Distributed Hydrogen with SureSource Hydrogen Trigeneration Systems

October 2018

FuelCell at a Glance

Delivering Clean Innovative Solutions for the Global Supply, Recovery and Storage of Energy

Snapshot

Design & Manufacture	Turnkey Project Development	Plant Operation

- Danbury, CT - Corporate, R&D
- Torrington, CT – Manufacturing, Service
- Taufkirchen, Germany – Manufacturing
- Pohang, South Korea – Manufacturing Partner

Company Overview

- FuelCell Energy designs, manufactures, undertakes project development, installs, operates and maintains megawatt-scale fuel cell systems
- Serving utilities, industrial and large municipal power users with solutions that include:
  - Both utility-scale and on-site power generation
  - Carbon capture
  - Local hydrogen production for transportation and industry
  - Long duration energy storage

Global Customers

Pfizer, LIPA Long Island Power Authority, ExxonMobil, UCI Medical Center University of California, Irvine, cenovus energy, TOYOTA, NRG YIELD, KOSEP Korea South-East Power Co., Dominion, AVANGRID, Southern California Edison An Edison International Company, Pacific Gas and Electric Company, Federal Ministry of Education and Research, Radisson, e·on, Pepperidge Farm, posco ENERGY, KOSPO Korea Southern Power Co., Ltd., CANARY WHARF GROUP PLC, Hartford Hospital, FRIATEC an Aliaxis company, KHNP

SureSource Solutions

Individual fuel cell
&
350 kW fuel cell stack

Four-Stack Module
1.4 megawatts

Completed module
1.4 megawatts

1.4 MW
SureSource1500™
47% Electrical Eff,
up to 90% Total Eff.

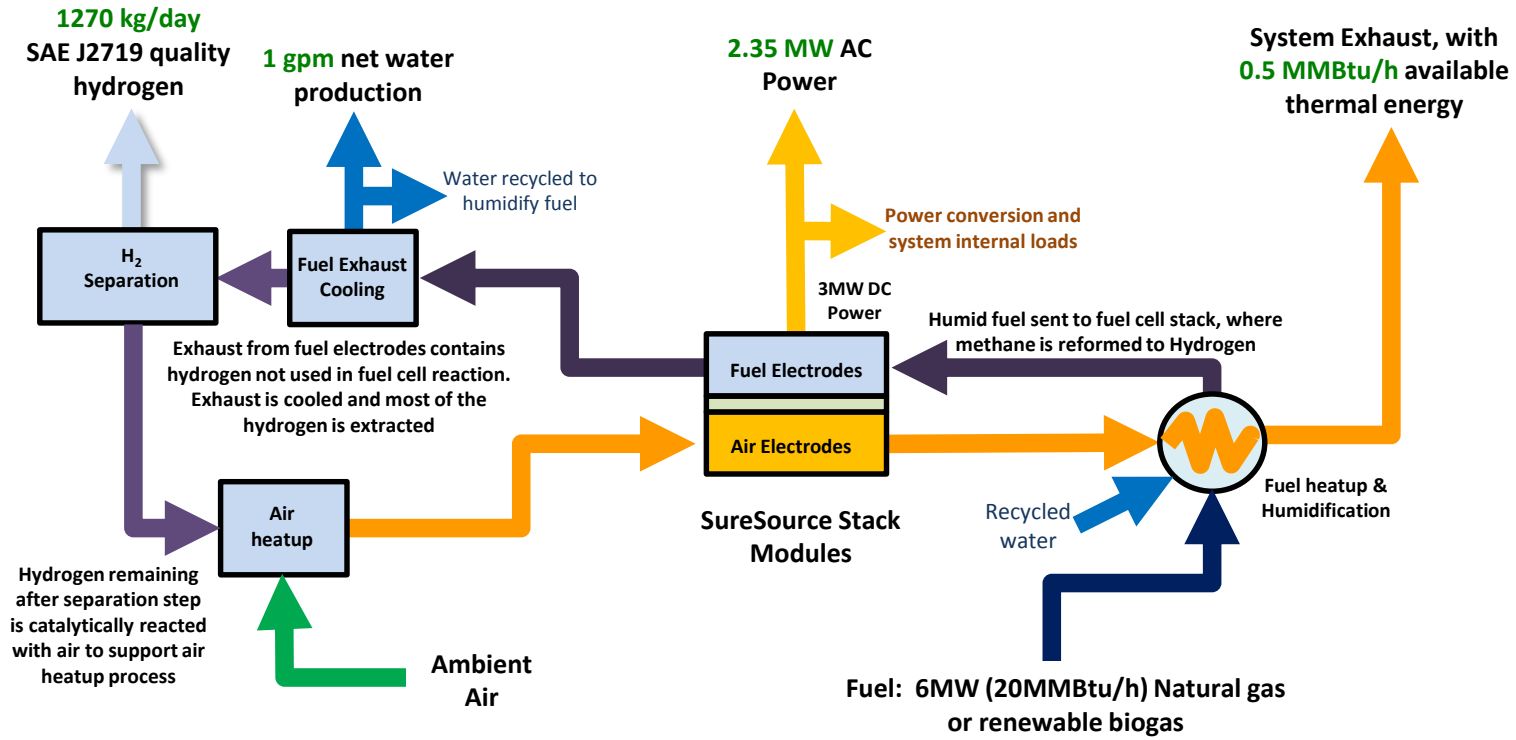
2.8 MW
SureSource3000™
47% Electrical Eff,
up to 90% Total Eff.

