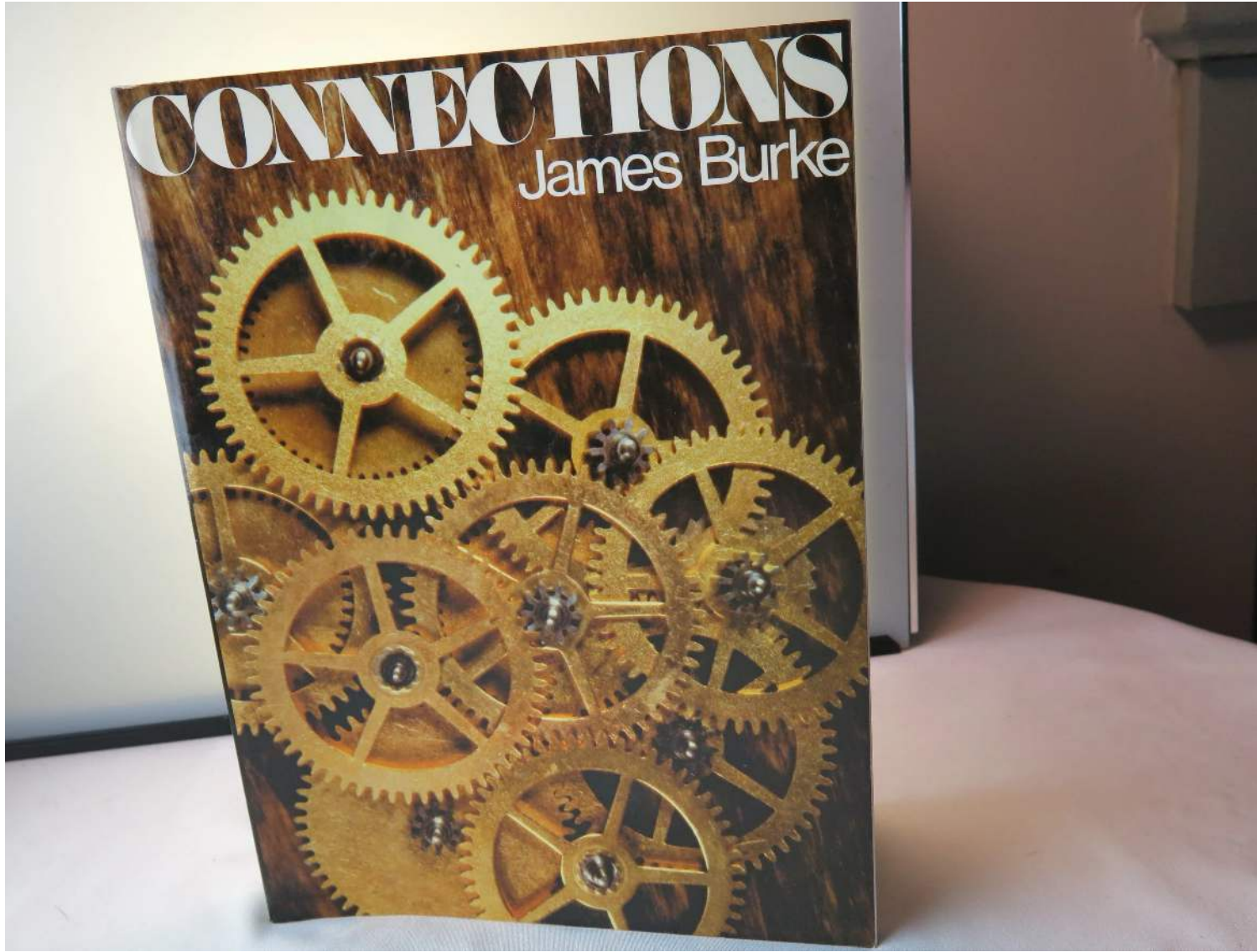


Climate Change & The Energy Transition

Global Issues &
Local Responses





Connections is a [science education](#) television series created, written, and presented by British science historian [James Burke](#).

The series was produced and directed by [Mick Jackson](#) of the [BBC](#) Science and Features Department and first aired in 1978 (UK) and 1979 (US)



What Is Climate Change?

Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates.

These changes have a broad range of observed effects that are synonymous with the term.



GLOBAL CLIMATE CHANGE
Vital Signs of the Planet



[FACTS](#)

[NEWS](#)

[SOLUTIONS](#)

[EXPLORE](#)

[NASA SCIENCE](#)

[MORE](#)

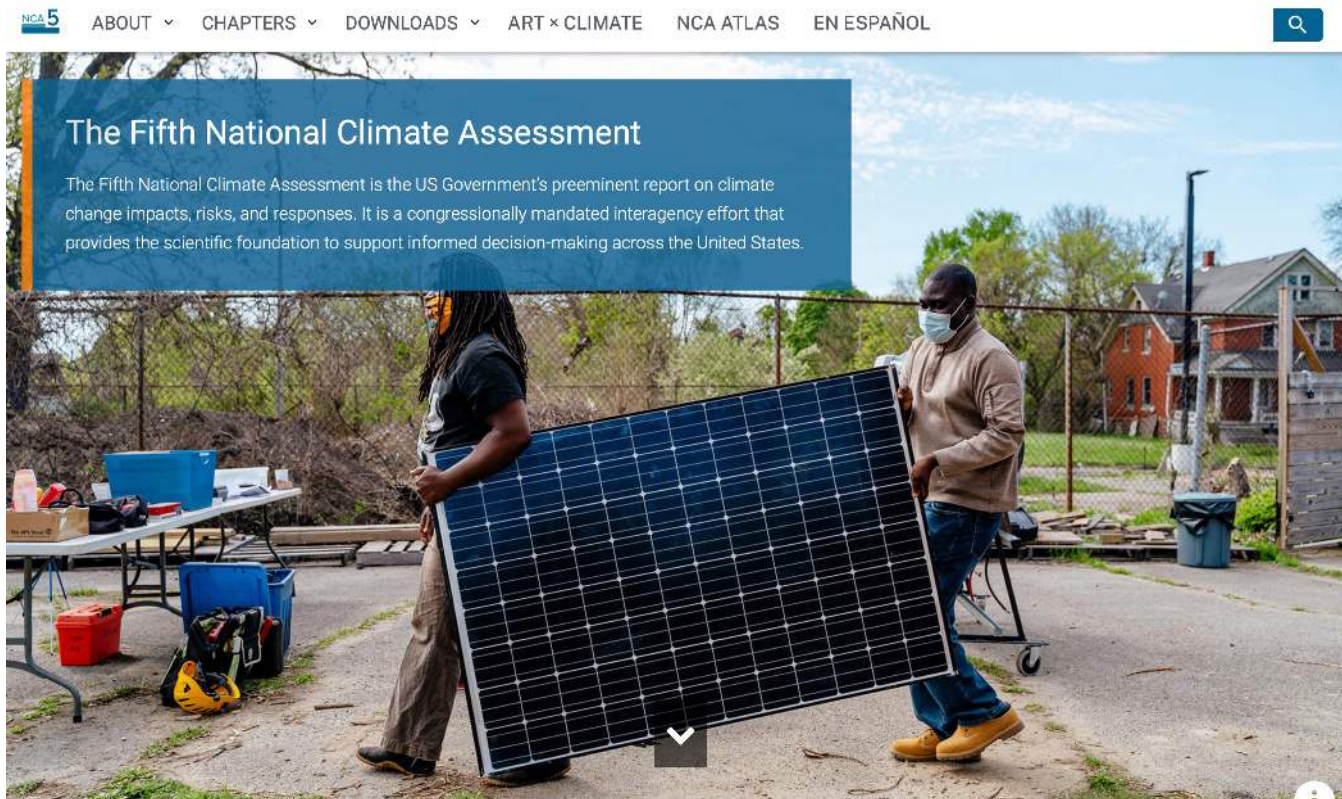


EVIDENCE

How Do We Know Climate Change Is Real?

There is unequivocal evidence that Earth is warming at an unprecedented rate. Human activity is the principal cause.

US Government

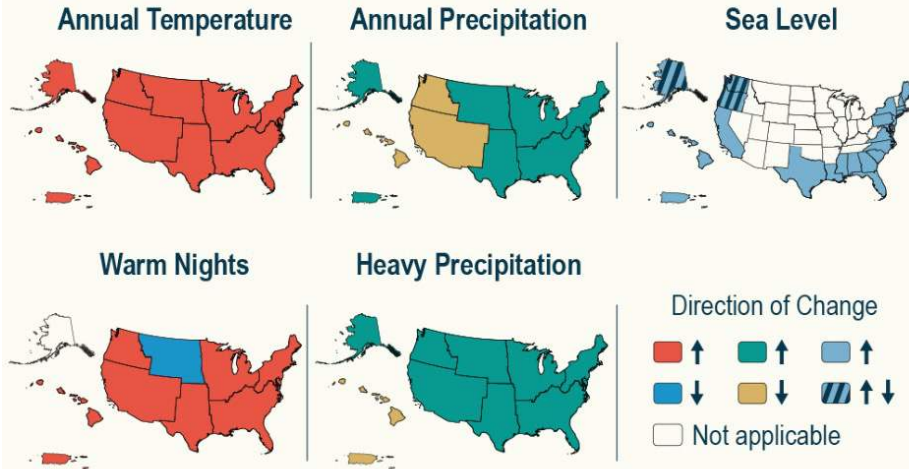


University of Washington



Climate Change Risks and Opportunities in the US

Climate change is happening now in all regions of the US



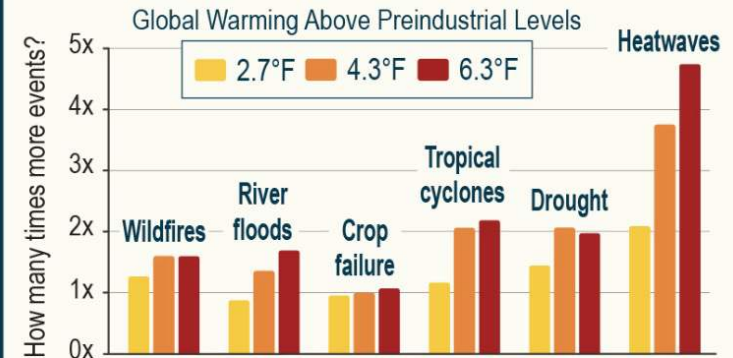
Each additional increment of warming leads to greater risks

Water supply
Food security
Infrastructure
Health and well-being
Ecosystems
Economy
Livelihoods and heritage



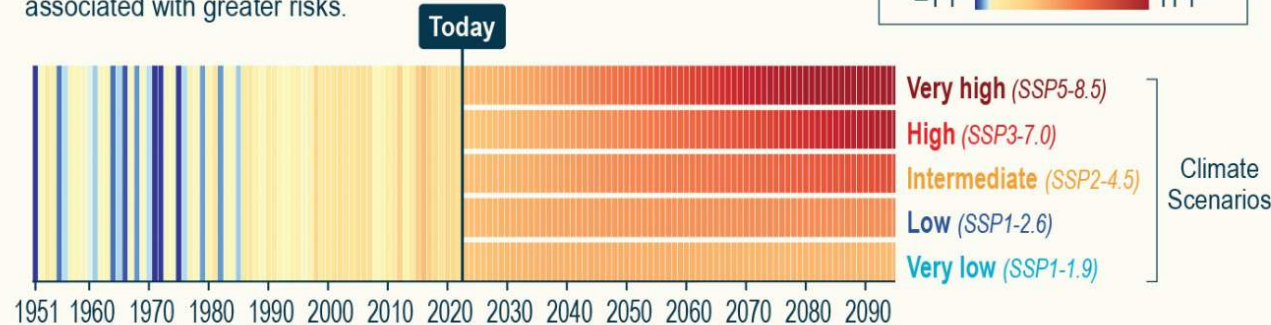
Without deeper cuts in global net emissions, climate risks to the US will continue to grow

► A person born in North America in 2020 will experience more climate hazards during their lifetime, on average, than a person born in 1965.

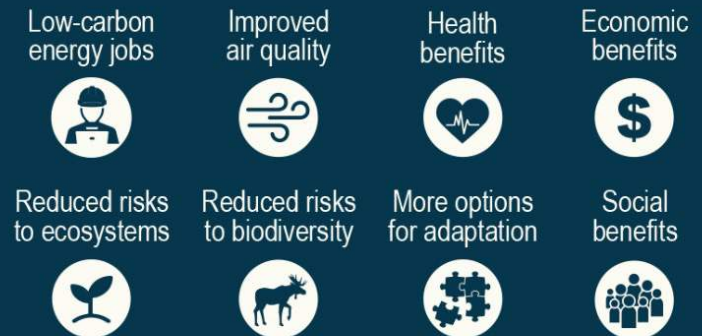


How much more the US warms depends on choices made today

► Future global greenhouse gas emissions from human activities determine whether and how quickly the US reaches warming levels associated with greater risks.



Action to limit future warming and reduce risks can have near-term benefits and opportunities



The Greatest Climate Risk? Compounding Calamities.

Taken together, some parts of the U.S. will see a number of issues stack on top of one another — heat and humidity may make it harder to work outside, while the ocean continues to claim more coastal land. The table below ranks the most at-risk counties in the U.S. if all of the perils were combined. You can also sort by

Taken together, some parts of the U.S. will see a number of issues stack on top of one another — heat and humidity may make it harder to work outside, while the ocean continues to claim more coastal land. The table below ranks the most at-risk counties in the U.S. if all of the perils were combined. You can also sort by individual climate risk to see how each one stacks up, with higher numbers being worse in all categories. The projections are for 2040-2060 under RCP 8.5.

“Top 2% best”



New Climate Maps Show a Transformed United States
<https://projects.propublica.org/climate-migration/>

All the World's Carbon Emissions

% of total global emissions in 2021



*175 countries



Source: Global Carbon Atlas
As of 2021

Global	~56B Tons
USA	~6B Tons
WA State	~102M Tons
San Juan County	~220k Tons

Cut by >90% by 2050

Climate Change and Energy Sources of Information

International

- UN
- IPCC

US Federal

- Agencies
- DOE, USDA, DOT...
- Federal Labs
- NREL, PNNL, LBL...

Other Nations

- EU
- Agencies
- Public, Private

US States

- Departments
- Commerce, Ecology, DNR, Transportation...

County

- Government
- Departments, Advisory Committees
- Organizations
- Citizens

Academic

- Universities

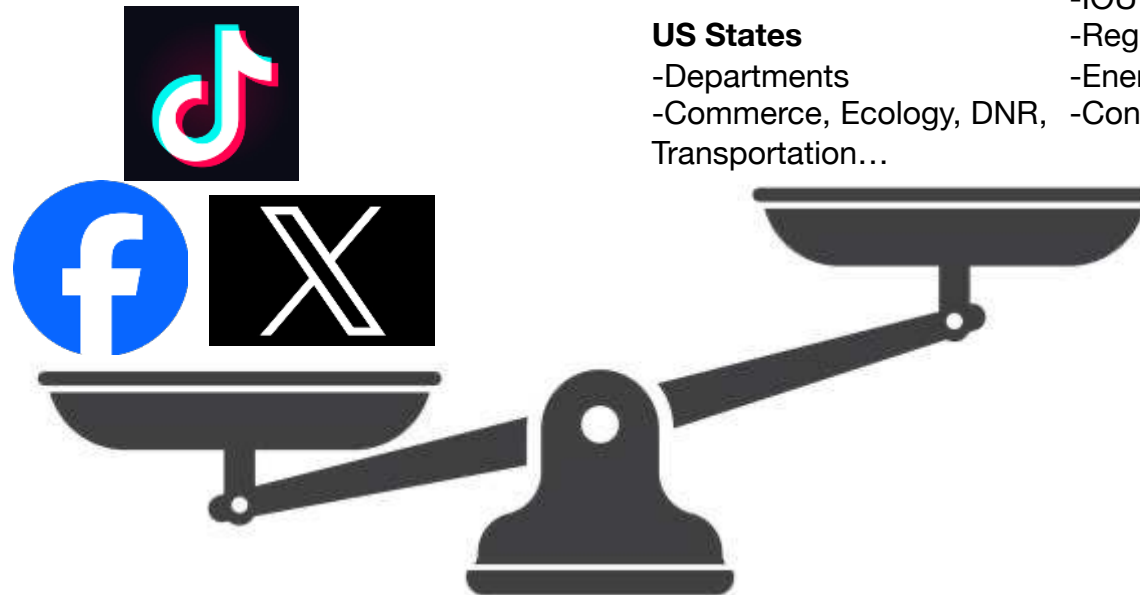
Industry

- Utilities
- RTO's, FERC, NERC
- FPMA's
- IOU's, PUD/MUD, Coops,
- Regulatory agencies
- Energy, Transportation, Maritime, Aviation...
- Consulting, Analysis, Private Research and Reporting

Media

- General, Focused
- Social

Where do people get information about Climate Change?



