

# MEMORANDUM

May 13, 2022

As a follow up to Waterpower Week in Washington DC held on April 4-7, DOE requested that OPALCO provide a visioning discussion to help inform their grant making process. Staff met with DOE this week (May 11th) and had a productive discussion, as outlined in the following presentation. This document reviews OPALCO climate action objectives and shows how all the parts of the solution work together. DOE staff are using the information to better serve utilities and cooperatives as they roll out infrastructure grant applications.





Partnership for Climate Action

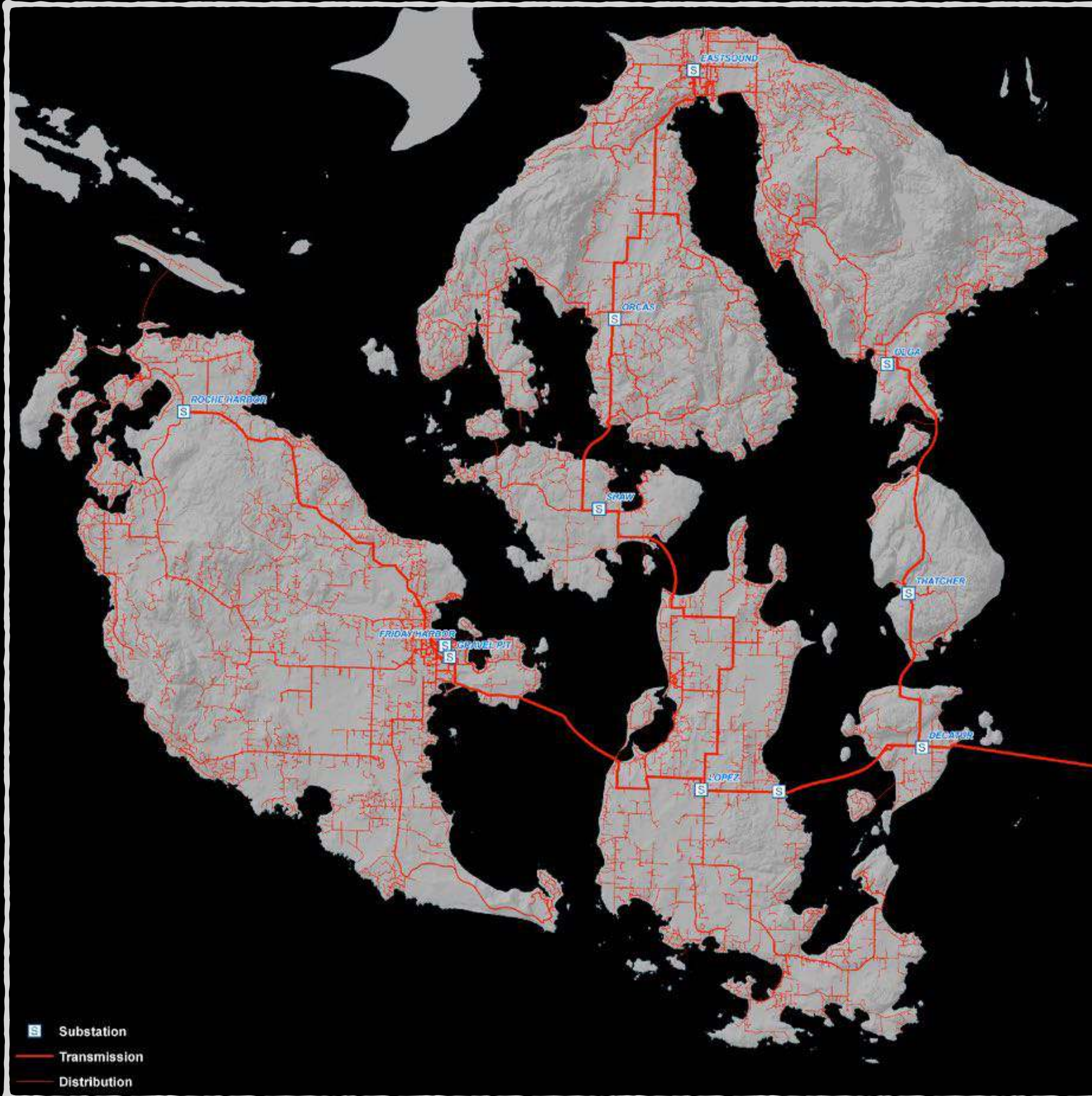
OPALCO



# Meeting Purpose

As the climate emergency accelerates, the OPALCO grid is evolving to meet the pressing needs to **decarbonize** and **increase local energy resilience**.

This document reviews OPALCO's climate action vision, strategy and objectives; showing how *all the parts of the solution work together*.





## DOE: Climate Goal

*The Energy Department is fighting climate change through science, clean energy research, and energy efficiency in our homes, businesses and vehicles.*

# OPALCO: Vision

*A highly interactive and fully connected energy and communication utility is woven into the environmental fabric of our remote island community.*

*Every aspect of our energy and communication life works as one.*

Local generation, electric transportation, efficiency, dispatchable load and storage, ultra-fast large vehicle charging, telemedicine and education, ...

# OPALCO: Net Zero Climate Innovation Laboratory

- ✓ *At the visible epicenter of environmental peril.*
- ✓ *Long track record of innovation and getting the job done.*
- ✓ *Successful grant collaborations with PNNL, WA CEF, BEF.*
- ✓ *Clean-tech jobs that transform a low-wage tourist economy.*
- ✓ *Burning need for storage and generation solutions that perform when the wind doesn't blow and the sun doesn't shine .*
- ✓ *Close proximity and potential collaboration with tribal community.*

*"OPALCO will become a model for islands and remote communities throughout the United States."*

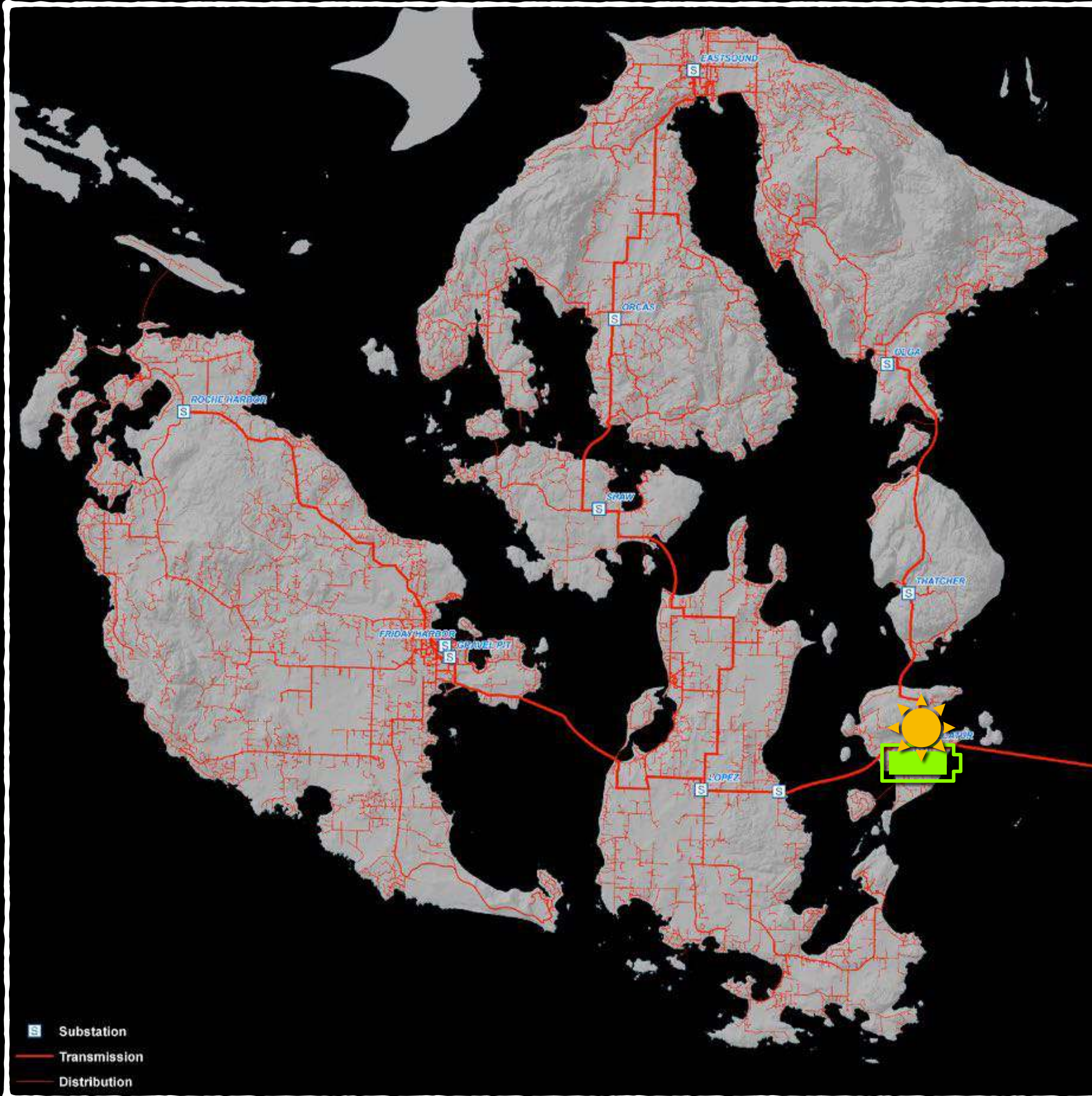
**Dr. Imre Gyuk**, director of energy storage research, DOE Office of Electricity

