



A National “Green Energy” Economic Stimulus Plan based on Investment in the Hydrogen and Fuel Cell Industry

Fuel Cell Seminar and Exposition
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A National “Green Energy” Economic Stimulus Plan based on Investment in the Hydrogen and Fuel Cell Industry

- Hydrogen / Fuel Cell Market
- Market Drivers
- Results:
 - Industrial Employment
 - Gross Domestic Product
 - Tax Revenue
- Economic Multipliers
- Barriers
- Conclusion
 - Documented Performance



Reasons for Market Growth



**Energy Crisis
Climate Change
Global Recession**

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**Renewable Energy
Hydrogen Economy
“Green Energy” Jobs**



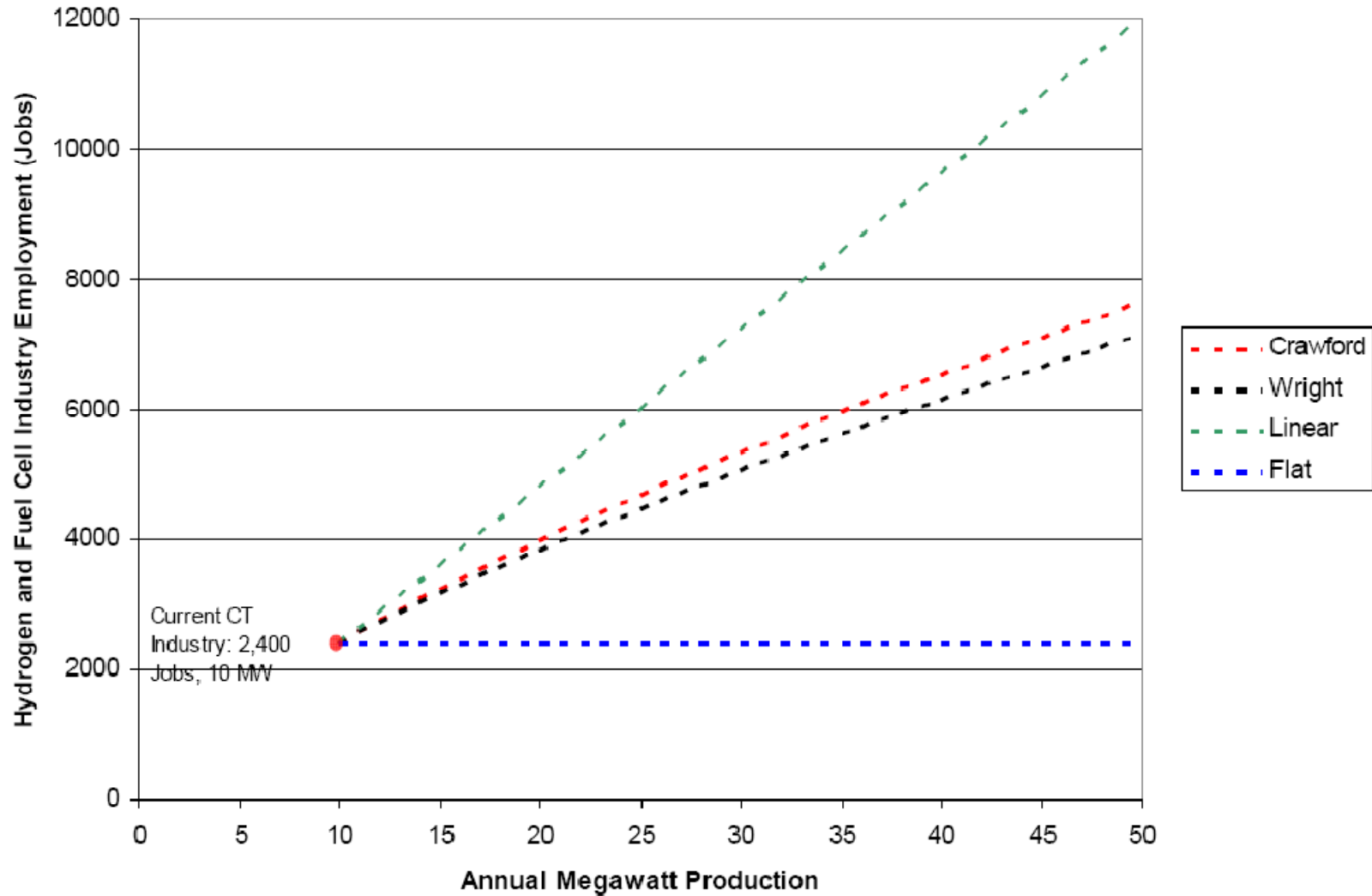
Reasons for Market Growth

Drivers Include:

- World electric consumption to double between 2003 and 2030.
- Growth of peak electric demand at customer sites.
- Transportation demands for petroleum exceed domestic supply.
- Increased energy efficiency required (oil cost/\$bbl).
- Reduced emissions of greenhouse gases and primary air pollutants.
- Demand for reliability through fuel diversity.
- Government investment.