International

- UN
- IPCC

US Federal

- Agencies
- DOE, USDA, DOT...
- Federal Labs
- NREL, PNNL, LBL...

Other Nations

- Agencies
- Public, Private

US States

- Departments
- Commerce, Ecology, DNR, Transportation...

County

- Government
- Departments, Advisory Committees
- Organizations
- Citizens

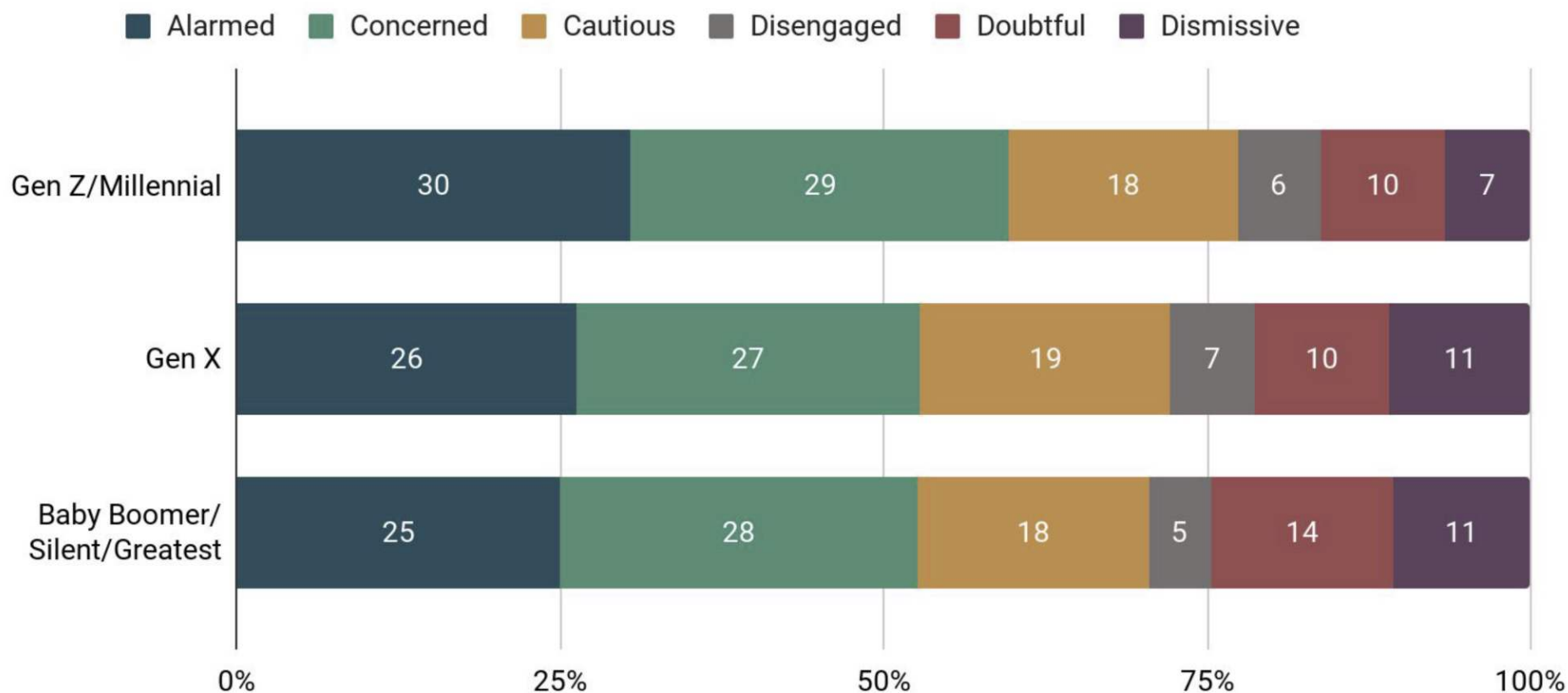
Academic

- Universities

Industry

- Utilities
- RTO's, FERC, NERC
- FPMA's
- IOU's, PUD/MUD, Coops,
- Regulatory agencies
- Energy, Transportation, Maritime, Aviation...
- Consulting, Analysis, Private Research and Reporting

Gen Z and Millennials are more likely to be Alarmed or Concerned about global warming and are less likely to be Doubtful or Dismissive than are older generations



Global Warming's Six Americas

April 2020, December 2020, March 2021, September 2021, April 2022, December 2022. Base: 6,211 U.S. adults (Gen Z/Millennial $n = 1,707$; Gen X $n = 1,567$; Baby Boomer/Silent/Greatest $n = 2,937$)

Source: Yale Program on Climate Change Communication;
George Mason University Center for Climate Change Communication

Yale Climate Opinion Maps 2023

10:42 AM Thu Mar 14

climatecommunication.yale.edu

88%

Estimated % of adults who think global warming is happening (nat'l avg. 72%), 2023

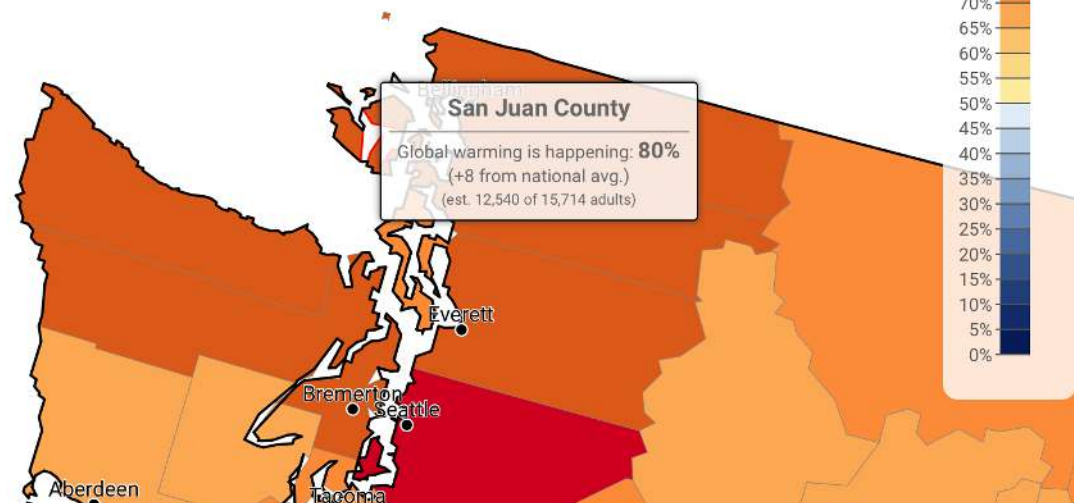
Select Question: Global warming is happening

Click map or: Washington San Juan County Un-Select

Absolute Value

National States Cong. Districts Metro Areas **Counties**

San Juan County: "Global Warming is Happening - **80%**"



Response to Climate Change Drives Changes to Energy Systems...

Washington State Energy Strategy 2021

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**.

FACT SHEET: The Biden-Harris Administration
Advances Transmission Buildout to Deliver
Affordable, Clean Electricity

...the President's goals of **reducing greenhouse gas emissions 50-52% below 2005 levels in 2030** and **achieving 100% clean electricity by 2035**.

Washington State Total gross emissions MMTCO₂e

<u>Year</u>	<u>Amount</u>	<u>Goal</u>
1990	93.5	2030 51.4
2000	111.0	2040 28.1
2010	95.0	2050 4.7
2015	94.6	
2016	95.1	
1017	95.3	
2018	95.5	
2019	102.1	

*From 2023 to 2030...
102.1 to 51.4 = -50%
6 years from now!*



Washington State Greenhouse Gas
Emissions Inventory: 1990–2019

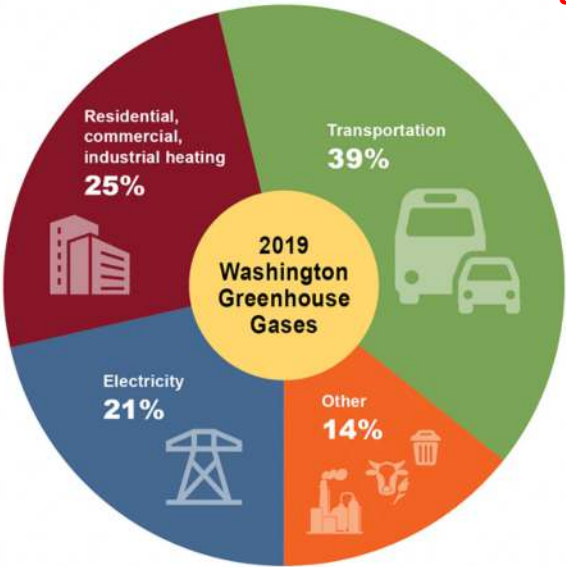
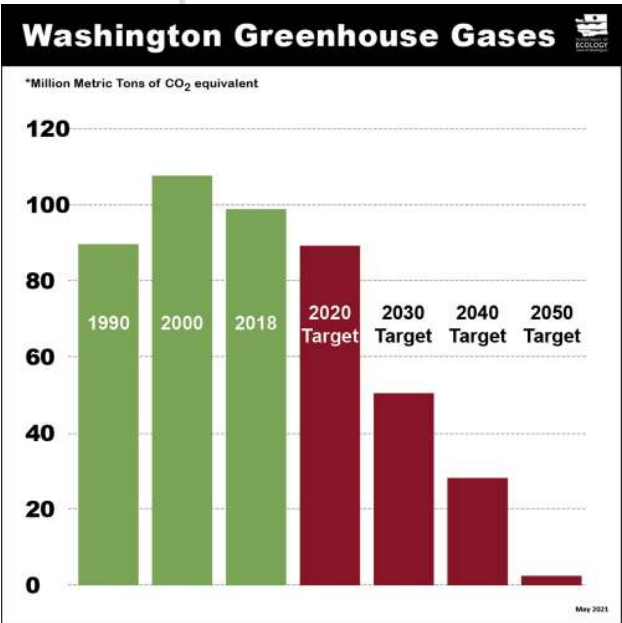
Stacey Waterman-Hoey
Air Quality Program

