

Enabling the Pathway to Economy-Wide Decarbonization

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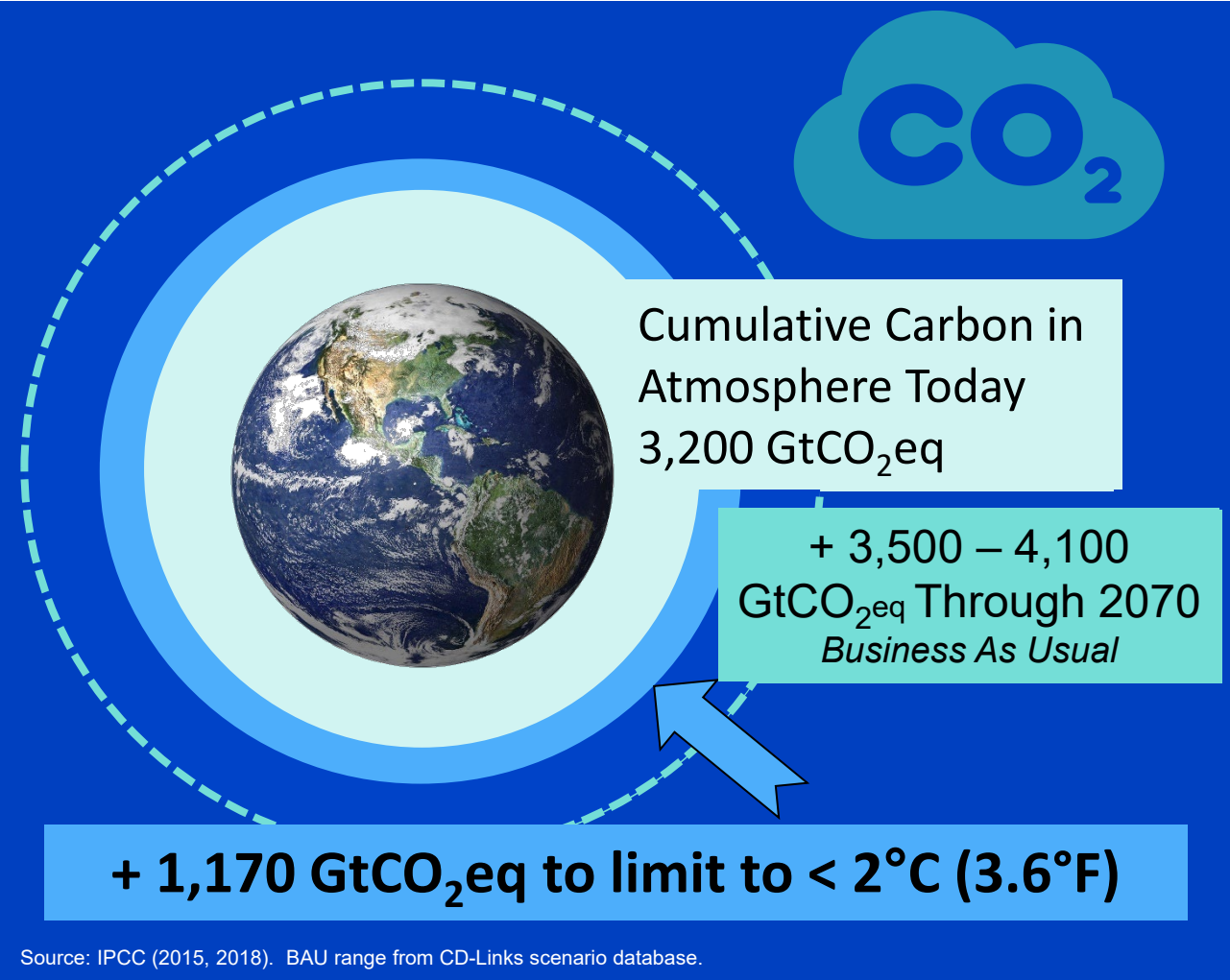