*"I consider it one step for an island and one giant leap for person-kind."*

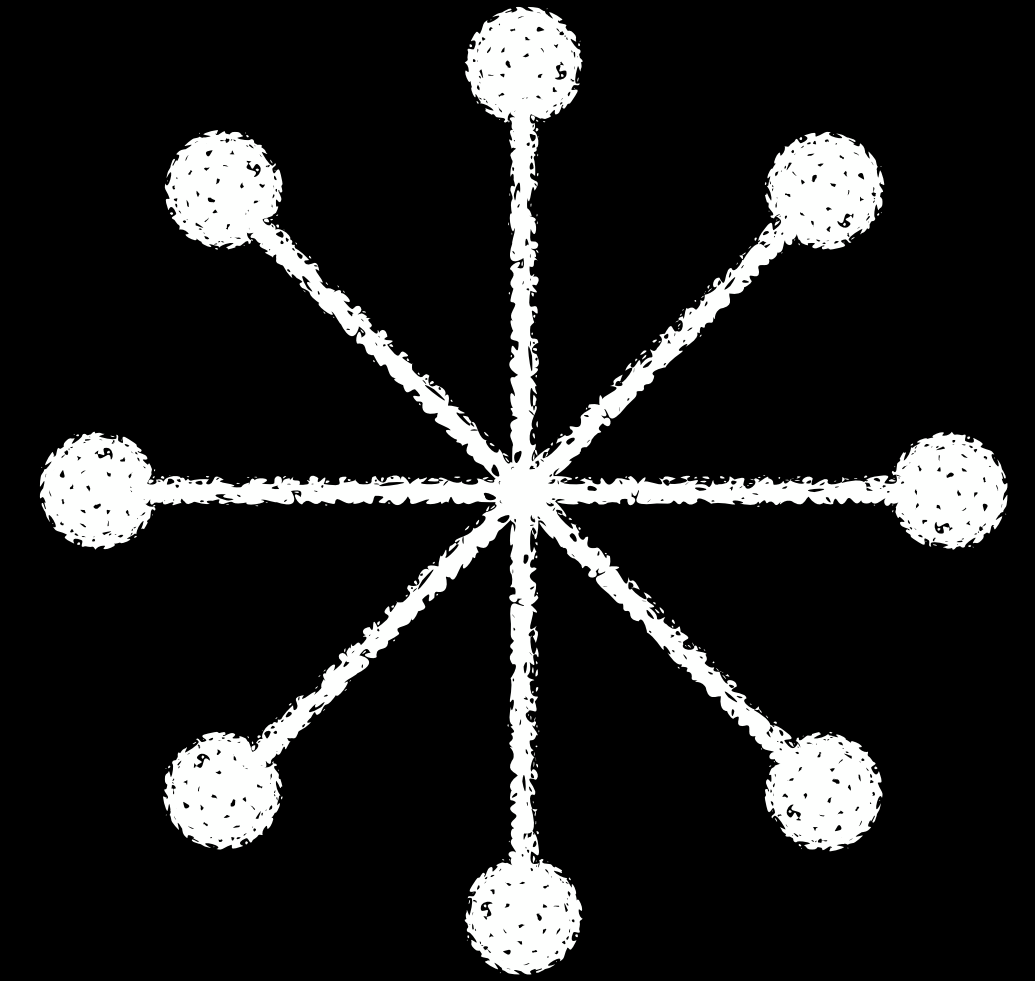
**WA Gov. Jay Inslee**, at Commissioning of first OPALCO Microgrid, funded by CEF



# OPALCO Grid: **Past - very dependent on the mainland**



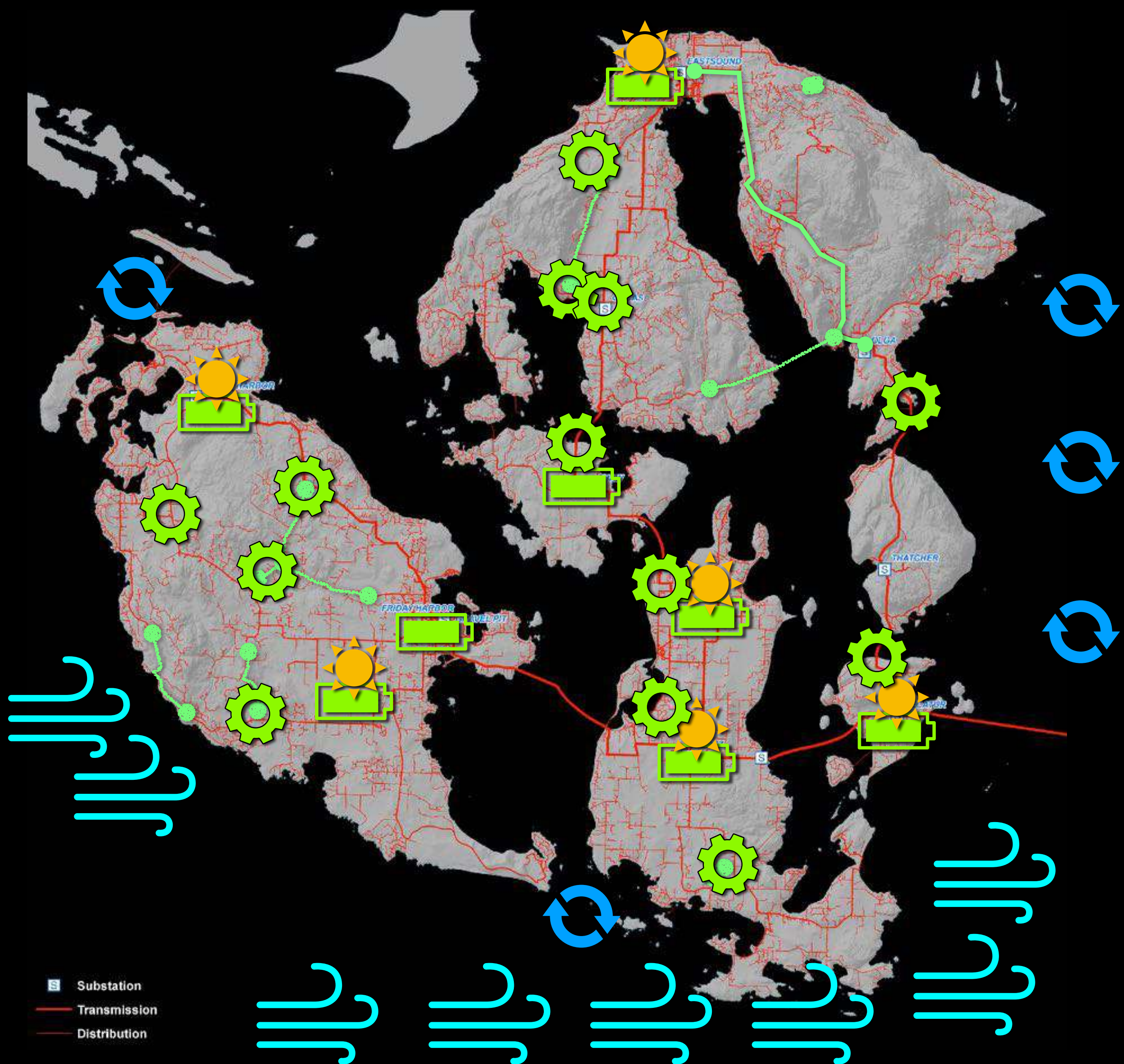
## Transmission and Distribution



**Mostly Radial**  
vulnerable to  
single-point  
failure



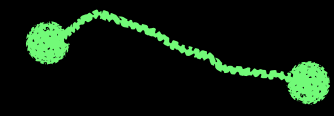
# OPALCO Grid: **Future** - increasing local energy resilience, supporting decarbonization



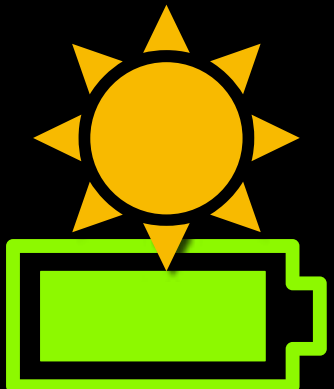
Grid Control



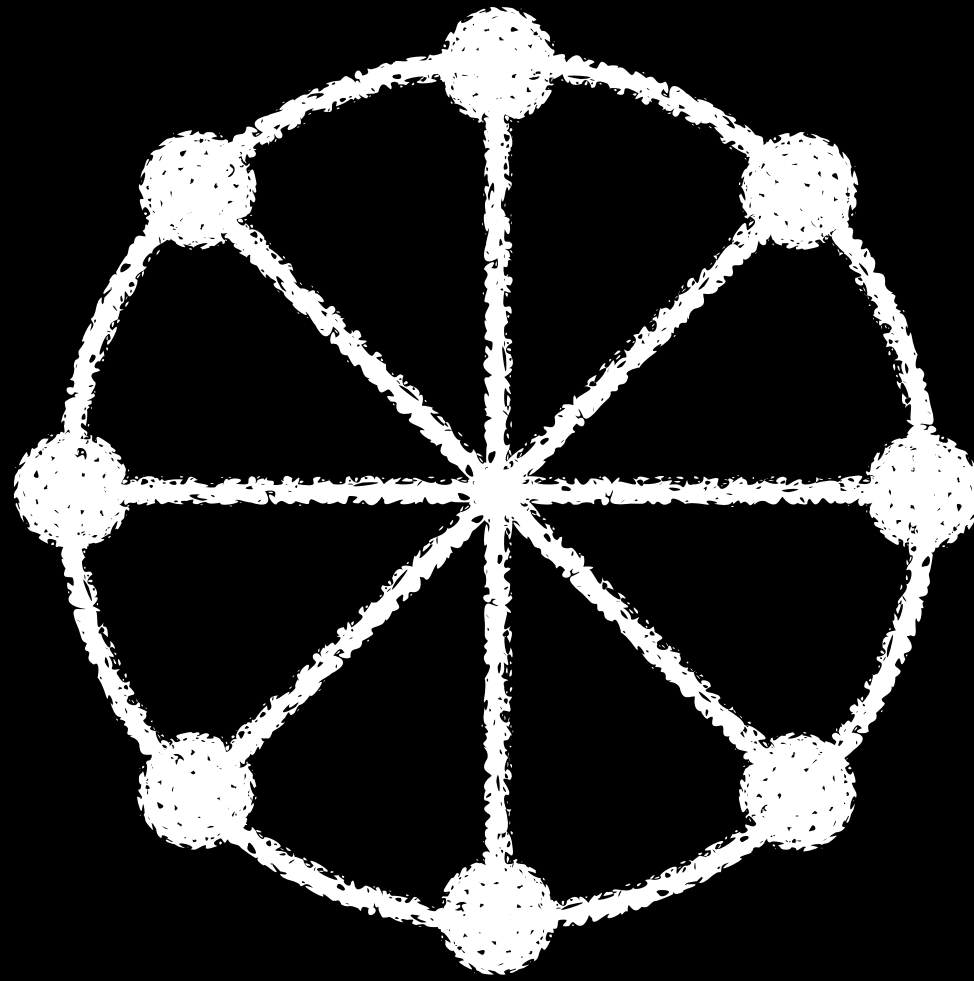
Multi-path  
Connectors



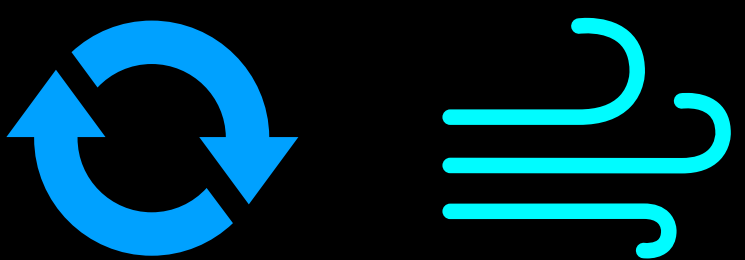
Microgrids  
at substations and  
population centers



Self Healing  
Architecture



Tidal + Wind  
Generators  
helps with winter problem





# Net Zero Climate Innovation Laboratory

*in the island's crucible, everything is connected, we are all in it together*

- ✓ **Protect population centers** from extended mainland outages with Microgrids
- ✓ **Increase energy affordability** clean efficient EVs and heat pumps save \$thousands for co-op members
- ✓ **Electrify public transportation** reduces largest source of CO<sub>2</sub> emissions (eShuttles, eBuses, ePlanes)
  - **Eases tourist ferry load** walk-on rather than drive (diesel ferries emit 40% of county CO<sub>2</sub> emissions)
  - **Helps low income co-op members** who can't afford cars and auto insurance
- ✓ **Protect endangered Orca whales** with quiet clean eFerries
  - **Dispatchable distributed storage-based ultra-fast large vehicle charging** (eFerries, ePlanes, eBuses)
- ✓ **Optimize load and generation** with AMI meters + adaptive *time of use* and *time of generation* rates
  - **Smart IoT grid control** - dispatchable member load and storage, solar inverters, efficiency systems
  - **Less driving, better quality of life** - enables tele-work, tele-health and tele-education
- ✓ **Reduce climate fire risk** with biomass peaker plants, producing biochar for farm/forest soil health