2.35 MW
SureSource
Hydrogen™
2.35 MW Power plus
1270 kg/day Hydrogen

3.7 MW
SureSource4000™
60% Electrical Eff.
Up to 80% total Eff

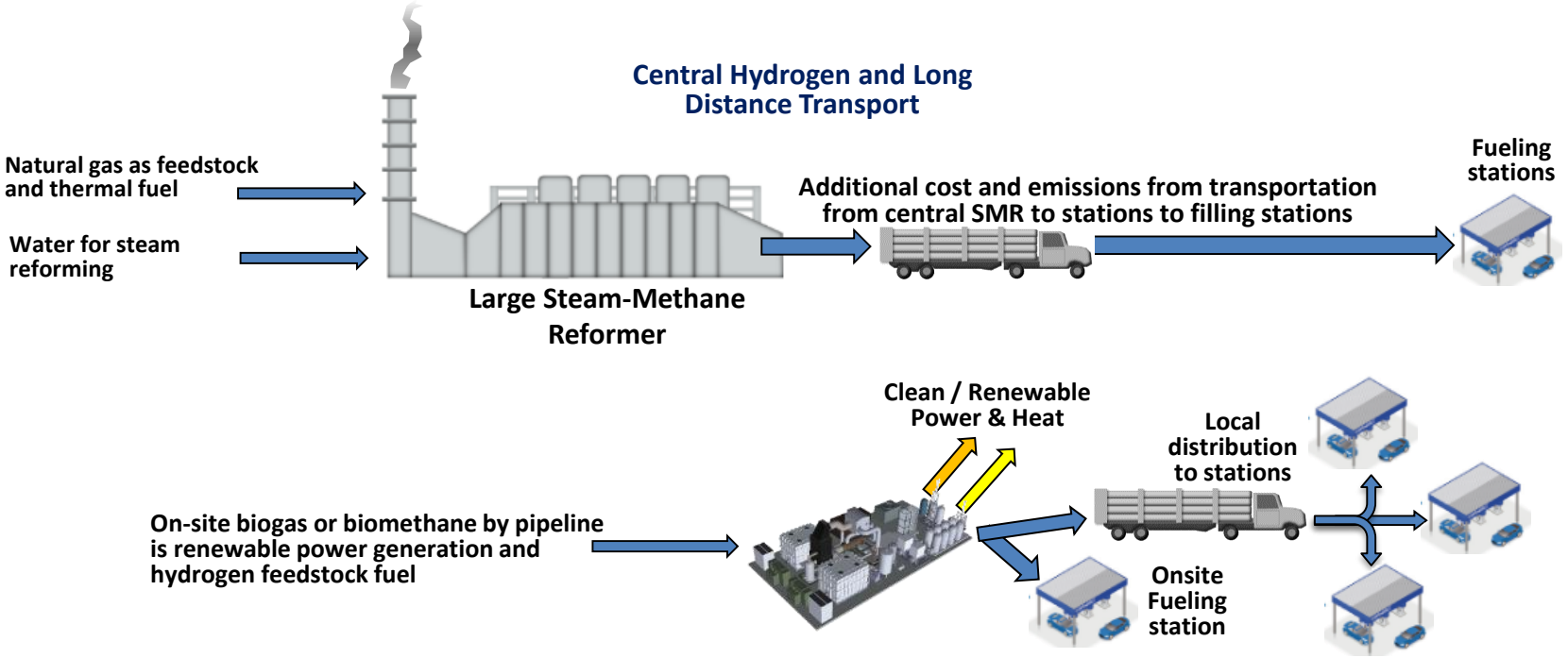
Larger Scale Fuel Cell Parks

SureSource Hydrogen Process (Trigeneration)



Hydrogen is produced from methane in the SureSource fuel cell stack modules, using fuel cell product water and waste heat to support reforming

