide study on California with one chapter focused on the industrial sector that offers quantitative pathways to targets, on an "illustrative" level.*

[111] Arnout de Pee et al., "Decarbonization of the Industrial Sectors: The Next Frontier: How Industry Can Move toward a Low-Carbon Future" (McKinsey & Co., 2018), https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/How%20industry%20can%20move%20toward%20a%20low%20carbon%20future/Decarbonization-of-industrial-sectors-The-next-frontier.pdf.

[112] Andrew Whitlock, Neal Elliott, and Edward Rightor, "Transforming Industry: Paths to Industrial Decarbonization in the United States" (American Council for an Energy-Efficient Economy (ACEEE), 2020).

[113] "Manufacturing Agenda: A National Blueprint for Clean Technology Manufacturing Leadership and Industrial Transformation" (BlueGreen Alliance, 2020).

[114] Ernest J. Moniz, "Optionality, Flexibility & Innovation: Pathways for Deep Decarbonization in California" (Energy Futures Initiative (EFI), 2019).

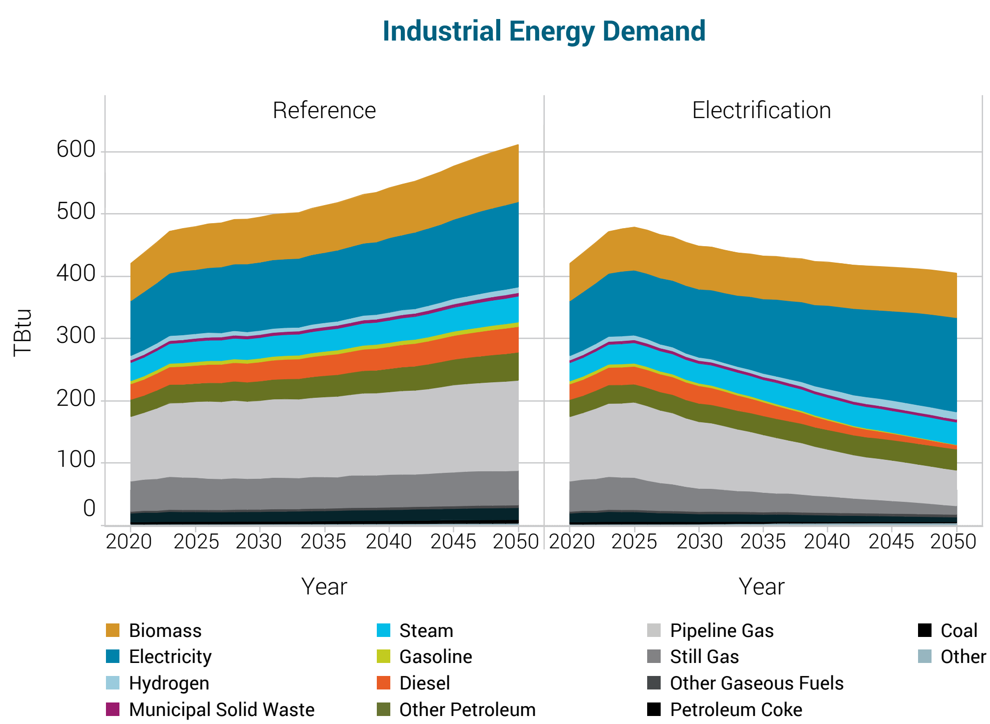
The deep decarbonization analysis did not include a detailed, process-specific model of industrial sector emissions. Instead, the model assumed that the industrial sector would increase energy efficiency by 1% each year and by 2050 could convert to electricity for 50% of process heating, 100% of machine drives and 75% of building heating and cooling. The result is a substantial reduction in total energy consumption, compared with the Reference Scenario and a substantial change in the mix of energy toward electricity as depicted in Figure 21.

Even in the industrial sector, where heat is often the most important form of energy, electrification will be critical. In the deep decarbonization modeling results, electricity replaces liquid and gaseous fossil fuels. Total final energy use in the industrial sector is 33% lower in the Electrification Scenario than in the Reference Scenario by 2050. Electricity starts at a 21% share of industrial energy demand in 2020, increasing to 36% by 2050 in the Electrification Scenario, while gaseous fuels drop from a share of 38% in 2020 to 18% in 2050.

> Every industrial facility and business has the potential to reduce greenhouse gas emissions and use energy more efficiently.

To meet the state's greenhouse gas reduction limits, Washington needs to develop a quantitative, industrial decarbonization roadmap.

FIGURE 21. FUELS IN THE INDUSTRIAL SECTOR IN THE REFERENCE AND ELECTRIFICATION CASES



Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020.

1.1. Build the Supporting Datasets

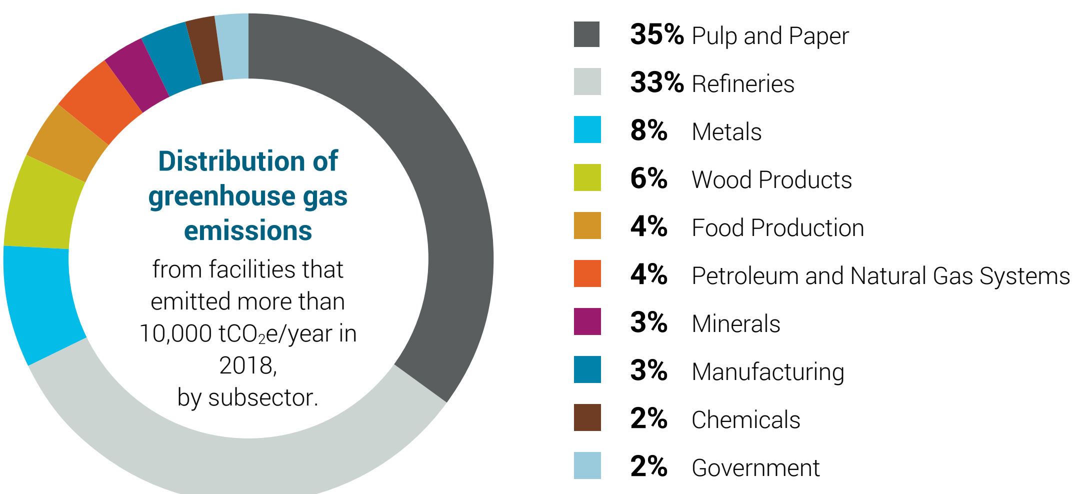
In terms of the value of goods produced, Washington's industrial sector is dominated by aerospace and data-processing activities, which account for over 54% of state industrial GDP.[115] These industries rely mostly on electricity and directly emit only a small fraction of the state's emissions. (Figure 22)

A handful of smaller industries contribute most of Washington's greenhouse gas emissions. As shown in Figure 22 and Table 3, refineries and pulp and paper facilities together accounted for about two-thirds of Washington's 2018 emissions reported by major facilities to Ecology, while those industries contribute less than 10% of the state's industrial production. Most of the emissions from pulp and paper facilities are due to combustion of biomass, considered less climatically-intensive than fossil fuel combustion because new carbon sequestration may be occurring on the harvested land.

Aluminum and steel production (metals) accounted for another 8% of greenhouse gas emissions, while lumber mills (wood products), food production and petroleum and natural gas systems account for another 4 to 5% each. These facilities produce greenhouse gas emissions from direct combustion of fossil fuels for heat and on-site electric generation, as well as greenhouse gas emissions from industrial processes, such as CO_2 from calcination of cement and perfluorocarbons (PFCs) from aluminum production.

> Electrification is a powerful tool for reducing industrial emissions.

FIGURE 22. DISTRIBUTION OF GREENHOUSE GAS EMISSIONS FROM FACILITIES THAT EMITTED MORE THAN 10,000 tCO_2e/YEAR IN 2018, BY SUBSECTOR



Most emissions from the Pulp and Paper and Wood Products subsectors are biogenic. The Metals subsector is dominated by the Alcoa Ferndale aluminum smelter, which is entering curtailment this year. The Government subsector consists almost entirely of steam plants operated by the federal government and by state institutions of higher education. (subsectors Transportation Fuel Supplier, Power Plants and Waste are excluded)

[115] As shown in Table 3, in calendar year 2018 the industrial sectors (including agriculture) had a combined gross product of $84.2 billion, of which $45.7 billion were in the aerospace and data processing sectors.

TABLE 3. WASHINGTON'S 12 LARGEST INDUSTRIAL SECTORS, IN ORDER OF 2018 GROSS DOMESTIC PRODUCT (GDP)

REMI industrial sector	GDP, mm$
Aerospace product and parts manufacturing	29,591
Data processing, hosting, related services	16,072
Petroleum and coal products manufacturing	5,452
Farm	4,263
Navigational, measuring, electromedical and control instruments mfg.	2,102
Beverage manufacturing	1,364
Fruit and vegetable preserving and specialty food manufacturing	1,227
Support activities for agriculture and forestry	1,140
Pulp, paper and paperboard mills	912
Architectural and structural metals manufacturing	858
Plastics product manufacturing	837
Pharmaceutical and medicine manufacturing	826

Source: REMI Outputs from Economic Impacts Modeling

ACTIONS

- The Department of Ecology should increase the subsector breakdown in its industrial sector greenhouse gas inventory. Both combustion and process emissions need to be broken down with the same taxonomy, so that data can be parsed meaningfully for policy-making.[116]
- The Department of Commerce should develop and publish detailed industrial sector energy data (following a coordinated taxonomy with Ecology) using federal Energy Information Administration forms data, or any new state reporting requirements.

Washington could become a world leader in the clean energy economy, while reducing the environmental impacts of existing industries in the state.

[116] In particular, industrial sector emissions from combustion of fossil fuels must be disaggregated from the residential and commercial sectors.

Worker wrapping an HVAC air duct with foil tape. 1905HKN/iStock

1.2 Assess the Potential for Industrial Sector Greenhouse Gas Reduction Measures

There are four decarbonization approaches for the industrial sector:

ENERGY EFFICIENCY has been and continues to be the highest form of industrial environmental performance. It delivers reduced energy costs, lower direct emissions from on-site energy generation and lower emissions from grid electric generators. Energy efficiency includes lighting, building insulation and heating, ventilation and air conditioning (HVAC) solutions. In the industrial sector specifically, energy efficiency also includes efficient generation of heat and process efficiency, such as high-temperature waste heat recovery, low-temperature waste heat recovery and smart manufacturing,[117] variable-speed drives[118] and compressed air efficiency.[119]

ELECTRIFICATION is a particularly powerful tool for industrial decarbonization in Washington. As the state's utilities comply with Clean Energy Transformation Act (CETA), the electricity supply will gradually become cleaner. According to the American Council for an Energy Efficient Economy (ACEEE), typically only about 15% of the energy consumption in the more energy-intensive industries is electricity.[120]

Ample opportunity for expansion of electric consumption exists, including:

- ***Fuel-switching boilers*** allowing an industrial installation to generate steam either with a fossil fuel or with electricity;
- ***Microwave or radiofrequency*** using the same technology consumers are familiar with in microwave ovens, to more efficiently dry high-water-content feedstocks or products;
- ***Heat pumps, microwave or infrared heat*** delivering low-temperature process heat more efficiently than steam;
- ***Membrane separation technologies*** displacing boiling and distillation with the much lower-energy approach of forcing a liquid against a sufficiently fine membrane, especially in petroleum refining;
- ***Ultrasound-assisted, electromagnetic or ohmic drying*** displacing conventional oven-drying especially in food processing; and
- ***Pulsed electric field, ultra-sonification, pulsed light, UV or microwave pasteurization/sterilization*** displacing conventional pasteurization and steam autoclave sterilization, especially in food processing.

[117] Ellen McKewen, "What Is Smart Manufacturing? (Part 1A)," CMTC Manufacturing Blog (blog), accessed November 1, 2020, https://www.cmtc.com/blog/what-is-smart-manufacturing-part-1a-of-6.

[118] "Variable Speed Drives," accessed November 1, 2020, https://www.sciencedirect.com/topics/engineering/variable-speed-drives.

[119] "Compressed Air Systems," Energy.gov, accessed November 1, 2020, https://www.energy.gov/eere/amo/compressed-air-systems.

[120] Whitlock, Elliott, and Rightor, "Transforming Industry: Paths to Industrial Decarbonization in the United States."

COMBINED HEAT AND POWER (CHP). Most industrial facilities need significant amounts of both electricity and heat. CHP is a method for providing both electricity and heat on site for industrial facilities. It is the use of low-grade heat exhausted by combustion-fired electric generation, for industrial purposes.[121]

HEAT SHARING involves the transportation of heat among multiple facilities. Heat is more difficult to transport than electricity, however it is not impossible. The recent trend toward increased use of hot water or other liquid carriers rather than steam is enabling longer transport distances and reducing energy demand. But even if steam is the carrier, deliberate colocation of facilities makes transport both physically and economically viable. Heat generation benefits greatly from economies of scale, so the economic equation can favor heat sharing more than is often realized.

The suite of commercially viable technologies for increasing efficiency or reducing carbon intensity in the industrial sector is well understood and well documented. What is not well understood is the potential to lower energy consumption or displace direct fossil fuel combustion with electricity.

ACTION

- Inventory the potential associated with different technologies to provide a basis for the calculation of appropriate decarbonization targets for industry.

1.3. Lay the Groundwork for Carbon Capture, Use and Storage

One feature common among industrial facilities is smokestacks. These fixed emission point sources are potential collection points to capture carbon that would otherwise enter the atmosphere as a greenhouse gas. Captured at the emissions point, there are at least three paths to treat CO_2 that mitigate greenhouse gas emissions to a greater or lesser degree:

GEOLOGICAL STORAGE. This is the conventional vision for carbon capture and storage (CCS), in which CO_2 stack emissions are stored in underground geological formations. Initial investigations by the United State Geological Survey show meaningful potential for geological storage in Washington.[122] In addition, the Pacific Northwest National Laboratory's research is showing previously unrealized potential for carbon storage in the flood basalts common in Washington's landscape.[123]

CARBON REUSE. CO_2 captured from smokestacks can be used as a source for carbon used to produce synthetic fuels. The vehicles or other energy consumers that eventually combust the synthetic fuels still end up emitting CO_2 to the atmosphere, but the carbon is used twice — rather than once — before being released. The climate benefit of the double use comes from the displacement of virgin fossil fuels that the vehicles would otherwise have used.

BUILT ENVIRONMENT. Carbon in the captured CO_2 can also be used as a component of novel construction materials that sequester the carbon in buildings, roads or other components of the built environment. This approach offers sequestration similar to geological storage, although the average duration of storage in construction materials might be lower than in the case of geological storage. Use in the built environment can encourage displacement of more emissions-intensive materials.

ACTIONS

- Continue support for research in Washington's geological storage potential for CO_2.
- Incorporate carbon capture, use and storage technologies in the portfolio of Centralized Technical Assistance.

[121] Exhaust heat can also be used for additional electric generation, in a combined cycle power plant (usually a combined cycle combustion turbine, "CCCT"). However, we are treating combined cycle power plants as an electric sector technology, not an industrial sector technology.

[122] "National Assessment of Geologic Carbon Dioxide Storage Resources - Results," U.S. Geological Survey, Circular, 2013, https://doi.org/10.3133/cir1386.

[123] B. Peter McGrail et al., "Potential for Carbon Dioxide Sequestration in Flood Basalts: SEQUESTRATION IN FLOOD BASALTS," *Journal of Geophysical Research: Solid Earth* 111, no. B12 (December 2006): n/a-n/a, https://doi.org/10.1029/2005JB004169.

2. Establish a Technology-Neutral Regulatory Framework

As an alternative to prescriptive, process-specific actions to address industrial emissions, a better approach may be to pursue one or more technology-neutral regulatory frameworks aimed squarely at the primary desired outcome of reducing greenhouse gas emissions. Two such mechanisms are a low carbon fuel standard (LCFS) to reduce the carbon intensity of fuels used in industrial and motor vehicle applications and a regulatory program to reduce emissions from stationary sources, similar to the Department of Ecology's Clean Air Rule (CAR).

A third, more comprehensive mechanism would be an economy-wide cap and trade program. Cap and trade is a proven strategy for reducing emissions in the industrial sector. It has been used in many countries around the world and in California, Quebec and to a more limited degree in the Regional Greenhouse Gas Initiative (RGGI), which includes 10 Northeast U.S. states.

2.1. Adopt a Low Carbon Fuels Standard

California, Oregon and British Columbia have all adopted relatively similar LCFS policies.[124, 125, 126, 127] An LCFS displaces conventional gasoline and diesel fuels with lower-carbon substitutes. An LCFS could help drive decarbonization across all segments of the transportation sector, as well as foster the development of clean fuels needed for important Washington industries.

Vehicle fleets and light equipment at industrial facilities consume some gasoline, while vehicle fleets, off-road equipment and backup generators use significant quantities of diesel. An LCFS could include off-road diesel, aviation fuel and/or marine fuels to expand its impact on industrial sector emissions.

> An effective LCFS would encourage clean fuels production in the state and achieve parity with similar standards in Oregon and California.

An LCFS could be structured so that revenue from credit sales fund zero emission vehicle charging and fueling infrastructure and improve the economics of in-state carbon capture and clean fuels production. Biofuels and potentially hydrogen and electrofuels could provide the state valuable flexibility in reducing transportation emissions from difficult-to-decarbonize activities such as aviation, long-distance or heavy-duty trucking and maritime shipping.

An effective LCFS would encourage clean fuels production in the state and achieve parity with similar standards in Oregon and California. In addition, an LCFS can be designed to recognize other environmental or economic benefits that result from some clean fuels. These co-benefits may include the reduction of wildfire risk when using waste biomass from forest management, the use of feedstocks that limit impacts on food crops and the use of co-products for biofuel manufacturing.[128]

ACTION

- Enact and implement an LCFS to establish a market and funding mechanism for clean fuels production.

[124] California Air Resources Board, "Low Carbon Fuel Standard," November 16, 2015, http://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf.California Air Resources Board.

[125] Chapter 754, Oregon Laws 2009, An Act, HB 2186, Relating to greenhouse gas emissions; and declaring an emergency.

[126] Consolidated Statutes of British Columbia, Chapter 16, Greenhouse Gas Reduction (Renewable and Low Carbon Fuel Requirements) Act.

[127] Julie Witcover, "Pacific Coast Collaborative Low Carbon/Clean Fuel Standard Program Comparison" (UC Davis PIEEE, June 2018).

[128] R. Divyabharathi and P. Subramanian, "Hydrothermal Liquefaction of Paddy Straw for Biocrude Production," *Materials Today: Proceedings*, March 2020, https://doi.org/10.1016/j.matpr.2020.02.390.

2.2. Regulatory Tools to Measure, Mitigate and Reduce Emissions from Industrial Sources

In 2016, the Department of Ecology adopted the CAR to address the major sources of greenhouse gases.[129] The proposed rule adopted emission standards to cap and reduce greenhouse gas emissions from significant in-state stationary sources, petroleum product producers, importers and distributors and natural gas distributors operating within Washington. Covered entities were required to reduce emissions 1.7% each year.

In March 2018, the Thurston County Superior Court ruled that parts of the CAR were invalid, preventing implementation of the rule. Compliance with the rule was suspended. On Jan. 16, 2020, the Washington State Supreme Court ruled that the portions of the rule that applied to stationary sources were valid, but that the portions that applied to indirect sources, such as natural gas distributors and fuel suppliers, were invalid. The Supreme Court sent the case back to the lower court to determine how to separate the rule.

The original CAR was based on greenhouse gas limits in place prior to 2020 (25% below 1990 levels by 2035). A new rule focused on stationary sources and designed to meet the newly adopted 2050 limit could result in a more stringent obligation than the original CAR, potentially requiring annual reductions of 3.5% per year. The Department of Ecology has not yet identified next steps for the CAR.

In a separate action and under explicit direction by the Governor, the Department of Ecology has begun rulemaking to strengthen and standardize the consideration of climate change risks, vulnerability and impacts in environmental assessments for major projects with significant environmental impacts. The rule will establish uniform methods, processes, procedures, protocols or criteria that ensure a comprehensive assessment and quantification of direct and indirect greenhouse gas emissions resulting from a project.

