



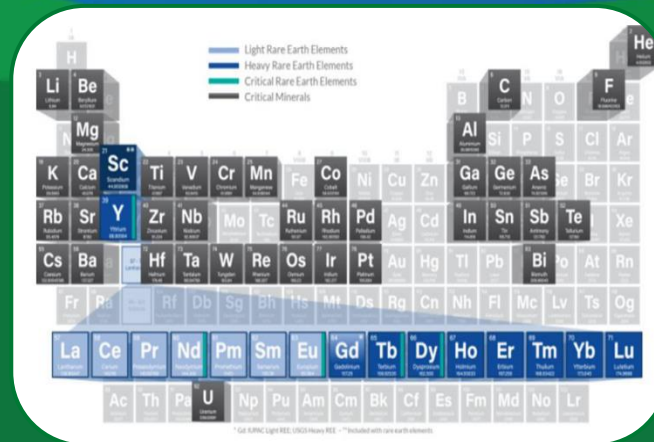
U.S. DEPARTMENT OF
ENERGY

Fossil Energy and
Carbon Management

DOE FECM Hydrogen Priorities 2024 CETP Call

Call Module 5 Hydrogen and Renewable Fuels

July 26, 2023



Fossil Energy and Carbon Management

FECM Role in Clean Hydrogen/Clean Fuels

- Co-Gasification of Biomass, MSW, Waste Coal & Plastic Wastes, with CCS to Produce Clean Hydrogen
 - Impetus to spur hydrogen production technology to underpin decarbonization goals
 - Technological aspects of co-gasification of biomass and carbonaceous mixed wastes such as coal wastes and plastics — **carbon recycling potential**
- Production of low-cost, carbon-neutral hydrogen from sustainable feedstocks/biomass
- Power generation and/or long duration energy storage using zero-carbon fuel turbines and/or reversible solid oxide cells



FECM Strategic Vision

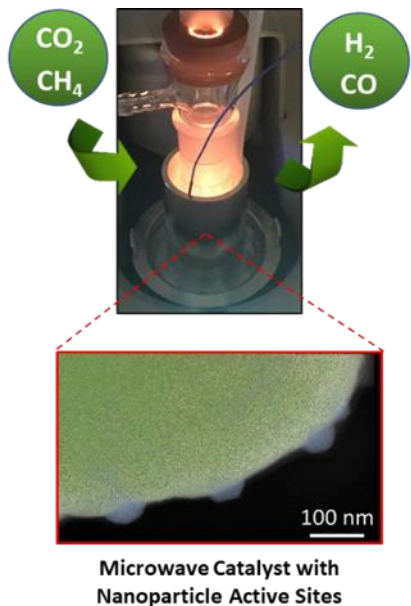


Read FECM's Entire Strategic Vision
by Scanning the Code Above

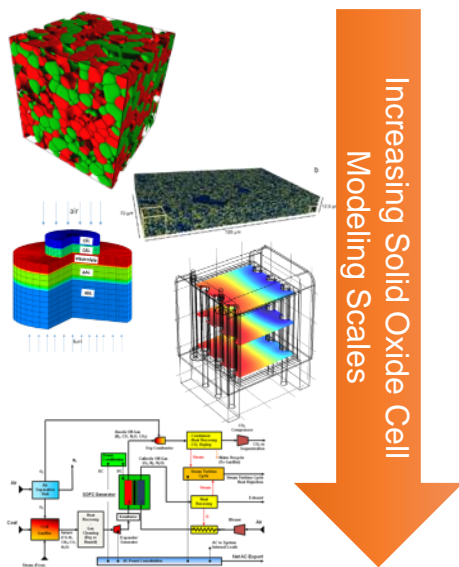
Clean Hydrogen Production

Hydrogen Production Pathways of Interest

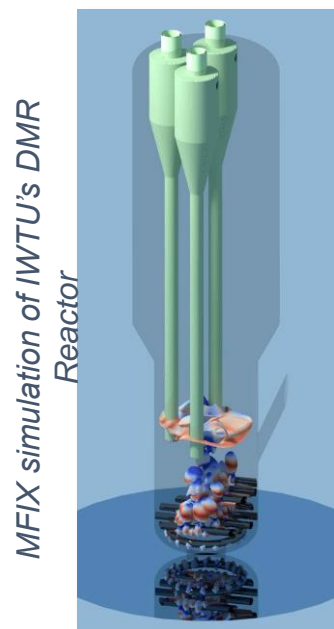
Advanced **natural gas reforming** technologies



