



Kentucky Hydrogen Hub

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The **Low-Carbon Resources Initiative** (LCRI) is a five-year R&D commitment focused on the advancement of low-carbon technologies for large-scale deployment across the energy economy. This initiative is jointly led by **EPRI and GTI**. Visit the initiative webpage for more details: www.LowCarbonLCRI.com



ENGAGEMENT

Industry & Stakeholder Participation

52 Sponsors

Electric & Gas Utilities
Energy Producers
Equipment Manufacturers
EPC Firms

Funding & Leverage for R&D Activities

\$131M Direct Funding
\$1B Leverage Goal (over 5 years)

Global Engagement & Collaboration

Research Organizations
Academia
NGO's
National Labs
Government Agencies

RESEARCH AREAS

Hydrogen

Ammonia

Synthetic/Derivative Fuels

Biofuels

Production

- » Electrolysis from clean energy sources
- » Biofuel and low-carbon processes
- » Carbon capture & storage
- » Innovative technologies

Storage & Delivery

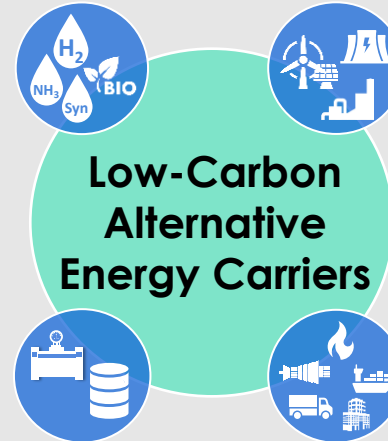
- » Pipeline blending
- » Safety and codes/standards
- » Underground & aboveground storage
- » Chemical storage

Integration

- » Energy system modeling & analysis
- » Grid electricity, renewables & nuclear energy
- » Gas networks/infrastructure
- » Consumer optionality

End Use Applications

- » Transportation
- » Industrial
- » Power Generation
- » Heating
- » Commercial
- » Residential



VALUE

Independent, Objective RD&D

Led by **non-profit research organizations** with missions to enhance the quality of life by making energy safe, affordable, reliable, and environmentally responsible

Low-Carbon Value Chain Approach

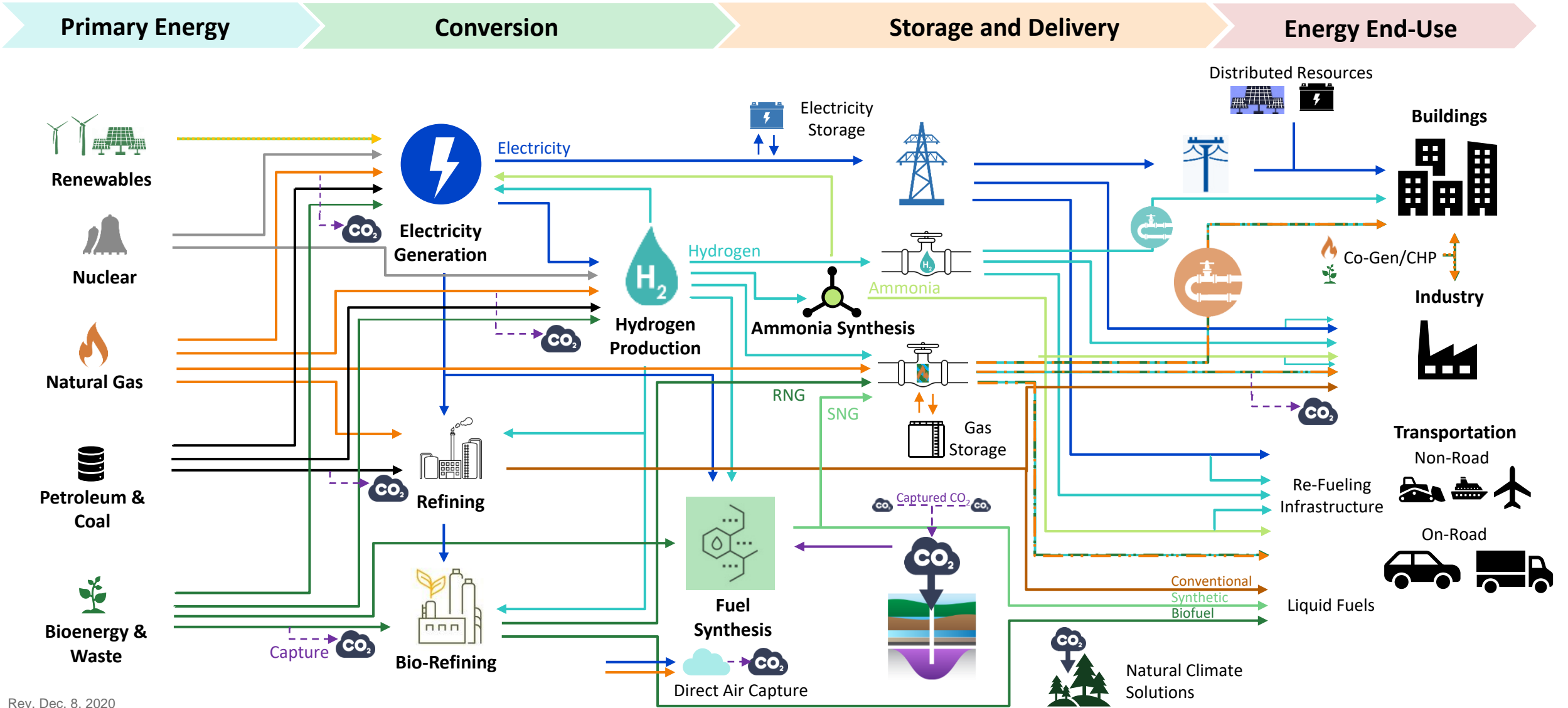
Comprehensive approach to address multiple pathways for low-carbon resource production, delivery, and economy-wide use