Port of Seattle. Clean Energy Transition Institute

ACTION

- Washington should continue to explore regulatory mechanisms to measure, mitigate and reduce greenhouse gas emissions from the operation and siting of significant in-state stationary sources, petroleum product producers, importers and distributors of natural gas.

2.3 Address Competitive Issues Raised by Emissions Policies

While there are many advantages to technology-neutral regulatory approaches, they also raise a concern about competitive effects on firms that serve markets outside the state. State-level emissions limits or fees may result in "leakage," where apparent emissions reductions in one state are offset by emissions increases in other states or countries. The industries that are most susceptible to leakage effects are referred to as energy-intensive, trade-exposed industries (EITEs). Examples of EITE industries include pulp and paper, cement, glass and metals manufacturing.

The appropriate response to concern about leakage is not necessarily to excuse EITEs from emissions reductions, but to structure state policy so leakage risk is anticipated and addressed. First, the state should anchor its industrial emissions policies in a detailed understanding of the manufacturing activity in Washington. Recent work for the Oregon Carbon Policy Office provides a good example.[130]

[129] "Clean Air Rule," Washington State Department of Ecology, n.d., https://ecology.wa.gov/Air-Climate/Climate-change/Greenhouse-gases/Reducing-greenhouse-gases/Clean-Air-Rule.
[130] "Oregon Sectoral Competitiveness under Carbon Pricing" (Vivid Economics, 2018), https://digital.osl.state.or.us/islandora/object/osl%3A676559.

Without data on energy costs, manufacturing processes and competitive conditions, the state might relax emissions reduction requirements for a firm or industry that would not actually present a leakage risk. It is possible through engineering and economic analysis to measure the actual risk of leakage for individual industries and plants. The results are likely to change over time. The state should undertake this analysis as part of an ongoing regulatory program for direct emitters.

Second, Washington should adopt industrial emissions reduction policies that are consistent with other jurisdictions. Leakage occurs when inconsistent regulations create an incentive to shift manufacturing activity to a less regulated jurisdiction. Strong inter-state partnerships or other multi-jurisdiction approaches can help avoid EITE flight, emissions leakage and job loss to other states.

Washington regularly collaborates with Oregon, California and British Columbia through the Pacific Coast Collaborative and other forums. A uniform policy framework among like-minded jurisdictions, such as was developed under the Western Climate Initiative,[131] continues to be the best approach to minimize negative economic and environmental effects among jurisdictions. Just as a geographically large energy economy creates market efficiency, a geographically large policy environment promotes least-cost solutions and accommodates niche markets, experimental policies or staged policy implementation.

Third, Washington should consider incentives for industrial efficiency improvements. Well-designed incentives would enhance the competitiveness of manufacturing firms located in the state and reduce leakage risk.

ACTIONS

- Develop and maintain data on processes, markets and costs of manufacturing activities in Washington and use this information to identify EITEs and craft responsive emissions reduction policies.
- Maintain and strengthen Washington's engagement with the Pacific Coast Collaborative, with a continued focus on advancing coordinated climate and industrial policies along the West Coast.
- Increase incentives and support for industrial efficiency, emission control and clean technology upgrades, including consideration of an industrial transformation bank, incorporating strong labor and equity standards to fund the retooling and upgrading of Washington's EITEs and low-carbon fuel pilot projects.

[131] "Program Design and Implementation," Western Climate Initiative, accessed November 1, 2020, https://wci-inc.org/our-work/program-design-and-implementation.

Logging truck on Snow Creek Road, Quilcene, WA.
Clean Energy Transition Institute

3. Develop and Implement a Coordinated Clean Energy Industrial Policy

Emissions from the industrial sector add a complex layer to an already challenging task for policy makers as they seek to promote economic vitality, business development and high-quality jobs. Climate policy must be incorporated into a coherent industrial policy. This approach has proven successful in countries around the world.[132, 133, 134] With an electric grid considerably cleaner than most states in the U.S., technological expertise, manufacturing history, fuel-refining infrastructure and biomass resources, Washington has an opportunity to become a world leader in the clean energy economy, while at the same time reducing the environmental impacts of existing industries in the state.

Washington possesses significant advantages to attract the manufacturing supply chains of solar, storage and microelectronic technologies that will be key to driving our low carbon economy, particularly as it relates to polysilicon-based technologies.

3.1. Adopt a Comprehensive Clean Energy Plan for Industrial Policy

Industrial policy is a matched set of tools and policies: procurement, workforce development, infrastructure development, tax incentives and research and development. Comprehensive industrial policy for climate and energy goals requires coordinated alignment and aggregation of interventions across different levels of government and between the public and private sectors, leveraging the strengths of agencies, jurisdictions and sectors.

Each country, state, or region's industrial policy generally emerges organically from existing industry clusters that are the natural fit for the jurisdiction's resources, culture and history. New industrial opportunities build on underlying competitive advantages in a region and these competitive advantages may change over time. Thus, an industrial ecosystem is not static and designing a low-carbon future for industry will take patience, focus and coordinated policy.

In some cases, the development of industries has created sacrifice zones, geographic areas that have been permanently impaired by environmental damage or economic disinvestment, often through locally unwanted or unusable land. It is important that Washington's policies ensure that rapid decarbonization does not come at the risk of creating sacrifice zones. In developing a clean energy industrial policy, business leaders, community representatives and labor unions must be engaged from the outset in mapping the priorities of those impacted. The policy must promote labor standards and shared benefits.

The state should lead with an equitable governance policy approach among key constituents to design a process to achieve decarbonization goals expeditiously and maximize benefits while minimizing risks for people who live or work where a project or manufacturing hub may be located and decreasing the likelihood that industries and jobs will leave Washington for other states.

ACTION

- Develop a coordinated clean energy industrial policy framework that supports the ability of industry to help decarbonize the buildings, transportation and electricity sectors and catalyzes regional decarbonization.

3.2 Create a Structure to Implement a Clean Industrial Policy

The success of the Washington 2021 State Energy Strategy and especially its industrial sector provisions, will depend on continued and coordinated participation across state agencies. Strengthened state agency leadership could feature more frequent energy planning, increased data gathering authority or increased regulatory authority.

States in the U.S., including Washington, have not typically engaged in frequent energy planning, increased data gathering and increased regulatory authority to steward industrial policy. Getting serious about industrial policy means making a clear home for it, within the state's current

[132] "Investment and New Industrial Policies: World Investment Report 2018" (UNCTAD, Division of Investment, 2018).

[133] Michael Landesmann and Roman Stollinger, "The European Union's Industrial Policy: What Are the Main Challenges?" (The Vienna Institute for International Economic Studies, January 2020).

[134] Todd Tucker, "Industrial Policy and Planning: What It Is and How to Do It Better" (Roosevelt Institute, July 2019), https://rooseveltinstitute.org/wp-content/uploads/2020/07/RI_Industrial-Policy-and-Planning-201707.pdf.

organization of agencies. The Office of Economic Development and Competitiveness (OEDC) within Department of Commerce is the obvious location in which to place industrial policy stewardship.

Greater attention to industrial energy planning would improve the state's influence over the pathways Washington takes to achieving its greenhouse gas reduction limits and industrial policy targets. The current process with many years between energy planning exercises means either that each plan eventually becomes perceived as old and therefore ignored; or, if each strategy is taken seriously, that Washington locks itself into approaches or policies that may no longer be the best choice in the context of changing technologies, politics, or economics as the decade goes by. More frequent planning would enable a nimbler approach to the state's energy policy in the industrial sector.

An important benefit of developing a more climate-aware industrial policy is that it could lead to better processes for siting industrial facilities, perhaps using a dedicated, multi-agency entity similar to the Energy Facility Site Evaluation Council (EFSEC).

ACTIONS

- The Legislature should establish responsibility for clean energy industrial policy within state government, with robust data collection and regular planning for the industrial sector.
- As part of its industrial policy, the Legislature should consider a review of potential tools to streamline permitting and siting of clean industrial activities that protect communities from disproportionate impacts.

> Greater attention to industrial energy planning is required to improve the state's ability to achieve its greenhouse gas reduction limits.

3.3 Provide Centralized Technical Assistance

The most effective policy framework for decarbonization will be one that includes both a downward pressure on emissions and an upward lift for the technologies that can achieve it. Knowledge about efficiency, electrification, process emissions reduction and carbon capture and storage needs to be broadened so that a wide spectrum of industrial entities have access. Since Washington contains a few entities within each given major industrial subsector, partnering regionally with multiple states to provide centralized technical assistance could be an effective approach.

A few existing programs can serve as examples. Washington's Department of Ecology has a program offering efficiency services to manufacturing and industrial facilities, the primary directives of which are efficiency, waste reduction and reducing regulatory overhead for small- and medium-sized plants. The Washington State University (WSU) Energy Program's industrial services group helps manufacturers adopt efficient technologies, productivity improvements and best practices by integrating and customizing products and services and provides technical assistance, assessments, training and project planning.

The New York State Energy Research & Development Authority manages five industrial programs that combine a focus on efficiency with energy management to increase competitive advantages and resiliency. Three that align particularly well with Washington's industrial energy policy offer strategic energy management, flexible technical assistance and on-site energy manager services.[135] Wisconsin's Focus on Energy program also offers support to industrial buildings through energy and local advisors on energy-saving equipment, technology and renewable energy options to reduce energy consumption and lower energy bills.[136]

ACTION

- Expand the Department of Ecology's *Efficiency Services for Manufacturing and Industrial Facilities* program and the WSU Energy Program's Industrial Efficiency team, incorporating best practices from other jurisdictions.

[135] "NYSERDA Industrial Programs," New York State, n.d., https://www.nyserda.ny.gov/All-Programs/Programs/Industrial-Programs.

[136] "Wisconsin's Focus on Energy," Focus on Energy: Partnering with Wisconsin Utilities, n.d., https://focusonenergy.com/.

4. Support Clean Energy Research, Innovation and Deployment

As Washington embraces the clean energy transition, leaders can build on the state's foundations in aerospace, maritime, information and communications technology (particularly data center infrastructure, artificial intelligence and machine learning), grid modernization and decarbonizing buildings. Support can be enlisted from Washington's world-class manufacturers, technologists and academic research organizations, including those in regional comprehensive universities across the state.

State policies can catalyze activities that align with sustainability, climate and carbon investment funds being established and policies being adopted by the private sector, including Microsoft, Amazon and other sector leaders. All this will help the state to more readily develop the technology and innovation required to meet the state, national and global climate goals, offer opportunities for economic and job growth and strengthen technology supply chains. Collectively, these efforts can help ensure our existing and future industries have access to the tools needed to reduce the carbon intensity of their operations.

As the state advances towards a net-zero emissions future, gas and liquid fuels are expected to continue to be part of the energy mix for some time to come — both as a limited source for electricity generation and for use in specific transportation, building and industrial applications. There is a need to develop and deploy technologies that can economically provide decarbonized fuels.

New technologies being researched, developed and deployed include "green hydrogen"[137] from electrolysis powered by renewable or non-emitting electricity; carbon capture, use and storage which can "decarbonize" conventional fossil fuels used for heat or electricity; and synthetic fuels produced by combining hydrogen and non-fossil sources of carbon. These technologies offer the potential to contribute to a decarbonized future, but require continued investment in research and development, pilot programs and commercialization, as well as a favorable regulatory environment and government financial support to reduce the significant risks associated with bringing new technologies to market.

Dr. Lisa Brown touring the Clean Energy Institute, October 2019. Department of Commerce

As discussed in Chapter C-Use Energy More Efficiently and Decarbonize Transportation Energy, even under the aggressive Electrification Scenario, a large number of internal combustion engines will remain on the road in 2030. This means there will be an immediate need to produce low-carbon liquid fuels to replace fossil fuels. The industrial sector and especially Washington's robust petroleum refining industry, could play an important role in meeting the demand for those fuels during the next decade and beyond.

Petroleum fuels are hydrocarbons, molecules built primarily from carbon and hydrogen and the technologies available to synthesize petroleum substitutes are well known. The petroleum industry in Washington has the equipment and the know-how to become a leading innovator and producer of synthetic fuels.[138, 139] Washington's 2030 target is an excellent catalyst for the local refineries to become world leaders in low-carbon fuel manufacture. While the technologies to synthesize hydrocarbons are well known, the sources of the carbon and hydrogen atoms used to do so could be defining elements of Washington's clean energy paradigm.

[137] "Hydrogen," BP, n.d., https://www.bp.com/en/global/corporate/energy-economics/energy-outlook/demand-by-fuel/hydrogen.html.

[138] A.A. Lappas, S. Bezergianni, and I.A. Vasalos, "Production of Biofuels via Co-Processing in Conventional Refining Processes," Catalysis Today 145, no. 1–2 (July 15, 2009): 55–62, https://doi.org/10.1016/j.cattod.2008.07.001.

[139] Susan van Dyk et al., "Potential Synergies of Drop in Biofuel Production with Further Co processing at Oil Refineries," Biofuels, Bioproducts and Biorefining 13, no. 3 (May 2019): 760–75, https://doi.org/10.1002/bbb.1974.

Maritime Blue foil ferry. Department of Commerce

4.1. Continue to Invest in the Clean Energy Fund

Washington's Clean Energy Fund (CEF) was conceived in 2013 to support "projects that provide a benefit to the public through development, demonstration and deployment of clean energy technologies that save energy and reduce energy costs, reduce harmful air emissions or otherwise increase energy independence for the state."[140] The CEF has received appropriations through a series of biennial budgets up to and including appropriations in the 2019 capital budget.

To date, through awards of $118 million, Washington's CEF investments have successfully leveraged over $400 million to support innovative projects including grid modernization and storage; energy efficiency and renewable energy projects (wind, solar, bioenergy) on farms and in commercial buildings and homes; and deployment of electrification charging infrastructure. The funding has resulted in energy savings, emission reductions and job creation throughout the energy supply chain, positioning the state as a leader in clean technology development.

In the immediate future, policy makers' investments in the CEF represent a proven opportunity for economic development and position Washington to leverage federal clean energy dollars. In the long term, the CEF has a structure that can help support the innovation and infrastructure adaptation necessary to make our state's clean energy transition. With its strategic goal of "developing, demonstrating and deploying clean energy technologies that save energy and reduce energy costs, reduce harmful air emissions, or otherwise increase energy independence for the state," the CEF can continue to be a tool to build on Washington's clean energy policies and sectoral strengths, ensure costs and benefits are equitably distributed and help the state rebuild our economy.

ACTION

The Legislature and the Department of Commerce should continue to support the CEF and deploy the resources consistent with the recommendations of the Energy and Climate Policy Advisory Committee in the Report to the Legislature submitted in Dec. 2020.[141]

4.2. Cluster around Centers of Research, Development and Entrepreneurship

Washington is renowned for its technical innovation, particularly in the aerospace and information industries. The state is home to the Pacific Northwest National Laboratory, one of 17 national energy laboratories. The Clean Tech Alliance represents over 1,100 members facilitating the growth of clean technology companies and jobs through education, research and services. Washington's large and regional research universities also are a ready source of innovation to support an industrial policy based on clean energy.

Washington's Maritime Blue Strategy was created in 2019 to accelerate innovation and create the nation's most sustainable maritime industry by 2050.

The Maritime Blue strategy is focused on shifting towards a thriving, low-carbon industry; becoming a global innovation hub; leading the nation in efficient, clean and safe working waterfronts; supporting a 21st century workforce; and establishing a world-class maritime cluster.[142]

[140] Section 1074(1), Engrossed Substitute Senate Bill 5035, 2013. https://app.leg.wa.gov/billsummary?BillNumber=5035&Year=2013&Initiative=false

[141] "Energy and Climate Policy Advisory Committee," Washington State Department of Commerce, accessed November 1, 2020, http://www.commerce.wa.gov/growing-the-economy/energy/energy-and-climate-policy-advisory-committee/.

[142] "Washington Maritime Blue Launches Ambitious Plan for Economic Growth, Jobs, Ocean Health," January 8, 2019, https://www.commerce.wa.gov/news-releases/growing-the-economy/washington-maritime-blue-launches-ambitious-plan-for-economic-growth-jobs-ocean-health/.

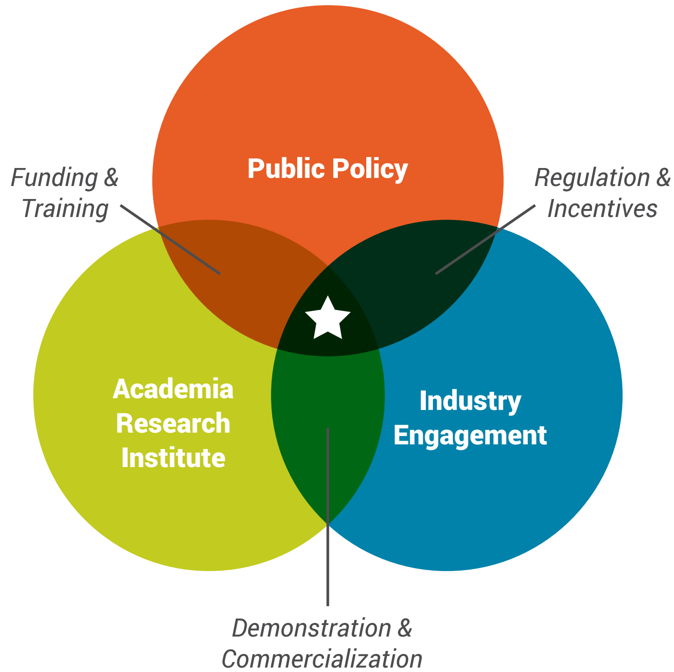
As a "cluster organization,"[143] Maritime Blue gathers businesses, public entities, community organizations, researchers and training institutions together to build a low-carbon marine industry that remains economically competitive. To date, Maritime Blue has assembled 55 industry members along with four research institutions, 14 organizational partners and 22 public sector partners and leveraged $6.5 million in public funding for programming and projects and $250,000 in private sponsorships.

It has garnered $32 million in private capital and $6 million in business sales related to the first cohort of 11 start-ups. This innovative project has successfully demonstrated a public-private partnership to develop economic advances for decarbonization of an industry. The example could serve as a framework from which to decarbonize the state's other industries.

In addition to nurturing industry clusters, there are opportunities for the state government to partner with individual companies. This can result in carbon reduction to help the state achieve its greenhouse gas emission limits, but also creates a forum for the state to learn from private sector initiatives.

Microsoft, for example, has established an investment fund supported by the company's internal carbon tax to provide funding for early stage clean energy technologies.[144] Alaska Airlines plans to reduce carbon emissions with flights powered by sustainable aviation fuel in key routes.[145] Skanska, a construction firm, pledged to eliminate emissions from both direct operations and its supply chain.[146] Amazon has pledged to be zero net carbon by 2040 and announced an initiative to electrify its delivery fleet.[147] PACCAR, a manufacturer of trucks, has invested in improving energy efficiency and reducing emissions, water consumption and waste at its manufacturing facilities, in combination with disclosing its greenhouse gas emissions.[148]

THE COMPONENTS OF A CLUSTER



THE ROLE OF A CLUSTER

Communication & marketing
Funding & investment
Knowledge & innovation collaboration
Incubation and commercialization
Joint industry projects (JIP)
Cross-cluster collaboration
Strategy review

[143] "World Class Cluster," Washington Maritime Blue, n.d., http://maritimeblue.org/cluster-2/.

[144] David Roberts, "Microsoft's Astonishing Climate Change Goals, Explained," *Vox*, 2020, http://www.voxx.com/energy-and-environment/2020/7/30/21336777/microsoft-climate-change-goals-negative-emissions-technologies?mbid=&bxid=5ec7510be36b.

[145] "Alaska Airlines and Microsoft Sign Partnership to Reduce Carbon Emissions with Flights Powered by Sustainable Aviation Fuel in Key Routes," *Microsoft News Center* (blog), October 22, 2020, https://news.microsoft.com/2020/10/22/alaska-airlines-and-microsoft-sign-partnership-to-reduce-carbon-emissions-with-flights-powered-by-sustainable-aviation-fuel-in-key-routes/.

[146] "Skanska UK Pledges Zero Emissions by 2045, Leads Construction Industry in Climate Commitments," *Mighty Earth*, May 19, 2019, https://www.mightyearth.org/skanska-uk-pledges-zero-emissions-by-2045-leads-construction-industry-in-climate-commitments/.

