Smart Electric Power Alliance

Energy Bootcamp Courses

Online Learning by SEPA

Hydrogen Fundamentals

3-Part Course | 7 Hours

November 7, 8, and 9, 2023, from 2:00 - 4:30 PM Eastern

On-Demand Available November 23, 2023

Session 1: Hydrogen—the Advantages and Challenges, Technology, Costs and Current Applications

- The initial push for hydrogen—starting with industrial applications.
  - Hydrogen in the industrial sector will create scale (e.G., Steel, cement).
  - Potential transportation applications: long-haul trucking, rail, maritime.
  - Long-term energy storage.
- The chemistry: advantages and challenges.
  - Molecular structure and why that matters.
  - Energy density.
  - Flame speed.
  - Other essential characteristics.
- Necessary price points and comparisons: technology, costs and current applications.
  - Grey hydrogen (steam methane reformation).
  - Blue hydrogen (carbon capture and storage).
  - Purple hydrogen (nuclear).
  - Turquoise hydrogen (pyrolysis).
- Green hydrogen (electrolysis from renewables).

Session 2: Green Hydrogen: From Creation to Consumption—Challenges Along the Entire Chain

- Electrolyzer technologies, current costs and challenges.
  - Solid oxide.
  - Alkaline.
  - Polymer electrolyte membranes (PEMs).
  - Anion exchange membrane.
  - Wright's Law and future cost projections.
- Transportation.
  - Compressed.
  - Liquified.
  - Liquid organic carriers.
  - Inorganic carriers (e.g., ammonia).
  - Storage (e.g., caverns).
  - "Well to wheel" efficiency losses in chain.
- Electric power grid applications.
  - Behind-the-meter generation for reliability/resilience – emerging use cases.
  - Grid-scale inter-seasonal storage to decarbonize the grid.
  - Carbon-light electricity generation: methane/hydrogen fuel mixtures: current turbine capabilities.

Session 3: The Futre of Hydrogen: Government Programs, Grid Applications and Proposed Projects

- Government programs driving scale.
  - Japan.
  - China.
  - Australia.
  - EU.
  - U.S.
- Grid applications and recent proposed projects.
  - Intermountain (LADWp).
  - New Fortress/GE—Hannibal Ohio.
  - Florida Power and Light.
  - San Diego Gas & Electric.
  - Douglas County Pud No. 1.
- Meaningful hydrogen production projects.
  - Australia.
  - North Sea.
  - U.S.
- What to watch for in the coming years.

Questions?

Contact learning@sepapower.org

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