The Energy Shift is Underway

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Florø, Norway, September 18, 2019
Hydrogenics’ Markets

**Fuel Cells**
- Transit Bus
- Railway
- Commercial Vehicle
- Marine

**Electrolyzers**
- Industrial Hydrogen
- Energy Storage, especially for Transportation Fuels
- Green Chemicals, Methanol, Ammonia, etc.
- H2 Refueling Stations
Released 2019... Generation 3 and HD50

**Rated Power:** 50 kW\textsubscript{\textit{net electrical}}

- Increased power in a monolithic stack module
- Leading power density:
  - 2.0 L/kW
  - 2.1 kg/kW, incl. air delivery and coolant pump
Hydrogenics’ capabilities to deploy multi MWs in large ships

- Hydrogenics is applying fuel cell technology, system and certification know-how developed and validated for buses, trucks and trains to maritime applications
- Combining our validated MW FC Power Rack platform with our HD Power Modules

- 100 kW Maritime Container APU (Honolulu, Hawaii, 120 kW gross power)
- 200 kW Energy Storage Project at the Glencore Mine (Arctic Quebec, 240 kW gross power)
- 360 kW “Water Go Round” High Speed Ferry by Golden Gate Zero Emission Marine
- 1 MW KOLON Water & Energy, HyPM™-R1000 (South Korea, 1800 kW gross power)
The HyLYZER®-1000 PEM Electrolyzer

- 2160 kg of H2 per day per skid
- Low cost of installation:
  - no special lifting tools
  - small footprint (~20 m² skid)
- No chemicals
- High Efficiency
  PEM Stack: 40 to 47 kWh/kg
  Plant: < 50 kWh/kg
- 30 bar(g) pressurized H2 without a compressor
Relative Scale of Alkaline verses PEM Electrolyzer Stacks

**Alkaline**

- 33 each x 75 kW Stacks of 33 kg/day

**PEM**

- 1 each 2.5 MW Stack of 1080 kg/day
20 MW PEM HyLYZER™ Indoor Plant

Input Power: 20 MW
Capacity: 5,000 Nm³/h
10,000 kg/day
Footprint: Compact 20 X 20 m

Not shown: auxiliary supplies and cooling towers
25 MW PEM HyLYZER™ Outdoor Plant

Input Power: 25 MW
Capacity: 6,000 Nm³/h
13,000 kg/day
Footprint: 40 X 20 m
Berlevåg, Norway, Highly flexible electrolysers balancing the energy output inside the fence of a wind park

OBJECTIVES
• Direct connection to 45 MW wind park
• Enhanced wind integration through hydrogen
• Demonstrate multiple control systems and applications for electricity storage, mini-grid and fuel production
• Remote operation (difficult access)
• Techno-economic analysis and regulatory aspects of wind-to-hydrogen

SOLUTION
• 1x HyLYZER®-500-30 (PEM) with all peripherals to produce 400 Nm³/h H₂ (power: 2,5 MW)

PROJECT
• This project receives financial support FCH-JU funding: 4,9 M€, GA No 779469, duration: 2018-2021

PARTNERS

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Markham Energy Storage Facility: 5MW +/- 1.05 MW Grid Balancing Services for IESO – North America’s 1st Multi MW P2G Facility

100 kW FC Power Rack

2 @ 2.5 MW Stacks
Our success is the result of one essential ingredient: the human one.

Experience / Leadership / Technology

We’re Ready.
September 9, 2019 - The transaction for Cummins to acquire Hydrogenics for a value of just under $300 million USD is now completed.

In the deal, Air Liquide agreed with Cummins to increase their holding of Hydrogenics to 19%

Cummins holds the balance 81%

The acquisition of Hydrogenics, with Air Liquide’s support, accelerates Cummins’ ability to innovate and scale hydrogen fuel cell technologies across a range of commercial markets.

Owning both fuel cell and hydrogen generation from electrolysis capabilities will enable the company to offer a full, differentiated hydrogen solution, from start to finish, seamlessly integrated for customers.

"Air Liquide and Cummins have a shared vision of the key role that hydrogen plays in the energy transition. As a shareholder, and more widely as a company, Air Liquide is highly supportive of a hydrogen-based society," said Pierre Etienne Franc, CEO, The Hydrogen Company. "The two global companies, leaders in their sector, have complementary expertise in the development of hydrogen energy. Thanks to Cummins’ investment, we believe Hydrogenics technologies will be able to accelerate significantly their development."