# OPALCO is in the heart of the Salish Sea



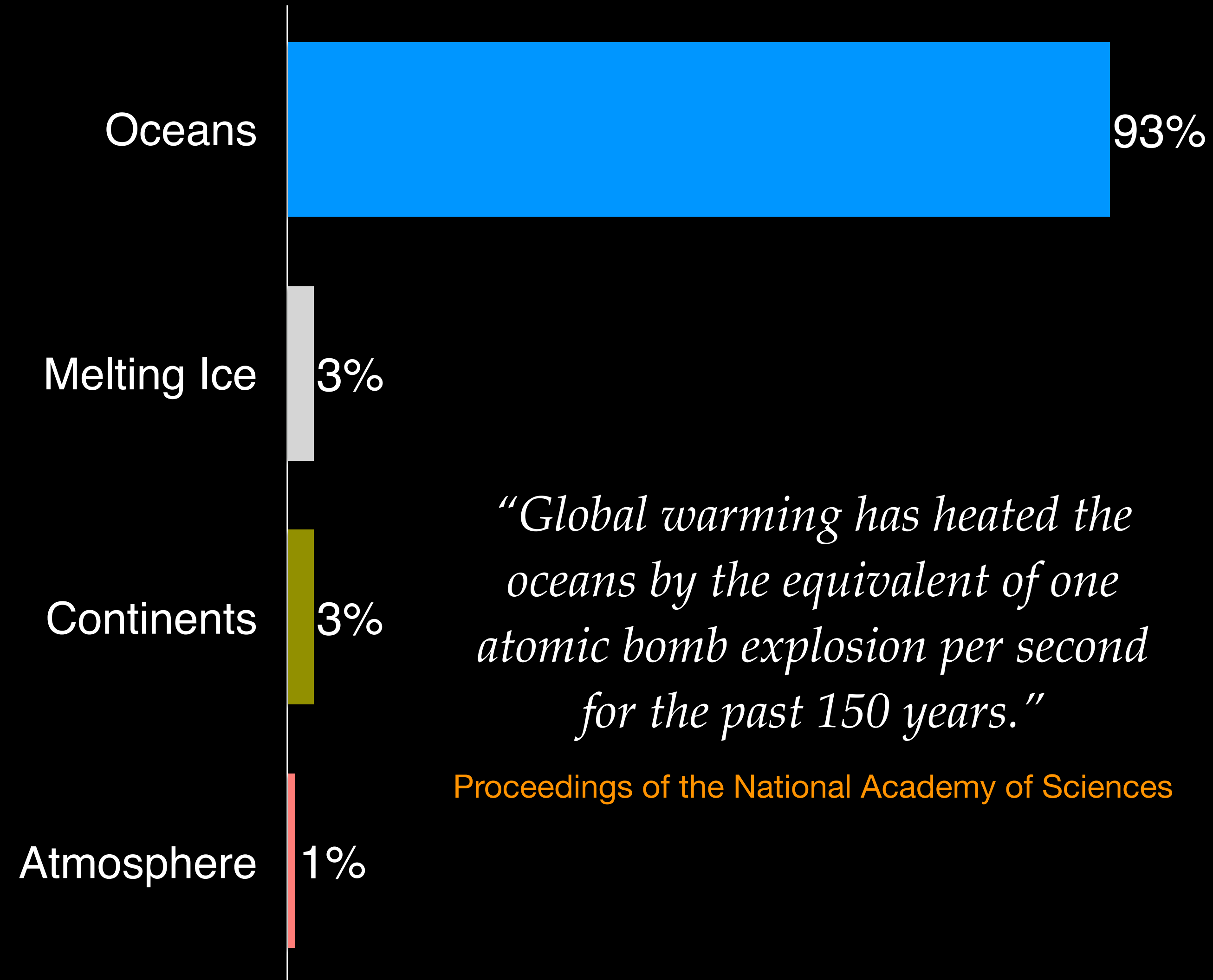
*The Salish Sea is a microcosm for the planet,  
as the climate emergency accelerates.*

*Its pristine waters and precious marine  
ecosystem are in peril, as is our community.*

*What we do here will inspire the world.*

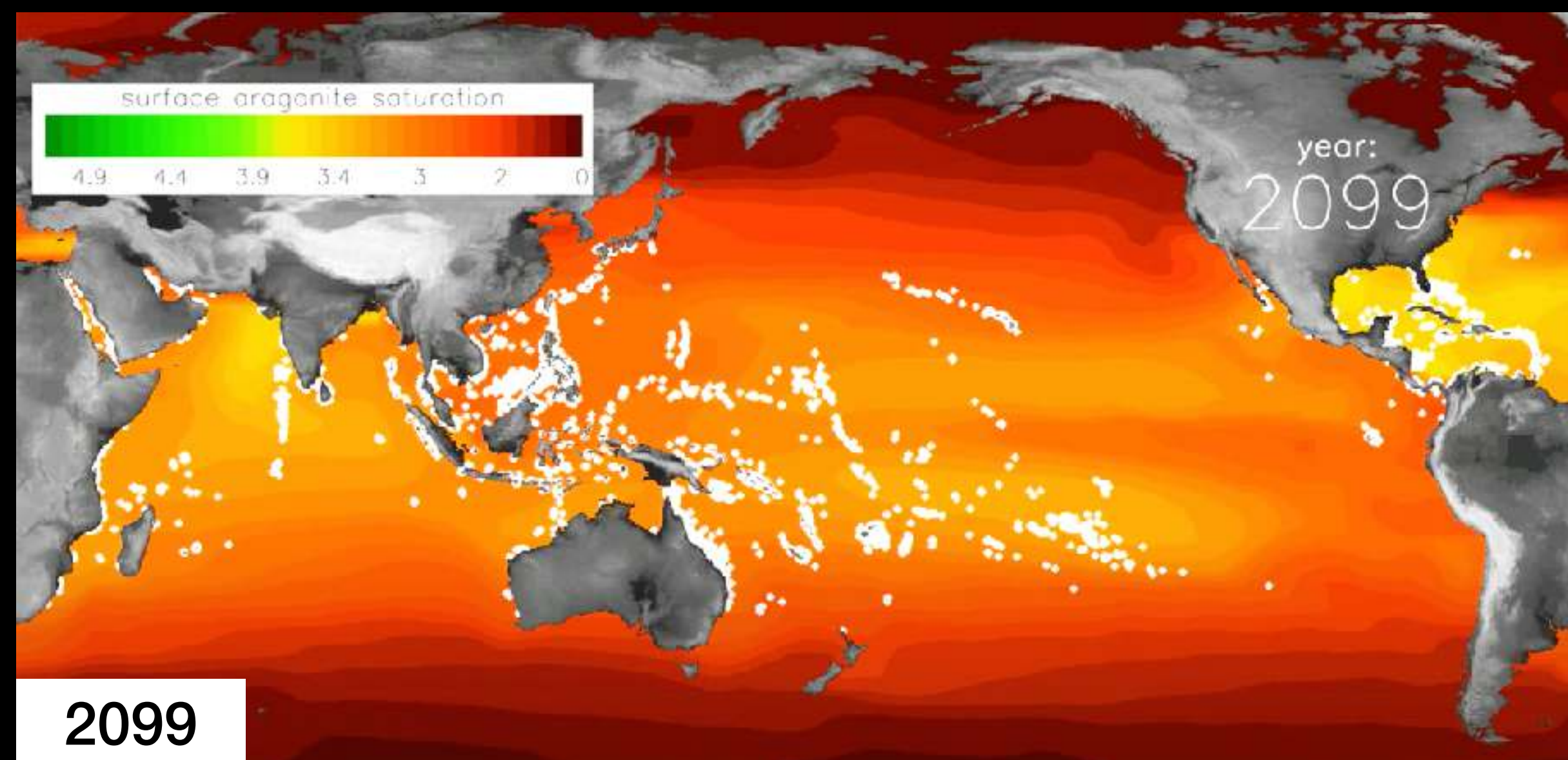
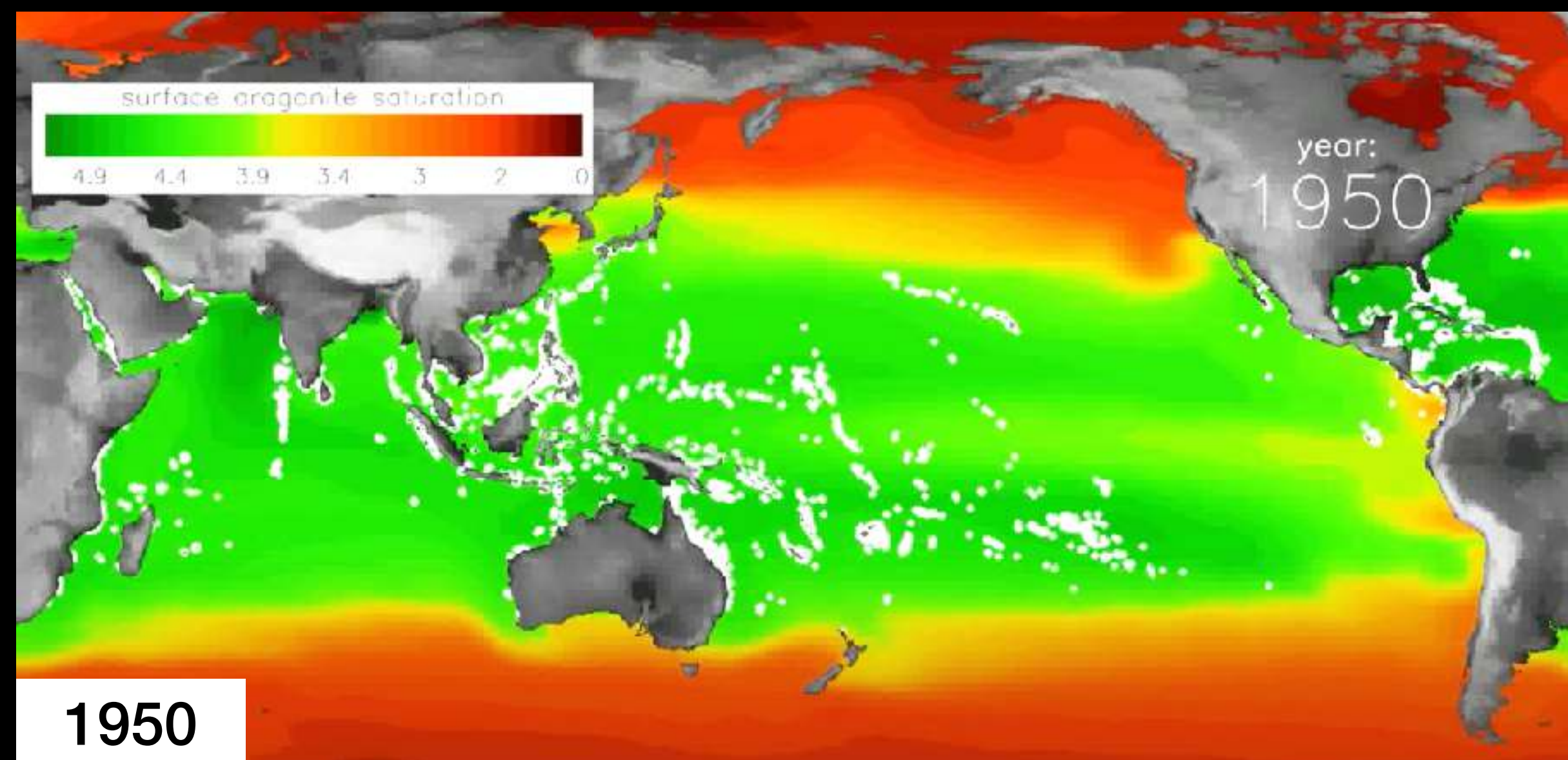


