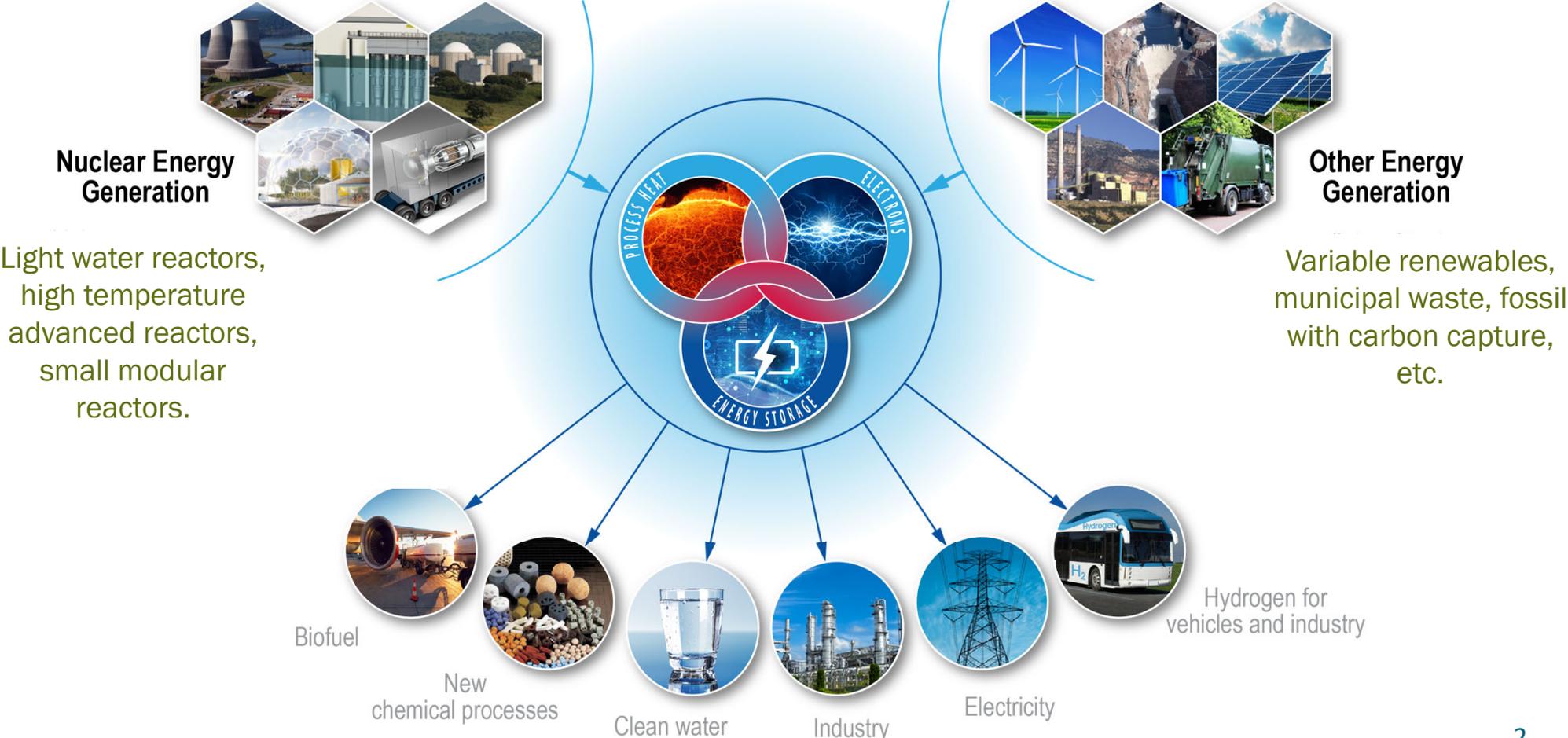


Industrial Process Emissions Reduction Workshop Office of Nuclear Energy

March 2, 2023

David Henderson
Office of Nuclear Reactor Deployment,
U.S. Department of Energy

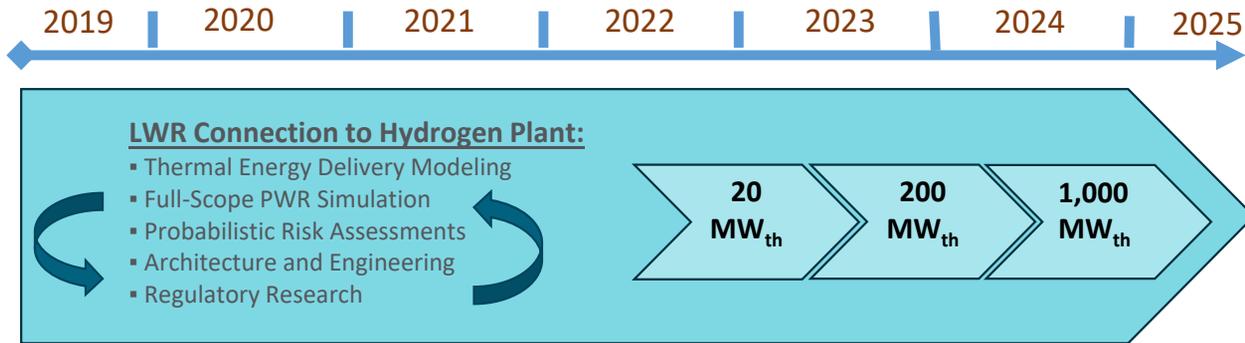
The Future Landscape for Nuclear Energy Systems



Office of Nuclear Energy Focus Areas



LWRS Flexible Plant Operation and Generation Pathway seeks to diversify and increase the revenue of the existing Light Water Reactor (LWR) fleet



