Ohio Fuel Cell Symposium

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Introduction and background

Markets and Potential

Products and Supply Chain



Introduction and Background



IdaTech – H2PT Background

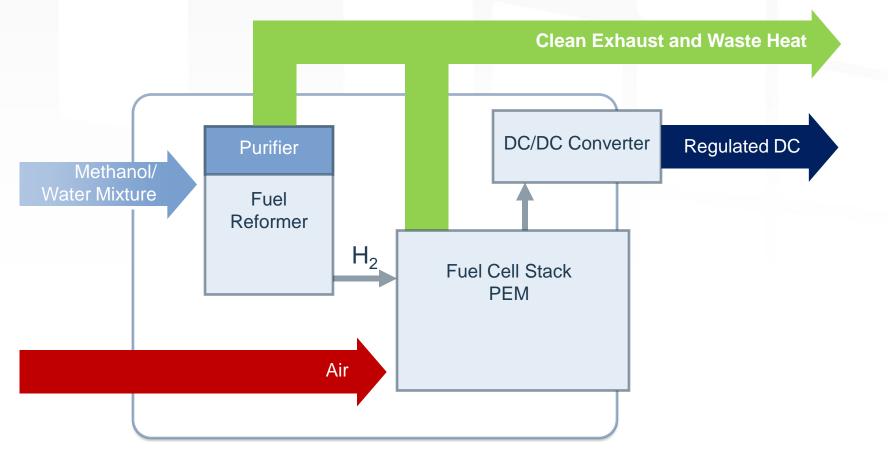
1998-1999 Formation	2000 – 2003+ Reforming and H2 purification development	2004 - 2009 Advanced product development & deployment	2010 - 2012 ElectraGen™ product deployment, licensing	2013 - 2016 Strategic alignment & consolidation
1998, NW Power Systems	Developed foundation for hydrogen production	Telecom backup and off grid power product development	Launched ElectraGen™ product line.	Name change to H2 PowerTech (H2PT)
founded	(reforming) and purification critical to	Advanced system design	Built factory in Tijuana, Mexico	Second factory built
Purchased	modern fuel cell	and integration with US		H2PT acquired by CHEM
in 1999 by Idaho	products.	Government and Intl. partners.	Sold ~1000 units worldwide.	May 2014.
Electric	Developed fuel cell			Ballard BUP assets
Utility, renamed	stack and systems integration	Internal fuel cell stack development capability	Sold non-exclusive IP license and factory	acquired June 2016
IdaTech	capabilities.		equipment to Ballard.	>2000 EGME/ME2
		Deployed ~300 systems.		systems sold
			Began 3 year non- compete, ending 7/1/15.	

- All commercial methanol fuel cell products based on licensed IP
- >15 years of experience and more than \$240 million invested
- IP based on >380 patents awarded and pending
- Continuing core development for advanced fuel cell products



Methanol Fueled Power System

Highly Efficient Reformer Extracts Hydrogen from Liquid Fuel





Markets and Potential



Core Markets

Telecommunications

Backup and off grid power >\$3 billion/year market



- Characteristic: Poor (or no) grid (developing nations), or need to guard against long term outages (developed nations)
- Opportunity: Backup diesel generators are unreliable, noisy, pollute and subject to theft (equipment and fuel)
- Geographies: Asia, India, Africa, Central and Latin America (poor grid); USA (high reliability)

Community Power

Off grid / micro-grid ~500 million people w/o power (but with cell phones)



- Characteristic: Massive expansion of mobile phones into communities not served by electric grid
- Opportunity: Diesel generators are unreliable, noisy, pollute and subject to theft (equipment and fuel), and higher cost
- Geographies: Africa, India, SE Asian Islands