# Where is the heat from global warming going?

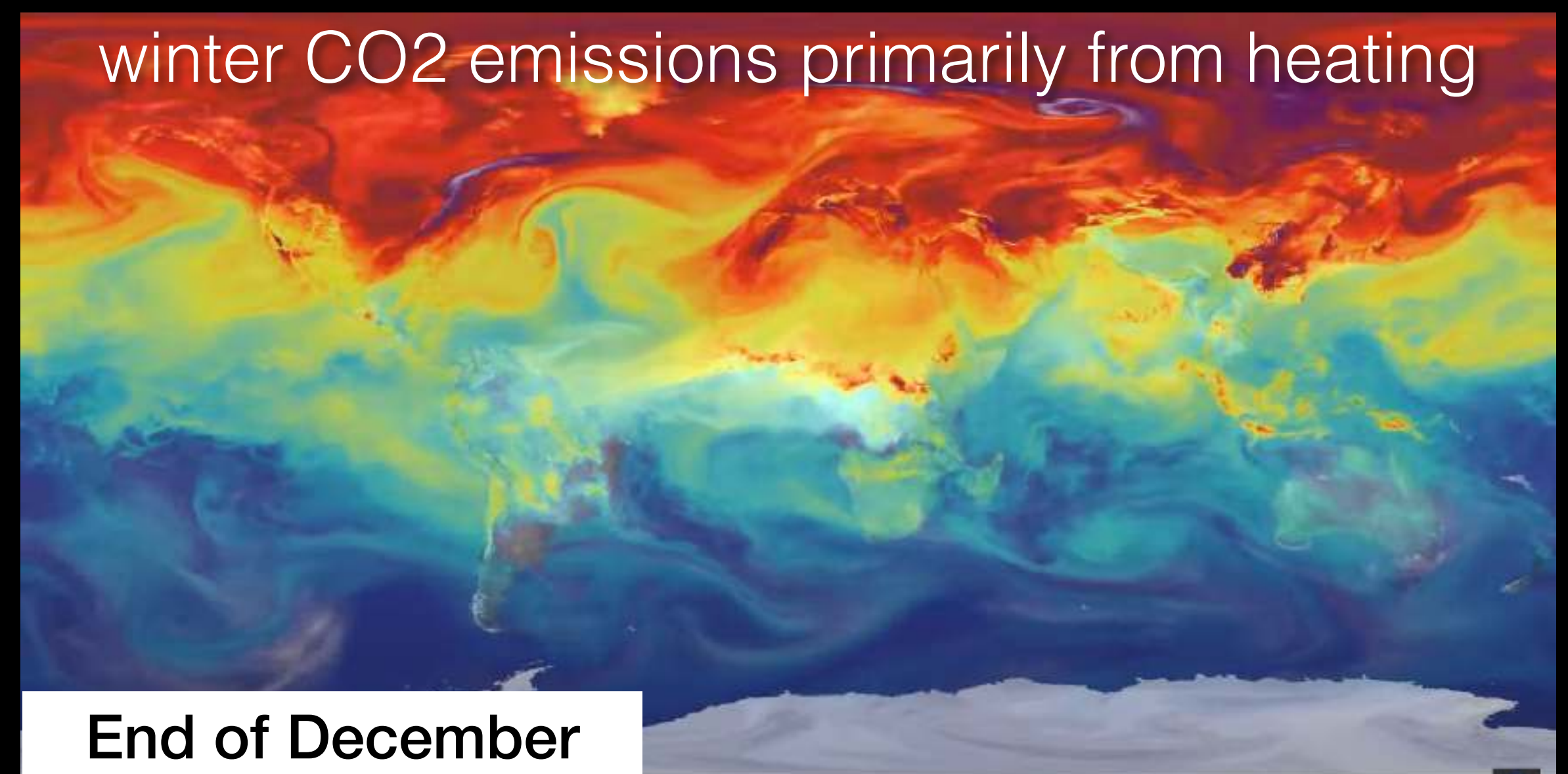
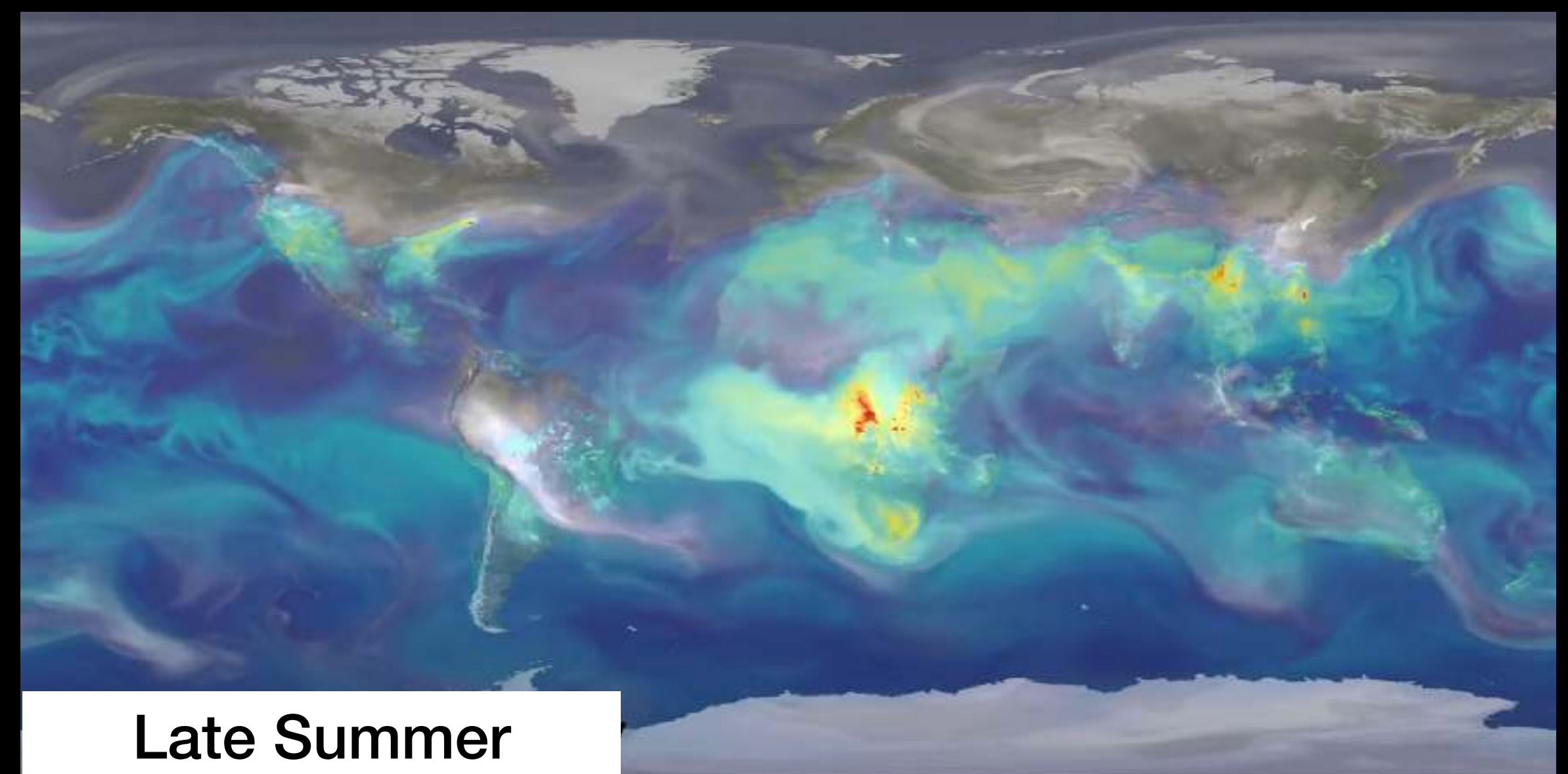




