

FRIENDS OF THE SAN JUANS

OPALCO

Local Renewable Generation and Climate Action Discussion

9 December 2024

Agri-Solar = Dual-Use Food + Energy Production



Delay Alert:

Bailer Hill Annual CO2 Equivalencies

4,700 MWhr Solar =

4,525,634 lbs CO₂/yr from Conventional Power Plant

= Auto CO₂ Emissions from 230,988 gallons gasoline

Annual Alternative to Bailer Hill:

Plant 33,943 Tree Seedlings/yr and Grow for 10 Years

* Basis: US EPA Greenhouse Gas Equivalencies Calculator



renewable energy

Fossil fuels are part of our everyday lives. Coal, oil, natural gas... they transport us, heat our homes, and make life easier. However, science shows that dirty energy harms our health and environment. Without investing in a renewable energy future, the next generations face a very uncertain future.

Innovations in renewable energy happen every day, providing people the opportunity to make choices to reduce their carbon footprint. Solar panel roofs, wind turbines, and electric cars and bikes are more accessible than ever, and are fantastic options to invest in a fossil fuel free future.

Friends works with the San Juan Islands Conservation District, Islands Energy and OPALCO on the **Cool School Challenge** (CSC), a program which engages students in reducing energy and carbon dioxide emissions school-wide. Friends also partners with other organizations on presentations about how to implement renewable energy and other sustainable solutions in our community.



The Cool School Challenge team at Lopez Elementary.



Imagine: Climate Action, Together

Friends *of the*
San Juans



Action Alert

Protect this place.

Four actions you can take this week to protect marine ecosystems and island communities!

Action # 1: Protect Washington's Ban on Net Pen Aquaculture

Action #2: Ban Discontinued Dispersants and Update Oil Spill Response Plans

Action #3: Advance Protections in San Juan County by Serving on a Local Committee!

Action # 4: Support local agri-solar projects. It helps farmers and improves our energy independence.

The Current Threat

Dirty energy threatens millions of vulnerable land and ocean species. The world is trying to replace dirty energy with clean renewables. However, old permitting processes designed to protect us from Big Oil cause most renewable energy projects to be canceled. Washington has just 5 years to reduce its CO2 emissions by 50%.

What's at Stake?

The climate emergency puts our precious natural world and island community at risk. This is the new normal: accelerating ocean warming, drought, wildfires, water shortages, extreme rain, and flooding. "Business as usual" is a death sentence to vulnerable species and humans and our rural way of life.

The Opportunity

Agri-solar is the fastest way to replace dirty energy with local renewables. It reduces our dependence on the mainland while helping farmers improve the economics of working the land. Join the Friends of the San Juans and OPALCO to take climate action, together.

Climate Change Is Destroying Nature.

Need to reduce CO2 50% by 2030.

Farming in the San Juans is not economic.

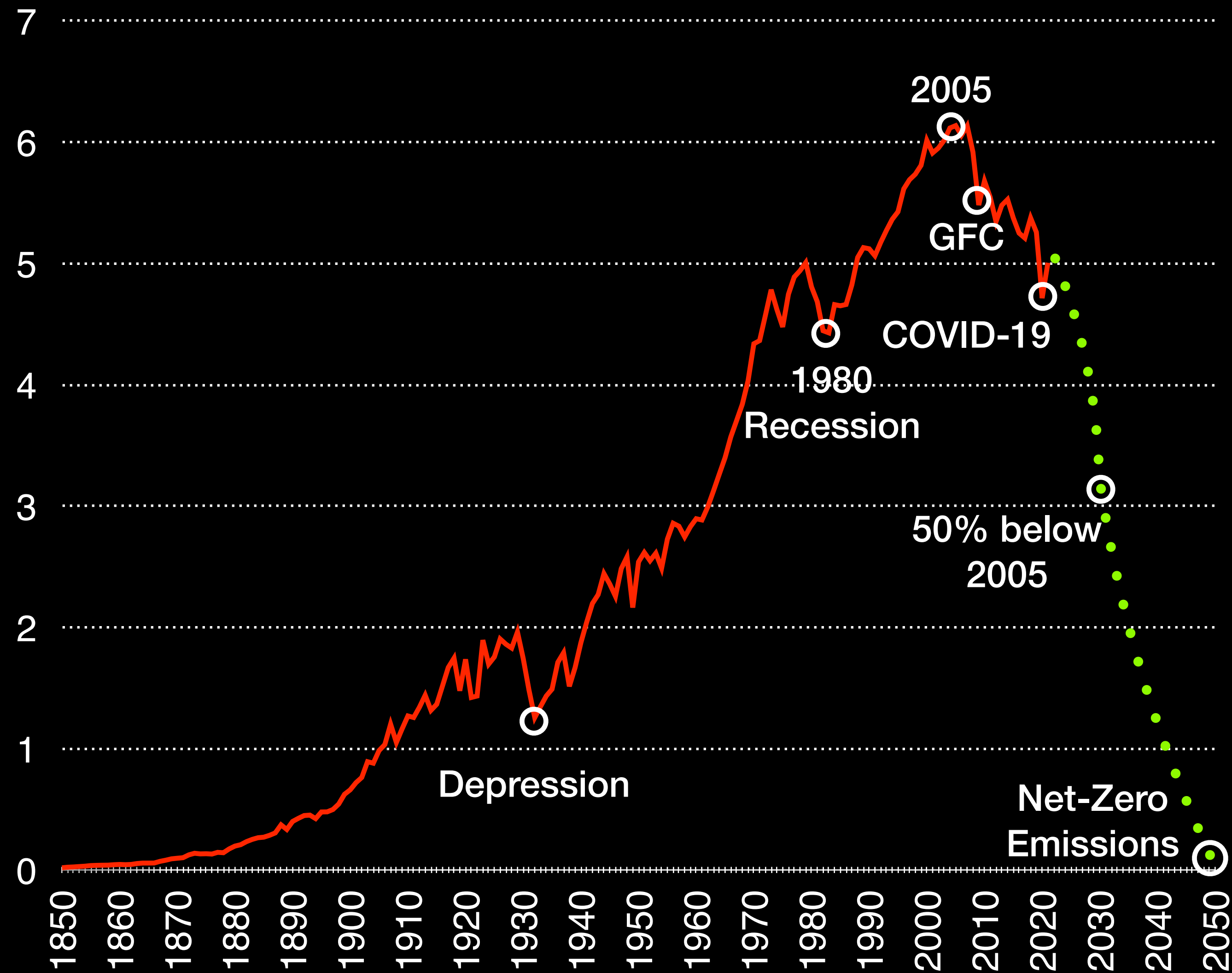
Mainland power outages are imminent.

Rooftop solar is not a silver bullet.

utility-scale solar will help

Supply/Demand Overview

US Annual CO₂ Emissions: 1850 - 2050 (billions of tons - Gt)



US Objectives

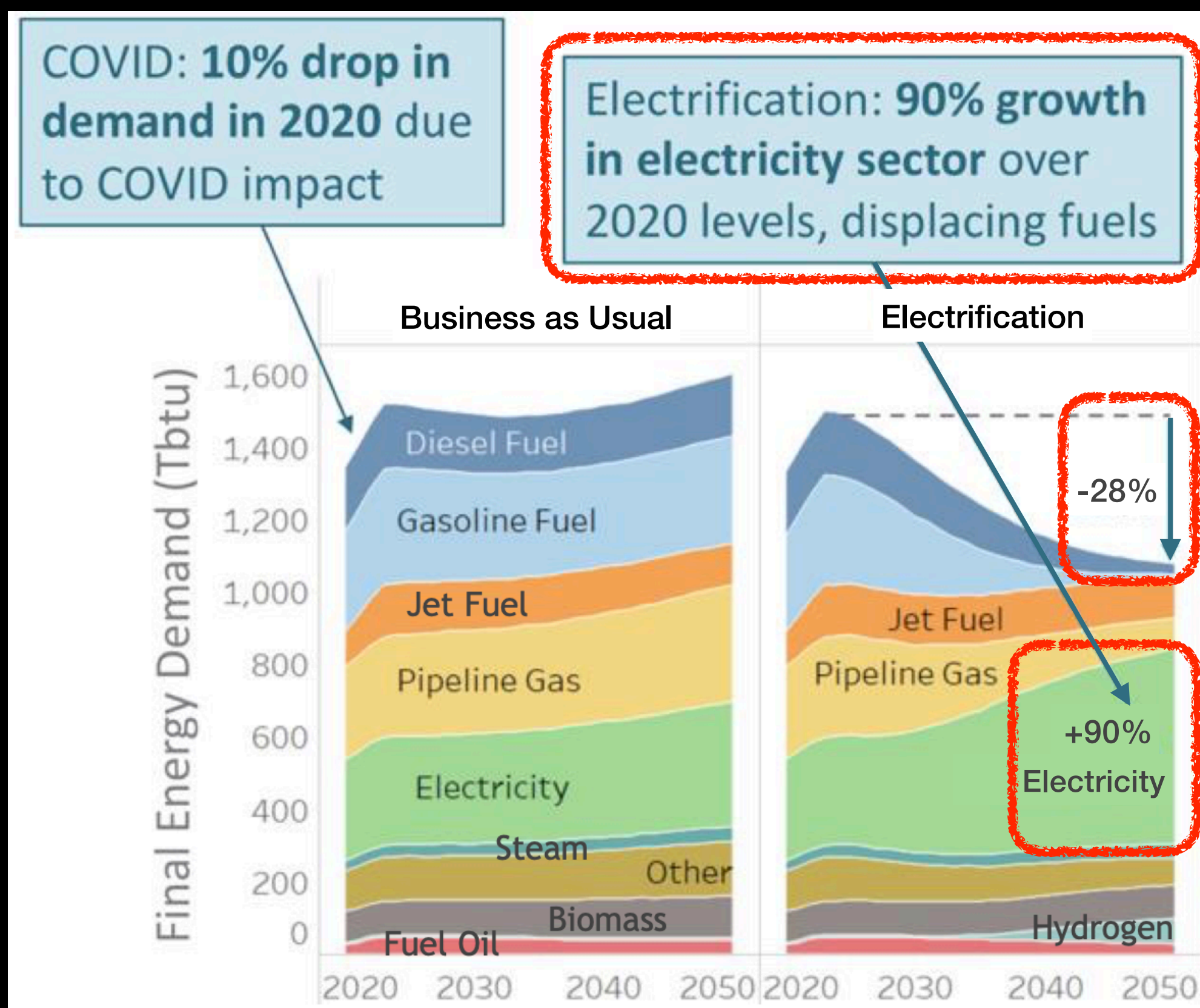
- reduce GHG emissions 50% below 2005 levels by 2030, Net-Zero by 2050
- invest in infrastructure, renewables + storage, resilience, electrify transportation (cars, trucks, ferries, planes)
- delivering 40% of the benefits to disadvantaged communities
- increase clean-tech jobs

Washington Objectives

- mirrors Federal objectives
- substantial funds from federal investment will flow through state (e.g. WA departments of Commerce and Transportation)

WA 2021 Energy Strategy and Implications

*Decarbonization will reduce **TOTAL** energy consumption by 28%, by nearly doubling demand for electricity*



Energy Megatrends to Decarbonize Energy Supply

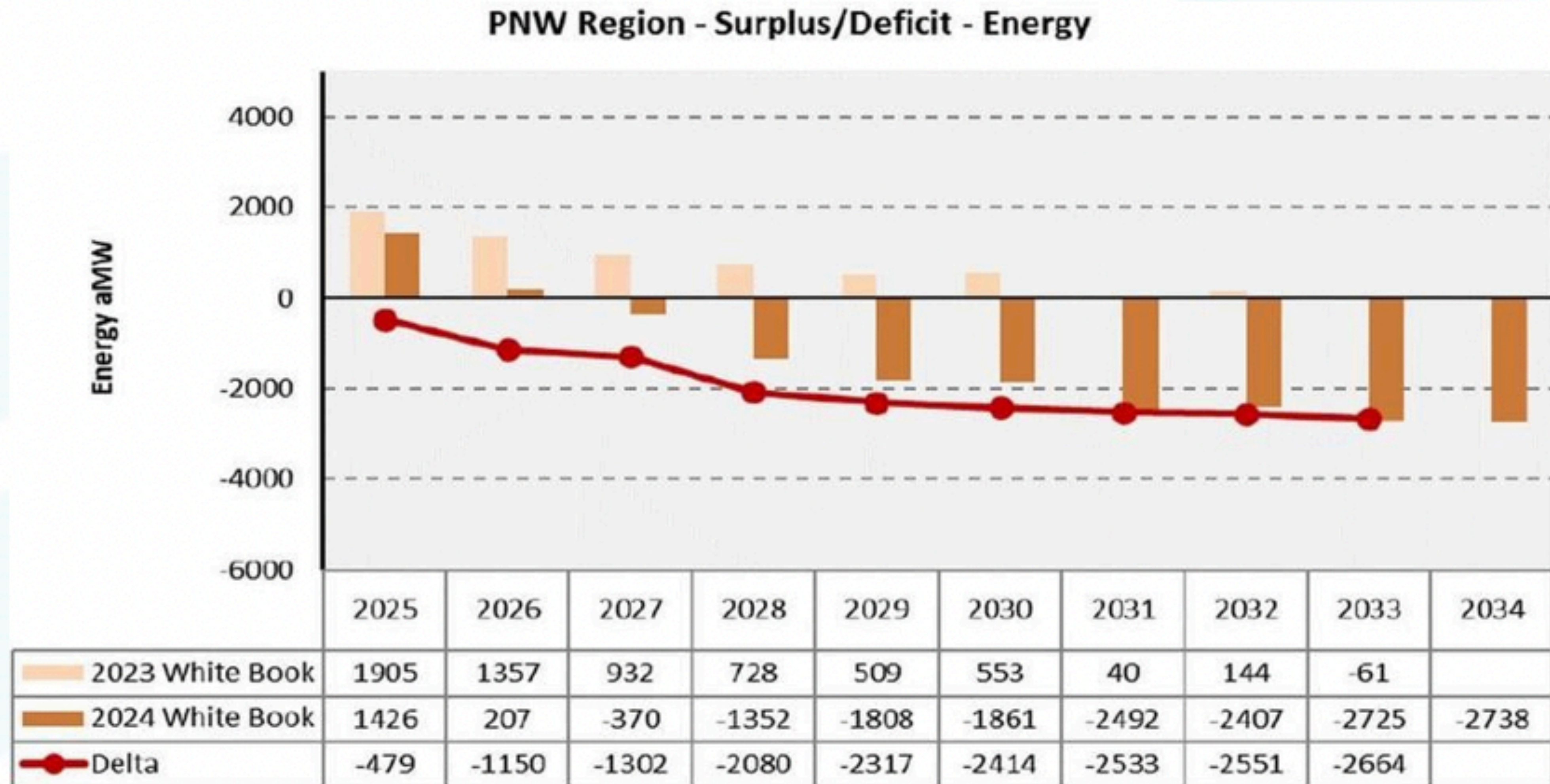
- ❖ Climate change → Decarbonization → Electrification Transportation and Heating
- ❖ Electric capacity decreasing dramatically 2025 coal plant shut down, hydro spill
- ❖ Solar and wind generation will be deployed to meet demand, but slowly
- ❖ California power play - NW hydro needed to stabilize intermittent solar and wind

If California was a country, it would be the fifth largest economy in the world!