South African FC Demonstration

3 Fuel Cells, powering 34 homes, off grid, for 2 years





China Installation Examples ME²PØWER





















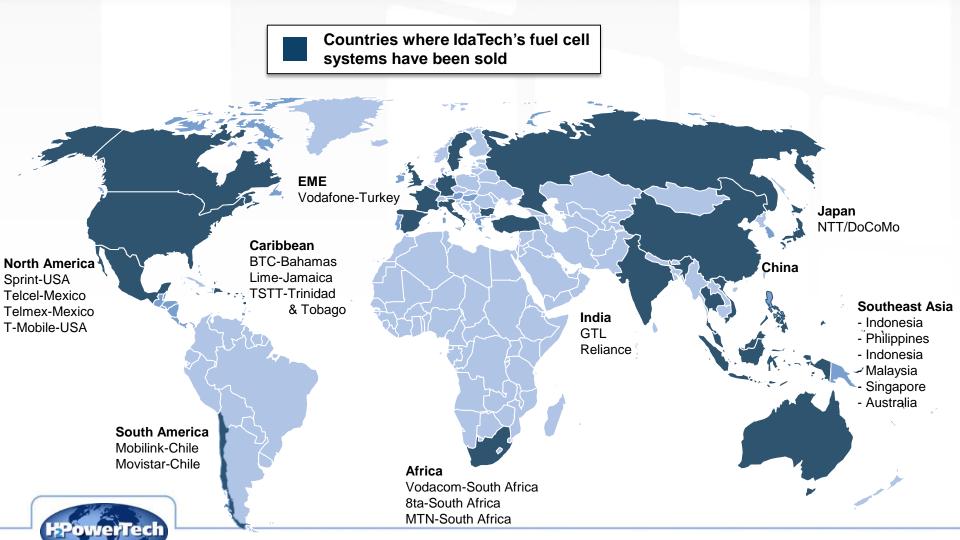




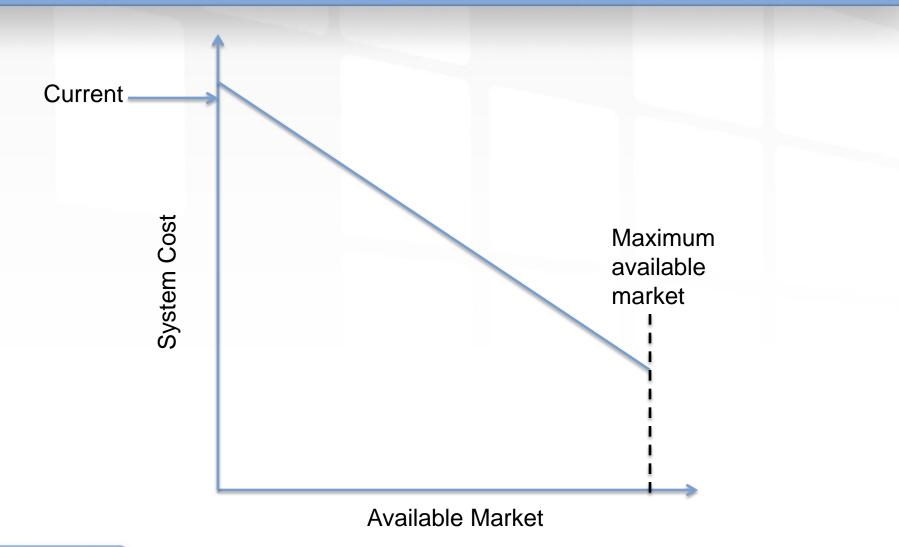


Global Deployment

2,000+ Systems in 30+ Countries



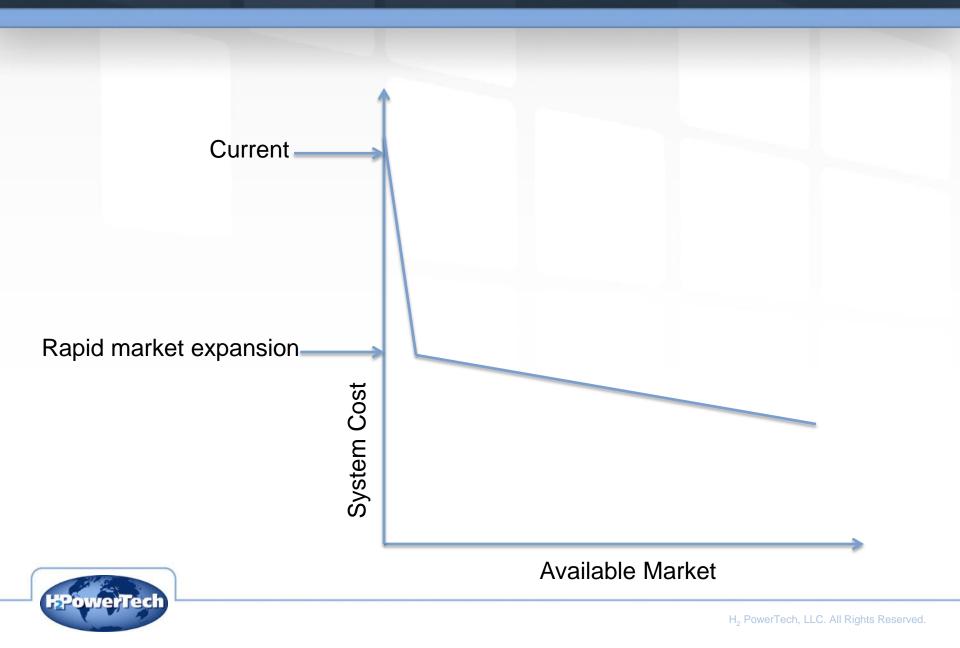
Market Adoption Curve?





