Graduating Sustainable Industrial Decarbonization Solutions from the Laboratory to Real-World Deployments

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Building Technologies and Science Center, Research Engineer
March 2024

Agenda

1. NREL at-a-Glance
2. Challenges and Opportunities: Industrial Decarbonization
3. Collaboration and Partnerships: Highlights Across the Lab
4. Innovation and Entrepreneurship Center
5. Campus Expansions & Integrated Industry Partnerships
6. Summary

History of the National Renewable Energy Laboratory

The Solar Energy Research, Development, and Demonstration Act of 1974, signed into law by President Jimmy Carter, **established the Solar Energy Institute (SERI).**

President Carter visits SERI on Sun Day, May 3, 1978.

- **October 1973**: Oil embargo drives up gas prices
- **October 1974**: Solar Energy Research, Development, and Demonstration Act signed into law
- **July 1977**: SERI begins operations in leased space
- **August 1977**: Department of Energy formed
- **1984**: First permanent research facility completed on South Table Mountain Campus
- **September 1991**: SERI elevated to national laboratory status
- **October 1994**: NREL establishes National Wind Technology Center at what is now the Flatirons Campus

Coast to Coast

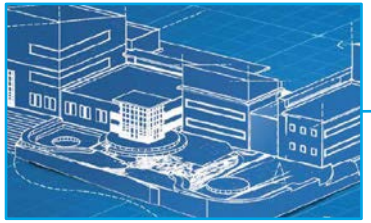
The **17** national laboratories have served as the leading institutions for scientific innovation in the United States for more than 90 years.

NREL Brings Distinct Capabilities

Foundational Science
Bench-Scale Discovery

- Solar Energy Research Facility
- Science and Technology Facility
- Field Test Laboratory Building.

Accelerated Technology Scale-Up
Scaling R&D and Process Engineering

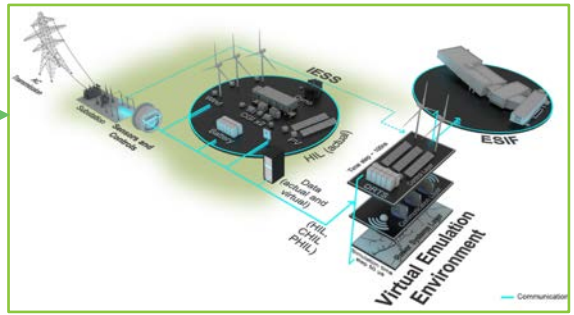


Energy Materials and Processing at Scale (Completion FY27)

Energy Systems Integration Facility

- Carbon-free H_2
- Products from electrochemical processes and CO_2
- Advanced batteries
- PV, wind, water power, geothermal
- New buildings and industrial materials, manufacturing and systems
- Grid and security tech.

Systems
R&D with Industry Partners



Advanced Research on Integrated Energy Systems

Markets

High-Performance Computing, Simulation, and Visualization

Integrated Energy Pathways

Electrons to Molecules

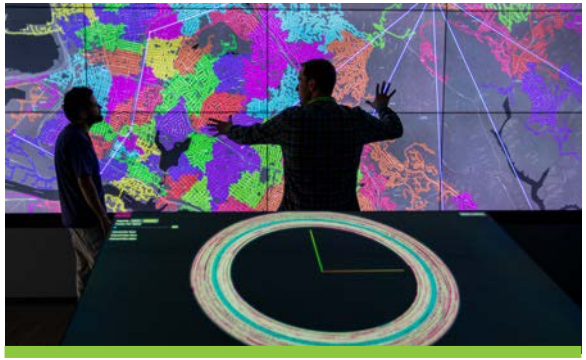
Circular Economy for Energy Materials

NREL's Vision:

A Clean Energy Future for the World

Three critical research areas respond to today's energy challenges and provide tomorrow's solutions.

Integrated Energy Pathways

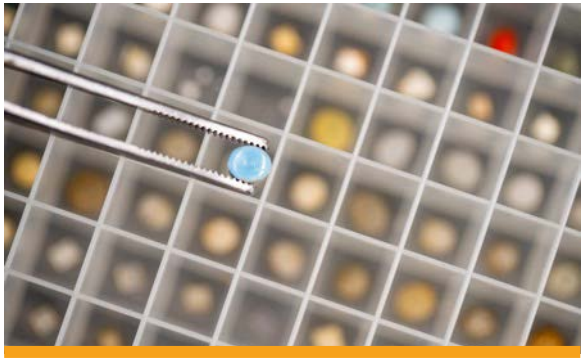


Developing the foundational knowledge and technologies to **optimize the integration of renewables, buildings, industry, energy storage, and transportation**—modernizing our energy systems and ensuring a secure and resilient grid.

Electrons to Molecules

Accelerating the **conversion of electricity and small waste gases** (e.g., CO_2, H_2O, N_2) into chemical bonds for the purposes of chemical, material, or fuel synthesis and/or energy storage.

Circular Economy for Energy Materials



Establishing the **foundational knowledge/technology** for design, recycle, reuse, remanufacture, and reliability for **energy-relevant** materials and processes.

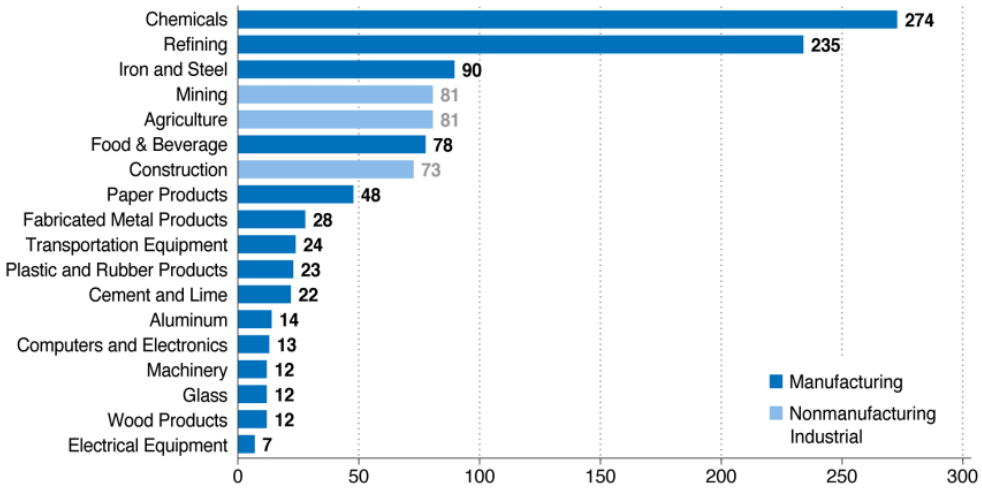
NREL's Three Critical Objectives

Our Challenges and Opportunities

Industrial Decarbonization

- Requires lowering carbon intensity of electricity generation, substituting electricity for fossil fuels.
- Calls for combination of renewable energy and diverse energy storage.
- Requires new technologies for **cement**, steel, ammonia, and ethylene industries.

Industrial Decarbonization



Energy-related CO_2 emissions breakdown by industrial subsector in 2020 (Million MT CO_2)

- Industrial sector responsible for 1,360 million metric tons of CO_2 emissions (~30% of total U.S. energy-related emissions).
- Manufacturing accounted for 83%.
- Nonmanufacturing accounted for 17%.

The U.S. industrial sector consists of manufacturing and nonmanufacturing subsectors, with the top three energy-related CO_2-emitting subsectors being chemicals, petroleum refining, and iron and steel.

Manufacturing Subsectors

- Iron and Steel
- Chemicals
- Food and Beverage
- Petroleum Refining
- Cement.

Decarbonization Pillars

Energy Efficiency

- Energy management approaches
- Thermal integration of process heat
- Smart manufacturing
- Improved technologies and processes; systems integration.

Industrial Electrification

- Electrification of process heat (e.g., heat pumps)
- Electrification of hydrogen production for industrial process use
- Grid and on-site generation sources.

Low-Carbon Fuels, Feedstocks, and Energy Sources (LCFFES)

- Fuel-flexible process
- Clean hydrogen fuels and feedstocks
- Biofuels and bio feedstocks
- Concentrating solar power
- Nuclear
- Geothermal.

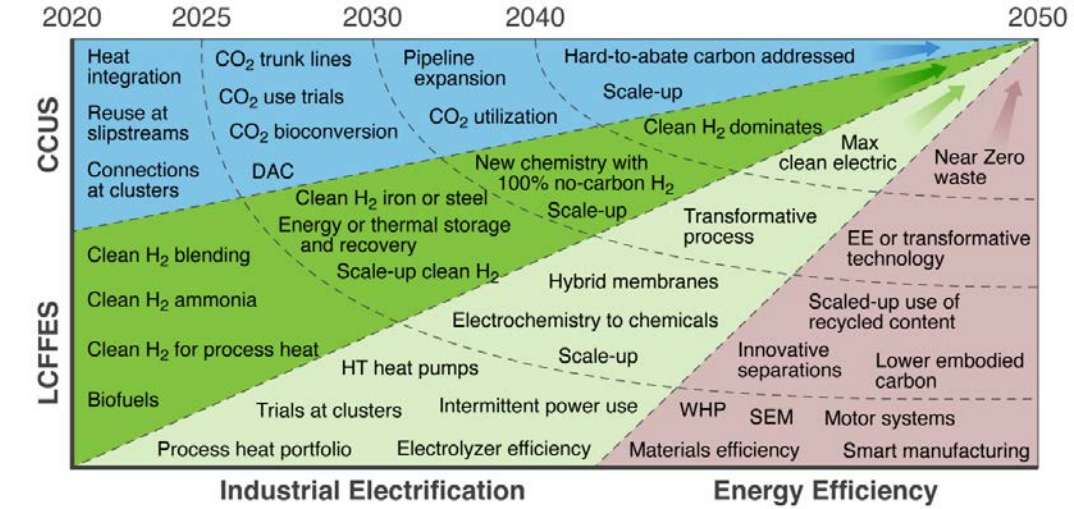
Carbon Capture, Utilization, and Storage (CCUS)

- Post-combustion chemical absorption of CO_2
- CO_2 pipelines and other CCUS-supportive infrastructure.

