

A wide-angle photograph of the Tacoma waterfront. In the foreground, a wooden pier with several white mooring bollards extends into the water. Two white motorboats are docked at the pier. In the background, a dense urban skyline is visible under a clear blue sky. Notable buildings include a large, modern, curved glass structure on the left and several multi-story rectangular buildings in the center and right. A green gantry crane is visible on the right side of the pier.

Serving our customers

Port Electrification Opportunities

Cam LeHouillier - Energy Research & Development

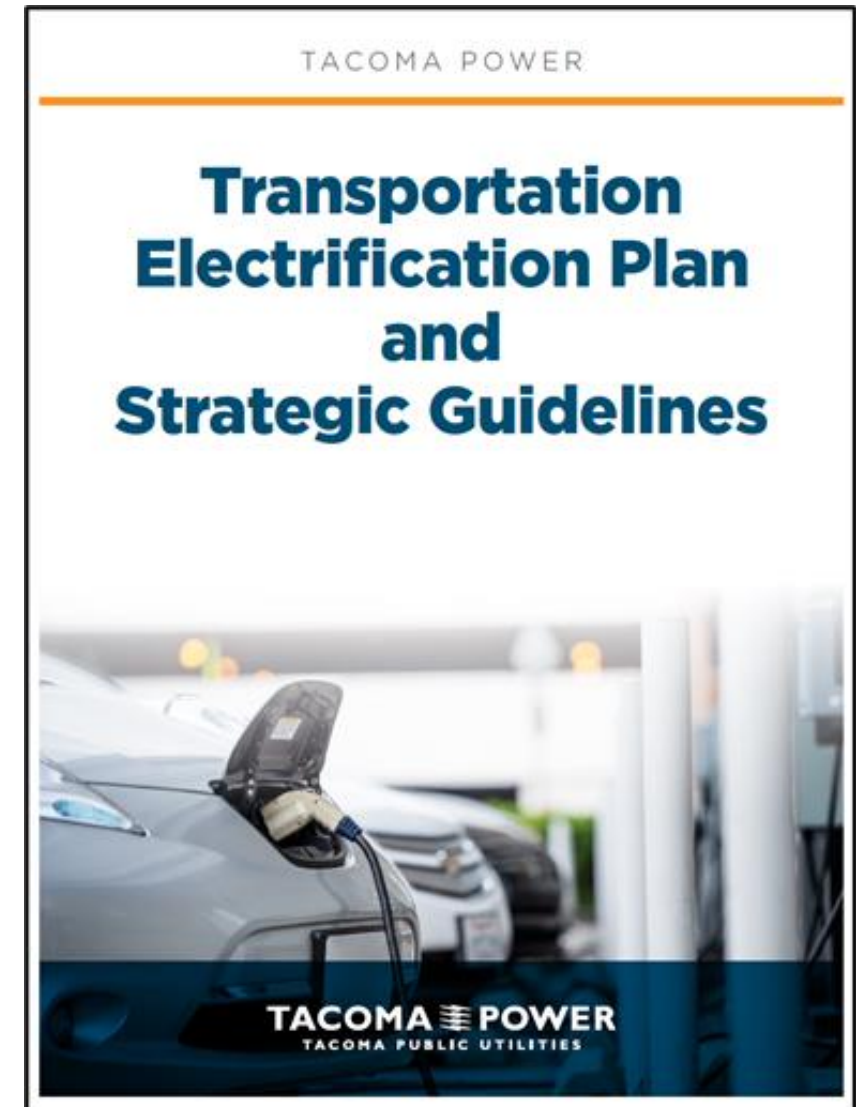
Tacoma Power

- Some of the cleanest and cheapest power in the country
- Decarbonization through electrification
- Economic and environmental benefits for all communities served



Transportation Electrification

- Three quarters of Tacoma's carbon emissions come from transportation
- Strategy of decarbonization through electrification
- Improves environment, benefits utility revenue, promotes environmental justice
- Heavy duty vehicles are a challenge!



