

HAWAII GAS

Hawai'i

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THE GAS COMPANY

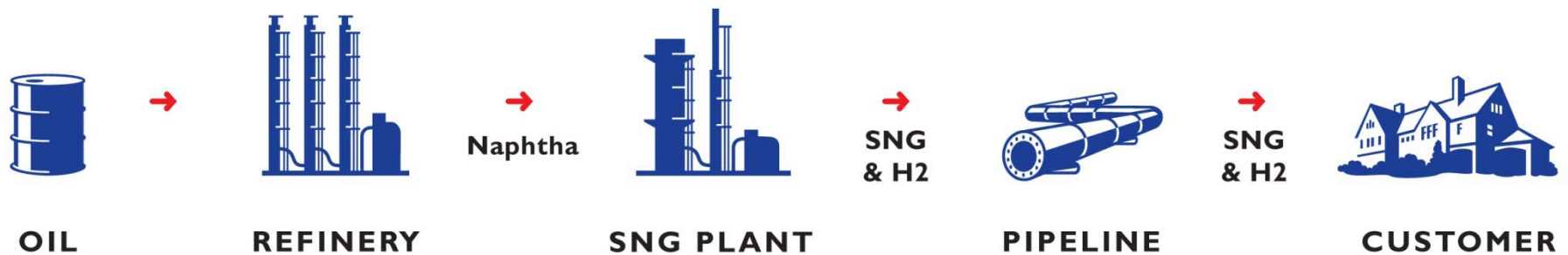
HAWAII GAS

Hawaii — New Energy State

- Hawaii is an island-state surrounded by ocean with no access to any landside energy grid
- Overall, the state is 90% dependent on imported oil for electric and thermal energy to power the economy
- Gas has been manufactured since 1904
- Size, location, and cost structure make Hawaii an ideal place to test new energy technology



The Gas Company Today Delivers H₂ & Methane throughout Honolulu



The Gas Company manufactures synthetic natural gas (SNG) from naphtha, a byproduct of the oil refining process

Hawaii's Energy Goals

- **Hawaii Clean Energy Initiative** goal:
 - reduce fossil fuel consumption by 70% by 2030 via
 - 30% energy efficiency measures and
 - 40% renewable energy generation
- State law (**Act 234**) requires Hawaii businesses to reduce greenhouse gas emissions to below 1990 levels by 2020
- How will this be possible? **Hydrogen.**



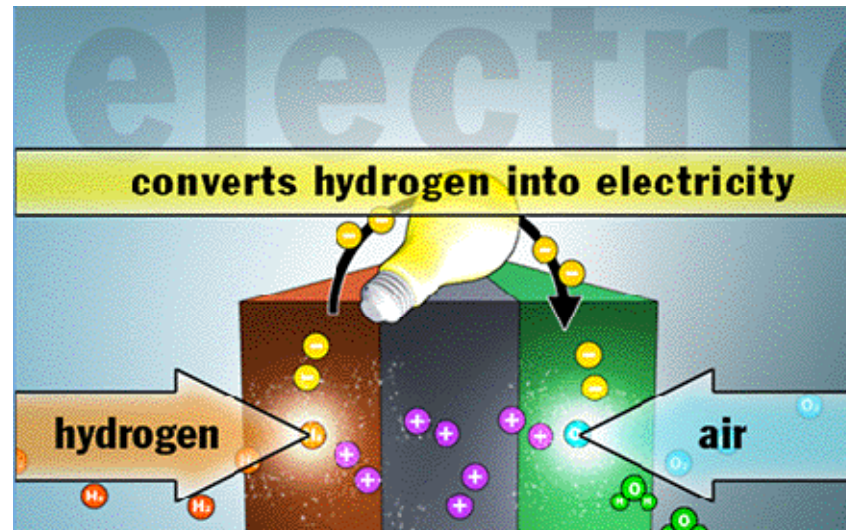
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SNG/Hydrogen Plant

- Produced hydrogen since 1974
- Delivering up to 12 % H₂ in our utility gas (SNG) stream
- Production capability is about 7,000 kg/day
- Can increase by about 40% without significant plant modification



