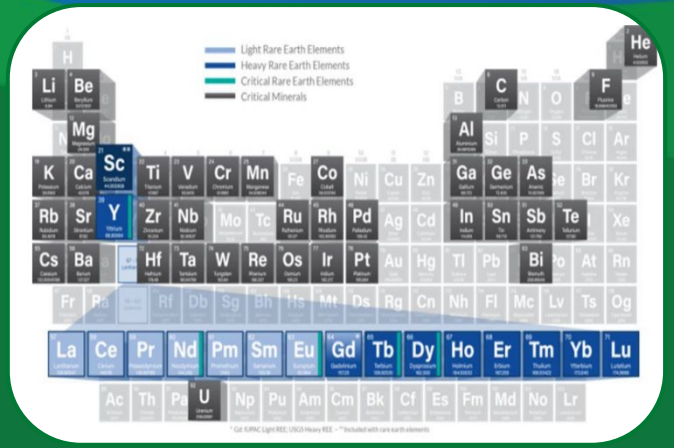
U.S. DEPARTMENT OF
ENERGY
Fossil Energy and
Carbon Management

OFFICE OF RESOURCE SUSTAINABILITY

June 2022

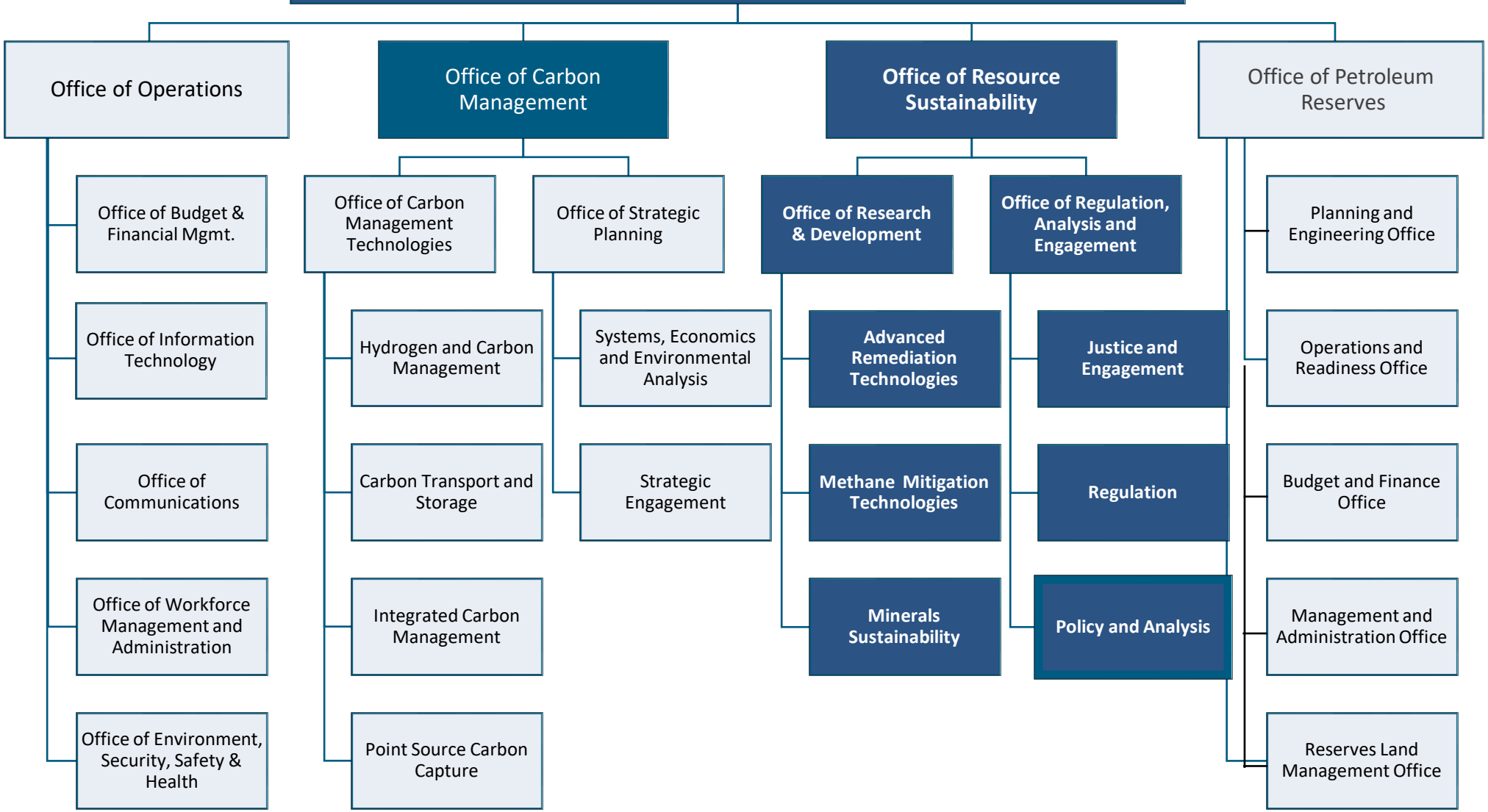


Goals for DOE

- The Department of Energy priorities reflect the Administration's energy and environment related goals:
  - ✓ Net-zero carbon emissions by 2050
