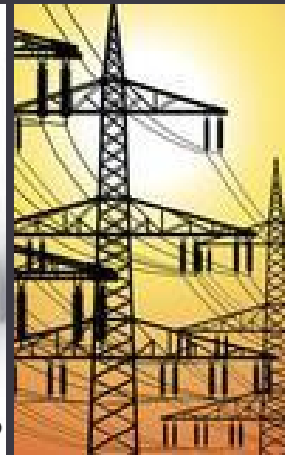
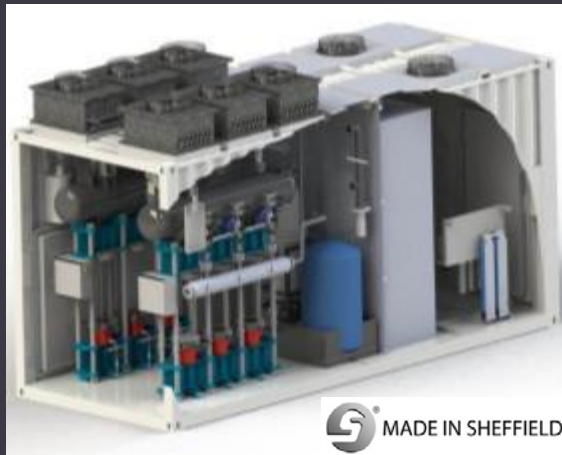


ITM POWER INC. CLEAN FUEL ITM Electrolysis at Forecourt Stations NREL Workshop Feb 27 & 28, 2014



ITM POWER INC. CLEAN FUEL ITM Electrolysis at Forecourt Stations

Contents:

- Introduction ITM Power Inc.
- Target Costs
- Challenges and Technology Developments - Continuous Improvements
- Renewable Energy - Power pricing is the Key
- HFuel PEM Electrolysis Module Spec
- 100 % Renewable Hydrogen Refuelling Project

INTRODUCTION - ITM POWER INC.

Established to enter the US Hydrogen market

Energy Storage:

- Pioneers of HES / P2G initiative in CA
- Board member of CHBC
- Committee member CHBC HES
- Member of FCHEA, CHFCA, OFCC and CALSTART

Clean Fuel:

- Founder member of H₂USA
- Actively engaged in CEC solicitations



ITM POWER INC.

ENERGY STORAGE | CLEAN FUEL



ITM POWER INC.

The Team so far.....



Graham Cooley

Graham joined ITM Power as CEO in 2009. Before that Graham was Business Development Manager in National Power plc and spent 11 years in the power industry developing energy storage and generation technologies. Before joining ITM Power Graham was CEO of Sensortec Ltd, Metalysis Ltd and Antenova Ltd.



Steve Jones

Steve has been with ITM since 2005 and has worked within core research, product testing and product development. Steve now heads up ITM's business development function and is MD of ITM Power Inc.



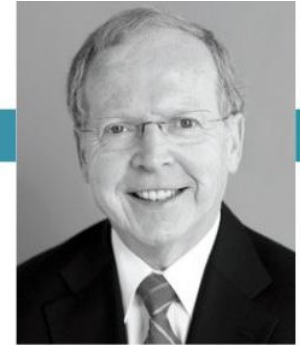
Geoff Budd

Geoff since August 2012 as ITM's North American Representative has focused on business development activities in the USA. Prior to that he spent 13 years with Ballard Power Systems in various roles, the last of which was as the Business Development Director in Europe. Geoff holds a BSc and a MBA.



Robert Rose

Robert Rose is executive director of the Breakthrough Technologies Institute, Inc. (BTI), and has been a member of the Secretary of Energy's Hydrogen and Fuel Cells Technical Advisory Committee since 2007. He also serves on the board of the American Councils for International Education.



Alan Lloyd

Alan Lloyd has served as the President of the International Council on Clean Transportation (ICCT) since 2006. He served as the Secretary of the California Environmental Protection Agency from 2004 through February 2006 and as the Chairman of the California Air Resources Board (CARB) from 1999 to 2004.

TARGET COSTS

FORECOURT

Target:

- \$2.30 per kg
- Forecourt production capacity 1,500 kg per day
- Footprint reduction

Power pricing is key – the future:

- Assuming 52kWh per kg
- Power pricing at \$0.04 per kWh
- OPEX Price \$2.3 per kg
- O&M estimate \$0.35 - \$0.40 per kg
- CAPEX with amortization over 10 years \$0.75 - \$0.90 per kg
- Carbon credits? Demand response credits?