Advancing electrical, thermal and chemical energy technologies that provide pathways to maximize the use of advanced nuclear energy sources in the industrial, transportation and commercial sectors.

Thermal Systems R&D:

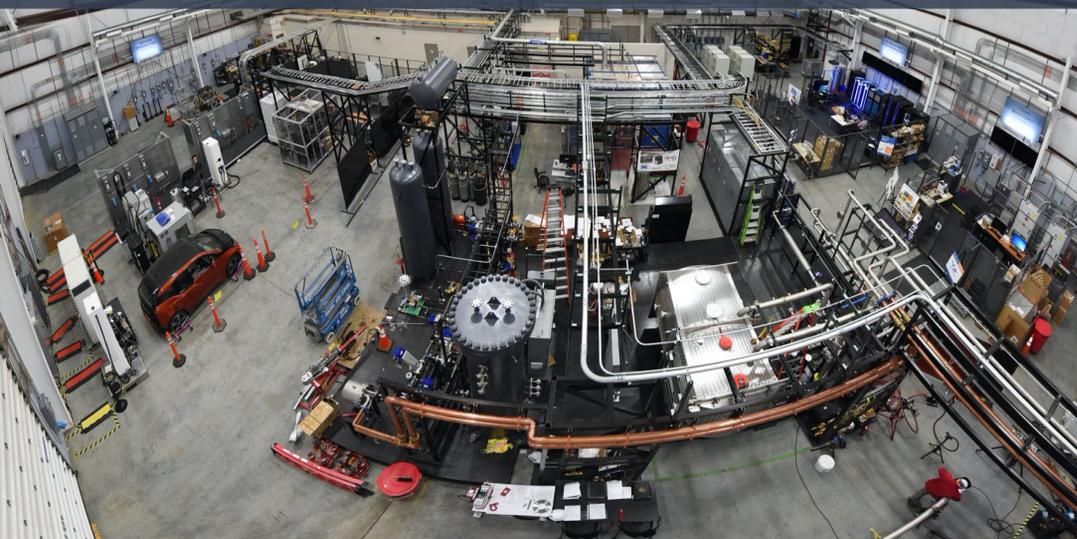
- Extraction
- HX
- Fluids
- Pipe
- Insulation
- Valves
- Pumps
- Heat Pumps
- Heat Engines
- System Design
- Controls