Getting to Net-Zero

Investments are needed in near-, mid-, and long-term timeframes to address numerous RD&D opportunities to accelerate industrial decarbonization by these top pillars.

Strategies need to be pursued to realize synergies within and across pillars and industries.

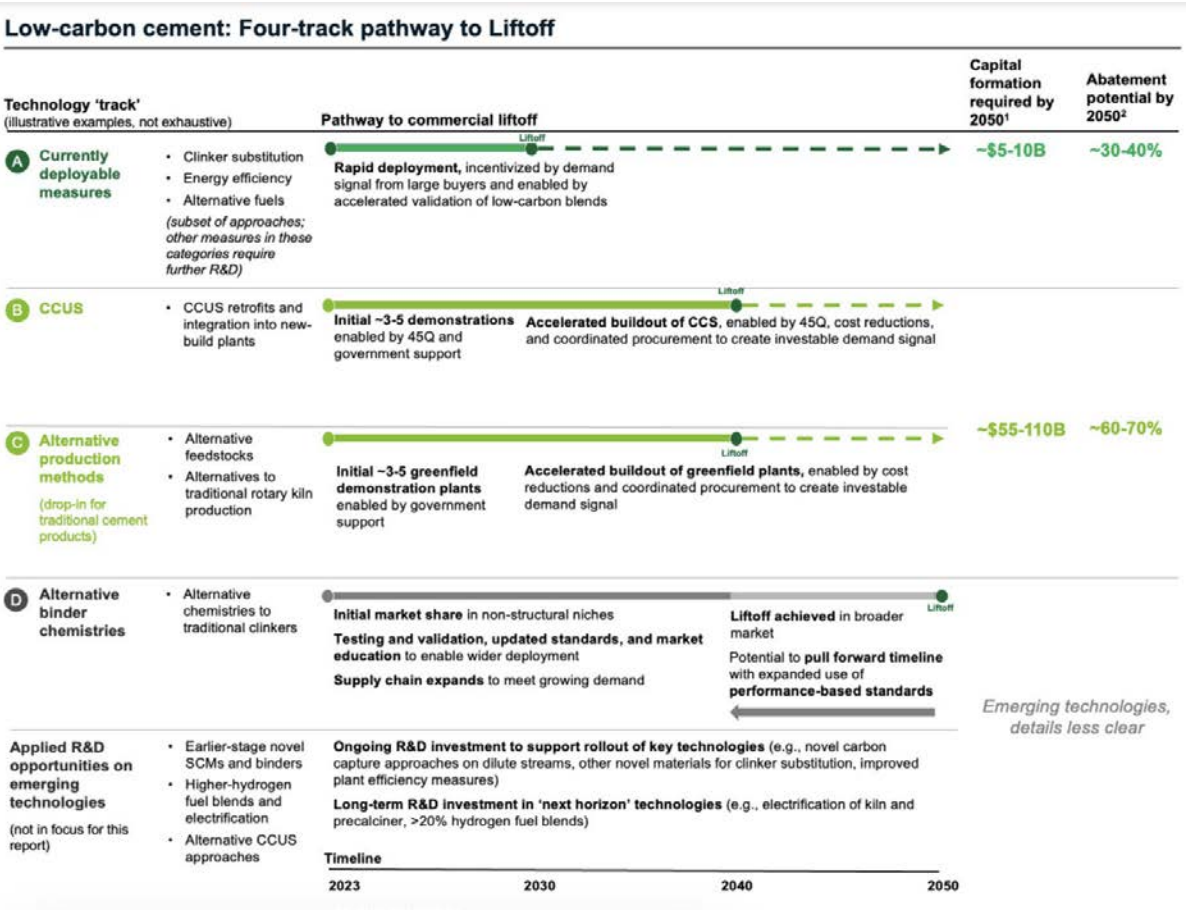


Landscape of major R&D investment opportunities for industrial decarbonization across all subsectors and decarbonization pillars

- Accelerated shift to low-carbon process technologies
- 100% clean electrical grid
- Ultra-low carbon energy carriers and feedstocks
- Procurement focus on embodied carbon
- Improved material efficiency and transition to circular economy
- Cost-effective carbon capture
- Negative emission technologies.

DOE Industrial Decarbonization Roadmap, 2022

Supported by low-carbon procurement, technologies could follow four parallel ‘tracks’ to decarbonization by 2050



Liftoff pathway for the cement sector is split across technologies with varying TRLs/ARLs and distinct economic, market, and policy constraints and enablers. Four parallel ‘tracks’ are outlined for different technology types. Other technologies are on a longer timeline and require continuing R&D investment to achieve demonstration stage and deployment readiness.

DOE Pathways to Commercial Liftoff: Low-Carbon Cement, 2023

Six key challenges must be overcome to scale technologies

1. Uniform standards to define low-carbon materials and enable informed procurement.
2. ~10 to 20-year adoption cycle for new blends and materials—both from long lead time needed to update standards and a long customer-adoption cycle.
3. Current procurement model is not structured to attract capital at required scale.
4. Decarbonization approaches may come with structural cost increases.
5. Key technologies have performance and cost uncertainty. Others are at lower TRLs and must make further R&D progress to deploy.
6. Projects may lack support from local communities and the public (particularly CCUS projects because of environmental and safety concerns).

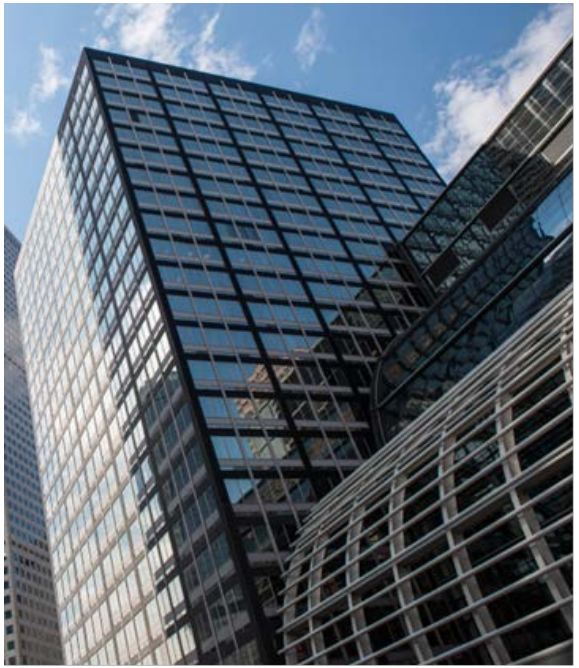


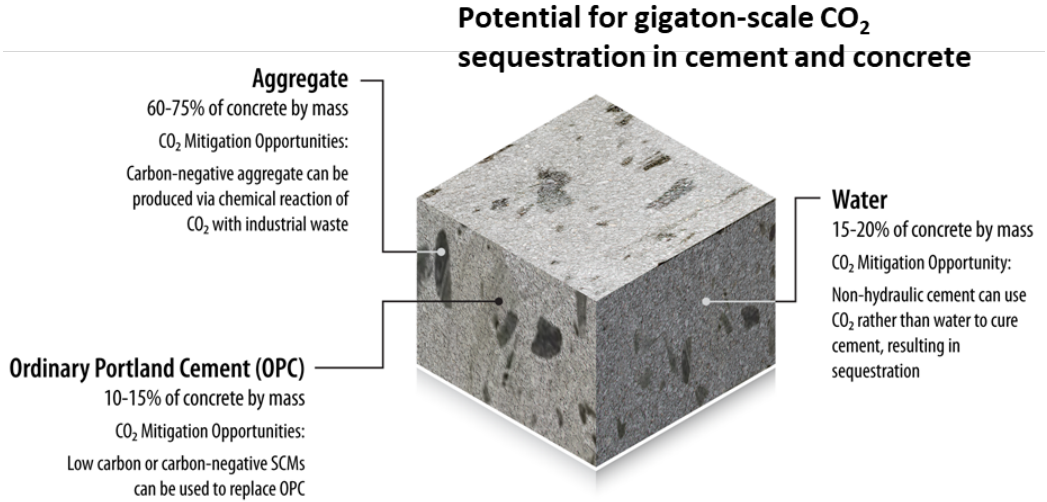
Image by NREL/39565

Challenges are real but solvable

1. Establish shared standards and data ecosystem for low-carbon products.
2. Targeted interventions to compress adoption cycle.
3. Develop alternative procurement models with firm, long-term offtake commitments
4. Policy and market models that offset structural costs.
5. Pre-deployment technologies, provide continuing support to accelerate progress
6. Implement robust community benefits plans and agreements that respond to public concern, mitigate potential harms, and ensure accountability.


Research Areas
in Industrial Decarbonization

Concrete Has a Large CO_2 Footprint Today, but Could Be Tomorrow's CCUS Solution



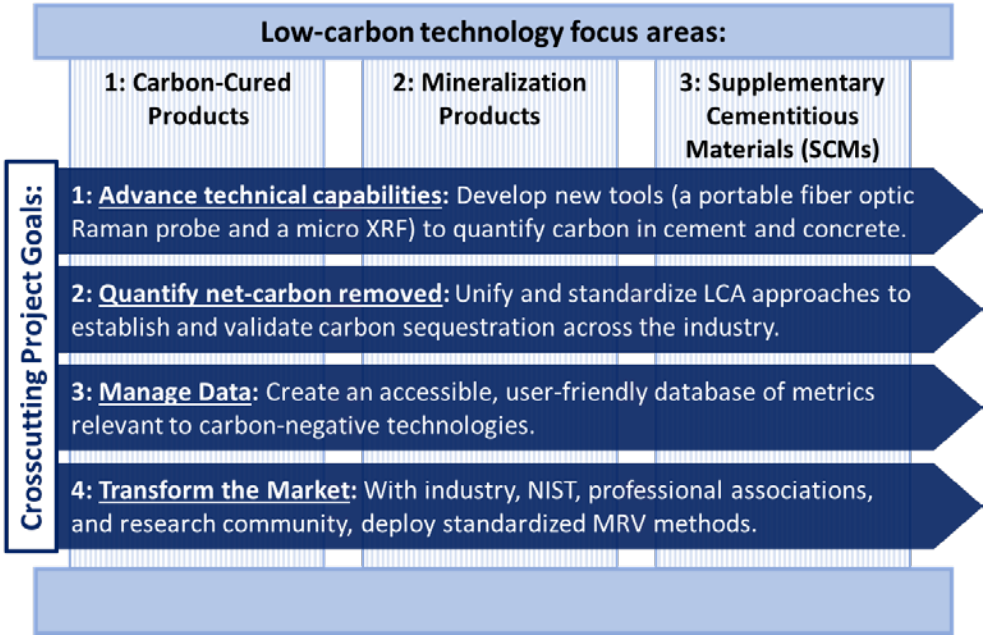
Many stakeholders are pursuing CO_2 sequestration opportunities, including:

- Established industry
- Startups
- Academia
- National laboratories.