# OCEAN ACIDIFICATION



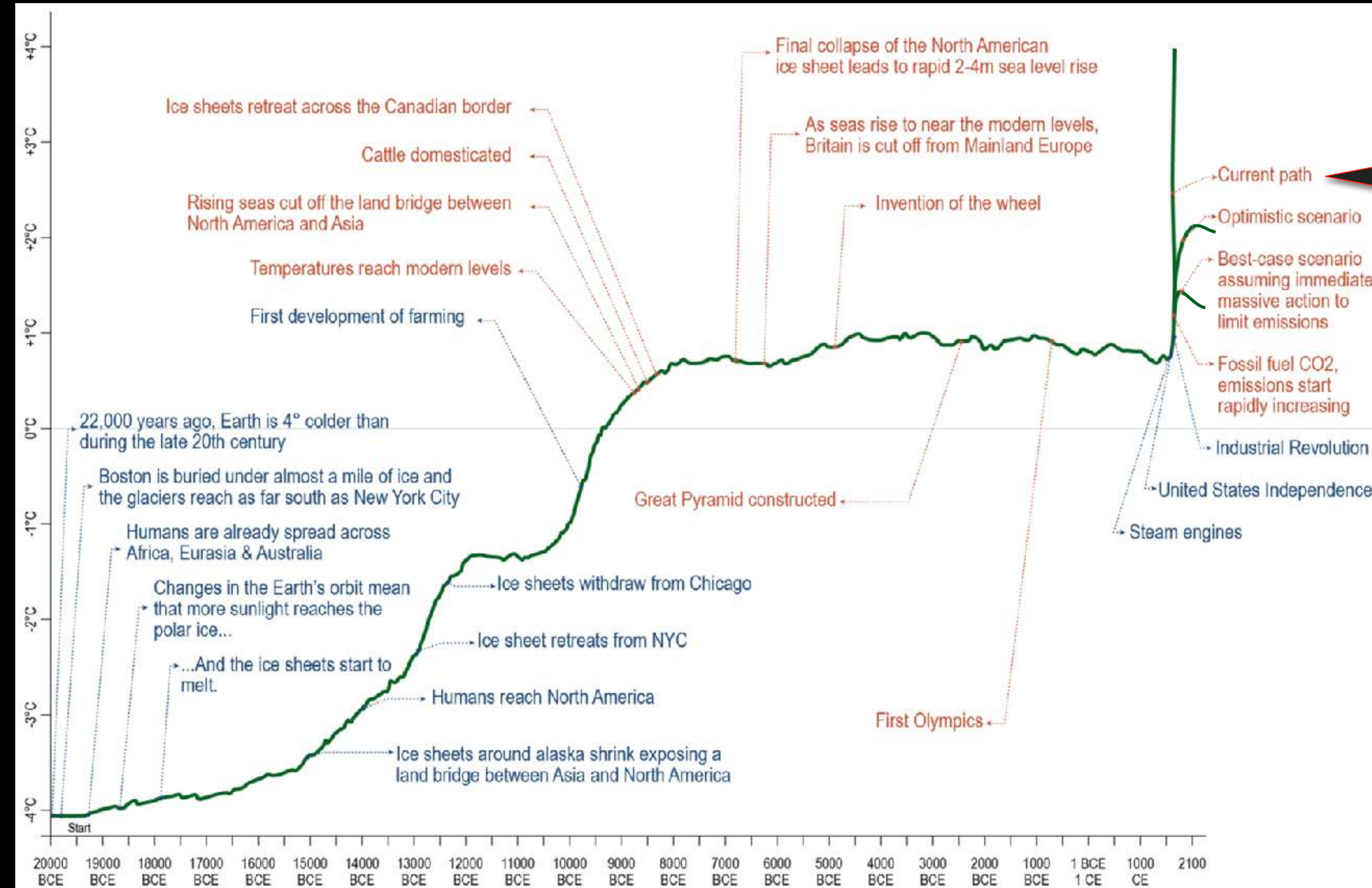
# CO<sub>2</sub> EMISSIONS





# Global Atmospheric Temperature Is Spiking

*One-third  
of all plant  
and animal  
species could  
be extinct in  
50 years.*





# NW Extreme Weather This Past Winter



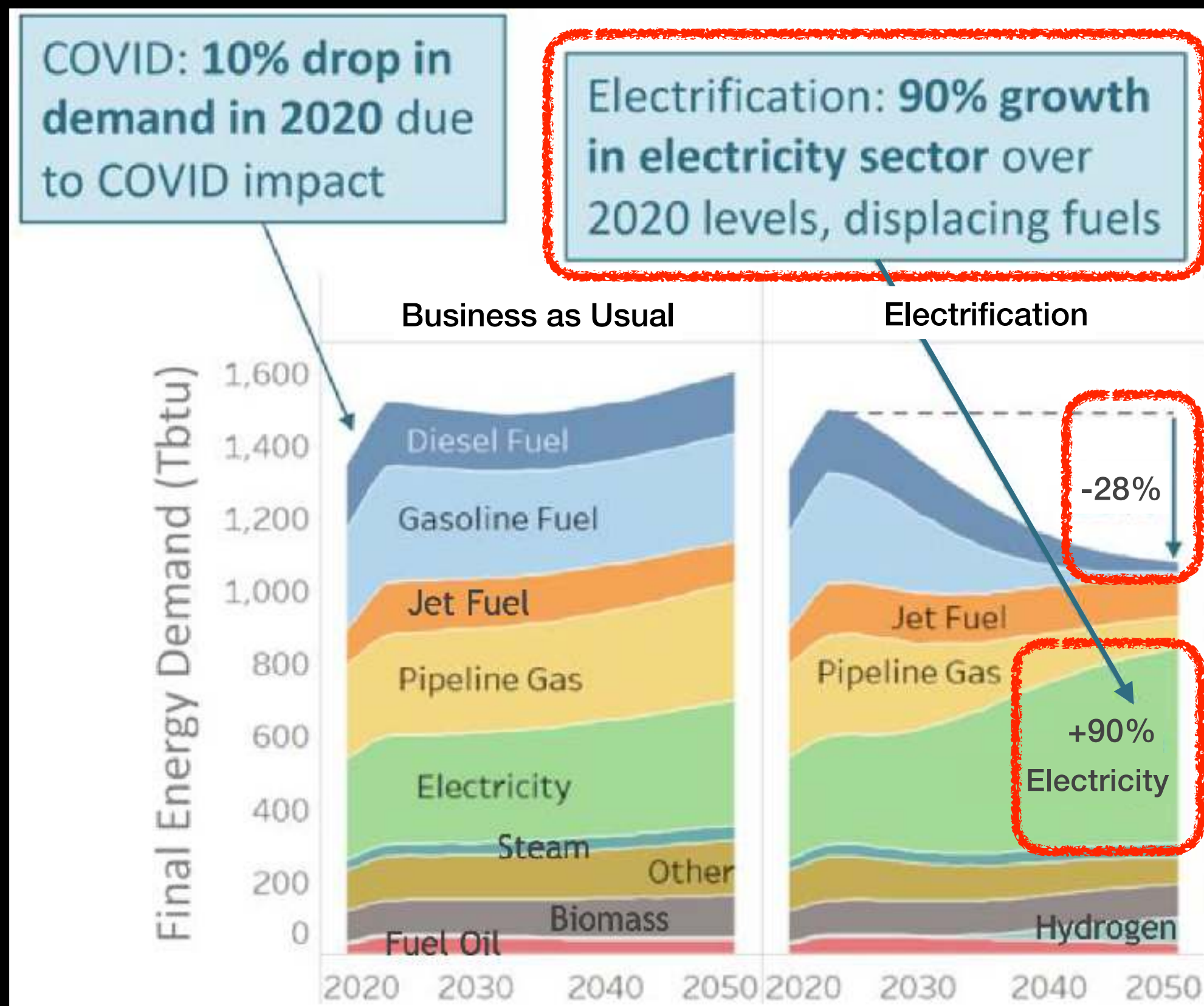


# NW Regional Energy Strategy and Implications

*Decarbonization will nearly double demand for electricity, while reducing TOTAL energy demand by 28%, but...*

## WA State Priorities and Implications

- ❖ **Decarbonize power generation**  
reduces regional capacity (Clean Energy Transformation Act (CETA))
- ❖ **Decarbonize heating and transportation**  
rapidly increases electric load
- ❖ **Develop new wind and solar**  
requires millions of acres of land, siting, acquisition, and permitting (NIMBYism issues too)





# NW Energy Capacity is Declining, Load is Increasing

Higher

- Beneficial Electrification (EVs, heating)
- Population shifts

Regional System Capacity

Deficit

=

\$\$\$ peak demand  
brown-outs  
rolling blackouts

Regional Load Annual Peak

- California demand
- shutdown nuclear
- shutdown coal

Lower



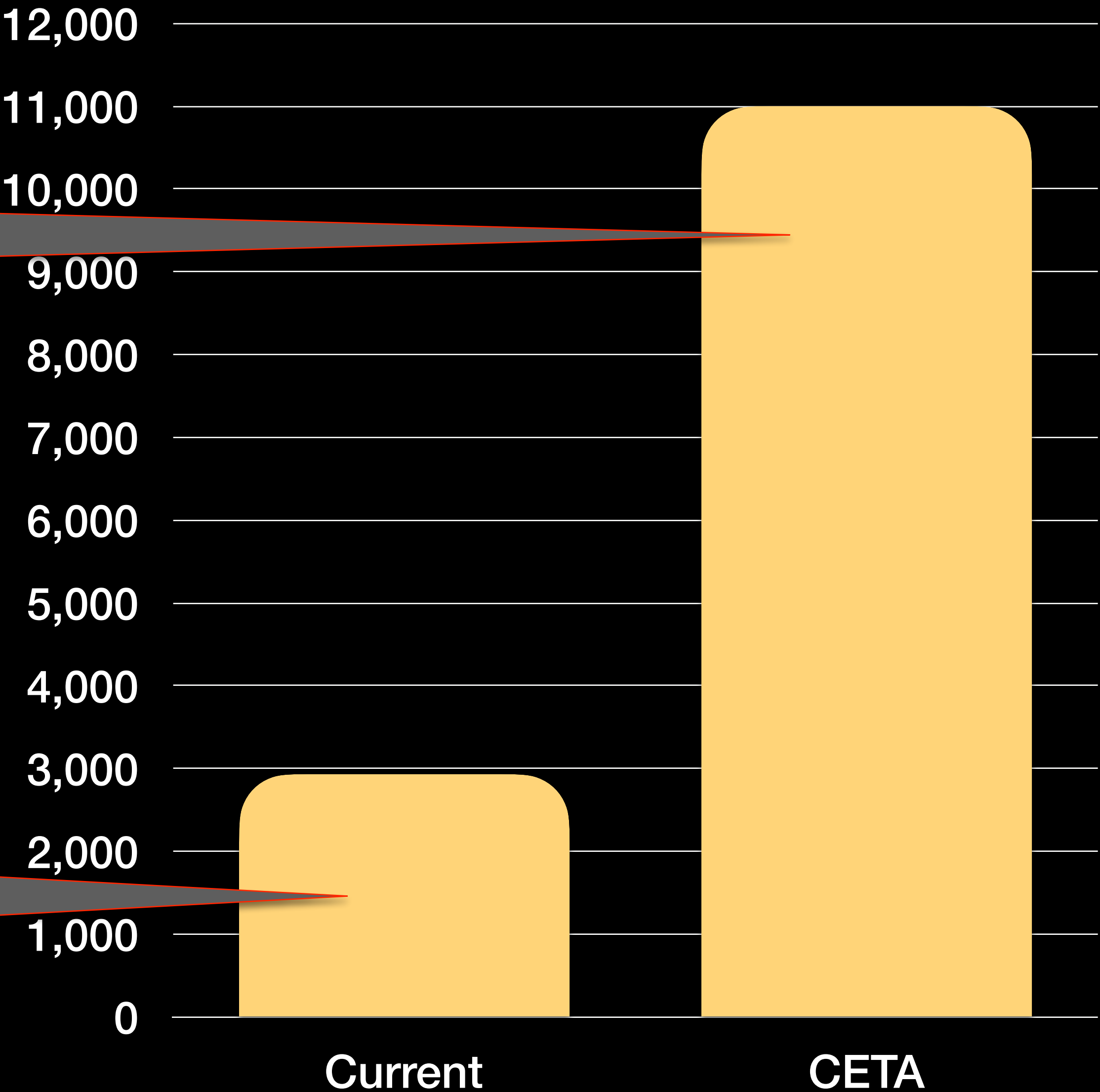


# How Long Will it Take to Develop New Wind Power Resources

Wind Power Needed (MW)

To meet CETA mandated ending of coal power, wind power will need to at least **triple** based on monthly average power. Much more will likely be needed, plus massive storage to meet ELCC hourly analysis.