High-Impact Results

Technology demonstrations
Techno-economic analysis
Energy economy modeling
Safety and performance protocols
Environmental impact assessments

Sept 27, 2021

Low-Carbon Energy Ecosystem



LCRI Research Areas



Renewable
Fuels



Hydrocarbon-
Based
Processes



Electrolytic
Processes



Delivery &
Storage



Power
Generation



Transportation,
Industry,
& Buildings



Safety and
Environmental
Aspects



Integrated
Energy
System
Analysis

RD&D Approach

Goals – Strategies – Actions – Activities

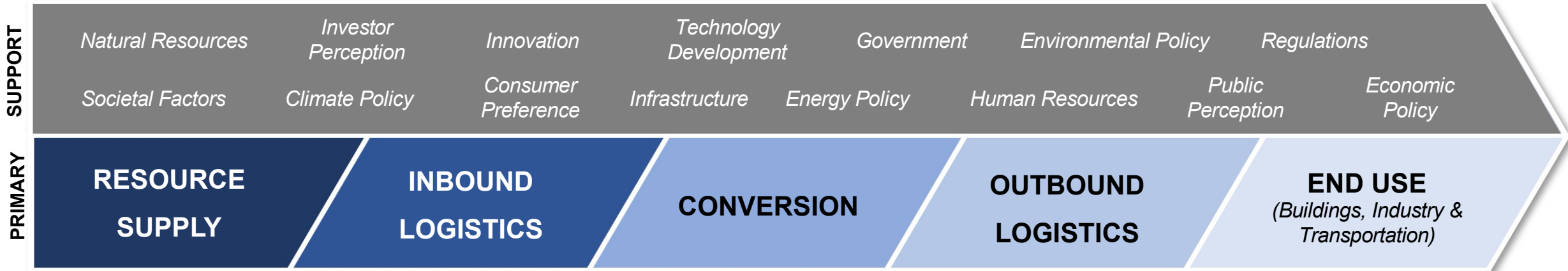
Technology Spectrum

Track – Participate – Lead



<https://lcri-vision.epri.com/>

The Energy Value Chain

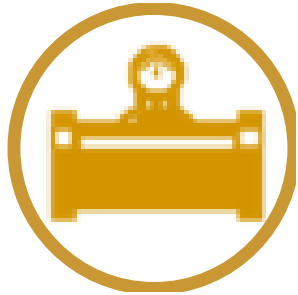


LCRI’s Energy Value Chain – Adopted as a systematic way of breaking energy production pathways into strategically relevant elements and activities in order to analyze how execution, sequencing and interaction among these activities contribute to scale, cost and emissions (scalability, competitive costs, net zero carbon emissions).

- The LCRI is focused on how to **close** the remaining GHG reduction gap that exists within the global **energy economy**.
- A **holistic, all-in approach** that informs broad, **comprehensive solutions**, that work **interdependently**, is integral to supporting LCRI’s mission to “enable **economy-wide** decarbonization by midcentury”

Integrated Energy System Analysis

Carbon-Free Energy Carrier
Production, Storage, and
Conversion

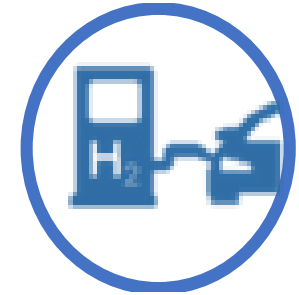
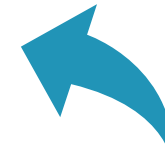