  - ✓ Carbon-free electricity grid by 2035
  - ✓ Justice40 Initiative—aimed to deliver 40% of the overall benefits of climate investments to disadvantaged communities

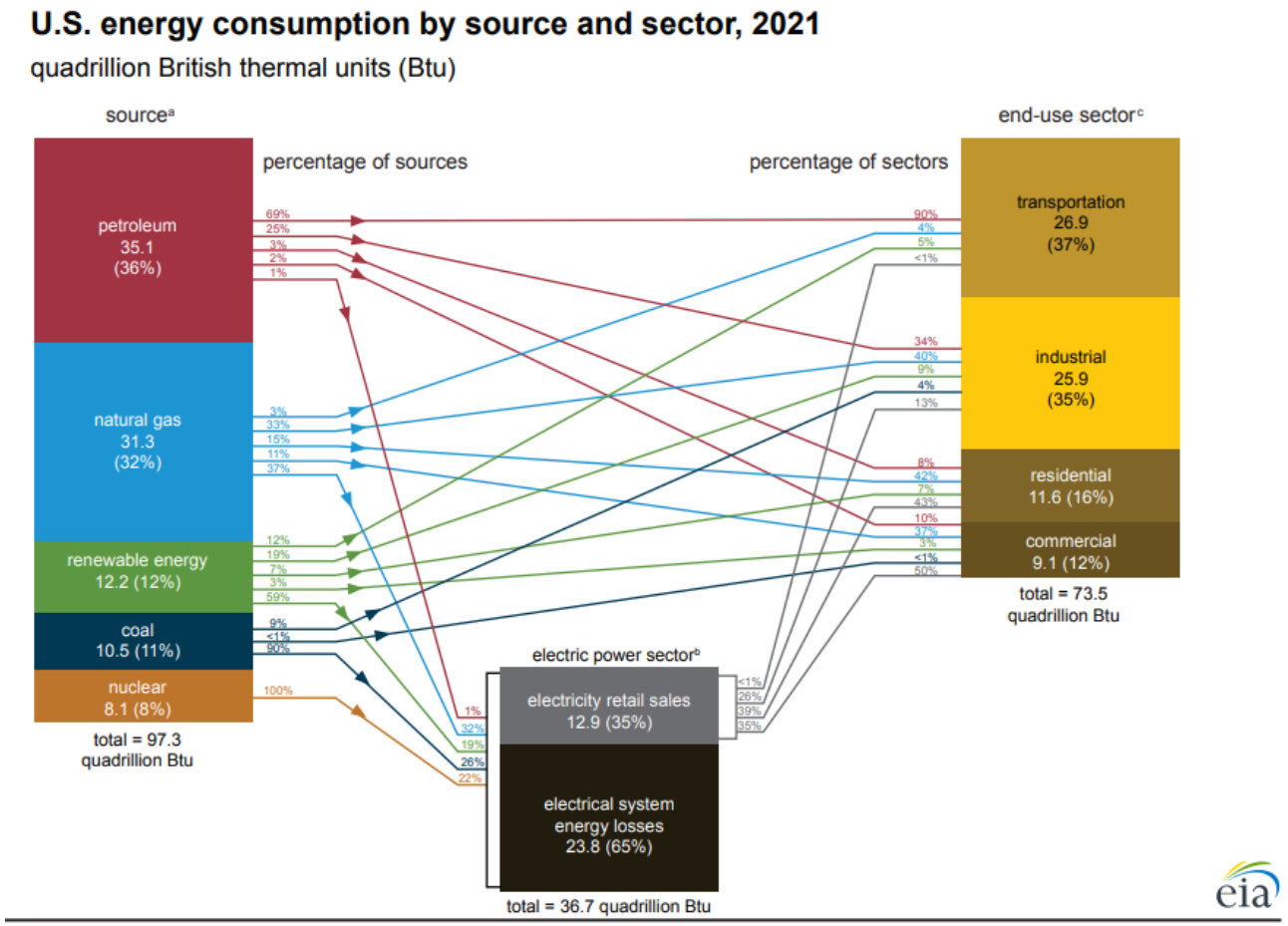
To achieve these goals, we have made changes to our name, our organization, and our research priorities.