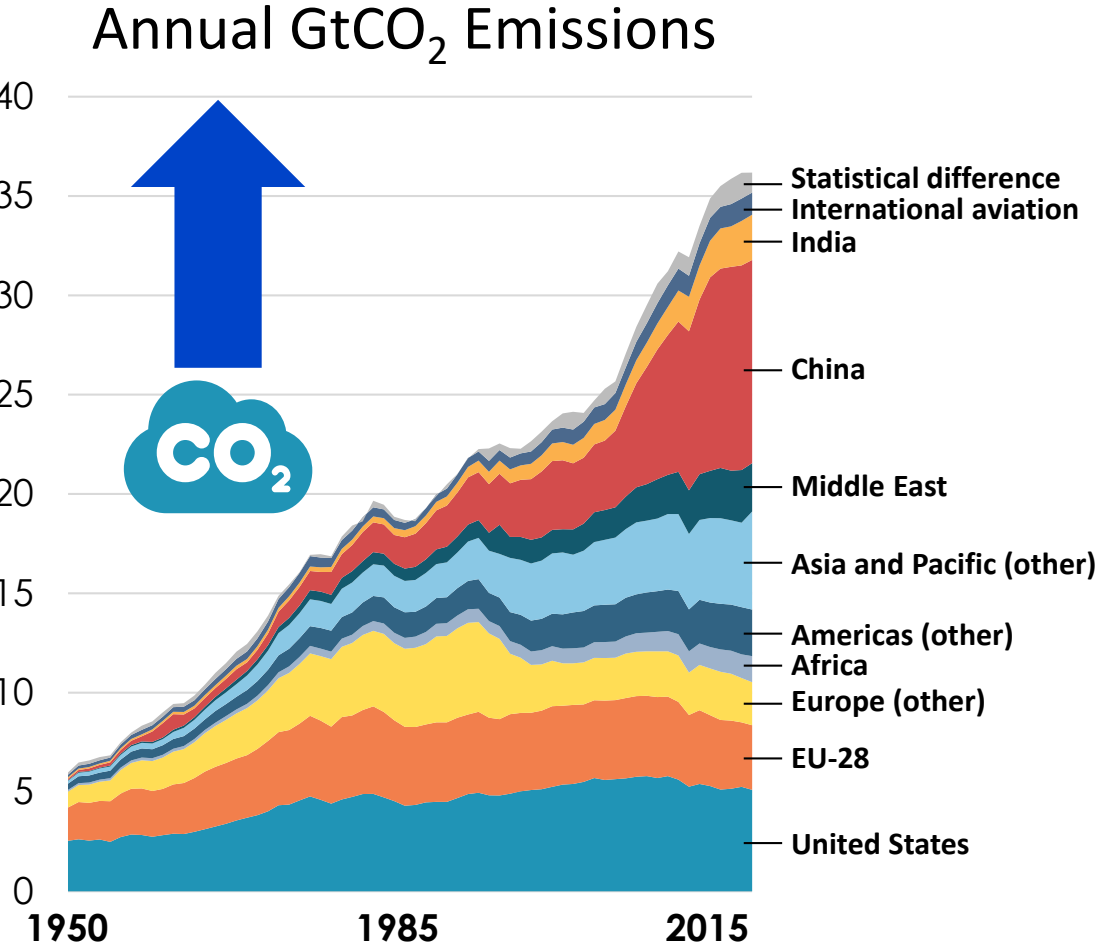
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ETN Global Virtual Annual General Meeting & Workshop

