Fuel Cells In Unreliable Grid Applications

Green Power for Mobile, November 2010

www.idatech.com
info@idatech.com
63065 NE 18th Street
Bend, OR 97701
541.383.3390

IdaTech
Power For The Long Run

About IdaTech

IdaTech designs and manufactures extended run backup power fuel cell systems for telecommunications applications.

Fuel cells are an alternative backup power solution to diesel generators and large battery banks.

IdaTech
Power For The Long Run

Telecom Backup Power Solutions

Fuel cells are:

- Reliable
- Low Maintenance
- Clean

Batteries can be:

- Expensive to maintain
- Unreliable after aging
- Temperature sensitive

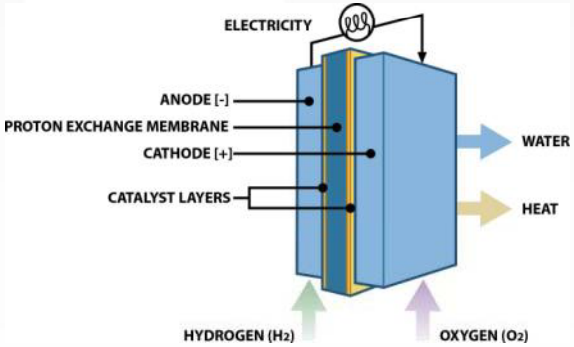
Generators can be:

- Unreliable
- Maintenance intensive
- Noisy

IdaTech
Power For The Long Run

What Is A Fuel Cell?

A fuel cell is a solid state DC generator that converts chemical energy into electricity. Fuel cells are typically fueled by Hydrogen.



Fuel cell system
with fuel processor:

Fuel: Methanol-water

Fuel cell system:

Fuel: Hydrogen

What is a fuel processor?

A fuel processor converts readily available fuel (like methanol-water) into hydrogen as needed, by the fuel cell stack.

IdaTech
Power For The Long Run

Typical H2 Fuel Cell System

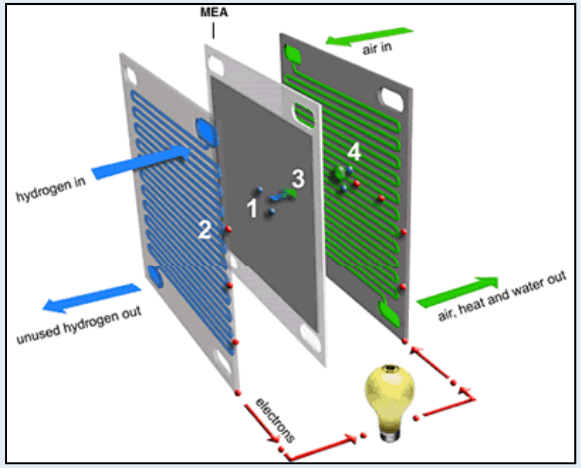
Clean Exhaust and Waste Heat

DC/DC Convertor

Regulated DC

Hydrogen

Air



Fuel Cell Stack (PEM)

IdaTech
Power For The Long Run

Typical Reformer Based Fuel Cell System

Clean Exhaust and Waste Heat

Hydroplus

Fuel Reformer

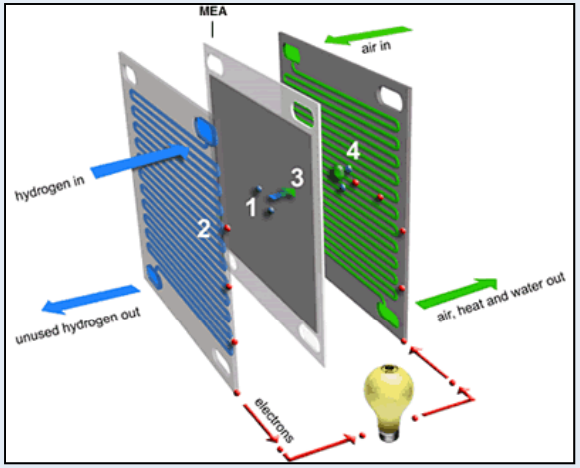
H_2

Purifier

H_2

DC/DC Converter

Regulated DC



Fuel Cell Stack (PEM)