Washington State Department of Ecology
Olympia, Washington

December 2022, Publication 22-02-054

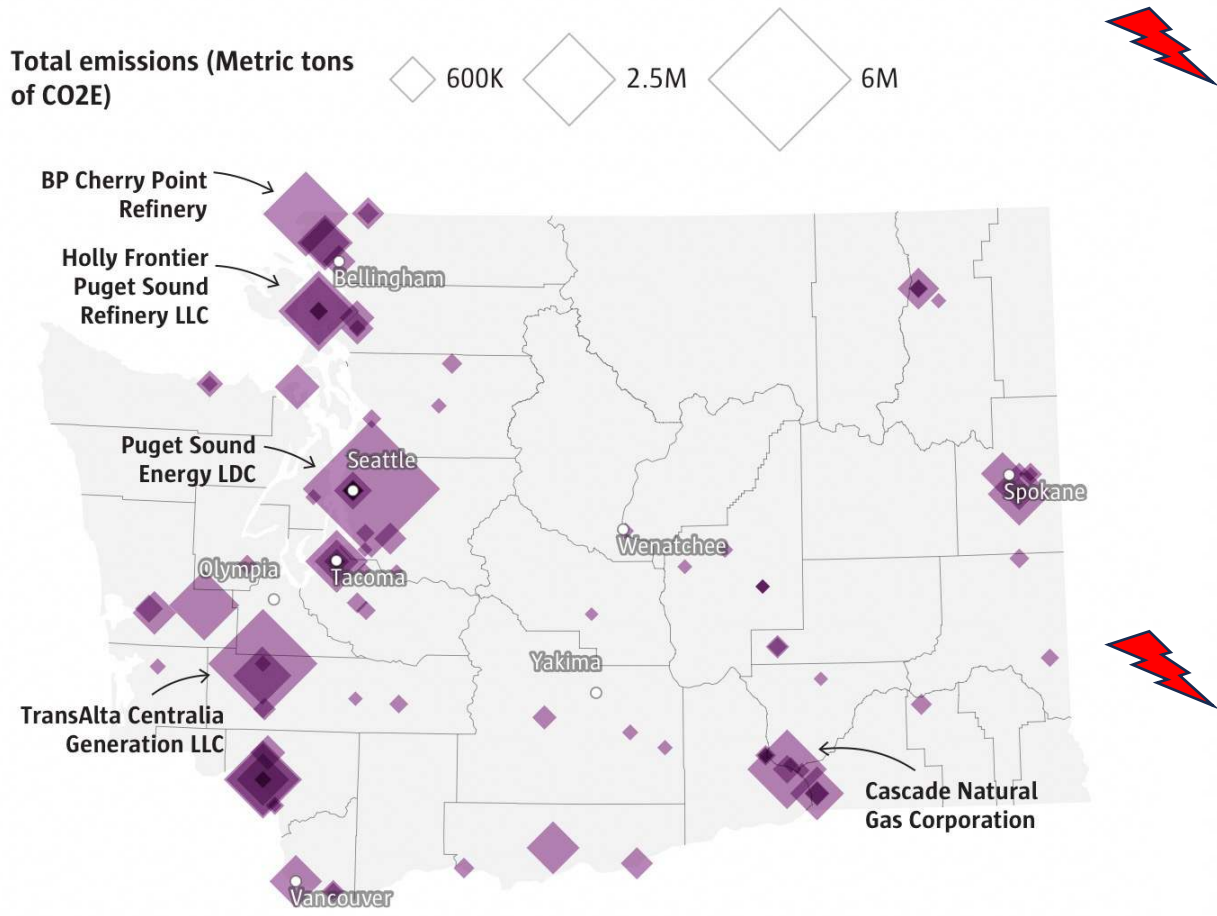


<https://apps.ecology.wa.gov/publications/documents/2202054.pdf>



Top carbon emitters in Washington state

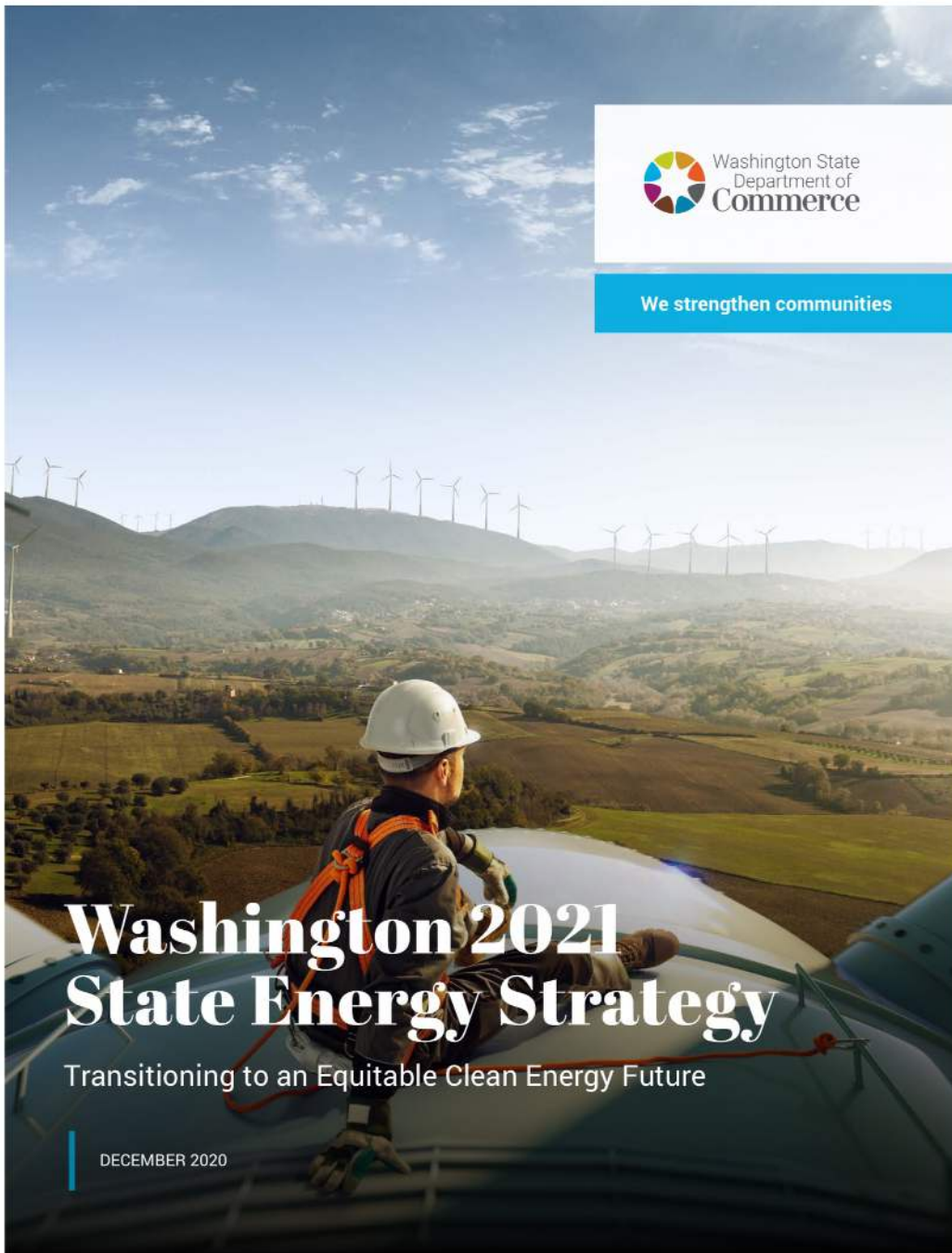
This map shows the top emitters in 2021, with one key omission: fuel suppliers, which account for all the gas sold in the state and burned on the road. The state recently removed fuel suppliers from its data; new data will be available in the fall.



Map: Frank Mina / The Seattle Times • Source: Washington state Department of Ecology

Top Emitters 22% of WA State total

Reporter	Industry	Parent company	Total emissions (Metric tons of CO2E)
Puget Sound Energy LDC	Natural gas supplier	Puget Holdings LLC	5,603,773
TransAlta Centralia Generation LLC	Power Generation Coal plants 730MW	TransAlta	3,484,305
BP Cherry Point Refinery - Blaine	Petroleum refineries	BP	2,066,338
HollyFrontier Puget Sound Refinery LLC - Anacortes	Petroleum refineries	Shell Petroleum	1,837,958
Cascade Natural Gas Corporation	Natural gas supplier	MDU Resources Group	1,787,939
Nippon Dynawave - Longview	Kraft mills		1,721,330
WestRock LLC - Longview	Kraft mills	Kapstone Paper & Packaging	1,475,085
Grays Harbor Energy Center - Elma	Power Generation Natural gas turbine plants 650MW		1,367,817
Marathon Anacortes Refinery	Petroleum refineries	Marathon Petroleum	1,296,106
Avista	Natural gas supplier	Avista	1,085,641



Major WA State Climate Legislation

- Climate Commitment Act (CCA- SB 5126)
- Clean Energy Transformation Act (CETA -SB 5116)
- HB 1181 - 2023-24
 - “Improving the state's response to climate change by updating the state's planning framework.”
- Energy Independence Act I-937 requires electric utilities to use renewable energy and energy conservation.

The 2021 State Energy Strategy is designed to provide a roadmap for meeting the state’s greenhouse gas emission limits. Enacted in 2020, the CCA commits Washington to limits of:

- 45% below 1990 levels by 2030, *(However!! I-2117 2024 Repeal)*
- 70% below 1990 levels by 2040 and
- 95% below 1990 levels with net zero emissions by 2050



PHASE 1

PHASE 2

PHASE 3

~~Collect
underpants~~

?

~~Profit~~

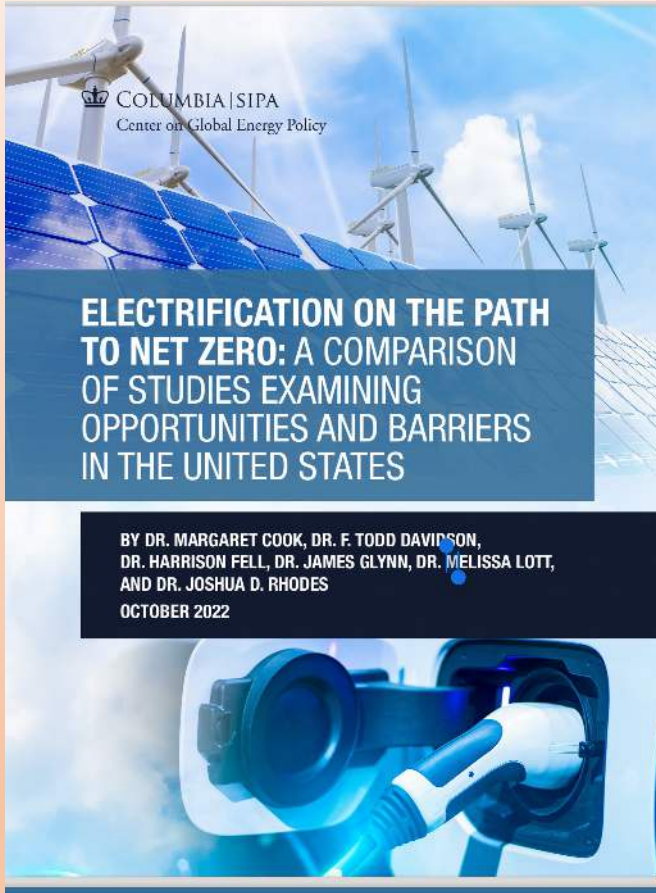
"Green-the-Grid!"

"Net-Zero 2050"





SOUTHPARK.CC.COM

Many Studies on How to Do This...Conclusions – Necessary, Complex, Expensive!



<https://tinyurl.com/2ne7ujb8>

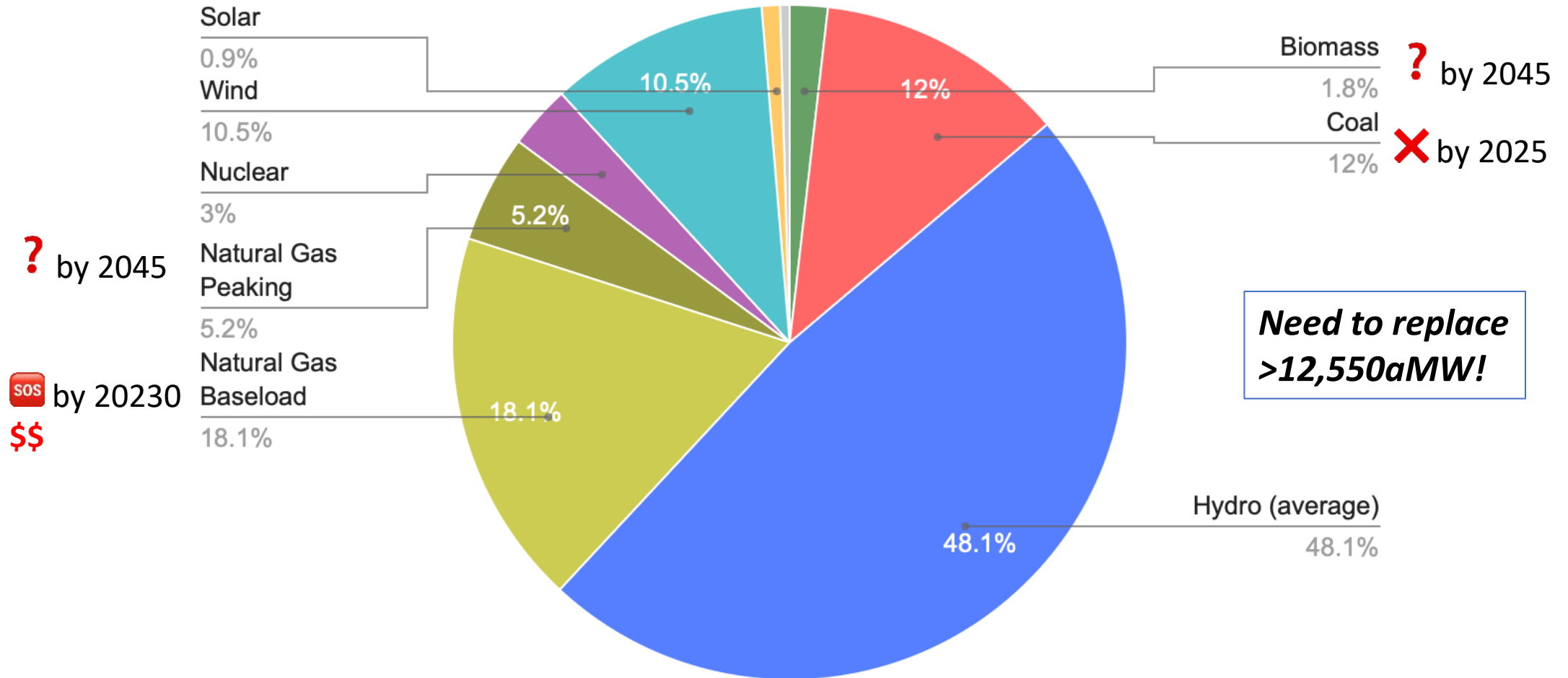
Table 1: Studies evaluated in this report

Study name	Abbreviation	Reference
Princeton’s “Net-Zero America” 	Princeton	Larson et al. 2020
“Carbon-Neutral Pathways for the United States”	Williams	Williams et al. 2021
Vibrant Clean Energy’s “Zero by 2050”	VCE	Vibrant Clean Energy 2021
“The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050”	White House	The White House 2021 (Global Change Assessment Model team)
Electric Power Research Institute’s (EPRI) “Powering Decarbonization: Strategies for Net-Zero CO ₂ Emissions”	EPRI	Blanford et al. 2021
Berkeley’s “2035 Electricity” and “2035 Transportation” reports	Berkeley 2035	Phadke et al. 2020; Baldwin et al. 2021
National Renewable Energy Laboratory’s (NREL) “Electrification Futures Study” 	EFS	Jadun et al. 2017; Hale et al. 2018; Mai et al. 2018; Sun et al. 2020; Murphy et al. 2021; Zhou and Mai 2021
NREL’s “Interconnections Seam Study”	Seams	Bloom et al. 2021



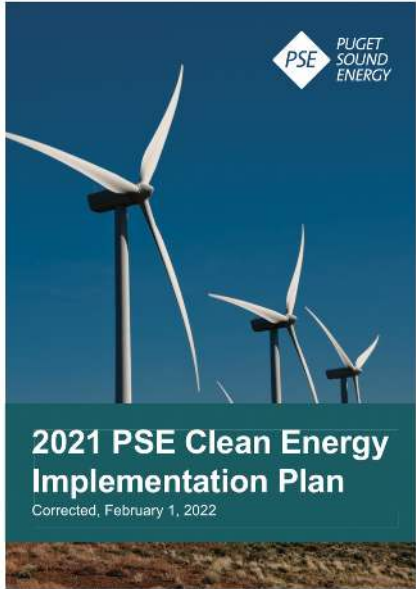
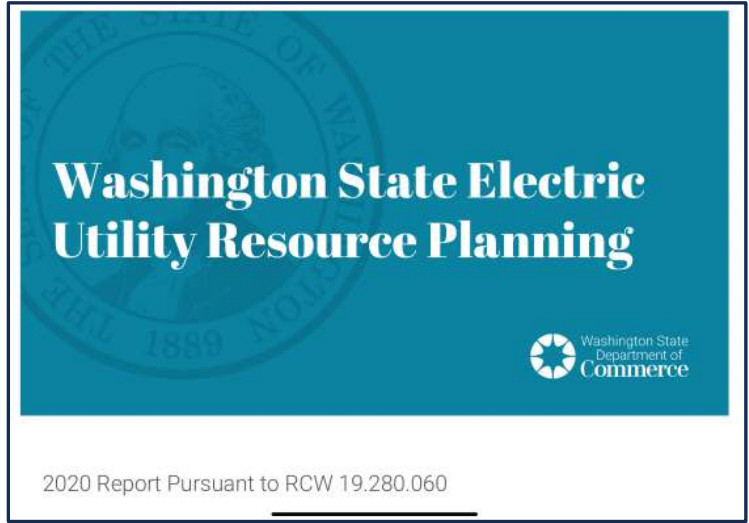
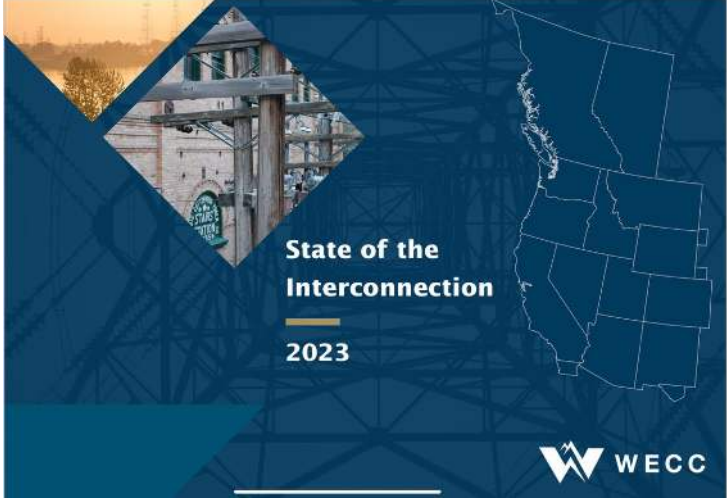
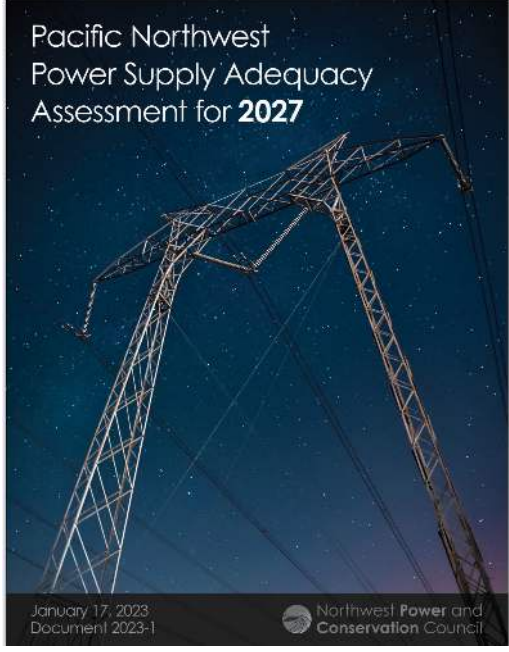
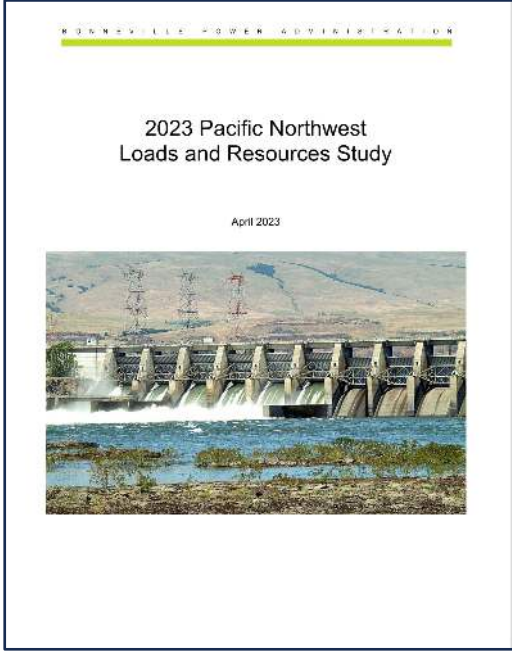
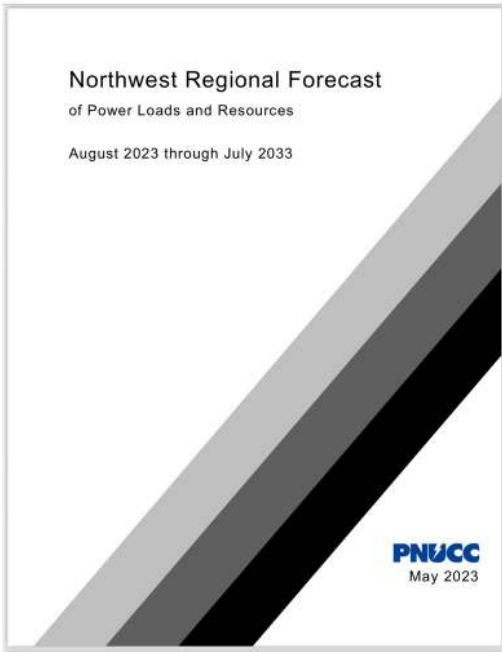
“100% clean and renewable wind, water, and sunlight (WWS) all-sector energy roadmaps for the 50 United States “
Mark Z. Jacobson et al., Stanford University 25 April 2015