[147] Mary Meisenzahl, "Amazon Just Revealed Its First Electric Delivery van of a Planned 100,000-Strong EV Fleet — See How It Was Designed," *Business Insider*, October 8, 2020, https://www.businessinsider.com/amazon-creating-fleet-of-electric-delivery-vehicles-rivian-2020-2.

[148] "Paccar: Sustainability," n.d., https://www.paccar.com/about-us/environmental-and-social/environmental/.

ACTIONS

- Replicate Maritime Blue for other centers of research and development to accelerate and support emerging low-carbon industrial opportunities.
- Create a knowledge center on public-private collaboration to help firms make and meet broader climate commitments through capacity building and knowledge sharing.
- Expand programs to incentivize research and market development for commercial low-carbon fuels; heat pumps; embodied carbon materials; direct air capture (DAC); carbon capture, utilization and storage (CCUS); electrification technologies; grid modernization; artificial intelligence and machine learning; and circular economy processes.

4.3. Continue Washington's Leadership in Sustainable Aviation

The ports of Seattle, Spokane and Portland, along with The Boeing Company, Alaska Airlines and Climate Solutions were early out of the gate in creating the Sustainable Aviation Fuels Northwest (SAFN) initiative,[149] the first regional assessment of feedstock pathways for producing sustainable jet fuel in the U.S.

SAFN led to two large USDA-funded advanced biofuels research consortia in Washington, Advanced Biofuels Northwest (University of Washington) and the Northwest Advanced Renewables Alliance (Washington State University), both of which dealt extensively with feedstock and conversion supply chain analysis. Until 2018, the Legislature funded the Sustainable Aviation Biofuels Workgroup,[150] which facilitated conversation among government, the aviation industry, research institutions and biomass feedstock producers to advance sustainable aviation biofuels in Washington.

Today, WSU co-leads the Center of Excellence for Alternative Jet Fuels (ASCENT)[151] with the Massachusetts Institute of Technology to create science-based solutions for the aviation industry's most difficult environmental challenges. ASCENT released a February 2020 study[152] looking at the availability of sustainable biomass in the region.

ACTIONS

- Explore the viability of creating an electric aviation cluster to implement Washington's Green Economy report[153] recommendations to leverage the expertise of the University of Washington's Clean Energy Institute (CEI) to persuade international electric aircraft manufacturers to develop electric aircraft in Washington.
- Create a business environment where Washington is seen as a center of excellence for electric aviation.
- Support building a testing facility in Washington for electric aircraft.
- Invest in upgraded infrastructure for testing electric aircraft.
- Continue to support the efforts of ASCENT and the Sustainable Aviation Biofuels Work Group to coordinate research, development and deployment of low-carbon liquid aviation fuels.

> Washington should build on its successful partnerships working towards decarbonization of the aviation and maritime industries.

[149] "Sustainable Aviation Fuels Northwest," Climate Solutions: Accelerating the Transition to our Clean Energy Future, n.d., https://www.climatesolutions.org/sustainable-aviation-fuels-northwest.

[150] "Sustainable Aviation Biofuels Workgroup" (Washington State Legislature, January 26, 2018), https://apps.leg.wa.gov/ReportsToTheLegislature/Home/GetPDF?fileName=Sustainable%20Aviation%20Biofuels%202017%20Update%20Final_435d458c-b62c-4bdd-868d-8f9e4f0576b5.pdf.

[151] "Ascent - The Aviation Sustainability Center," Ascent, n.d., https://ascent.aero/.

[152] Port of Seattle and Washington State University, "Potential Northwest Regional Feedstock and Production of Sustainable Aviation Fuel," 2020, https://www.portseattle.org/sites/default/files/2020-07/PofSeattleWSU2019_final.pdf.

[153] "Washington's Green Economy" (Washington State Department of Commerce, 2020), https://deptofcommerce.app.box.com/s/jpy44m0svj05sfxp8353khsceq42lfss.

4.4. Explore a New Hydrogen Economy

Twenty years ago, a vision for the "hydrogen economy" took hold, in which a nontoxic, odorless, gaseous fuel speeds fuel-cell-powered "hypercars."[154] While development has occurred more slowly than expected, hydrogen can potentially play an important role in reducing greenhouse gas emissions from the industrial sector.

Hydrogen is not an energy source but an energy carrier. Hydrogen requires energy to produce and like electricity, it is only as clean as the feedstock used to produce it. Hydrogen is useful as a directly consumed power source for fuel cells and it can be used for hydrocarbon synthesis to produce the liquid fuels to achieve the state's 2030 greenhouse gas reduction limits. Hydrogen can also be used to promote the manufacture of more novel liquid energy carriers, such as ammonia or hydrazine.

Green hydrogen production is an important manufacturing opportunity for Washington industry. Petroleum refineries already include systems to produce and handle hydrogen, so are likely starting points for increasing production. Washington can learn from the European Union's hydrogen strategy, which calls for building up a hydrogen industry that can enable large-scale use of renewable and low-carbon hydrogen as a replacement for fossil fuels in industry and hard-to-decarbonize sectors, an energy carrier and form of energy storage and a feedstock for synthetic liquid fuels.[155]

ACTION

- Commerce should work with utilities, industrial firms, federal agencies and other stakeholders to accelerate the development of hydrogen production and should encourage pilot projects and research activities.

4.5. Continue to Assess Biogenic Feedstocks as a Foundational Resource

Fossil fuels are the result of geologic sequestration of ancient vegetation. Plants growing today also contain carbon and hydrogen. Whether the state's liquid and gaseous fuels are derived from fossil sources, dedicated crops, organic waste streams or other biogenic sources, or are synthetic fuels produced from any number of non-fossil sources of carbon and hydrogen, they result in the same two combustion products: carbon dioxide and water.

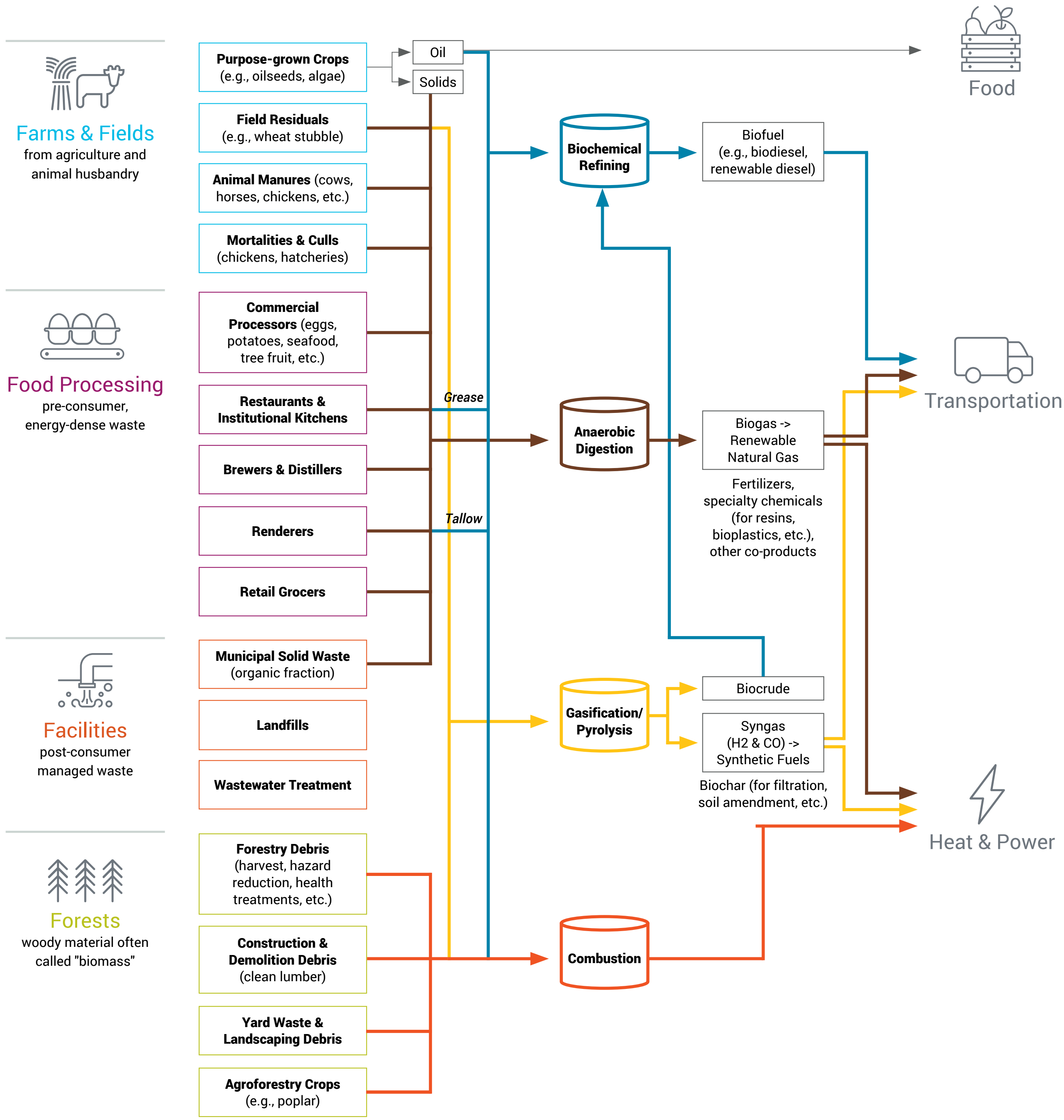
[154] Amory B. Lovins and David R. Cramer, "Hypercars, Hydrogen and the Automotive Transition," *International Journal of Vehicle Design* 35, no. 1/2 (2004): 50, https://doi.org/10.1504/IJVD.2004.004364.

[155] European Commission, "A Hydrogen Strategy for a Climate-Neutral Europe," 2020, https://ec.europa.eu/energy/sites/ener/files/hydrogen_strategy.pdf.

Hydrogen-powered passenger vehicle. audioundwerbung/iStock

FIGURE 23. PRIMARY BIOENERGY PATHWAYS IN WASHINGTON STATE

This diagram represents the feedstocks and process technologies discussed throughout the strategy that are best suited to deliver various forms of bioenergy and value-added co-products in Washington.



Biogas plant with cows.

The difference is what happens *after* the feedstocks have been extracted. As feedstocks derived from the management and harvest of agricultural and forestry crops are used for biofuel production, new crops are grown on agricultural and forest lands, extracting carbon dioxide from the atmosphere effectively compensating for what is being emitted through combustion of the biofuel.

Whether in gaseous, liquid or solid form, biogenic fuels can support those industrial processes most in need of heat or most in need of liquid or gaseous fuels, supplementing the role of electricity in meeting thermal needs. The use of biogenic feedstocks for heat, electricity and liquid and gaseous biofuels is inherently more complex than other forms of renewable energy production. Biogenic feedstocks offer opportunities for economic development, waste utilization and value-added co-products absent in other forms of renewable energy generation. Some feedstocks, however, raise concerns about sustainable sourcing, scale and siting.

ACTION

- The departments of Natural Resources, Agriculture, Ecology and Commerce, along with WSU's Center for Sustaining Agriculture and Natural Resources, should expand collaborative efforts to assess Washington's biogenic feedstocks to help inform future state policies. With specific focus of on developing markets for low-grade woody biomass from forest management and fire hazard reduction processes, including opportunities for various methods of carbon sequestration as informed by DNR's Carbon Sequestration Advisory Group.[156]

> Using biogenic feedstocks for heat, electricity and liquid and gaseous biofuels is complex.

[156] "Carbon Sequestration Advisory Group," Washington State Department of Natural Resources, accessed December 1, 2020, https://www.dnr.wa.gov/CarbonAdvisoryCmte.

5. Expand Policies to Consider Consumption-based Emissions

Emissions associated with the manufacture and transport of consumer products are referred to as "upstream emissions," "embodied emissions" or "embodied carbon." Washington has some of the most sophisticated low-carbon manufacturing technology capabilities in the world. The state is home to some of the best-in-class facilities on the planet in terms of production of low-carbon building and manufacturing materials such as steel rebar[157] and aerospace aluminum products.[158, 159]

Global demand for low-embodied carbon materials will grow as more jurisdictions seek to reduce consumption-based emissions. Washington can continue to lead in low-carbon intensity manufacturing, contributing significantly to in-state and global reductions in greenhouse gas emissions. In addition to decarbonizing existing industry, Washington is emerging as a leader in the global clean tech industry[160] and green building,[161] presenting entirely new opportunities for high-wage jobs and economic growth.

Reducing consumption-based emissions is not an alternative to reducing production-based emissions. They are both essential strategies. Washington's Center for Sustainable Infrastructure[162] and the University of Washington Carbon Leadership Forum[163] are laying important groundwork in this area by developing standardized approaches for measuring embodied carbon.

5.1. Conduct a Consumption-based Inventory

To lower consumption-based emissions, it is important to understand Washington's consumption patterns and the extent to which consumption emissions differ from production emissions. Emission inventories that include the embodied carbon of goods and services purchased by consumers are called "consumption-basis" inventories.[164]

King County computed and reported consumption-basis inventories in 2008 and 2015. In 2015, King County's conventional community inventory reported 20 million tCO_2e, while the consumption-basis inventory reported 58 million tCO_2e, well over 2½ times higher.[165]

The state of Oregon has computed consumption-basis emissions for 2005, 2010 and 2015. In 2015, Oregon's conventional inventory reported 63 million tCO_2e, while the consumption-based inventory reported 89 million tCO_2e. The difference in Oregon's case is less dramatic than in King County because the larger geography means that more industrial sources are captured in the conventional inventory. Even so, Oregon's consumption-basis inventory is still some 41% greater than its conventional inventory.[166]

> Global demand for low-embodied carbon materials will grow as more jurisdictions seek to reduce consumption-based emissions.

[157] According to the EC3 calculator, Nucor in Seattle produces the lowest embodied carbon steel concrete reinforcing and merchant bar in the world, and Farwest Steel Corporation with facilities in Oregon and Washington, as well as CT Sales, Inc. in Woodinville and Addison Construction Supply in Tacoma are also some of the lowest carbon producers in the world for fabricated reinforcing bar (https://www.buildingtransparency.org/en/).

[158] Helen Sanders, "Carbon Counting: A Driver for U.S. Sourced Aluminum? (Part 2)," Insights and Inspirations, September 6, 2019, https://www.usglassmag.com/insights/2019/09/carbon-counting-a-driver-for-u-s-sourced-aluminum-part-2/.

[159] Kaiser Aluminum, External Affairs and United Steelworkers Local 338. Best in Class: Flat Rolled Products. Based on data from Ecometrica, http://emissionfactors.com, August 2011.

[160] Washington is home to the Clean Tech Alliance, the largest state trade association of clean tech businesses in the U.S.

[161] Paul Roberts, "Growing the Green Economy in Washington State: Exploring an Eco-Nomic Center" (CQC AWC Center for Quality Communities, March 2019), http://cfqc.org/wp-content/uploads/2019/04/ExploreEcoNomincCenterSummary.pdf.

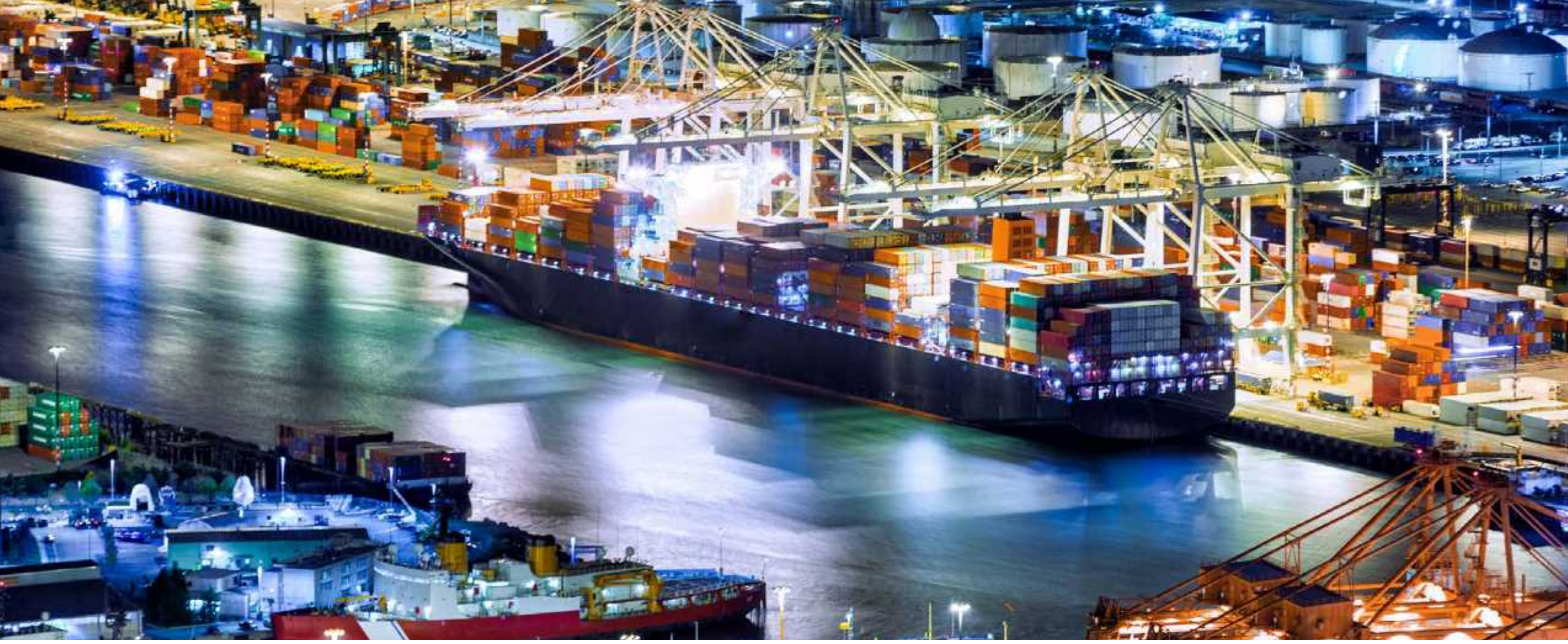
[162] "Center for Sustainable Infrastructure," accessed December 1, 2020, https://www.sustaininfrastructure.org/.

[163] "EC3 Tool Methodology," Carbon Leadership Forum, accessed October 26, 2020, https://carbonleadershipforum.org/projects/ec3-methodology/.

[164] Washington State's existing GHG inventory already treats electricity on a consumption basis, counting out-of-state emissions associated with imported electricity and discounting in-state emissions associated with exported electricity. However, doing this for all services and products is a much bigger step – electricity is just one of hundreds of product categories that would be estimated in a full, consumption-basis inventory.

[165] "King County Greenhouse Gas Emissions Inventory: A 2015 Update" (Cascadia Consulting Group, Hammerschlag & Co. LLC, December 2017), https://your.kingcounty.gov/dnrp/climate/documents/2015-KC-GHG-inventory.pdf.

[166] "Consumption-Based Greenhouse Gas Emissions Inventory for Oregon," accessed October 26, 2020, https://www.oregon.gov/deq/mm/pages/consumption-based-ghg.aspx.



Aerial view of a cargo ship loaded at a Port of Seattle container terminal. Ultima_Gaina/iStock

While the Oregon and King County inventories disclosed consumption emissions greater than production emissions, states that export more manufactured products than they import could have lower consumption-based emissions than their production-based emissions. For example, the emissions associated with Washington's aviation manufacturing industry would not be attributed to Washington in a consumption-based approach. Understanding the difference and managing reductions of both is necessary to reduce the global pool of greenhouse gas emissions rather than just shifting where those emissions occur or are measured.

Understanding consumption-based emissions is also important for equity. A household's carbon footprint generally increases with income, ranging from 19.3 to 91.5 tons of CO_2-equivalent annually. The average carbon footprint of the wealthiest households is over five times that of the poorest.[167]

ACTION

- Conduct an inventory of the embodied carbon of goods and services purchased by Washingtonians.

5.2. Incentivize Environmental Product Declarations for Products & Materials Consumed in State

Environmental Product Declarations (EPDs) often described as "nutrition labels" for carbon content, make it easy to track embodied carbon and recognize low-carbon producers. By establishing demand for and a willingness to purchase low-carbon products, private sector investments and innovation are encouraged.