Major Challenges Ahead

- ❖ Millions of acres of land will be required for solar, wind and transmission corridors
- ❖ Permitting/siting/acquiring new land resources will take years and capital - **NIMBY**
- ❖ Federal and State financial assistance will be needed to meet capital requirements

NW Regional Energy Deficit Forecast Accelerating



From BPA's Load and Resource Study Shows Energy Deficits Starting in 2027 and Growing Rapidly in Low Water Years by Ernst, S. (2024). NewsData.

Washington Energy Strategy Reality Check

During the January 2024 cold snap, the Washington power system almost collapsed

Between now and 2035, each year we are more at risk

Picture the loss of life and economic impact that took place in the 2021 Texas blackout

The Clock Is Ticking

- Regional loads growing faster than projected
- Coal plant shutdowns shrinking regional capacity
- New renewables projects will take decades to deploy
- **Shortfall starts this year, growing to 25,000 MW deficit by 2035**

source: Northwest Regional Forecast, 2023; PNUCC

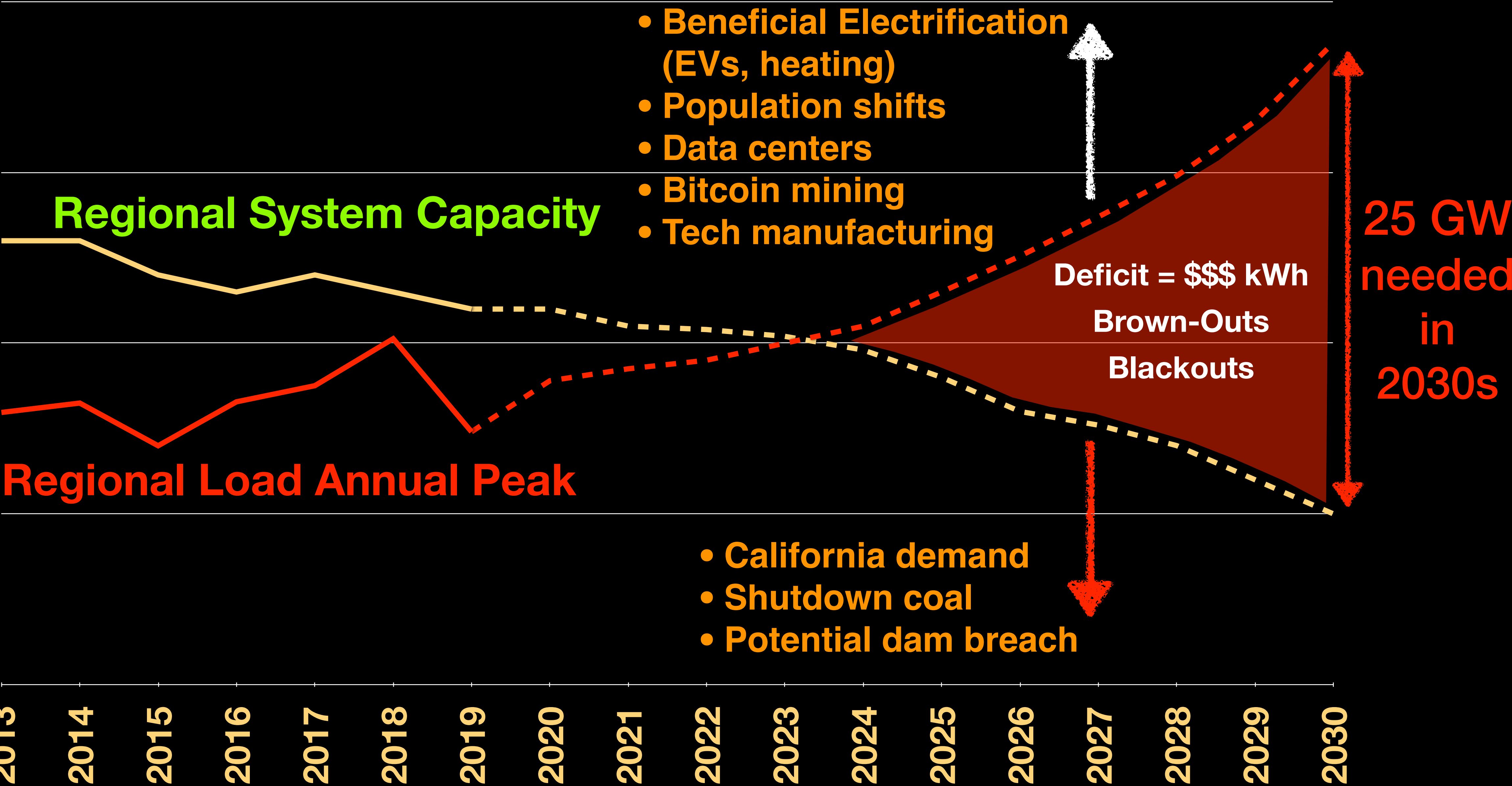
source: Transportation Electrification Strategy, 2023; WA DoT

- **Northwest needs to be adding 2,500 MW per year – 25 X faster than normal**

Deficit mainly due to legal and permitting barriers that have historically slowed development to 125 MW per year

NW Energy Capacity is Declining, Load is Increasing

Higher



Lower

2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

NW Power & Conservation Council: 6 August 2024 Planning and Analysis Study

NWPCC increased estimate to 30 to 70 GW needed in the NW

2030 NW New Energy Resource Buildout By Fuel Type (MW)



NWPCC just estimated over 400 GW needed across western region

“We should expect our total build to be between 406 and 613 GW, which is astonishing! That is the biggest number I have ever seen.”

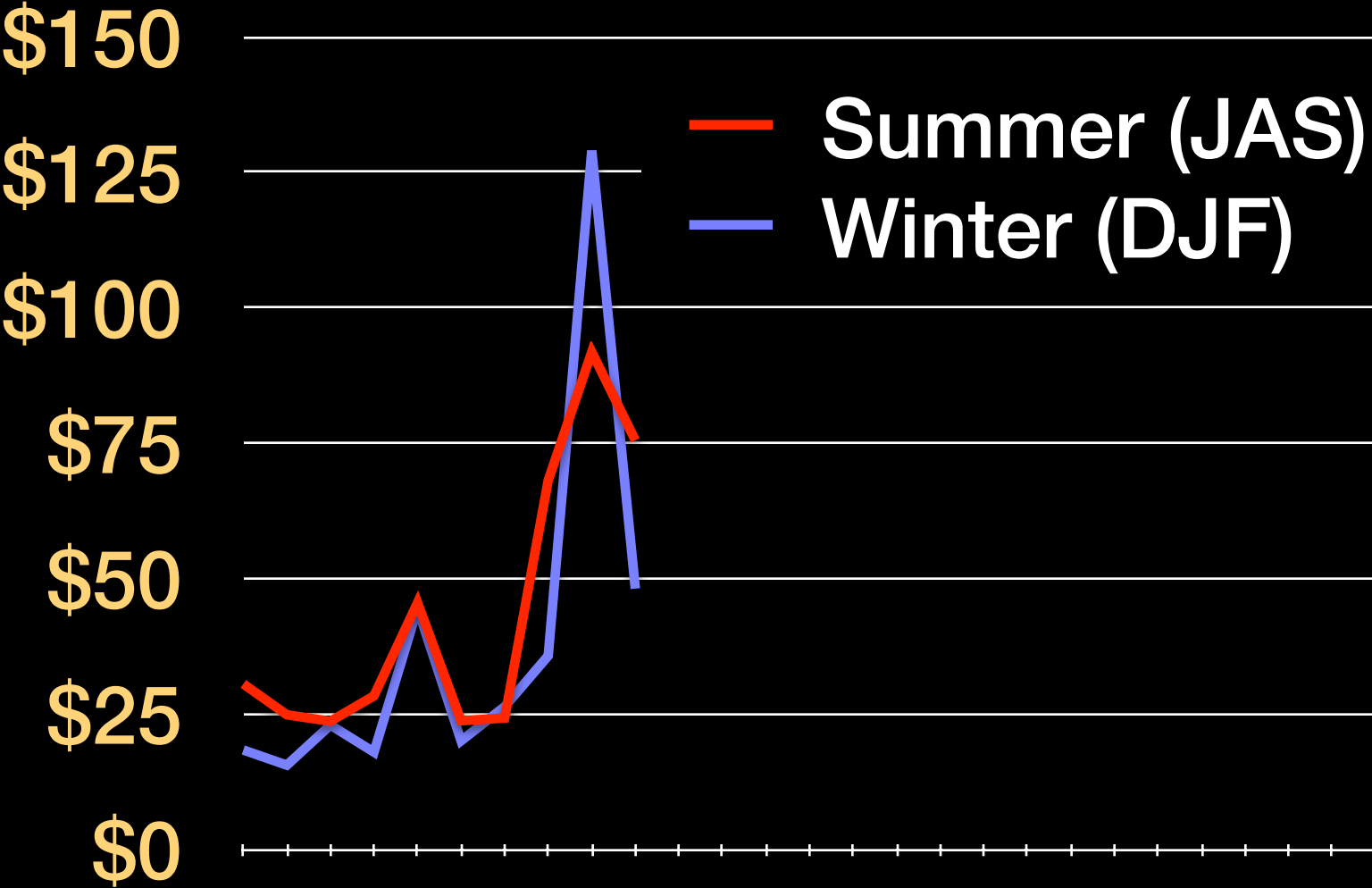
NWPCC 13 August 2024 Study Presentation

Supply-Demand Shortfall: Mid-Columbia Price History (\$/MWh)

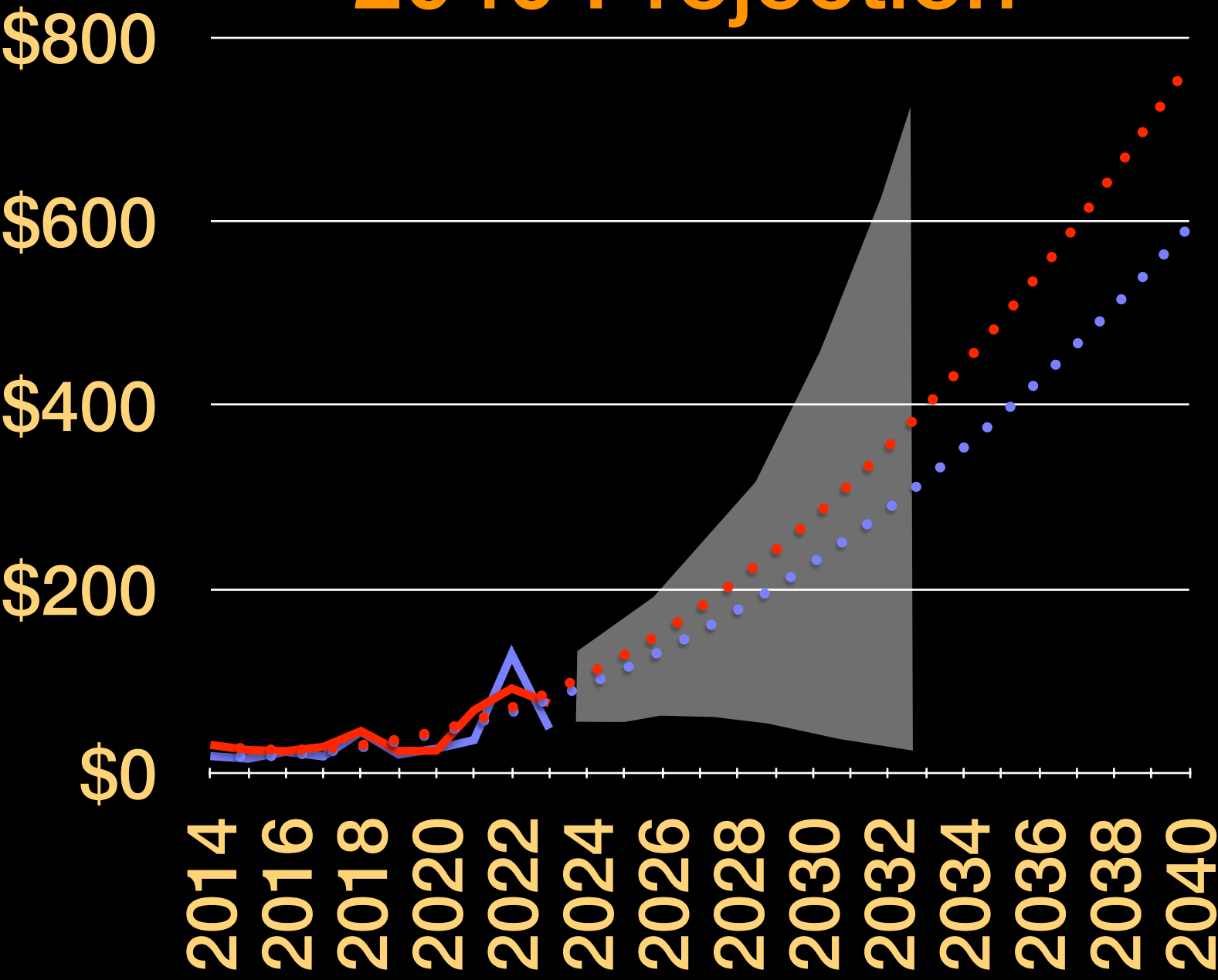
Monthly Weighted Avg. Mid-C Price



Seasonal Mid-C Price



2040 Projection



California Is Actively Pursuing Our Northwest Energy Supply

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Need a power line? That'll be \$3B and 18 years.