The Hydrogen Fuel Cell works at the molecular level

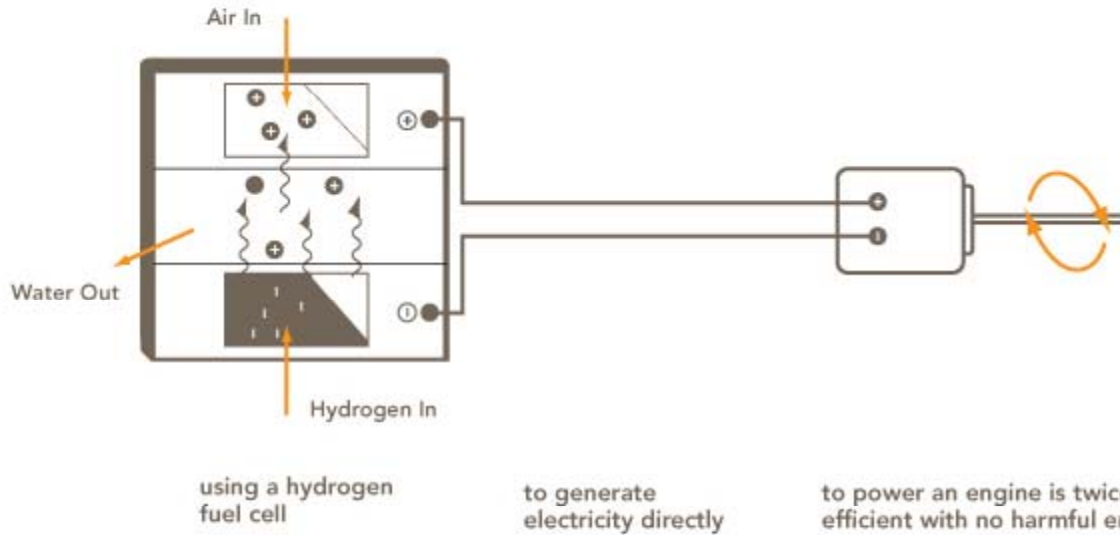
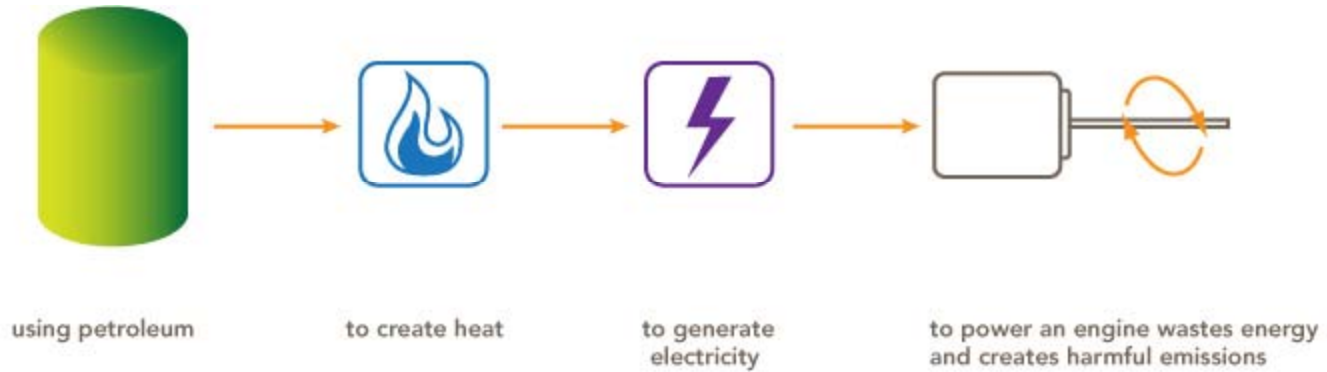