There is little consensus on methods for measurement, reporting, and verification (MRV) of CO_2 content sequestered in products.

Standardized MRV methods are needed to ensure robust carbon accounting, build public confidence, increase bankability of technologies, and inform codes and standards of the future.

Our Goal: Standardize MRV Approaches for Low-Carbon Cement and Concrete



NREL is leading a team of national laboratory, industry, and academic partners to standardize MRV.

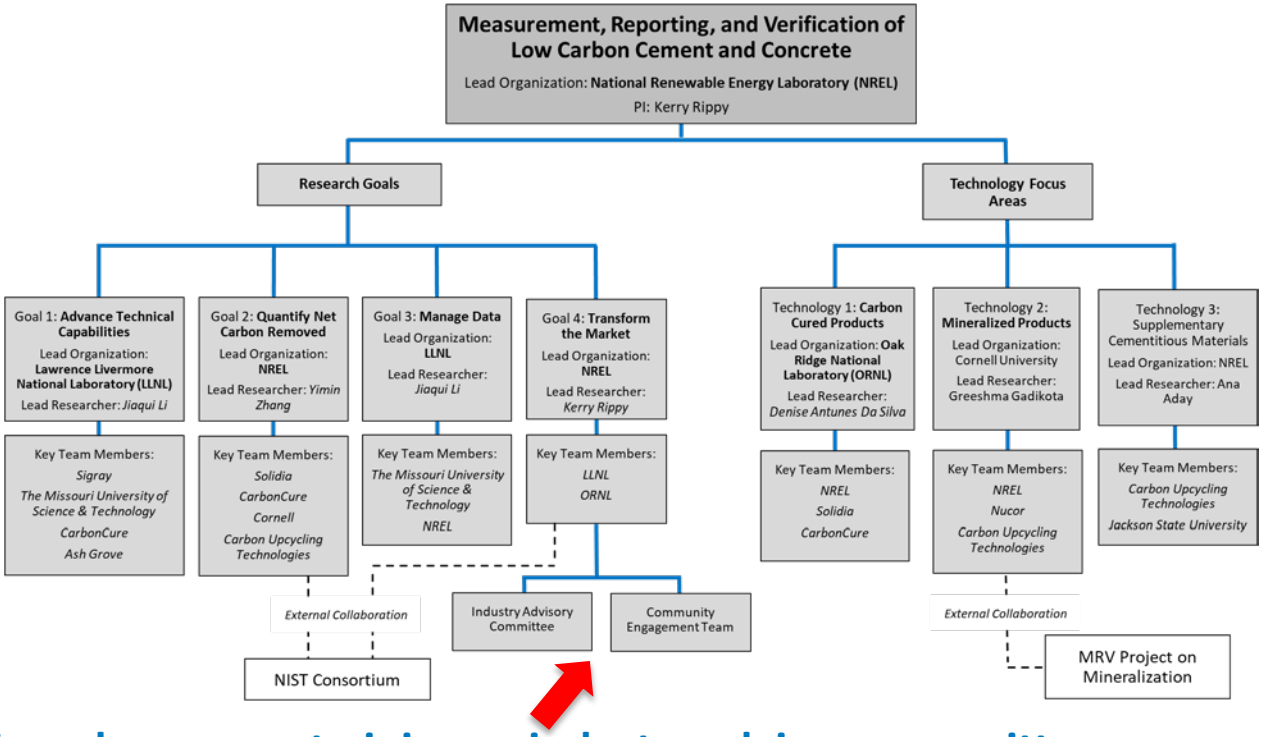
We have identified four goals that will be applied across three technology focus areas.

Members: NREL, Lawrence Livermore National Laboratory, Solida, Oakridge National Laboratory, Carbon Upcycling, Nucor, Sigray, Carbon Cure, Jackson State University, Missouri S&T, Cornell

This project is funded by the DOE Office of Technology Transitions in collaboration with the Office of Clean Energy Demonstrations (OCED) and the Office of Fossil Energy and Carbon Management (FECM).

OTT Office of Technology Transitions

Our Project Team Is Large but Needs More Support!



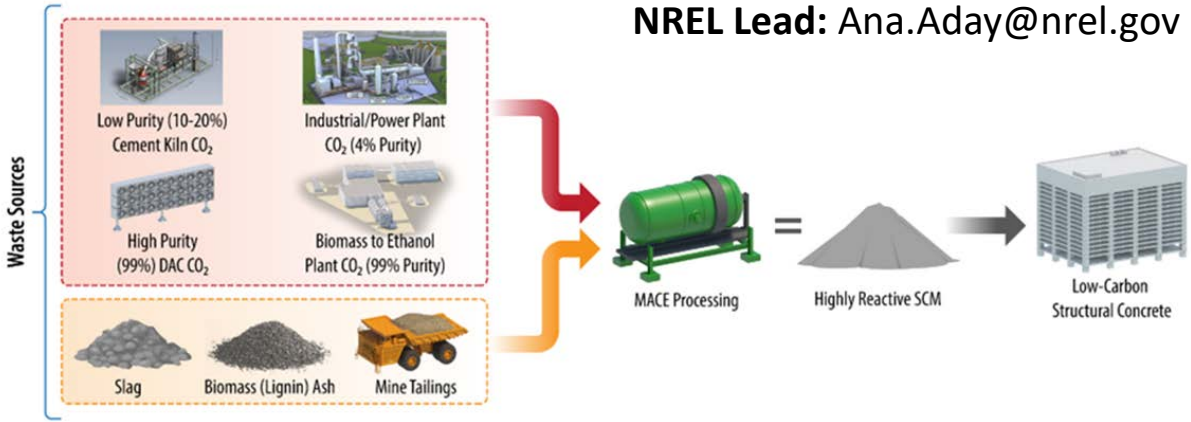
We want to collaborate, working closely with all stakeholders to ensure our MRV solutions work for everyone and are widely adopted.

Please contact Kerry.rippy@nrel.gov if you are interested in supporting this effort!

We welcome you to join our industry advisory committee or our community engagement team!

CO_2 Mineralization Into Construction and Building Materials

NREL Lead: Ana.Aday@nrel.gov



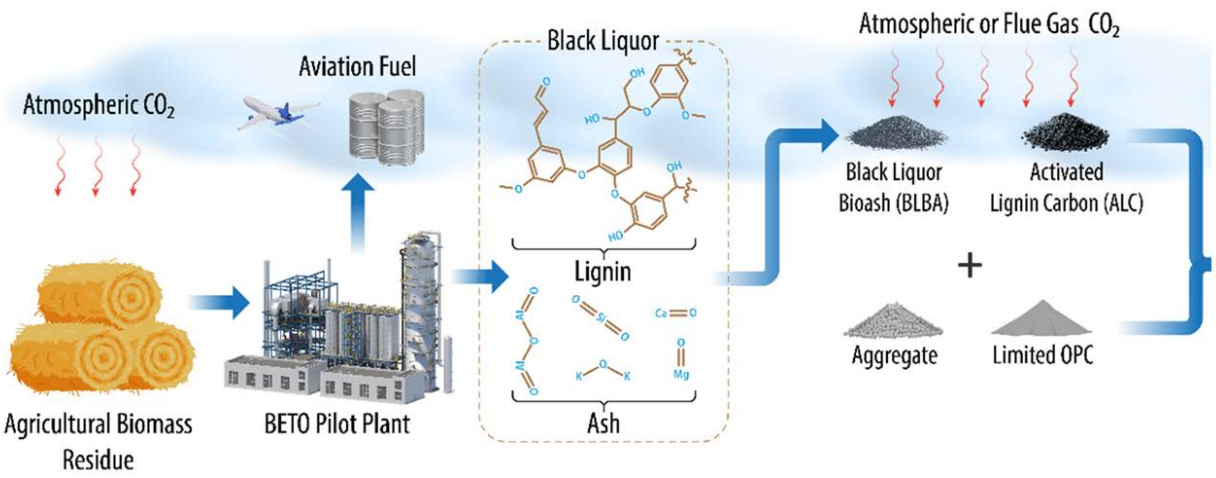
ACT4 CO_2 Mineralization Into Enhanced Building Construction Materials:

Industrial processes to manufacture building construction materials (e.g., steel, plastics, cement/concrete) are responsible for significant greenhouse gas (GHG) emissions. The production of cement alone emits 2.3 billion tons of CO_2 per year, accounting for ~8% of human-caused GHG emissions. Clinker substitution (Portland cement [PC] replacement) and CCUS have been identified as the two biggest technology opportunities to decarbonize the cement industry. **NREL** and **Carbon Upcycling Technologies (CUT)** have teamed up to upcycle a variety of low-value byproducts from biomass and industrial sources into advanced supplementary cementitious materials (SCMs) for the cement and concrete industry.

Technology Impact

- This technology combines CCUS and clinker substitution into one solution.
- Unlocks low-value waste products and mineralizable resources that are currently available in North America for use as SCMs.

CO_2 Mineralization Into Construction and Building Materials



ARPA-e Carbon-Negative LignoCrete Summary

NREL has developed a low-carbon concrete mix using two bio-derived SCMs from lignin-rich byproducts of sustainable aviation fuel production. At end of life, this material can be ground and recycled for use as road base or aggregate with no risk of organic matter decomposition and CO_2 secondary release, meeting cradle-to-gate and cradle-to-grave objectives.