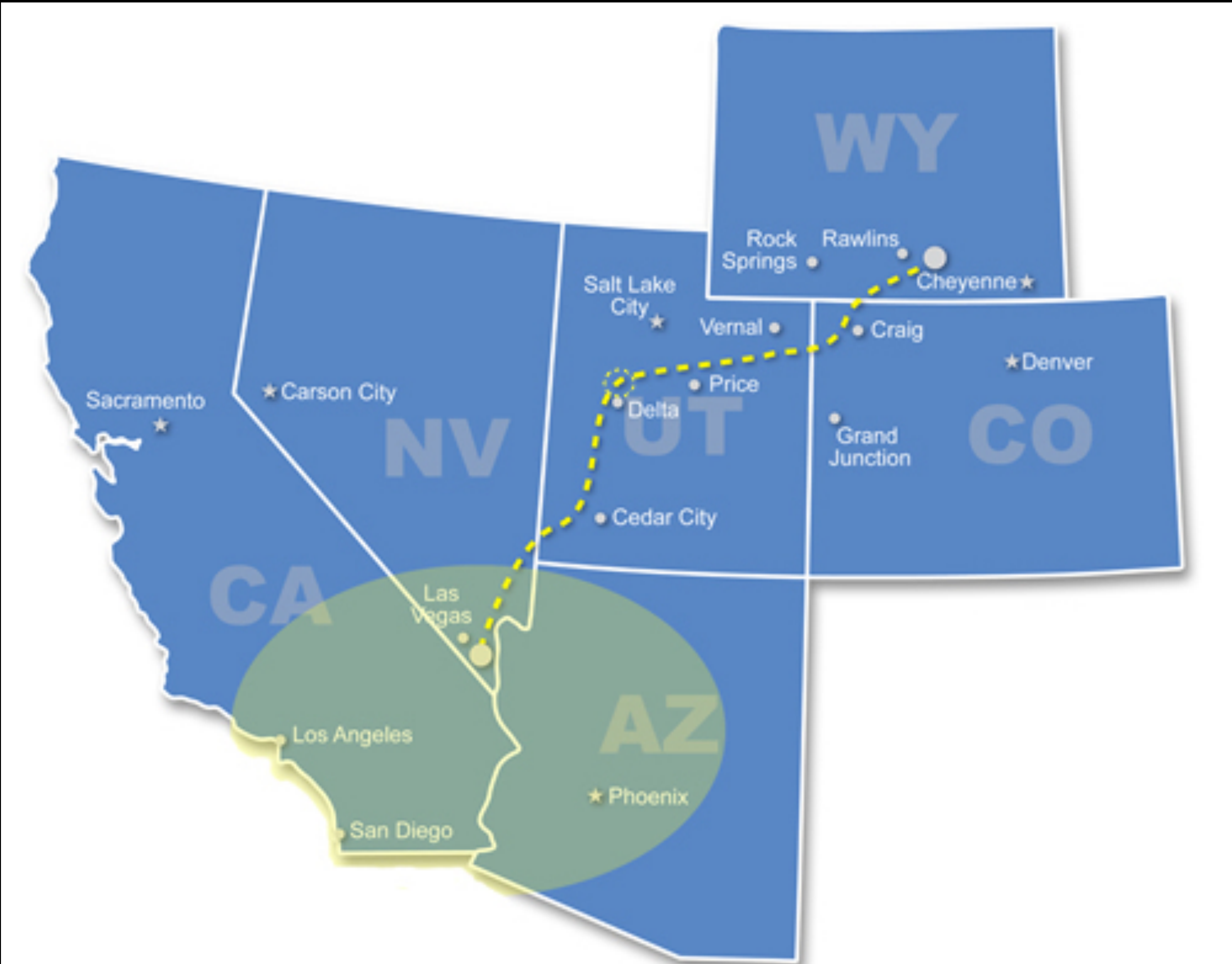
By ARIANNA SKIBELL | 06/21/2023 05:59 PM EDT



Interior Secretary Deb Haaland (center left) and Energy Secretary Jennifer Granholm (center right) arrive at a ceremony for the TransWest Express transmission line in Wyoming. | Jason Plautz/POLITICO's E&E News

A 732-mile power line broke ground in Wyoming this week, paving the way for the country's largest onshore wind project to send zero-carbon energy to California, Arizona and Nevada.

While the \$3 billion TransWest Express Transmission project marks a win for the Biden administration, it took nearly two decades to green-light, [writes Jason Plautz](#).



How Long Will it Take to Develop 25+ GW of Renewable Resources?

National Resistance to Renewables

“Local governments are banning green energy faster than they’re building it.”

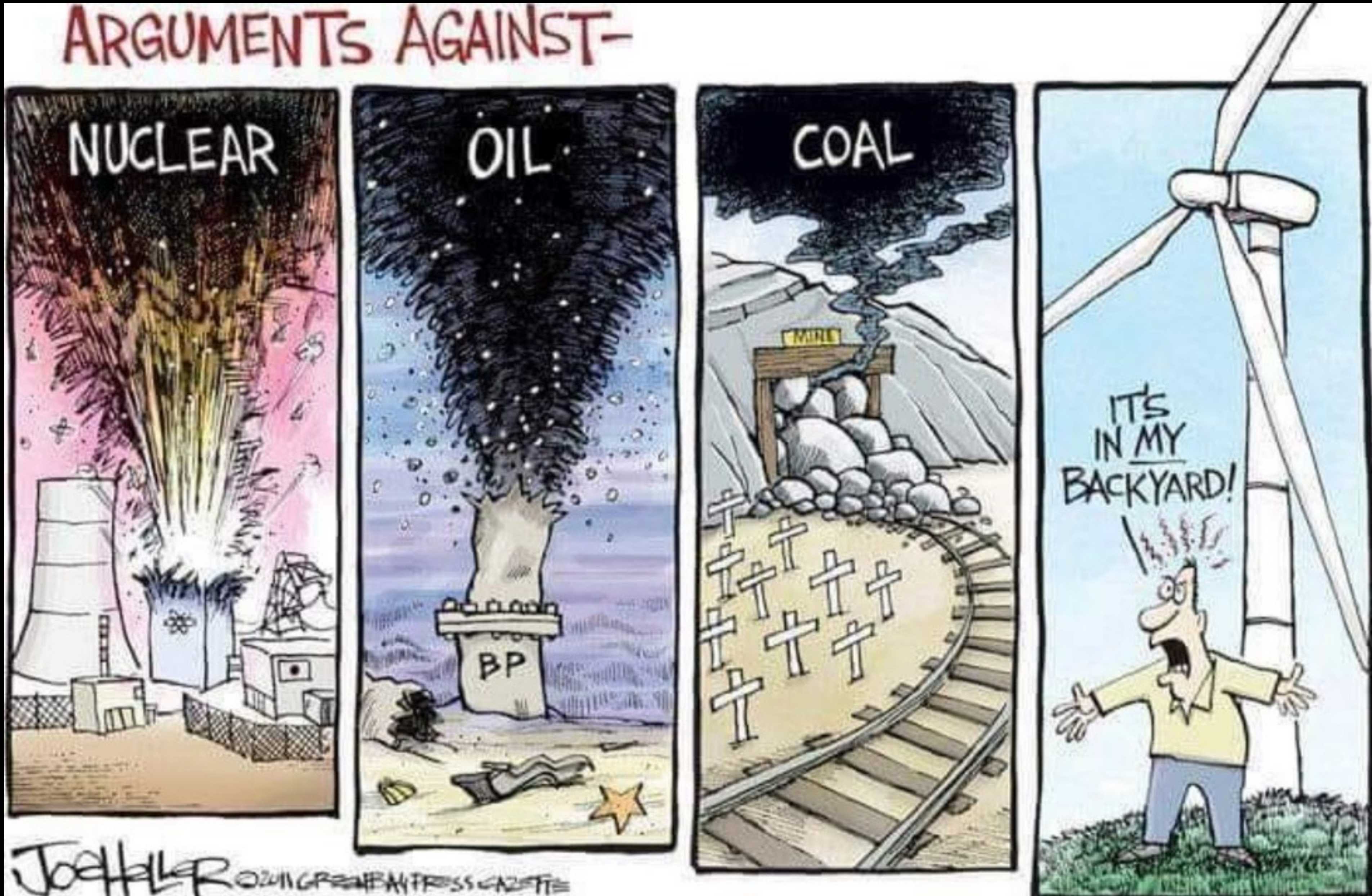
2024 USA Today Study

There are over 300 wind power projects held up by court cases

25 years to develop



NIMBY + BANANNA (Build Absolutely Nothing Anywhere Near Anyone)



Permitting Evolution

...Some good news

NRDC, Sierra Club, and Others Are Evolving Their Thinking on Permitting

- ✓ NRDC
- ✓ Sierra Club
- ✓ World Resources Institute
- ✓ The Nature Conservancy
- ✓ Environmental Defense Fund
- ✓ Defenders of Wildlife
- ✓ National Audubon Society

Why?

They recognize that streamlining these processes is essential to scaling up clean energy deployment, meeting climate goals, and transitioning away from fossil fuels.

- Accelerate the Transition to Clean Energy
- Meet National and State Climate Targets
- Reduce Regulatory Barriers
- Promote Economic Benefits
- Improve Grid Resilience and Reliability
- Leverage Bipartisan Support for Clean Energy Economic and Energy Security Benefits

NRDC, Sierra Club, and Others Are Evolving Their Thinking on Permitting How?

- ✓ NRDC
- ✓ Sierra Club
- ✓ World Resources Institute
- ✓ The Nature Conservancy
- ✓ Environmental Defense Fund
- ✓ Defenders of Wildlife
- ✓ National Audubon Society

NRDC, Sierra Club and others support reforms that streamline the NEPA process without sacrificing essential environmental protections.

They recognize that streamlining these processes is essential to rapidly scaling up clean energy deployment, meeting climate goals, and transitioning away from fossil fuels.

- **Significantly reduce the time and cost it takes to permit renewable energy projects**
- **Align zoning laws with renewable energy goals.** This might involve supporting zoning reforms that make it easier to develop solar farms in areas where they would be most effective.
- **Addressing Local Zoning and Land Use Barriers.**
- **Promoting "One-Stop-Shop" Permitting Processes** with a more streamlined, coordinated framework for federal, state, and local agencies to review projects, reduce duplicative reviews and avoid multiple rounds of environmental assessments.

Rooftop Solar Overview

...Not the silver bullet

we all want

OPALCO Climate Action Programs: Switch It Up, Rebates, Fuel-switching

Two decades of classic energy efficiency measures (insulation, windows, weatherization, etc) have helped reduce load-per-meter. Now, fuel-switching offers next-level **TOTAL** energy efficiency improvements.

BPA Rebates	2017	2018	2019	2020	2021	2022	2023	2024 partial	Total
Ductless HP	55	79	98	88	78	96	102	30	626
HP Water Heater	14	20	16	28	24	20	16	4	142
Switch It Up Program									
Ductless HP				144	62	87	111	58	462
Ducted HP				3	1	1	33	11	49
			HP fuel-switch share=>			21%	15%		
HP Water Heater				7	0	1	1	1	10
Solar						62	95	41	198
Battery						11	9	3	23
OPALCO Fuel-switch Rebates									
EV Charger						7	47	27	81
Ductless HP						8	64	17	89
			HP fuel-switch share=>			100%	100%	100%	

Notes

- Rooftop solar installs are accelerating, thanks to Switch It Up (SIU) program started in 2022.
- OPALCO also reduce the renewable energy credit in 2022 to make it more equitable, reducing cost-shifting to those that couldn't afford solar.
- SIU is also reducing CO2 emissions from members who electrify their cars and heating.
- EVs ar 5X more efficient than fossil-fueled cars.
- Heat pumps are 3 X more efficient.

Switch It Up!

Switch It Up!