Pacific Northwest Generating Capability: 33,828 MWa*



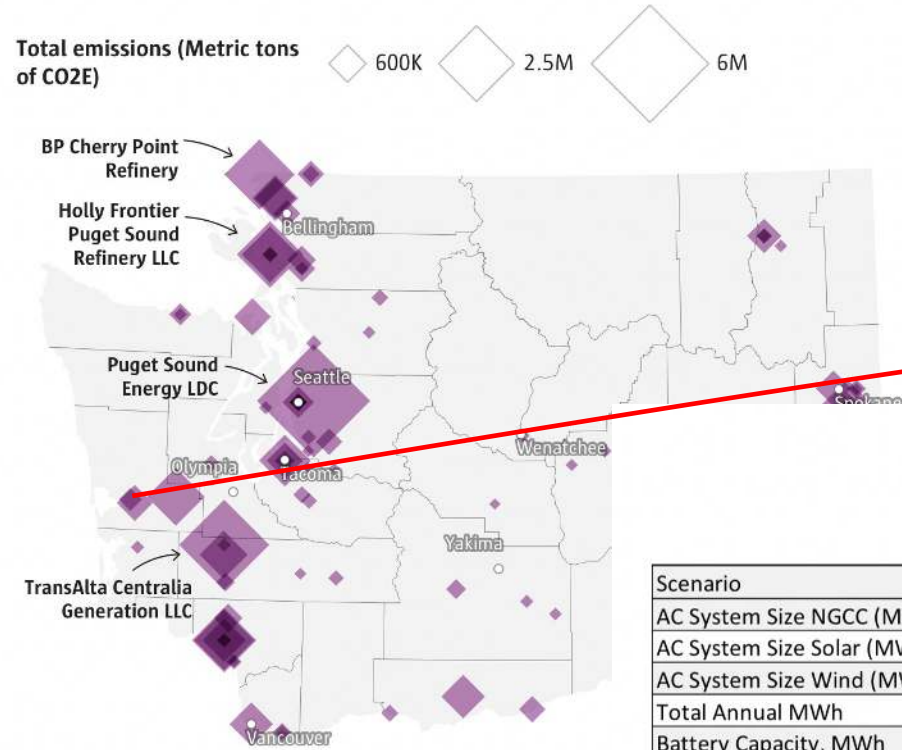
Capability is the maximum amount of energy the plants are capable of producing over the course of an average year. Download chart as PNG

* Other (yellow segment) includes geothermal, petroleum, and solar



Top carbon emitters in Washington state

This map shows the top emitters in 2021, with one key omission: fuel suppliers, which account for all the gas sold in the state and burned on the road. The state recently removed fuel suppliers from its data; new data will be available in the fall.



Map: Frank Mina / The Seattle Times • Source: Washington state Department of Ecology



Replacement of Gray’s Harbor Energy Center
650MW Gas Turbine Generating Plant
with Wind and Storage (a “wicked” problem)
CapEx: \$5.8B Area: 22,000 acres (34 sq. mi.)

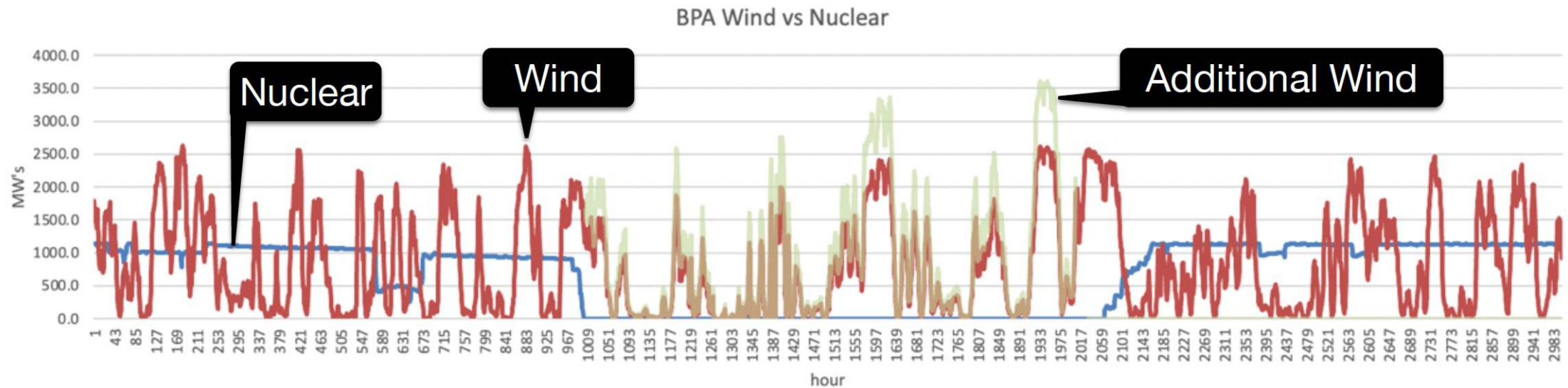
[–Gray’s Harbor Energy center is located on a 20-acre site within the
Satsop Redevelopment Park in Grays Harbor County
–Lopez+Shaw islands area: 37 sq.mi.]

	NGCC	NGCC with Carbon Tax	Solar and NGCC	Solar and Storage	Wind and Storage	Solar, Wind and Storgae
Scenario	1	1	2	3	4	5
AC System Size NGCC (MW)	650	650	650	-	-	-
AC System Size Solar (MW)	-	-	650	2,958	-	845
AC System Size Wind (MW)	-	-	-	-	2,625	2,065
Total Annual MWh	4,839,900	4,839,900	4,839,900	6,738,381	12,392,152	11,671,720
Battery Capacity, MWh	-	-	-	10,250	6,550	2,410
Acreage	30	30	5,460	24,843	22,053	24,443
Wholesale Rate, \$/MWh	\$47.1	\$88.4	\$88.4	\$181.0	\$135.9	\$99.0
Carbon Tax (\$/MWh)	N/A	\$41.3	\$41.3	\$133.9	\$88.7	\$51.9
Carbon Tax (\$/ton)	N/A	\$75.0	\$75.0	\$389.6	\$258.2	\$151.0
Capital Expenditure	\$702,000,000	\$702,000,000	\$1,630,200,000	\$7,720,641,000	\$5,811,379,774	\$5,075,501,108
Annual O&M + Fuel Cost	\$110,627,806	\$110,627,806	\$116,087,806	\$101,718,000	\$363,743,664	\$272,621,604
Debt	\$280,800,000	\$280,800,000	\$652,080,000	\$3,088,256,400	\$2,324,551,909	\$2,030,200,443
Equity	\$421,200,000	\$421,200,000	\$978,120,000	\$4,632,384,600	\$3,486,827,864	\$3,045,300,665
ROE	10.50%	13.24%	10.50%	10.50%	10.50%	10.51%

Table 1: Summary Table

“MEASURING RENEWABLE ENERGY AS BASELOAD POWER”

BPA 2023 Load and Generation During Nuclear Shutdown



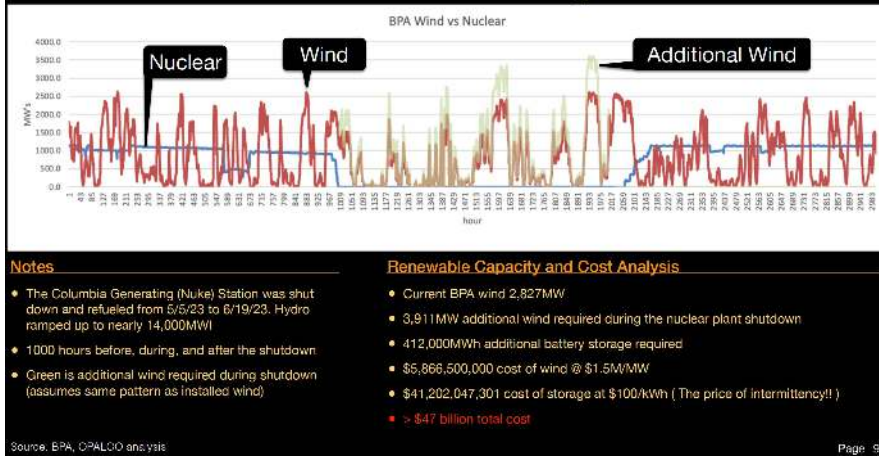
Notes

- The Columbia Generating (Nuke) Station was shut down and refueled from 5/5/23 to 6/19/23. Hydro ramped up to nearly 14,000MW!
- 1000 hours before, during, and after the shutdown
- Green is additional wind required during shutdown (assumes same pattern as installed wind)

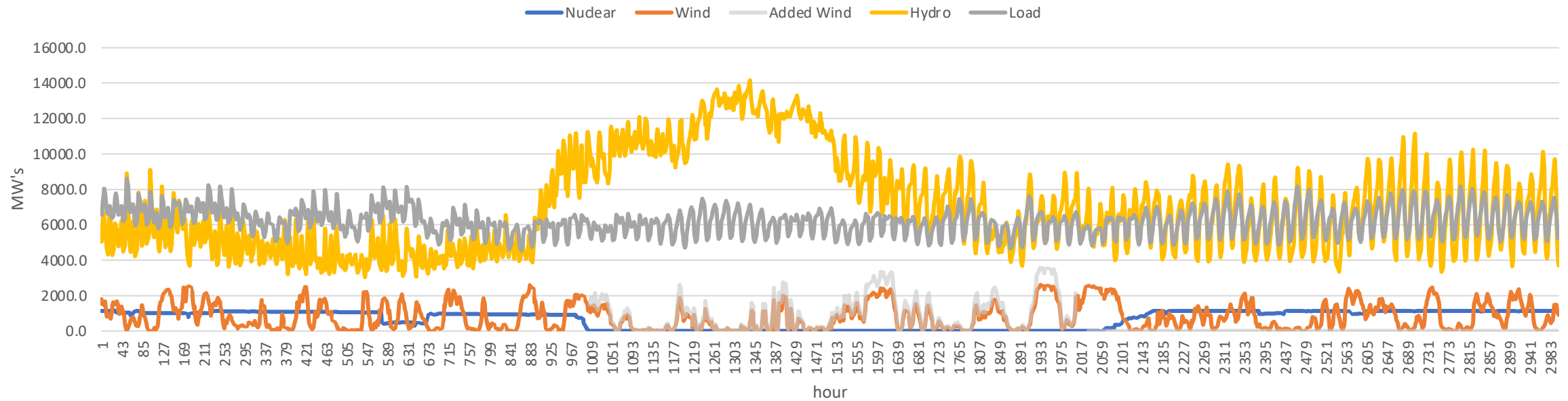
Renewable Capacity and Cost Analysis

- Current BPA wind 2,827MW
- 3,911MW additional wind required during the nuclear plant shutdown
- 412,000MWh additional battery storage required
- \$5,866,500,000 cost of wind @ \$1.5M/MW
- \$41,202,047,301 cost of storage at \$100/kWh (The price of intermittency!!)
- > \$47 billion total cost

BPA 2023 Load and Generation During Nuclear Shutdown



BPA Load, Wind, Hydro, and Nuclear



Clean Energy
Transition Institute

BLOGPROGRAMS ▾RESOURCES ▾ABOUT ▾MISSIONSEARCH




Nation's First Regional, Economy-Wide Net-Zero Pathways Analysis


Eileen V. Quigley

June 21, 2023

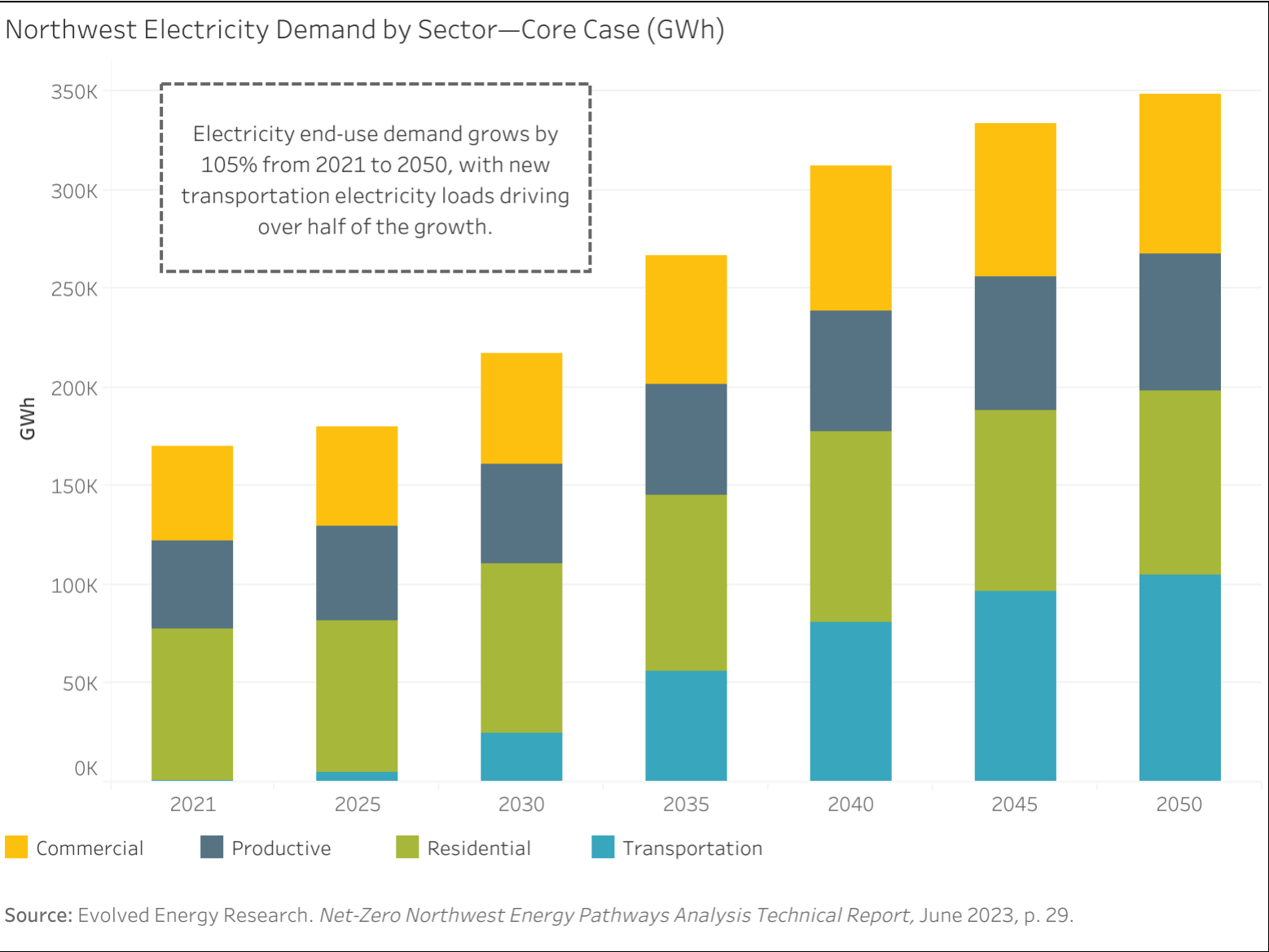
Resource Adequacy in the Pacific Northwest