EPDs are independently verified and registered documents that communicate transparent and comparable information about the life-cycle environmental impact of products.[168] Without regulatory requirements, the disclosure of life-cycle emissions is left to voluntary private sector action. While some private companies are requiring EPDs for their construction projects, state and local governments procure and fund many of these products and materials. Public agencies could play a significant role in incentivizing better disclosure practices.

ACTION

- State agencies, through the State Efficiency and Environmental Performance Office, should explore the potential for EPDs to support environmentally aware procurement policies and establish a baseline for standardized accounting and reporting.

[167] Morteza Taiebat and Ming Xu, "5 Charts Show How Your Household Drives up Global Greenhouse Gas Emissions," PBS, September 21, 2019, https://www.pbs.org/newshour/science/5-charts-show-how-your-household-drives-up-global-greenhouse-gas-emissions.

[168] The International EPD® System, "What Is an EPD? - The International EPD® System," accessed December 28, 2018, https://www.environdec.com/What-is-an-EPD/.

6. Leverage the Economic Transition to Create New Inclusive, Living-Wage Jobs

As Washington transitions to a decarbonized economy, there is an opportunity to support the recovery and competitiveness of the Washington economy and create inclusive, living-wage jobs in a wide range of areas from agriculture and manufacturing, to utilities and construction (Figure 23).[169]

These occupations tend to have higher, more equitable wages and lower educational requirements when compared with other occupations, nationally.[170] Clean energy jobs have the added indirect effect of creating health and climate benefits for Washington communities. The Low Carbon Prosperity Institute estimates that every million dollars invested in clean energy programs leads to $2.4 million in clean air and climate benefits.[171]

Workforce development must be a priority as the state emerges from the current economic recession, which has been especially hard on clean energy jobs. Prior to the economic downturn caused by the COVID-19 pandemic, Washington had a total of 83,728 clean energy jobs. Since the pandemic, the state has lost roughly 20% of its clean energy jobs.[172] Not only have these job losses upended the financial security of affected Washington households, they also threaten to deplete the workforce necessary for the clean energy transition.

Washington has experience rebuilding its clean energy workforce in the wake of a recession. In the 2008 financial crisis, the state lost tens of thousands of clean energy jobs. Using American Recovery Reinvestment Act of 2009 (ARRA) funding, the state invested in its workforce, equipping employees with the skills necessary to participate in the clean energy economy. Washington's Weatherization Assistance Program deployed $60 million of ARRA funding to hire hundreds of workers to weatherize 7,000 low-income homes, creating jobs while reducing utility bills and improving thermal comfort.[173]

E2 CLEAN JOBS WASHINGTON 2019 FINDINGS

11x	more clean energy jobs in Washington than fossil fuel jobs
10.1%	of Washington clean energy workers are veterans, nearly double the national average
8.3k	rural Washington residents work in clean energy
7 OUT OF 10	clean energy employees in Washington work at companies with fewer than 20 employees
45%	of Washington's clean energy workforce is located outside the Seattle metro area
5 OUT OF 10	counties by clean energy jobs per capita have populations fewer than 100,000—including No.1 Jefferson County which is home to 23 clean energy jobs for every 1,000 employable residents

[169] "Clean Jobs Washington 2019" (E2), accessed December 2, 2020, https://www.e2.org/wp-content/uploads/2019/12/E2-Clean-Jobs-Washington-2019.pdf.

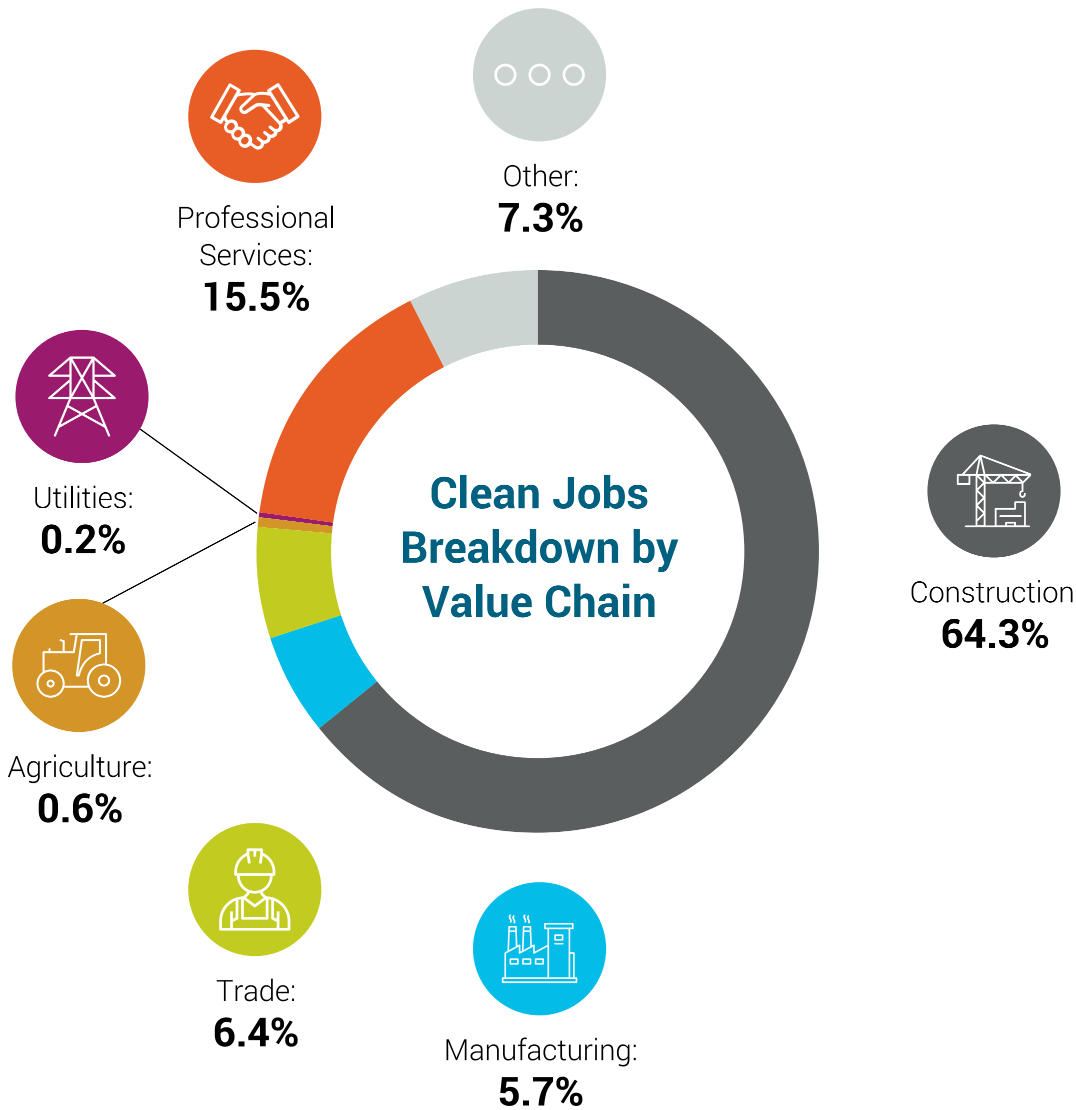
[170] Mark Muro et al., "Advancing Inclusion through Clean Energy Jobs" (Brookings, April 2019), https://www.brookings.edu/wp-content/uploads/2019/04/2019.04_metro_Clean-Energy-Jobs_Report_Muro-Tomer-Shivaran-Kane.pdf#page=18.

[171] Jonah Kurman-Faber, Kevin Tempest, and Ruby Wincele, "Building Back Better: Investing in a Resilient Recovery for Washington State" (Low Carbon Prosperity Institute, Climate Xchange, 2020), https://www.lowcarbonprosperity.org/wp-content/uploads/2020/06/Building-Back-Better-Investing-in-a-Resilient-Recovery-for-Washington-State-Website.pdf.

[172] "Clean Energy Unemployment Claims in COVID-19 Aftermath| October 2020 Unemployment Analysis," E2: Business leaders for a better environment, stronger economy, n.d., https://e2.org/reports/clean-jobs-covid-economic-crisis-october-2020/.

[173] Kurman-Faber, Tempest, and Wincele, "Building Back Better: Investing in a Resilient Recovery for Washington State."

FIGURE 24. WASHINGTON'S 2019 CLEAN JOBS BREAKDOWN



Source: E2 Clean Jobs Count 2019

ARRA kicked off unprecedented growth in clean energy jobs in the state between 2008 and 2015.[174] Since then, Washington has continued to invest in the clean energy workforce, funding efforts and institutions such as the WSU Extension Energy Program, the Pacific Northwest Center of Excellence for Clean Energy, the Smart Buildings Center, the Clean Energy Fund, the Weatherization-Plus-Health program, the Community Energy Efficiency Program, the Rural Rehabilitation Program and the Energy Efficiency and Solar Grants Program.[175, 176]

[174] Ibid.

[175] "Washington's Clean Energy Roadmap" (U.S. Department of Energy| Energy Efficiency & Renewable Energy, n.d.), https://www.energy.gov/sites/prod/files/2020/02/f71/Washington-Implementation-Model.pdf.

[176] "Workforce Development," Washington State University Energy Program, n.d., http://www.energy.wsu.edu/ResearchEvaluation/WorkforceDevelopment.aspx.

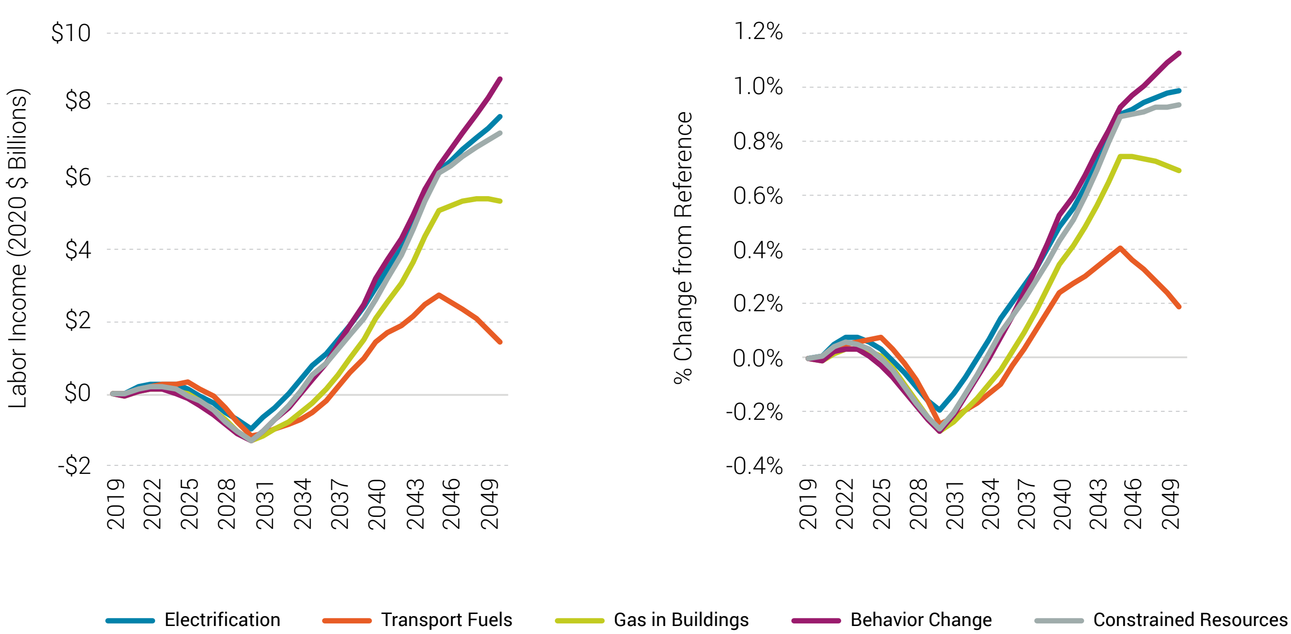
Washington's 2021 State Energy Strategy represents an opportunity to further support clean energy jobs and the state's overall workforce. Economic modeling shows that the strategy's climate and energy policies could boost employment in the 2020s and grow the workforce in the long term. The initial boost comes from investments made to build, transport, install and maintain the clean energy infrastructure needed for decarbonization. Employment takes a dip in the late 2020s and early 2030s as the economic benefits of deploying this infrastructure have yet to catch up to the costs of the energy transition. Employment would then regain speed, outperforming the Reference Scenario by as much as 1.2% (See Appendix E - Economic Impacts of Decarbonization Pathways Modeling).

Figure 25 shows the economic impact to labor income in Washington State in response to the analyzed deep decarbonization scenarios. Labor income is the sum of all household income types. These include wages and salaries, investment income and fringe benefits (mostly health insurance), adjusted for any changes in the cost of living, such as to energy prices or housing prices. The patterns for labor income are like those for employment and GDP across scenarios and through time.

Policy choices will lead to minor deviations from these predicted trends. Investments in transportation fuels leads to the greatest economic boom in the near term due to investment in manufacturing, delivering and distributing, and clean fuels statewide. However, long-term economic growth on this pathway is less than other alternatives given the higher costs to maintain clean fuel infrastructure. The Electrification and Constrained Resource Scenarios offer the greatest economic benefits over the long term. No matter the variation, each pathway increases jobs in the short- and long-term.

Current occupational and demographic trends suggest that not all workers will have an equal opportunity to compete for these jobs. The Legislature will need to pair a coherent, statewide workforce development strategy with inclusive policies that allow all Washingtonians to participate in clean energy economy.

FIGURE 25. ECONOMIC IMPACT TO LABOR INCOME IN WASHINGTON STATE



Source: Appendix E - Economic Impacts of Decarbonization Pathways, December 31, 2020 (p. 8).

6.1 Invest in Green Public Infrastructure

In Washington state, public works projects require a certain percentage of labor hours for a given construction project be performed by Washington State registered or approved apprentices (Apprenticeship Utilization Requirements).[177] From energy retrofits in public buildings to EV charging stations at state facilities, public works projects offer the opportunity to reduce emissions and generate demand for skilled apprentice labor in the clean energy economy.

Most agencies under the authority of the Governor (excluding WSDOT) must require 15% of the total labor hours to be performed by state-approved apprentices for projects estimated to cost $1 million or more. WSDOT must require 15% of the total labor hours to be performed by state-approved apprentices for projects estimated to cost $2 million or more. All public works by a school district or four-year higher education institution estimated to cost $1 million or more must contain specifications requiring that no less than 15% of the labor hours to be performed by registered apprentices.

ACTION

- Continue to invest in green public infrastructure and consider expanding labor requirements for public projects.

6.2 Invest in Reducing Emissions from State Contracts and Operations

In addition to the statewide greenhouse gas emissions limits, Washington state agencies are subject to a requirement to reduce emissions from state operations.[178] One way to support in-state industry and enlist the private sector in decarbonization is to leverage the buying power of state and local government. In 2020, Governor Inslee issued Executive Order 20-01, concerning State Efficiency and Environmental Performance.[179]

When making purchasing, construction, leasing and other decisions that affect state government's emissions of greenhouse gases or other toxic substances, agencies are explicitly directed to consider the benefits and costs, including the social costs of carbon of available options to avoid those emissions. Where cost-effective and workable solutions are available to reduce or eliminate emissions, decision makers are required select the lower-emissions options.

However, directives are not sufficient without attention to implementation. For example, the state has set requirements in Chapter 194-28 WAC for state agencies and local governments to procure alternative fuels and vehicles procurement based upon total cost of ownership and the social cost of carbon, but these rules have yet to receive the enforcement authority and administrative funding necessary for effective implementation.

Governments in Washington procure a wide range of products and services. Public contracts present opportunities to support high-quality, accessible jobs. Requiring or incentivizing suppliers and contractors to meet certain labor standards, disclose the emissions performance of their products and follow low carbon practices can support a strong workforce and further the state's progress in decarbonizing. Requiring agencies to factor greenhouse gas emissions into purchasing decisions supports and drives clean industry—leveling the field for those who have invested in green approaches and motivating others to follow suit.

ACTION

- Adopt "Buy Clean / Buy Fair" requirements for public projects.
- Ensure that existing procurement requirements and associated master contracts are supported and properly implemented.

[177] Chapter 39.04.320 RCW.

[178] (1) State agencies shall meet the statewide greenhouse gas emission limits established in RCW 70A.45.020 to achieve the following, using the estimates and strategy established in subsections (2) and (3) of this section: (a) By July 1, 2020, reduce emissions of greenhouse gases to eight hundred five thousand metric tons, or fifteen percent below 2005 emission levels; (b) By 2030, reduce emissions of greenhouse gases to five hundred twenty-one thousand metric tons, or forty-five percent below 2005 levels; (c) By 2040, reduce emissions of greenhouse gases to two hundred eighty-four thousand metric tons, or seventy percent below 2005 levels; and (d) By 2050, reduce overall emissions of greenhouse gases to forty-seven thousand metric tons, or ninety-five percent below 2005 levels and achieve net zero greenhouse gas emissions by state government as a whole. (RCW 70A.45.050).

[179] "State Efficiency and Environmental Performance," Pub. L. No. Executive Order 20-01 (n.d.), https://www.governor.wa.gov/sites/default/files/exe_order/20-01%20SEEP%20Executive%20Order%20%28tmp%29.pdf.

6.3 Invest in Washington's Clean Buildings and Weatherization Workforce Development Organizations

Washington's Green Economy Report found that a majority of Washington's clean energy sectors do not have well established workforce pipelines. The report identified 11 recommendations to develop and support workforce pipelines. In addition to those recommendations, a number of other complementary opportunities exist. One of those relates to building energy efficiency and decarbonization.

Building energy efficiency continues to be an excellent economic and climate change investment for Washington. It is the single largest clean tech employer and, according to the E2 2019 clean jobs in Washington study, demand for clean buildings and weatherization jobs are anticipated to grow as a result of market forces and public policy, i.e., the Clean Commercial Buildings Standard (Chapter 285, Laws of 2019). Additional investments in the state's buildings workforce will assist the state in meeting its climate objectives by ensuring that it has the workforce capable of accomplishing the state's energy efficiency and decarbonization objectives.

Washington has two model workforce development organizations for energy efficiency and decarbonization in the buildings sector. The Smart Buildings Center has been a regional leader in commercial building energy efficiency training and education, offering state of the art trainings in building energy efficiency and nationally recognized building operator certification program — a competency-based credentialing program for building engineers and maintenance personnel.