16 March 2021

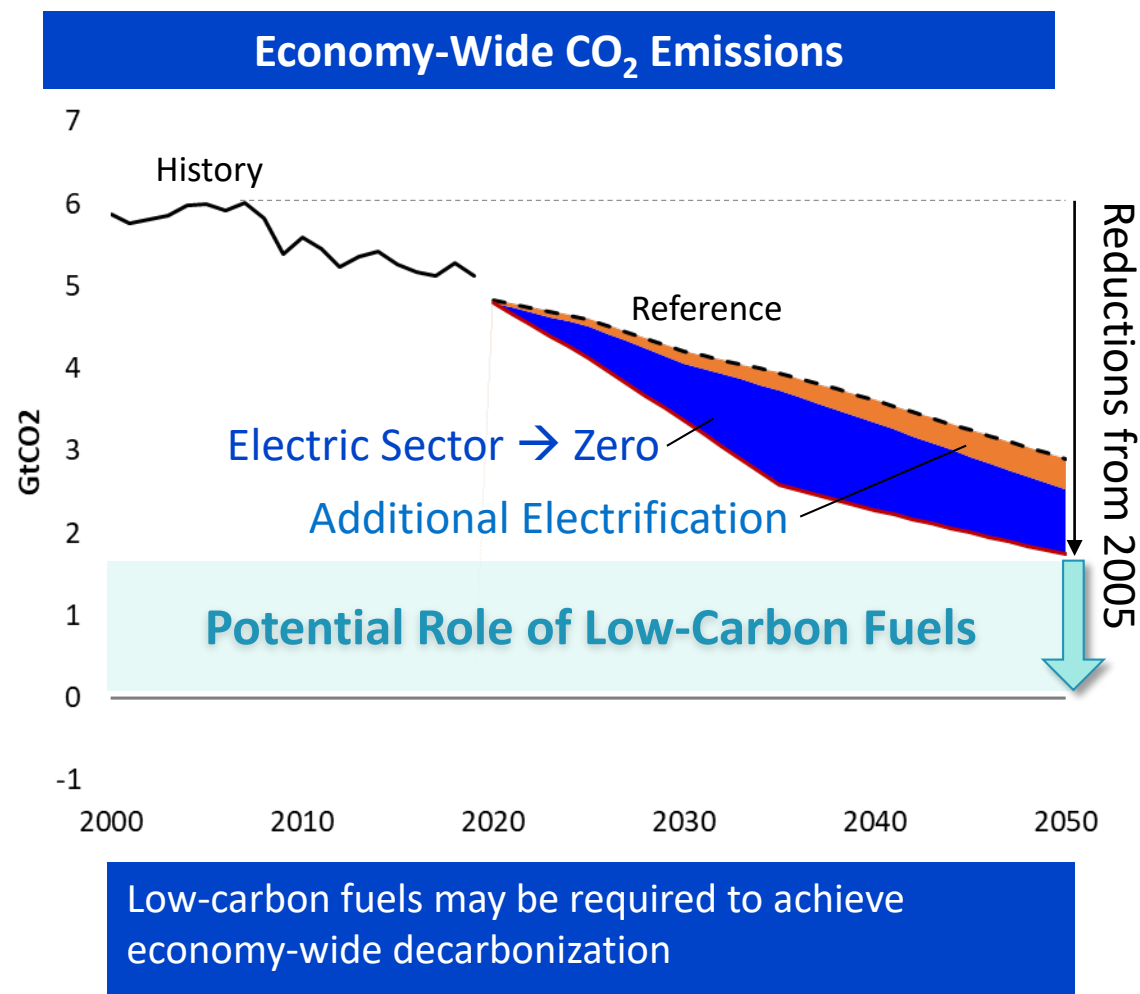


Global Carbon Dioxide Emissions Trends



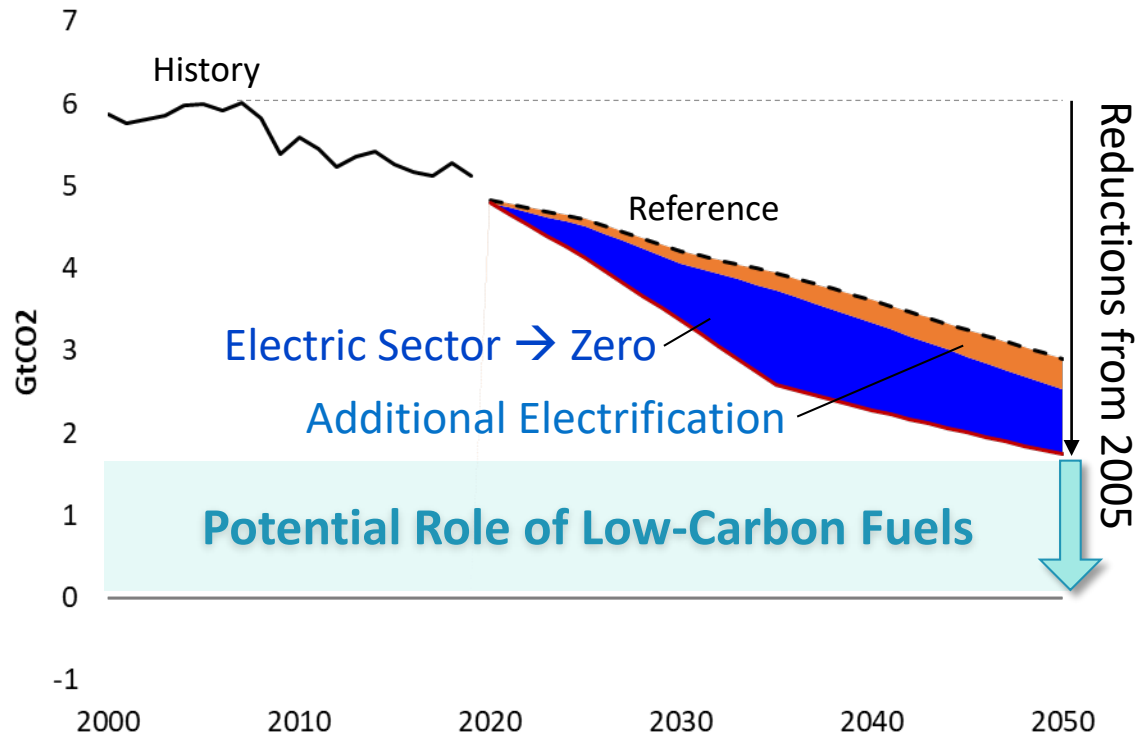
CO₂ emissions could outpace target for maintaining < 2°C

