



FuelCell Energy  
Ultra-Clean, Efficient, Reliable Power

# High Efficiency Fuel Cells for Stationary Power Applications: Entering the Mainstream

*International Partnership for Hydrogen and Fuel Cells in the Economy Roundtable Meeting, Berlin, Germany*

*Chip Bottone, President & CEO, FuelCell Energy (NASDAQ: FCEL)*



November 17, 2011



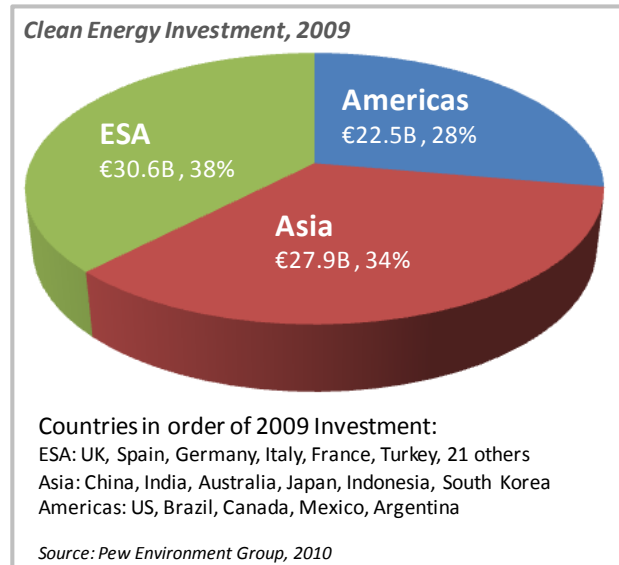
## Global need for Clean Baseload Distributed Generation

- Growing urban populations and increasing power demand - 50% by 2025<sup>1</sup>
- Central generation difficult to site and costly – requires T&D
- Intermittent wind/solar limited to certain geographies
- Public health impact of pollutants & environmental impact of greenhouse gas emissions
- Obsolescence of existing power generation becoming an issue over next decade

## Clean-tech Leadership is key to economic growth

- EU is the leader in Clean Energy investment and Renewable Energy use (€30.6B in 2009, 90 GW installed)
- China overtook U.S. last year as largest single country investor in Clean Energy
- Energy policy mechanisms being implemented in Americas and Asia began in Germany

*Global investment in Clean Energy grew 230% between 2005 and 2010, despite economic downturn; FCE's 5-year CAGR was 49%*





## Global need for Clean Distributed Baseload Generation

### Direct FuelCell® Solution

- Ultra-Clean, Efficient, Reliable Power
- Distributed baseload generation
  - > Continuous power where needed
  - > Reduces reliance on transmission grid
- Virtually zero pollutants (NOx, SOx & PM)
  - > Easy to site in congested/urban areas
- Highest electrical efficiency vs. alternatives
  - > More power from a given unit of fuel
  - > 47%-70% electrical efficiency
  - > 90% total efficiency with combined heat & power (CHP)



**300 kW power plant at a wastewater plant**



**1.4 MW power plant at a bakery**



**4.8 MW utility owned power plant**



**20 MW fuel cell project powering adjacent city - distributed generation**



# Ultra-Clean Power Markets

- Seven global markets for MW-Scale Power Generation
- Operating on clean natural gas or directed biogas

End Market:

Applications:

Key attributes:

Near Term Market Size:

## Utilities & IPP's

Baseload distributed generation

Reduces grid congestion and investment; Emissions; RPS

750 MW  
\$2000 Million

## Gas Transmission

Pressure reducing stations

Efficiency; CHP; New revenue source; Ultra-clean power; RPS

350 MW  
\$950 Million

## Industrial

On-site with CHP

Reliability; Ultra-clean power & heat

290 MW  
\$750 Million

End Market:

Applications:

Key attributes:

Near Term Market Size:

## Education & Healthcare

On-site with CHP  
Efficiency; Sustainability; Energy security; Ultra-clean CHP

180 MW  
\$500 Million

## Commercial & Hospitality

On-site with CHP  
Reliability; Ultra-clean power & heat

110 MW  
\$300 Million

## Government

On-site with CHP  
Support RPS and Sustainability goals

65 MW  
\$170 Million

## On Shore Oil Production

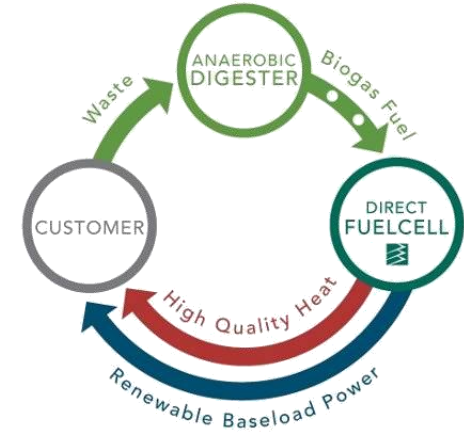
On-site with steam or CO<sub>2</sub> injection  
Emissions; Eliminate flaring; Reliability; Productivity

50 MW  
\$130 Million



# Renewable Baseload Power Markets

- Four global markets for MW-Scale Power Generation
- DFC plants convert waste disposal problems into ultra-clean power solutions
- Helps customers achieve sustainability goals



	Wastewater	Landfill Gas	Agriculture	Food & Beverage
End Market:				
Applications:	Municipal water treatment facilities	Landfills	Farms & ranches generating plant & animal waste	Food processing and breweries
Key Attributes:	Emission compliance; Sustainability; Energy security; Supports RPS	Waste disposal solution; Emission compliance; Supports RPS	Waste disposal solution; Sustainability; Energy security; Supports RPS	Waste disposal solution; Sustainability; Energy security; Supports RPS
Near Term Market Size:	480 MW \$1250 Million	110 MW \$300 Million	100 MW \$260 Million	80 MW \$200 Million





WHAT

	Carbonate (MCFC)	Solid Oxide (SOFC)	PEM
<b>Size range</b>	> 1 MW	5kw - 200kw	~ < 10 kw
<b>Commercialized</b>	Yes	In process	Yes
<b>Advantages</b>	High efficiency, CHP, fuel flexible	High efficiency, limited CHP, fuel flexibility varies by type	Load following, low temperature
<b>Electrical efficiency</b>	40%-50% or higher using turbine or organic rankine cycle	45%-60%	25%-40%

WHERE

<b>Typical Application</b>	Large scale baseload power users	Small commercial baseload power users	Transportation, residential - load following
<b>Markets</b>	Utility grid support, universities, municipal water treatment facilities, industrial operations	Commercial buildings	Buses, forklifts, residential power/heating
<b>Sales price per kW (before subsidies)</b>	FCE: MW class \$3,000-\$3,500/kW	Bloom Energy: ~\$7,000 - \$8,000/kW <sup>(1)</sup>	ClearEdge: ~\$11,000/kW <sup>(2)</sup>

(1) New York Times article, Jan- 2011

<http://green.blogs.nytimes.com/2011/01/20/an-affordable-way-to-buy-fuel-cell-power/?partner=rss&emc=rss>

(2) WSJ article, Aug- 2011

<http://clearedgepower.com/node/143/>



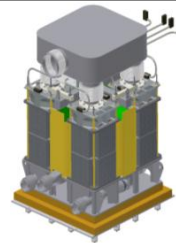
Manufacture	Sell (direct & via partners)	Installation	Service

Growing Market Presence		
<p>182 MW installed and in backlog 5 yr CAGR 48%</p>	<p>Over 80 Direct FuelCell® plants generating power at more than 50 sites globally</p>	<p>Providing:</p> <ul style="list-style-type: none"> <li>• On-site power</li> <li>• Utility grid support</li> </ul>