The Buildings Performance Center has been a leader in weatherization training and education. Employers and trainees highly recommend the Center, but also note the need for trainings to be offered more frequently and for the curriculum to be expanded. Additional funding will also be required to expand outreach and recruitment activities.[180]

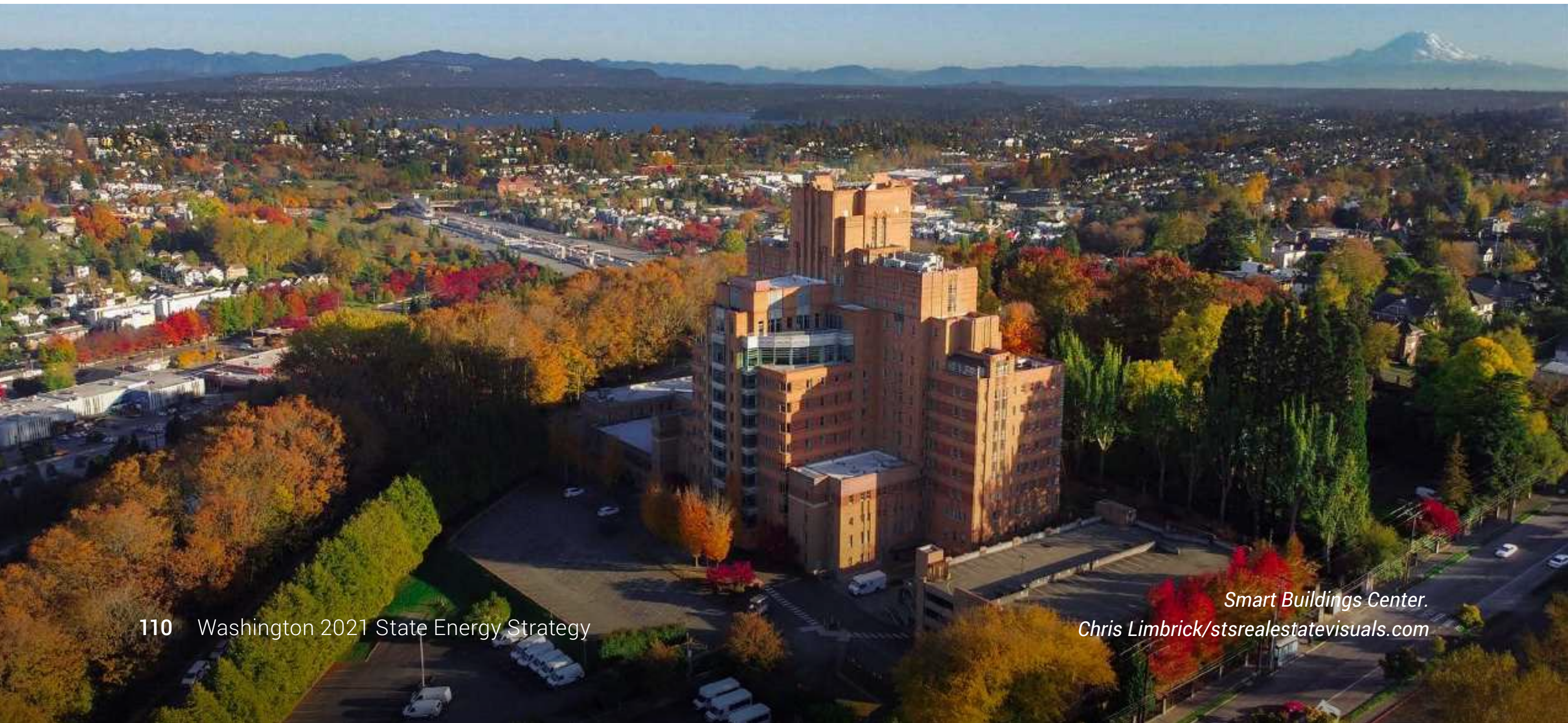
The 2021 State Energy also recommends a significant market shift to heat pumps. The installation and maintenance of these heat pumps requires a skilled workforce with licenses or certifications in electrical and refrigeration management. It is in the interest of the state to ensure that it has a workforce ready to install and maintain over the medium to long-term.

ACTION

- The Legislature should invest in workforce development organizations for building energy efficiency and decarbonization. Funding should go toward the expansion of the state's existing curriculum, increasing the frequency of trainings and providing grants and stipends for

[180] Alan Hardcastle, "Weatherization Workforce Roadmap for Washington State" (Washington State University Energy Program, March 2020), https://www.commerce.wa.gov/wp-content/uploads/2020/11/Wx-Workforce-Roadmap-FINAL-March-2020-Rev-1.pdf.

[181] Ibid.



Smart Buildings Center.
Chris Limbrick/stsrealestatevisuals.com

participants in commercial and residential energy audit certifications, building operator certifications, energy management and energy code training and construction trades. Grants, stipends and trainings should be equitably advertised and offer opportunities to historically under-resourced and underrepresented communities.

- Assess labor market development needs for electrical and refrigeration licenses or certifications for heat pumps, and develop plans with the apprentice training institutions to meet those needs.

Technical trainer explaining solar panel model to students. Cavan Images/Alamy Stock Photo

6.4 Establish Accredited System of Regional Dual-Credit Career & Technical Education Programs

Washington's Centers of Excellence partner with business, industry, labor and the state's education system to create workforce pipelines for industries critical to the state's economic vitality.[182] There are currently 11 Centers of Excellence.[183] Each center specializes in one key sector of the economy.[184]

The Pacific Northwest Center of Excellence for Clean Energy serves as the state's sole Center of Excellence for clean energy.[185] Located in Centralia, Washington, the Center offers 65 community college programs in the areas of power generation, transmission and distribution; solar, wind and hydro technologies; and demand response. Students receive the skills they need to be successful in their chosen industry and externships to demonstrate and further hone their skills.[186] They graduate ready to meet the state's workforce needs and connections to industry leaders in their fields of study.[187]

As the transition to the clean energy economy accelerates, there will be a need for greater workforce development in areas not currently covered by the Pacific Northwest Center of Excellence for Clean Energy or the Smart Buildings Center. For instance, the state currently lacks a workforce pipeline for the clean transportation sector.

The Centers for Excellence provide a model upon which the state can meet its workforce needs as they relate to the clean energy transition.

ACTION

- The Legislature should commission the state's Centers of Excellence to identify regional "clusters" of dual credit career and technical education (CTE) courses and funding opportunities in the clean energy sector. Each cluster should advance a degree or certification in two or more careers in clean energy.[188] The Centers of Excellence should engage under-resourced and underrepresented communities in the development of their programs and recruitment policies. Grant and stipend opportunities for these communities should be part of each program.

6.5 Establish the Washington Climate Corps Program

To complement a dual-credit CTE initiative, the state should establish a comprehensive apprenticeship strategy that provides clean energy and construction training and work experience to young adults and veterans. A Climate Corps program would provide hands-on experience and community energy planning to prepare Washington communities for the clean energy transition.

[182] "About Us," Washington State Centers of Excellence, n.d., https://www.coewa.com/about.

[183] "Centers of Excellence," Washington State Centers of Excellence, n.d., https://www.coewa.com/centers-of-excellence.

[184] Ibid.

[185] "Clean Energy," Washington State Centers of Excellence, n.d., https://www.coewa.com/clean-energy.

[186] "Who We Serve," Washington State Centers of Excellence, n.d., https://www.coewa.com/who-we-serve.

[187] "Industry," Washington State Centers of Excellence, n.d., https://www.coewa.com/industry.

[188] Existing COEs representing advanced manufacturing, clean energy, maritime and IT have applied for a federal grant opportunity, but funding is not guaranteed.

King County Metro All-Electric Bus. Ned Ahrens

ACTION

- The Legislature should establish the Washington Climate Corps through the Washington Service Corps. Intermediary grants should be provided to the Centers of Excellence and Career Connect Washington to link dual-credit CTE graduates to existing registered apprenticeship programs, connect businesses to established apprenticeship programs and assist industries in establishing new apprenticeship programs when needed.

6.6 Establish a Battery-Electric Bus Fleet Training Program

To meet Washington's greenhouse gas emissions targets will require the conversion of Washington's public buses to battery electric fleets. A new and retrained workforce will be required to operate and maintain these vehicles and their supporting infrastructure.

King County Metro is the first metro area in Washington to begin planning a workforce program for battery-electric buses. In its 2020 Battery-Electric Bus Implementation Report, King County Metro identified that the transition to a battery-electric fleet will require training for battery maintenance, safety and dispatching, operator training, transit control center and service quality. Metro is currently working with the industry leaders to develop this program and coordinate and help write the training manuals to meet local transportation requirements. The report notes:

Longer term, Metro leadership needs to work closely with its operational workforce to assure a successful transition from launch to long-term operations. Metro should also be actively working with local colleges for a pipeline of required trades and competencies as electricians are going to be in high demand as transportation continues to electrify.[189]

Establishing a statewide training workforce pipeline for battery-electric fleets would provide workforce development for the whole state as the state transitions its bus fleets to battery-electric and zero-emission vehicles.

ACTION

- The Legislature should establish a workforce pipeline for the operation and maintenance of battery-electric buses and the installation and maintenance of their requisite charging infrastructure. The program should include grants and stipends for under-resourced and underrepresented communities and the operators and crewpersons of retiring fossil fuel fleets.

6.7 Prepare for a Just Industrial Transition

Even with policy intention and intervention to maintain existing industry and grow new clean industries, some Washington industries may decline over the next decades due to global or national market forces. When possible, that decline should be managed to avoid worker displacement and economic disruption. Planning a just transition is a way to decouple emissions reductions from economic opportunities for communities and workers.

Steps to enable rapid decarbonization (e.g., expedited permitting or siting) should be thoughtfully implemented

[189] "Battery-Electric Bus Implementation Report" (King County Metro, January 2020), https://kingcounty.gov/~/media/depts/metro/programs-projects/zero-emissions-fleet/battery-electric-bus-implementation-report.pdf.

so as not to create displacement, environmental damage or economic disinvestment in local communities, referred to as "sacrifice zones," often through locally unwanted land use. Tools such as the Washington Environmental Health Disparities Map[190] can help identify communities most impacted by siting a certain industry and to determine the local priorities. The permitting and siting processes must ensure meaningful participation of and representation by those most impacted in decision making.[191]

Long-term planning needs to recognize that fossil fuel use will continue to decline, with or without explicit policy. The state needs a long-term strategy for transitioning the skilled fossil fuel workforce to good-paying, skilled, clean energy jobs.

The landmark 2011 Memorandum of Understanding between the State of Washington and TransAlta to phase out the coal-fired power plant in Centralia is a successful example of a just transition. The agreement includes a commitment by TransAlta to make annual financial assistance payments to support weatherization and energy efficiency; education, worker retraining and economic development in the region (Lewis and South Thurston counties), and grants to support the deployment of clean energy technologies.[192] Under the agreement, $55 million in grant funds are overseen by three Coal Transition Funding Boards: the Weatherization Board, Economic & Community Development Board and Energy Technology Board.[193]

Unit 1 of the Centralia coal plant is slated to shut down on December 31, 2020. Unit 2 will shut down on December 31, 2025. The 15-year timeline adopted for the phaseout plan was designed to minimize job losses by allowing many employees to reach retirement age, or plan ahead to seek new employment.[194]

> The state needs a long-term strategy for transitioning the skilled fossil fuel workforce to good-paying, skilled, clean energy jobs.

Over the coming decade, the fossil fuel industry is expected to lose about 140 jobs per year in Washington.[195] Prior to the COVID-19 pandemic, researchers estimated that these job losses could primarily be handled through retirement.[196] Protections for workers, such as pension guarantees,[197, 198] bridges to retirement, wage compensation insurance,[199, 200] and retraining are important for a just transition.

ACTIONS

- Identify the industries that are likely to experience transition and make a transition plan for the workers well in advance of closure. Engage industry leaders, community representatives and labor unions from the outset in mapping the priorities of each group impacted by industrial transition.
- Ensure that transition policies promote labor standards, shared benefits and long-term support for Washington industries and jobs.
- Adopt permitting and siting processes that ensure community participation and representation.

[190] "Washington Tracking Network: A Source for Environmental Public Health Data," n.d., https://fortress.wa.gov/doh/wtn/WTNIBL/.

[191] "Front and Centered Approach to Equitable Greenhouse Gas Reduction in Washington State" (Front and Centered, 2020), https://frontandcentered.org/accelerating-just-transition-in-wa-state/.

[192] "Memorandum of Agreement" (Washington Department of Ecology, December 23, 2011), https://ecology.wa.gov/DOE/files/85/858591f6-dd25-47be-ba1d-0f58264ca147.pdf.

[193] "Centralia Coal Transition Grants," n.d., https://cctgrants.com/.

[194] "TransAlta, Legislators and Environmental Groups Reach Agreement for Centralia's Transition," accessed October 26, 2020, https://www.transalta.com/our-operations/united-states/centralia/community-updates/transalta-legislators-and-environmental-groups-reach-agreement-for-centralias-transition/.

[195] Robert Pollin, Heidi Garrett-Peltier, and Jeannette Wicks-Lim, "A Green New Deal for Washington State" (University of Massachusetts Amherst, 2017), https://www.peri.umass.edu/publication/item/1033-a-green-new-deal-for-washington-state.

[196] Ibid.

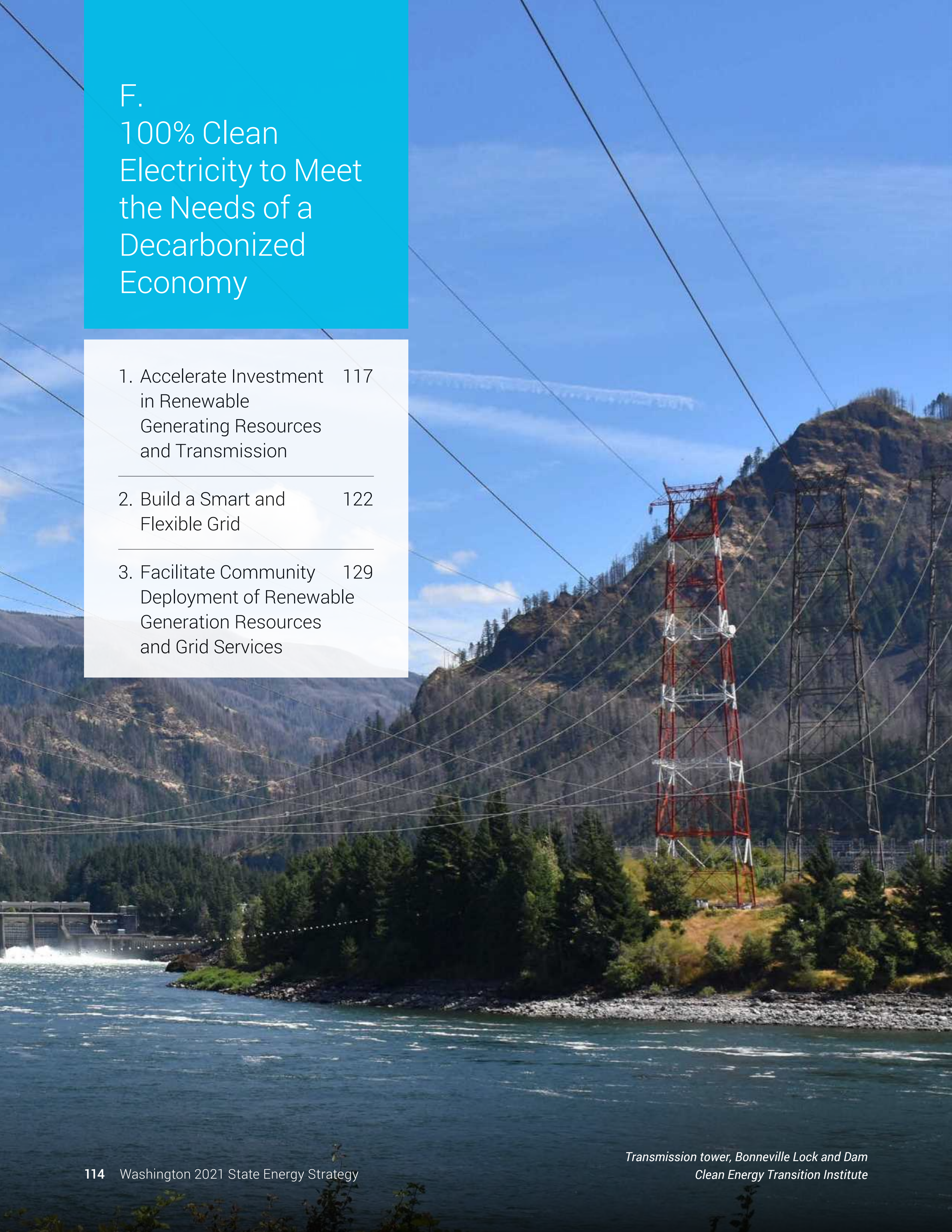
[197] Jeremy Brecher, "No Worker Left Behind: Protecting Workers and Communities in the Green New Deal," New Labor Forum 29, no. 2 (May 1, 2020): 68–76, https://doi.org/10.1177/1095796020915177.

[198] Elena Foshay, Jill Kubit, and Lara Skinner, "Making the Transition: Helping Workers and Communities Retool for the Clean Energy Economy" (Apollo Alliance and Cornell Global Labor Institute, 2009), http://www.nlg-laboremploy-comm.org/media/Events_Conv2010-GreenEconCornell_ILR_Making_the_T.pdf.

[199] Robert Pollin and Brian Callaci, "The Economics of Just Transition: A Framework for Supporting Fossil Fuel–Dependent Workers and Communities in the United States," Labor Studies Journal 44, no. 2 (June 1, 2019): 93–138, https://doi.org/10.1177/0160449X18787051.

[200] Foshay, Kubit, and Skinner, "Making the Transition: Helping Workers and Communities Retool for the Clean Energy Economy."

F. 100% Clean Electricity to Meet the Needs of a Decarbonized Economy



Transmission tower, Bonneville Lock and Dam
Clean Energy Transition Institute

F. 100% Clean Electricity to Meet the Needs of a Decarbonized Economy

Electricity will play a transformative role in meeting Washington's greenhouse gas reduction limits. The state will need to grow and manage clean, reliable electricity generation to meet increasing demand from buildings, industry and transportation. With its relatively clean grid,[201] ambitious clean electricity requirements and deep expertise in electricity, Washington is poised to be a leader in the transition to an electrified, decarbonized economy over the coming decade.

This will require a comprehensive change of the electricity sector—from the interactions of individual customers and communities with the grid to the generation and transmission of electricity across the West. An equitable transformation, as envisioned in the Clean Energy Transformation Act (CETA), will reflect community priorities for resilience and affordability, ensure that all customers benefit from smart grid services and preserve reliable service.

The electricity sector strategies complement those recommended for other sectors with end uses converted from fossil fuels to electricity where possible. This is particularly true for the transportation and buildings sectors. The strategies will:

- Meet CETA's requirements for a greenhouse gas neutral electricity supply by 2030 and 100% renewable or non-emitting ("clean") electricity by 2045, while incorporating equity, reliability and resource adequacy principles.
- Fulfill energy and capacity demands created by increased electricity use in transportation, buildings and industry.
- Increase grid resilience and satisfy community demands for electricity services.[202]
- Advance an equitable clean energy economy and create living-wage jobs.

Solar panels on roof of North Utility Building at Marymoor Park, WA.

The deep decarbonization modeling analysis performed for this strategy, combined with a review of existing decarbonization plans and independent analyses, point to a transformational role for the electricity sector in a decarbonized future. Even in those scenarios with continued use of gas or liquid forms of energy, Washington needs clean electricity to produce those fuels.

[201] "Washington State Electric Utility Fuel Mix Disclosure Reports: For Calendar Year 2018" (Washington State Department of Commerce, 2019), https://www.commerce.wa.gov/wp-content/uploads/2020/04/Energy-Fuel-Mix-Disclosure-2018.pdf.

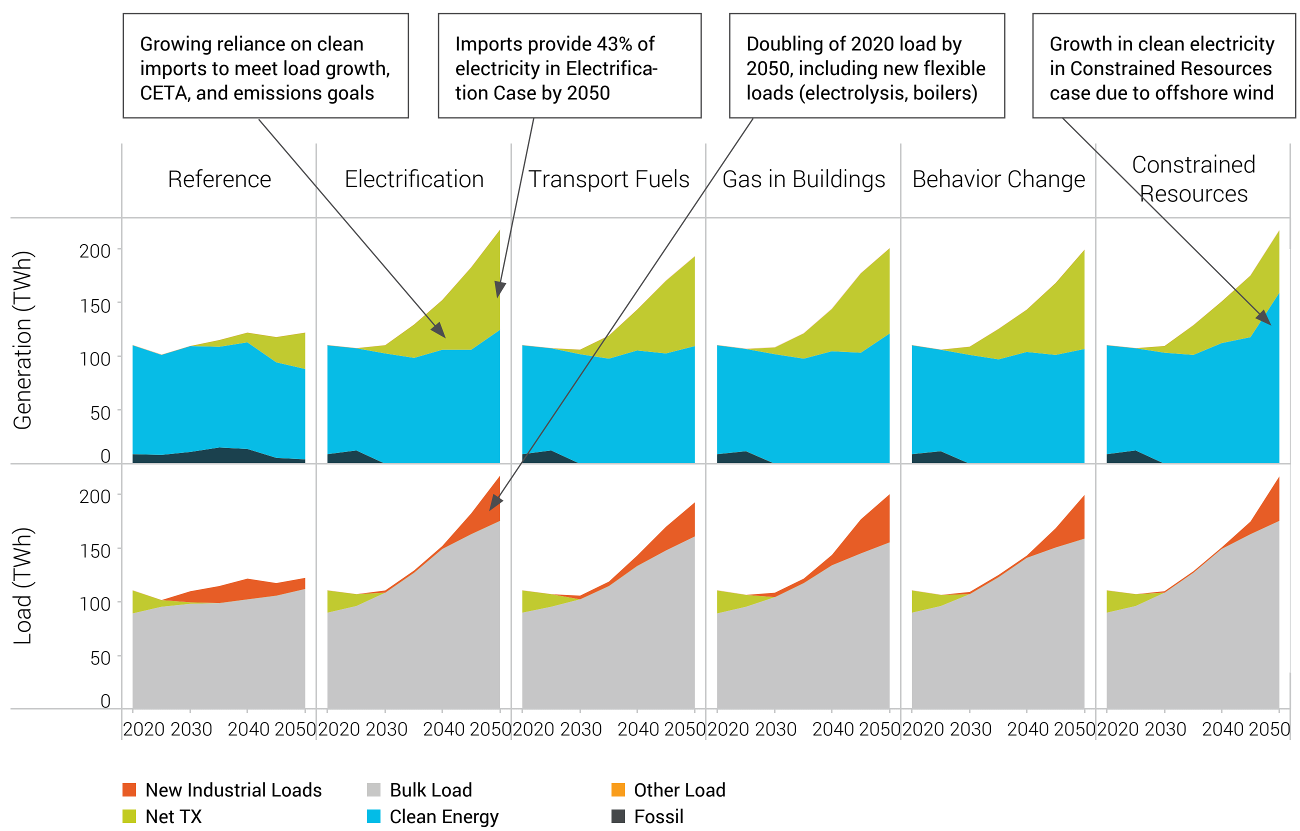
[202] Ralph Kappelhoff et al., "Embracing the Voice of the Customer" (2019 Grid Forward Conference, October 9, 2019). Customer and community demands include enhanced energy security, health and environmental benefits, uninterruptible, high-fidelity power for data operations and the procurement of locally-sourced electricity.