Tacoma Power Port projects

Shorepower at Husky Terminal

- Infrastructure scheduled to be energized 2022
- Supported with a special tariff
 - removed “demand charge”
 - effectively \$0.115/kWh energy

Cargo/Material Handling Equipment Charging Pilot

- Cover utility “make ready” costs and up to 50% of customer side charging equipment installation



WA Maritime Blue - Joint Innovation Projects

High Speed Passenger Ferry

Engineering support for shoreside charging equipment, or hydrogen fueling infrastructure

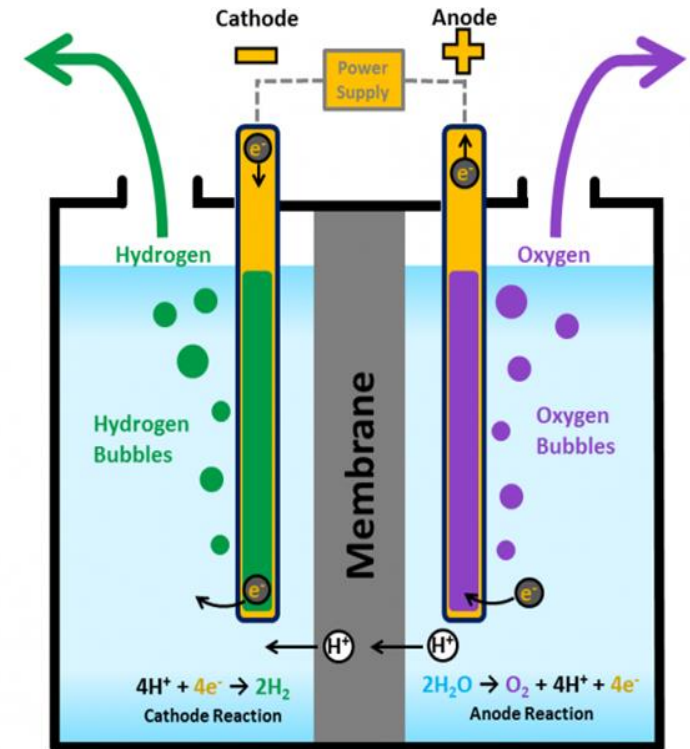
Tacoma Maritime Incubation Center

Supporting innovative start-ups operating at the nexus of maritime and clean energy



Green Hydrogen Benefits

- Green electrolytic hydrogen stores renewable electricity as a fuel and can increase the penetration of renewables.
- Potential fuel source for heavy duty vehicles (long-haul trucking, transit, rail, maritime).
- Stored hydrogen for stationary power generation to replace diesel gensets at schools and hospitals, shore power.
- Can be used to supplement natural gas for heating
- Production and distribution of green electrolytic hydrogen produced from Tacoma Power's clean electricity is in line with our existing business and would compliment retail sales.



Tacoma as a Green Hydrogen Hub

- Supportive Federal and State policy with legislative support for development
- Tacoma is on the I-5 corridor with good access for long-haul truck fueling.
- Tacoma is well-situated with a seaport, rail lines, robust water supply, clean low-cost electricity supply
- Tacoma has a web of support industries and a skilled workforce.
- Many possible local end-uses for renewable hydrogen fuels.



Regional Trains



Heavy-Duty Trucks



Long Range Vehicles



Heat for Buildings & Industry

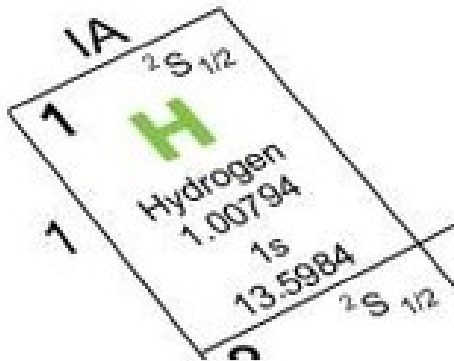


Industry Feedstock

Green Hydrogen support

Renewable Electrofuels Tariff

- Recognizes the flexible nature of electrolytic load
- Reduced demand charge in exchange for interruptibility
- Customers are willing to curtail operations for a minimum of 15% of hours during the year
- Curtailment minimum 1 hour up to 3 days
- Utility can count on contract for resource adequacy
- Existing customers benefit from increased revenues, jobs