## Advanced Technology Programs



**Renewable hydrogen for vehicle fueling**



**Solid Oxide Fuel Cell Development (SECA program)**



**Carbon capture**



## • *Distributed Manufacturing Model*



London

### *European Served Area (ESA)*

- Europe, Mid-East, Russia, Africa
- Served from Mfg base in Europe



### *Americas*

- North, Central, South America
- Served from Mfg base in USA

### *Asia*

- Korea, Japan, S.E. Asia
- Served from Mfg base in Asia



California



Canada



Connecticut



South Korea

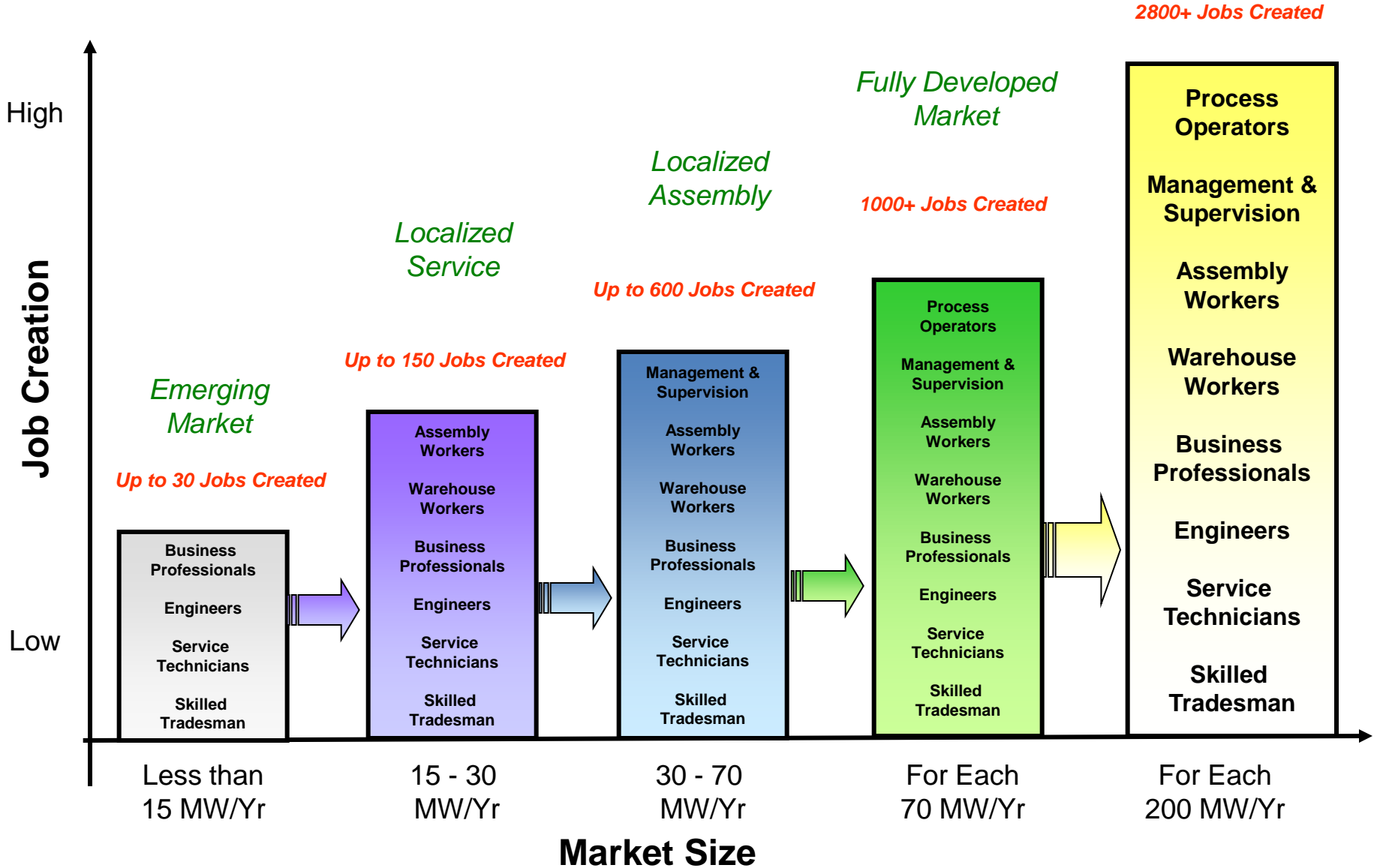


Indonesia





# Market Entry Model

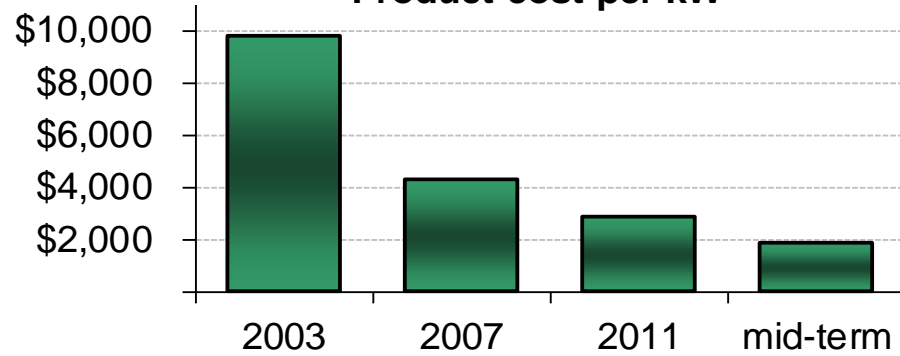




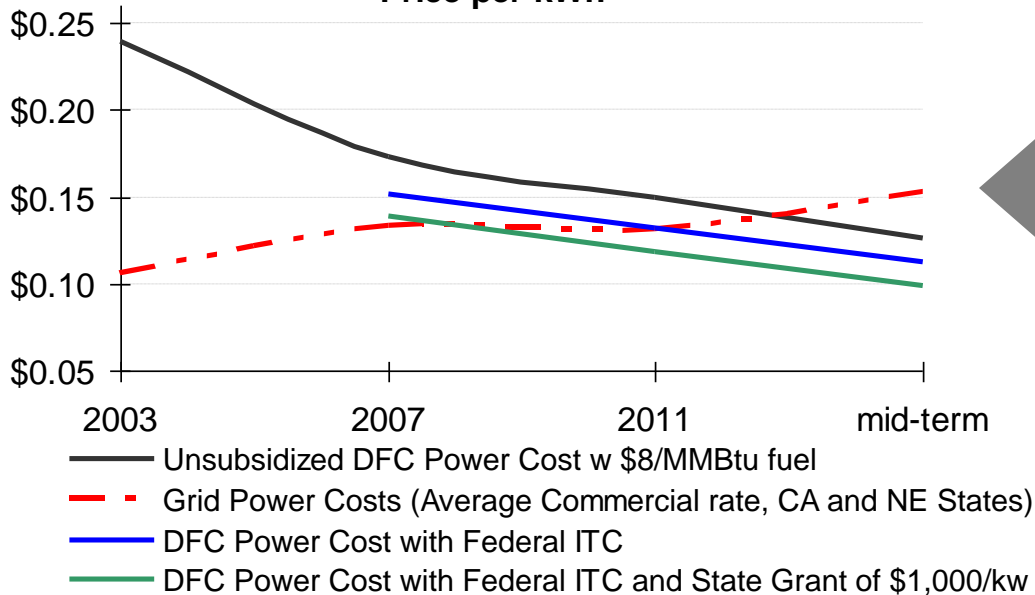