The modeling suggests that electricity demand in Washington could grow by 13-20% over 2020 levels by 2030. Electricity load growth then accelerates, and by 2050 is up to 92% above the 2020 level, as shown in Figure 26. By 2045, 42-50% of the energy used in Washington would be in the form of electricity, up from 21% today. This growth — occurring parallel with CETA requirements for carbon-neutral electricity by 2030 and 100% non-carbon emitting by 2045 — will require diverse, new non-carbon-emitting generation resources.

The transformation to clean electricity will enable and require Washington to use energy more efficiently. In addition to the inherent efficiency advantages of electric vehicles and electric heat pumps over direct combustion alternatives, Washington must continue to prioritize end-use efficiency, with particular emphasis on the buildings sector. This has been a successful strategy in the Pacific Northwest for more than 40 years. As the power system evolves, an increasingly smart grid will allow more complex energy management, such as regional demand response programs and other non-wires solutions, leading to the efficient use of renewable and non-emitting generation.

To transform the state's overall energy system, the electric power system requires substantial alteration. New or expanded transmission capacity is required for access to the best renewable resources and to take full advantage of coordination opportunities across the West.

FIGURE 26. POTENTIAL FUTURE ENERGY MIX IN DEEP DECARBONIZATION MODELING



Source: Appendix A – Deep Decarbonization Pathways Modeling Report, December 11, 2020 (p. 38).

A modernized grid will allow more flexibility in operations and more use of distributed resources such as solar, storage and demand response. The institutions and organizations that operate, plan and regulate the electric system also require change.

1. Accelerate Investment in Renewable Generating Resources and Transmission

Significant quantities of new clean generation will be required to meet the future energy requirements of Washington's businesses and households. The resource requirements include new power generation facilities, expanded transmission capacity, demand response resources, end use energy efficiency and modernization of the electric distribution grid. Washington's utilities can choose among multiple types of clean generation resources.

The deep decarbonization modeling suggests that wind and solar will be the most cost-effective resources, but all resource decisions are subject to more specific analysis, including the 2021 Northwest Power Plan[203] and individual utility integrated resource plans. Under CETA, nuclear generation can compete as well. There also are choices to be made about the location of new generating resources, either within the state or at more distant locations with better energy characteristics but greater transmission requirements. The actual outcome will almost certainly be a combination of resource types sited both in-state and outside Washington.

The electric power system investments required by the transformation can provide an important economic and financial opportunity for workers and businesses. However, after almost 30 years of stable electricity demand,[204] electric resource acquisition of this scale and at this pace will be an unfamiliar challenge for utilities, project developers, planning organizations, the financial community, regulators and siting agencies. The Legislature anticipated this challenge in CETA with additional planning requirements[205] and authority for the Utilities and Transportation Commission (UTC) to use alternative regulatory approaches.[206]

Wind turbines, Goldendale, WA. Clean Energy Transition Institute

Recommended approaches to meet this challenge focus on a more robust transmission system across the Western Interconnection, an increased focus on resource adequacy, reform of wholesale electric markets, improved data and research about resource options and accelerated modernization of the communications and control abilities in the distribution system.

[203] "The 2021 Northwest Power Plan," accessed November 1, 2020, https://www.nwcouncil.org/2021-northwest-power-plan.

[204] The state's electricity consumption in 1992 exceeded its consumption in 2018, the most recent year for which data is available. "Table CT3. Total End-Use Energy Consumption Estimates, 1960-2018, Washington," Washington - SEDS - U.S. Energy Information Administration (EIA), n.d., https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_use/tx/use_tx_WA.html&sid=WA.

[205] Chapter 19.280.030 RCW.

[206] Chapter 80.28.401 RCW; Chapter 80.04.250 RCW.

Panoramic view of solar panels.

1.1. Assess the Potential for and Facilitate Deployment of New Clean Energy Resources

To take best advantage of opportunities to develop clean resources within Washington, utilities will need detailed information about potential locations. Accurate site information could speed resource development, avoid duplication of efforts and reduce conflicts among competing uses, including wildlife and military uses.

In 2020, the Legislature funded a pilot study, modeled on work in California,[207] to identify solar sites in the Columbia Basin that minimize conflict among potential uses. However, this funding was among the budget items vetoed due to budget shortfalls related to the COVID-19 pandemic.[208] This pilot study concept should be expanded to a statewide assessment.

An assessment should engage a range of stakeholders and communities, ensure burdens and benefits are shared and incorporate public and environmental health as part of the review. Technical, environmental, legal and economic criteria should reflect the requirements of communities, utilities and project developers. This stakeholder engagement should inform a statewide effort to identify clean energy corridors or development zones. A successful assessment could support changes to permitting requirements.

ACTION

- Funding should be made available to Commerce and electric utilities to conduct a statewide clean energy potential assessment to identify clean energy development zones.

[207] "Mapping Lands to Avoid Conflict for Solar PV in the San Joaquin Valley," May 2016, https://www.law.berkeley.edu/research/clee/research/climate/solar-pv-in-the-sjv/.

[208] "Engrossed Substitute Senate Bill 6168," § 604(33) (2020), http://leap.leg.wa.gov/leap/budget/lbns/2020Omni6168-S.SL.pdf.

1.2. Strengthen the Transmission System across the West and within the State

A power system that relies primarily on renewable resources will require a more robust and flexible transmission network, compared to a power system that relies on fossil fuels. Enhanced transmission capacity improves access to superior wind resources in the Mountain West and superior solar resources in the Southwest. A robust transmission system increases reliability and reduces the amount of resources each utility must hold in reserve to ensure adequate supplies.

While unsuccessful past efforts could discourage a strategy that relies on out-of-state resources and coordinated operations, the crucial role of transmission, as well as effective market coordination, is demonstrated in recent analysis for the Western Interstate Energy Board.[209] The analysis concluded that increased regional grid integration and market coordination would lower future electricity costs and significantly reduce the potential for curtailment of renewable generation.

Under baseline business-as-usual assumptions, renewable curtailments could approach 20% of total renewable energy production by 2035. (Curtailment occurs when renewable generation exceeds demand for electricity.) With regional coordination, curtailments would be less than 10% and production costs would be $2.2 billion lower than in the baseline case. In contrast, limited regional coordination — that is, no day-ahead market — results in the highest increase in costs ($11.3 billion in 2035) and leads to renewable curtailment of 50%.

The needed expansion of transmission capacity will require coordination among utilities, planning agencies and governments. Some stakeholders advocate for creation of a regional transmission organization to administer the transmission grid on a regional basis.[210] The owners of existing transmission resources, such as BPA and various retail electric utilities, are in the best position to advance this work and build on recent progress in establishing NorthernGrid, a collaborative transmission planning entity.[211]

An important element of this work in Washington is the transmission corridors workgroup created by the Legislature as part of CETA.[212] The primary focus of this workgroup is to ensure adequate transmission capacity and appropriate environmental review of transmission projects within the state. In addition to new capacity, additional capacity could be made available within the existing system through the reform of transmission pricing and contract structures.

ACTIONS

- The Governor's office, the UTC and Commerce should pursue opportunities for enhanced transmission planning and integration across the Western grid and advocate for joint development where feasible.
- Utilities and planning agencies should evaluate the need for joint development of new and upgraded transmission capacity and consider the viability of a regional transmission organization.

1.3. Encourage and Monitor Development of a Resource Adequacy Program

One of the core requirements of CETA is reliable service. Each utility must ensure it maintains enough resources to maintain reliable service under a wide range of operating conditions.[213] The priority of resource adequacy (RA) is demonstrated by CETA's provision allowing a utility to temporarily suspend the clean energy transition if necessary to preserve reliability.[214] Commerce is directed to lead an evaluation of the impact of CETA's requirements on system reliability and other values starting in 2023.[215]

[209] Energy Strategies, "Western Flexibility Assessment" (Western Interstate Energy Board, 2019). https://westernenergyboard.org/wp-content/uploads/2019/12/12-10-19-ES-WIEB-Western-Flexibility-Assessment-Final-Report.pdf

[210] "Electric Power Markets," Federal Energy Regulatory Commission, accessed November 30, 2020, https://www.ferc.gov/industries-data/market-assessments/electric-power-markets.

[211] "NorthernGrid," accessed November 30, 2020, https://www.northerngrid.net/.

[212] Chapter 19.405.150 RCW.

[213] Chapter 19.280.030 RCW.

[214] Chapter 19.405.090 RCW.

[215] Chapter 19.405.080 RCW.

Hydroelectric power plant and transmission at the Grand Coulee Dam, WA.

In 2019, the Northwest Power Pool (NWPP), composed of major generating utilities serving the Northwestern U.S., British Columbia and Alberta, started a project to address RA. NWPP has proposed a program in which individual utilities would adopt consistent standards for the amount and type of resources needed to serve customers reliably. An RA standard and program not only reduce the risk of a shortage of electricity supply, but also lower the amount of resources needed to achieve any particular level of reliability.

While the NWPP initiative is a promising start, ongoing monitoring and evaluation by the UTC and Commerce will be required. The effective implementation of an RA program in compliance with CETA will require complex analysis of resource requirements and the contributions to reliability from diverse resources, such as hydro, wind, solar, storage and demand response.[216] The analytical methods must be consistent and transparent. They must account for the diverse capabilities of these resources to ensure that renewables, storage and hybrid resources compete on an equal footing with thermal resources.

ACTIONS

- Washington utilities, resource owners and developers and other stakeholders should continue to engage in development of a consistent and non-discriminatory RA program through the NWPP.
- Commerce and the UTC should review the progress and outcomes of the NWPP RA initiative and evaluate the need for additional state action to ensure CETA's RA requirements are fulfilled.

1.4. Reform and Expand Wholesale Electricity Markets

Wholesale markets are important for maintaining a reliable and affordable electricity supply. Invisible but beneficial to individual customers, these markets help utilities balance the supply and demand for electricity. When utilities find a cheaper power source outside their own portfolio, a market transaction avoids the excess costs of building or separately procuring additional resources. Without electricity markets, electricity would be more expensive and less reliable.

Historically, Washington's electric utilities have relied heavily on a bilateral market in which individual utilities, power plant operators and brokers contract for power at the mid-Columbia delivery point on the transmission system.[217] A bilateral market focuses on short-term trades without a central entity to consider other financially feasible trades.

Since 2014, the region's utilities have increasingly relied on the Western Energy Imbalance Market (EIM) to identify and capture cost-minimizing power trades in a centralized system. The EIM was created by the California Independent System Operator and PacifiCorp. By 2022, most utilities serving Washington customers will participate directly or indirectly in the EIM.[218] These markets have saved utility customers in the West more than a billion dollars when compared with the cost for each utility running its own power plants to serve its own customers every hour.[219]

[216] "Redesigning Capacity Markets: Innovation Landscape Brief" (International Renewable Energy Agency, 2019), https://www.irena.org/publications/2019/Jun/Market-Design-Innovation-Landscape-briefs.

[217] "Wholesale Electricity and Natural Gas Market Data," accessed November 1, 2020, https://www.eia.gov/electricity/wholesale/.

[218] "Western EIM Factsheet" (California ISO, 2020), https://www.westerneim.com/Documents/WesternEIMFactSheet.pdf.

[219] "ISO Announces the Western EIM Surpassed $1 Billion in Benefits" (California ISO, Western Energy Imbalance Market, 2020), https://www.westerneim.com/Documents/ISO-Announces-Western-EIM-Surpassed-1Billion-Benefits.pdf.

There is value in extending the scope of organized markets to cover more than the short-term market. However, the existing wholesale electricity markets require reform to ensure that market rules do not force utilities to choose between meeting their clean electricity obligations and realizing the efficiency benefits of organized markets. This potential conflict arises because existing markets typically do not differentiate between electricity from renewable sources and electricity from natural gas or coal-fired plants. While market traders have the option to specify that electricity will be renewable, the vast majority of current market transactions are for "unspecified electricity." This market rule is the result of industry practice rather than any legal requirement.

Because of the potential conflict between market practices and clean electricity requirements, in November 2019 Commerce and the UTC convened a carbon and electricity markets workgroup under CETA. The workgroup will provide input into rules to address the use of market purchases to serve retail customers. Commerce and the UTC are required to adopt rules by June 2022.

Electricity market reform is necessarily a multi-state effort. Success will likely require a different organization or governance structure than the EIM, which is controlled by the State of California with participation by a Body of State Regulators.[220] For example, public power utilities in the Northwest have published a set of principles for appropriate governance of an expanded market.[221]

These principles include establishing a board with a selection process that is durable and independent from market participants or regional governments; giving that board decision-making authority over market rules; engaging an independent market expert; including a third-party dispute resolution process and ensuring that participation is voluntary. In the longer term, the industry should explore the use of market mechanisms to buy and sell capacity resources, which will become increasingly important as coal and natural gas generating facilities are retired.

[220] "Western EIM - EIM Body of State Regulators," accessed November 1, 2020, https://www.westerneim.com/Pages/Governance/EIMBodyofStateRegulators.aspx.

[221] "Northwest Public Power EDAM Governance Interests" (Public Generating Pool, Public Power Council, PNGC Power, Northwest Requirements Utilities, 2019), https://static1.squarespace.com/static/5e9fc98ab8d9586057ba8496/t/5ee532273ef4864f3e274b8e/1592078888146/1-23-2020-EDAM-Governance-Interests-with-logos.pdf.

Solar installation at the Capitol in Olympia, WA. Department of Commerce

ACTIONS

- Wholesale market participants should develop market rules to allow trade in electricity from sources verified to comply with CETA's clean energy requirements. The UTC and Commerce, with input from the Carbon and Electricity Markets Workgroup, should adopt rules to ensure this outcome.
- Electric utilities should pursue the long-term development of a fully integrated Western regional electricity market, beginning with expansion of organized markets to trade day-ahead and longer term resources. Long-term market development should explore opportunities to trade capacity resources, including demand response resources.
- Commerce's 2024 CETA evaluation under RCW 19.405.080 should include an assessment of industry progress in developing efficient and resource-specified electricity markets.

2. Building a Smart and Flexible Grid

A smart, flexible and optimized grid is foundational to meeting CETA goals and electrifying the economy while assuring system reliability and resilience at both the distribution and transmission levels. A modern system allows for two-way energy flows, control and management of the entire grid using data and digital technologies. The grid must be both resilient and flexible.

Resiliency includes the mitigation of and recovery from outages due to a range of possible scenarios including earthquakes, wildfires and human-caused cyber and physical attacks. Simply put, how much can the grid bend, but not break. Flexibility gives the system the capacity to manage and balance variable load from both centralized and especially distributed energy resources (DERs), like wind and solar. There is a wide range of DER technologies and applications available today.[222, 223]

Developing a modern grid will require new planning processes, infrastructure, software solutions and other tools to enable a mix of DER technologies.[224] Grid operators will need new controls to securely and reliability operate that future grid—managing variable demand and supply, ensuring adequate resource capacity and providing resilience.[225] Utilities will need situational awareness of capacity constraints and resilience for critical infrastructure to avoid issues experienced by some states with high penetrations of renewables, such as Hawaii and California.

Supported by new markets for firm capacity and other essential grid services,[226] the deployment of flexible capacity through demand response programs and other "non-wires" strategies, such as microgrids, will reduce grid congestion and improve efficiency, especially at the transmission level. At the distribution level, these adjustments will enable interactive customer engagement and allow for deployment of community-scale resources.

> To electrify the economy while assuring system reliability and resilience requires a smart, flexible and optimized grid.

[222] Tanuj Deora, Lisa Frantzis, and James Mandel, "Distributed Energy Resources 101: Required Reading for a Modern Grid," Advanced Energy Perspectives, 2017, https://blog.aee.net/distributed-energy-resources-101-required-reading-for-a-modern-grid.

[223] "The Many Types of Distributed Energy Resources, Common and Obscure," August 14, 2019, https://insidelines.pjm.com/the-many-types-of-distributed-energy-resources-common-and-obscure/.

[224] Kelsey A Horowitz et al., "An Overview of Distributed Energy Resource (DER) Interconnection: Current Practices and Emerging Solutions" (National Renewable Energy Laboratory, April 11, 2019), https://doi.org/10.2172/1508510.

[225] Appendix H – WA State Energy Strategy PNNL Presentation to CETI October 2020

[226] These include frequency response, regulating, contingency and ramping reserves, voltage management and power quality. "Connected Communities, Funding Opportunity Announcement (FOA) Number: DE-FOA-0002206, Appendix J" (Department of Energy, Office of Energy Efficiency and Renewable Energy, 2020), https://eere-exchange.energy.gov/Default.aspx#FoaId9d24afcd-e292-4ea2-a4d3-d36e2b9dd9c7.

Portland General Electric's Salem Smart Power Center includes a large-scale energy storage system. Portland General Electric

Fire threatening power lines running along US 97 in Washington State. WA State Department of Transportation

A modern electric grid delivers reliable, affordable and clean electricity to consumers where and when they want it. Grid resilience protects customers and businesses from outages. Flexibility ensures that renewable and distributed resources are smoothly integrated into the grid.

A better understanding of the value of DERs — especially the value of services ancillary to the grid — will help utilities and regulators understand the full impact and opportunity of these assets. A roadmap for DERs has been laid out through previous work on energy storage: The UTC conducted foundational work[227] to understand regulatory barriers. Five different pilot projects, funded in part by grants from the state's Clean Energy Fund (CEF)[228] and supported by analysis by the Pacific Northwest National Laboratory (PNNL), showed how storage can provide a range of services to the grid, such as energy shifting, flexibility and improved distribution system efficiency.[229]

2.1. Expand the State's Energy Infrastructure Security & Emergency Management Capabilities

As transportation and buildings are electrified and "smart" appliances become more ubiquitous, a flexible grid is essential. Flexibility will help to meet variable energy and demand needs (e.g., the timing of vehicle charging) and to deploy distributed stored energy (e.g., storage in vehicle batteries and water heaters). Strengthening and updating the electric grid with new technology can help prevent outages and permit real-time data sharing to increase system-wide efficiency.

At the same time, grid modernization will require a focus on cybersecurity and policies and practices to safeguard privacy. Privacy and security considerations are related but not synonymous. Generally, privacy is about controlling who has access to personal information, and security is about protecting that information from unauthorized access.[230]

Advanced metering infrastructure (AMI) is one of the key components of a smart grid, but its progress has been delayed by — among other factors — concerns about security and privacy.[231] Security protections, incentives for customer participation and opt-out provisions may address these concerns and remove obstacles to full deployment.[232]

Further, with regard to cybersecurity and resiliency, while Commerce is working with the National Association of State Energy Offices (NASEO) to develop and review best practices for the security of solar installations, the overall capacity of Washington's energy emergency management office is stretched thin. Washington should have a full Washington Office of Energy Infrastructure Security and

[227] "Report and Policy Statement on Treatment Of Energy Storage Technologies in Integrated Resource Planning and Resource Acquisition" (Washington Utilities and Transportation Commission, 2017), https://www.utc.wa.gov/_layouts/15/CasesPublicWebsite/GetDocument.ashx?docID=237&year=2016&docketNumber=161024.