Air

IdaTech
Power For The Long Run

Reformers Overcome the H_2 Barrier

50 hours of autonomy

OR

Comparisons	Reformer based fuel cell system	Bottled hydrogen based fuel cell system
First cost	Up to 50% lower than bottled hydrogen, depending upon runtime.	Competitive at 10 hours runtime or less.
Operating cost	Essentially flat, based on fuel use.	Cylinder rental, frequent, high cost refueling beyond low power and low outage applications.
Logistics	Liquid: 225 Liters = 50 hours, easily stored, transported and refilled. Available globally.	Bulky, 30 cylinders at 64 kg each required for 50 hours. Specialty chemical with limited availability.
Footprint	About 6 square meters.	About 86 square meters.
Permitting	None required for less than 225 Liters.	Extensive codes and setback requirements. Regulations vary by locality.

IdaTech Power For The Long Run

Images are approximately to scale

Product Evolution Roadmap

2005 → 2006 → 2007 → 2008 → 2009 → 2010 → 2011 → 2012

ElectraGen™

ElectraGen™ XTR

ElectraGen™ XTi

ElectraGen™ H2-I

ElectraGen™ ME

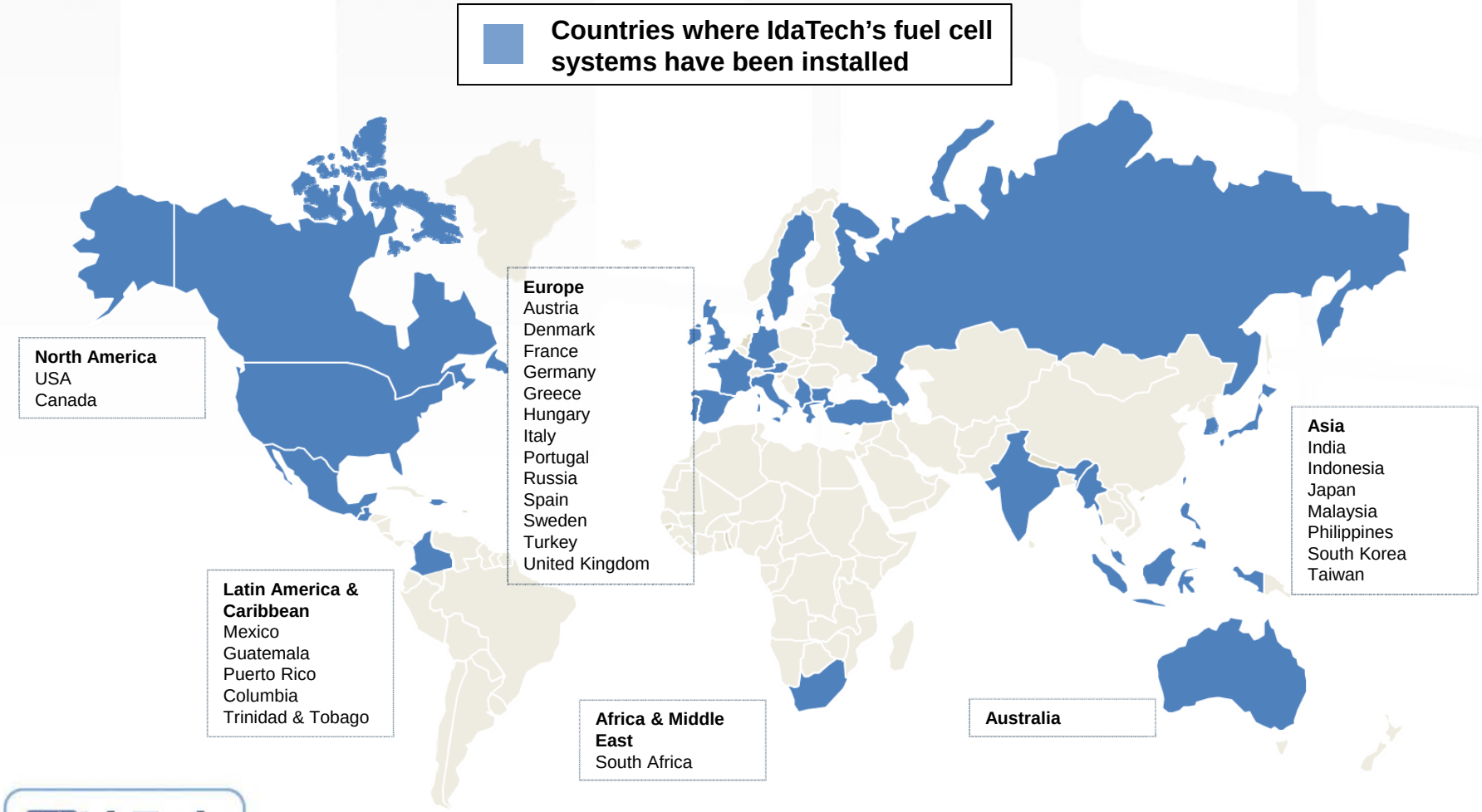
Future Innovative Offerings

Incredible Evolution Pace – Rapid Development – Cost Reduction

IdaTech Power For The Long Run

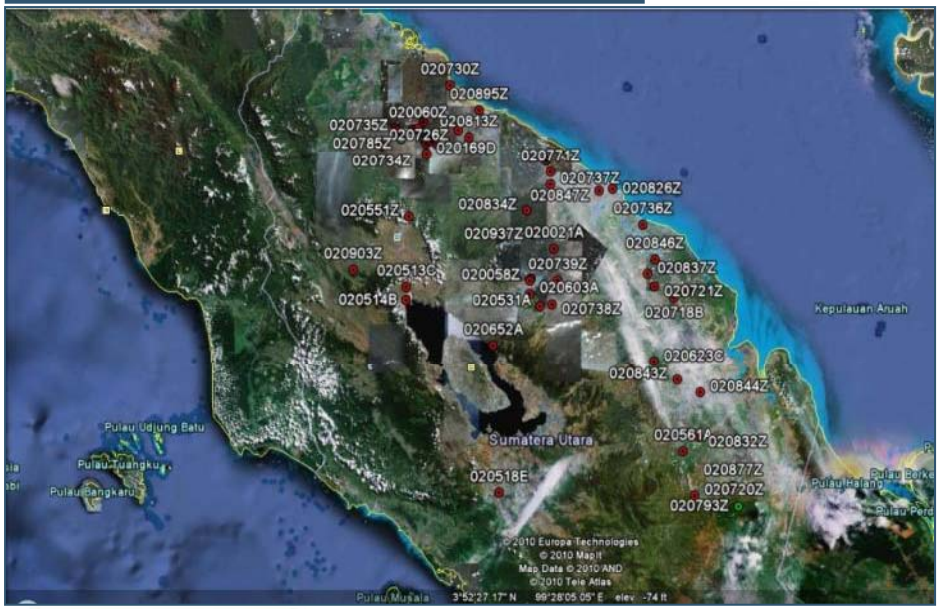
Industry Adoption

Over 800 ElectraGen™ Systems Installed in 30 Countries



IdaTech
Power For The Long Run

Business Case: Indonesia



Challenge:
- Poor grid quality (several hrs/week)
- Outdoor BTS (no air conditioner for batteries)
- Diesel theft issues
- Local community issues (generator noise)

IdaTech partner: Cascadiant

Solution:
- 500 fuel cell systems being deployed
- Location: Sumatra and Java
- Load (average): 1kW @48Vdc
- Product: 2.5 kW ElectraGen™ H2-I
- Fuel: Hydrogen gas
- Site autonomy: 6 cylinders

IdaTech
Power For The Long Run

Business Case: Metro Manila - (SMART)

Small shelter
DC power: 54 A (2.7kW @48VDC)
Battery back-up: 4 x branches of 150AH
Genset: 25kVA
Air-conditioning units: (2 split units)2kVA-3kVA