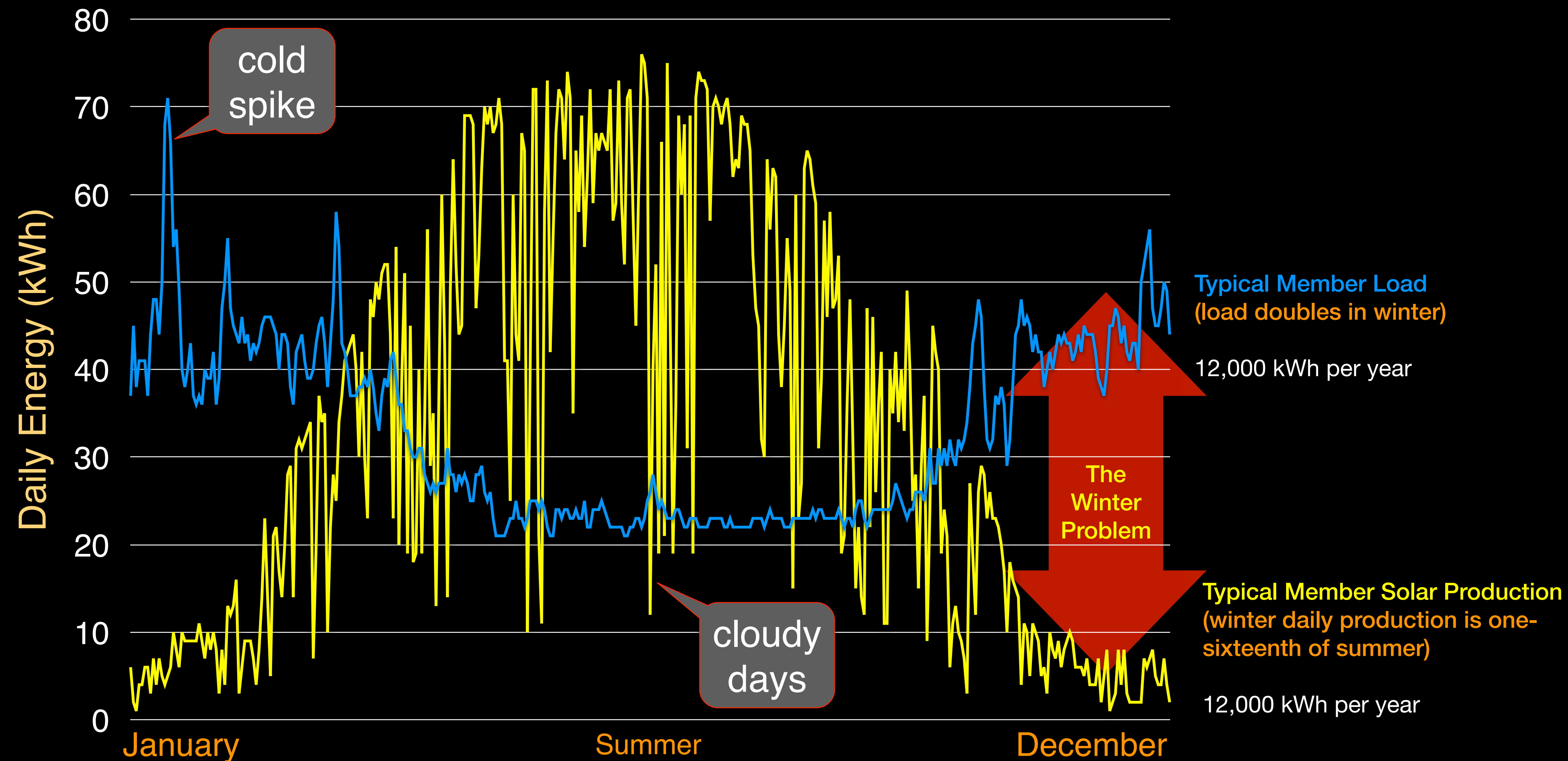
This is the current installed NW wind power capacity. It required over 25 years to develop.





# The Winter Problem: Daily Typical Net-Zero Solar Member Load and Production

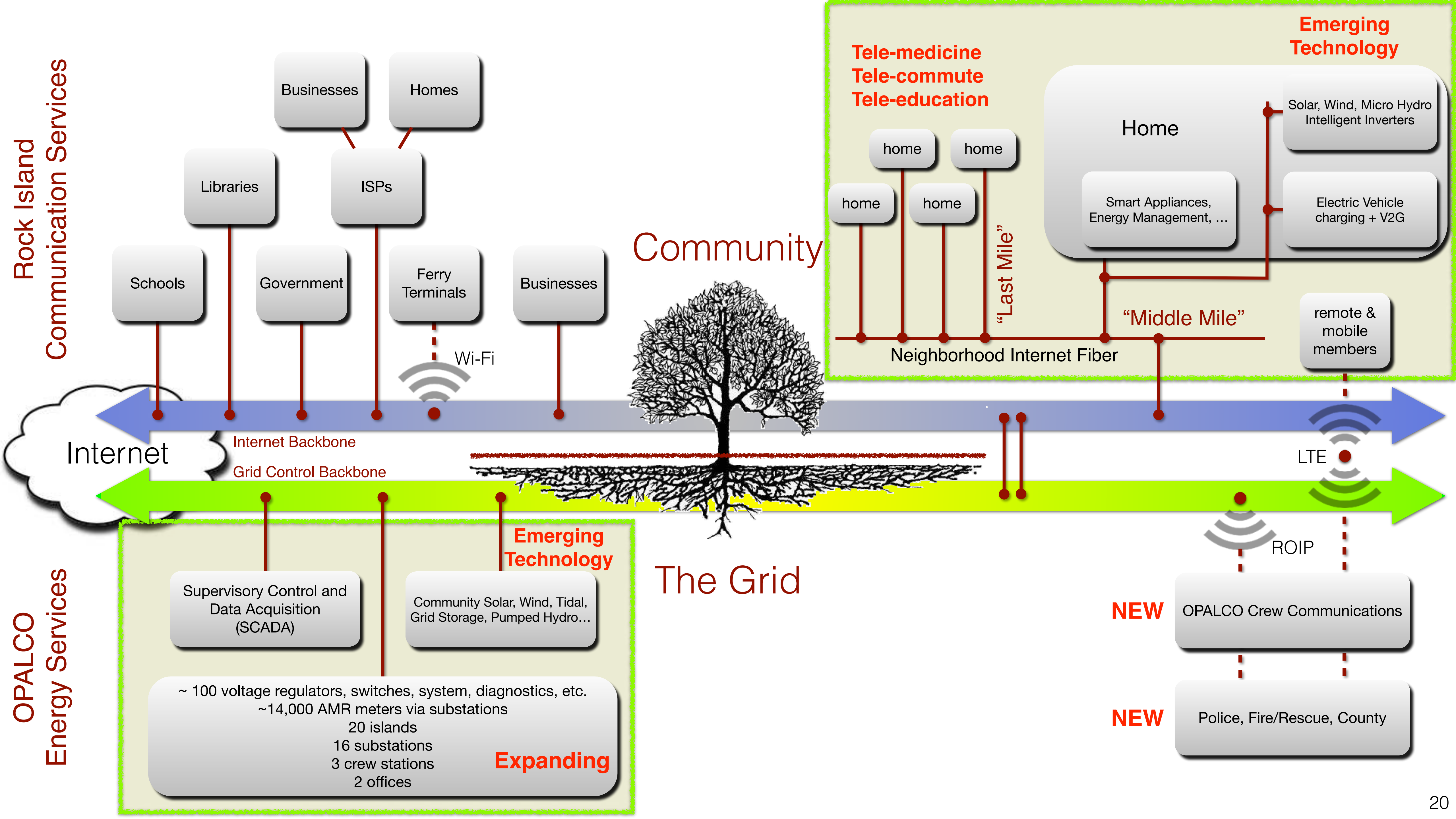
*rooftop solar is convenient for members to implement, but it is not ideal in northwest winters*





# OPALCO climate action strategy and objectives







# San Juan County Carbon Footprint: Simplified Estimate

*N.B. OPALCO estimate. We are working with San Juan County to establish a formal assessment.*

Fuel	Amount Used	CO2 Intensity	Tons CO2	Share
Electricity	215,000,000 kWh	48 - 73 lbs CO2/MWh	7,848	8%
Gasoline	2,700,000 gallons	8.9x10 <sup>-3</sup> MT/gal	26,433	27%
Propane	1,896,750 gallons	5.2x10 <sup>-3</sup> MT/gal	10,849	11%
Wood/Other	1,802 cords	6,600 lbs/cord	5,946	6%
SJC Ferry Diesel	3,827,701 gallons	10.18x10 <sup>-3</sup> MT/gal	38,966	40%
Agriculture			1,718	2%
Waste Treatment/Recycling			4,664	5%
Total			96,424	100%

- ❖ 2,700,000 gallons gasoline = 18 million kWh for EVs
- ❖ 1,900,000 gallons of propane = 12 million kWh for heat pumps

~6.4 T/person/year



# Typical SJC All Electric Home: More Efficient, Lower Cost, Much Cleaner

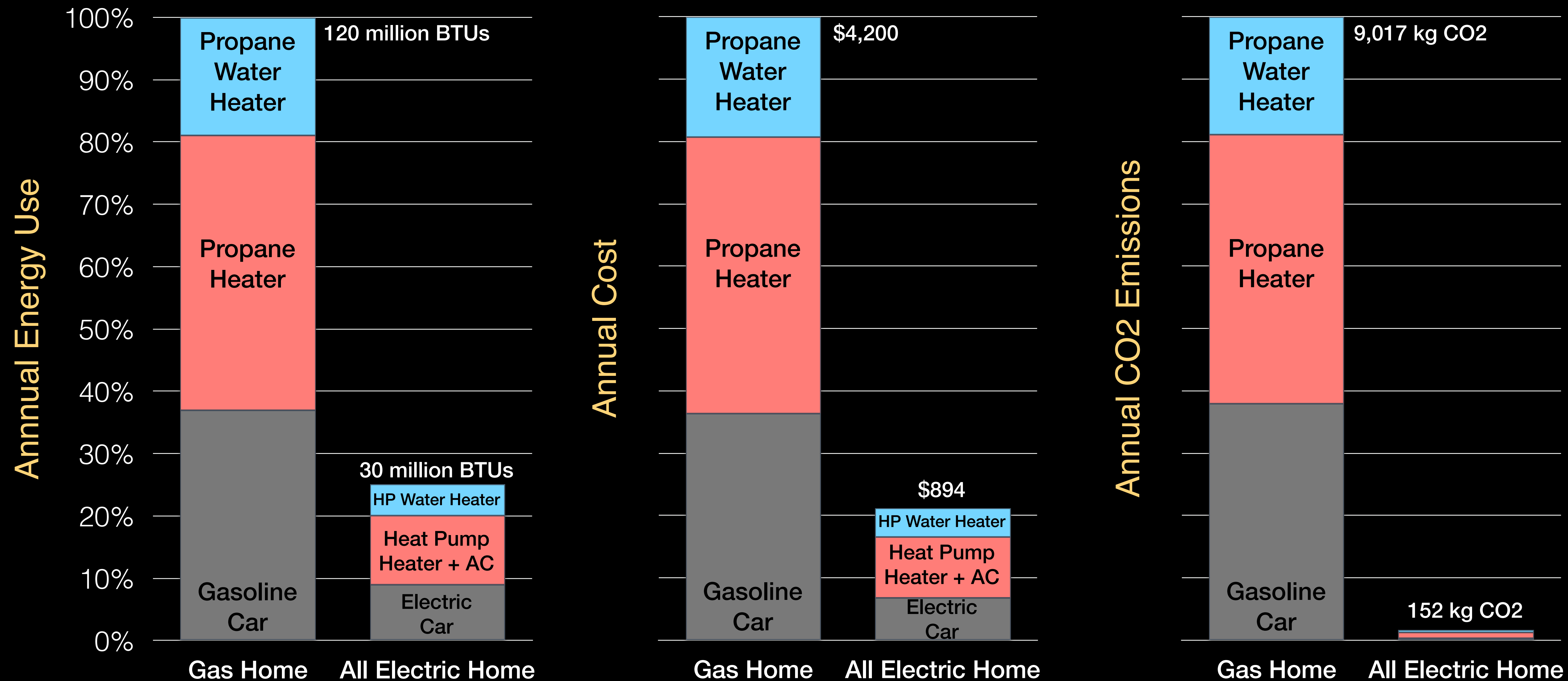
Save Energy



Save Money



Save the Planet!





