Project Title: Hydrogen Storage for Flexible Fossil Fuel Power Generation: Integration of Underground Hydrogen Storage with Gas Turbine

- **Award Number: DE-FE0032012**

Prime Recipient: GTI

PI: Jeff Mays

Sub-Recipients: University of Illinois Urbana Champaign
Cost-Share Partners: MHI, Ameren, Hexagon Purus, LCRI

Location: Des Plaines, IL

DOE: $199,961
Non-DOE: $116,085

Total: $316,046 (37% Cost Share)

Objectives

- Advance the commercialization of a zero carbon, fossil based integrated energy production system utilizing
  - Economical low-carbon H_2 production
  - H_2 storage (subsurface and above ground)
  - High-H_2 fired gas turbine
  - CO_2 sequestration
- And demonstrates the ramping and dispatch capabilities of traditional Electric Generating Units (EGU) powered by blended NG/H2 turbines

Relevance and Outcomes/Impact

- Demonstrate capabilities of H2 storage in unconventional subsurface strata – sedimentary rock
- Validate <35% increase in LCOE for low-carbon power generation
- Demonstrate fuel blending from multiple sources
- Validate economical, low-carbon hydrogen production

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1) Gas Turbine EGU via Blue Hydrogen and H2 storage in sedimentary rock strata
    a) MHI H-25 gas turbine (30-40 MWe, simple cycle or cogeneration)
    b) GTI Compact Hydrogen Generator (CHG), 57 MWth (17.1 MMSCFD of H2)
    c) 2.2M SCF of above ground storage, 2.8M SCF of underground storage
    d) Electricity sales and possibly steam for heating
2) Target storage duration is 24+hr for this proof of concept
3) Gaps/Challenges
    1) H2 Turbine – Project enables demonstration of >90% H2, can lower/offset with NG if required
    2) CHG – Scaleup is biggest gap. Use interim demonstration scale (~11 MWth) to demonstrate commercial construction and processes
    3) Underground H2 Storage - also a significant gap. Assessing reservoir behavior with H2 instead of NG and understanding changes to reservoir requirements for acceptable operation
4) Identifying reservoir restrictions and assessing CAPEX for well preparation and completion

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What is needed to be able to pilot **a demo plant by 2025?**

Continued development of 100% H2 Turbine Development with dual fuel capability

What does NETL need to consider in regard to a **low-carbon future**?

GTI foresees storable hydrogen as necessary for a low carbon future. There is a need to Advance H_2 storage in unconventional reservoir

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