Integrated Energy System Approach to Decarbonization



Integrated Energy System Approach to Decarbonization

Economy-Wide CO₂ Emissions

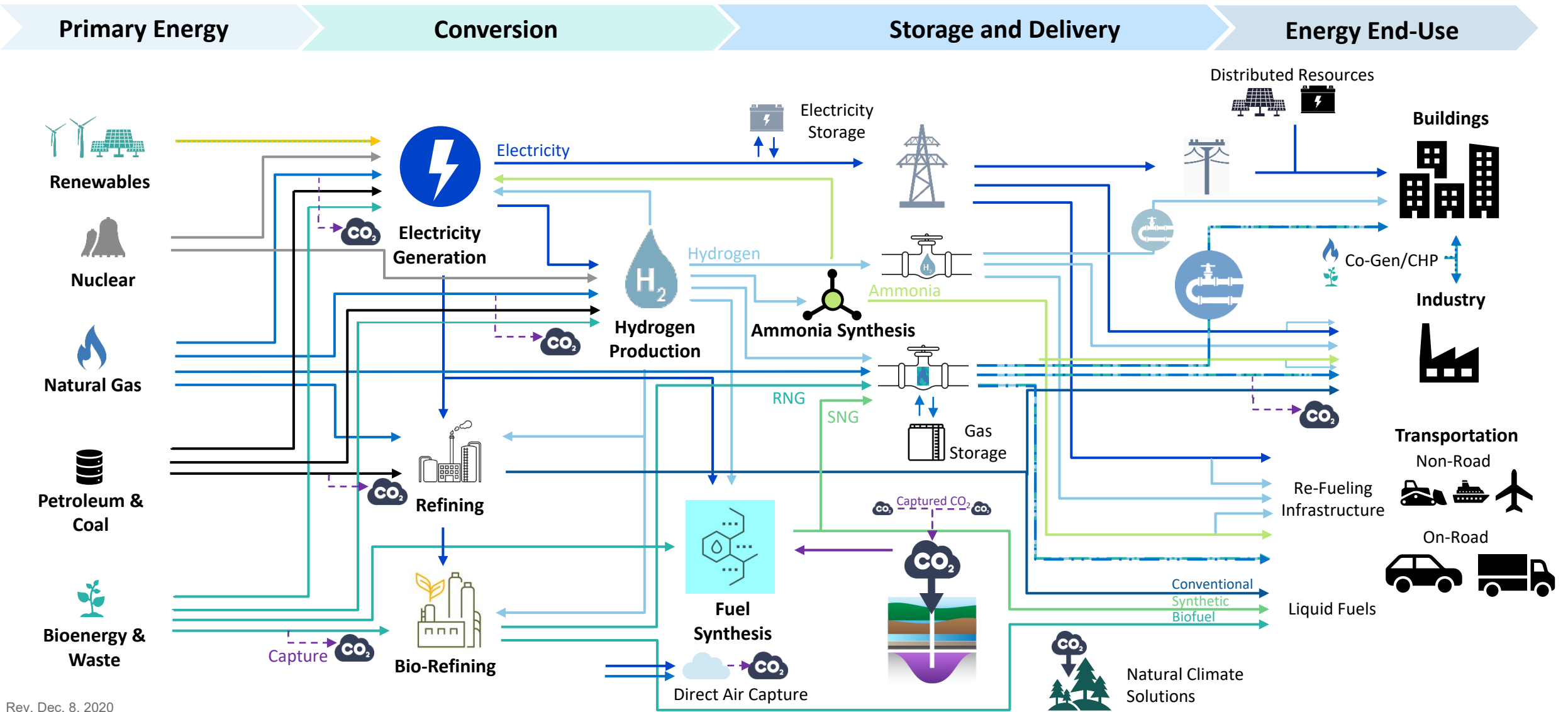


Low-carbon fuels may be required to achieve economy-wide decarbonization

Evaluating the Potential Role of Low-Carbon Fuels

- Various pathways exist to support carbon reductions across the energy-economy (e.g., efficiency improvements, electrification)
- Commercial options are currently limited for hard-to-abate areas and deep carbon reduction targets
- Significant need and opportunity to support the transition to low-carbon fuels using an integrated energy system approach