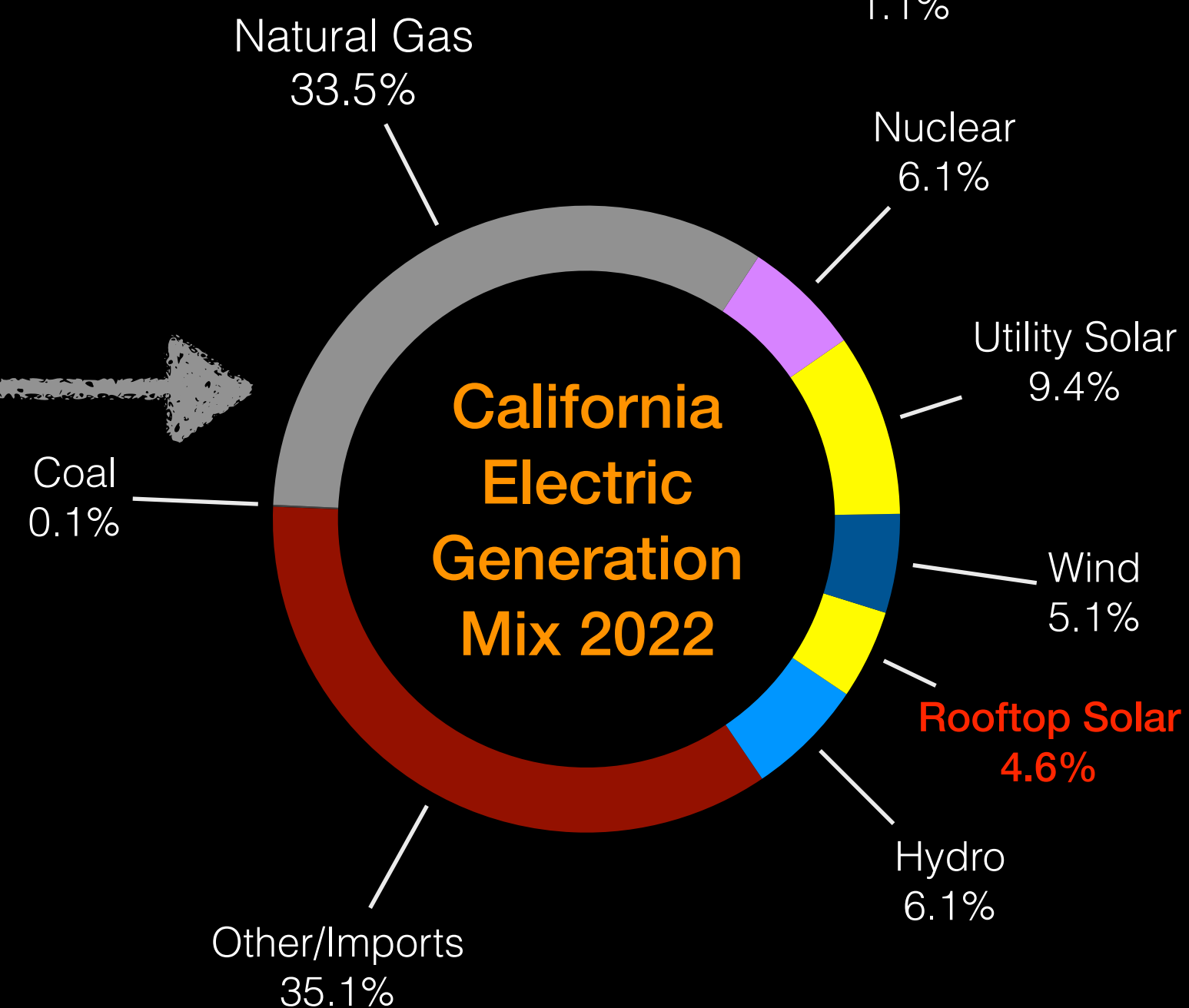
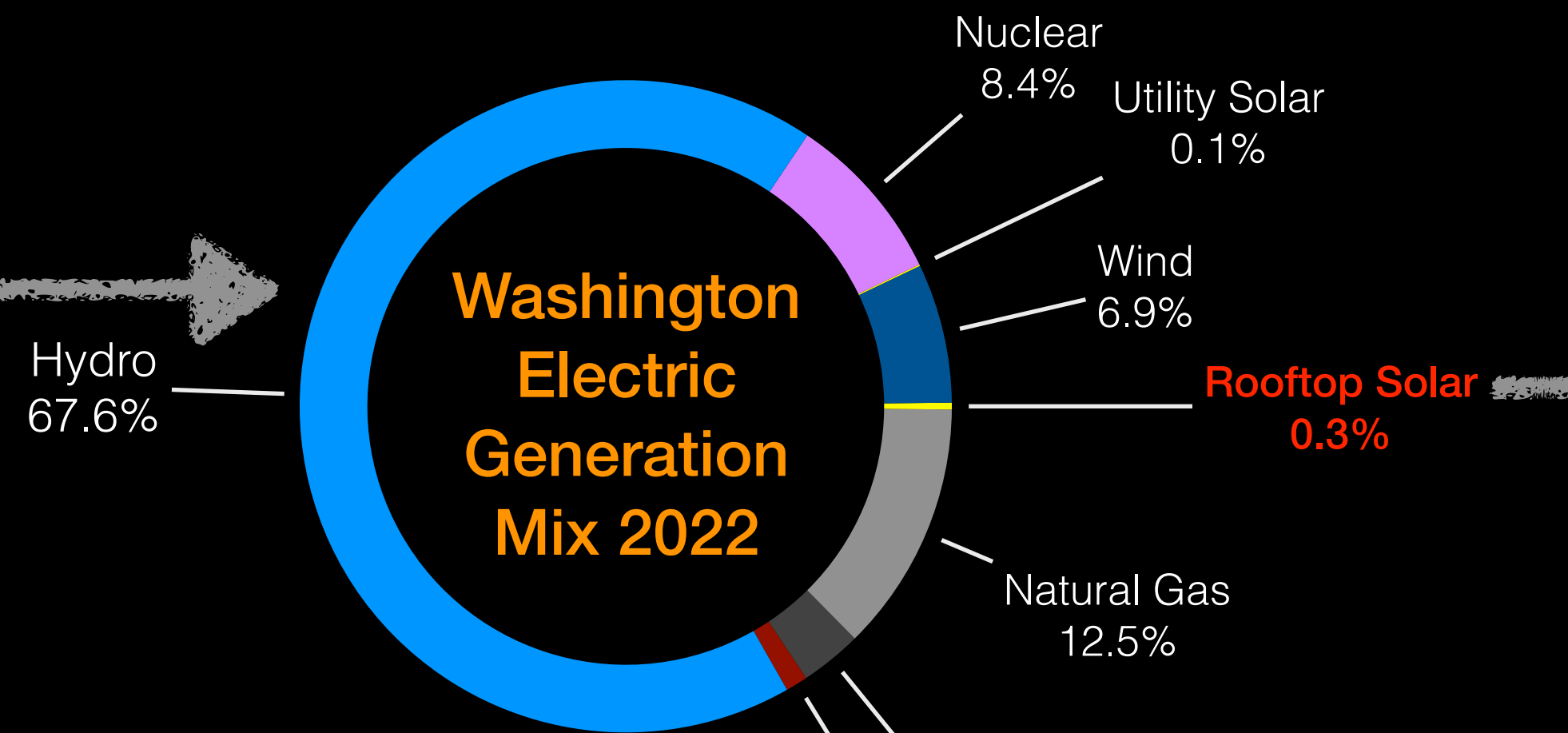
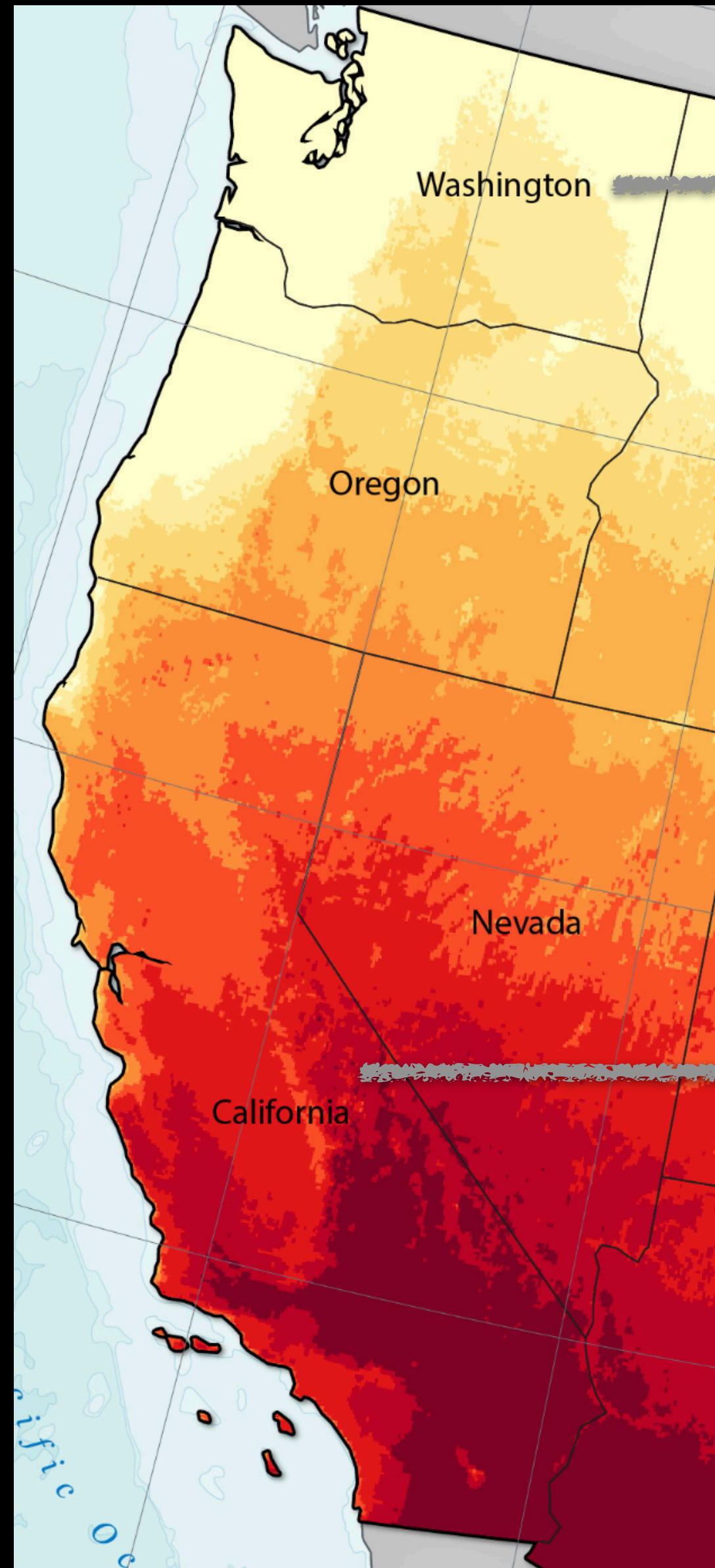
OPALCO can utilize \$46.8M in Rural Energy Savings Program (RESP) funds to provide on-bill financing for co-op members for energy efficiency measures. OPALCO is reimbursed for the funds once member measures are installed. There are now 867 projects completed and billing for a total of \$15.9M net outstanding (total projects less member pay-offs). There are another 40+ projects in various stages of the process. Current project details are as follows:

Measure	Project Origination Year						Grand Total
	2019	2020	2021	2022	2023	2024	
Appliance					36,112	51,093	\$ 87,204
Energy Storage				39,510	8,204	47,766	\$ 95,479
Ductless Heat Pump	648,252	620,060	637,599	1,571,737	1,781,049	2,225,263	\$ 7,483,960
EV Charger						32,129	\$ 32,129
Fiber		30,725	48,681	29,301	41,929	56,117	\$ 206,753
Ducted Heat Pump	8,119	30,000	15,000	18,127	956,159	404,209	\$ 1,431,615
Heat Pump Water Heater	13,985	9,805		5,012	15,701	6,022	\$ 50,525
Insulation				256,935	42,634	235,938	\$ 535,506
Other	14,543			92,649	188,075	7,878	\$ 303,146
Solar + Storage				480,057	425,011	328,258	\$ 1,233,325
Solar				1,897,659	2,927,875	1,593,661	\$ 6,419,195
Windows				563,557	437,569	402,727	\$ 1,403,853
Grand Total	\$ 684,900	\$ 690,589	\$ 701,280	\$ 4,954,544	\$ 6,860,317	\$ 5,391,060	\$ 19,282,690

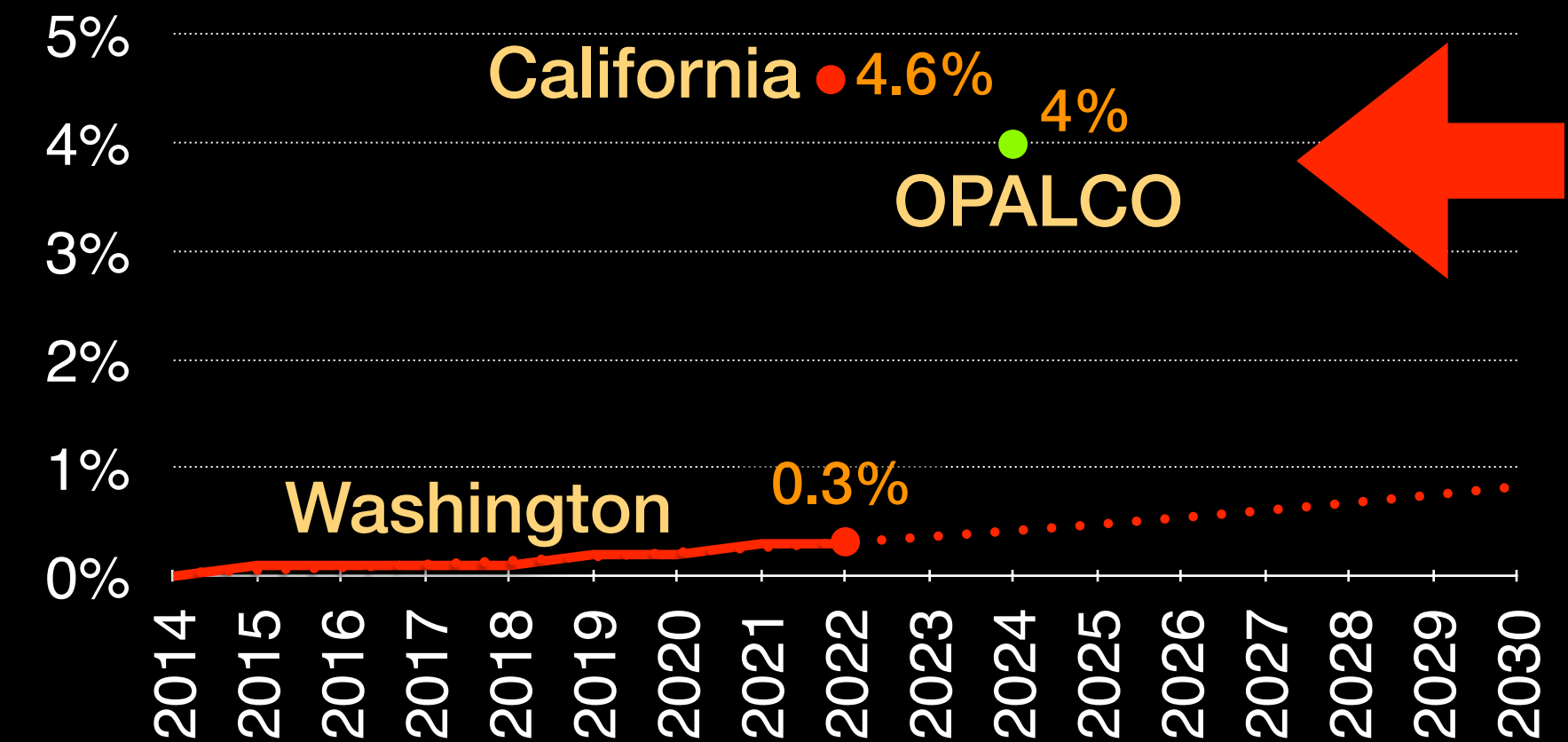
\$7,652,520

The Winter Problem: Northwest is not the Southwest – NW winter solar production is less than one-third of the SW

Annual Solar Irradiance



Rooftop Solar % of Total



Notes

- In California, rooftop solar is only 4.6% of the total state energy portfolio.
- In Washington, where solar irradiance is a small fraction of California, rooftop solar contributes only 0.3%, and is projected to be less than 1% by 2030.
- December production is 72% less than California.
- Washington solar capacity factor is about one-third of California's.
- California utility-scale solar production is double rooftop. In Washington, it's one-third of rooftop. WA policy should incentivize utility-scale solar, which is more capital and production-efficient.