March 2019



Energy+Environmental Economics

Projected PNW Electricity Demand by Sector



Average Renewable Land Requirements

Solar 6 acres / MW
Wind* 16acres / MW

Average Renewable Cost

Solar** \$1M /MW
Wind \$1.3-2.2M / MW

4 hr Storage costs are \$255/kWh to \$403/kWh in 2030 and \$159/kWh to \$380/kWh in 2050

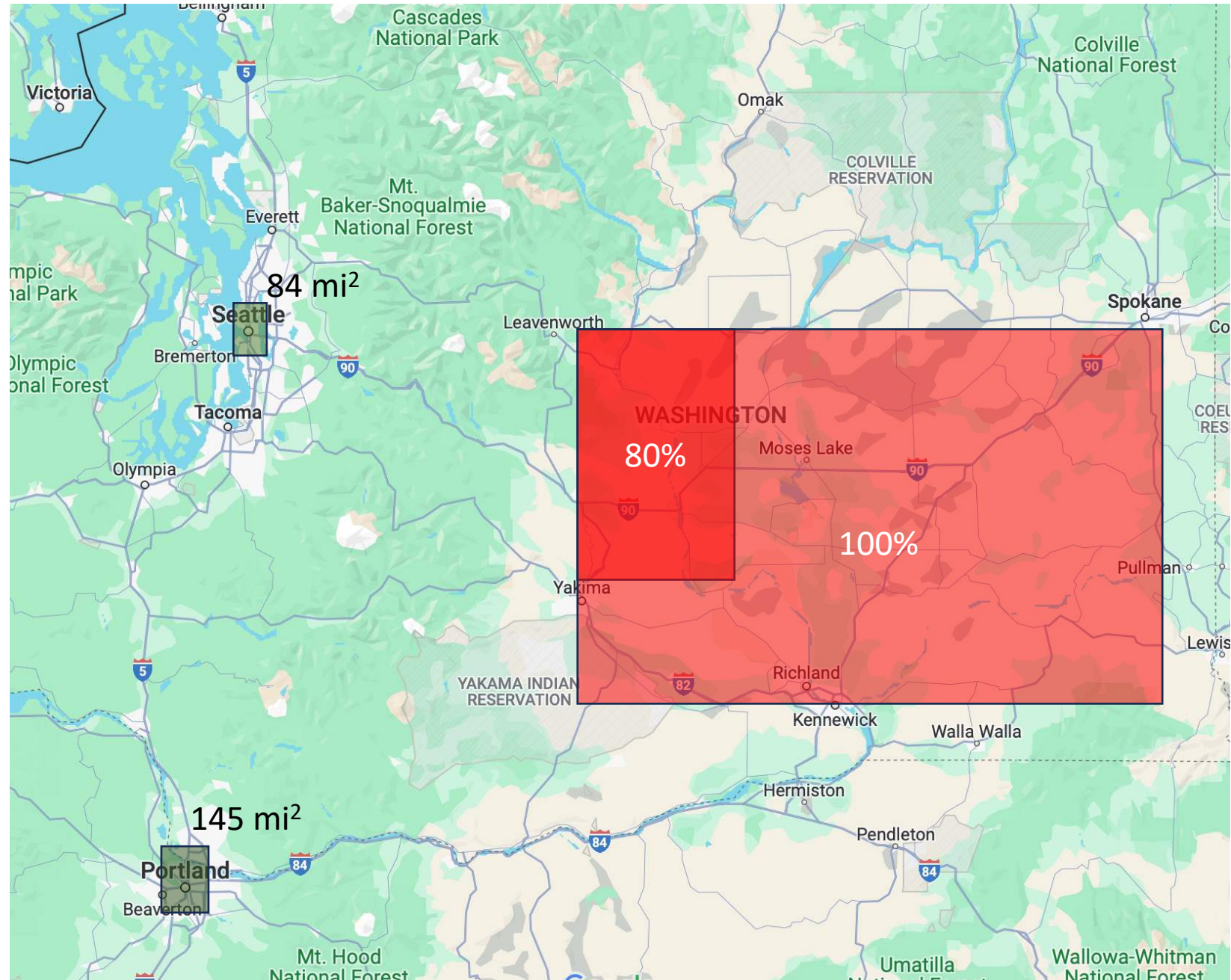
*NREL -"Land-Use Requirements of Modern Wind Power Plants in the United States"
**NREL – Solar Installed System Cost

Land Required For 80%-100% GHG free grid in Pacific Northwest

*Land use in 80% Reduction case
ranges from 8 to 37x
the area of Portland and Seattle
Combined*

*Land use in 100% Reduction case
ranges from 20 to 100x
the area of Portland and Seattle
Combined*

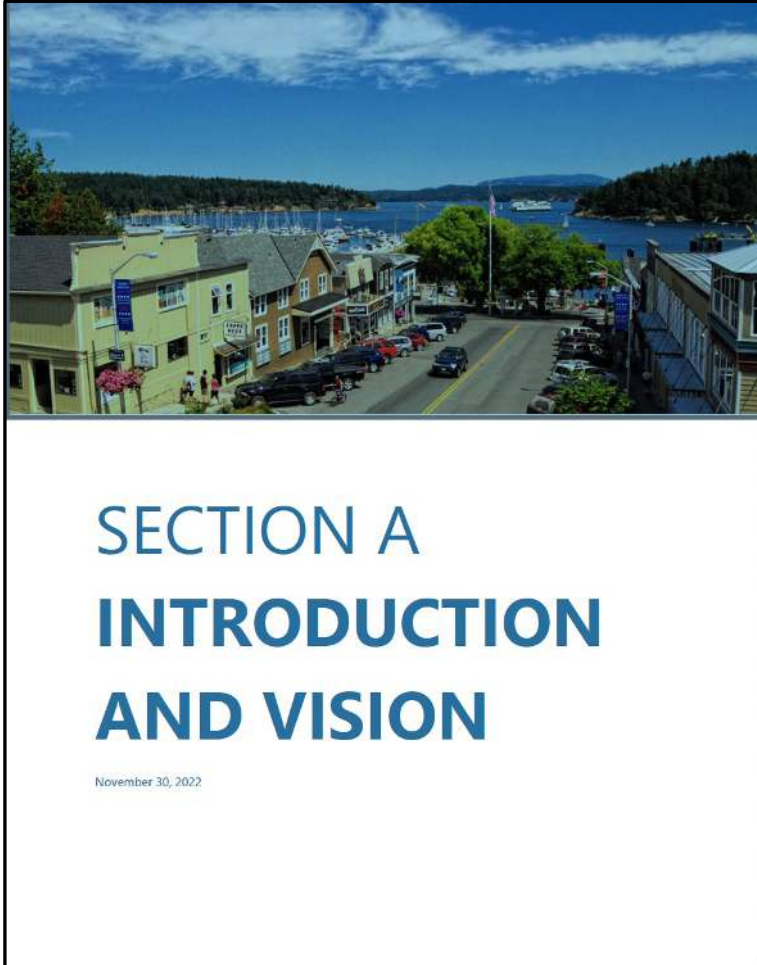
*“Resource Adequacy in the
Pacific Northwest
Serving Load Reliably under a Changing
Resource Mix
January 2019”
–Energy+Environmental Economics*



Looking Ahead...now what, locally?

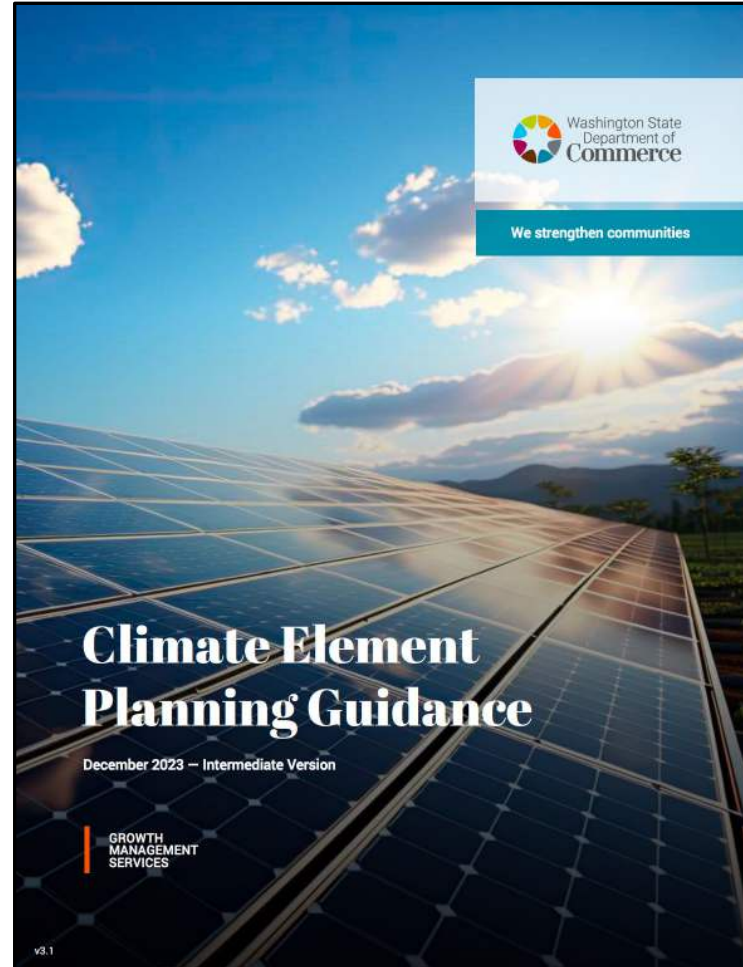


San Juan County Comprehensive Plan
Update due July 2025

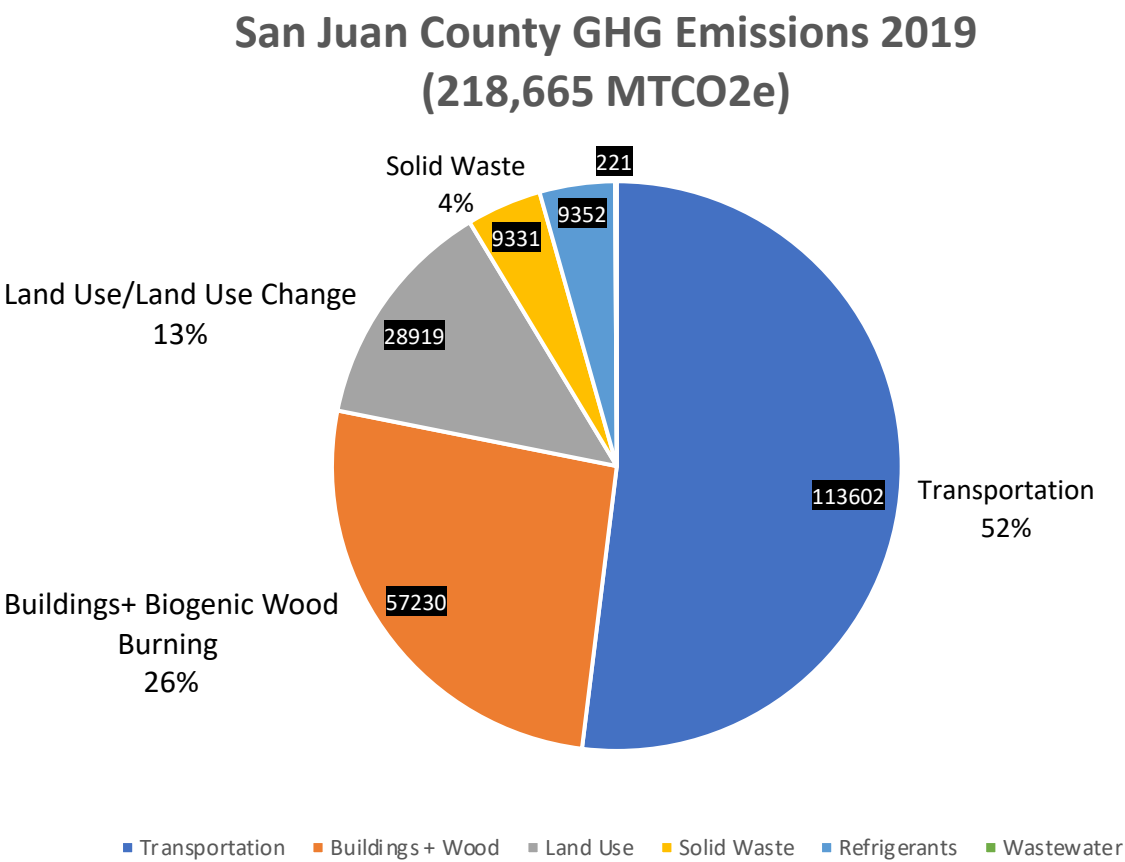
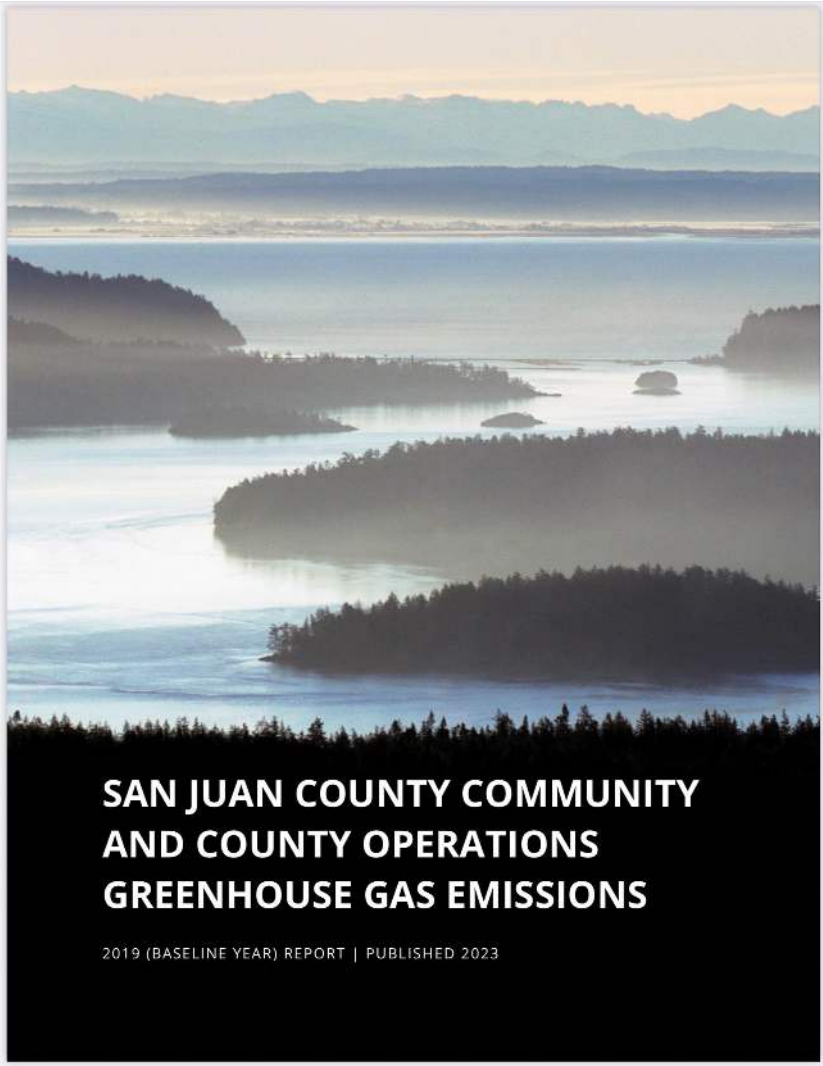