Industry Employment





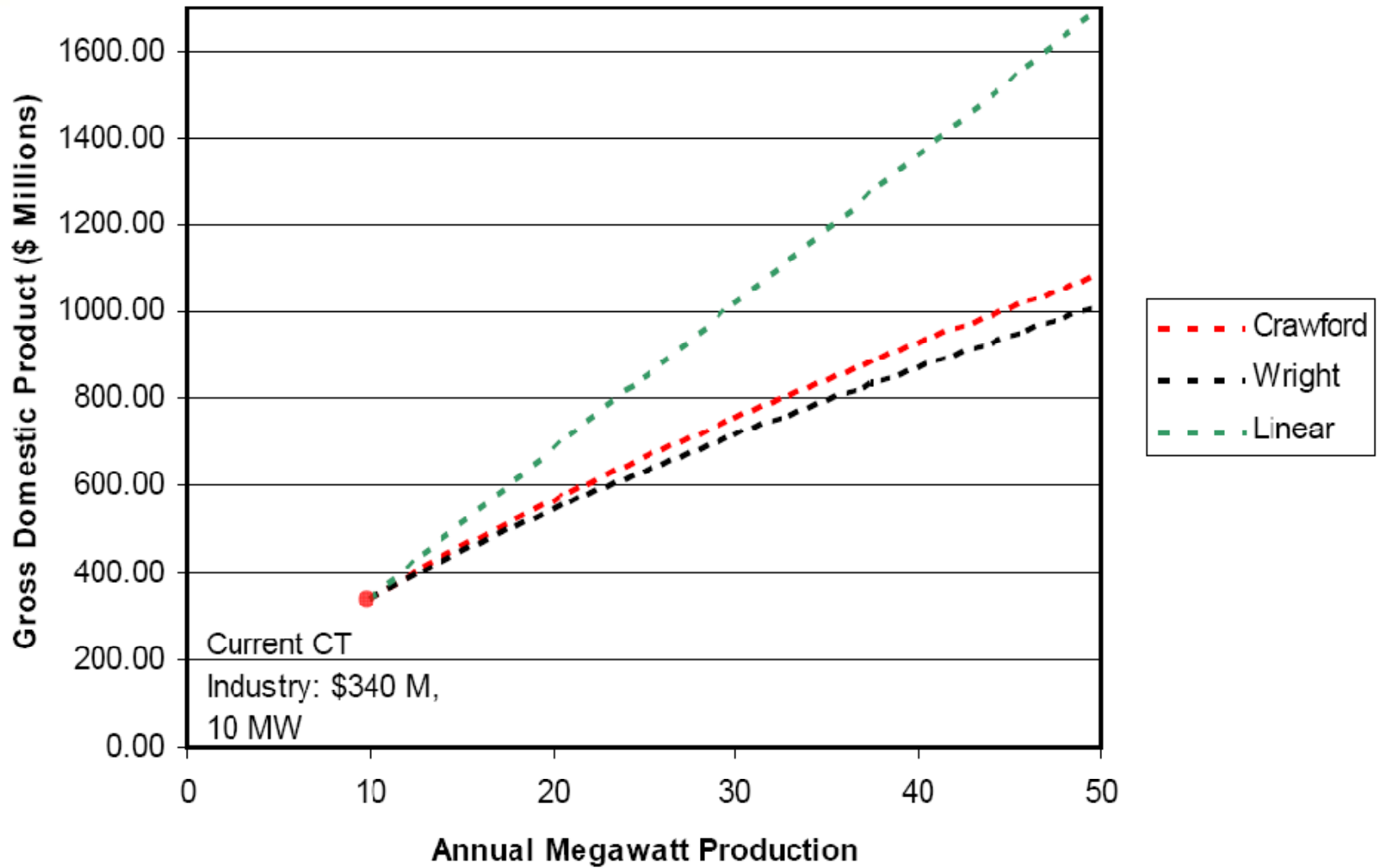
Industry Employment

Results:

- Approximately 7,100 direct, indirect and induced jobs per 50 MW of consistent annual production of hydrogen and fuel cell manufacturing