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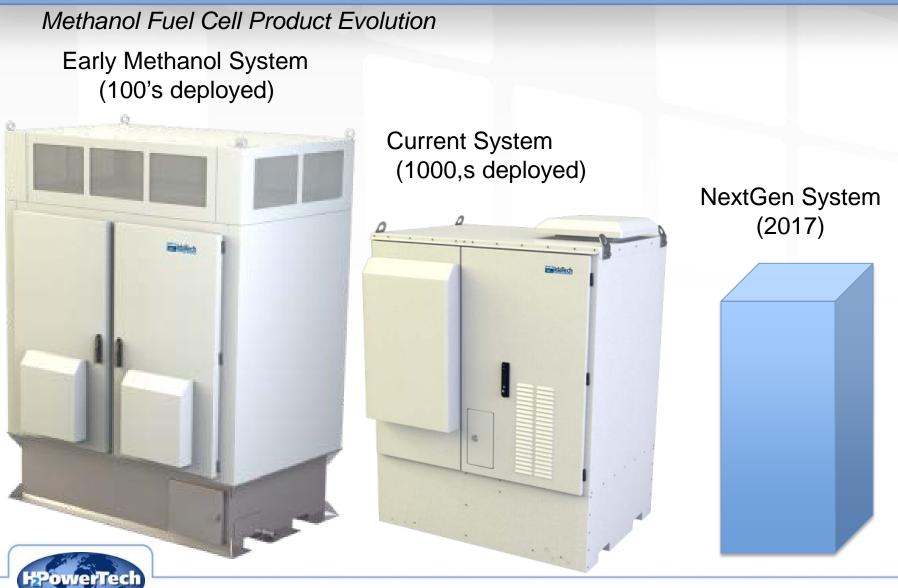
More Realistic Curve



Products and Supply Chain

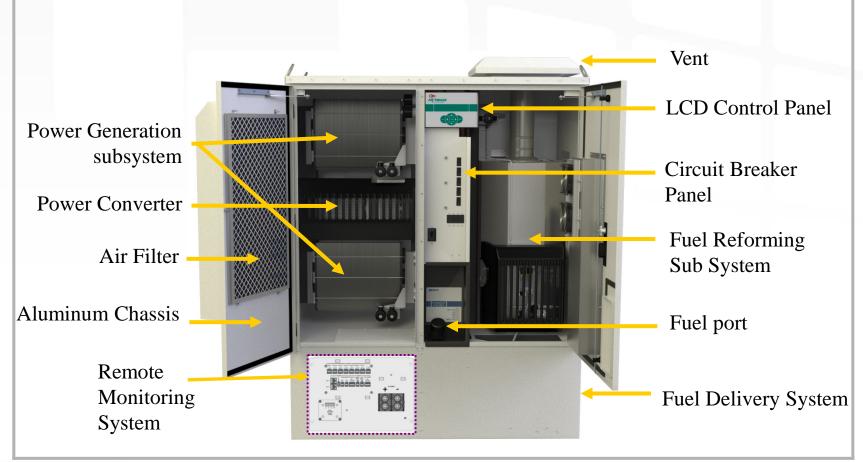


Methanol Systems



ME² POWER System Structure

Fuel Cell system is comprised of 3 main components: (1) fuel delivery, (2) fuel reforming, and (3) power generation subsystem.





Selected Part Characterization

Part	Description	Comments	
Graphite bipolar plates	Custom		
Metal bipolar plates	Custom	Development	
MEA's	Custom	Supply concentration	
Cathode air blower	Commercial	48 VDC, 400 SLPM at 1.5 pressure ratio	
Fuel pump	Commercial	24 or 48 VDC, 100 mL/min at 180 psig	
Coolant pump	Commercial	23 L/min at 530 mBar	
Combustion air blower	Commercial	24 or 48 VDC, 11.5g/s at 1.015 pressure ratio	
DC Converter	Custom	> 95% efficient, nominally 5kW output	
H2 pump	Custom	24 or 48 VDC	
Humidifier	Custom		
Solenoid operated valves	Commercial	12 or 24 VDC. Needs to seal against H2	



Examples of Parts



DC Converter



Humidifier



Graphite Bipolar Plate