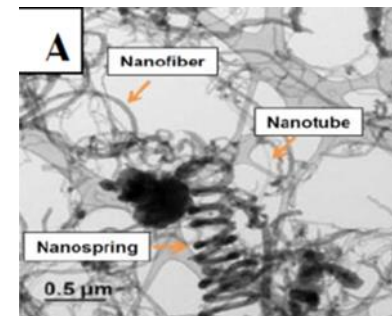
Hydrogen production from water and excess electric power using **solid oxide electrolysis cells**



Co-gasification of biomass and wastes—enabling Biomass with Carbon Removal and Storage (BiCRS)



Methane pyrolysis for hydrogen and solid carbon co-products



Solid carbons recovered from a catalytic natural gas pyrolysis process

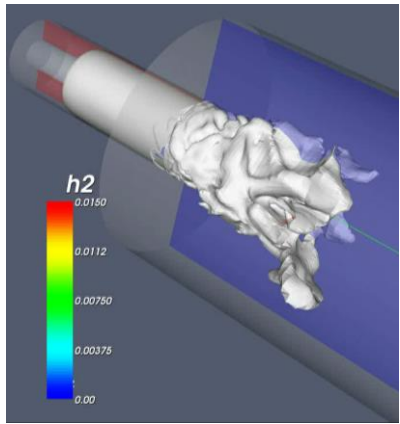
Chemical looping reforming and gasification with oxygen carriers



50 kW Chemical Looping Reactor

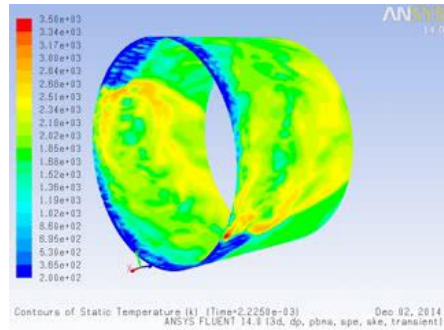
Clean Fuels Utilization

Hydrogen, ammonia and synfuel **gas turbine combustion**



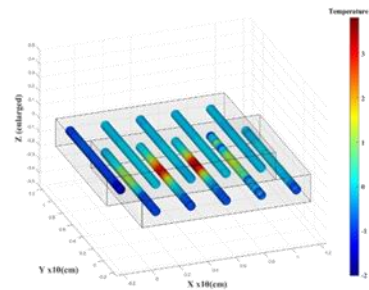
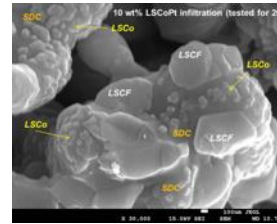
LES Simulation of combustor flashback with increasing H_2 content in natural gas

Hydrogen-fueled **rotating detonation combustion** for turbine efficiency increases

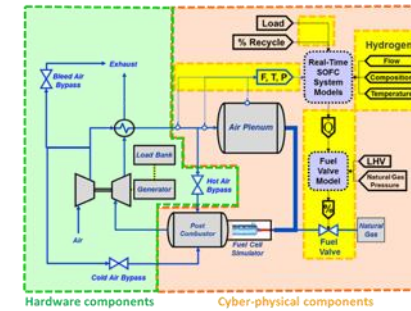


Simulations and high-pressure experiments on rotating detonation combustion

Solid oxide fuel cells and reversible solid oxide cells

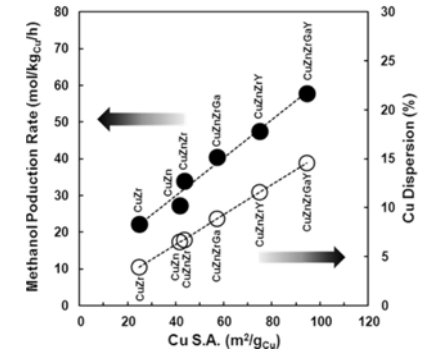
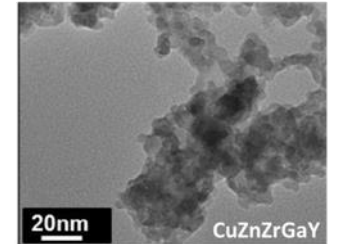
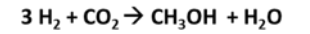


Operability of R-SOCs with **integrated energy systems**



Hybrid Performance Cyber-Physical Test Facility

Improved catalysts for methanol and DME **chemical synthesis from hydrogen**



NETL's optimized methanol synthesis catalyst



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Thank You! Questions?

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