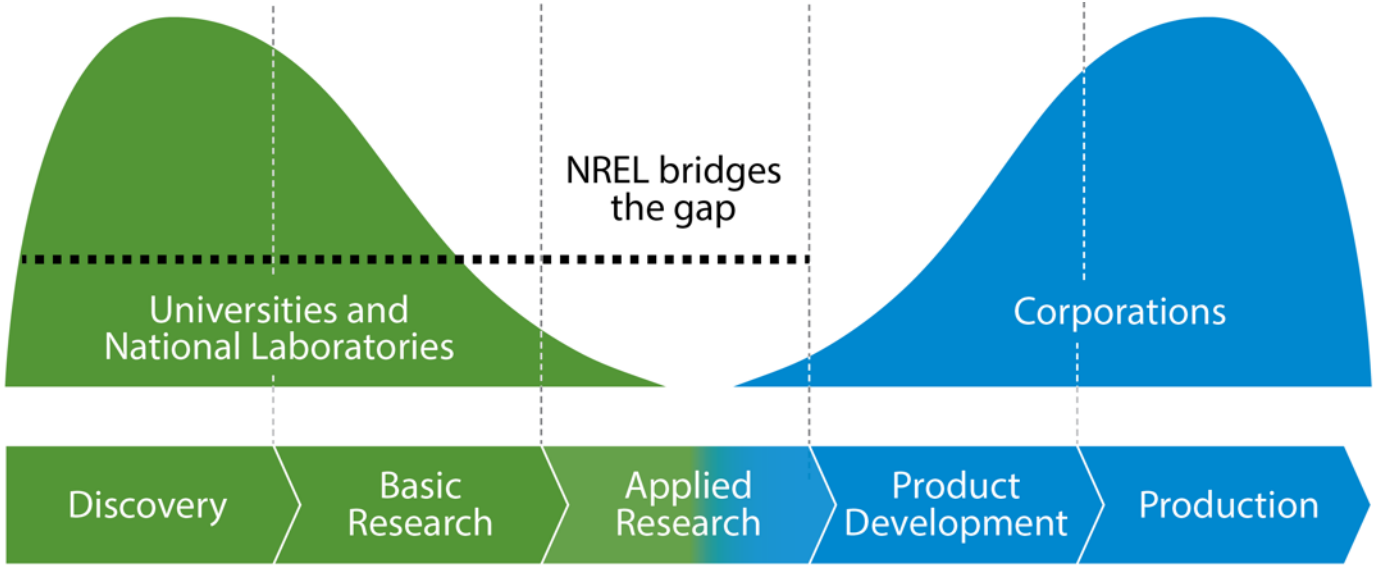
Technology Impact

- Potential to eliminate 20%–60% of U.S. cement related emissions by 2040.
- Can disrupt the traditional cement and concrete industry in the U.S. by displacing ordinary Portland cement (OPC) and heavy industry-based SCMs with low carbon/carbon-negative biobased materials.
- Partners: Carbon Upcycling Technologies, CU Boulder

NREL Lead: Michael.Griffin@nrel.gov; **Technical Lead:** Ana.Aday@nrel.gov

Partnering for Impact

We Reduce Risk in Bringing Innovations to Market



NREL helps bridge the gap from basic science to commercial application.

Forward-thinking innovation yields disruptive and impactful results to benefit the entire U.S. economy.

Accelerated time to market delivers advantages to American businesses and consumers.

How Can NREL Help Where Industry Can't ?

Industry invests in short-term R&D when they are confident about a return on investment.

NREL:

- Assumes a longer, broader view.
- Takes on early-stage, high-risk R&D.
- Conducts research that makes it possible for industry to bring important new solutions to the market.

"It is often too risky for the private sector to be on that bleeding edge of research where profits are years and years away."

Venkatesh Narayanamurti
Professor of Science and Technology Policy
Harvard Kennedy School
Quote from *the Washington Post*

Partnering With Business for Competitive Advantage

In **2023**, NREL had:

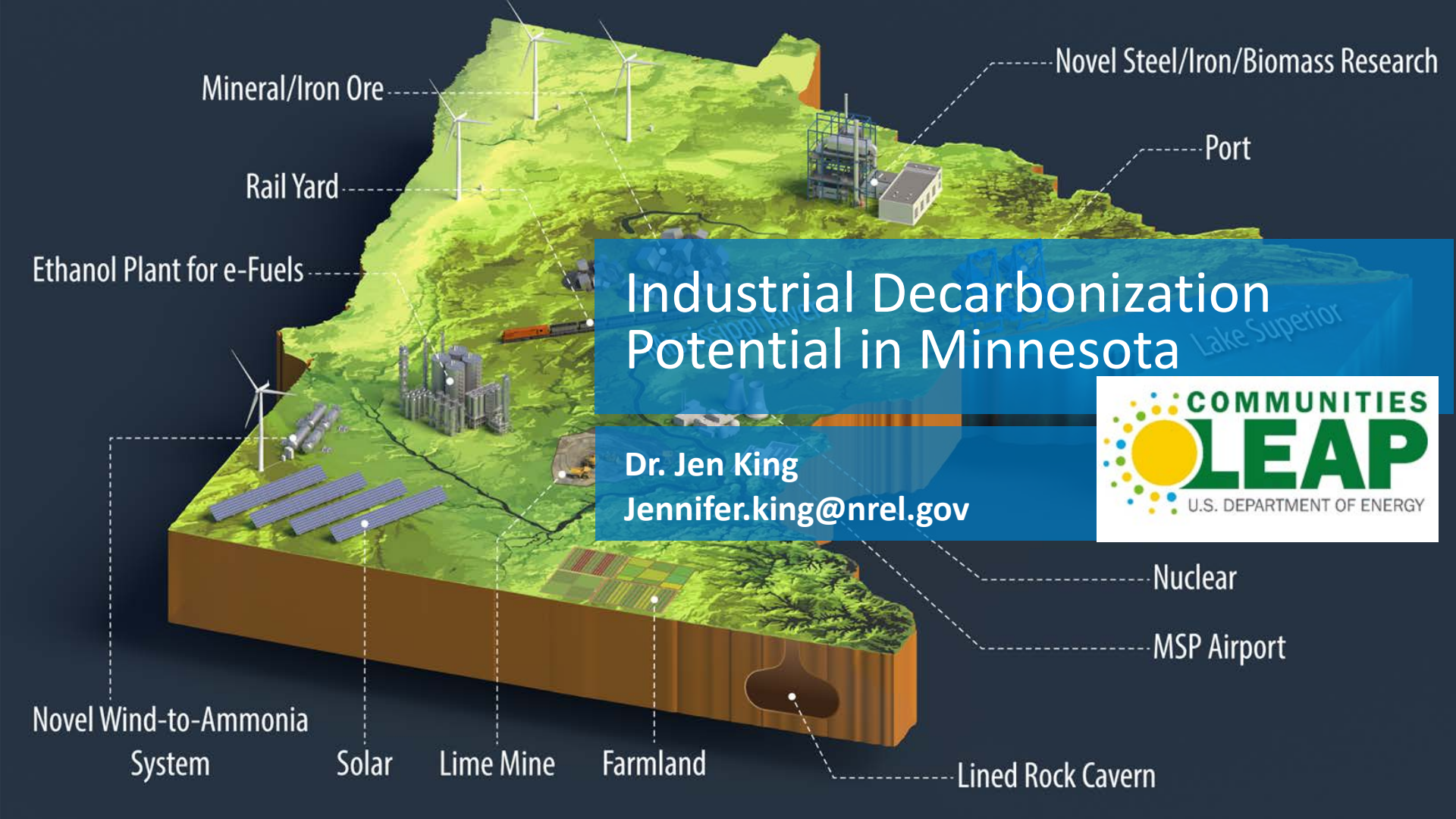
more than **1,100** active partnerships with **industry, academia,** and **government**

340
new partnership agreements

$143M
value of new partnership agreements

300
unique new partners

767
unique active partners



Industrial Decarbonization Potential in Minnesota

Dr. Jen King
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COMMUNITIES LEAP
U.S. DEPARTMENT OF ENERGY

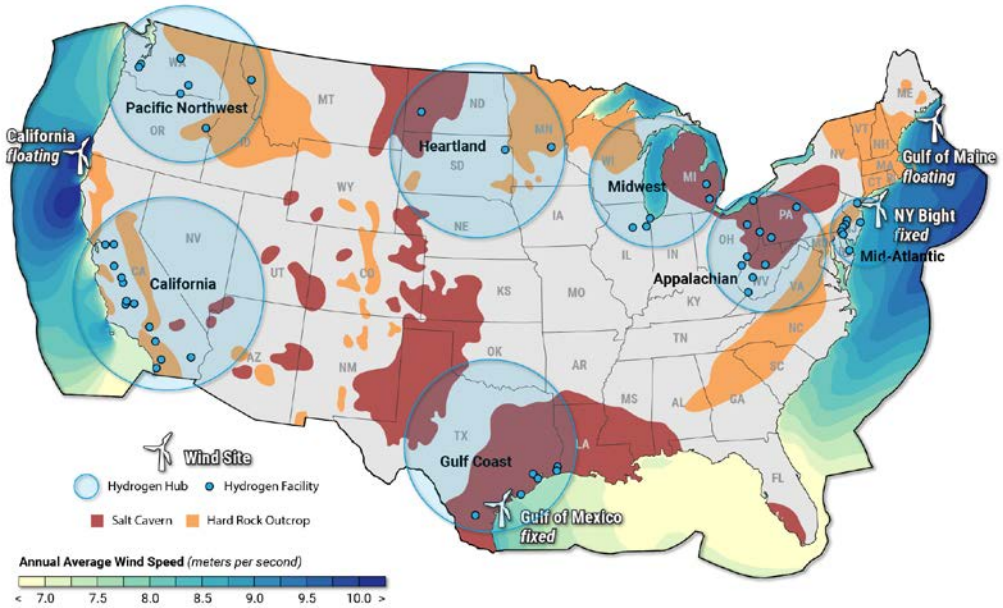
Building on the C-LEAP Pilot

- The Communities LEAP pilot is delivering technical assistance to 24 communities.
- 24-32 additional communities will be selected for cohort 2.
- Technical assistance is the primary offering through the program, but one or more team members can serve as a subcontractor to DOE's providers & receive up to $50,000 for services rendered.