Office of Fossil Energy and Carbon Management



Role of Resource Sustainability in the Energy Mix

- The United States continues to produce and use historically high levels of oil and natural gas
- Mounting concern over climate change have increased attention to reducing emissions from fossil energy production and use
- Fossil fuels will continue to provide a significant portion of domestic energy consumption as the U.S. transitions to a clean energy economy
- FECM's Office of Resource Sustainability focuses on developing technologies that will reduce the environmental impacts of our historical and continued dependence on coal, oil, and natural gas



Reducing the environmental impacts associated with the production, transportation, and storage of oil and natural gas is critical to achieving net-zero emissions

Current Program Areas

Adv. Remediation Technologies	• Research and solutions for the environmentally sustainable production and use of oil and natural gas resources. • Water management research including for produced water treatment and reuse technologies. • Methane Hydrates characterization and environmental assessments.
Methane Mitigation Technologies	• Develop new technologies to reduce or eliminate methane emissions across the natural gas supply chain in the United States. • Develop advanced technologies that will result in a significant reduction of methane emissions from natural gas production due to venting or flaring activities. • Transformational concepts for decarbonized, clean hydrogen from domestic natural gas resources.
Minerals Sustainability	• Technologies to improve critical mineral economics, and reduce the environmental impacts of mineral extraction, processing, and use. • Geological characterization, sustainable mining, concentration and processing, and separation and metallization technology development.
Justice and Engagement	• Support energy justice goals associated with legacy fossil fuel production and use, provide expertise in support of engagements and initiatives with government, non-profit, academia and industry entities
Regulation	• Review applications for the import and export of natural gas, liquefied natural gas (LNG), and compressed natural gas (CNG)
Policy and Analysis	• Analyze fossil energy market developments and trends in support of the Administration's energy transition and other policy goals

Advanced Remediation Technologies

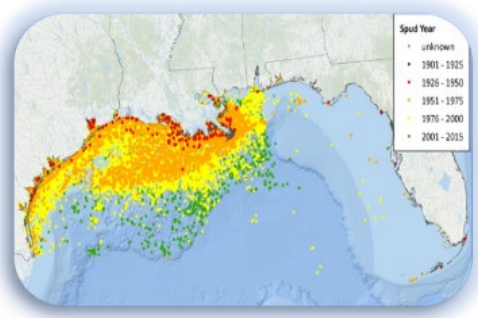
Focused on developing technologies that can be applied to the remediation and prevention of environmental impacts from the recovery of fossil energy resources.