+

Section 3: Resilience Sub-element
Section 4: GHG Emissions Reduction Sub-element



SJC GHG Inventory – 2019 Base Year



**BY THE NUMBERS
SNAPSHOT**

2021 Numbers

238,640,807

kilowatt hours (kWh)
purchased

\$32,131,904

annual electric sales

\$1,100,000

Capital Credits Paid to
Members

15,569

meters connected

11,645

Members

1,259

miles of power lines
(87% underground)

25

submarine cables

20+

islands served



OPALCO

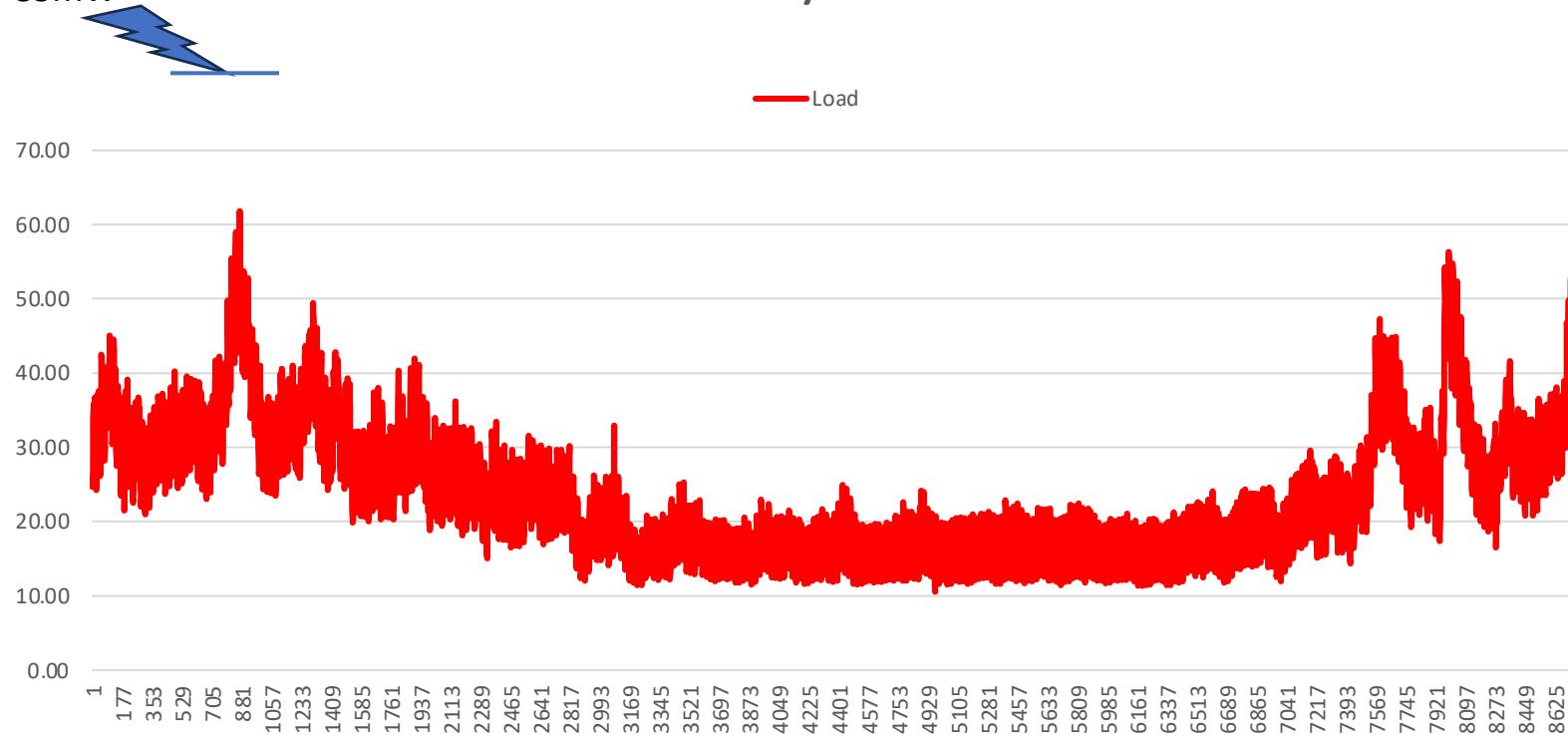
Co-op Run. Community Powered.

657 member generators

(1.5% local generation)

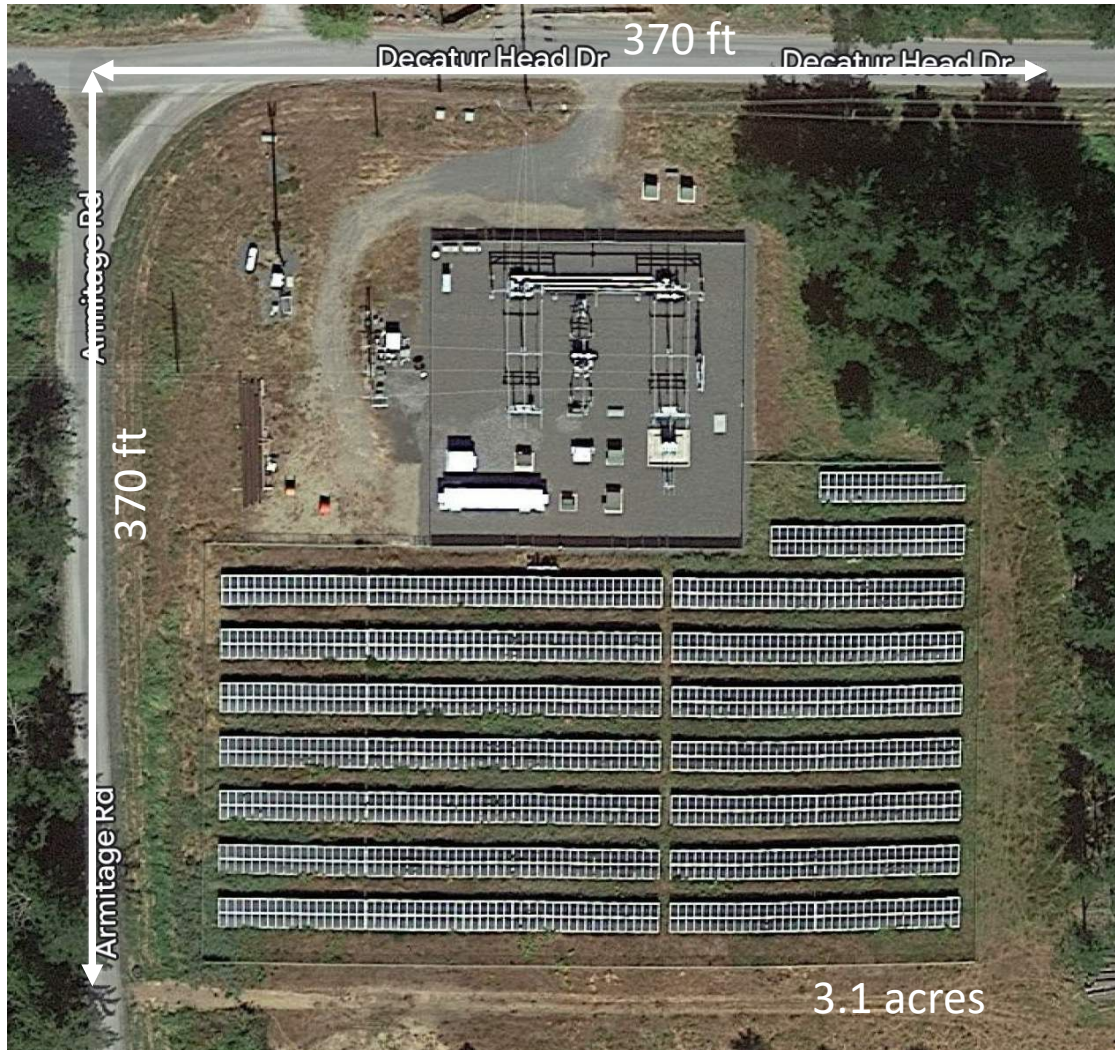
Example: OPALCO 2014 Load MW by Hour

2024 peak ~83MW

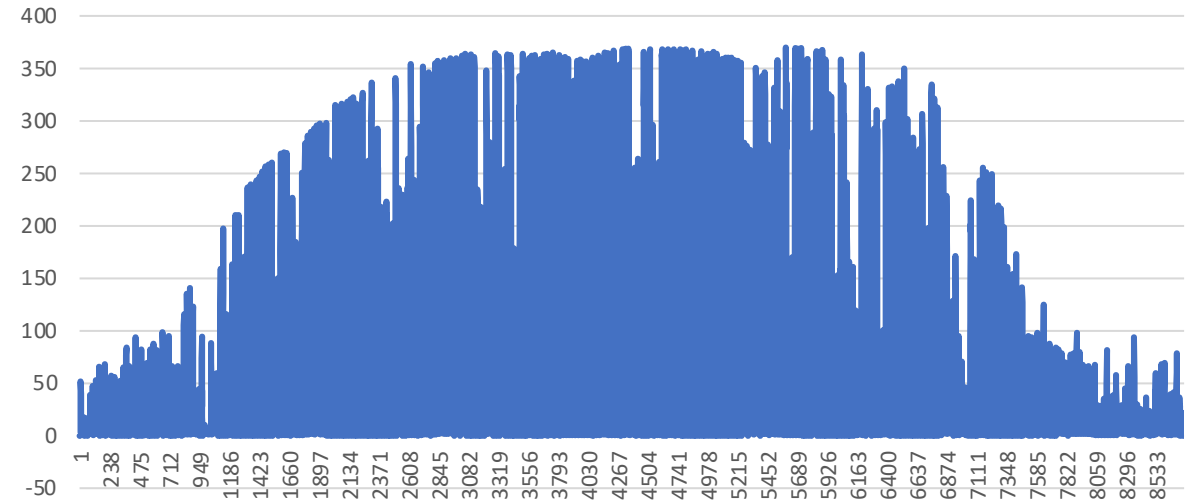


2014 Load Characteristics:

Hours/yr:	8,760
Total:	206,873MWh
Maximum:	61.8MW (2/6/14 8:00am)
Minimum:	10.6MW
Average:	23.6MW



Decatur Community Solar Array



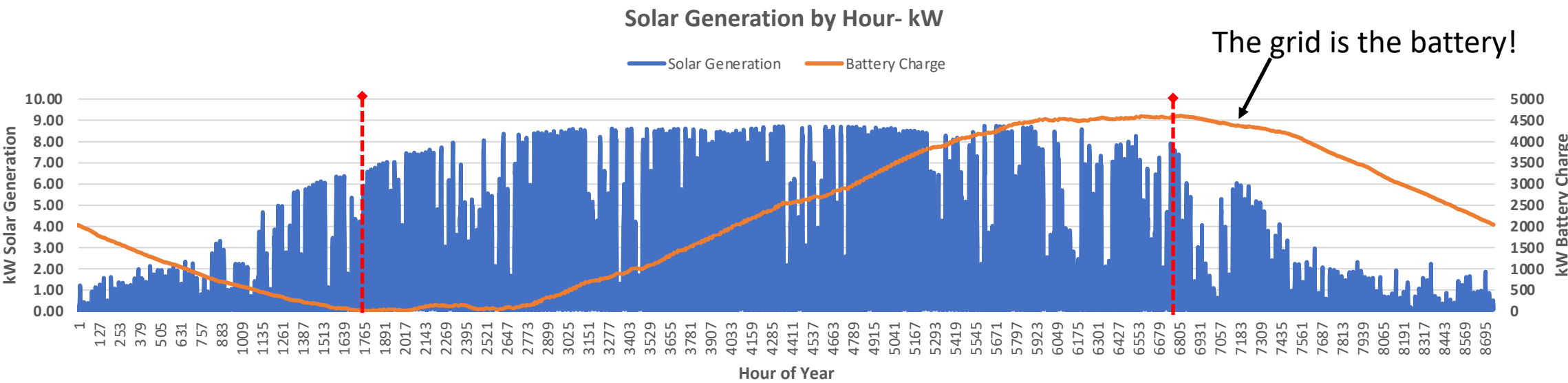
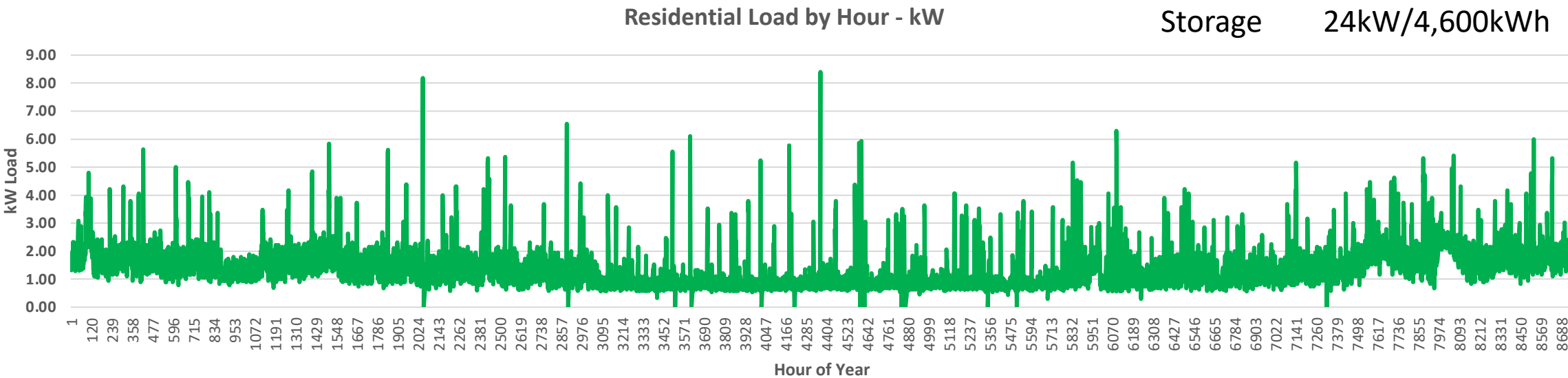
Solar Generation Characteristics:

Hours/yr:	8,760
Total:	506,614kWh
Maximum:	370kW
Minimum:	0kW
Average:	58kW
Summer:Winter	6:1
Hours/year zero output:	3,954
Hours/yr > zero output:	4,806
kWh/kW :	1,013
Capacity Factor	12%