Local Solar Potential on Rooftops is Less than you Think

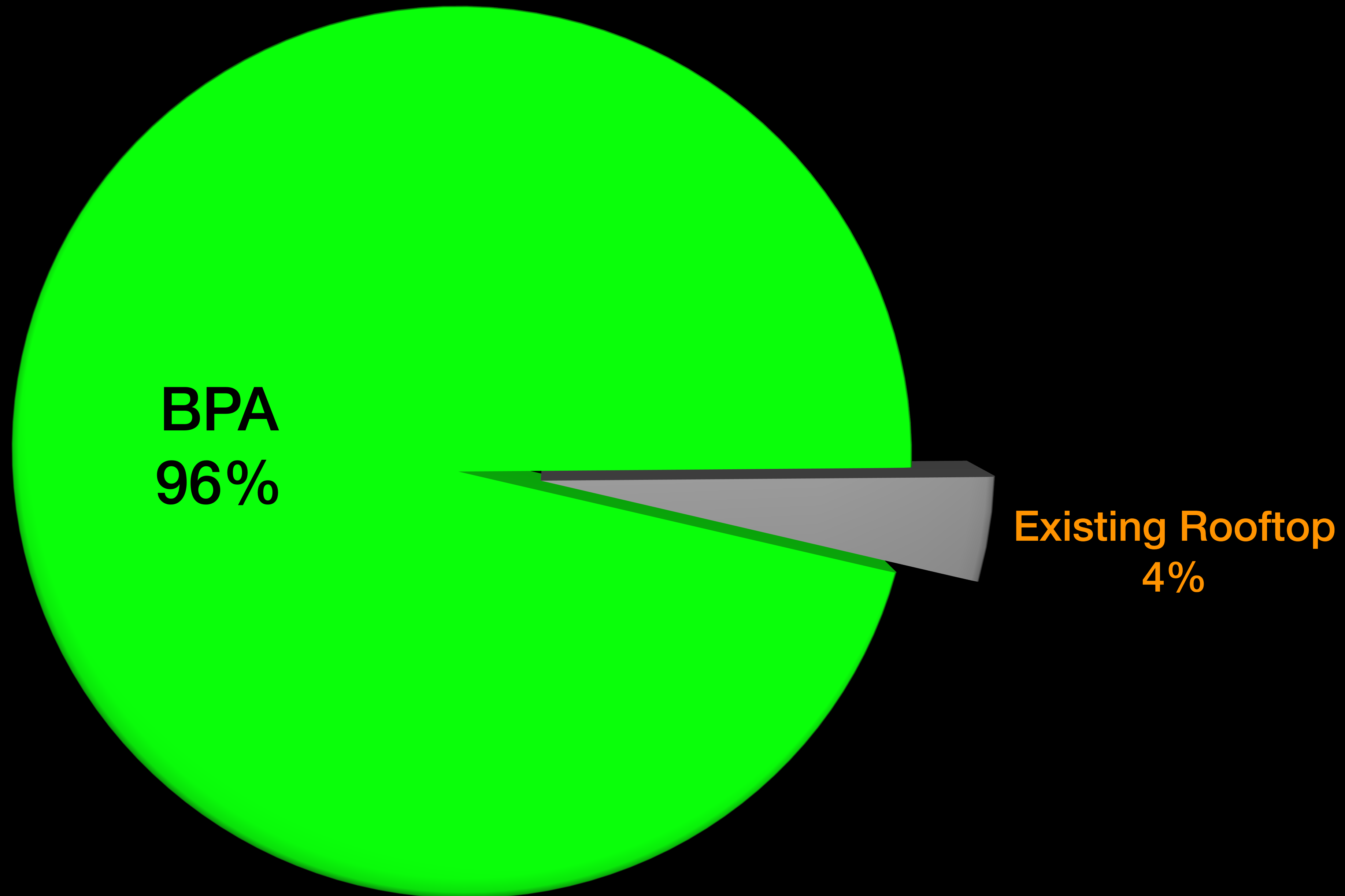
OPALCO member rooftop solar is an important part of the solution, where it makes sense.



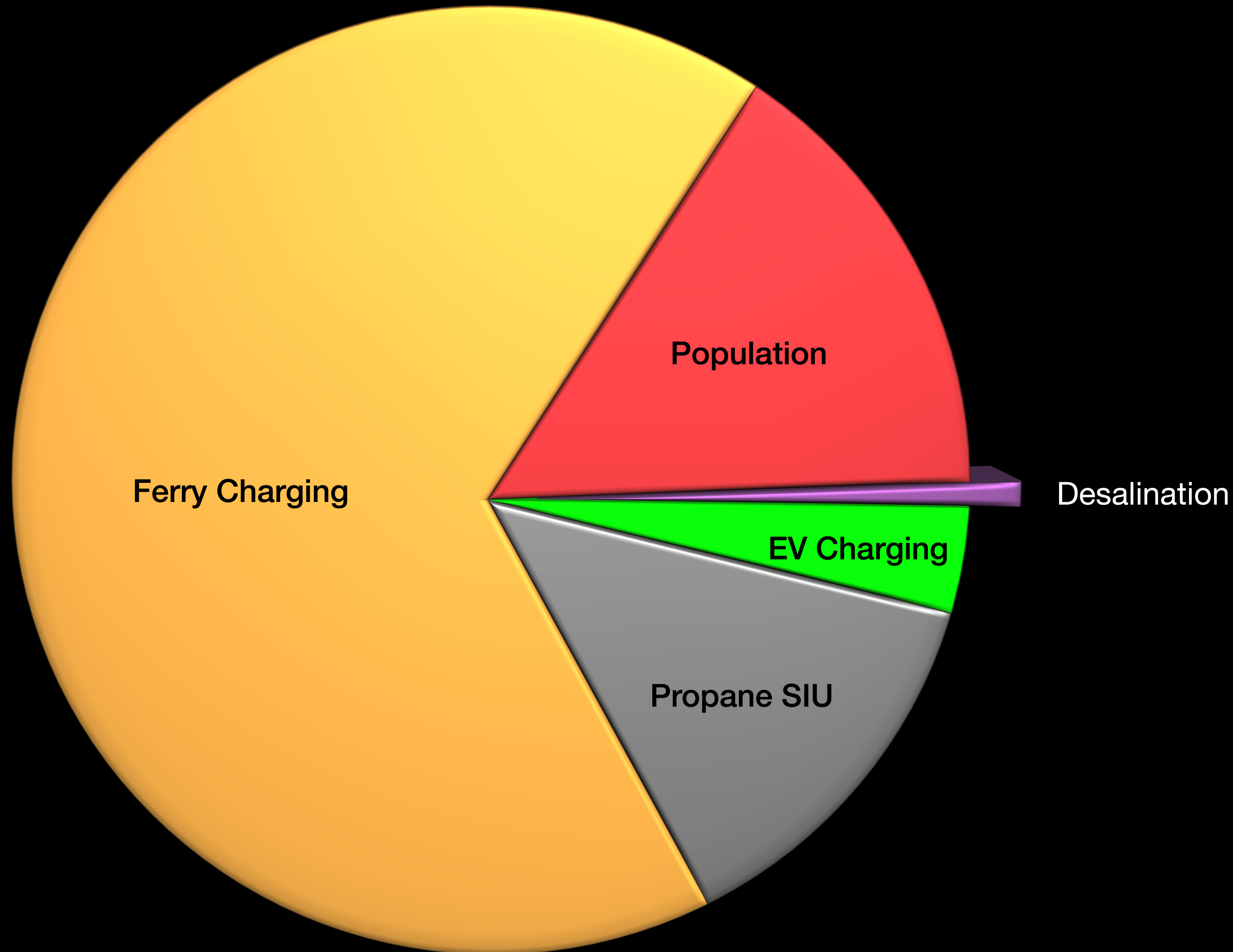
- ❖ Generation can be degraded due to tree shade and poor roof orientation to the sun
- ❖ Sunny portions of rooftops are a small percentage of rooftop surface area, rooftops are a small percentage of land
- ❖ Rooftop solar inverters provide lower-quality power, requiring grid systems to maintain power quality as # of rooftops increases.

Yellow dots correspond to sunny portions of roof

2024 Rooftop Analysis: 240 million kWh load



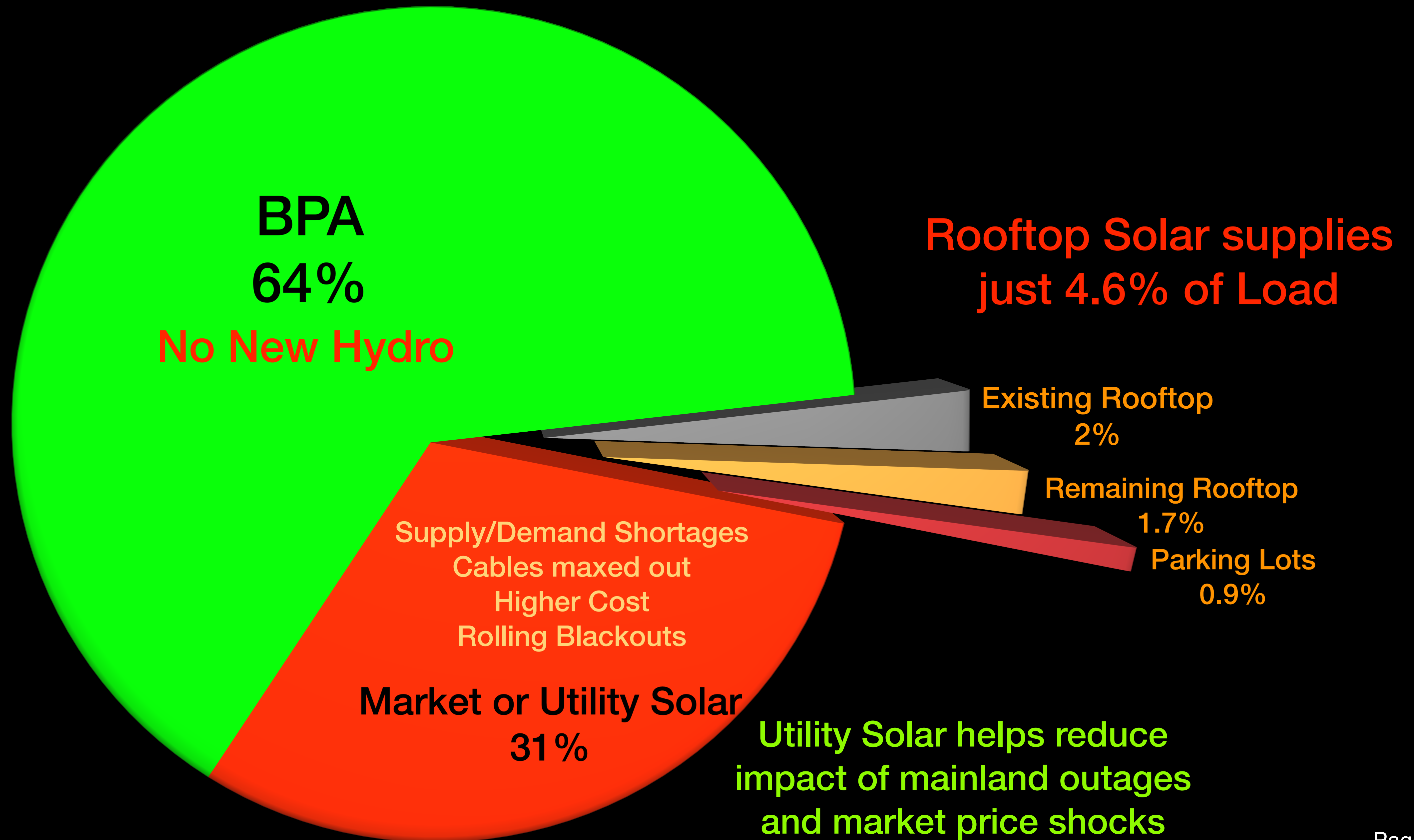
Projected 2035 SJC Load Increase = 49%



Notes

- No new hydro. New generation resources required to meet load.
- Projected 98% increase in cost of power from 49% increase in mainland kWh purchase at market rates
- EV charging excludes visitor charging
- Population excludes climate refugees

2035 Rooftop Analysis: 357 million kWh projected load



The Three Pillars of Washington Energy Policy

Rooftop Solar is a small fraction of what's needed, more expensive, with more cost-shifting

- ✓ **Net-zero GHG emissions by 2050** (50% reduction by 2030)
 - 5 years left to achieve 50% reduction
- ✓ **Energy Resilience**
 - Rooftop doesn't work during outages
 - Utility-scale solar + storage does, directed to critical services via sectionalized grid
 - Utility solar are tilting arrays to maximize winter production
 - Only 1,500 to 1,700 potential roofs (see appendix)
 - Only 3.5 MW of commercial rooftop and parking area
- ✓ **Equitable**
 - Rooftop costs 6X more than utility-scale solar (capital and power cost)
 - Rooftop solar cost-shifts operational costs to those who can't afford solar

Agri-Solar Overview

Agri-Solar = Dual-Use Food + Energy Production: Two Approaches

Utility Ownership

- Produces 10X all current rooftop kWh, at 6X less cost
- Much faster to deploy at scale
- Works during outages
- Tracks the sun to maximize production, especially in winter
- Partner with farmers for grazing, pollinators, shade-loving crops
- Improved land fertility and value per acre versus haying

Farmer Ownership

- Farmer sells to OPALCO through a Power Purchase Agreement (PPA)
- Switch It Up Funding and grant-funded joint-projects
- The average farmer loses \$51 per acre per year.
- A PPA for \$6 per MWh would produce \$10,000 per acre per year.