# Successful Cost Reductions

Product costs reduced >60% since first commercial installation in 2003

Product cost per kW



Price per kWh

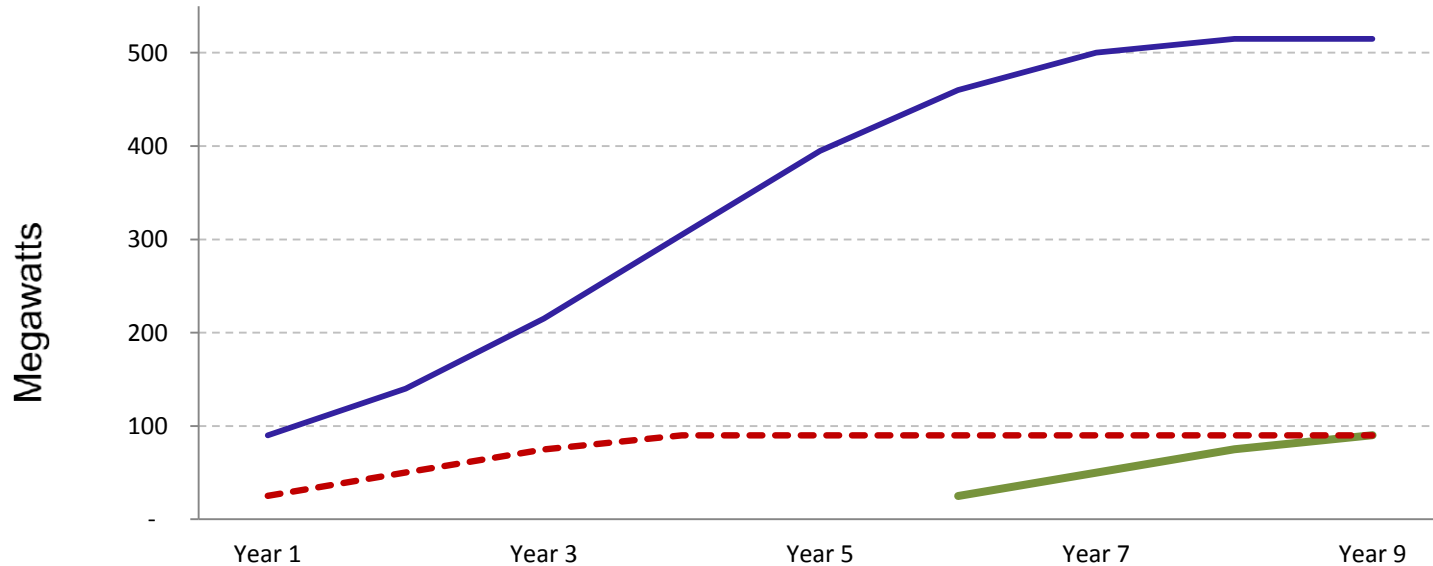


- DFC cost per kWh decreasing
- Grid costs increasing (i.e. investment in new capacity and transmission grid)
- Renewable biogas price per kW lower