[228] "Federal Research Spurs Washington State to Store Energy," Pacific Northwest National Laboratory, 2014, https://www.pnnl.gov/NEWS/release.aspx?id=1060.

[229] Vilayanur V. Viswanathan et al., "Washington Clean Energy Fund: Energy Storage System Performance Test Plans and Data Requirements" (Pacific Northwest National Laboratory, April 17, 2017), https://doi.org/10.2172/1474881.

[230] "Creating Smart Communities: A Guide for State Policymakers" (National Conference of State Legislatures, 2020), https://www.ncsl.org/Portals/1/Documents/energy/Smart_Communities_v03_11_20_35545.pdf. p. 19.

[231] Coley Girouard, "The State of Advanced Metering Infrastructure and Time-Varying Rates, in Three Maps and One Graph. The Leaders – and Laggards – May Surprise You.," Advanced Energy Perspectives (blog), accessed October 29, 2020, https://blog.aee.net/the-state-of-advanced-metering-infrastructure-and-time-varying-rates-in-three-maps-and-one-graph.-the-leaders-and-laggards-may-surprise-you. Some stakeholders also express concern about AMI as a tool to perform remote shutoffs and enable workforce reductions.

[232] Dockets U-180525, adoption order 7/29/2020 and Dockets U-180117, policy guidance issued on 4/10/2018.

Emergency Management modeled on the U.S. Department of Energy Office of Cybersecurity, Energy, Security and Emergency Response (DOE CESAR).[233]

A fully-funded office would coordinate with local emergency management officials to include assessment data in local hazard mitigation plans, support applications for FEMA resilience (BRIC) funding and coordinate energy resilience data and efforts with other infrastructure planning groups, such as the Washington Infrastructure System Improvement Team (Sync),[234] Public Works Board[235] and the Infrastructure Assistance Coordinating Council.[236]

The Energy Emergency Management Director at Commerce should have the authority and resources to: coordinate with utilities and local, state and federal emergency management offices about data uses and opportunities; review current industry standards for demand response equipment; coordinate with key state agencies and other stakeholders to identify what standards are already in place and what needs to be added; provide educational opportunities for energy providers in cybersecurity best practices; and continue to coordinate with NASEO on cybersecurity best practices.

ACTIONS

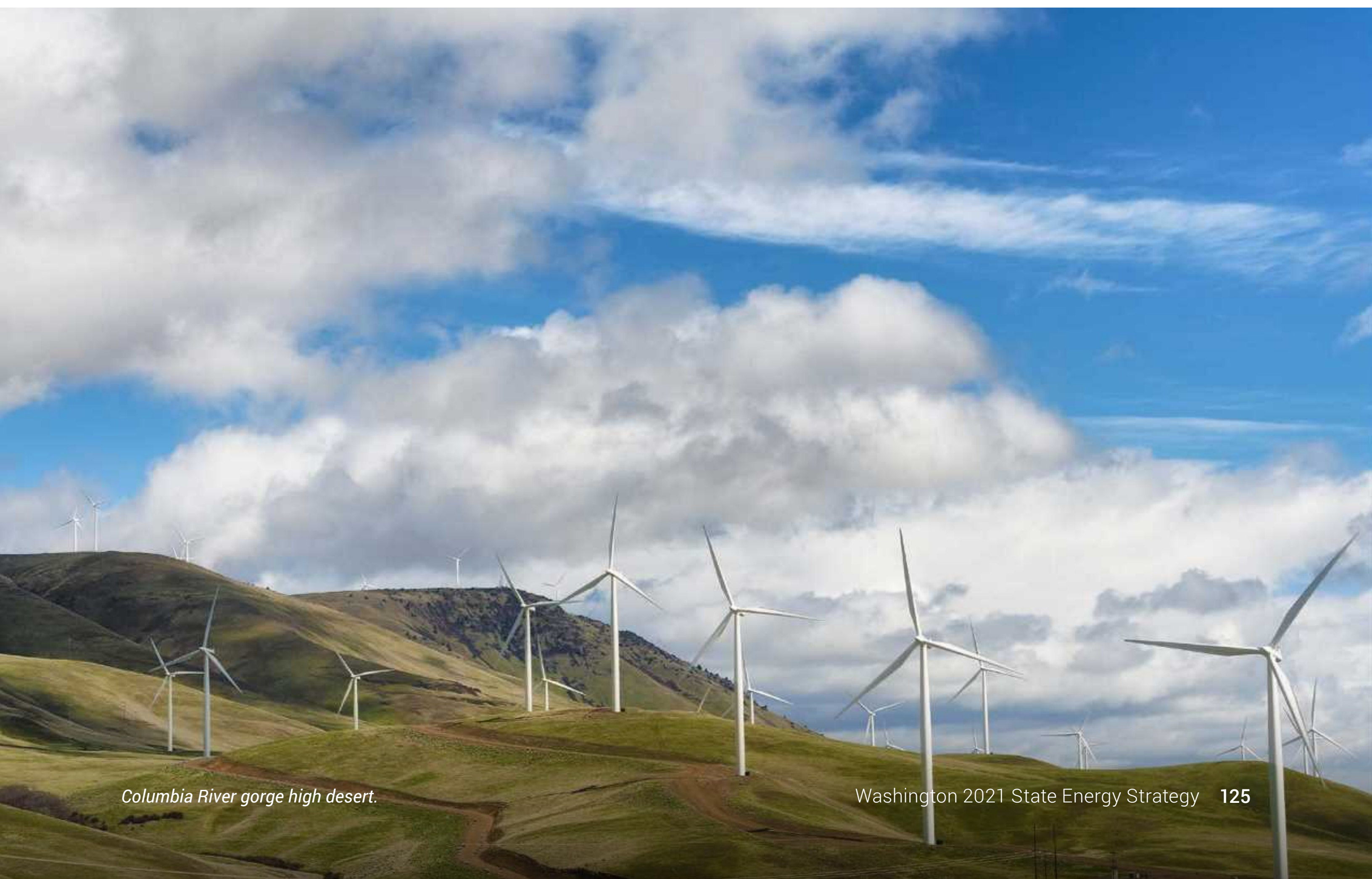
- Provide support for increased deployment of advanced metering infrastructure (AMI), with safeguards for privacy and security.
- Expand the energy emergency management program at the Department of Commerce.
- Develop statewide energy security standards.

233 "Office of Cybersecurity, Energy Security, and Emergency Response," Energy.gov, accessed November 1, 2020, https://www.energy.gov/ceser/office-cybersecurity-energy-security-and-emergency-response.

234 "Sync - System Improvement Team," Washington State Department of Commerce, accessed November 1, 2020, http://www.commerce.wa.gov/building-infrastructure/sync-systems-improvement-team/.

235 "Public Works Board - Home Page," Washington State Department of Commerce, accessed November 1, 2020, http://www.commerce.wa.gov/building-infrastructure/pwb-home-page/.

236 "Infrastructure Assistance Coordinating Council (IACC)," accessed November 1, 2020, https://www.infrafunding.wa.gov/.



Columbia River gorge high desert.

2.2 Define and Value Storage Resources

As the electricity system transforms to 100% clean resources, there is a likely role for energy storage to balance the supply and demand for electricity. Storage options include pumped hydro systems, battery storage systems and other technologies.

The need for storage resources should be assessed with care because the deep decarbonization modeling suggests that there may be other, more cost-effective approaches, such as developing hydrogen production as a flexible load. The value proposition for storage in the Pacific Northwest may be different from other regions where hydro resources are not available for short term load balancing.[237]

Long-duration storage, which would enable the region to hold hydroelectric generation from wet years to dry years, is a potentially valuable resource. Storage resources are also likely to be an important tool in increasing the resilience of the electricity grid. For example, community-based resilience hubs equipped with on-site renewable generation and battery storage could provide vital services during natural disasters and extended outages.

A technology-neutral policy toward capacity and demand response resources will allow storage resources to emerge where appropriate. Washington should also ensure that CETA's energy accounting practices accommodate the charging and discharging of storage resources.

ACTIONS

- Utilities should establish planning and evaluation methods that appropriately identify, define and calculate the value of storage for integration and of variable renewable energy resources to be considered as a source of capacity, ancillary services and additional services, such as voltage regulation.
- The UTC and Commerce should ensure that CETA's energy accounting methods accommodate the charging and discharging of storage resources within the electricity grid.

2.3. Prepare for Widespread Deployment of Distributed Energy Resources (DERs)

Washington's clean energy transition will require integration of DERs. Clear policy guidance, a common framework and better data can help inform utility and local planning for DER integration, guard against incompatible technology decisions and increase the confidence of investors and regulators. A voluntary, non-adversarial technology roadmap development could accelerate the identification and prioritization of the requirements for investments, communications, cybersecurity and technical standards.

There also is a need for a better understanding of the value of DERs and the capacity of distribution systems to host them. Utilities should perform and publish analyses of hosting capacity—that is, the amount of DERs that can be added to the distribution system at a given time and location without compromising power quality or reliability. This type of analysis will also assist utilities in meeting their CETA obligation to identify and acquire demand response resources.

Utilities can also identify system constraints, where DERs might be beneficial to the system. Project developers can use data from hosting capacity analyses to make interconnection processes faster and more transparent, identify the optimal locations to deploy DERs and avoid unnecessary distribution grid upgrades.[238] An analysis of critical loads can help local jurisdictions and emergency managers right size and prioritize DERs to promote resilience on the most important parts of the grid. The Oregon Public Utilities Commission's distribution system planning provides a helpful model for the UTC and individual utilities.[239]

[237] A summary of The Growing Role of Energy Storage in Clean Energy Policy can be found here: https://www.ncsl.org/research/energy/the-growing-role-of-energy-storage-in-clean-energy-policy.aspx

[238] Gwen Brown, "California Adopts First Interconnection Rules to Utilize Hosting Capacity Results," Interstate Renewable Energy Council (blog), 2020, https://irecusa.org/2020/09/california-adopts-first-interconnection-rules-to-utilize-hosting-capacity-results/.

[239] "Distribution System Planning," Oregon Public Utility Commission, accessed November 30, 2020, https://www.oregon.gov/puc/utilities/Pages/Distribution-System-Planning.aspx.

DER planning involves analyzing the potential contribution of demand-side resources to energy needs and resource adequacy while factoring in the distribution grid upgrades needed to realize that potential. In 2019, the Legislature adopted policy and practices that utilities must address if they pursue distributed energy resource planning.[240] However, DER planning remains voluntary for Washington utilities. The Legislature should continue to assess whether to maintain this approach or provide more specific requirements for DER planning.

ACTIONS

- Request support from the U.S. Department of Energy and PNNL to convene a DER workgroup to identify and resolve grid architecture barriers to DER deployment.
- Utilities should incorporate comprehensive assessments of the value of DERs in the specific context of individual distribution grids by performing and publishing hosting capacity and critical load studies.
- The Legislature should assess whether voluntary distribution system planning is the appropriate policy approach given the requirements of CETA.

2.4. Pursue Universal, Statewide Deployment of Broadband

The importance of universal broadband access is discussed throughout this strategy. Within the electricity sector, the value of broadband access comes from the role of communication in a flexible, smart electric grid. The electric grid needs universal communication to manage a diverse portfolio of clean energy resources. This approach will require rapid communication of information across the electricity network to individual devices located at customers' premises. Smart, connected end-use equipment, such as EV chargers and electric water heaters, interact with grid operators to maintain reliable service.

For example, Washington adopted a requirement that electric water heaters sold in the state have a built-in communications port capable of supporting remote

Biofuel worker. Argonne National Laboratory-Wes Agresta

demand response signals.[241] The port can be used with any number of communications devices and networks, which might be a proprietary electric utility network or a broadband Internet connection, but its value as resource to balance the power grid exists only with a reliable data connection.[242]

The electric industry is well-positioned to support widespread deployment of broadband access, combining its own communication requirements with those of education, public safety, business and other parts of society. Several electric utilities already provide telecommunications services in their service areas. For example, 15 public utility districts operate telecommunications systems that are available to retail providers of Internet service.[243] Utilities can also contribute to a societal solution as users of a public network where feasible, rather than investing in proprietary solutions.

ACTION

- Adopt a state policy to mandate universal broadband access.

[240] Chapter 19.280.100 RCW.

[241] "Appliance Standards," Washington State Department of Commerce, accessed November 1, 2020, http://www.commerce.wa.gov/growing-the-economy/energy/appliances/.

[242] The communications port is described in this BPA report: "Performance Test Results: CTA-2045 Water Heater: Testing Conducted at the National Renewable Energy Laboratory" (Palo Alto, CA: EPRI, 2017).

[243] "PUDs Providing Telecommunications Services," Washington Public Utility Districts Association, accessed November 1, 2020, https://www.wpuda.org/telecommunications.

2.5. Advance Grid Modernization with Clean Energy Fund Investments in Resilient & Flexible Projects

Grid resilience is an excellent investment. According to the National Institute for Building Science, every $1 invested in resilience funding through federal agencies saves $6 in averted disaster costs.[244, 245] These figures represent the savings to physical infrastructure in the face of natural disasters. As recently recommended by the Energy & Climate Policy Advisory Committee (ECPAC), the Clean Energy Fund (CEF) can invest in new technology and infrastructure required for a successful and equitable transition to clean electricity by adding resilience as a project priority. ECPAC and Commerce also recognize the need to engage communities on how these funds should be deployed to ensure projects are beneficial to local energy resilience.

There is also a long history of supporting infrastructure planning assistance in Washington through the Infrastructure Assistance Coordinating Council,[246] which helps local jurisdictions connect with grants and funding. However, local planning efforts do not often include grid modernization planning. By creating a mechanism for more holistic, institutional support for local clean energy infrastructure planning, flexible and resilient solutions like DERs can be introduced much further upstream in the planning process.

Planning efforts would be enhanced by increased connection between utilities and research institutions and the U.S. Department of Energy, and increased engagement from the clean tech sector. State funding should leverage private, federal or other funding and could include programs that increase resilience through microgrid and transactive projects, deploy demand response or load flexibility, especially with large industrial customers, and deploy clean energy solutions for critical load centers.

ACTIONS

- Provide state support for flexible and resilient planning and project development by creating a new cluster within Commerce's Office of Economic Development and Competitiveness to focus on utility grid optimization and DER deployment.
- Target CEF funding to projects that enable flexible load management and increase grid resilience.

[244] "National Institute of Building Sciences Issues New Report on the Value of Mitigation," National Institute of Building Sciences, 2018, https://www.nibs.org/news/381874/National-Institute-of-Building-Sciences-Issues-New-Report-on-the-Value-of-Mitigation.html.

[245] "Every $1 Invested in Disaster Mitigation Saves $6," The Pew Charitable Trusts, accessed November 1, 2020, http://pew.org/2D2JuLb.

[246] "Infrastructure Assistance Coordinating Council (IACC)."

Solar installation at the Decatur Island Community Solar Project.
Orcas Power & Light Cooperative

3. Facilitate Community Deployment of Renewable Generation Resources and Grid Services

Just as utilities must incorporate equity into their planning, state government must address access and equity in its own programs and funding. The Legislature has begun to signal this change through updated budget instructions for the CEF[247] and by funding efforts like the state Environmental Justice Task Force,[248] which has identified ways that state agencies can incorporate environmental justice priorities into their work.

Historically, state incentives have not been readily accessible to community-scale projects. Under the Renewable Energy System Incentive Program (RESIP),[249] over half of the solar installed was for residential scale solar, while community solar accounted for just 1% of projects.[250] Net metering laws often restrict meter aggregation and do not have specific requirements for virtual net metering, limiting access for multifamily projects. Low-income households can have difficulty taking advantage of incentives,[251] and a significant gap in adoption of distributed solar technologies exists for communities of color.[252]

To address the inequities created by previous efforts as deployment of DERs is accelerated, community engagement and understanding of opportunities for local capacity-building must be prioritized. Public processes like the King County Climate Equity Task Force and community-based participatory research provide models of equitable and accessible approaches to this work.

Priority communities can be identified using statewide energy equity indicators and environmental health and cumulative impact analysis tools such as the Environmental Health Disparity Map.[253] These tools can also be used in partnership with direct service providers like community action partnerships,[254] who have a rich history of working with state agencies and are well situated for qualifying and engaging with highly impacted populations. This mapping and other recommendations are supported by the work of the Environmental Justice Task Force.

3.1. Increase the Opportunity for Community DERs and Energy Program Management

Sharing the benefits of DERs allow communities to be in control of their energy supply, provide local clean job opportunities and bring resilience to the grid. However, local projects must compete with the economies of scale that utility-scale projects provide. In addition to helping local jurisdictions obtain the data to help understand the value of resilience on their grid (Section 2), the state can ensure a more equitable clean energy future by supporting local planning resources, including efforts by Tribal governments.

Policies must recognize the individual needs of Tribes across the state and help leverage local energy resources, such as bioenergy, or support projects that promote energy independence, such as microgrids. Both public and private entities can create carve-outs in existing programs to account for the unique tax status of Tribes and the structure of land ownership that may prevent Tribes from taking advantage of some financial tools. Programs should help leverage funding from the DOE Tribal Energy Office.

Consideration could be given to forming energy districts as community institutions modeled after Conservation Districts.[255] In addition, a resilience hub program[256] would

[247] "Substitute Senate Bill 6090" (2018), http://leap.leg.wa.gov/leap/budget/lbns/1719Cap6090-S.SL.pdf.

[248] "Environmental Justice Task Force."

[249] Chapter 82.16.165 RCW.

[250] "The Renewable Energy System Incentive Program: Legislative Report: October 2019" (Energy Program, Washington State University, 2019), http://www.energy.wsu.edu/documents/Renewable%20Energy%20System%20Incentive%20Program%20Report-Oct2019.pdf.

[251] Bentham Paulos, "Bringing the Benefits of Solar Energy to Low-Income Consumers: A Guide for States & Municipalities" (Clean Energy States Alliance, 2017), https://www.cesa.org/wp-content/uploads/Bringing-the-Benefits-of-Solar-to-Low-Income-Consumers.pdf.

[252] Deborah A. Sunter, Sergio Castellanos, and Daniel M. Kammen, "Disparities in Rooftop Photovoltaics Deployment in the United States by Race and Ethnicity," Nature Sustainability 2, no. 1 (January 2019): 71–76, https://doi.org/10.1038/s41893-018-0204-z.

[253] "Washington Environmental Health Disparities Map" (Washington Department of Health, n.d.), https://www.doh.wa.gov/DataandStatisticalReports/WashingtonTrackingNetworkWTN/InformationbyLocation/WashingtonEnvironmentalHealthDisparitiesMap.

[254] "Washington State Community Action Partnership > Home," accessed November 1, 2020, http://www.wapartnership.org/.

[255] Conservation districts were established as part of the New Deal and authorized in Washington in 1939 through RCW 89.50. See also, "A Geography of Change" (Winneshiek Energy District, 2019), https://energydistrict.org/wp-content/uploads/2019/01/A-Geography-of-Change-full.pdf.

[256] Kristin Baja, "Resilience Hubs" (Urban Sustainability Directors Network, 2018), https://www.usdn.org/uploads/cms/documents/usdn_resiliencehubs_2018.pdf.

Solar installer.

support deployment of solar generation, storage and microgrids at community centers to provide the surrounding community free access to essential services, such as heating, cooling, device charging and internet access in the event of a grid outage.

Providing grants and technical assistance to community centers for the development of resilience hubs in both rural and urban areas of need could encourage local engagement and community independence. Projects may also provide important insights into community-focused resilience metrics, which can used to inform a "value of resilience" to be incorporated into regional planning.

In some rural communities, increased support of opportunities for agrivoltaics — the beneficial co-location of solar panels and agricultural activity — could demonstrate that solar projects do not have to compete for land with agricultural production. The state should consider a statewide standard for pollinator-friendly solar (see Maryland and Minnesota) and consider funding research and pilot projects.