*Powers the county through three seasons + critical services in winter
540 acres = just .5% of land*

News: Small US State Launches Game-Changing Agrivoltaic Project

DOE recognizes the enormous opportunity for agrivoltaics to combine agriculture with clean energy production, while increasing revenue for farmers and landowners,”

Dr. Becca Jones-Albertus

Director, U.S. DOE Solar Energy Technologies Office.



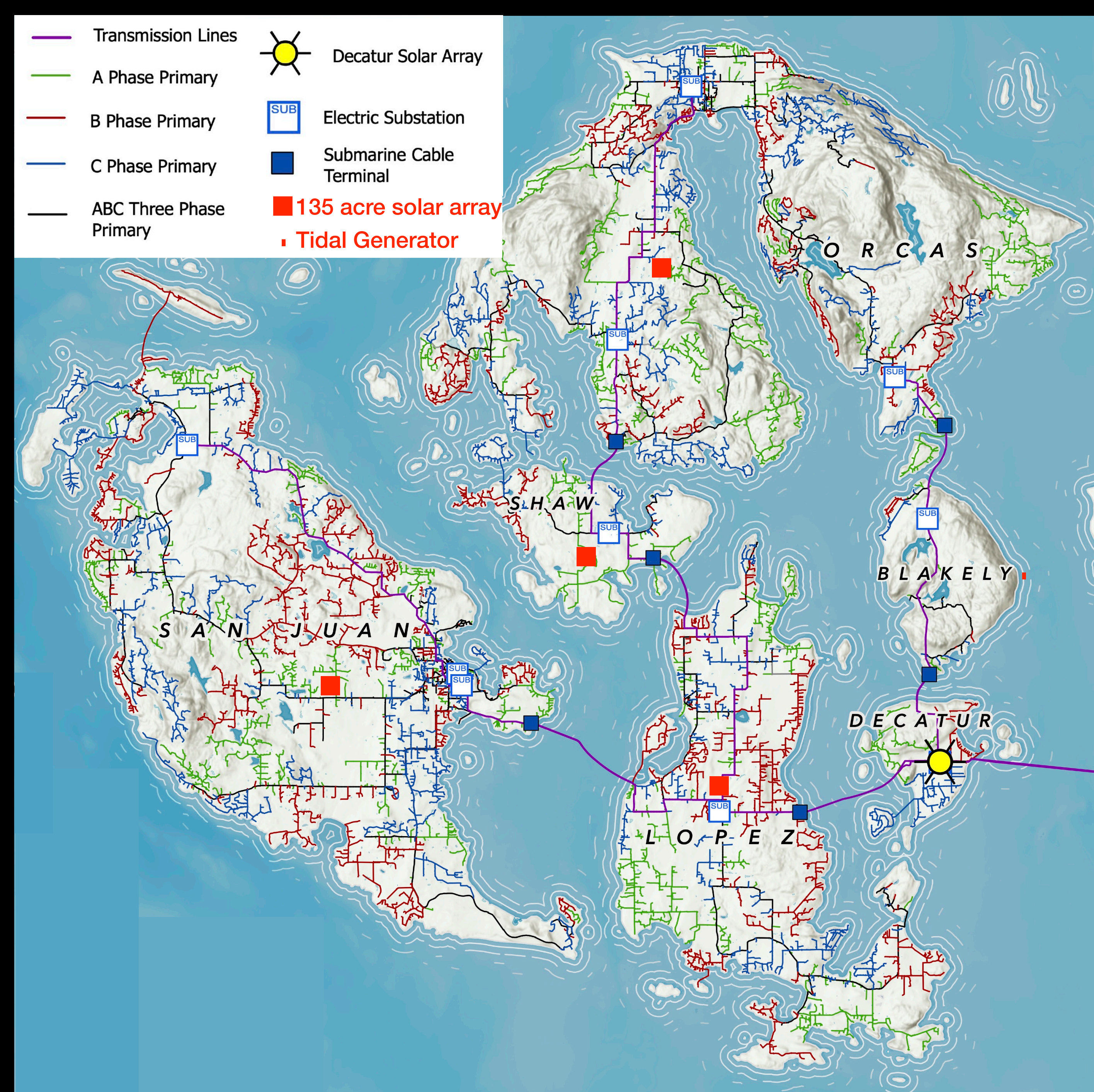
“We found increases over time for all habitat and biodiversity metrics: floral rank, flowering plant species richness, insect group diversity, native bee abundance, and total insect abundance, with the most noticeable temporal increases in native bee abundance,” the research team concluded. Overall, they assessed that insect communities responded to the habitat restoration project at the relatively rapid pace of less than four years.

In another key finding, the researchers found that bee visitations from the solar array to a nearby soybean field were comparable to the visitations from a nearby farmland preserved under the US Department of Agriculture’s Conservation Reserve Program.

OPALCO Grid

Notes

- Bailer Hill Community solar doubles local solar production over all rooftop installed since 2008
- 90 million kWh, about 30% of annual load could be met with 540 acres of agri-solar = 135 acres per ferry-served island.
- 135 acres could be a single site, or spread across several sites.
- The larger the site, the better the economies of scale and logistics
- Red squares and rectangle are drawn to scale.



Land Use Challenges

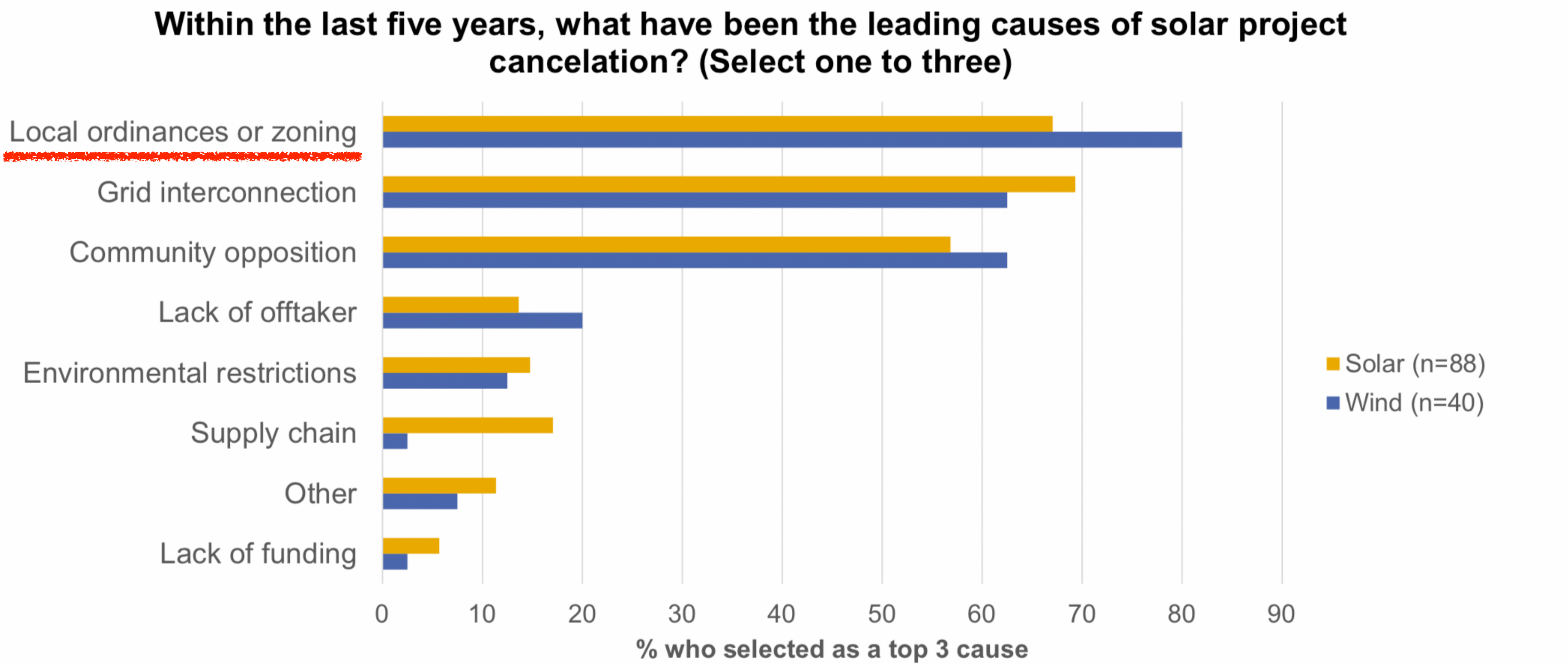
Why Bailer Hill?

- Needed to be an ag site, close to our substation, for sale, can't be a "jewel of the San Juans"
- 65% of County land use acres are "NO"
- 35% is arduous Conditional Use Permit
- Grants decision-making required OPALCO ownership
- Prefer not needing to remove trees
- Poor soil conditions, evaporation, and pollinator profile, that could be improved with agri-solar
- No warning signs in pre-development vetting process
- Reasonable sale price for membership

*Bailer Hill Micro-grid
public support is running
about 8 to 1 in favor.*

The public wants clean energy, but they don't want to look at it. NIMBY = Not In My Backyard

Local ordinances, interconnection, and opposition are leading causes of cancelation for both wind and solar



Why did OPALCO choose Bailer Hill Site? Not allowed in 65% of county's 109,000 acres!

San Juan County Land Use Designations

Land Use Designations	RURAL					RESOURCE		SPECIAL	
	RGU	RR	RFF	RI	RC	AG	FOR	C	N
	Rural General Use	Rural Residential	Rural Farm-Forest	Rural Industrial	Rural Commercial	Agricultural	Forest	Conservancy	Natural
Commercial Power-generation Facilities	C	N	N	C	C	C	C	N	N

Legend

Transportation

Ferry Route

Ferry Landing

ComprehensivePlan

LandUse Type

Activity Center

Agricultural Resource (AG)

Conservancy (C)

Country Corner Commercial (CCC)

Eastsound Alrpport District (no residential development is allowed)

Eastsound Natural (max. 1 unit per parcel)

Eastsound Rural (max. 1 unit/5 acres)

Eastsound Residential 1/acre (max. 1 unit/acre)

Eastsound Residential 1/acre P*

Eastsound Residential 2/acre

Eastsound Residential 2/acre P*

Eastsound Residential 4-12/acre (min. 4 - max. 12 units/acre)

Eastsound Residential 4/acre P*

Eastsound Rural Residential (max. 1 unit/5 acres)

Eastsound Rural Residential (max. 1 unit/2 acres)

Town of Friday Harbor

Friday Harbor Incorporated UGA

Friday Harbor Unincorporated UGA

Forest Resource (FOR)

Deer Harbor Hamlet Commercial

Deer Harbor Hamlet Industrial

Deer Harbor Hamlet Park

Deer Harbor Hamlet Residential

Island Center (IC) (See SJCC 18.30.230)

Lopez Village Growth Reserve Area

Lopez Village Commercial

Lopez Village Institutional

Lopez Village Residential

Marina (max. 6-8 units/acre)

Marine Center LAMRID

Master Planned Resort (MPR)

Natural (N)

Olga Community Center

Olga Hamlet Commercial

Olga Hamlet

Olga Park Site

Orcas Village Commercial

Orcas Village Residential

Orcas Village Transportation

Rural Commercial (RC)

