Green Hydrogen - Utilization

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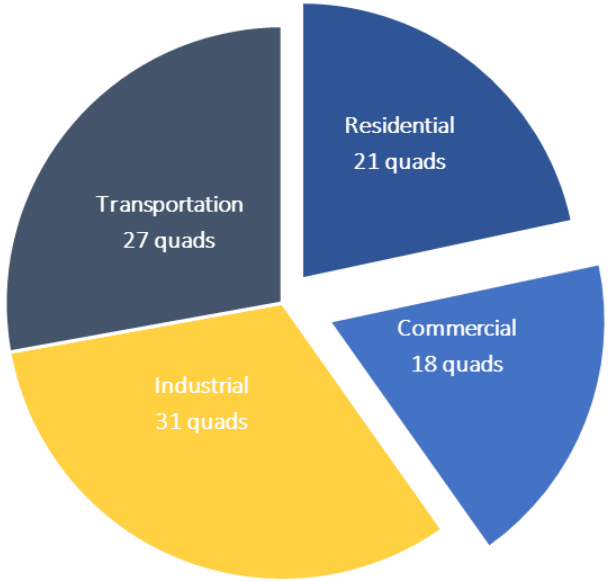
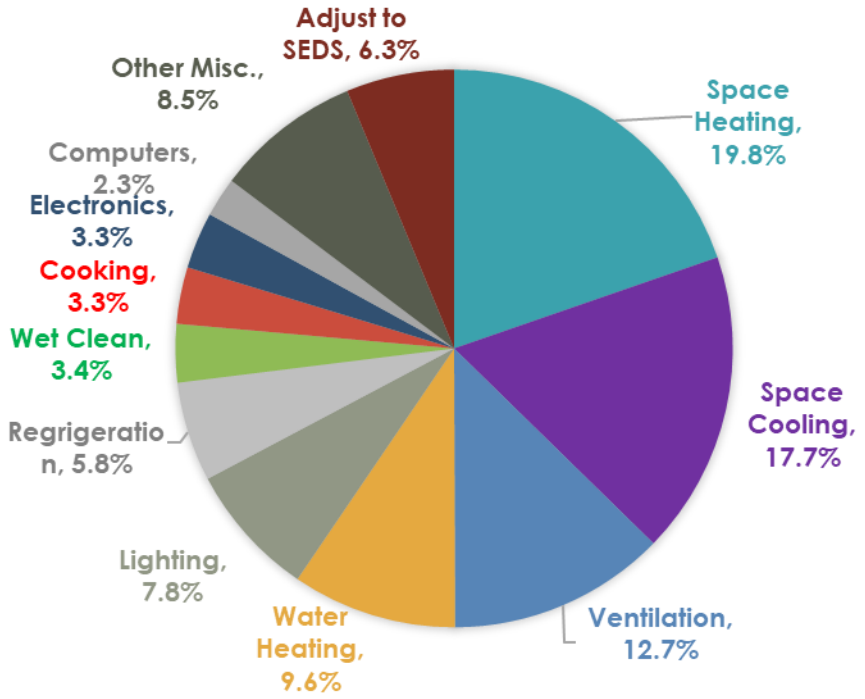
Introduction

ORNL – Buildings R&D

- BTRIC: DOE User Facility
- Developing advanced, energy efficient equipment for deployment in residential and commercial buildings
- Efficiency, Resiliency, Emissions, Carbon foot-print