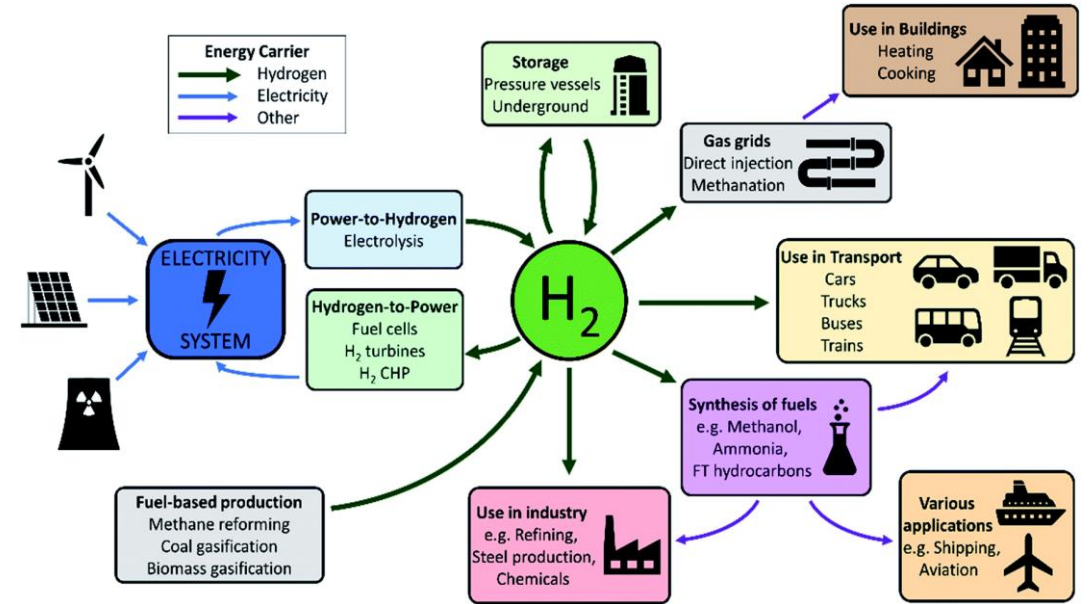


Tacoma Power Demonstration Projects

- Dept of Commerce Clean Energy Fund grant for \$1.5M awarded for an electrofuel demonstration project at Central Treatment Plant
- Stable, non-flammable, energy dense electrofuel will be produced using Tacoma Power's clean electricity, recycled CO₂ source from biodigesters, and water
- The project partners will also construct a mobile, trailer-mounted power generation unit that uses the electrofuel to provide 20kW of power to refrigerated containers at the Port of Tacoma – displacing pollution emitting diesel generators
- Tacoma Power and partners (Toyota, Sacre Davey, OCO Chem, PNNL) are seeking an additional \$14M in federal funds from an Economic Development Administration (EDA) grant to expand the project.
- An expanded project is designed to produce 2.5 t/day of fuel will support the construction of a flatbed mounted power supply unit of 1.2 MW, sufficient to provide mobile shore power at Ports.

Green Hydrogen Research Studies

- Mobile Cold Ironing System
- Fleet Electrification (FCEV)
- Ketron Island Microgrid
- Alt Fuel Tech Rail (AFTeR)
- High Speed Passenger Ferry