For more information about Communities LEAP Cohort 2, visit our website: https://www.energy.gov/communitiesLEAP/communities-leap.

Project Goal – Tightly Coupled Systems

Vision: Develop reference designs for GW-scale off-grid, tightly coupled, hybrid energy systems purpose-built for green H_2 production, in close proximity to or co-located with industry end uses, that *can accelerate the path to decarbonization for hard to abate industries*.



Team effort (lead noted):

Hanna Breunig (LBNL)
Pingping Sun (ANL)
Myra Blaylock (SNL)
Joao Pereira Pinto (ORNL)

NREL contributors:

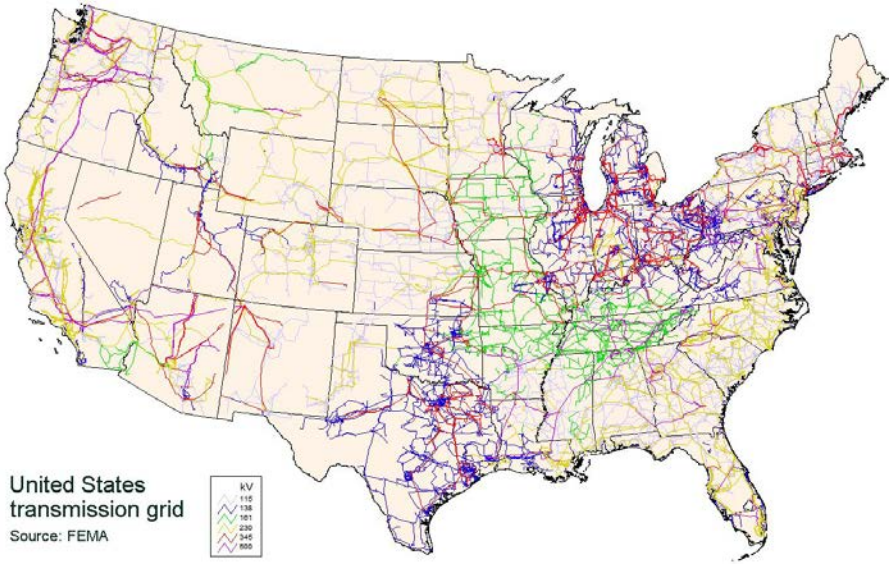
Evan Reznicek, Masha Koleva, Dan Rowland, Matt Kotarbinski, Elenya Grant, Kaitlin Brunik, and many others.

Why Is This Important?

Potential Impact: Time to deployment can be reduced.

Integrated H_2 (directly coupled wind-H_2) provides an accelerated deployment pathway and opens up new locations that lack grid infrastructure. Maximize existing infrastructure.

Co-location of assets can provide cost savings and **cross-sector coupling opportunities**.

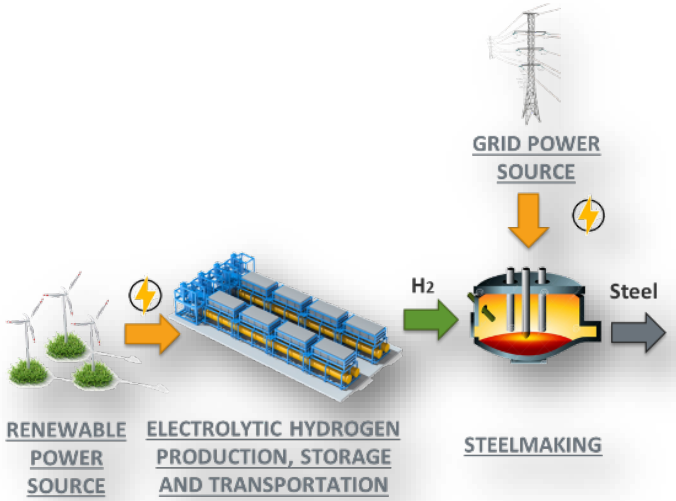


Industrial Decarbonization In More Detail

- Focused on 4 pillars driven by clean fuels (H_2+e-fuels): **green ammonia, green steel, green concrete/cement, and clean e-fuels.**

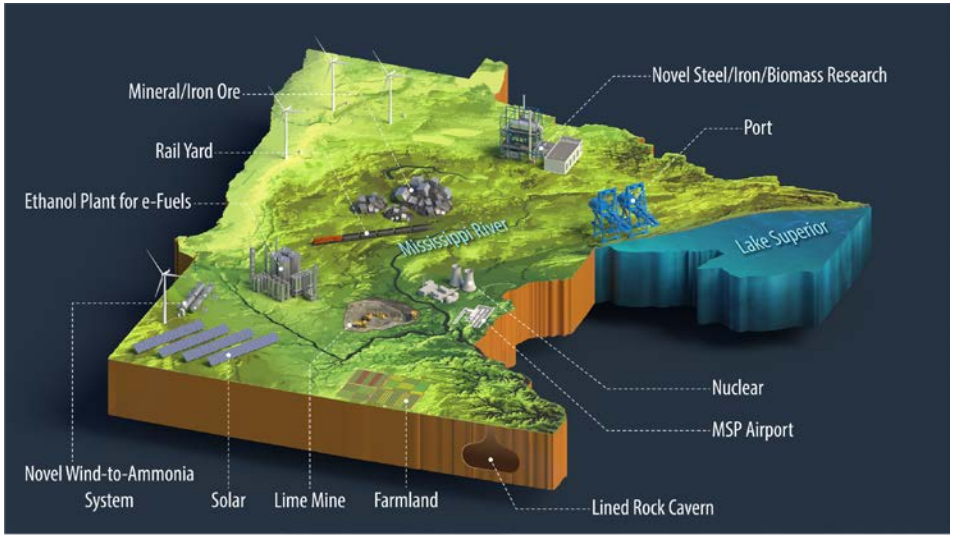
- Industrial decarbonization requires combination of:
  - Green electrons (renewables)
  - Geologic storage (lined rock caverns) to store H_2
  - Access to raw materials such as **water, iron ore, etc.**
  - Existing (or emerging delivery) infrastructure or location for end use.

- **Northern Minnesota (Duluth, Iron Range) has been identified as a location for low-cost steel.**
  - IRA tax incentives are a game changer
  - Results of a community-driven program (C-LEAP).



Minnesota's Opportunity

- ✓ MN occupies a *unique* position with key assets co-located in-state
  - Resources
  - Infrastructure, shipping
  - Renewable energy
  - Storage
  - Industry & business
  - Governments, agencies
  - Communities
  - Academia & research
  - NGOs.



- ✓ The IRA provides a finite window of opportunity (2035)
- ✓ Requires the "**Minnesota Community**" to own it

The Energy Transition and the Opportunities of Integrated Industrial Decarbonization

R.T. Weberg
rtweberg@d.umn.edu

Natural Resources Research Institute

University of Minnesota Duluth
Driven to Discover®

Green Steel Scenarios

A) Blast furnace conversion to green hydrogen blending

- ➢ **MN role:** provide designed iron feedstocks

B) Green Iron Product(s) + Electric Arc Furnace

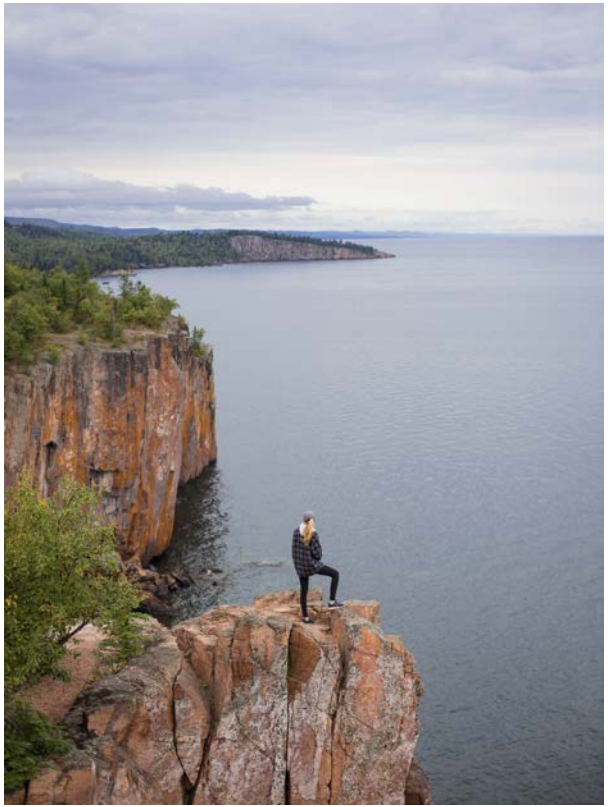
- DRI (direct reduced iron), HBI (hot briquetted iron), pig iron
- ➢ **MN role: produce green iron and/or steel products**