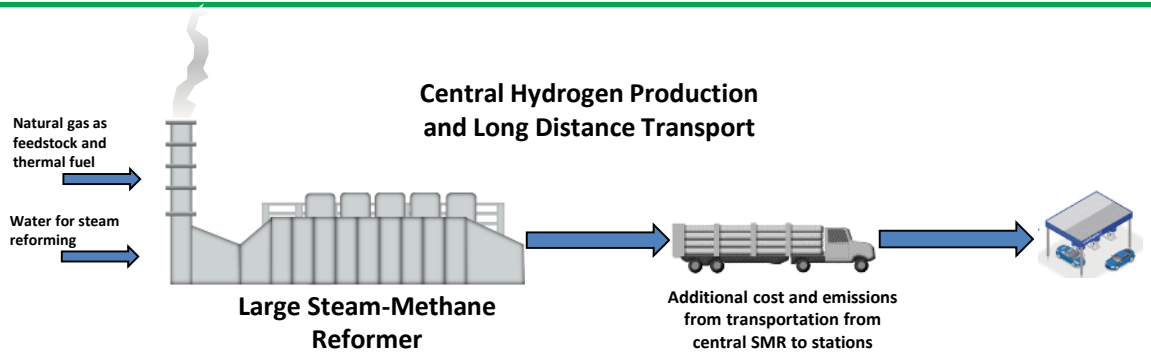
Distributed Hydrogen Advantage

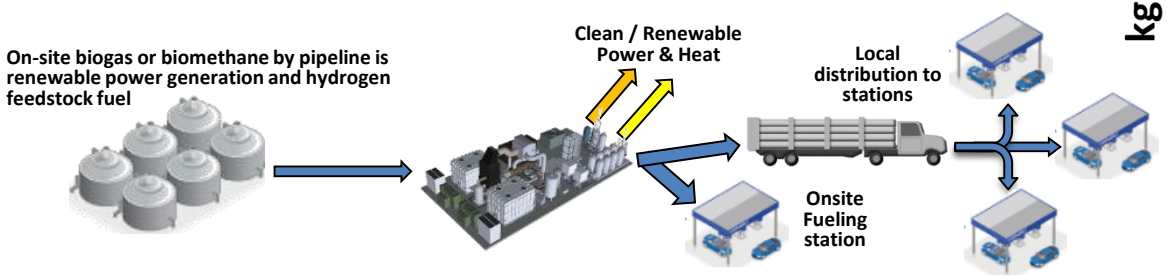


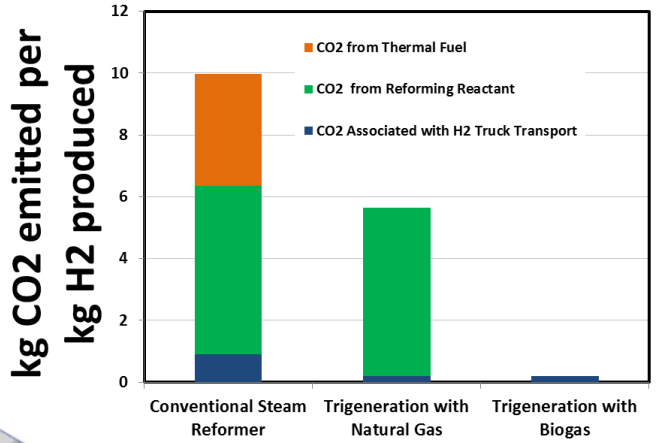
On-Site and/or Local Distributed (<40 miles) Hydrogen using Trigeneration Fuel Cells

Efficient co-production of hydrogen with clean power and heat close to users

Distributed Hydrogen Low Carbon Footprint