Low-Carbon Energy Ecosystem



Beyond 2030 – How might value chains incorporate low-carbon fuels?

LCRI Focus: Hydrogen | Ammonia | Synfuels | Biofuels

Production



Advanced
Nuclear

Next Gen
Electrolysis



Existing
Clean
Generation

Natural
Gas CCS



Delivery & Storage



Utilize Existing Natural Gas Infrastructure
through Blending



Shipping, Trucking, and
Conversion/Intermediates

End Use



Combustion &
Heating



Heavy Duty
Transportation



Electric Generation



Advanced
Fuel Cell



Large Industry



Chemical Process

Current Status

38 Sponsors

Electric & Gas Utilities

Energy Producers

Equipment Manufacturers

Engineering & Energy Services

\$109M Funding

47:1
Avg Sponsor
Leverage

14
Active R&D
Projects

40+
Technology
Reports &
Assessments

20+
Preliminary
Techno-Economic
Cases

Sponsorship Goals



50 Sponsors



Value Chain Diversity



Global Perspectives



Relationship Expansion

Global Strategic and Technical Engagement

Industry Consortia



Hydrogen Council | Green Ammonia Consortium | World Energy Council – Hydrogen Global Initiative | Fuel Cell and Hydrogen Energy Association

Global Research Community



Part of LCRI Technical Collaboration Network

Universities – MIT Energy Institute, GT Strategic Energy Institute | National Labs | Research Institutes – GTI, Fraunhofer Institute

Leveraging Knowledge through Strategic and Technical Engagement

Regional and National Networks



Hydrogen Europe | Australian Hydrogen Council | Hypos East Germany | Fuel Cells and Hydrogen Joint Undertaking (EU)

Other Stakeholder Groups



EUTurbines | ETN Global | HYBRIT | SALCOS

LCRI Technical Collaboration Network

Establishing connections with laboratory communities, other research organizations, academia, federal/stat/local government agencies, international energy ministries, and non-governmental organizations



Knowledge sharing
through technical
meetings



Journal
publication
opportunities



Future LCRI
conference
participation

Building a network of broad, diverse set of expertise for idea sharing and collaboration

<https://www.epri.com/pages/sa/lcri-tcn>



Low-Carbon Resources Initiative

FOCUS

Multiple options and solutions to establish viable pathways for deep carbon reductions

Technologies for hard-to-decarbonize areas of the energy economy

Affordable, reliable, and resilient integrated energy systems for the future

RESEARCH AREAS

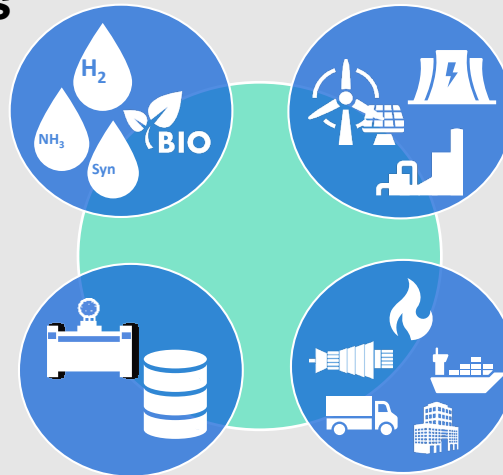
Hydrogen **Ammonia** **Synthetic/
Derivative Fuels** **Biofuels**

**Production
Pathways**

**Integrated
Energy
Systems**

**Storage &
Delivery**

**End Use
Applications**



VALUE

Independent, objective research leveraged by global engagement and collaboration

Comprehensive approach to low-carbon value chain and technology analyses

High-impact results from technology evaluations and safety, environmental, & economic assessments



LCRI

LOW-CARBON RESOURCES INITIATIVE

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to Economy-Wide Decarbonization