U.S. Department of Energy Manufacturing Automation and Recycling for Clean Hydrogen Technologies Virtual Experts Meeting

Organized by the U.S. Department of Energy (DOE) Hydrogen and Fuel Cell Technologies Office (HFTO), Advanced Manufacturing Office (AMO), National Renewable Energy Lab (NREL), and Oak Ridge National Lab (ORNL)

May 24-26, 2022

All times in Eastern Standard Time (EST) and subject to change

Purpose:
The 2021 Bipartisan Infrastructure Law (BIL) initiated $500M of activities for clean hydrogen technology manufacturing and recycling to meet the Nation's decarbonization goals. Manufacturing efficiencies of key components can be improved via automation to increase throughput and minimize handling steps. End-of-life recovery and recycling will benefit from cost-effective, clean, and precise disassembly processes. The state-of-the art for manufacturing leverages some automation but has gaps. The state-of-the-art for remanufacturing and recycling is still manual/bottlenecked for many steps. Manufacturing and recycling advances could have crosscutting benefits for fuel cells, electrolyzers, and related clean hydrogen equipment.

Goals for Experts Meeting:

- Identify RD&D gaps in automation/scaling of manufacturing and recycling for polymer electrolyte membrane (PEM) and solid oxide cells/stacks/systems and hydrogen storage tanks
    - Determine what scalable manufacturing and recycling technologies/processes are ready for larger demonstrations at pilot scale to de-risk industry adoption
    - Identify what additional R&D could lead to pilot demonstrations in 2-4 years
- Create opportunities for experts in differing areas to overlap in expert presentations, panel discussions, and moderated breakout sessions to address needs

Tuesday 5/24: Manufacturing Automation for Clean Hydrogen Technologies

11:00 AM	**HFTO Welcome and Introduction** Dimitrios Papageorgopoulos, **DOE, HFTO**
11:15 AM	**Manufacturing Expert Presentations** Brian James, **Strategic Analysis, Inc.** Kathy Ayers, **Nel Hydrogen, US** Todd Striker, **Cummins, Inc.** Dan Hawtof, **Corning Inc.** Michael Skocik, **Advanced Robotics for Manufacturing (ARM) Institute**
1:30 PM	**Break**
2:00 PM	**Cell Manufacturing and Assembly Automation Expert Panel** Steve Rock, **Advent Technologies, Inc.** Natalya Bailey, **Bloom Energy** Scott Swartz, **Nexceris, LLC** Gary Robb, **DOE, HFTO**

3:00 PM	**Breakout Sessions: Cell manufacturing automation, inspection, and supply chain** 1. Cell Manufacturing Automation Needs 2. Inspection/Component Tracking for both BOL and EOL 3. Materials/Components Flow and Supply Chain Analysis
4:00 PM	**Wrap-up and Adjourn**

Wednesday 5/25: Manufacturing Automation for Clean Hydrogen Technologies

11:00 AM	**HFTO Welcome and Introduction** Colin Gore, **DOE, HFTO**
11:10 AM	**Carbon Fiber/Composite Manufacturing** Amit Naskar, **ORNL**
11:45 AM	**Stack Assembly and BOP Manufacturing Automation Expert Panel** Jessica Elwell, **OxEon Energy** Robert Mount, **Renewable Innovations** Tony Leo , **FuelCell Energy, Inc.**
12:45 PM	**Breakout Sessions: (Dis)assembly automation, inspection, and standardization** 1. Stack and System Assembly/Disassembly Automation Needs 2. Rapid Inspection Opportunities 3. Materials and Component Supply Chain Needs for Stacks/BOP
1:45 PM	**Break**
2:15 PM	**Carbon Fiber and Composites Manufacturing Expert Panel** Dylan Winter, **Hexagon** Glade Gunther, **Solvay** Cassidy Houchins, **Strategic Analysis, Inc.** Anand Rau, **PNNL** Daryl Thompson, **HyPerComp Engineering, Inc.**
3:15 PM	**Breakout Sessions: Process opportunities, environmental impacts, supply chain** 1. Carbon fibers and onboard storage tanks #1 2. Carbon fibers and onboard storage tanks #2
4:15 PM	**Wrap-up and Adjourn**

Thursday 5/26: Recycling, Remanufacturing, Reuse of Clean Hydrogen Equipment

11:00 AM	**HFTO Welcome and Introduction** Sunita Satyapal and Dimitrios Papageorgopoulos, **DOE, HFTO**
11:15 AM	**Recycling Expert Presentations** Ross Gordon, **Johnson Matthey** Andrew Park, **Chemours** Steve Grot, **Ion Power** George Lucas, **Gannon Scott** Karen Swider Lyons, **Plug Power** Paul Wilkins, **Bloom Energy** Tedd Lister, **INL/Quantum Ventura** Soydan Ozcan, **ORNL**
2:40 PM	**Break**
3:00 PM	**Breakout Sessions: Materials, environmental impact, component value tracking** 1. Pt, Ir, ionomer, carbon, and other materials (PEM cells) 2. Rare earth elements, stack and BOP components (solid oxide cells) 3. Carbon fiber and composites (H_2 storage tanks)
4:00 PM	**Wrap-up and Adjourn**