Gross Domestic Product





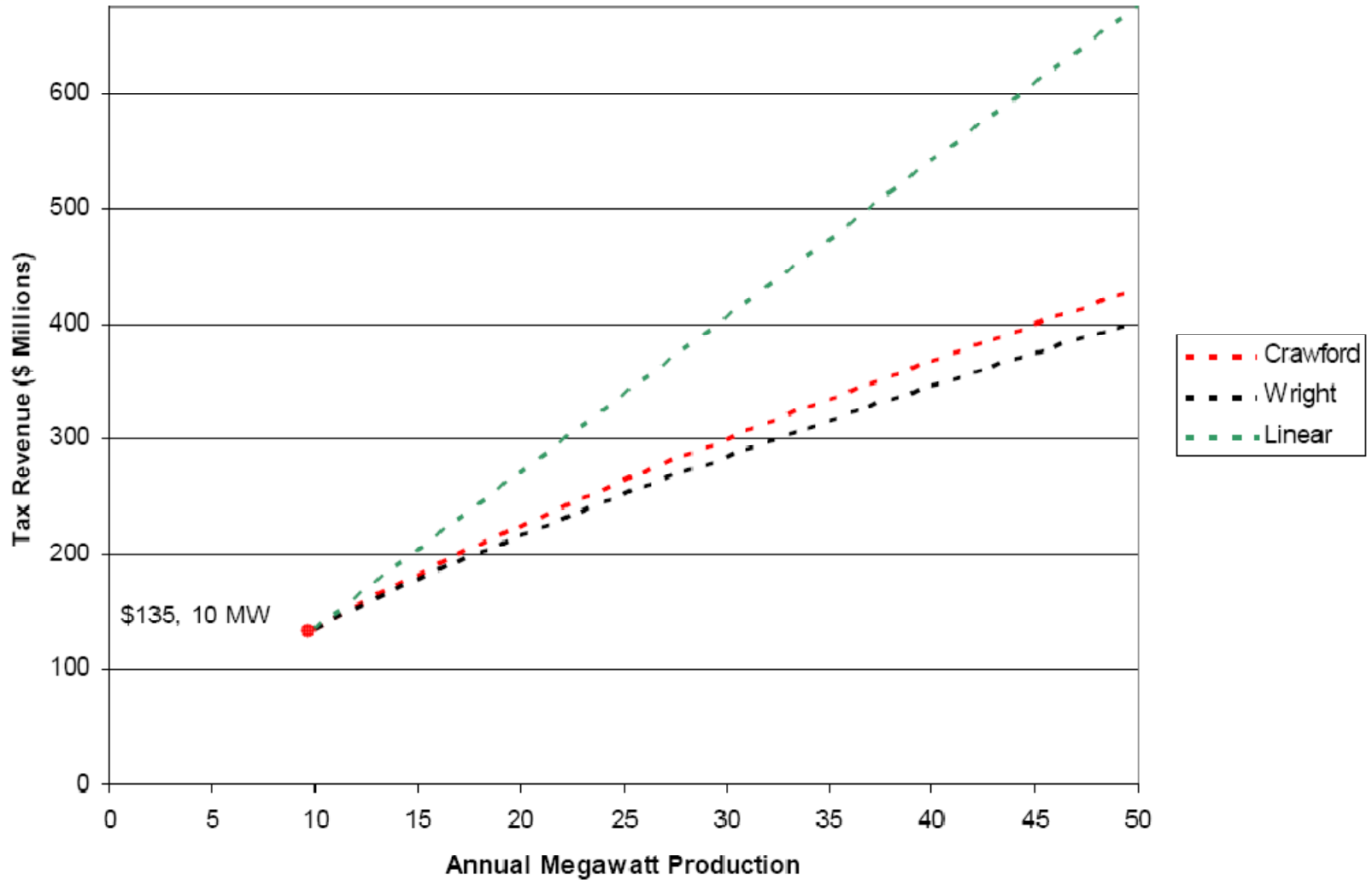
Gross Domestic Product

Results:

- Approximately \$1.0 billion in gross domestic product per the annual production of 50 MW of hydrogen and fuel cell manufacturing



Local, State and Federal Tax Revenue





Local, State and Federal Tax Revenue

Results:

- Approximately \$400 million in federal, state, and local taxes annually for 50 MW of annual hydrogen and fuel cell production



Economic Multipliers

Economic Multipliers			
	Employment	Industry Revenues	Employee Compensation
Multiplier	2.31	1.84	1.72

- For each job the hydrogen and fuel cell industry directly supports, an additional 1.31 jobs are indirectly supported elsewhere in Connecticut.
- For every \$1.00 of revenue generated by industry, an additional 84 cents of revenue is received by the state of Connecticut.
- For every \$1.00 paid to industry employees, an additional 72 cents is paid by other employers in the supply chain.