MODULAR ELECTROLYSERS
HYDROGEN ENERGY SYSTEMS

CHALLENGES AND TECHNOLOGY DEVELOPMENTS

FORECOURT

Challenges:

- Footprint requirements – Greenfield vs. Brownfield sites, storage capacity on site.
- Alkali verses PEM - ramp up / down response / footprint / gas purity / safety
- Power infrastructure – 1500kg/day = 3MW electrolyzer

Focus on Technology Developments. Continuous Improvements:

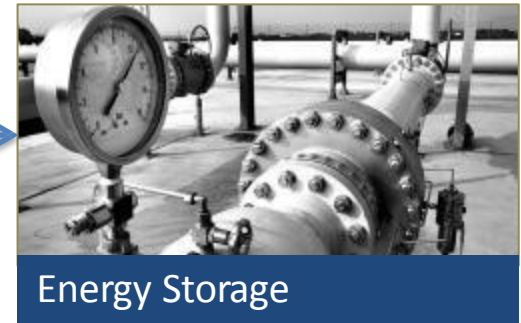
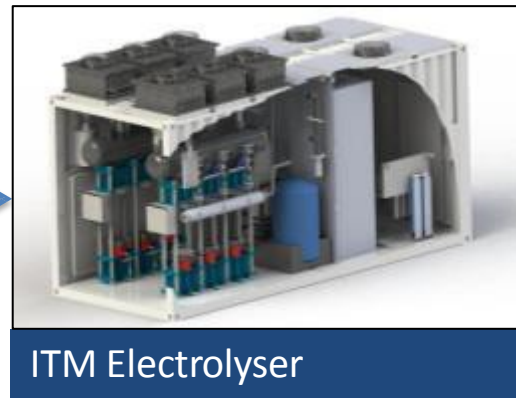
- Reduction in unit CAPEX costs – 50%
- Reduction in O&M costs – component selection
- Improvement in efficiency – 15-20%
- Packaging improvements.
- Overrun capacity 50% – make extra H2 when power prices low
- Focus on demand response linked to renewables
- Rain water/grey water harvest



MODULAR ELECTROLYSERS
HYDROGEN ENERGY SYSTEMS

KEY IS RENEWABLE ENERGY POWER PRICING - RAPID RESPONSE ELECTROLYSER

Available in MW modules | Responds in 1sec | Self pressurises to 80bar

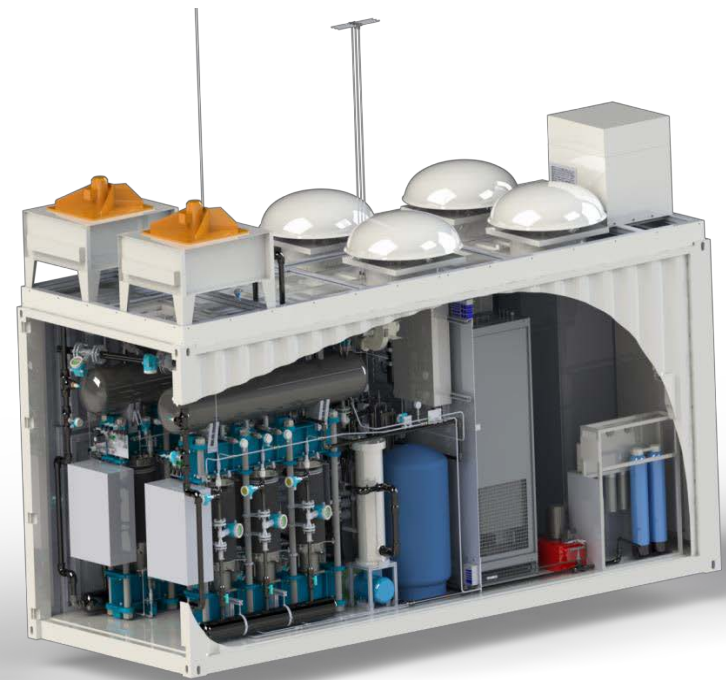


MODULAR | RAPID RESPONSE
HYDROGEN ENERGY SYSTEMS

ELECTROLYSIS MODULE SPECIFICATION

Rapid response | Self pressurising

- Technology - PEM
- Rapid response - 1 sec response time 0-100% load
- Self pressurising – up to 80bar
- Modular in MW units
- Need to focus on power contract to access cheap rate renewable electricity
- Dual use electrolyzers – vehicles & energy storage linked to renewable power / Biogas production



AEG
POWER SOLUTIONS

MODULAR ELECTROLYSERS
ENERGY STORAGE | CLEAN FUEL



Hyundai, Chino 100% Renewable Hydrogen Station



H2 Frontier Inc



ITM POWER INC. ENERGY STORAGE | CLEAN FUEL