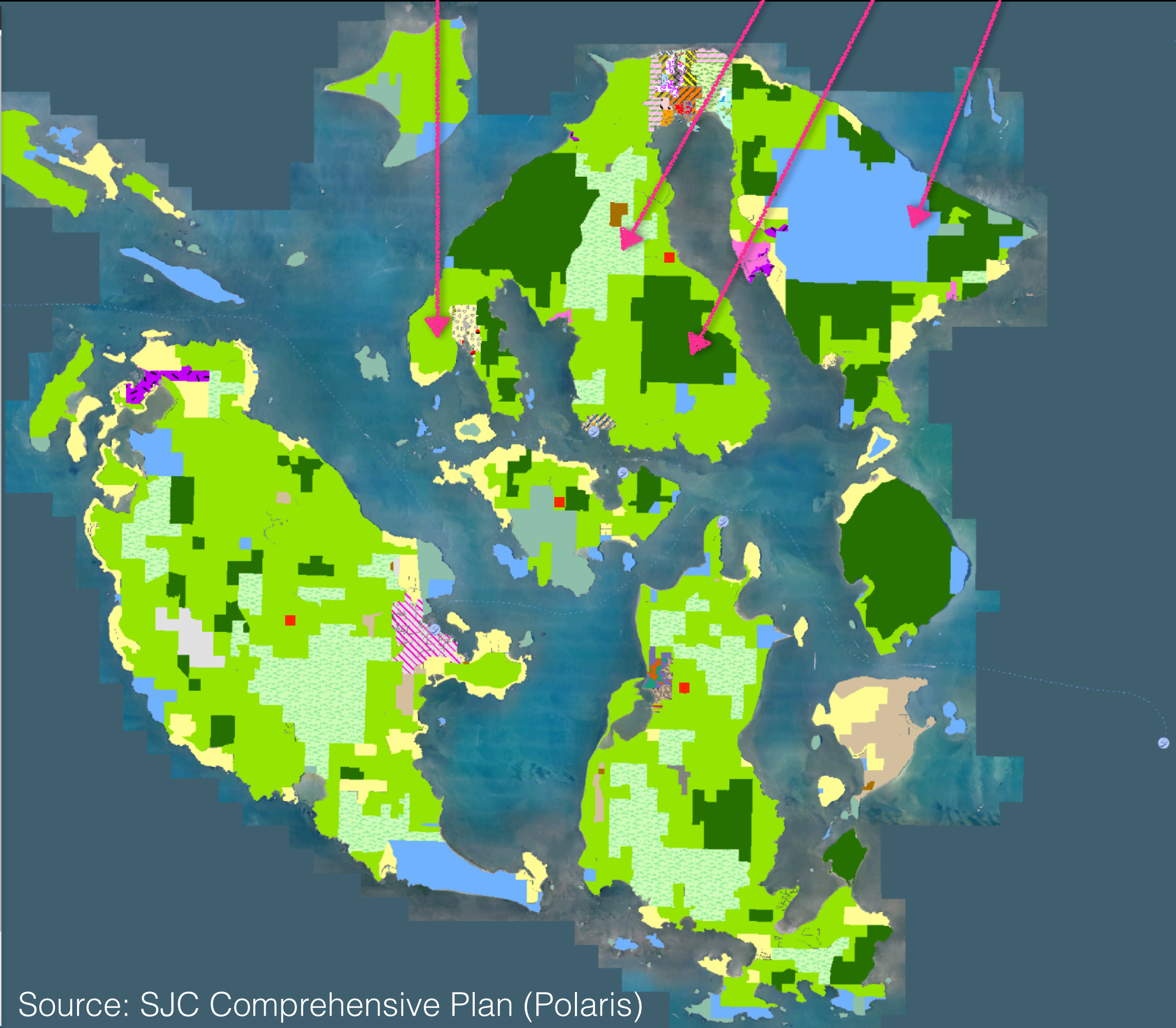
Rural Farm Forest (RFF)

Rural General Use (RGU)

Rural Industrial (RI)

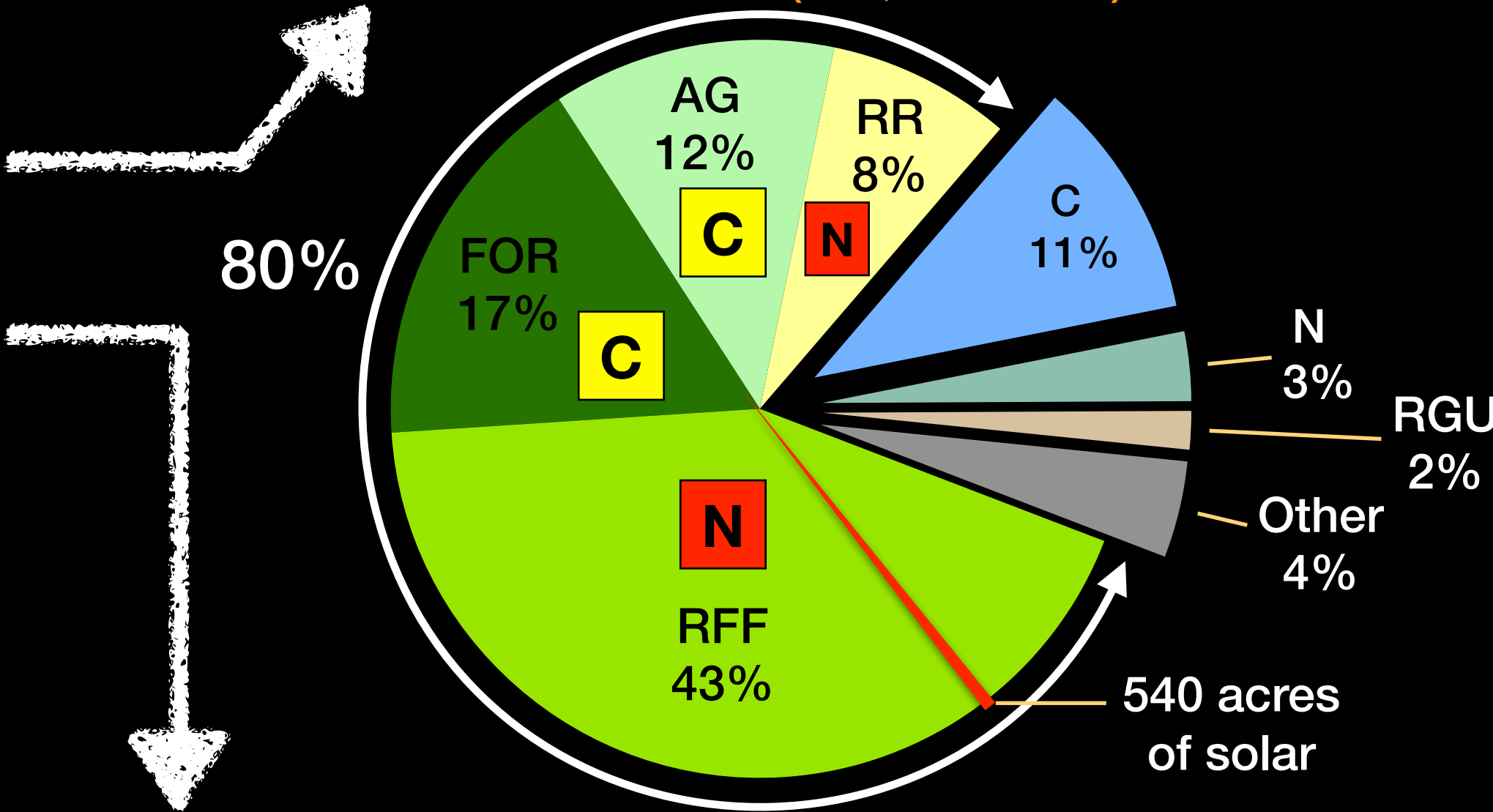
Rural Residential (RR)

Service & Light Industrial (SLI) (residential use allowed only as accessory to commercial, institutional, or industrial use)



Source: SJC Comprehensive Plan (Polaris)

Land Distribution (109,000 acres)



Y	Use allowed outright, without project permit
P	Provisional use, subject to administrative consistency review for compliance
C	Conditional use, subject to public notice and permit hearing procedure
N	Prohibited use

Of the county's 109,000 acres, we only need 540 acres (0.5%) to produce 35% of our energy use.

Discussion

Climate Change Is Destroying Nature.

Need to reduce GHGs 50% by 2030.

Farmers can't afford the land.

Rooftop solar is not a silver bullet.

Where do we agree?

What's your plan?

Imagine: Climate Action, Together

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San Juans



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Thank You!

Addenda

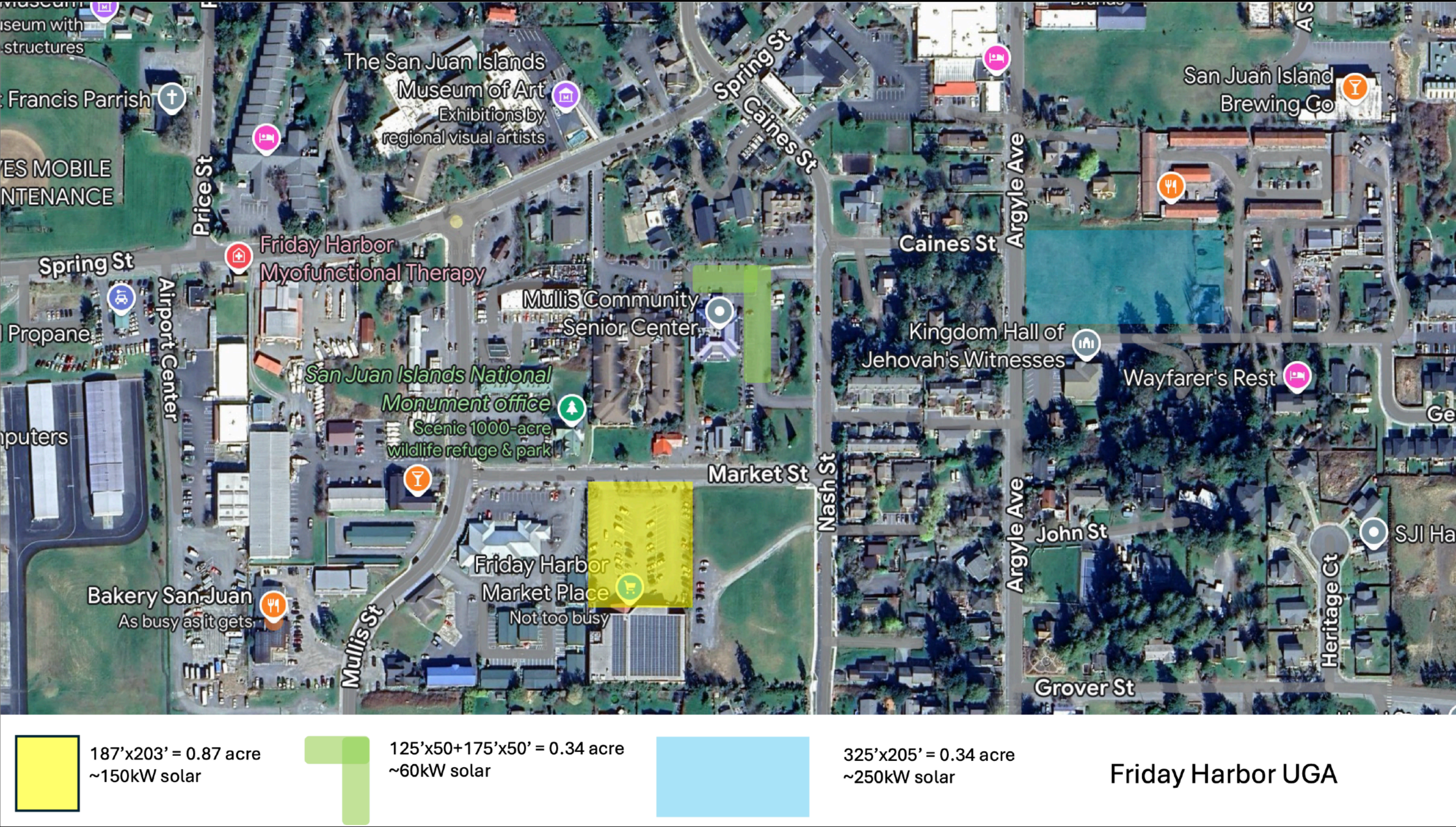
Rooftop vs Utility-Scale Community Solar Potential and Cost Estimates

Rooftops **	total units	% suitable (NREL)*	probability of N+1 (using CA 30yr data ****)			Power & Cost	Units	
						Residential/Commercial Rooftop		
Total Housing Units	13,619	5,714		Mean	95% Confidence	1,562	rooftops	
Owner Occupied	5,507	3,731	20%	746	698-794	10	kW/rooftop	
Renter Occupied	2,201	1,491	1%	15	7-22	1,000	kWh/kW	
Vacant/Vacation Rental	5,911	4,005	20%	801	751-851	15,620	MWh/yr	
				1,562	1,456-1,667	3.15	\$/kW installed ***	
Percentage of Total						\$49,204,333	Installed Cost	
Owner Occupied	40.44%					5%	Distribution Upgrades	
Renter Occupied	16.16%					\$2,460,217	Upgrade Cost	
Vacant	43.40%					\$51,664,550	Total Cost	
						\$2,583,227	\$/yr 20 yr amortization	
Vacant use by type						\$165.38	Power cost/year/MWh	
Seasonal, Recreational, or occasional	4,408							
For sale only	222							
For Rent	214							
Rented or sold, not occupied	111							
For migrant workers	0							
Other vacant	556							
** https://www.sanjuancountywa.gov/DocumentCenter/View/25361/2022-03-11_Page_Staff-Report_HAC-Housing-Element-Feedback								
*** https://www.energy.gov/eere/solar/solar-photovoltaic-system-cost-benchmarks?utm_source=chatgpt.com								
**** https://www.californiadgstats.ca.gov/charts/								
https://www.osti.gov/biblio/1575064								
https://data.nrel.gov/submissions/121								
* Rooftop_PV_Technical_Potential.xlsx			Zip Code			Total Roofs	% Suitable	Suitable Roofs
DEER HARBOR	SAN JUAN	WA	WA_98243	98243	Rural Fringe	163	66.1%	108
EASTSOUND	SAN JUAN	WA	WA_98245	98245	Rural Fringe	2437	66.1%	1610
FRIDAY HARBOR	SAN JUAN	WA	WA_98250	98250	Rural Fringe	3976	68.5%	2724
LOPEZ ISLAND	SAN JUAN	WA	WA_98261	98261	Rural Fringe	1858	68.5%	1272
San Juan County						8,434	67.7%	5,714
Forecasting Potential:								
Spatial distribution of solar PV deployment: an application of the region-based convolutional neural network								
https://epjdatascience.springeropen.com/articles/10.1140/epjds/s13688-023-00399-1?utm_source=chatgpt.com								

