

# H2-AMP

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# PLUG INTEGRATED Solutions Ecosystem







### The Global Leader in hydrogen solutions

Plug Power has been a leader in hydrogen solutions for 25 years.

As the world's most comprehensive hydrogen energy services company, Plug Power has built a global footprint in hydrogen generation, hydrogen supply, services and equipment.

Plug Power is also the world's largest user of liquid hydrogen and has built more hydrogen refueling stations than anyone in the world. 25 years

258 granted patents

40+ tons

of hydrogen consumed daily 60,000+

systems in service

832 million hours of operation

2,500+



# Global accounts rely on Plug



### **Electrolyzer Systems: Versatile and Scalable**



	<image/>	
1 MW System	5 MW System	10 MW System
200 Nm <sup>3</sup> /hr, 425 kg/day	1000 Nm <sup>3</sup> /hr, 2125 kg/day	2000 Nm <sup>3</sup> /hr, 4250 kg/day
One 1 MW Allagash Stack	Five 1 MW Allagash Stacks	Ten 1 MW Allagash Stacks
Fully containerized solution (standard 40 ft / 12.2m ISO container)	Includes full BoP for turnkey simplicity	Includes full BoP for turnkey simplicity
Scalable Drop-and-Play convenience	Efficient, scalable solution for large volume H <sub>2</sub> plants	Efficient, scalable solution for large volume H <sub>2</sub> plants

### **1 MW Allagash Stack platform**



Best-in-class price-performance in the production range from 30 Nm<sup>3</sup>/hr to 400 Nm<sup>3</sup>/hr The Allagash Stack is at the heart of our 1, 5, and 10 MW modular system building blocks

#### **ENOUGH CAD DRAWINGS!**











- 20,000 Hour Seven Cell Demonstration
  - <2.0 V at End
  - <2.0 mV/1000h voltage rise</p>
  - No measurable membrane thinning
- 20 Full Stacks Delivered

10



### DRIVING SCALE: FIRST PEM GIGA FACTORY



### **Rochester**, NY

Australia, South Korea, France facilities also announced



### **Second Generation 1 MW Allagash**



- Maintain Reliability of 1<sup>st</sup> Generation
- Designed for Manufacturing
  - Greatly Reduce Waste Generated
  - Labor Reduction
    - ~75% Reduction
    - Online Quality
- Enhanced Performance/Capability





### Strong Reduction in Cost while Improving Performance in the Near Term







# **Enough Iridium?**



- ~10 MT/year
- Pt is ~200 MT/year



- Current Baseline: 0.2 kg Ir/MW
  - If all Ir used in PEM electrolysis; 50 GW/year
  - Added Solar/Wind Capacity: 50 GW/year
  - 20% Penetration would be high
- Beta-Tested Technologies
  - 500 GW/year
  - With 20% Penetration of all new wind and solar would use 2% Supply

### What if There was no Iridium?





AEM and Pt-Based technologies are a viable alternative

- 10% more energy needed with Pt
  - Assume \$0.02/kWh
  - 50 kWh/kg
  - Adds \$0.10/kg H<sub>2</sub>



# What Worries? Expanding Supply Chain



- Supply Chain Gaps in
  - Catalyst Manufacturing
  - Catalyst Coating
  - Anode PTL
  - Cathode PTL
  - Washers
  - Titanium Forming
  - Coating