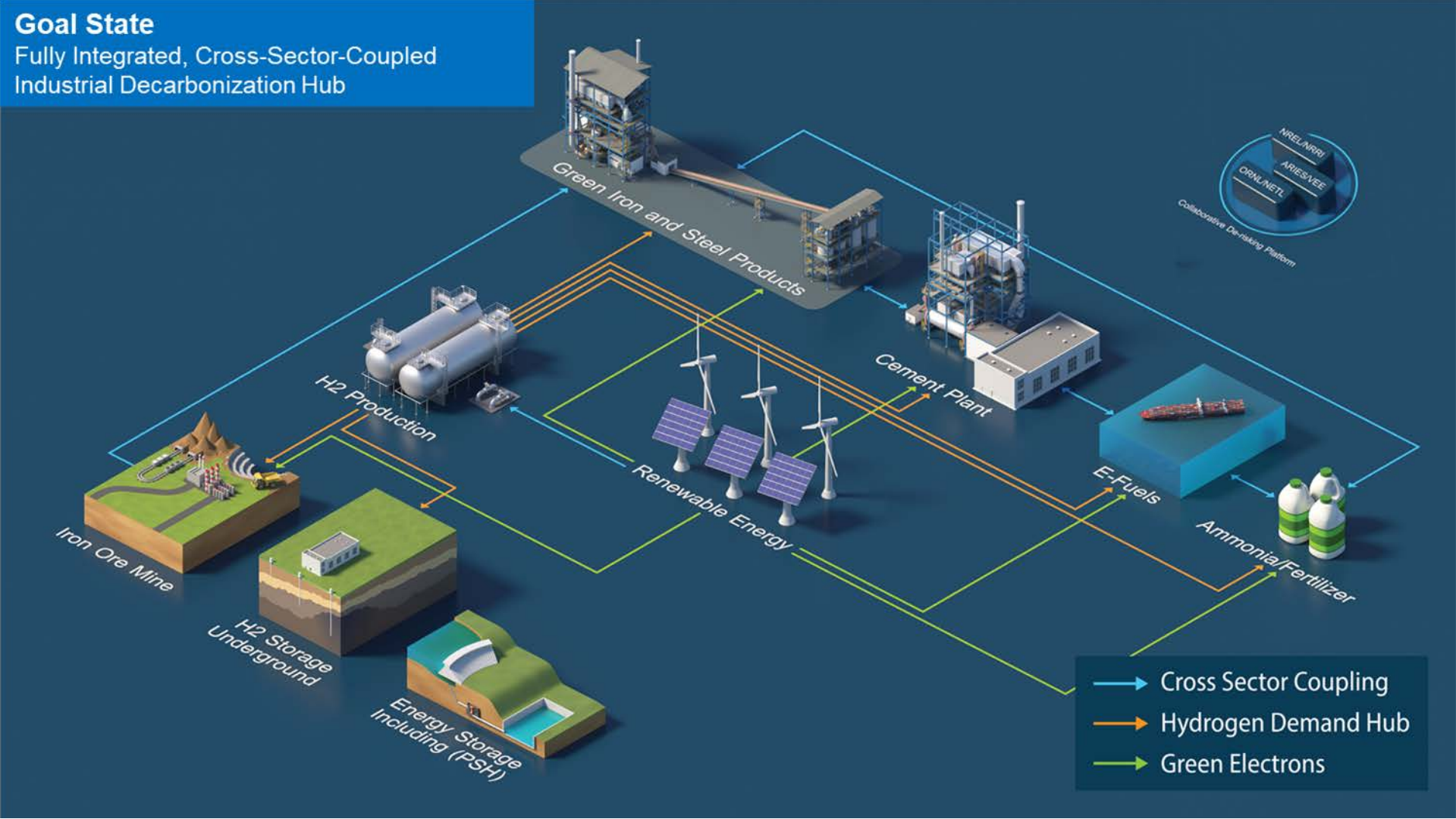
C) Conversion of Ore to Green Iron Units/Green Steel

- Green energy with/without green hydrogen to convert ore to product
- Can utilize poor grade ores
- May be amenable to renewable power variability
- ➢ **MN role:** engage opportunities, support development
  - SSAB, H_2 Green Steel, others

Emerging Minnesota Execution Plan

1. **Minnesota Assessment & Planning**
   - 90 days: identify leader(s), engage stakeholders
2. **Research Effort – ongoing risk reduction**
   - 5 MW H_2 generation
   - Collaboration: NREL, NRRI, national labs
   - Initiating 2024
3. **Pilot Demonstration**
   - 100 MW H_2 generation
   - Targeting 2027 commissioning
   - Industry participation
4. **Full Demonstration**
   - 1 GW H_2 generation
   - Must be initiated by December 2032
   - Industry investment




Goal State
Fully Integrated, Cross-Sector-Coupled
Industrial Decarbonization Hub
Green Iron and Steel Products
NREL/NRRI
ARIES/VEE
ORNL/NETL
Collaborative De-risking Platform
H2 Production
Cement Plant
Renewable Energy
E-Fuels
Ammonia/Fertilizer
Iron Ore Mine
H2 Storage Underground
Energy Storage Including (PSH)
Cross Sector Coupling
Hydrogen Demand Hub
Green Electrons

Impacts and Challenges

- Investment in next generation industry
  - New jobs, workforce development, housing
- Community inclusion
  - Continued outreach, updates; breaking traditional practices
- Broader portfolio of Minnesota iron products
  - Offtake markets; changing economic dynamics
- Cross-coupled industries
  - Inter-industry cooperation, incentives; Identify benefits
- Reduced CO_2, carbon footprint
  - LCA verification; quantify national & global impact
- Enhanced global competitiveness
  - Changing market expectations vs. “green sourcing”
- Retain value/opportunity in Minnesota and region
  - Reinvest in economy, communities, environment
- Minnesota as national decarbonization model
  - Build productive partnerships to help accelerate national priorities

Manufacturing Today

Questions? Please reach out to:

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Stor4Build
U.S. DEPARTMENT OF ENERGY

Stor4Build Overview

A Multi-Lab Building Energy Storage Consortium

Stor4Build is a multi-lab consortium designed to accelerate equitable solutions in energy storage technologies for buildings.

Photo from iStock-1411304340

Funded By:

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Co-Directors:

BERKELEY LAB | NREL Transforming ENERGY | OAK RIDGE National Laboratory

Supported By:

ACEEE American Council for an Energy-Efficient Economy | Pacific Northwest NATIONAL LABORATORY

Stor4Build
U.S. DEPARTMENT OF ENERGY

Learn more on Energy.gov

Accelerating the Equitable Growth, Optimization, and Deployment of Cost-Effective Storage Technologies for Buildings

- Stor4Build is addressing the need for equitable solutions that ensure benefits of storage technologies are clear for all communities.
- 5-year goal is to implement a community-scale demonstration of technologies, which will serve as a foundation for large-scale deployments of thermal and battery energy storage and systems capable of satisfying both the heating and cooling needs in buildings.
- Multi-lab consortium includes active participants from industry, utilities, nonprofit organizations, communities, building owners, academia, government, and other research institutions.
- Two steering councils (R&D and Market Adoption) support equity-centric scaled adoption of building energy storage technologies and a market transformation to increase market viability.

Funded By:

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Co-Directors:

BERKELEY LAB | NREL Transforming ENERGY | OAK RIDGE National Laboratory

Supported By:

ACEEE American Council for an Energy-Efficient Economy | Pacific Northwest NATIONAL LABORATORY

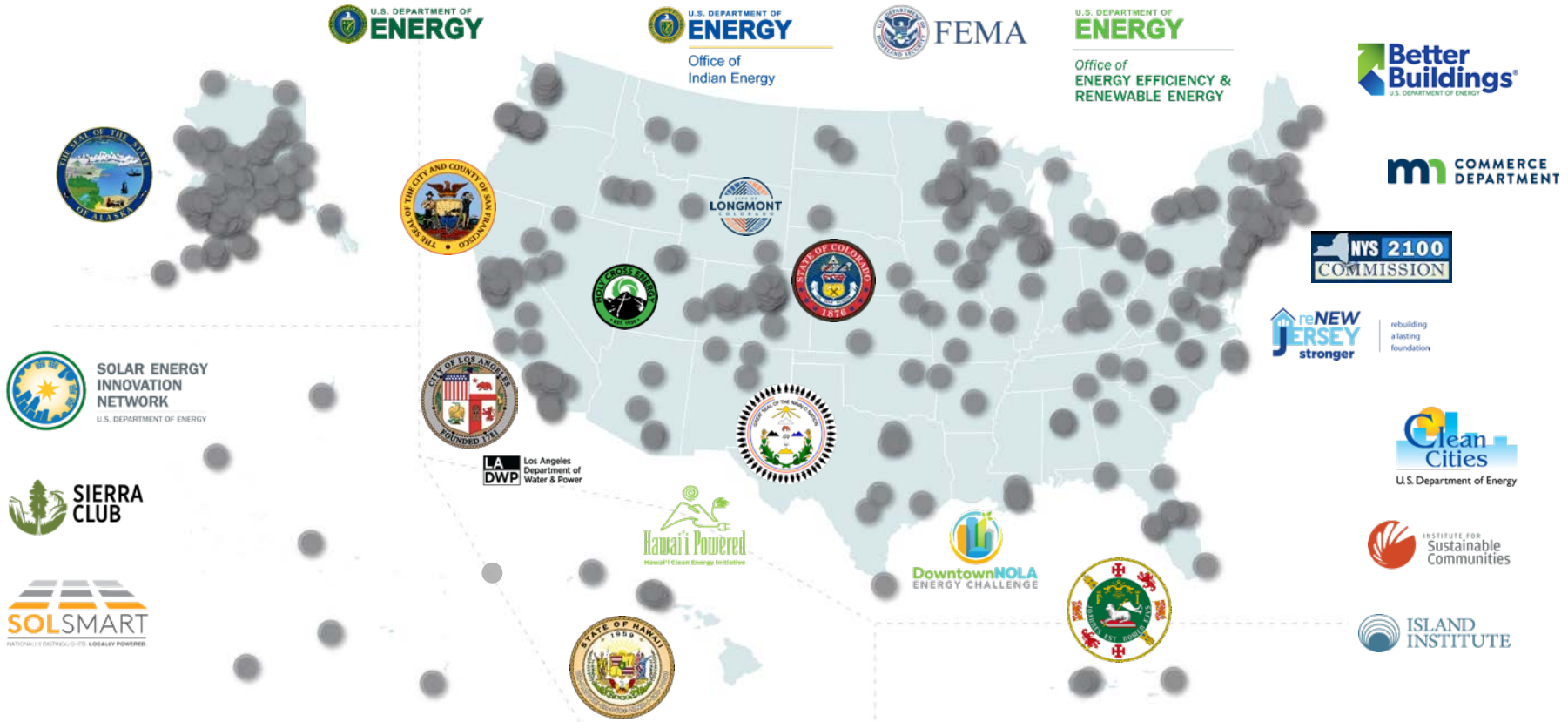
Get Involved

Contact Stor4Build@ee.doe.gov
for more information on ways to collaborate or to receive the latest Stor4Build news.

Learn more on Energy.gov

Research Prioritizes Equity at Every Stage

Photo from iStock-693474546



NREL has partnered with and supported **more than 3,000** communities, tribes, jurisdictions, utilities, and businesses for **energy transitions** planning, technical assistance, capacity building, workforce development, and more.