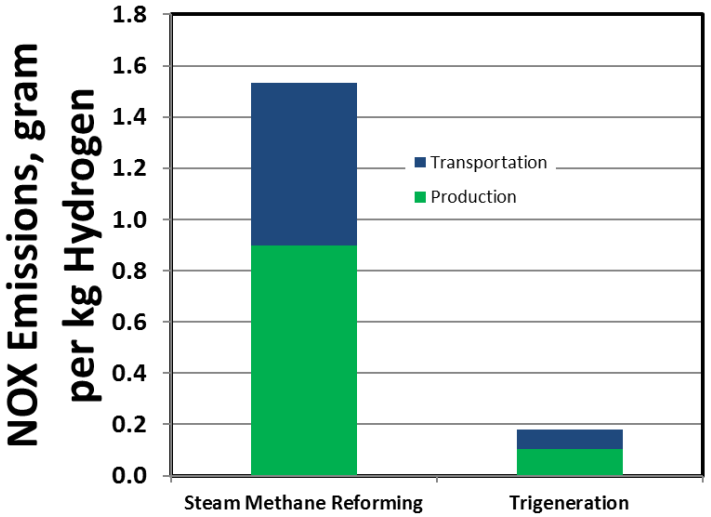


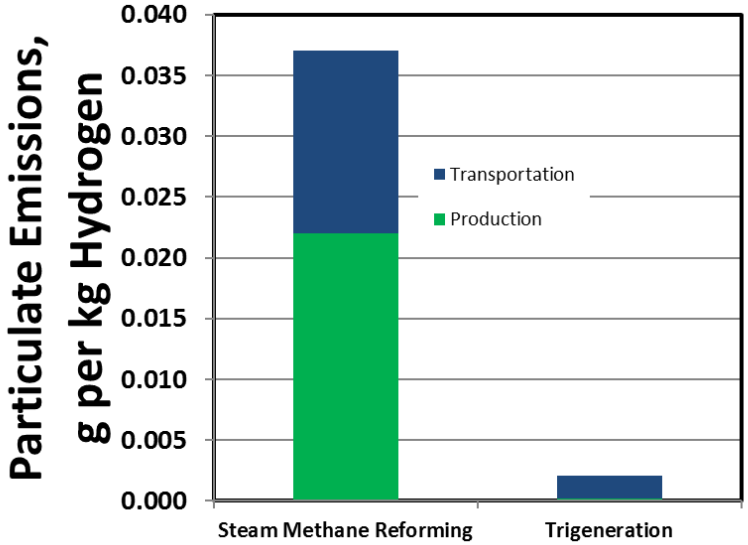


Comparison of CO_2 Emissions for Central SMR and Distributed Hydrogen

Distributed Hydrogen Trigeneration systems produce hydrogen with fuel cell waste heat, avoids methane combustion and avoid cost & emissions of long distance truck transport