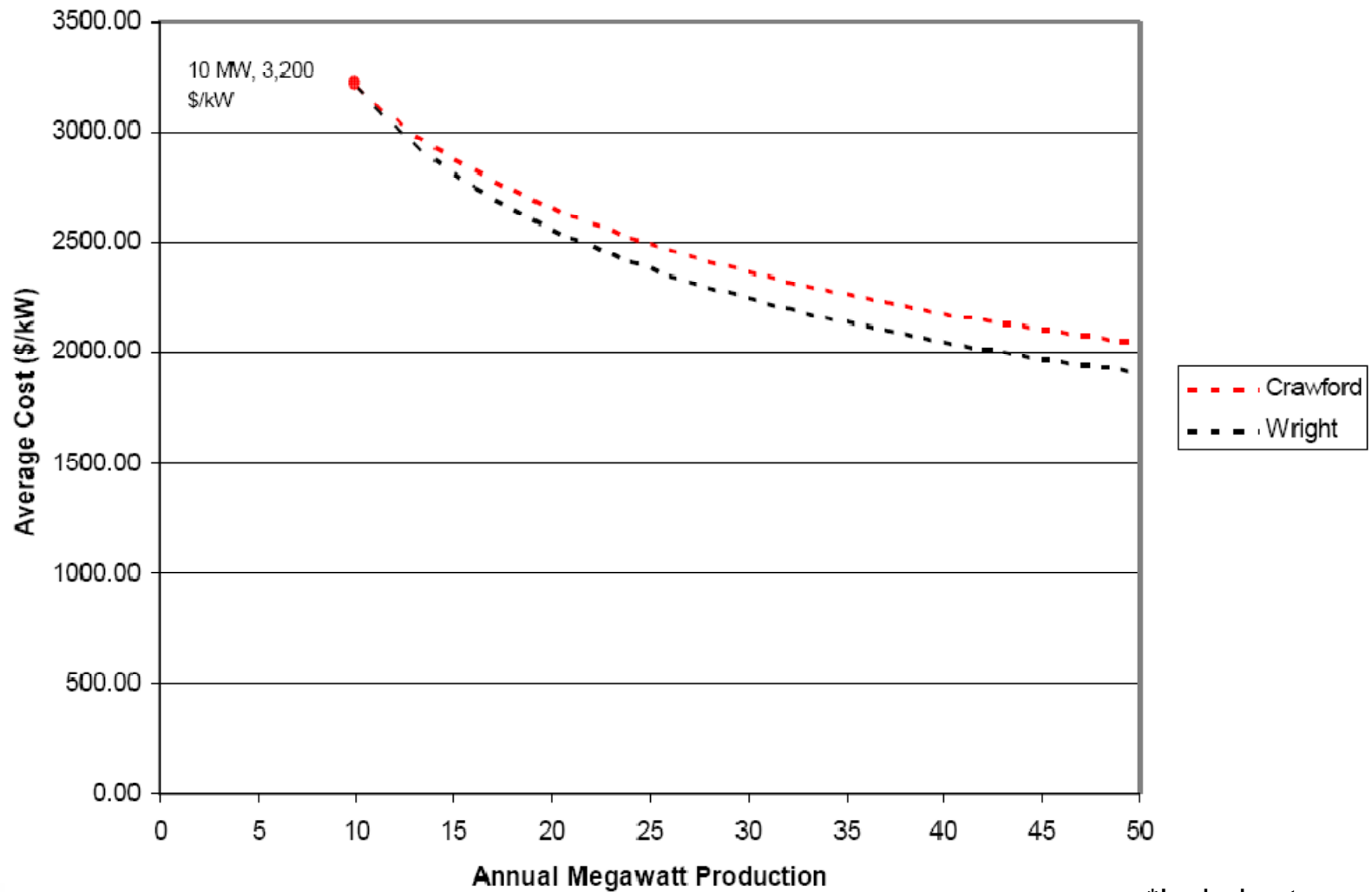


Barriers

- Cost
- Internalization of Environmental Value
- Long Term Investment



Cost Reduction Gains/Production Curve





Emission Reduction and Energy Savings

- Fuel cell generation facilities can substantially reduce emissions, greenhouse gases, and energy use.