EPIX
ELECTRIFIED PROCESSES FOR
INDUSTRY WITHOUT CARBON

Source: Bladerunner and Starcraft Green Steel

Electrified Processes for Industry without Carbon (EPIXC)
$140+ Million DOE Clean Energy Manufacturing Institute

Vision: Electric heating is economical and supports manufacturing decarbonization ***everywhere for everyone.***

Goals

- Embody DEIA
- Close knowledge and training gaps to de-risk industrial deployment of electric heating technologies
- Leverage broad industrial consortia
- Operate industrially relevant testbeds (cement, steel, chemicals and refining, food processing and pulp and paper)
- Demonstrate cost parity of electric heating when compared to levelized cost of heating with fossil fuels with CCUS

Maria Curry-Nkansah
Chief Diversity Officer

17 U.S. Manufacturing Institutes

(Academia, Industry, National Labs, and More)

https://www.manufacturingusa.com/institutes

Energy Transition in Real Time—The Why?

Appalachian Mountains Coal Country

- For almost a century, coal powered America, made millionaires, and at its peak employed 883,000 people.
- Today, roughly 43,600 people work for the industry.
- Significant energy and economic shifts from coal to natural gas
  - High unemployment and lost pensions (due to bankruptcies)
  - High poverty rates
  - High numbers of children below the poverty line (45-50% in many counties)
  - Highest per capital opioid epidemic
  - Legacy health issues due to $PM_{2.5}$ and exposure to other toxins
  - Extreme soil and water pollution
  - Improved air quality due to coal mining and coal-fired plant closures

But… Even if a community has clean air; if there are no jobs or economic development, you have cascading effects leading to widespread poverty entrapment.

Diversified WFD Port Arthur Jumpstart Project

Texas Golden Triangle Empowerment Center

- Port Arthur
- Beaumont
- Orange

Salt River Materials Navajo Cement Project

- Puma, Arizona

Missouri Steel Testbed

- Rolla Missouri
- Tuskegee Alabama
- Montgomery Alabama

Career Pathway Support

What is the Institute's role and depth of training?

Career Path Strategy

Skill Level	Activity	Curriculum Developers and Training Providers
	Professional Position Corporate Internships Research Internship	• Universities • National Labs • Industry • KAAs/KTAs
	Journeyman Apprentice Pre-Apprentice	• Industry • Unions • Community Colleges • Community WFD • Trade Associations • KAAs/KTAs
	Entry Level positions Basic Math Skills Life Skills/Wrap Around Services	• Community WFD Groups • High Schools • Unions • Industry • Trade Associations • Community Colleges • KAAs/KTAs

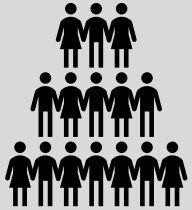

EPIX
ELECTRIFIED PROCESSES FOR
INDUSTRY WITHOUT CARBON
https://www.energy.gov/eere/articles/doe-selects-arizona-state-university-lead-new-institute-drive-industrial

NREL | Innovation & Entrepreneurship Center

Without Startups, Innovation Stalls

Advance Tech

Open Markets



Create Jobs

Innovation & Entrepreneurship Center

Building a **cleantech ecosystem** to **empower** market solutions that **transform** communities around the world.

Network Management

We build and maintain lasting relationships with key, relevant, and emerging performers and customers in the cleantech ecosystem.

- Entrepreneurs
- Incubator/Accelerator Network
- Investor Advisory Board
- Industry Boards

Convene the Ecosystem

We design and execute events and opportunities to connect our customers with each other to help bring relevant technologies to market and develop innovative markets.

- Industry Growth Forum
- Innovation Showcase
- Camp Cleantech

Tech Incubation Programs

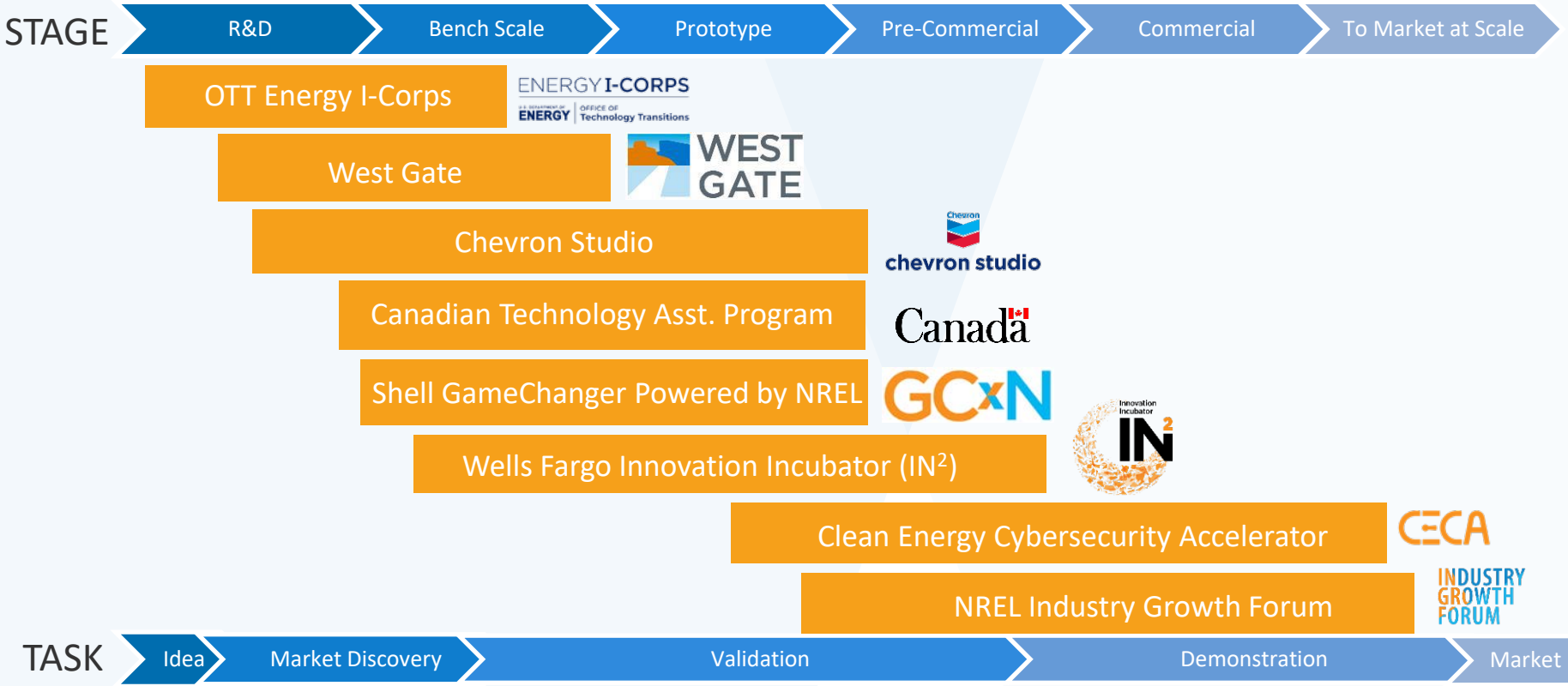
We create solutions and programs that suit our customers' needs by identifying gaps preventing innovations from getting to market or preventing market growth.

- Wells Fargo IN^2 program
- Shell GameChanger powered by NREL
- Clean Energy Cybersecurity Accelerator
- Energy I-Corps
- Canadian Tech Incubator
- NCAP

Innovation & Entrepreneurship Center

Building a **cleantech ecosystem** to **empower** market solutions that **transform** communities around the world.

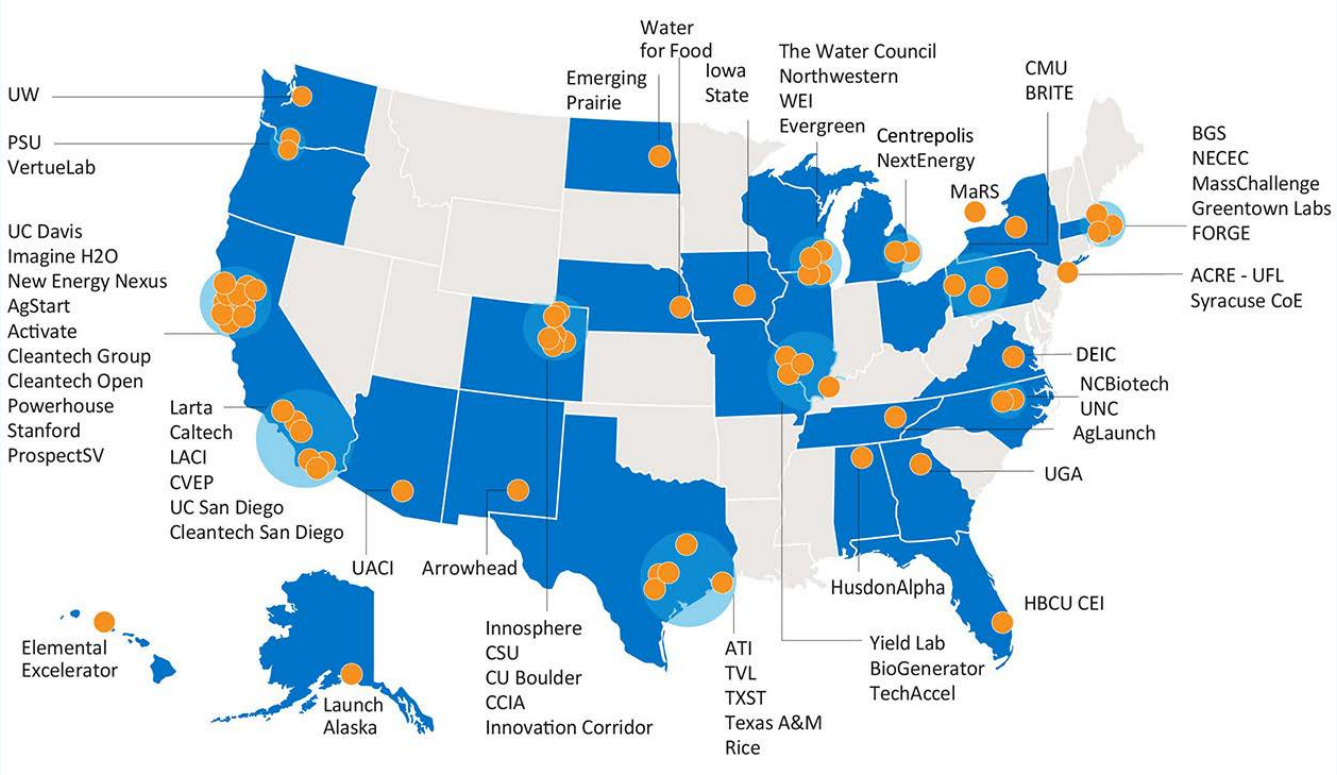
Accelerating Tech to Market With Tech Incubation Programs



