

DOCKETED	
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Project Title:	Hydrogen
TN #:	265058
Document Title:	Presentation - GET AHEAD OF THE GRID
Description:	***This replaces TN 265041 due graphic and fonts overlap***5E. Craig Klaasmeyer, Kaizen Clean Energy
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Organization:	Kaizen Energy
Submitter Role:	Public
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GET AHEAD OF THE GRID.

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CO-FOUNDER

July 2025



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Clean mobile power where & when you need it

200 kW off-grid generation scalable to MWs



- Drop & Play
- No NOx
- Low Cost
- Autonomous

Hydrogen-based Distributed Generation



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Clean Diesel Genset Replacement



Bridge power to grid upgrades



Construction & Agriculture



Events & Studios



Microgrids



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Kaizen's differentiated approach

Liquid fuel

- Methanol as a hydrogen carrier
- Liquid at ambient conditions

Onsite H₂ production

- Produce hydrogen onsite & on demand

Low temp PEM fuel cell

- No NO_x emissions

Containerized

- No permanent infrastructure



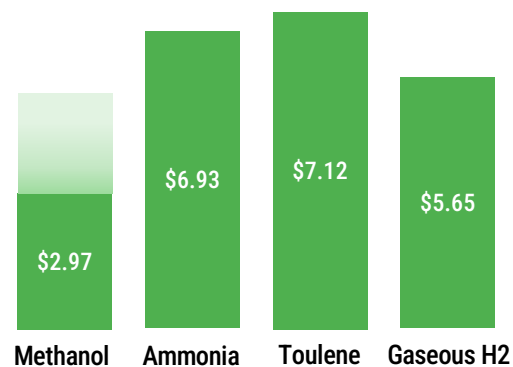
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Methanol is the best hydrogen carrier

Lowest cost

- Densest carrier
- Liquid at ambient
 - Cheaper to transport & store
- No liquefaction costs or boil off

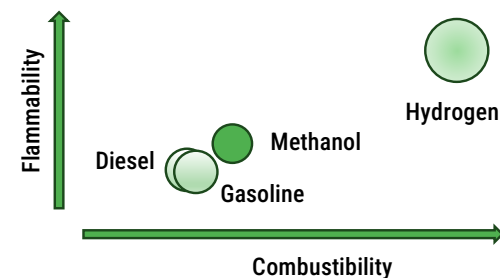
Hydrogen Carrier Costs (\$/kg)