Criteria Pollutants Emissions Reductions





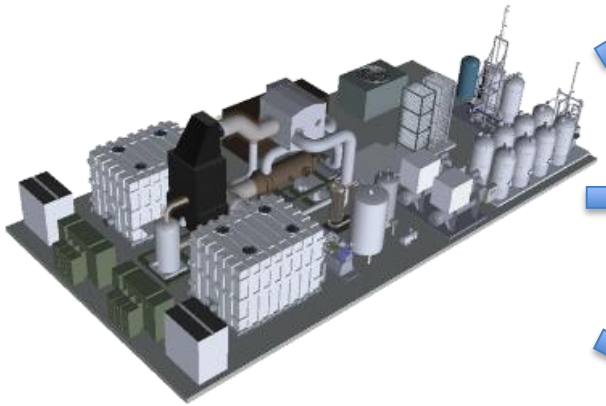
SureSource 1500 and 3000 power plants have achieved CARB DG Certification on Anaerobic Digester Gas under the California Distributed Generation Program 2013 Waste Gas Standards

Distributed Hydrogen Overview

Transportation Energy Center

Renewable Feedstock:
On-site Biogas: 912 MCFD
Biomethane by pipeline: 540 MCFD
(4263 GGE/day)

Backup fuel: natural gas



SureSource Hydrogen System

2.3 MW Clean and green power – 18 GWh/year

- 8,500 tons per year avoided grid CO_2 emissions with biogas fuel in California
- 1800 tons per year avoided grid CO_2 emissions with natural gas fuel in California
- 2 tons per year avoided NOX

1270 kg/day hydrogen

- 6200 tons per year CO_2 reduction from vehicles
- 8.9 tons per year NOX reduction from vehicles

0.5 MMBtu/h thermal energy

- 290 tons per year avoided boiler CO_2 emissions
- 0.1 tons per year avoided NOX

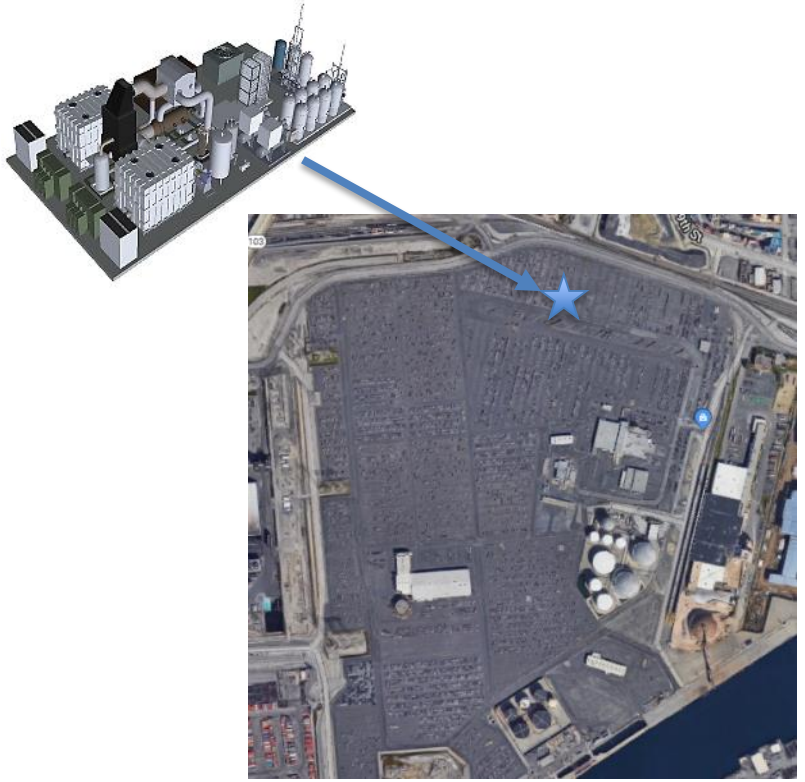
Co-production of power with hydrogen improves economics to produce the most affordable hydrogen and generate state LCFS credits & potentially federal RINS