**Goal is to price below the grid, without incentives**



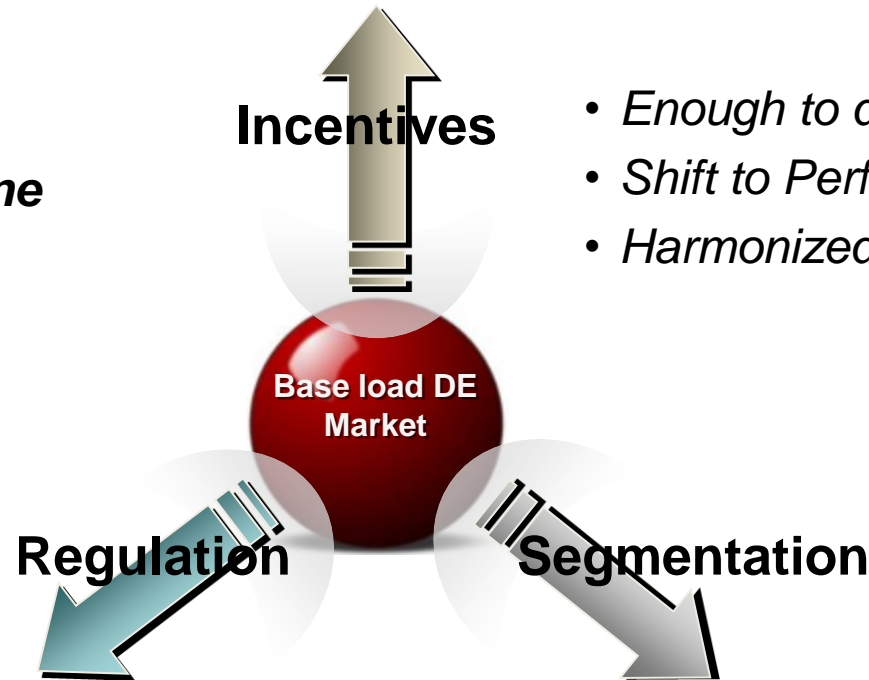
# Operating (Services) Model



***Growing installed base drives Production and Revenue***



**The forces of opportunity and change determine market size and adoption rate...**



- *Enough to drive parity?*
- *Shift to Performance based ?*
- *Harmonized programs ?*

- *Utility operating model?*
- *Utility business model?*
- *Optimized value proposition?*
- *Attractive application drivers?*

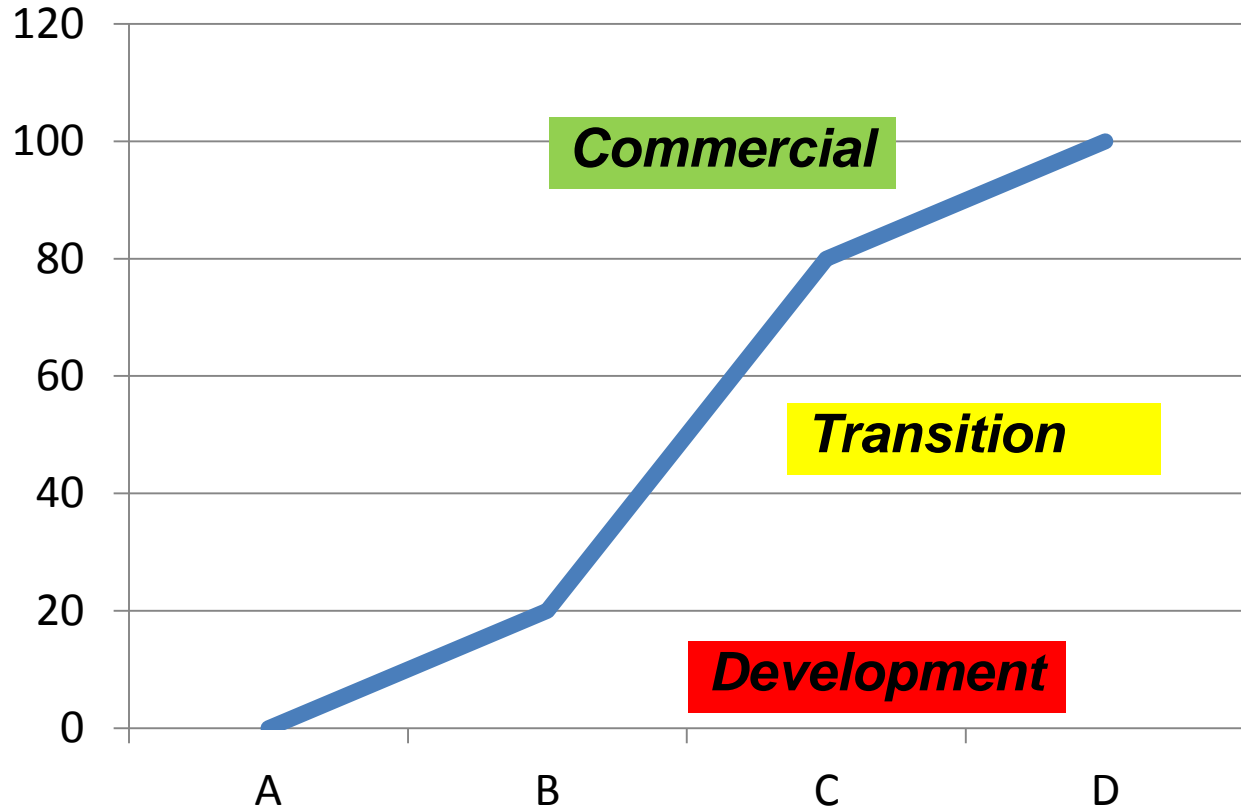
***Clean and Renewable power at Grid Parity pricing,  
Utility rate based Distributed Energy***