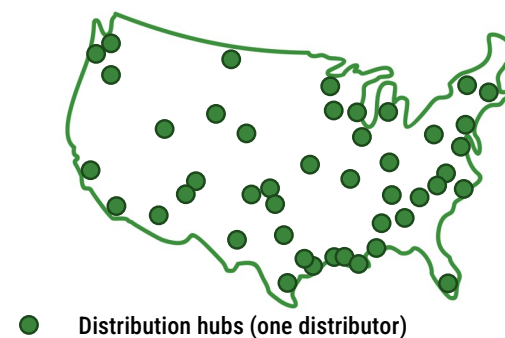
■ Avoided cost by reforming on site

Source: US Department of Energy

Safe



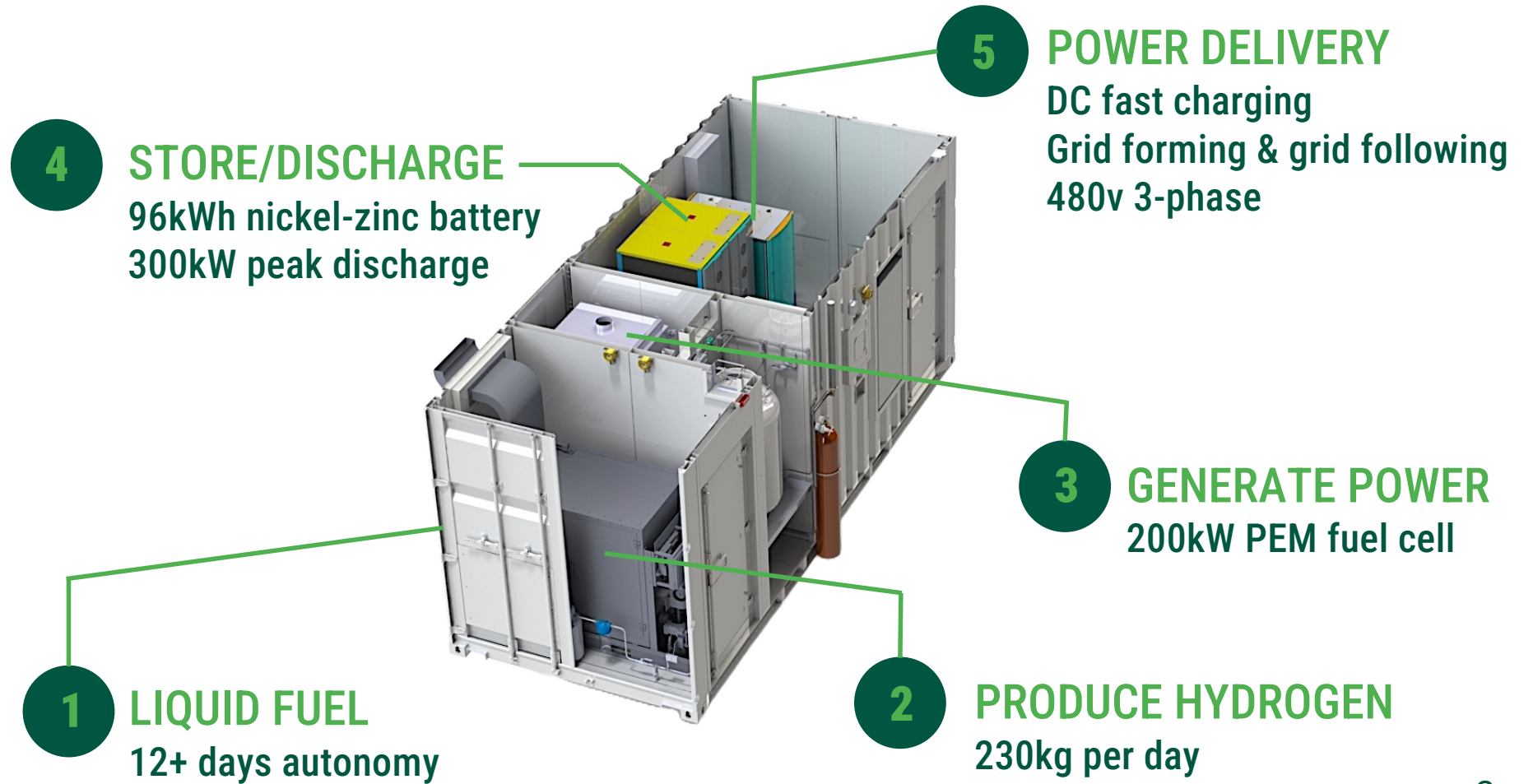
Readily available





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How It Works



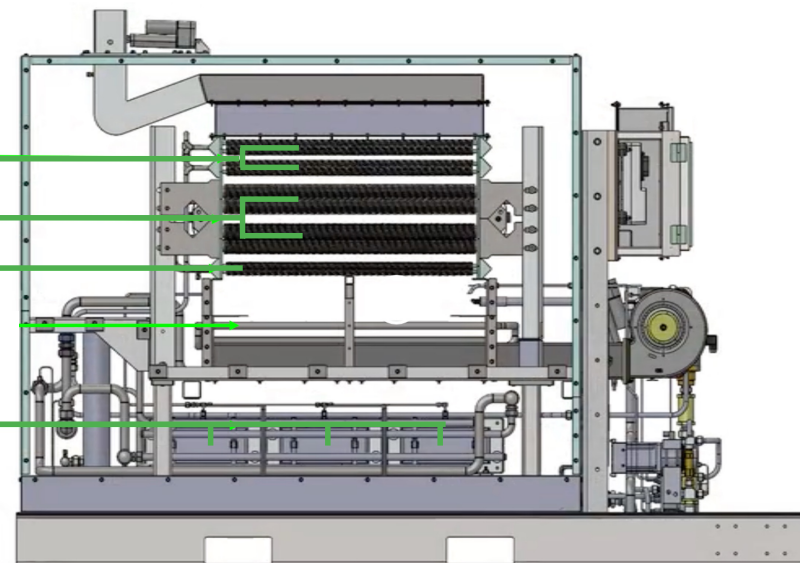


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Onsite & on-demand H₂ production