The Message – Needs to be clear – tell the public in simple terms



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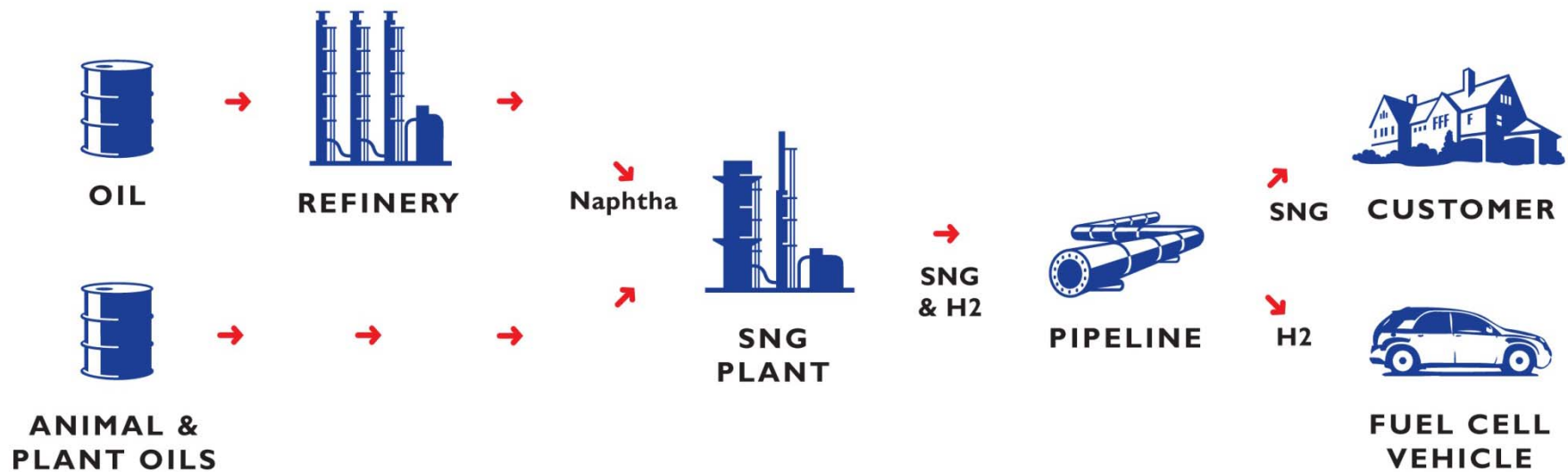
More Energy to the Wheel



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The Gas Company Tomorrow
20+% H₂ & 80% Methane



Adapting existing infrastructure to use sustainable feedstock and produce 21st century fuels

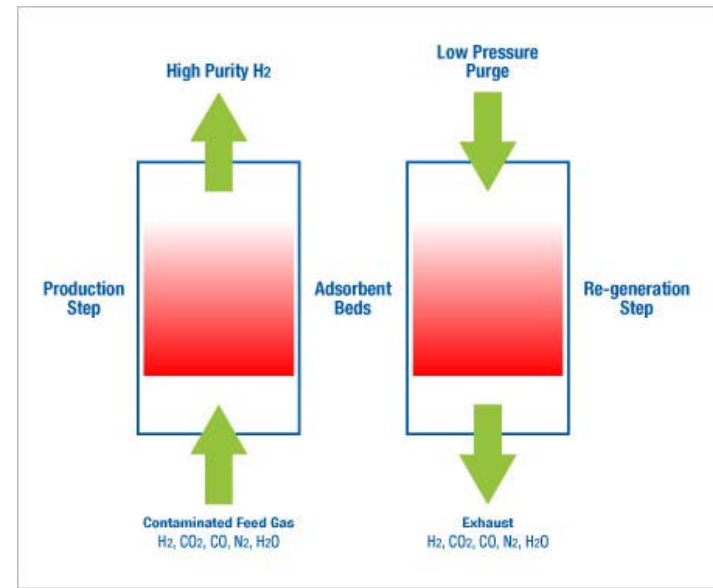
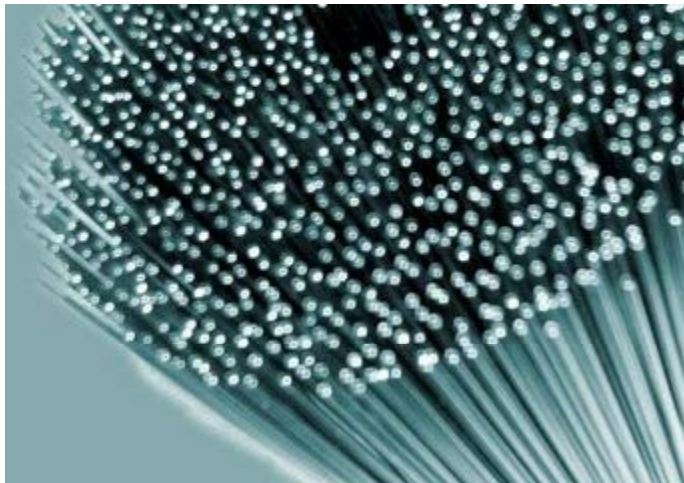