Integrated Energy



System Analysis

Bioenergy Supply,
Conversion, and Potential



Non-Electric End-Use and
Emission Reduction Options

Enhanced Representation of
Electric and Fuel Delivery Networks

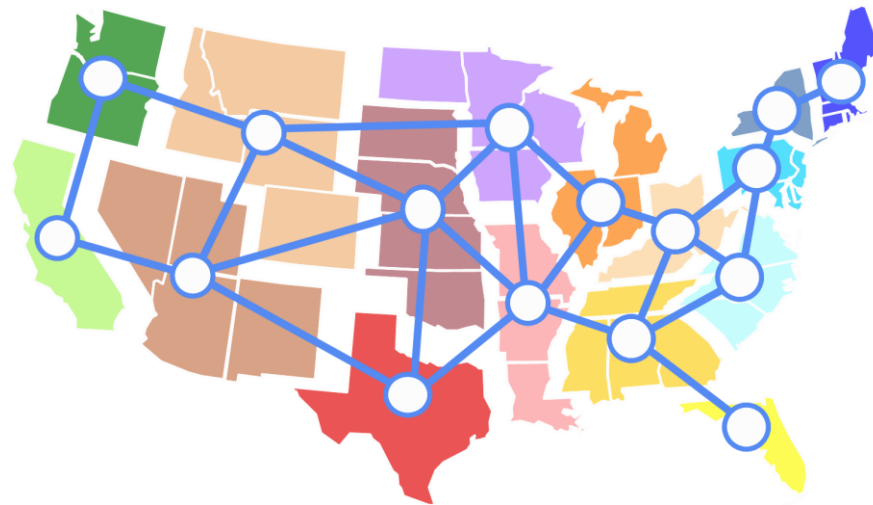


Framework for understanding drivers of change across the energy ecosystem

Energy-Economy Model US-REGEN

MODEL FEATURES

- » Integrated modeling of electric generation, fuels production, infrastructure, & energy end-use
- » Spatial, temporal, sectoral, & technology detail
- » State & federal policy targets
- » Economic trade-offs



More information at <https://esca.epri.com>

Model Outputs

- » Economic equilibrium for energy production, capacity, & end-use
- » Emissions (GHG, CO2, etc.), air quality, water & land use
- » Least-cost deployment mix of energy subject to inputs & constraints

LCRI Sponsorship



LCRI
LOW-CARBON
RESOURCES INITIATIVE

Electric Only



Gas Only



Dual Fuel



OEMs



O&G



EPC



Learn More About LCRI

Technical Areas

Integrated Energy Systems Analysis

Renewable Fuels

Hydrocarbon-Based Processes

Electrolytic Processes

Storage, Delivery, & Transport

End Use Applications

Power Generation

Safety

Environmental Aspects

[https://lcri-
vision.epri.com](https://lcri-vision.epri.com)

**LCRI
Research
Vision**

LCRI@epri.com

Email

www.LowCarbonLCRI.com

Public Webpage

Quick Links & Information

LCRI General Info

- [LCRI 1 Pager](#)
- [LCRI Scope](#)
- [LCRI FAQ](#)

LCRI Introductory Videos

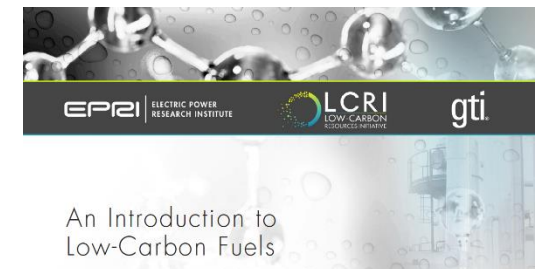
- [LCRI Advisory Structure](#)
- [LCRI Roadmap Approach](#)
- [LCRI Technology Pipeline](#)
- [LCRI Roadmap Reviews](#)
- [Colors of Hydrogen](#)
- [Who is EPRI – Who is GTI](#)

LCRI References

[LCRI Launch Document](#)



[Low-Carbon Fuels White Paper](#)





LCRI

LOW-CARBON
RESOURCES INITIATIVE

Enabling the Pathway
to Economy-Wide Decarbonization

Beyond 2030 – Integration of Low-Carbon Energy Carriers

LCRI Focus:

Hydrogen

Ammonia

Synthetic/ Derivative Fuels

Biofuels

Production Sources



Next Gen
Technologies

Integrated
Clean
Electricity



Integrated
Nuclear
(Current &
Advanced)

Natural Gas
with CCS



Delivery & Storage



Existing Natural Gas Pipeline through
Blending and/or New Infrastructure



Shipping, Trucking, and Conversion/Intermediates
Aboveground and Underground Storage

End Use Applications



Combustion



Heavy Duty
Transportation



Electricity Generation



Advanced
Fuel Cell



Large Industry



Chemical Processes