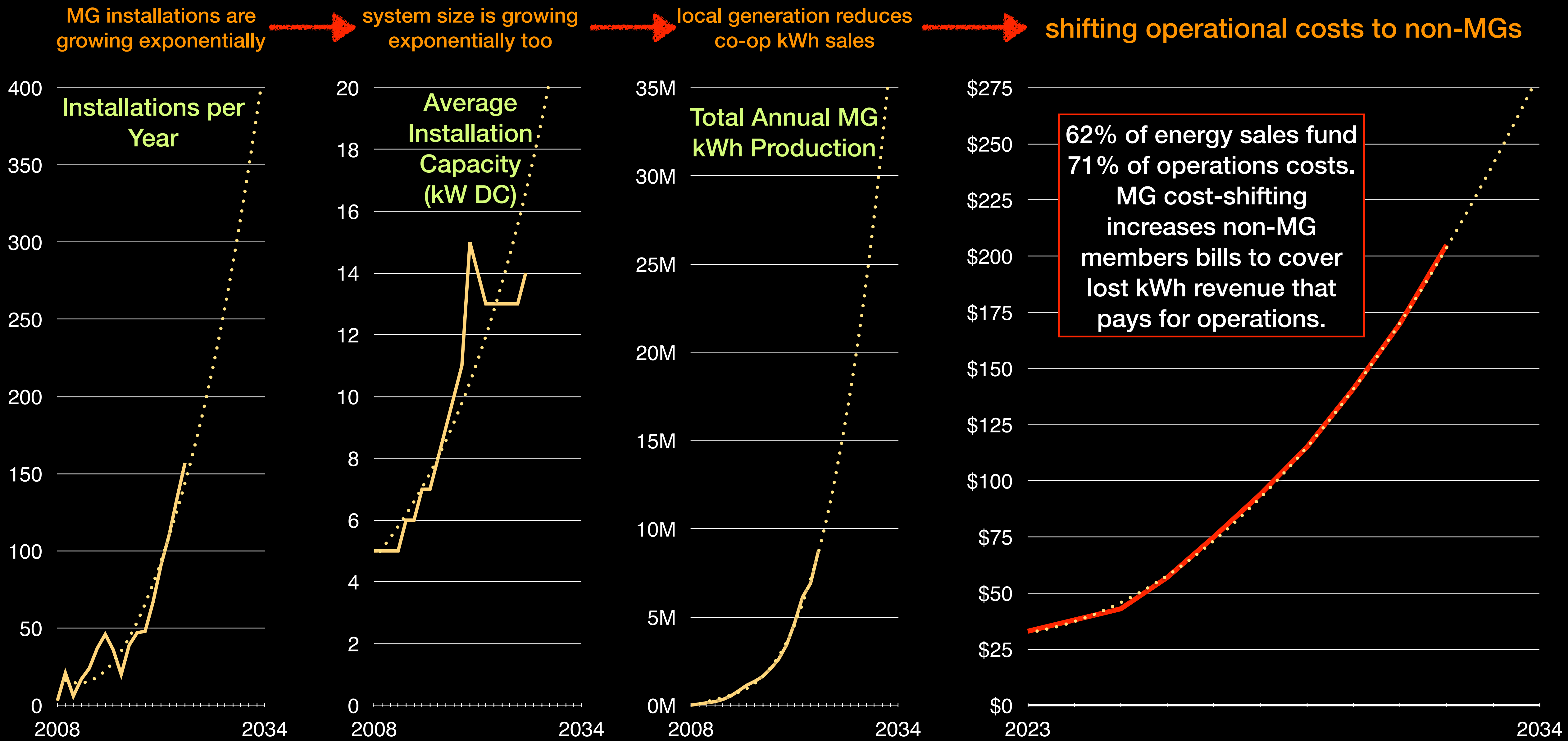
Total Land Area SJC			
175.22	sq.mi.		
112,141	acres		
Houses	13,619		
Average impervious area			
	3700	sq.ft. avg	
	50,390,300	sq.ft.	
	43560	soft/acre	
	1157	acres	
Land Bank	4000	acres	
SJ Preservation Trust	18000	acres	
Roche Harbor LLC	4000	acres	
WA State	6000	acres	
Fed Gov't	2141	acres	
Sub Total:	34141	acres	
Ag Land	18000	acres	
Forest Resource	19098	acres	
Rural Frm Forest	20000	acres	
SubTotal	57098	acres	
Roads			
length	757	miles	
width	55	feet avg	
area	5047	acres	
Total	97442	acres	

				NREL Estimate	N+1 probability	
	Developed Area		Estimated Rooftop Area	60%	20%	
Friday Harbor	853	acres	167	100	20.0	acres
East Sound	1875	acres	59	35	7.1	acres
Lopez Village	197	acres	49	29	5.9	acres
					21.2	acres
					1.0	MW/6acres
					3.5	MW
Airports	339	acres				
Urban Areas	3264					
Total Area accounted for	100706					

Rooftop Impervious Surface Analysis



2023 Rooftop Solar Member Generator Analysis: Cost-Shift Forecast through 2032



Understanding OPALCO Renewable Energy Programs

November Board Meeting Member Comment

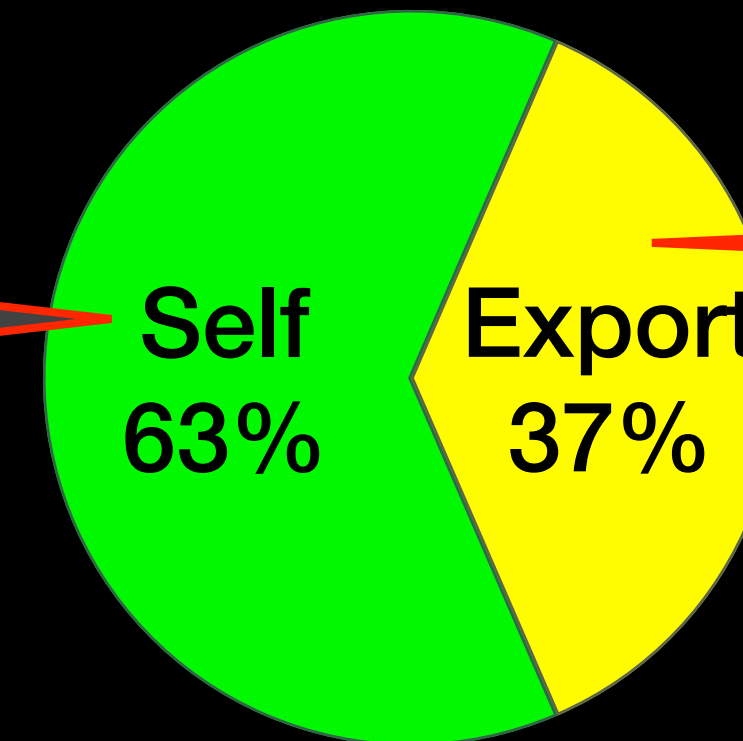
- Is the Board aware that OPALCO's approach to the Renewable Generation Credit is unique in the state?

Answer

- OPALCO is a leader in more equitable approaches to rates and low-interest on-bill financing for renewables.
- Having renewables customers pay their fair share of the grid reduces cost shifting. That is financially equitable and consistent with the Washington CETA and CCA financial equity mandates.
- OPALCO renewable energy credits apply to exported energy only. Powering your home receives credit at the full retail rate.
- Since OPALCO introduced these innovations, solar projects, and installers have accelerated, tempered by a limited labor force and affordable housing.

Annual Hours of Production (%)

Powers home, reducing kWh sales at full retail rate



Sold to utility to meet other member's load, replacing BPA, at higher renewable energy credit rate.

	2020	2021	2022	2023	
	64	84	90	103	Total
Annual Installation Count					341
	13.4	15.0	12.5	12.4	Avg.
Average Installation Size (DC kW)					13.3
					Avg.
Installer Avg Installation Size (DC kW)					
ECOTECH SOLAR	9.4	11.3	46.6	18.3	21.4
WESTERN SOLAR	17.5	42.1	12.0	12.2	20.9
RAINSHADOW	11.9	11.2	9.9	13.1	11.5
SWIFTWATER SOLAR				11.2	11.2
SOLGEN POWER	9.0	6.7	12.5	12.6	10.2
Installations by Installer					
ECOTECH SOLAR	2	1	1	4	
WESTERN SOLAR	4	9	5	6	
RAINSHADOW	52	64	68	57	
SWIFTWATER SOLAR	0	0	0	14	
SOLGEN POWER	1	4	5	5	

Renewables On-bill Financing	2022	2023	Total
Solar and battery projects	64	89	153
Solar and battery financing	\$1,229,022	\$1,609,802	\$2,838,824

Agri-Solar Economics

	Acres	% Total	\$/ACRE	500 acres
Cropland	7,928	40.5%		6.3%
Pastureland	6,255	32.0%		8.0%
Woodland	3,954	20.2%		12.6%
Other	1,434	7.3%		
Total	19,571	100.0%		2.6%
Crops	\$5,734,000		\$723	\$/ACRE CROPLAND
Livestock	\$4,909,000		\$785	\$/ACRE PASTURELAND
Total	\$10,643,000		\$544	\$/ACRE TOTAL
Gov't Payments	\$72,000			
Farm Related	\$747,000			
Total Income	\$11,462,000		\$585.66	\$/ACRE/year TOTAL
Total Expenses	\$12,453,000		-\$636.30	\$/ACRE/year TOTAL
NET INCOME	-\$991,000			

If Agrivoltaics adopted:

1MW	6 acres
1,000MWh/yr	
\$42/MWh	\$42,000/yr
	+\$7,000/acre/yr

Example Agri-Solar Economics

SJC 2017 USDA Ag Census

Total Farms	316
Total Farm Land (acres)	18,402
Average Farm Size (acres)	58
Market value of products sold	\$4,119,000
Government payments	\$55,000
Farm-related income	\$820,000
Total farm production expense	\$6,983,000
Net Cash Farm Income	-\$1,989,000

Code 18.60.160 Landscaping: On all agricultural or forest resource lands (AG and FOR), the maximum area of development which is not related to agricultural or forestry uses and activities shall be limited to **20 % of the parcel area**, but not less than one acre, regardless of the assigned density. Further, in the division of a parcel by any means, the allowable area for conversion of the parent parcel to nonfarm and/or nonforestry use shall not be exceeded. This shall not apply to parcels smaller than five acres.

Source: USDA 2017 Ag Census

Example Farming the Sun with Agri-Solar

- Shade for bees, sun-sensitive crops, grazing
- 200-acre agri-solar farming cooperative (1% of Ag land)
- 40 MW array, generating 40,000MWh per year (16% of SJC annual electric load)
- Power Purchase Agreement of \$50/MWh, generates **\$2,000,000/yr income**
- Which offsets the entire **-\$1,989,000** of losses
- Further offset by grants from USDA and WA DOC to the Ag Community

Notes:

- **Bailer Hill project:** 19.27 acres parcel; .5 acres impervious surface; .000268 acres of piles allowing farming beneath raised panels (bees, grazing, shade crops).

Table 1: Areas Not Available for Agricultural Use Post Construction

	Quantity	Total SQFT	Acres
PV Array Piles W 6"x9"	495	9.9	0.000227
PV Array Piles W 6"x10"	660	19.8	0.000455
Gravel Access Roads	1	5,450	0.125115
Gravel Pad BESS Yard	1	16,184	0.371532
Concrete Equipment Slabs	1	486	0.011157
Total Impervious Surface Area		22,149.70	0.508486
10-foot Perimeter Landscaped Buffer	1	34,414	0.79
Total Area Not Available for Agriculture Use Post-Construction		56,563.70	1.298486

Community agri-solar is more efficient, cost-effective, and equitable



WASHINGTON STATE UNIVERSITY
Energy Program

The Washington State University (WSU) Energy Program delivers program management, on-site assessments, analytical tools, and training to meet evolving energy challenges in the State of Washington, the Pacific Northwest, the United States, and internationally.

Partnering with a wide range of agencies, organizations, institutions, and businesses, our energy experts identify energy challenges and develop solutions.

Our customers include large and small businesses, public and private utilities, manufacturing plants, local and state governments, federal agencies and facilities, schools and universities, national laboratories, tribes, professional and trade associations, and consumers.

Our staff of energy engineers, energy specialists, technical experts, and software developers work out of Olympia, Washington. The WSU Energy Program is a self-supported department within the University.

We are part of the College of Agricultural, Human and Natural Resource Sciences (CAHNRS). Our Director reports to the Associate Dean of the College/ Director of WSU Extension.

Contact
Karen Janowitz
WSU Energy Program
janowitzk@energy.wsu.edu

Website: www.energy.wsu.edu

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Photo by Lexie Haln, Lightsource bp; courtesy of the U.S. Department of Energy.

Dual-Use Solar Opportunities for Washington State

Executive Summary

To meet Washington state's directive to replace its fossil-fuel generated energy sources with renewable and non-emitting energy sources by 2045, clean energy such as solar will need to be developed. Solar photovoltaic (PV) installations require five to ten acres per one megawatt (MW) of generated electricity, which can create conflict with other land uses. Across the country and the world, land use conflicts are eased when solar PV is co-located with agricultural operations, often called dual-use solar, allowing food production and ecosystem services to continue on the same site where electricity is generated.

Currently, Washington state lags far behind many other states in dual-use solar applications and research. This report, written by Washington State University (WSU) Energy Program as mandated by the Washington State Legislature, provides information such as dual-use solar research, benefits, considerations, policies, and incentives. The intent of this report is to increase the opportunities and practice of dual use in Washington.

Benefits and challenges

Dual-use solar provides numerous economic and environmental benefits, including improved economics for farmers and other agricultural producers, ecosystem services such as maintaining soil health, and expanded siting opportunities for solar development. Farmers benefit by keeping their land in production, and developers may see some soft costs (non-hardware) reduced.

Below are many of the benefits derived from various dual-use activities. More specific information is under the individual activities in the next section.

Dual-Use Agri-solar Benefits

- Improved farm economics from solar energy sales
- Increase access to ag land that would otherwise be unaffordable
- Reduce climate impacts, including:
 - Reduce soil evaporation and plant transpiration
 - Shade cooling - grazing, bees, sun-sensitive crops, broccoli, etc.
 - Pollinator habitat diversity - safeguards soil health, improves stormwater retention, reduces wind and soil erosion

Agri-solar is more efficient, cost-effective, and equitable

County Council, Planning Department

- ❖ Permitting certainty is needed to meet grant schedule requirements
- ❖ Balance competing land use priorities agriculture and local renewable energy, working together
- ❖ Collaborate as a team to win infrastructure and energy transition grants

Members, Community Organizations

- ❖ Work together to achieve carbon reduction goals
- ❖ Adopt energy efficiency measures for home and business
- ❖ Donate land and easements for renewable energy projects
- ❖ Support local energy resilience
 - rooftop solar (4.2 MW rooftop solar + battery)
 - community solar microgrids
 - EVs and chargers
 - electric public transit
 - tidal and biomass energy