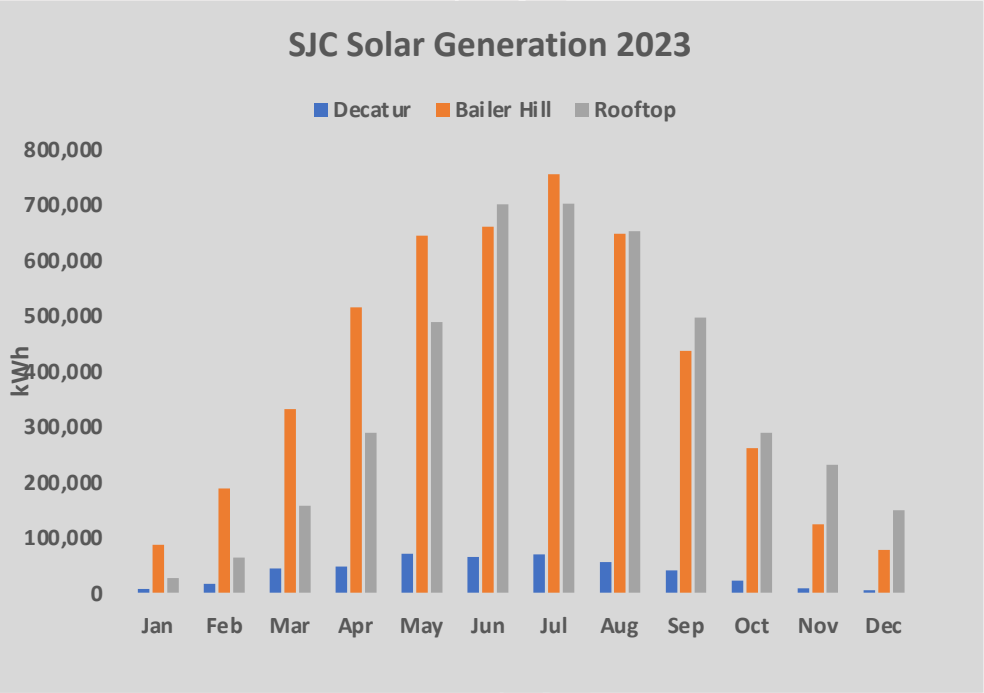
“Net Zero” House – Solar+Storage

Load 12,000kWh
Solar Gen 12,000kWh

Storage 24kW/4,600kWh



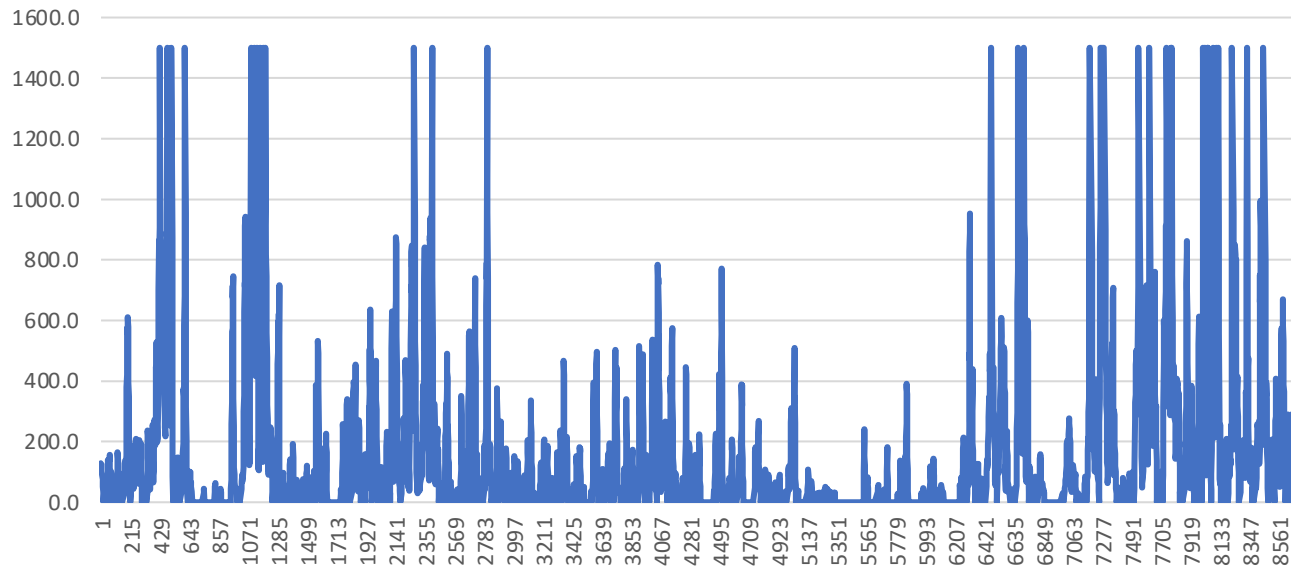
SJC Solar Generation



2023	Load kWh	Decatur kWh		Bailer Hill kWh		Rooftop kWh		Total kWh	
Jan	23,530,698	8,269	0.04%	87,971	0.37%	28,294	0.12%	124,534	0.53%
Feb	22,725,760	18,268	0.08%	188,979	0.83%	64,865	0.29%	272,112	1.20%
Mar	26,104,682	45,022	0.17%	332,574	1.27%	158,575	0.61%	536,171	2.05%
Apr	19,919,683	49,204	0.25%	516,145	2.59%	289,837	1.46%	855,186	4.29%
May	13,725,073	72,128	0.53%	644,833	4.70%	489,689	3.57%	1,206,650	8.79%
Jun	9,967,841	65,601	0.66%	661,030	6.63%	701,750	7.04%	1,428,381	14.33%
Jul	12,788,948	70,633	0.55%	755,894	5.91%	702,366	5.49%	1,528,893	11.95%
Aug	12,300,207	57,473	0.47%	647,846	5.27%	652,407	5.30%	1,357,726	11.04%
Sep	12,113,633	41,764	0.34%	437,191	3.61%	497,135	4.10%	976,090	8.06%
Oct	13,999,023	23,043	0.16%	261,632	1.87%	289,954	2.07%	574,629	4.10%
Nov	21,442,222	10,034	0.05%	124,809	0.58%	232,622	1.08%	367,465	1.71%
Dec	25,753,081	6,009	0.02%	78,414	0.30%	150,058	0.58%	234,481	0.91%
Total	214,370,851	467,448	0.22%	4,737,318	2.21%	4,257,552	1.99%	9,462,318	4.41%
Average	17,864,238	38,954	0.22%	394,777	2.21%	354,796	1.99%	788,527	4.41%



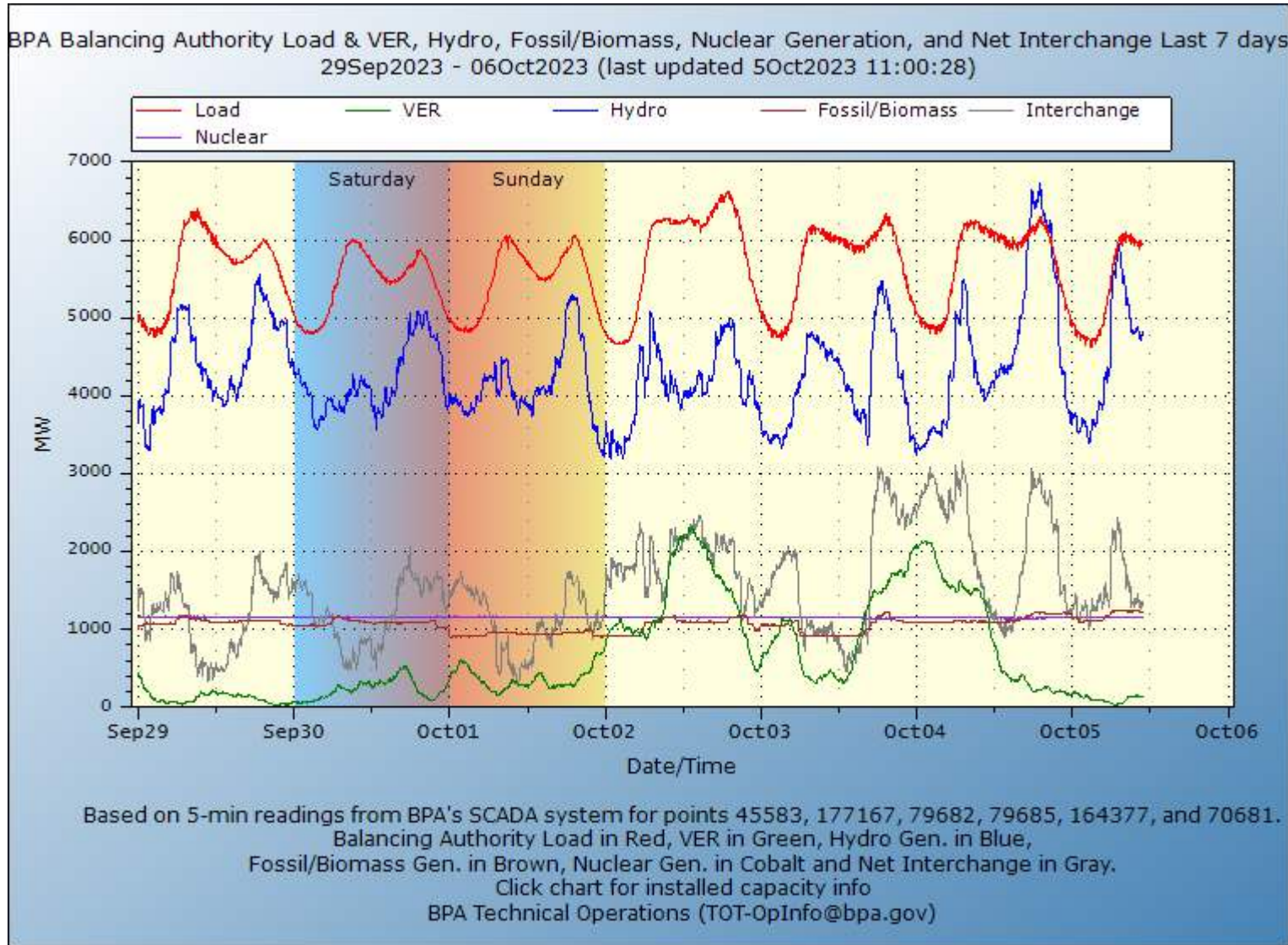
Wind 1.5MW
GE XLE1.5



Wind Generation Characteristics:

Hours/yr:	8,760
Total:	1,449,145kWh
Maximum:	1,500kW
Minimum:	0kW
Average:	166kW
Hours/year zero output:	3,505
Hours/yr > zero output:	5,255
Hours/yr < Average output:	3,133
kWh/kW :	966
Capacity Factor:	11%

BPA Balancing Authority Load and Total VER, Hydro, Fossil/Biomass, Nuclear Generation, and Net Interchange, Near-Real-Time



In the renewable energy sector, a **dunkelflaute** (German: ['dʊŋkəlˌflaʊtə], lit. 'dark doldrums' or 'dark wind lull', plural dunkelflauten) is a period of time in which **little or no energy can be generated** with wind and solar power, because there is neither wind nor sunlight.

“Wind ~ZERO”

11/14/09-11/27/09	13 days
1/12/17-1/18/17	6 days
1/1/18-1/9/18	8 days
10/30/19-11/09/19	10 days

Orbital Marine Power O2 floating Tidal Turbine



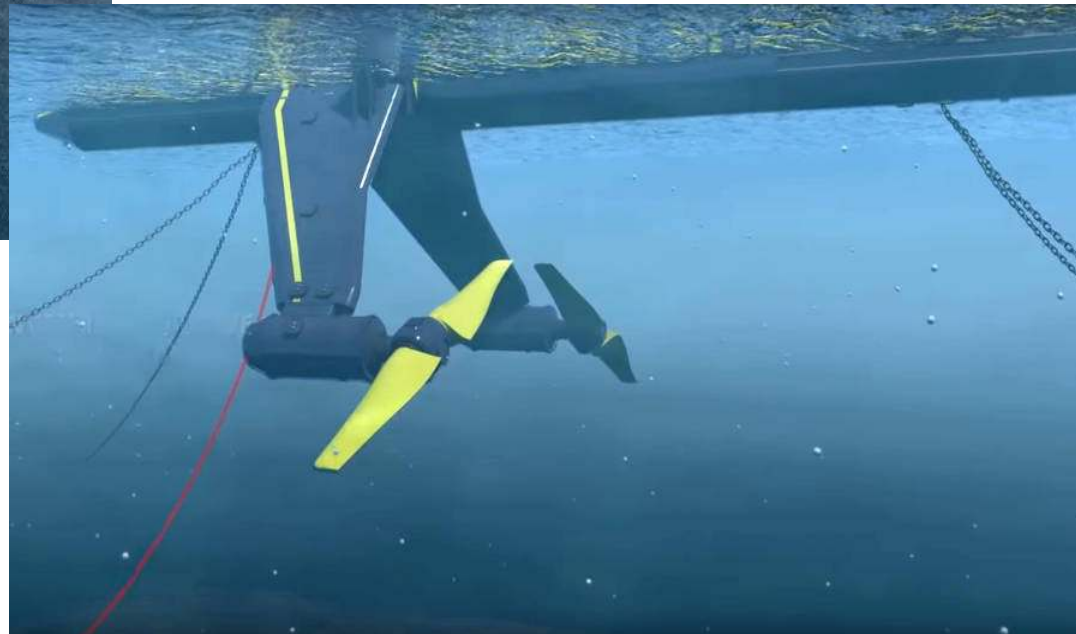
<https://www.orbitalmarine.com>

“PNNL is investigating the unique benefits of marine energy and quantifying its potential value to the grid.

As part of that project, the research team found that including marine energy in an energy portfolio can **decrease the need for solar and wind up to 50% all while requiring less battery storage.**”

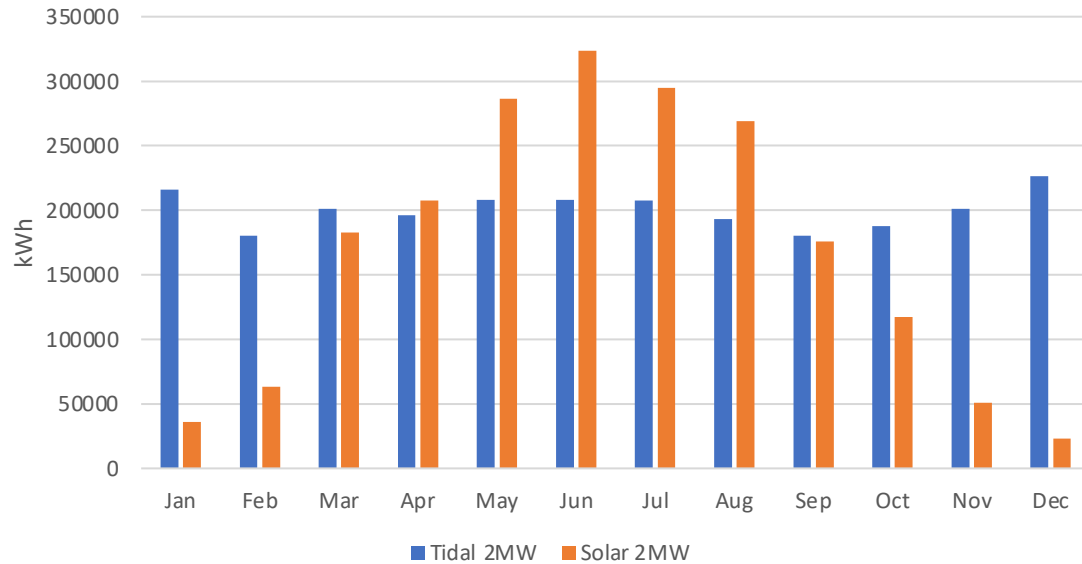
https://www.pnnl.gov/main/publications/external/technical_reports/pnnl-31123.pdf

- 242- foot hull with suspended rotors
- Floating approximately 5 feet above the waterline and 7.5 feet below
- 2 MW unit maximum output @ 2.5m/s current
- Estimated annual production is anticipated to be 2.5GWh
- ~10x less BESS required for firming vs solar across seasons