OPALCO is developing ultra-fast charging at ferry terminals, marinas, airports, public transport hubs.  
The eFerry and eBus projects are grant-funded.

Seattle, Pure Watercraft  
40 HP electric outboard motor



walk-on eFerry



Grant Funded!  
V2G eBus



ground effect eFerry



hydrofoil eFerry



float ePlane



eShuttle



# OPALCO Community Solar: Decatur Island Microgrid

*“Decatur will become a model for islands and remote communities throughout the United States.”*

Dr. Imre Gyuk, director of energy storage research, DOE Office of Electricity

## Solar

512 KW

525 MWh

## Storage

500 KW

2.5 MWh



Funded by WA Clean Energy Fund and PNNL

7 Use Cases (peak shaving, extend submarine cable life, etc.)



# OPALCO Community Solar: Bailer Hill Microgrid

- Tracking agri-solar (maximize farmland and wetlands)
- 45% allocated for low income members
- WA Clean Energy Fund Grant

## BAILER HILL MICROGRID PROPOSED SITE

**19**  
acres

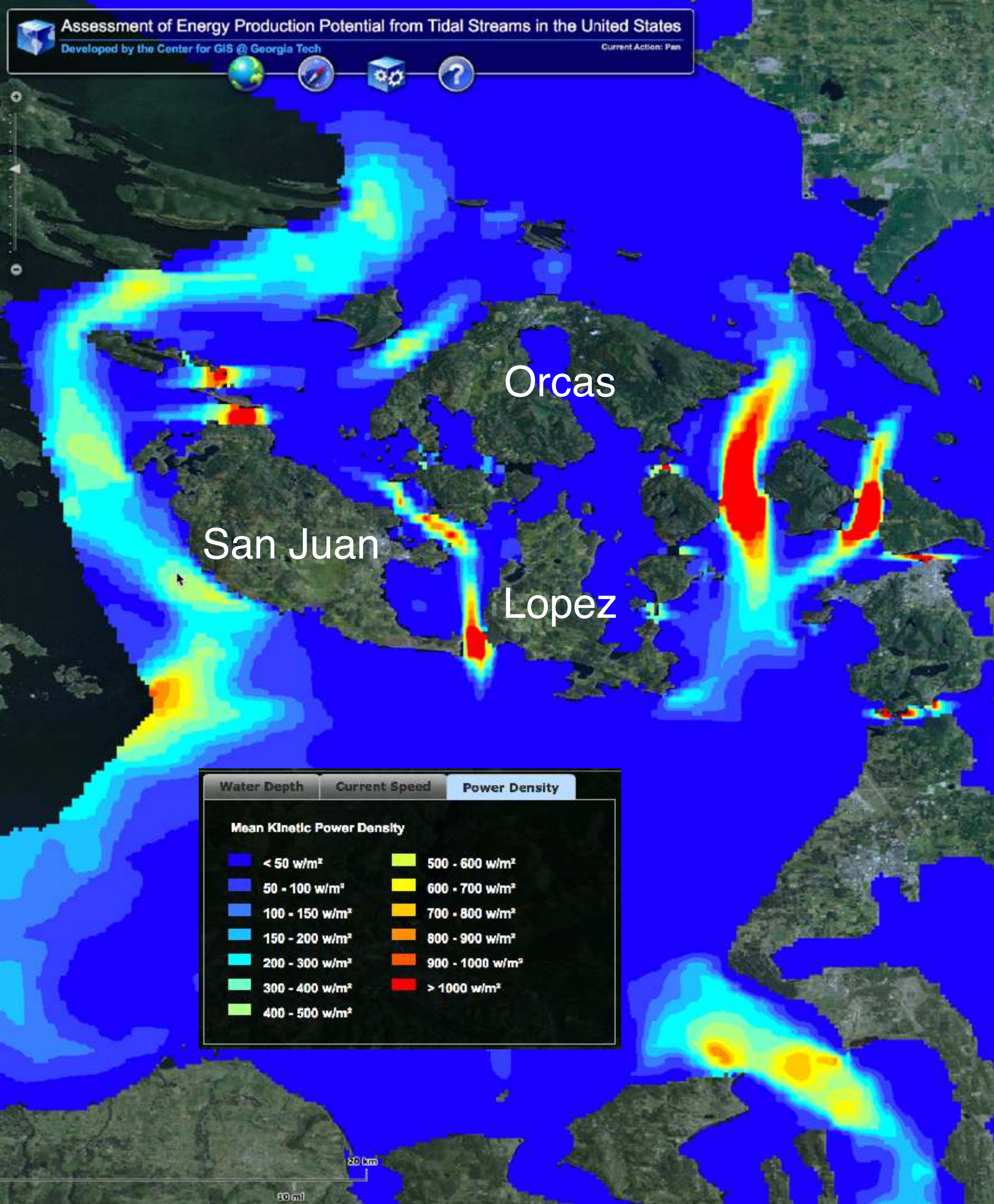
**2.5MW**  
solar array

**5M**  
kWh annual  
production

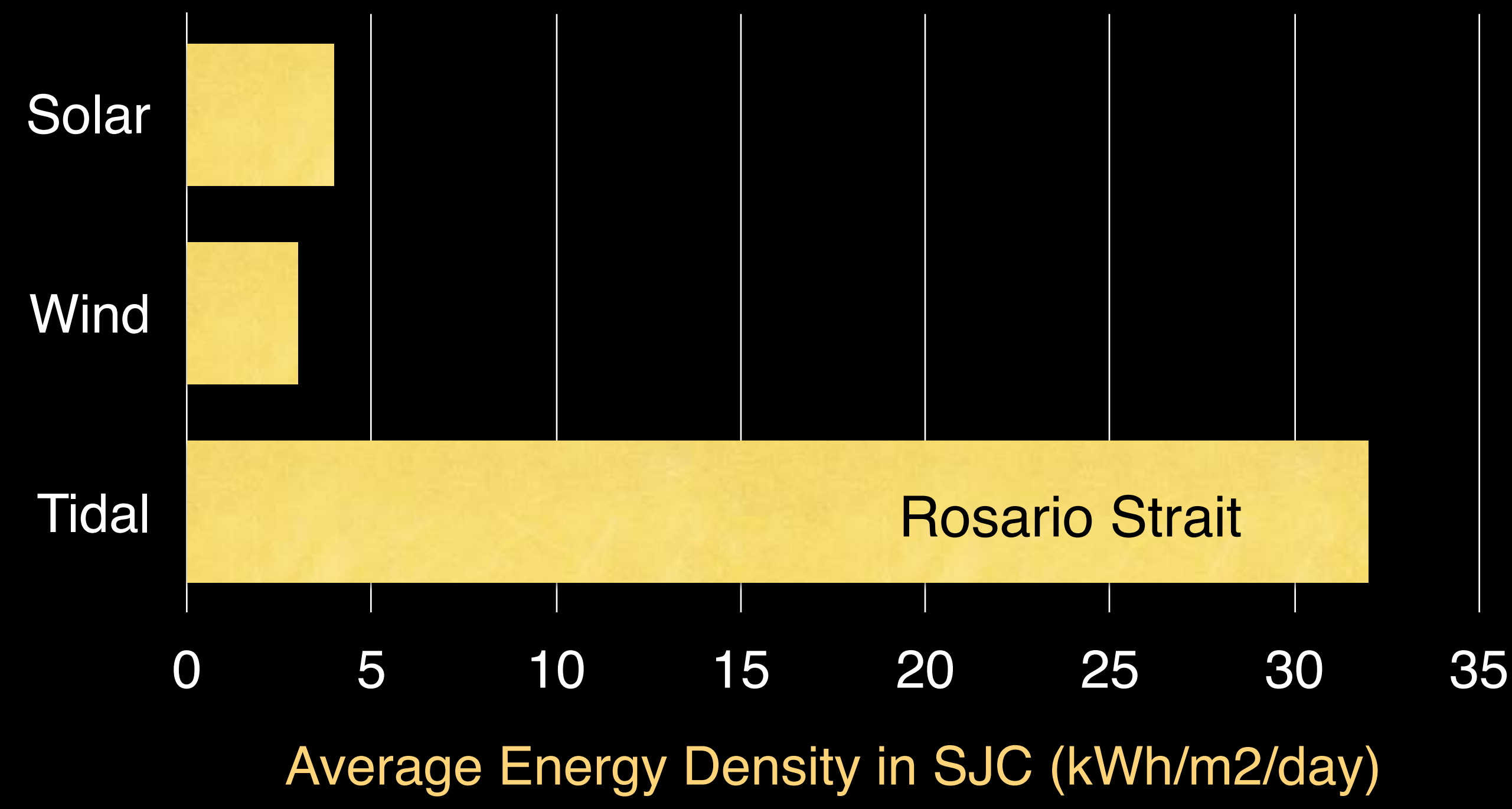
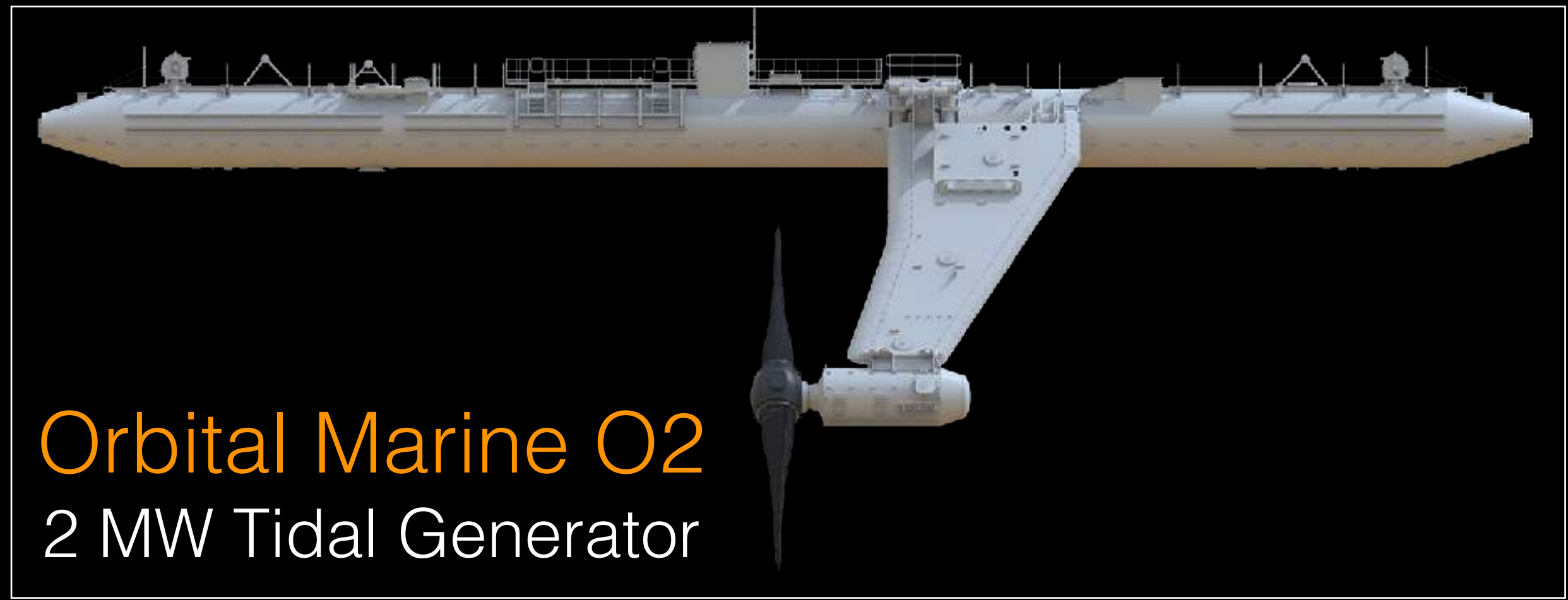
**2MW**  
battery storage