To help community projects get off the ground, the state can allocate resources to fund community-centered feasibility studies and other outreach and education for flexible and resilient energy projects. Funds can also be used to develop training resources including sample project plans, design standards and sample past projects and templates. Streamlined applications and eligibility can be implemented to eliminate redundancies and the complexity of grant application processes.

ACTIONS

- Develop resources for expanded outreach, technical assistance and education for community efforts.
- Create specific programs for Tribal energy projects that promote Tribal sovereignty and self-determination.
- Support the development of community resilience hubs and energy districts.
- Support clean energy projects that benefit agricultural communities.

3.2 Develop Tools for Equitable Energy Distribution and Deployment

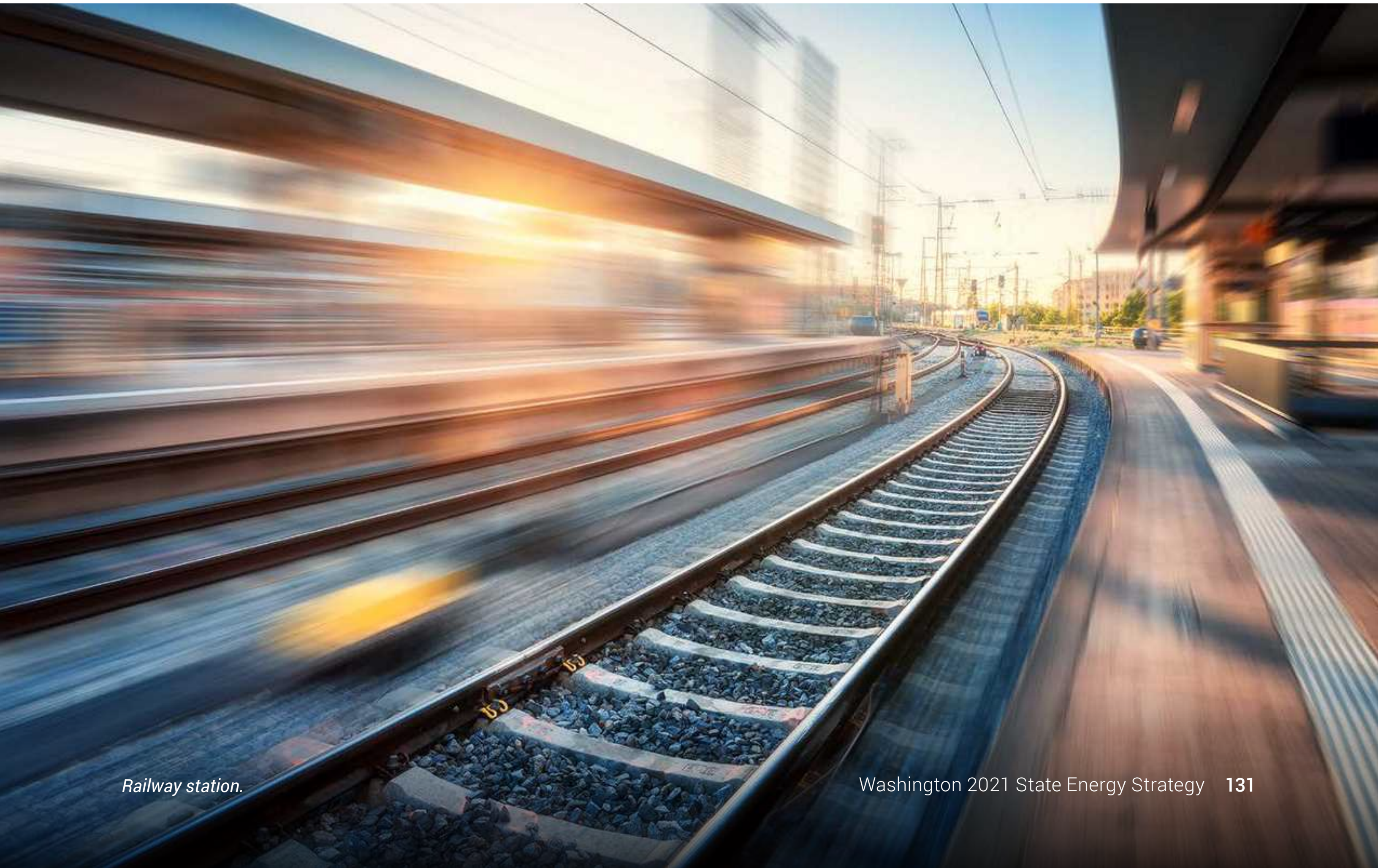
Energy equity indicators, data collection and a publicly accessible energy equity dashboard would assist in ensuring a just transition. The indicators should include both outcome and process measures. Outcome measures, such as increasing renewable energy in communities, must be supported by community engagement process metrics to hold state agencies accountable for increasing meaningful engagement with communities.

To understand current inequities associated with disbursement of energy funds and incentives, Commerce should review past and existing programs that support clean energy (e.g., Clean Energy Fund, Energy Efficiency and Solar grants) and other state incentives, such as the RESIP and net metering. Commerce should compare the locations of projects supported by public programs with the Environmental Health Disparities Map to identify highly impacted populations. The outcome can be used to identify gaps in service and specific use cases (i.e., multifamily housing) for further investment.

The Legislature and Commerce should use equity design elements for CEF and related energy programs. Those elements could include a lower or no match requirement based on applicant type, a requirement that grant applicants identify how their project will lead to more equitable outcomes, incentives to include underrepresented communities or organizations on project teams and ensuring community-driven outreach and participation in program design and implementation.

ACTIONS

- Perform an equity assessment of existing programs related to renewable energy.
- Explore the adoption of energy equity indicators and a publicly accessible energy equity dashboard, including both outcome and process measures.
- Use an equity and environmental justice lens for CEF program structure, design elements and participation.



Railway station.

Wind turbine, Goldendale, WA.
Clean Energy Transition Institute

List of Appendices

The following appendices accompany the Washington 2021 State Energy Strategy and are located on the Department of Commerce's website.

Appendix A – Deep Decarbonization Modeling Technical Report, December 11, 2020

Appendix B – Data Accompanying Deep Decarbonization Modeling Technical Report, December 11, 2020

Appendix C – Transportation, December 31, 2020

Appendix D – Heat Pumps, December 31, 2020

Appendix E – Economic Impacts of Decarbonization Pathways Modeling, December 31, 2020

Appendix F – Washington GDP by Sector, November 23, 2020

Appendix G – Building Emissions by Fuel Type, November 24, 2020

Appendix H – WA State Energy Strategy PNNL Presentation to CETI, October 9, 2020

Appendix I – Washington State Energy Policy Inventory, August 29, 2020

Appendix J – Bibliography, December 28, 2020

List of Acronyms

AMI advanced metering infrastructure
ASCENT Aviation Sustainability Center
BEV Battery electric vehicles
BPA Bonneville Power Administration
BPS building performance standard
BRIC Building Resilience in Communities
CAR Clean Air Rule
CCS carbon capture and storage
CCUS carbon capture, utilization and storage
CEF Clean Energy Fund
CEI Clean Energy Institute
CETA Clean Energy Transformation Act
CHP combined heat and power
CO_2 carbon dioxide
CTR commute trip reduction
DER distributed energy resource
DES Department of Enterprise Services
DOE United States Department of Energy
ECPAC Energy & Climate Policy Advisory Committee
EFSEC Energy Facility Site Evaluation Council
EIM energy imbalance market
EITE energy intensive and trade exposed
EJ environmental justice
EPD environmental product declaration
EV electric vehicle
EVSE electric vehicle supply equipment
FCV fuel cell vehicle
FEMA Federal Emergency Management Agency
GDP gross domestic product
GW gigawatt
HFC hydrofluorocarbon
HVAC heating, ventilation, and air conditioning
JTC Joint Transportation Committee
LCFS low carbon fuel standard
LDV light-duty vehicle
LIHEAP Low-Income Home Energy Assistance Program
MPO metropolitan planning organization
NASEO National Association of State Energy Offices
NWPP Northwest Power Pool
NO_x nitrous dioxide
PACER property assessed clean energy and resilience
$PM_{2.5}$ Fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller
PNNL Pacific Northwest National Laboratory
R&D research and development
RA resource adequacy
RESIP Renewable Energy System Incentive Program
RIO Regional Investment and Operations Model
RTPO regional transportation planning organization
RUC road usage charge
SAFN Sustainable Aviation Fuels Northwest Initiative
SEEP State Efficiency and Environmental Performance Office
SO_x sulfur dioxide
TDM transportation demand management
TOD Transit-oriented development
USDA United States Department of Agriculture
UTC Utilities and Transportation Commission
VMT vehicle miles traveled
WAP Weatherization Assistance Program
WSDOT Washington State Department of Transportation
WSF Washington State Ferries
WSTC Washington State Transportation Commission
ZEV zero-emissions vehicle

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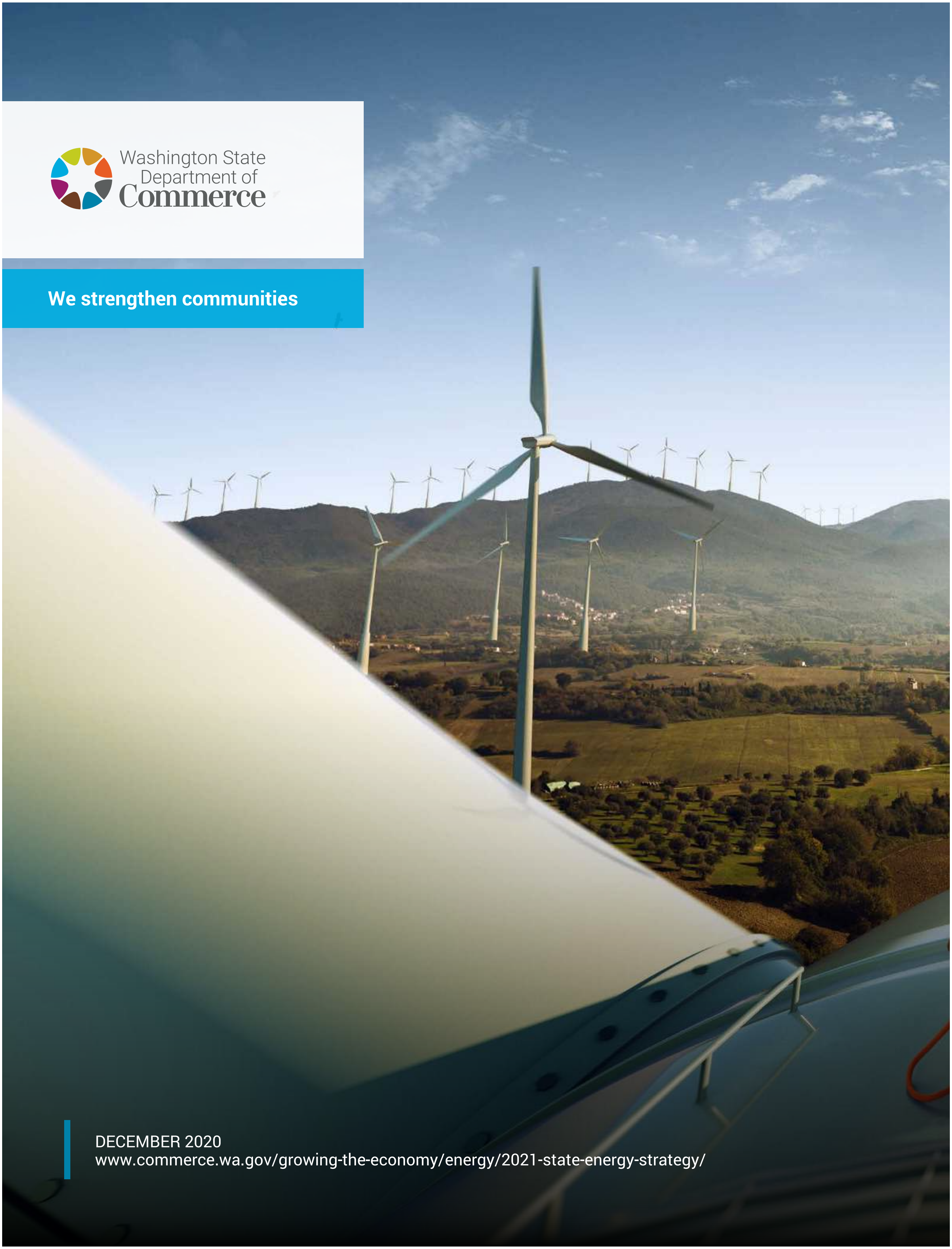
We strengthen communities



DECEMBER 2020
www.commerce.wa.gov/growing-the-economy/energy/2021-state-energy-strategy/

Key Actions

Washington State Department of Commerce

Communities

Climate change will inflict its greatest harm on highly impacted communities, Tribes, rural areas and low-income households, just as the economic and health impacts of COVID-19 are now disproportionately affecting those same populations. Absent deliberate and committed efforts, the envisioned clean energy transformation could easily leave these communities worse off.

- Adopt state policies to achieve universal broadband access.
- Examine clean energy policies for equity impacts in development and during implementation.
- Provide needed funding for communities to participate in the clean energy transformation.
- Support workers to ensure they have the skills for clean energy jobs and adopt policies to protect workers in transition.

Transportation

No sector is as important as transportation to achieving decarbonization, nor as complex in its operation and governance.

- Establish specific targets for vehicle sales, transportation demand and emissions with accountability measures for meeting those targets.
- Adopt a low carbon fuel standard – a comprehensive mechanism to replace fossil fuels with electricity, hydrogen and clean synthetic or biogenic fuels.

Buildings

There is great potential to reduce and eventually eliminate the use of fossil fuels to heat and power Washington's residences, offices, warehouses, shops and other buildings.

- Replace the direct consumption of fossil fuels, primarily natural gas, with high-efficiency electric heat pumps for space and water heating.
- Strengthen and deepen energy efficiency programs and standards to focus on avoiding and reducing emissions.
- Adopt specific targets and accountability for greenhouse gas emissions in the built environment.

Industry

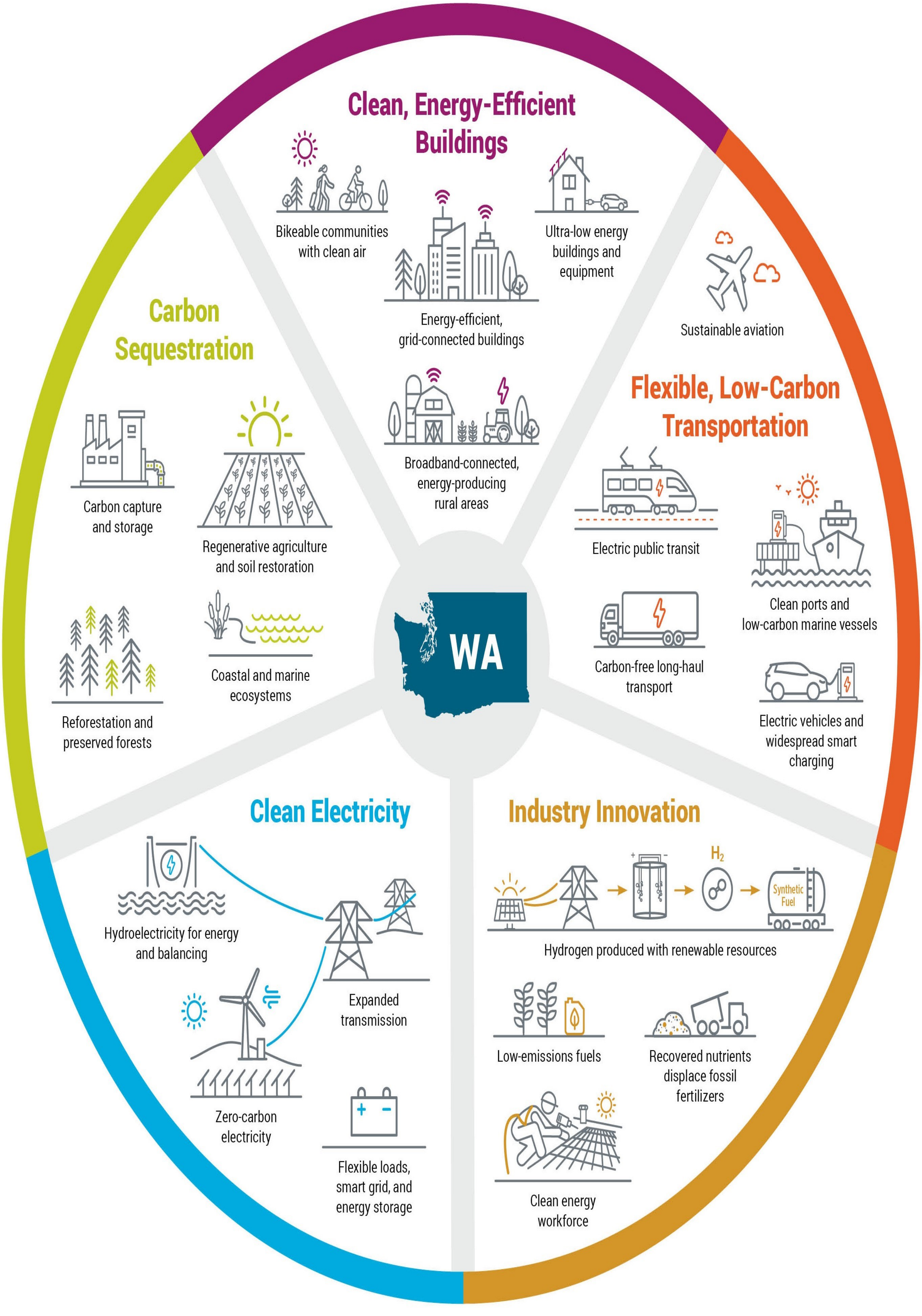
Policy makers and the private sector would benefit from more information, technology and coordination.

- Conduct a thorough assessment of opportunities to transition to low-emission industrial production and collect information about the use of fossil fuels in industrial processes and the opportunities to increase efficiency and switch to electricity.
- Coordinate with other jurisdictions to adopt consistent policies that recognize and reward lower emission in-state production.
- Enhance research and development programs and state agencies' data and analytical resources.
- Promote development of green hydrogen production, clean fuels refining and carbon capture.

Electricity

Washington is on its way to eliminating greenhouse gas emissions from electricity with the implementation of the Clean Energy Transformation Act (CETA). Structural changes are needed to ensure the capacity to provide electricity to replace fossil fuels in transportation, buildings and industry.

- Invest in new transmission capacity and renewable generation, coordinating with other states.
- Develop distributed energy resources with smart grid capabilities and in consumer equipment to ensure reliability and flexibility.
- Strengthen market mechanisms to ensure resource adequacy and efficient electricity markets.


Clean, Energy-Efficient Buildings
Bikeable communities with clean air
Energy-efficient, grid-connected buildings
Ultra-low energy buildings and equipment
Broadband-connected, energy-producing rural areas
Flexible, Low-Carbon Transportation
Sustainable aviation
Electric public transit
Clean ports and low-carbon marine vessels
Carbon-free long-haul transport
Electric vehicles and widespread smart charging
Industry Innovation
H_2
Synthetic Fuel
Hydrogen produced with renewable resources
Low-emissions fuels
Recovered nutrients displace fossil fertilizers
Clean energy workforce
Clean Electricity
Hydroelectricity for energy and balancing
Expanded transmission
Zero-carbon electricity
Flexible loads, smart grid, and energy storage
Carbon Sequestration
Carbon capture and storage
Regenerative agriculture and soil restoration
Reforestation and preserved forests
Coastal and marine ecosystems
WA

UTILITY ADVISORY COMMITTEE AGENDA ITEM COVERSHEET

Meeting Date: 3/9/2021

Agenda Category: Other Informational Items

Prepared By: Clint Whitney, Energy Services Director

Subject:
Forward Agenda Items

Department:
Energy Services

Recommended Motion:

Summary:

May 2021
Review and Recommendations for Rates (RES)
Water and Wastewater Capital Programs Funding Strategies (PW)
Review and Recommendations for Ambulance Utility Rates and Strategic Plan (FES)

July 2021
Reliability Analysis (RES)

September 2021
UAC Applicant Interviews
Review and Recommendations for Bonds (RES)

Fiscal Impact:
This is an informational item only.

Attachments: