



US Fuel Cell Council
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Matching Federal Government Energy Needs with Energy Efficient Fuel Cells

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US Fuel Cell Council
Hotel Palomar
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Micro & Man-Portable <ul style="list-style-type: none">• Less Than 100 Watts• Consumer electronics, defense (solder power), speciality applications	Portable, Backup, API <ul style="list-style-type: none">• 100 Watts to 10 Kilowatts• Battery replacement or charging, defense (platoon power), telecom backup, remote, auxiliary power
Buildings & Facilities <ul style="list-style-type: none">• 5 Kilowatts to Megawatts	Speciality vehicles & Material handling <ul style="list-style-type: none">• 1 to 50 Kilowatts• Forklifts, airport tugs



Pittsburgh, Pennsylvania – October 1992


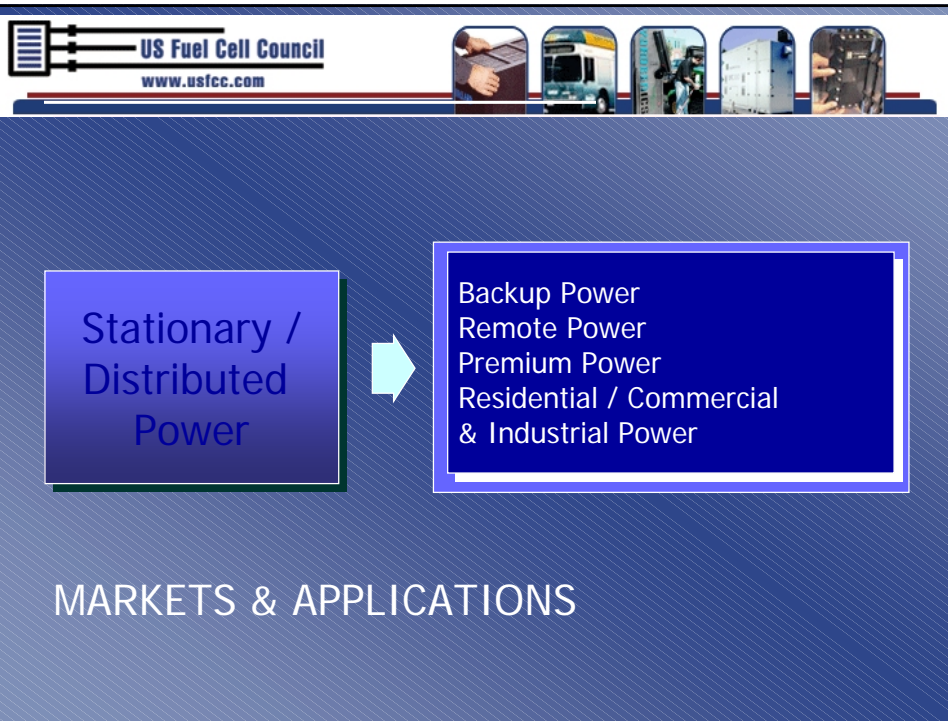


Stationary /
Distributed
Power



- Increasing Need for Reliability
- Increasing Need for Power Quality
- Energy Security
- Shift to Distributed Alternatives
- Modular Need / Flexibility of Design
- Industry Deregulation
- Carbon Dioxide Abatement

MARKETS & MARKET
DRIVERS





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- Prime Movers
 - 7x24
 - CHP
 - Grid Connect and/or Grid Independent


Types of Fuels Utilized

- Natural Gas
- Propane
- Anaerobic Digester Gas

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- Federal Government
- State and Local Governments
- Large Commercial Corporations
- Colleges and Universities
- Utilities



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- Industrial
 - Factories
 - Central Power Houses
 - Waste Water Treatment Plants
- Hospitals and Nursing Homes
- Hotels, Dormitories, Barracks
- Prisons and Jails
- Fire Stations

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US Postal Service – San Francisco Mail & Processing Center – 250 kWe

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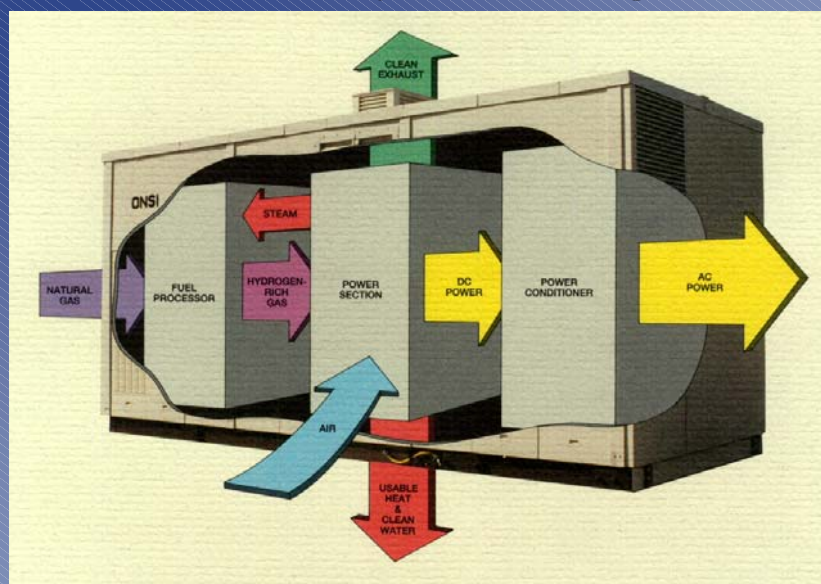


Santa Rita Correctional Facility, California – 1,000 kWe



El Estero Waste Water Treatment Plant, Santa Barbara, California
500 kWe

Fuel Cell System Diagram



Source: UTC Power



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US Embassy
United Kingdom








5kW GenSys

- Thermal Output - 22,000 BtuH 135 Deg F
- Weight - 2,200 pounds
- 32" x 68" x 84"
- Reliability > 90%
- 26% electrical efficiency





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SOFC Companies

- Ceramic Fuel Cells Limited
- Acumentrics
- Fuel Cell Technologies
- Rolls Royce
- FuelCell Energy
- Siemens Power
- UTC Fuel Cells
- ZTEK

Phosphoric Acid Fuel Cells

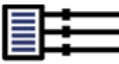
- One of the few fuel cells commercially available
- U.S. and Japanese suppliers have been marketing 50 to 200 kW systems
- Over 245 units have been installed worldwide with a combined operating history of almost 5 million hours
- Cost challenges have limited commercial success

PureCell 200 (PC25)




- > 3P/480VAC/GP/GI
- > 900,000BtuH 140-250 Deg F
- > 40,000 lbs...2000lb/kW
- > 10X10X18
- > Reliability 97%
- > 39% electrical efficiency

200kW ChevronTexaco - Houston, Texas



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PureCell 200 FUEL CELL POWER PLANT

Specifications

• Power Output	200 kW
• Standard Output Voltage	480 V
• Standard Frequency	60 Hz
• Efficiency at ISO conditions	40 +/- 2%
• Available thermal energy	264 kWth
• Fuel gas type	Natural Gas
• Fuel consumption (935 Btu/ft ³)	31.5 ft ³ /min
• Noise	65 dBA at 10 feet
• Emissions	<div> NO_x0.02 lb/MWh SO_x0.001 lb/MWh CO0.05 lb/MWh </div>



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600kW_e Fresno, California Project 12 Story Commercial Office Building





600 kWe Fresno, California Project
3 UTC Power PureCell 200 Power Plants



600kWe Fresno, California Project
100 Ton Adsorption Chiller



Molten Carbonate Fuel Cells


- Best suited for large power plants
- Japanese, European, and US firms have demonstrated systems of 250 kW to 2 MW class
- Can use natural gas directly without the need for an external fuel processor and have had some recent test successes
- Commercial products available today

Specifications



• Power Output	300 kW
• Standard Output Voltage	480 V
• Standard Frequency	60 Hz
• Efficiency at ISO conditions	47 +/- 2%
• Available thermal energy	123 kW
• Exhaust temperature	650 F
• Allowable backpressure	5" WC
• Fuel gas type	Natural Gas
• Fuel consumption (935 Btu/ft ³)	35 ft ³ /min
• Average water consumption, average	2.0 gpm
• Noise	72 dBA at 10 feet 65 dBA at 10 feet
• Emissions	NO _x 0.02 lb/MWh SO _x 0.001 lb/MWh CO 0.05 lb/MWh




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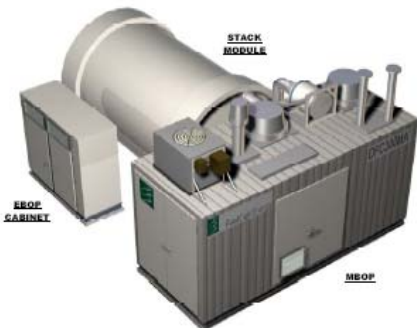
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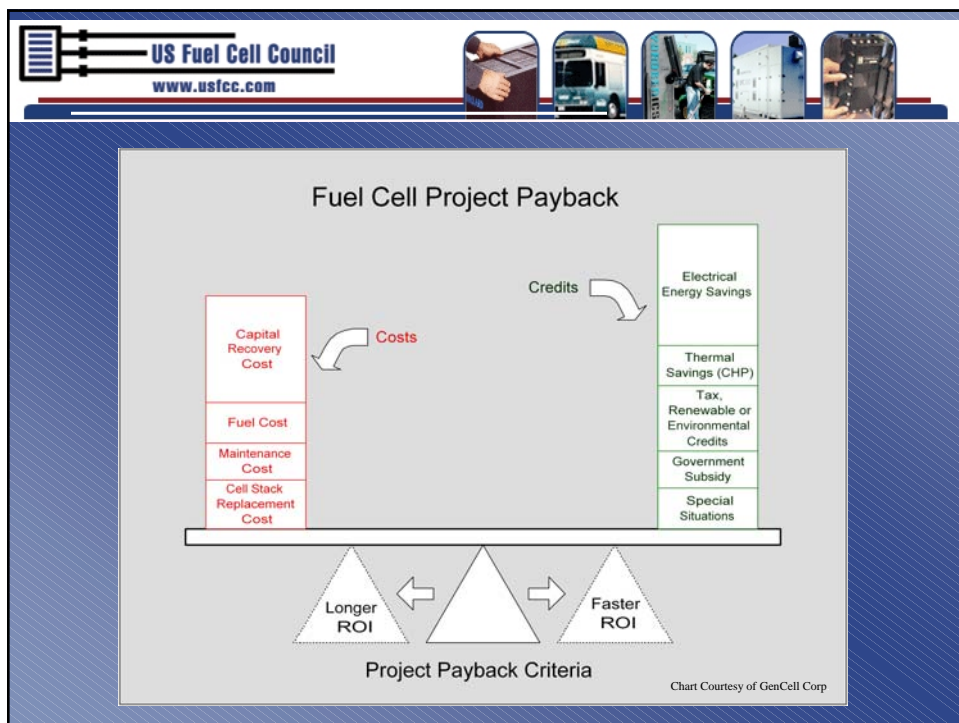






FuelCell Energy



- Overall Plot Area 29' x 33'



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Fuel Cell Costs ROM

- ❑ Capital Expenditure – Est. \$1.8MM
- ❑ Operation and Maintenance – Est. \$0.038/kWH
- ❑ Fuel Costs – @ Assumed \$7.00/MMBtu...\$0.07/kWH

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LOGANEnergy Corporation

The Power of Fuel Cells

Thank You !

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