*Coming to San Juan Island in 2023*

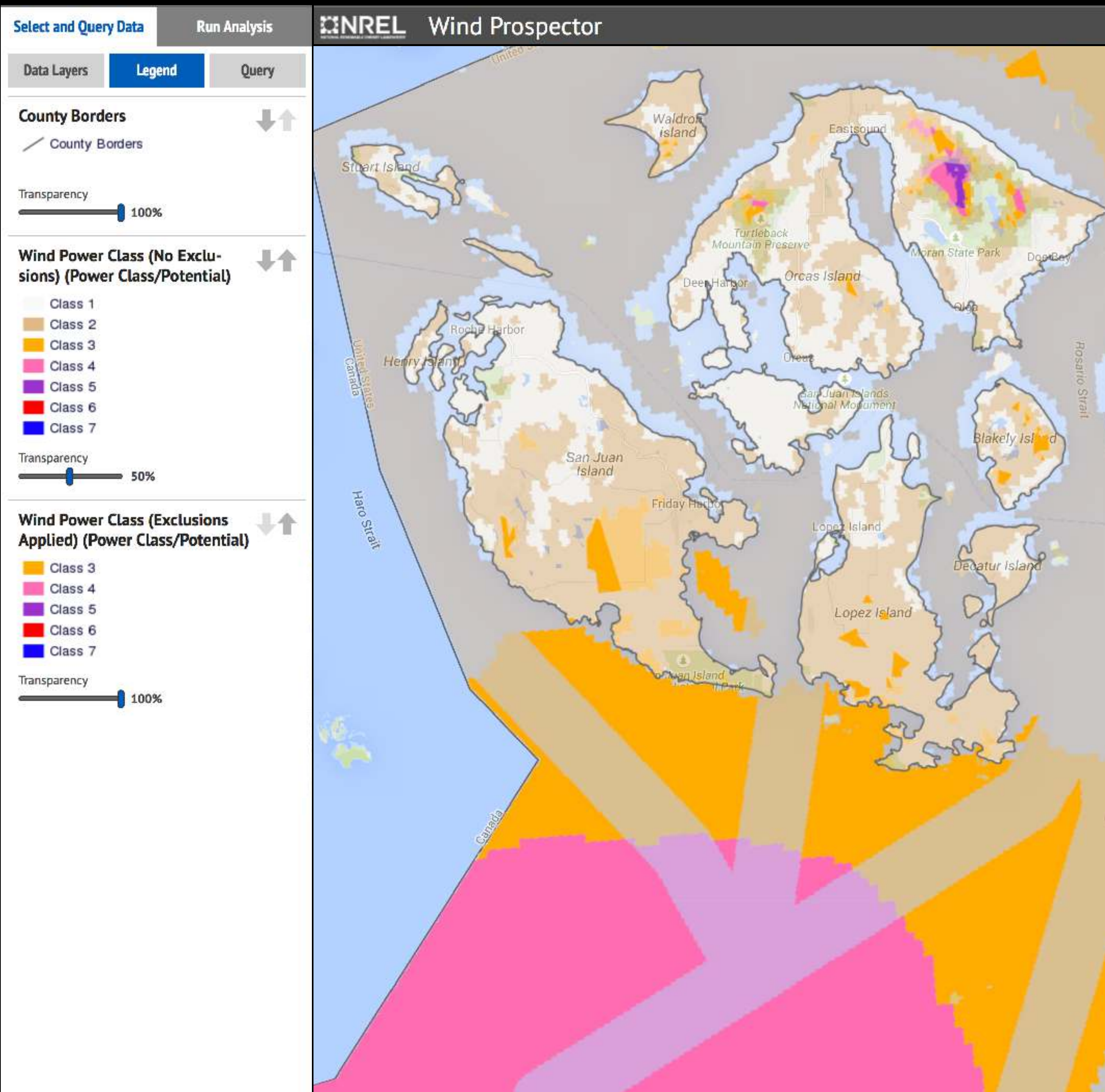




# Tidal Power







# Wind Power

*While wind energy is strongest in the winter, and helps with the winter problem, it is still subpar in most of the county.*





# Impact Investments Improve Community Resilience and Wellbeing

*We use preliminary funding for proof of concept, and scale up with deeper funding*

Sequential Priorities: Outages (ASAP), Decarb (accelerating in 2030s), Winter prob. (2030s)

Challenges and Risks>							2025	2030	2035
Solutions		Mainland Outages	Decarbon- ization	The Winter Problem	Climate Fire	Climate Drought			
Grid Modernization	AMI meters, SCADA, FTH, sectionalizing, telemed	✓	✓	✓	✓				
Electric Public Transportation	eShuttles, eBuses, eBoats with dispatchable storage	✓	✓	✓					
Ultra-fast Charging Infrastructure (up to 15 MW)	eFerries, ePlanes, eBuses, eBoats, EVs	✓	✓	✓					
Microgrids	solar + storage, near critical services	✓		✓		✓			
Tidal Energy	Orbital Marine, experimental	✓		✓		✓			
Wind Energy	shallow offshore, experimental	✓		✓		✓			
Biomass Energy	biochar, peaker, sustainable farm/forest soil health	✓		✓	✓	✓			
Long-term Storage and Green Hydrogen	electrolyzer + fuel cells	✓		✓					
Dispatchable Storage	V2G, residential, commercial	✓		✓					



# Grants Need To Support Long-Range Projects

## Decarbonization, Local Energy

- \* Mainland Submarine Cable (\$100M)
- \* Tidal Power (\$60M)
- \* Pumped Storage (\$44M)
- \* Utility-Scale Solar (\$100M)
- \* Wind (\$80M)
- \* Green Hydrogen Longterm Storage and Commercial Transportation (\$100M)
- \* BioMass Generation (\$48M)
- \* Ultra-fast Large Vehicle and V2G Charging Infrastructure for Islands (\$99M)

## Resilience

- \* Eastsound Area Battery Storage (\$14M)
- \* Orcas Area Battery Storage (\$10M)
- \* Friday Harbor Area Battery Storage (\$26M)
- \* Roche Harbor Area Battery Storage (\$14M)
- \* Lopez Area Battery Storage (\$12M)
- \* Shaw Area Battery Storage (\$6M)

## Broadband, IoT

- \* Smart Meter Infrastructure (\$6M)
- \* Broadband Resilience (\$6M)
- \* Fiber to the Home (businesses) to support smart meter infrastructure and IoT (\$100M)



# The OPALCO Team: 100 Years of Innovation

- ✓ OPALCO Board
- ✓ OPALCO Staff
- ✓ OPALCO co-op members

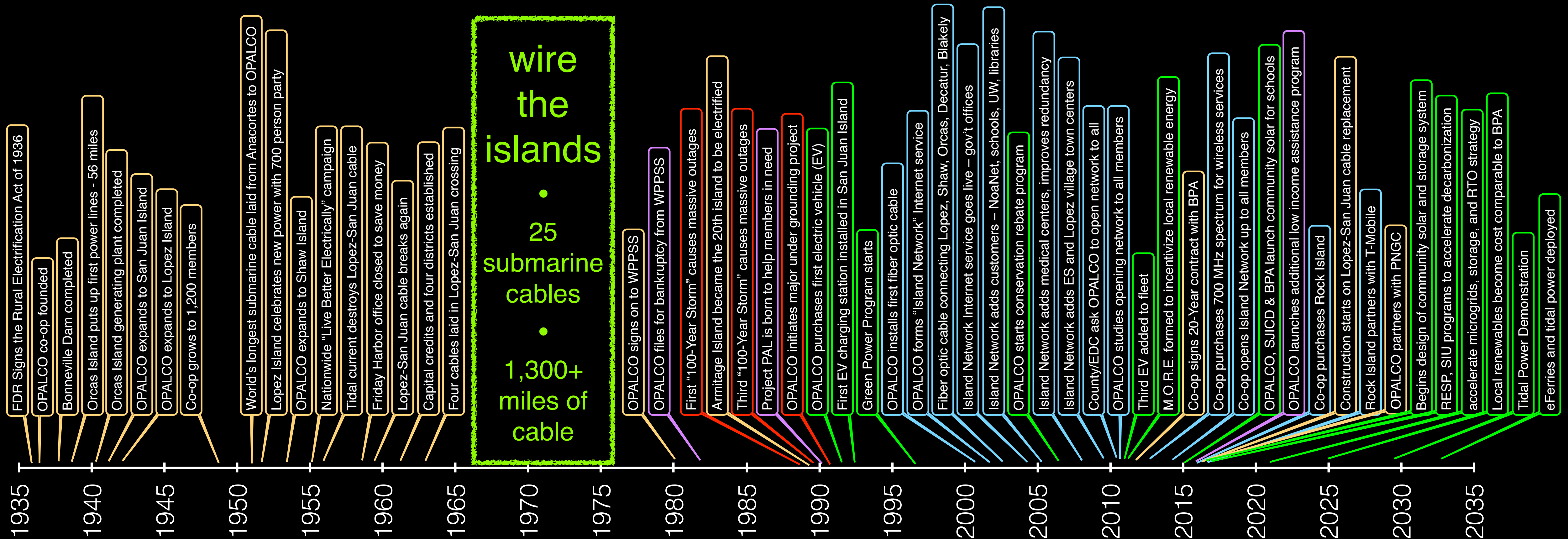
communication services, grid modernization, tidal, AMI meters, solar + storage microgrids, ultra-fast large vehicle charging...

efficiency, local energy, and decarbonization Programs

low income programs

undergrounding to storm-harden grid

Energy Services





*Thank You!*