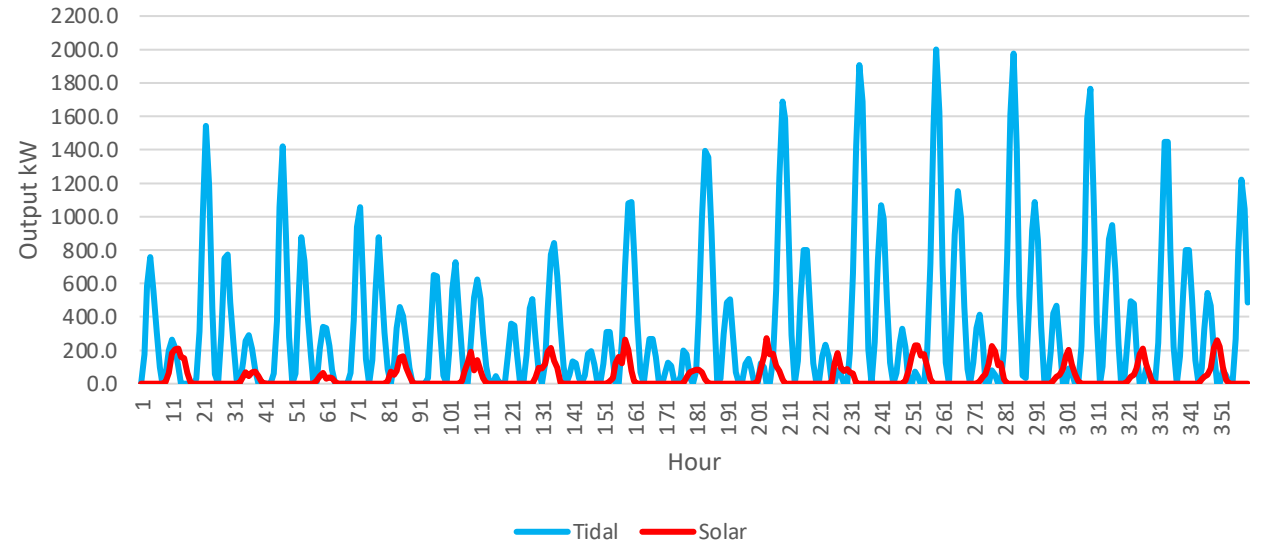




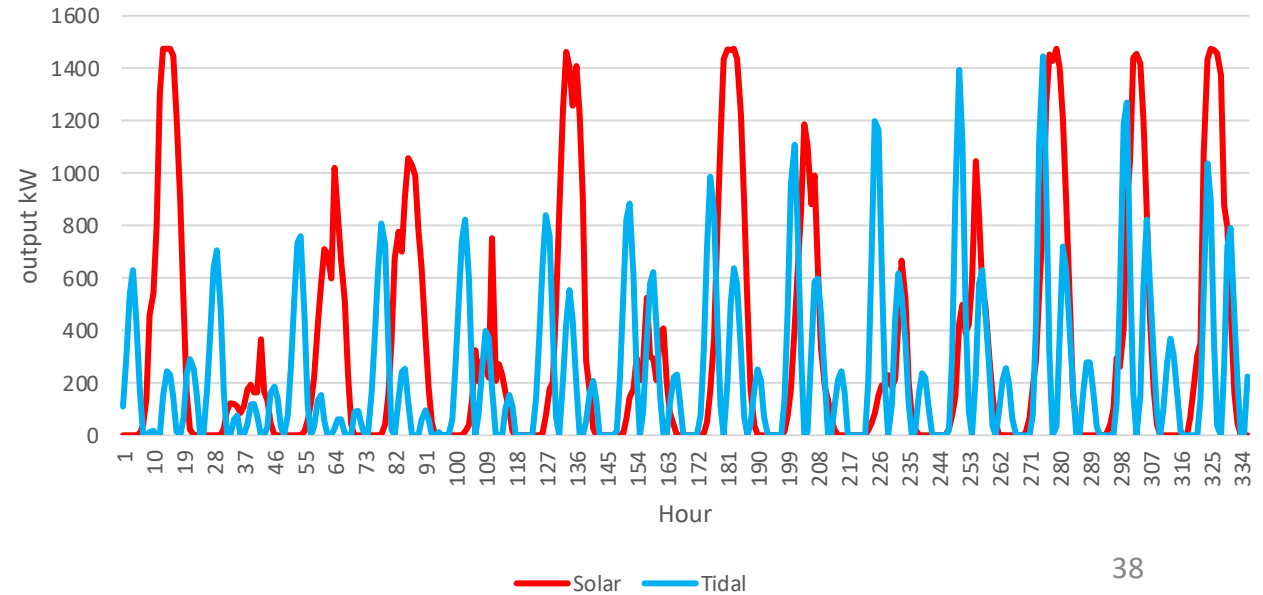
2MW Tidal vs 2MW Solar Monthly kWh output



Tidal & Solar Output - kW Jan 1-15



Tidal & Solar Output - kW Jul 1- 15



Decarbonizing Buildings - Heating



San Juan County WA Residential Heating by Fuel Source

San Juan County, WA

Table B25117 American Community Survey 2020

5-year

	Lopez	Orcas.	San Juan.	Total	
Renewable					
Electricity	787	1643	2566	4996	
Solar	15	0	22	37	
Total	802	1643	2588	5033	59.5%
Fossil					
Utility gas	34	76	111	221	
Bottled, tank, or LP gas	257	492	705	1454	
Fuel oil, kerosene, etc.	154	65	72	291	
Coal or coke	0	0	0	0	
Wood	392	511	501	1404	
Total	837	1144	1389	3370	39.8%
Other fuel					
No fuel used	4	2	12	18	
Total	16	16	24	56	0.7%



~54,000 TCO₂eq

Ready to Switch It Up?

“Switch It Up is OPALCO’s on-bill financing program. Members can choose from a variety of efficiency projects to improve their home or business and finance the project on their OPALCO bill. Five or ten year terms are available with a 2% amortized interest rate (for projects under \$100,000).”

Project	2019	2020	2021	2022	2023	Grand Total
Appliance					12,132	\$ 12,132
Energy Storage				39,510		\$ 39,510
Ductless Heat Pump	648,252	611,617	641,765	1,553,247	989,390	\$ 4,444,272
Fiber		30,725	48,681	29,301	30,038	\$ 138,745
Ducted Heat Pump	8,119	30,000	15,000	18,127	546,682	\$ 617,928
Heat Pump Water Heater	13,985	9,805		5,012		\$ 28,802
Insulation				256,935	7,799	\$ 264,735
Other	14,543			90,649	2,245	\$ 107,437
Solar + Storage				302,520	138,161	\$ 440,681
Solar				1,541,688	1,302,235	\$ 2,843,923
Windows				563,557	62,272	\$ 625,829
Grand Total	\$ 684,900	\$ 682,146	\$ 705,446	\$ 4,400,546	\$ 3,090,954	\$ 9,563,993

What could Drive Future **Local** Load Increase?

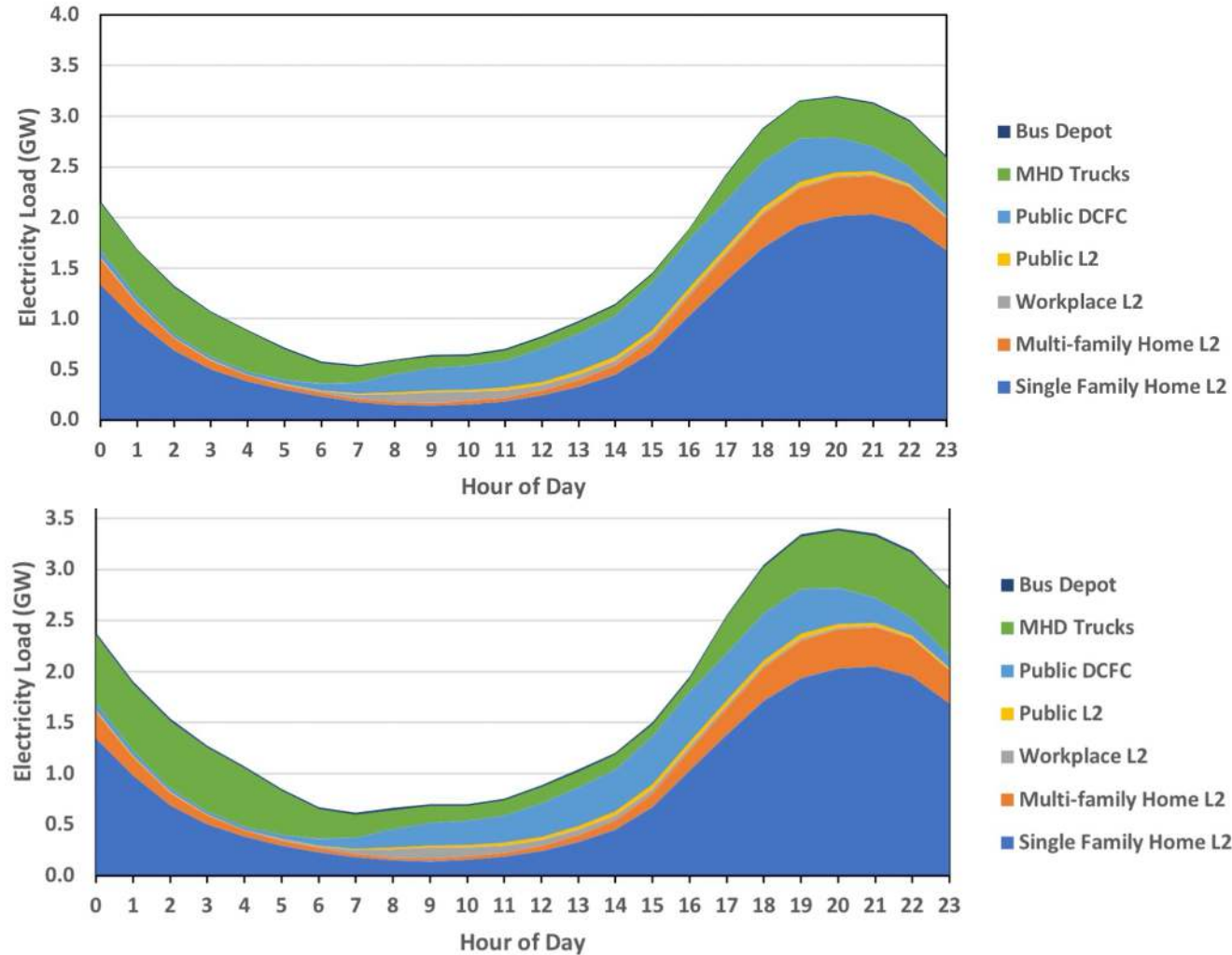
Decarbonization of Transportation and Buildings!

“Unofficial – Back of the spreadsheet estimate – YMMV!”

2021 Load		~238,000,000kWh
EV Charging	SJC Total Vehicles	22,000
	If 25% are EV's by 2032	5,500
	Additional load	+6,875,000kWh
“Switch It Up”	50% of 3,370 houses	+25,200,000kWh
WSF Ferry Electrification		+79,000,000kWh
Population Growth 0.5%/yr	+600 houses	+7,200,000kWh
Total Load Increase		+118,275,000kWh +50%

Draft Washington State Transportation Electrification Report

FIGURE 31. STATEWIDE EV LOAD, 2035 BASELINE (TOP) AND STRONG ELECTRIFICATION POLICY (BOTTOM) SCENARIOS



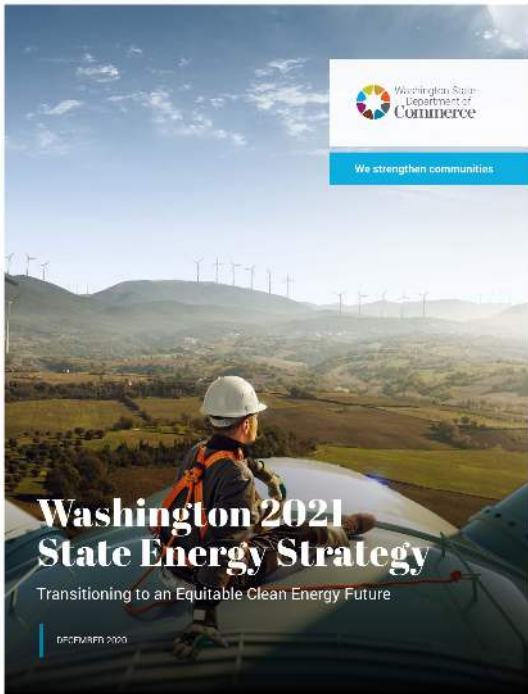
2021 WA State
Nameplate Capacity
30,609MW
Net Generation 110TWh

Peak Additional 2035
Load for EV Charging:

+3,500MW peak
+15TWh annual load

+11% peak
+14% annual load

Big Picture – What needs to happen to meet GHG goals?



1) Transition Electric Grid to Low to Zero Carbon

- a) Acquire large amount of new renewable generation
- b) Find land to put it on
- c) Build new Transmission Lines to move the power
- d) Acquire large amount of ESS (Energy Storage Systems)
- e) Improve siting and permitting process!
- f) Integrate large amounts of DER's (Distributed Energy Systems)
- g) Create an RTO (Regional Transmission Organization) in the PNW to coordinate energy production, transmission, and markets

2) Electrification of Transportation (39% GHG)

a) Transportation Electrification Strategy

<https://www.commerce.wa.gov/growing-the-economy/energy/clean-transportation/ev-coordinating-council/transportation-electrification-strategy>

3) Electrification of Buildings (25% GHG)

- a) <https://www.commerce.wa.gov/growing-the-economy/energy/clean-energy-fund/building-electrification-grant/#:~:text=The%20Building%20Electrification%20Program%20provides,the%20path%20to%20zero%2Denergy>



Eastsound, Washington

2020 – 2040

Integrated Resource Plan

OPALCO's Vision for the Next 20 Years

Executive Summary

- Continue to meet the energy needs of the members
- Support San Juan County's GHG reduction and Climate resiliency goals
- Achieve SJC Comprehensive Plan objectives
- Incentivize conservation and efficiency
- Increase local renewable generation for resiliency, and as a buffer to market volatility!
- Improve grid for reliability, and to integrate increasing amounts of VER's
- adopt new technology and operating procedures when appropriate

<https://www.opalco.com/wp-content/uploads/2019/11/OPALCO-2020-2040-IRP-R16.pdf>

<https://www.opalco.com/?s=quick+facts>

Grant Funding (State, Federal) \$\$ and more \$!

- Underground cable replacement
- Sectionalization (i.e. Resilience, redundant paths)
- Distribution System upgrades (protection, monitoring)
- R.O.W. clearing (fire hazard reduction)
- Next Generation Meters (more information, higher speed com link)
- Substation Transformer Replacement (40-50 years old)
- Inter-island Submarine cable replacements (next 2035)



- Community Solar (up to 30% local generation + storage goal)
- Tidal Generation investigation
- Next Generation SCADA software (“Smart Grid” - integration of more distributed generation and storage sources, bi-directional EV transactions, microgrids, etc)
- Third Submarine Cable to mainland (north to Bellingham area)

What else is there?

“I have made this ~~letter~~ longer than usual because I have not had time to make it shorter.”
presentation

17th century French mathematician and philosopher Blaise Pascal

- Technology advancements
 - battery chemistry
 - other long term storage technologies
 - carbon capture/storage
- PNW Geothermal potential
- Widespread adoption of residential demand response
- Cybersecurity
- AI, Software (SMOP!)
- PNW and WECC market structure
- Funding??
- Sociopolitical implications

Presentation - Recommendations

1. Learn more about Climate Change & Energy Transition

- Use credible sources
- Dig a little deeper
- Fact check social media content!

2. Make your voice heard

- Vote!
- Participate (attend/watch Council, Committee, and Board meetings)
- Volunteer

3. Support

- GHG reduction efforts
- Climate resiliency projects
- Energy efficiency and local renewable generation
- Local economy, agriculture initiatives



THANK YOU!

**For more information:
<https://www.opalco.com/?s=quick+facts>**