U.S. Energy Consumption



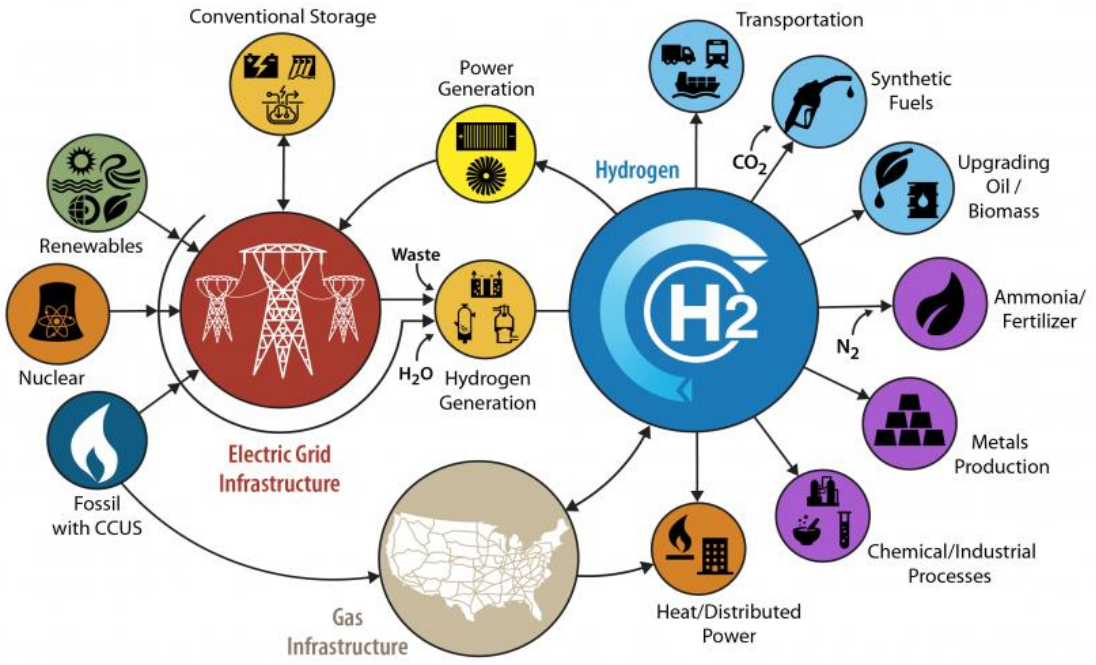


Buildings

- Energy use - 40% of U.S. total
- Electricity use - 75% of U.S. total
- Primary energy resources – Electricity, Fossil fuels
- Natural gas use - 28% of U.S. total
- Buildings energy - ~$400 billion per year, 39% of U.S. carbon emissions

Green Hydrogen for Decarbonization

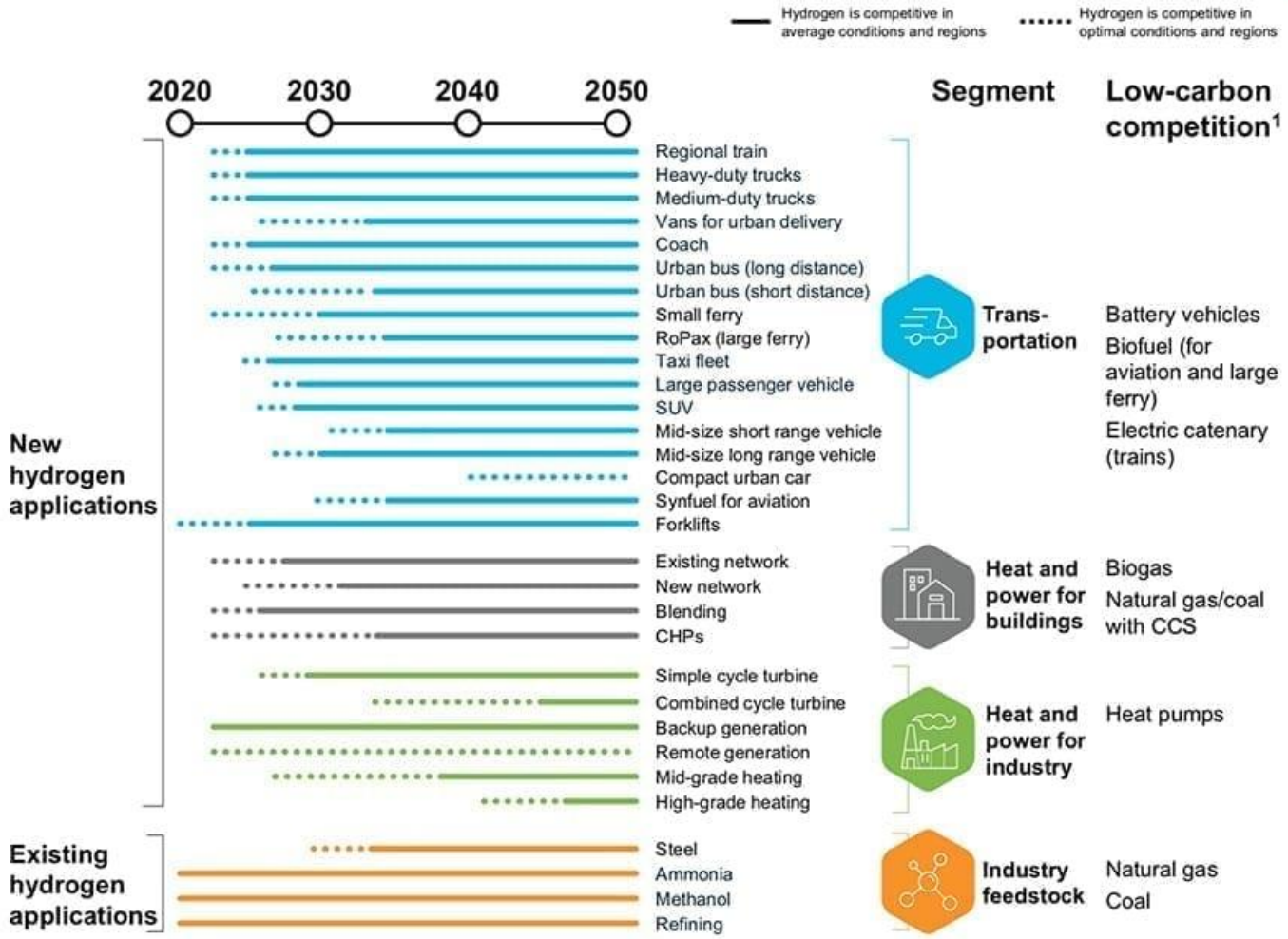
- US Dept. of Energy H_2 Earth Shot
- Clean, sustainable hydrogen from domestic renewable energy resources
- Long-term energy storage (of excess renewables) in chemically bound form at a utility scale
- Affordable clean energy transition
- Buildings, transportation, and industry