Port of Long Beach Project

Toyota to Build the World's First Megawatt-scale 100% Renewable Power and Hydrogen Generation Station

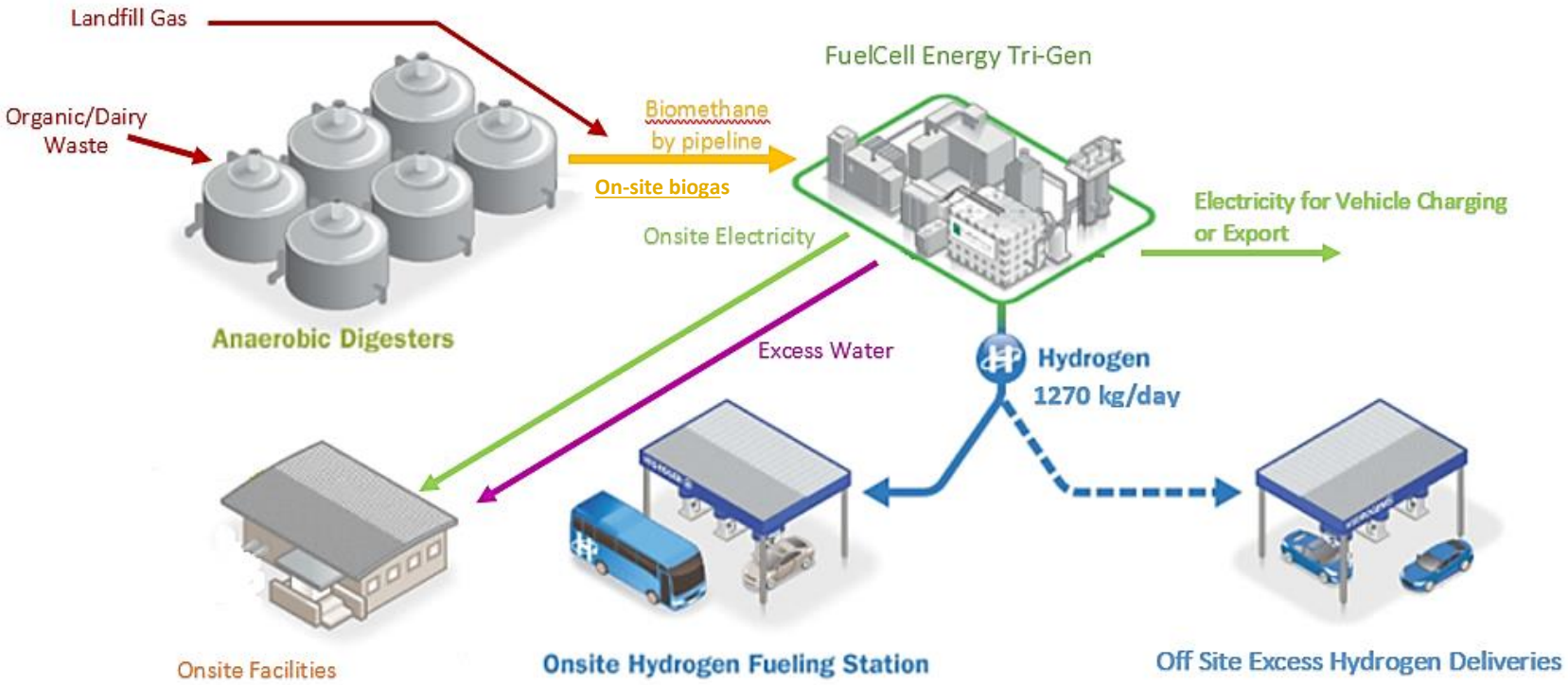
Tri-Gen will generate on-site hydrogen to supply Toyota Fuel Cell Vehicles, including Project Portal Heavy-Duty Truck Concept

Toyota Logistics Services at the Long Beach Port will become first Toyota facility in North America to use 100% Renewable Power



Supporting the Advancement of California's ZEV Fueling Infrastructure

Transportation Energy Center



Thank you

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