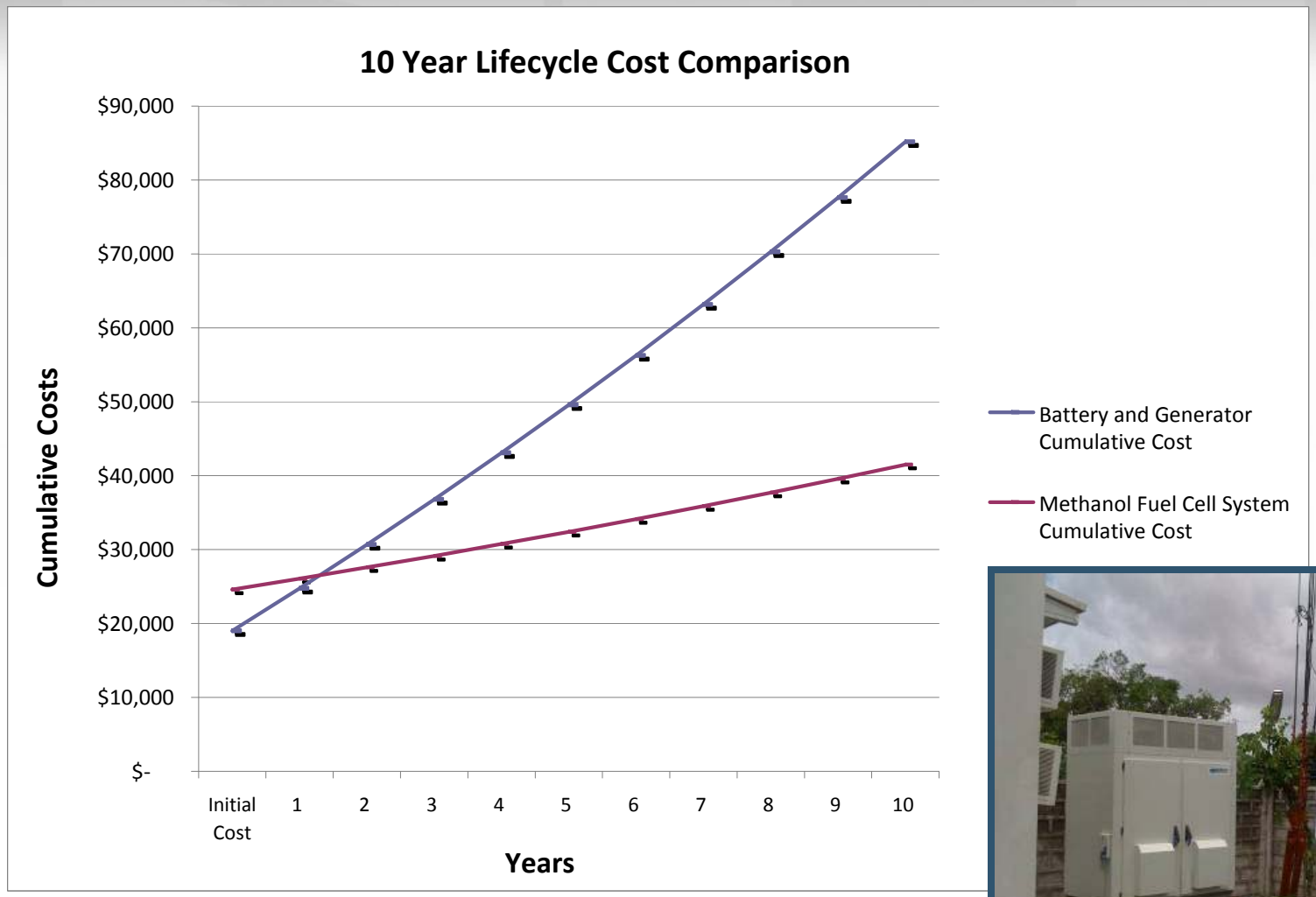
Challenge:
- Poor grid quality (several hrs/week)
- High emissions
- High maintenance
- Unreliable backup power

IdaTech partner: AECI

Solution:
- Location: Manila
- Load (average): 2.7kW @48VDC
- Product: 5kW ElectraGen™ XTI
- Fuel: Methanol-water (HydroPlus)

IdaTech Power For The Long Run

Business Case: Metro Manila - (SMART)



IdaTech
Power For The Long Run

Business Case: Trinidad

Challenge:
- Poor grid quality (several hrs/week)
- Refueling issues
- Extended run (autonomous)
- Severe weather (tropical storms)

IdaTech partner: Precision Power & Air

Solution:
- Over 50 fuel cell systems deployed
- Location: Trinidad and Tobago
- Load (average): 2.1kW @48Vdc
- Product: 3 kW & 5kW ElectraGen™ XTI
- Fuel: Methanol-water (HydroPlus)