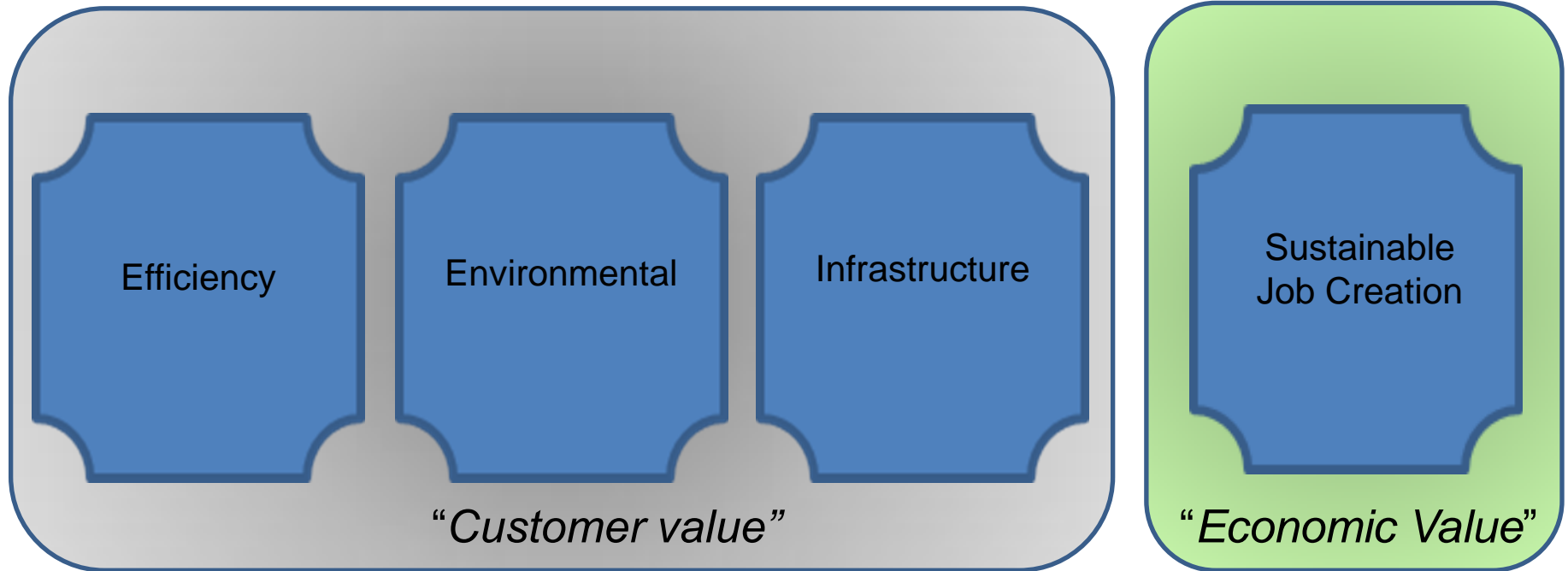


# Commercialization Investment

**Investment Value**



**Time (t), years**



***Customer, Economic and Shareholder Value***



# Vision for Industry

Market Size



Time



FuelCell Energy  
Ultra-Clean, Efficient, Reliable Power

***Thank You !***