Nuclear Applications R&D:

- Industrial Requirements
- Process Models
- Process Validation
- Reference Plant Design
- Cost Analysis
- Emissions Analysis
- Site Integration & Safety Basis
- Human Factors / Controls

Capabilities Supporting the Expansion of Nuclear Energy Beyond Electricity Generation

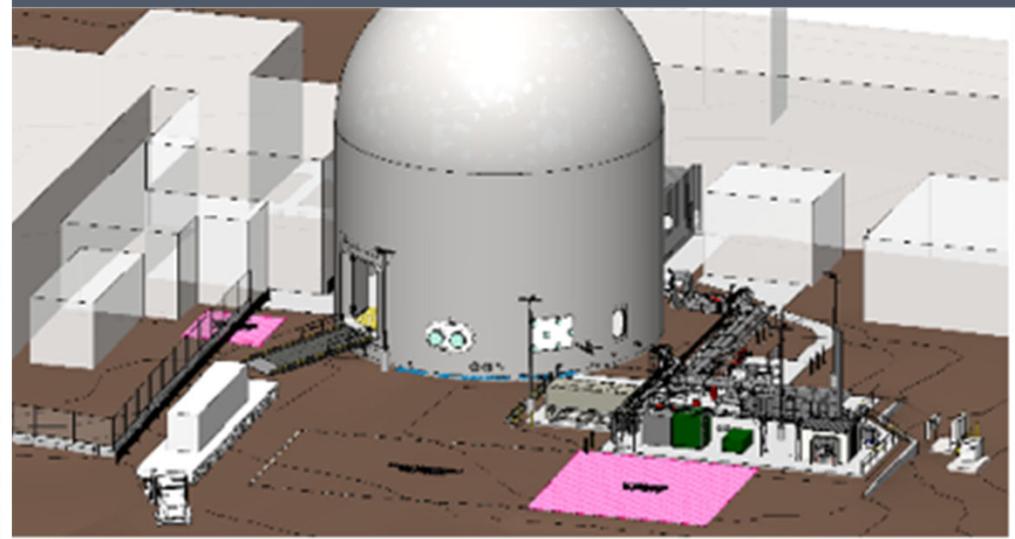
Dynamic Energy Transport and Integration Laboratory (DETAIL)



Microreactor Applications, Research, Validation & Evaluation (MARVEL)



Demonstration and Operation of Microreactor Experiments (DOME)



First of a kind Nuclear-H₂ production demonstration projects

Constellation (Exelon): Nine-Mile Point NPP



- 1 MWe Low Temperature Electrolysis (LTE)
- Using “house load” power
- H₂ production beginning ~October 2022

Nine Mile Point Nuclear Power Plant

Davis-Besse Nuclear Power Plant



Energy Harbor: Davis-Besse NPP



- 1-2 MWe LTE
- Power provided by completing plant upgrade with new switch gear at the plant transmission station
- H₂ production beginning ~2023/24

Prairie Island Nuclear Power Plant

Palo Verde Generating Station



Xcel Energy: Prairie Island NPP



- 150 kW High Temperature Electrolysis (HTE)
- Engineering planned for tie into plant thermal line
- H₂ production beginning ~Q1 2024

APS/PNW Hydrogen: Palo Verde Generating Station



- 15-20 MWe LTE H₂ production, ~6-8 tons H₂/day
- H₂ storage + H₂ / gas peaking turbines (50%), syngas pilot
- H₂ production expected 2024 (Award still under negotiation)



Thank you!

<https://ies.inl.gov/SitePages/Home.aspx>

<https://lwrs.inl.gov/SitePages/FlexiblePlantOperationGeneration.aspx>

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