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Pressure Swing Adsorption

Hydrogen separation technology at the dispenser



Power + Energy Micro-channel Palladium Diffusion

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*Already on the Road and Ready
for Tomorrow*

7,000 kg/day supports up to 15,000 vehicles on Oahu

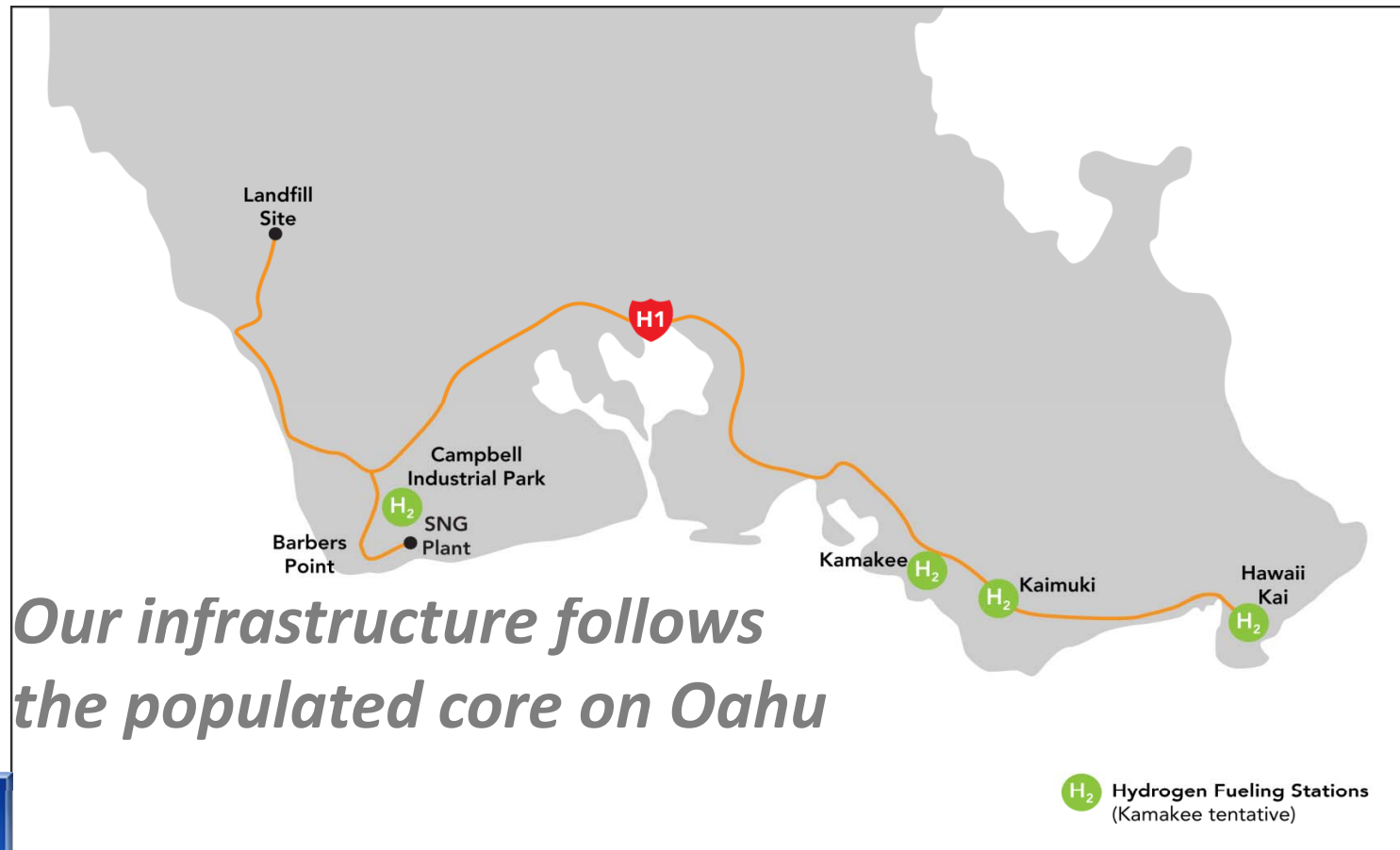


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Our Infrastructure and the Hydrogen Highway

Ideal for hydrogen vehicle fueling & support

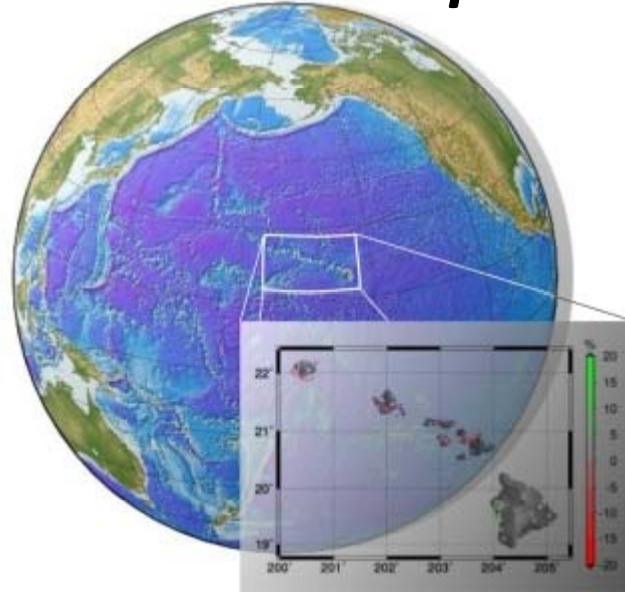


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Why Hydrogen Hawaii?

Hawaii – farther from any Continent than any other Island Group



- Controlled environment
- Receptive public – recognizes need for diversified energy
- Collaboration with GM accelerates deployment in Hawaii



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Hawaii – The Canary in the coal mine



- \$7 Billion/Year oil bill paid by 1.3 million citizens
- Bypassed opportunities to invest in the past
- US must invest now – the future is not paradise



HAWAII GAS

- Highest utility prices
- Highest gasoline cost
- Needs to diversify fuel sources recognized and institutionalized
- Fuel conservation – a major component of public policy

Pricing



Today - H₂ - Delivered to the retail dispenser is competitive with gasoline on a \$/mile basis



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HAWAII GAS

- We are regulated by the State
- Already in production at about 50% of Gasoline Equivalent
- After separation and dispenser cost H₂ Hawaii competes with Gasoline and Diesel

Price Assurance



Future efficiency gains, economies of scale, and renewable/recoverable sources of feedstock likely to keep prices competitive



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HAWAII GAS

- Working with fuel cells in Hawaii since 1978
- Currently supporting Fuel Cell Energy project at the Pacific Missile Range - Kauai with fuel

Our Experience



Fuel cell vehicles – a platform for development of a diversified energy infrastructure for Hawaii and our energy future



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HAWAII GAS

Integrated Energy Solutions

A 21st century approach to energy management



- Grid stability
- Renewable energy storage
- Transportation fuel efficiency



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*Working Together
for Hawaii's Energy Future*



Hawaii - a self-sustaining hydrogen market

The Gas Company - ready with hydrogen - delivery infrastructure -
bridge to renewable energy

GM Collaboration – vehicles – technology – investment – public
awareness - credibility



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