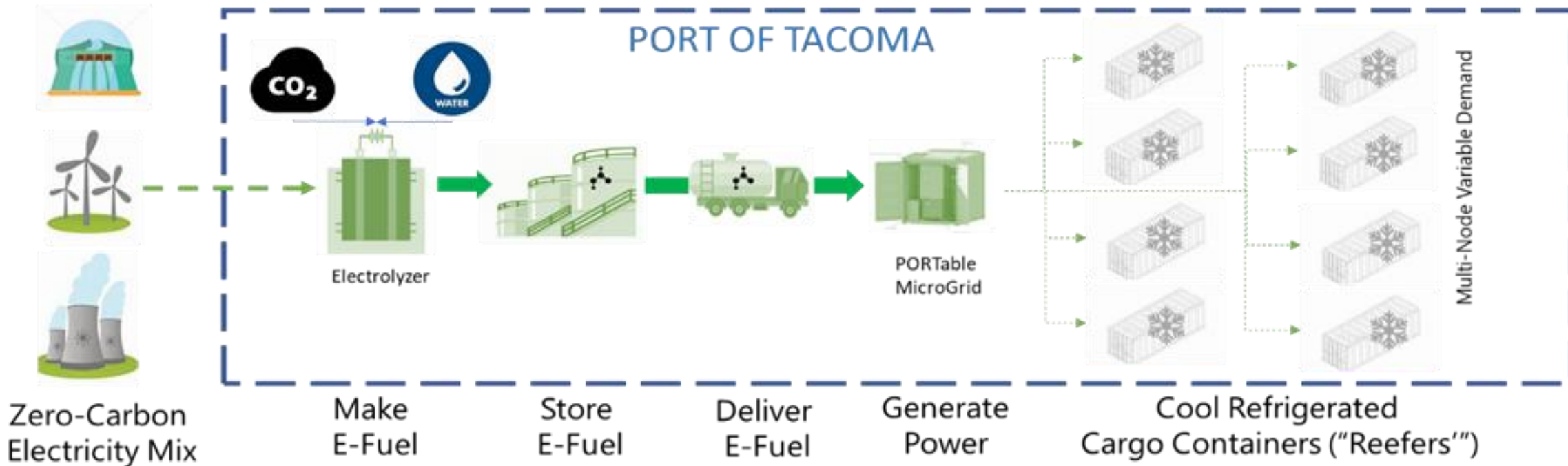
Clean Energy Fund 4 Proposal

Mobile Maritime Shore Power Unit and LHC Production Facility



E-Fuel Microgrid

- Carbon-neutral
- Pollution-free
- Noise-free
- Non-flammable
- Scalable
- Flexible
- Low-cost



Mobile Shore Power Unit

Process Flow Diagram

Mobile Shore Power and eFuel Production Overview

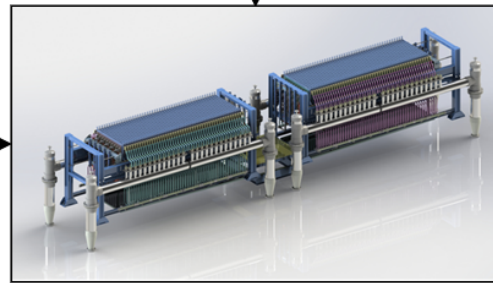


Inputs

570-630 kW
15 MWh/d

H_2O
1500 kg/d

CO_2
2600 kg/d



eFuel Electrolyzer Stack
(2 modules, 32 cell/module)
Production Rate: 3,000 L/d



Carbon Flux Electrolyzer™

Outputs

O_2
Oxygen
900 kg/d

H_2CO_2
Formic eFuel
2500 kg/d

Balance of Plant

eFuel Storage
(125,000L, 4.5m tall, 6m dm)
4 Re-Fuels

Plant Boundary Line

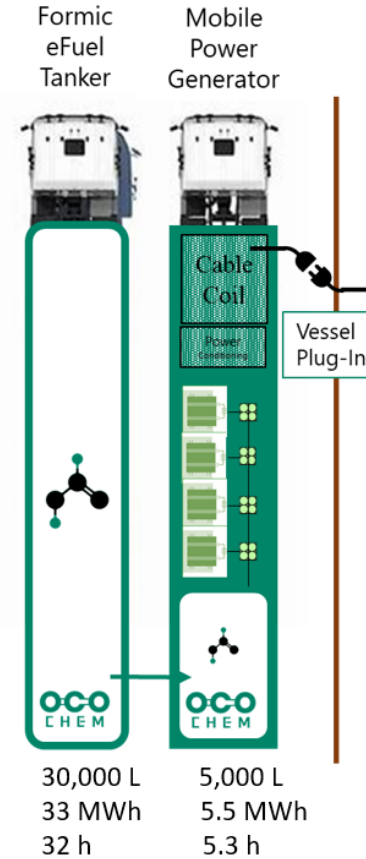
System Techno-Economic Attributes:

- E-Fuel Production Plant Produces Enough Fuel/Mo. (27 days) to Deliver a maximum of 1MW of Power (or 3000 kg of Hydrogen) for 72hrs.
- Energy In/Out Roundtrip efficiency: 20%
- Max LCFS+BBB Credit: \$5 + \$3/kg_H2 -> \$24,000
- Input Energy Cost: 400MWh @\$40/MWh = \$16,000



12 Re-Fuel Trips/Year
at Maximum Usage
Rate (1MW, 72hr.)

Formic E-Fuel Production



30,000 L
33 MWh
32 h

5,000 L
5.5 MWh
5.3 h

Mobile Power Generator

Fuel Cell Type and Power	4 x 250kW PEM (60% Efficiency)
FA Purity	85-99%
FA Energy Density	1.8 kWh/L
Delivered Electricity	1.1 kWh/L
Max Power	1.2 MW
H2 Delivery (Max)	42 kg/hr.
1 Trip Energy Capacity	38.5 MWh

Fuel Storage
Energy Storage
Min. Energy Duration (1MW)

Mobile Shore Power Generation

Thank You!