Potential Average Annual Emissions Reduction and Energy Savings Associated with the Displacement of 50 MW of Conventional Fossil Fuel Generation			
Air Emissions		Energy Savings	
NO _x	280 tons	Btu	1.75 – 2.0 Trillion
SO ₂	234 tons	No. 2 Oil Equivalent	12.5 - 15 Million Gallons
CO ₂	180,456 tons		

- Fuel cells would increase transportation efficiency by two to three times.

Average Expected Energy Use (mpge)					
Passenger Car		Light Truck		Transit Bus	
Hydrogen Fuel Cell	Gasoline Powered Car	Hydrogen Fuel Cell	Gasoline Powered Light Truck	Hydrogen Fuel Cell	Diesel Powered Transit Bus
81.2	29.3	49.2	21.5	7.04	3.9



Economic/Financial Modeling

Connecticut Center for Advanced Technology, Inc.

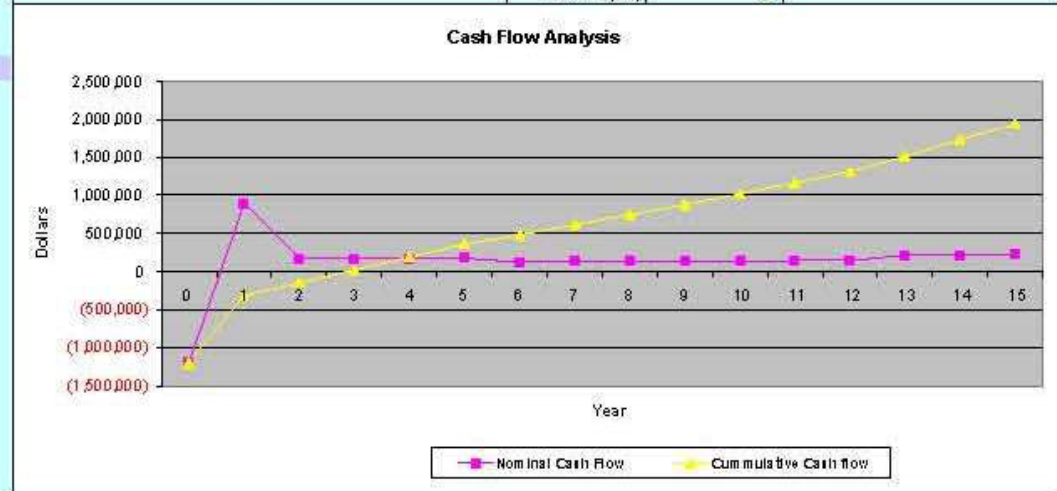
Combined Heat and Power Financial Model

Payback in year 3	
NPV	\$864,566
IRR	25%

Technology	
924	KWAC Peak Host Demand Capacity
53%	Host approximate Load Factor
4,053,998	kWhs Host Average Energy Demand
0%	Host Expected Return on Equity
3,903,868	btu/hr Average Host Heat Demand
400	KWAC Fuel Cell Installation
97.00%	Capacity Factor
8,126	Average Heat Rate
27,620	mmbtu Heat Input Per Year Required
3,398,880	Fuel Cell Gen is 83.8% of Host Requirement
1,537,000	btu/hr Average generated
16.91	Utility Avoided Energy Cost \$/kWh
3.0%	Utility & Nat Gas & LFG Esc. Rate
3.0%	O&M Esc. Rate
\$12.00	Fuel Cell Input Fuel
\$0.00	Fuel Oil Cost \$/mmbtu
\$13.70	Hot Water and Chilled Water Cost \$/mmbtu
\$30.00	Recs Market Value De-Esc @2%
2.00	O&M \$/kWh
80.0%	Natural Gas or Oil Fired Boiler Efficiency
15	- Number of Years in the Analysis
rate 35	Host CL&P Electric Rate
Third Party Rate	0.00

Cost of Capital:			
	Percent	Rate	pre-tax
Debt	100.00%	7.00%	7.00%
Equity	0.00%	12.00%	0.00%
Weighted Capital Cost			7.00%

Capital Cost:	
Install Cost	\$3,000 perkW
B/E Analysis	\$0 perkW
Total Cost	\$3,000 perkW
Or	\$1,200,000 Dollars
Re-stack	\$1,500 per kW
Subsidies&Tax	(724,000)
Host Equity	\$0



CL&P
 U I
 Non Profit



Results

- Cost Reduction Projected
- Environmental Value Internalized
- Cash Flow Analyzed



Hydrogen / Fuel Cell Economy: Documented Performance

- Energy Reliability
- Environmental Performance
- Climate Control
- Economic Value
- Green Jobs



Contact

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