INPUT: METHANOL + WATER ⇒

- 1 VAPORIZERS**
700C at burner tip
No NO_x formation
- 2 REACTOR CORE**
380C temp
Hydrogen produced
- 3 PURIFIER MODULES**
Palladium membranes



⇒ OUTPUT: ISO-GRADE HYDROGEN

20-year commercial operations

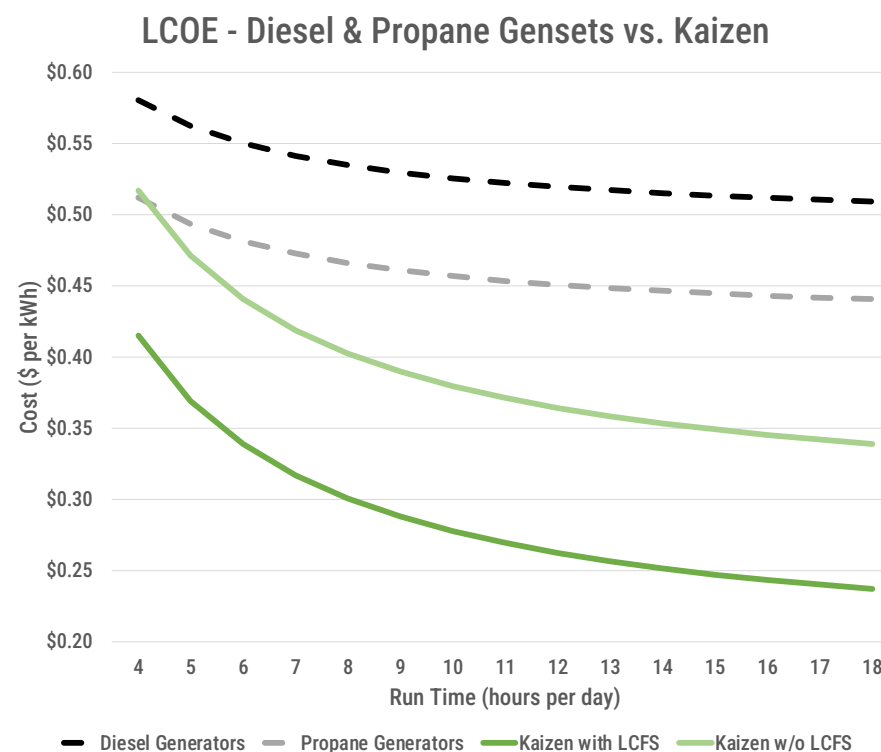


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Low levelized cost of electricity

Lower LCOE than Diesel & Propane w/o Subsidies

	Diesel Generator	Propane Generator	Kaizen with LCFS	Kaizen w/o LCFS
Asset Description				
Nameplate Capacity (kW)	200	200	200	200
Operating Rate (% Capacity)	75%	75%	75%	75%
Efficiency	30%	25%	50%	50%
Fuel Assumptions				
Diesel/Propane Cost (\$/gal)	\$ 5.00	\$ 2.50	-	-
Methanol Cost (\$/kg)	-	-	\$ 0.50	\$ 0.50
Grants/ITCs/LCFS				
LCFS Credits (\$/kWh)	\$ -		\$ 0.10	\$ -
Investment Tax Credits (%)	\$ -		50%	50%
Grants (\$000)	\$ -		\$ -	\$ -
LCOE (\$/kWh)				
Fuel	\$ 0.44	\$ 0.37	\$ 0.14	\$ 0.24
Return of Capital	0.02	0.02	0.06	0.06
Maintenance	0.05	0.05	0.05	0.05
Total	\$ 0.51	\$ 0.44	\$ 0.24	\$ 0.35