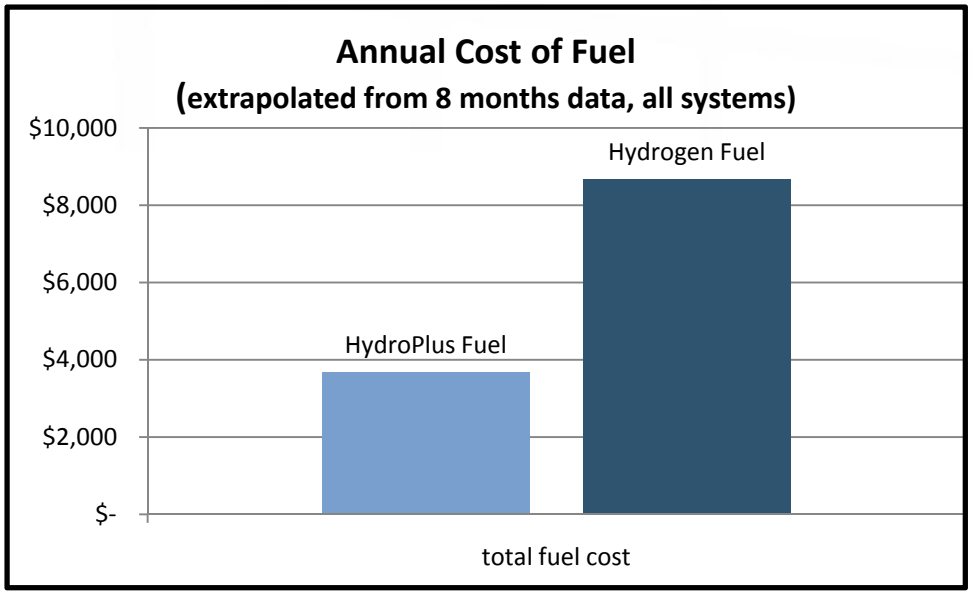
IdaTech Power For The Long Run

Business Case: Trinidad

Results:

- Liquid fuel cell systems out performed hydrogen systems during tropical storm in summer 2010.
- Hydrogen cylinders ran out of fuel while the ElectraGen™ systems continued to provide power to the sites.
- Total run time = 1166 hours
- Total energy generated = 2484 kW-h
- Highest demand site: 204 hours (approx. 25 hours per month)

through August 2010



IdaTech
Power For The Long Run

HydroPlus

- Composition
  - 62% methanol & 38% de-ionized water
- Methanol is a common liquid
  - Global production in 2010 – 57 billion liters
- Common methanol applications
  - Windshield washer fluid (up to 50% methanol)
  - Fuel additive – Over 3.5 billion liters in China 2007
  - Solvent
  - Manufacture of plastics and building products
- Benefits of methanol based fuel
  - Easily transported liquid fuel
  - Water miscible, biodegradable and sulfur-free
  - Extremely low freezing point < -60°C
  - May be stored for years without degradation
- Renewable sources of methanol
  - produced by crude glycerol in mass production
  - waste CO_2, wood waste, and others are in development
  - Global production of bio-methanol now greater than 280 million liters annually

HydroPlus Supply Chain

- 33 vendors in 18 different countries where IdaTech is deploying fuel cells

IdaTech Power For The Long Run

Green Advantages of Fuel Cells

Why Are Fuel Cells Green?

- Low emissions: (methanol fuel cells vs. diesel genset)
  - 50% reduction in CO_2 emissions
  - More than 95% reduction in CO, NOx and SOx emissions
  - No particulate matter emissions
- At least 20% more efficient than a diesel generator
- Very quiet (background noise level)
- No hazardous fuel spill
- Renewable liquid fuel (bio-methanol fuel)

Summary

- IdaTech and its partners have deployed fuel cell systems in 30 countries
- ElectraGen™ backup power fuel cell systems yield customer savings and improved TCO with payback of 1-3 years vs. diesel generator
- Fuel cell systems are greener than diesel generators
- Methanol is more environmentally friendly compared to diesel and has renewable sources
- IdaTech's customers include 5 of the top 10 global telecom carriers
- IdaTech has partnerships with telecom suppliers in all regions for strong local support
- IdaTech continues to innovate and develop new products for new markets and power ranges

IdaTech
Power For The Long Run

Thank You !

IdaTech
Power For The Long Run