Hydrogen production (1-1-1)

U.S. Hydrogen Economy

Ensure the U.S. achieves a 100% clean energy economy and reaches the net-zero emissions no later than 2050.



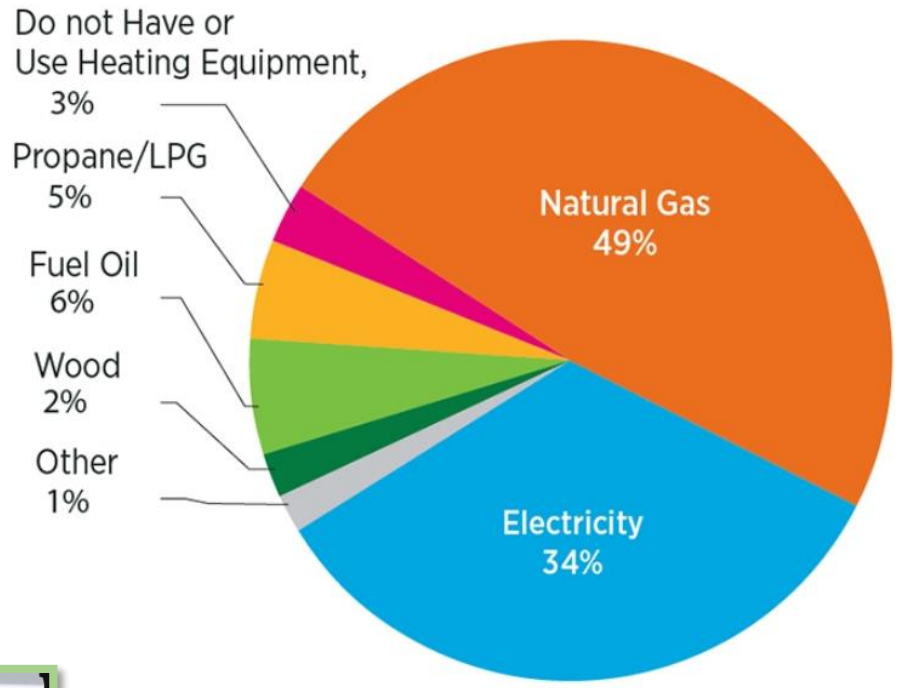
ORNL Research Thrust Areas – H_2

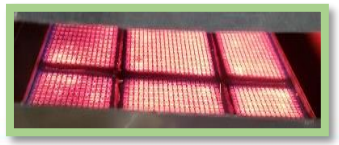
- Methane to Hydrogen – Pyrolysis at scale & SMR/ATR with carbon capture
- Electrolysis – PEM, SOE, AEM, RSOC (materials, reliability, cost)
- Sequestration – Sub-surface, conversion to fuels/chemicals
- Materials – pipeline, leak sensing, diagnostics, high strength, weld
- Hythane, Hyblend – Engines, turbines, furnaces, SOFC, G2P
- Decision science

Building Energy

Green hydrogen blended gas

- 5% to 50+ % increase over time
- Gas utilities/American Gas Association road map
- Building net-zero targets
- Equipment and appliances compatibility
- OEM urgency
- Cogeneration systems (e.g., Thermionics, TPV, SOFC, PEM, RSOC)





Key Takeaways/ Recommendations

- Buildings - one of the major and fastest growing energy consumers, present both challenges and R&D opportunities
- Decarbonization of buildings requires technologies to address energy efficiency, resiliency, carbon foot-print, and cost
- HENG, Hyblend etc. are necessary bridging solutions
- H_2 as a long-term storage for grid stabilization and decarbonization
- On-site hybrid cogeneration – to lower the primary energy consumption, carbon intensity, and utility bills

Thank You

For discussions/suggestions/queries
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