No NO_x Emissions



NO_x

Operating temperature below NO_x formation



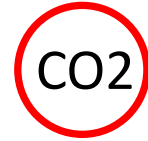
PM

No C-C bonds



SO_x

No sulfur



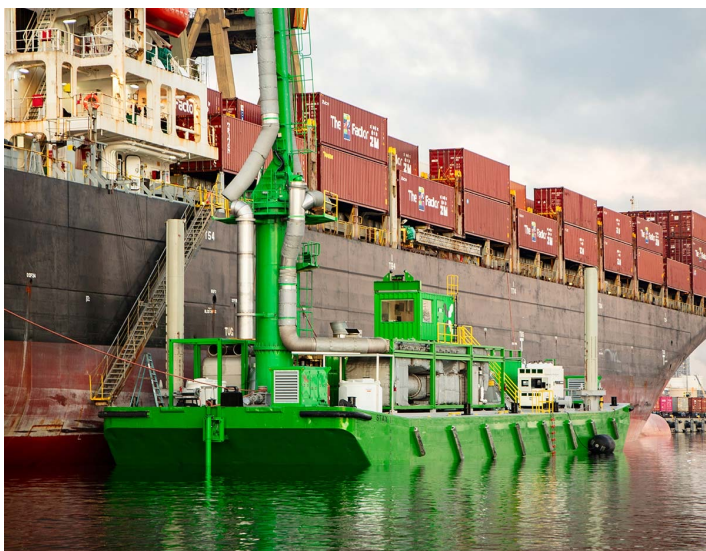
CO₂

35-100% lower CO₂



First California deployment

200kW diesel genset replacement



- Replace diesel genset on marine vessel
 - Environmental remediation vessel
 - Capture and treat diesel emissions
- Port of Long Beach
- Commissioning Q3 2025
- Partially funded by grants from South Coast AQMD, MARAD



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Flexible, low cost H2 fueling

Small footprint

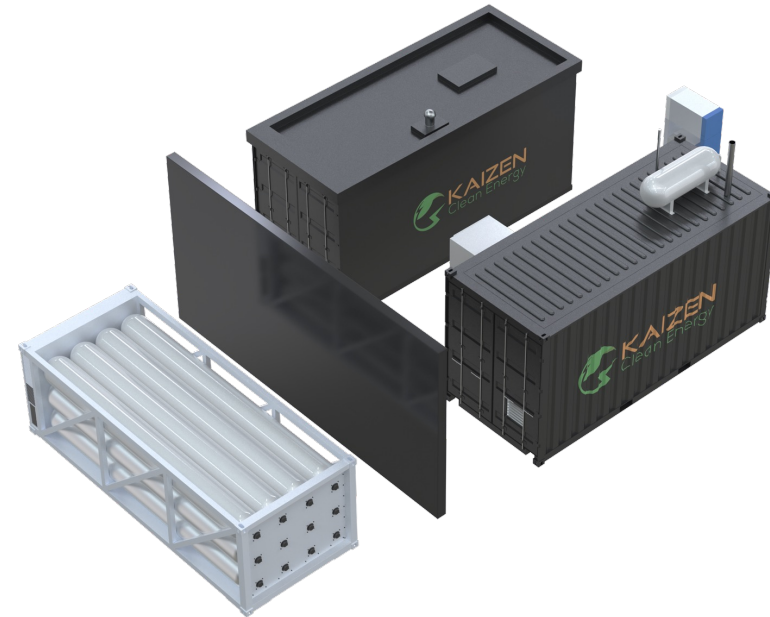
- 2 x 20' containers
- Cascade storage
- Methanol tank

Scales to meet fleet needs

- 230-1000kg/day

Fuel security

- 3,000kg H2 stored onsite in 20' tank
- No boil off





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Kaizen is the lowest delivered cost of H2.

Hydrogen fueling at half the opex of liquid H2



Feedstock⁽¹⁾

\$3 -\$5

Power

1.5

Maintenance

1

\$6 - \$7 per kg

Liquid H2

LH2 (delivered)

~~\$9 -\$11~~

Boil-off

1.5

Power

1

Maintenance

1

\$12 - \$14 per kg

1. USGC methanol pricing of \$350 to \$600 per ton.



Clean mobile power where & when you need it

- **Drop & Play**
 - Quick & easy redeployment
- **Low Cost**
 - 50% per kWh cost of diesel gensets
- **Clean**
 - No NOx or PM
- **Secure**
 - 12 + days fuel autonomy

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