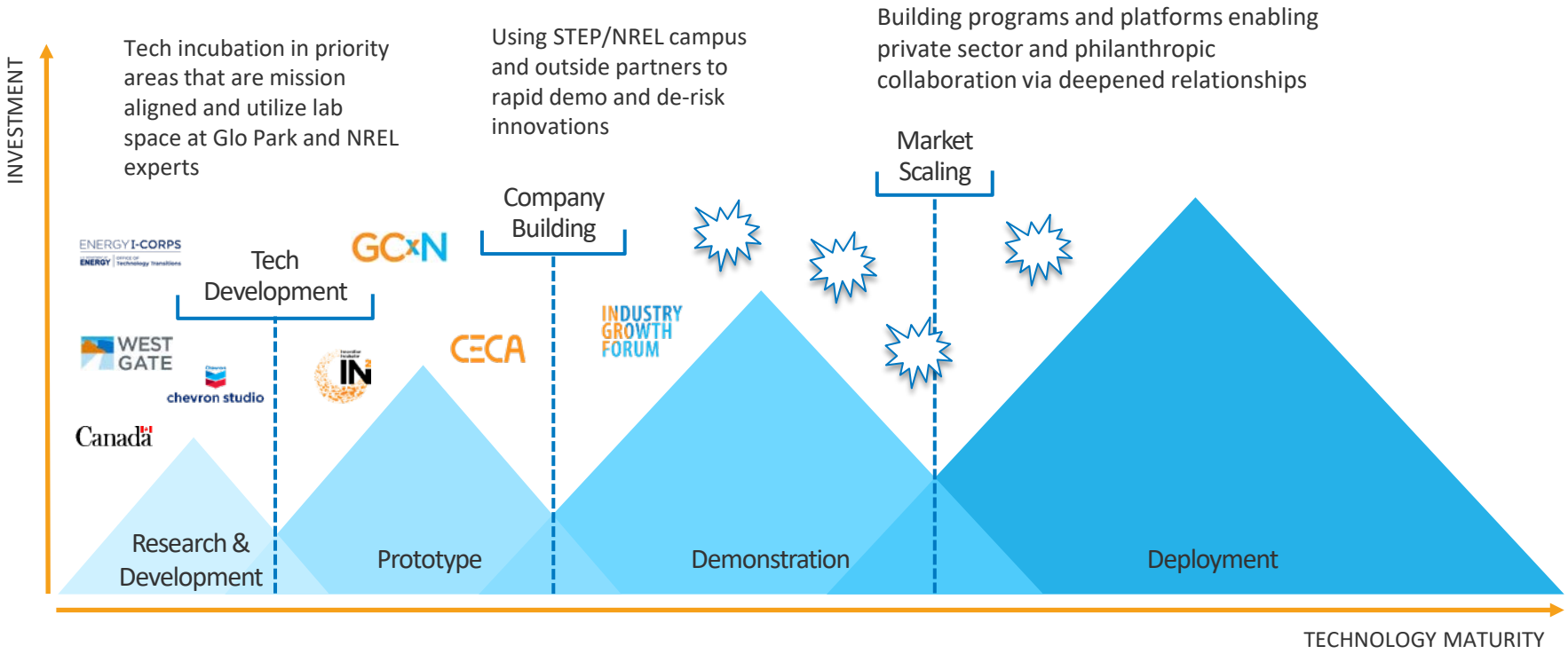
Our Incubation Network

60+ incubators, accelerators and university programs

We gain referrals for top startups and convene and fund this network to build a diverse and healthy cleantech pipeline.



Next decade expanded focus on innovation around demonstration and deployment barriers using IEC capabilities



Campus Expansion To Support Partnerships and Innovation

Global Energy Park (Glo Park)

South Table Mountain Energy Park

Energy Materials & Processing at Scale (EMAPS)

South Table Mountain Campus

NREL's administrative offices, education center, and most research laboratories are located at our 327-acre campus in Golden, Colorado.

- Energy Systems Integration Facility
- Field Test Laboratory Building
- High-Flux Solar Furnace
- Integrated Biorefinery Research Facility
- Renewable Fuel Heat Plant
- Solar Energy Research Facility
- Solar Radiation Research Laboratory
- Thermal Test Facility
- Vehicle Testing and Integration Facility.

Photo by Josh Bauer, NREL 59216

The Global Energy Park

Leading the Future of Energy

Glo Park

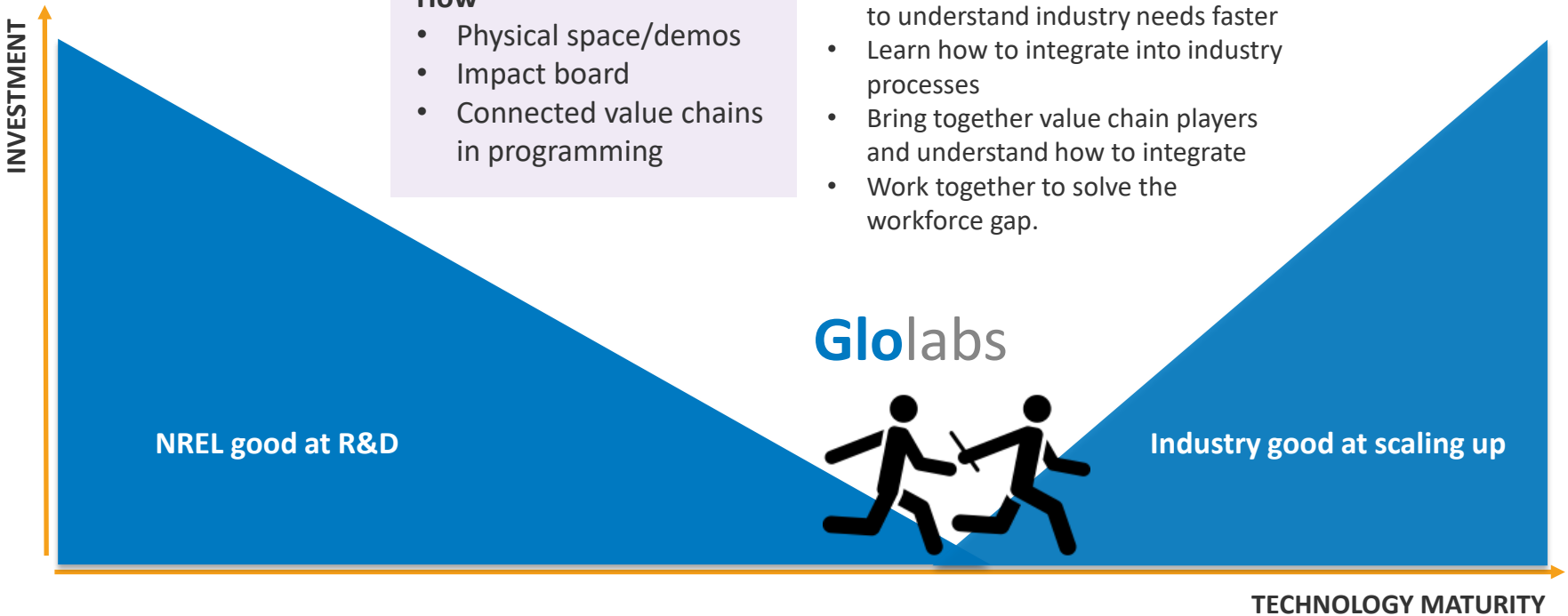
The visionary state of Colorado-led Global Energy Park (“Glo Park”) will be a living laboratory where leaders from around the world will collaborate to tackle the **planet’s most complex and urgent energy issues**, all while creating advanced-industry workforce **opportunities and engaging** people of all ages.

A rendering of the proposed Global Energy Park provided by NexCore Group and Page.

Focused portfolio of activities that simplifies the process for startups and accelerates the scale-up with industry

How
- Physical space/demos
- Impact board
- Connected value chains in programming

- Create efficiencies and opportunity to understand industry needs faster
- Learn how to integrate into industry processes
- Bring together value chain players and understand how to integrate
- Work together to solve the workforce gap.



North Campus

The **new net-zero energy building** will allow for open access by the community to enjoy the plaza and learn about the technology and careers in clean energy along “educational trails” from outdoor exhibits in the open space between the north and south campuses.

South Table Mountain Energy Park

The South Table Mountain Energy Park (STEP) is the future home of startups, entrepreneurs, and new innovations to help move the latest research and products closer to commercialization.

NREL is working closely with the Colorado State Historic Preservation Office on a master plan for STEP, located just south of NREL's South Table Mountain Campus, that will outline short-, mid-, and long-term developments.

Photo by Josh Bauer, NREL 77068

South Campus

NREL will preserve the **historical origins** as barracks in the newly named South Table Mountain Energy Park but renovated to incorporate the latest technology and practices in assuring businesses can de-risk their technology to move to commercialization.






Energy Materials & Processing at Scale (EMAPS)

- 127,000 sq. ft signature facility that minimizes barriers to rapidly scaling up new energy, materials, devices, and processes.

- JE Dunn and SmithGroup awarded design-build contract.
- Design is underway.
- Construction is anticipated to begin in early fall of 2024 and completed in FY 2027.

Staying Ahead of Future Energy Challenges

Collaborative approaches to launching new research areas and solving complex energy system challenges.

Photo from iStock 953782406

What's Next

- Prepare stakeholders for clean energy implications of emerging trends in climate, society, and technology.
- Inform research capabilities/networks around climate adaptation and clean energy workforce development.
- Industrial decarbonization has fair reaching benefits that improve the quality of our homes and businesses.
- On-site laboratories and immersive computational rooms will enable NREL researchers and partners to conduct joint research and experiments

Thank You

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Questions, please reach out via email!

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