Water Research

Waste to resource
Environmental sustainability
Industry collaboration

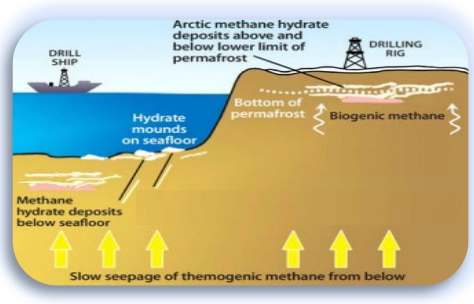
Field Laboratory Network

Basin-specific strategy
Fundamental shale
Emerging Plays



Offshore

Spill prevention
Borehole integrity
Aging infrastructure



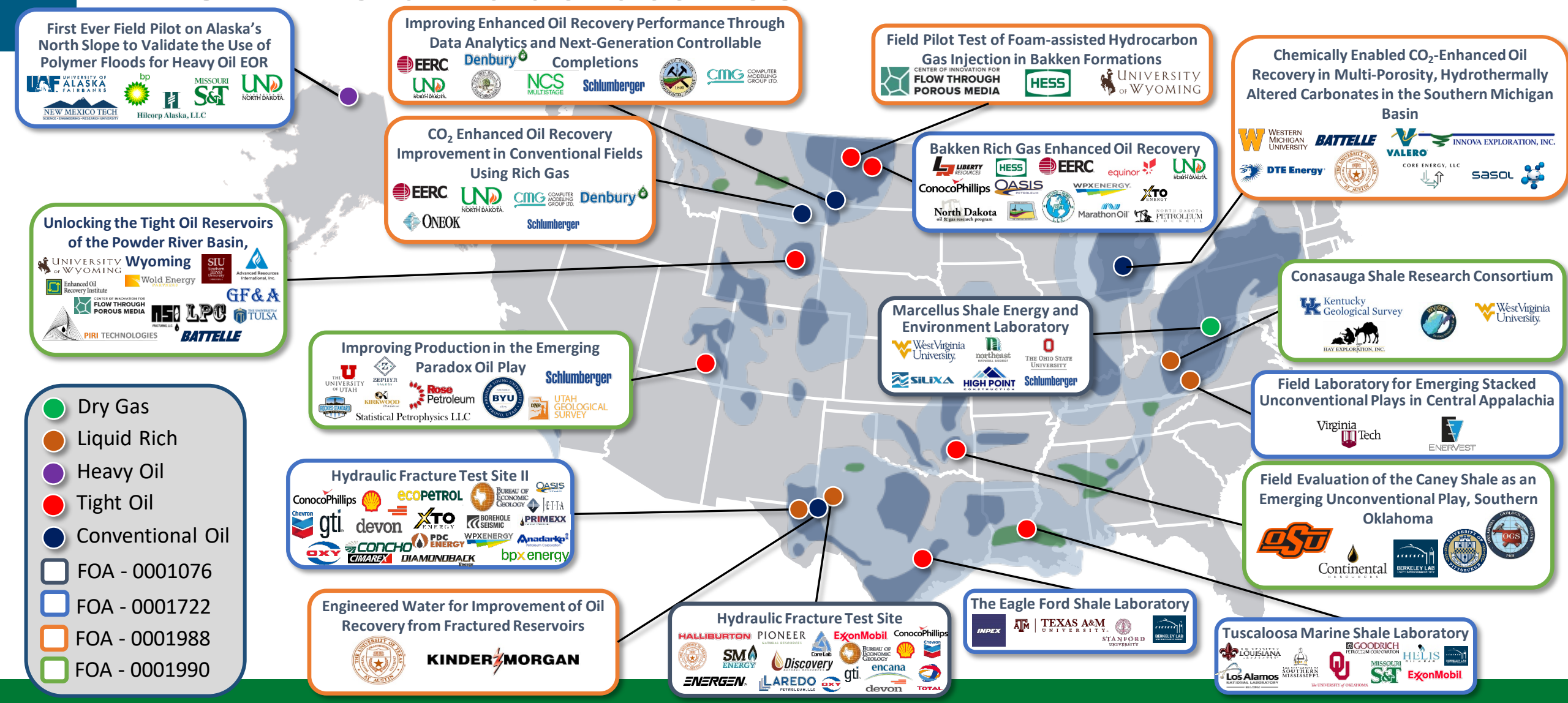
Methane Hydrates

Climate change stability
Resource characterization
International collaboration

AI/ML

SMART initiative
Reservoir characterization
Interagency collaboration

FECM Field Laboratories



Methane Mitigation Technologies

Methane Emissions Mitigation

Advanced materials, data management tools, inspection and repair technologies, and dynamic compressor R&D for eliminating fugitive methane emissions across the natural gas value chain

Methane Emissions Quantification

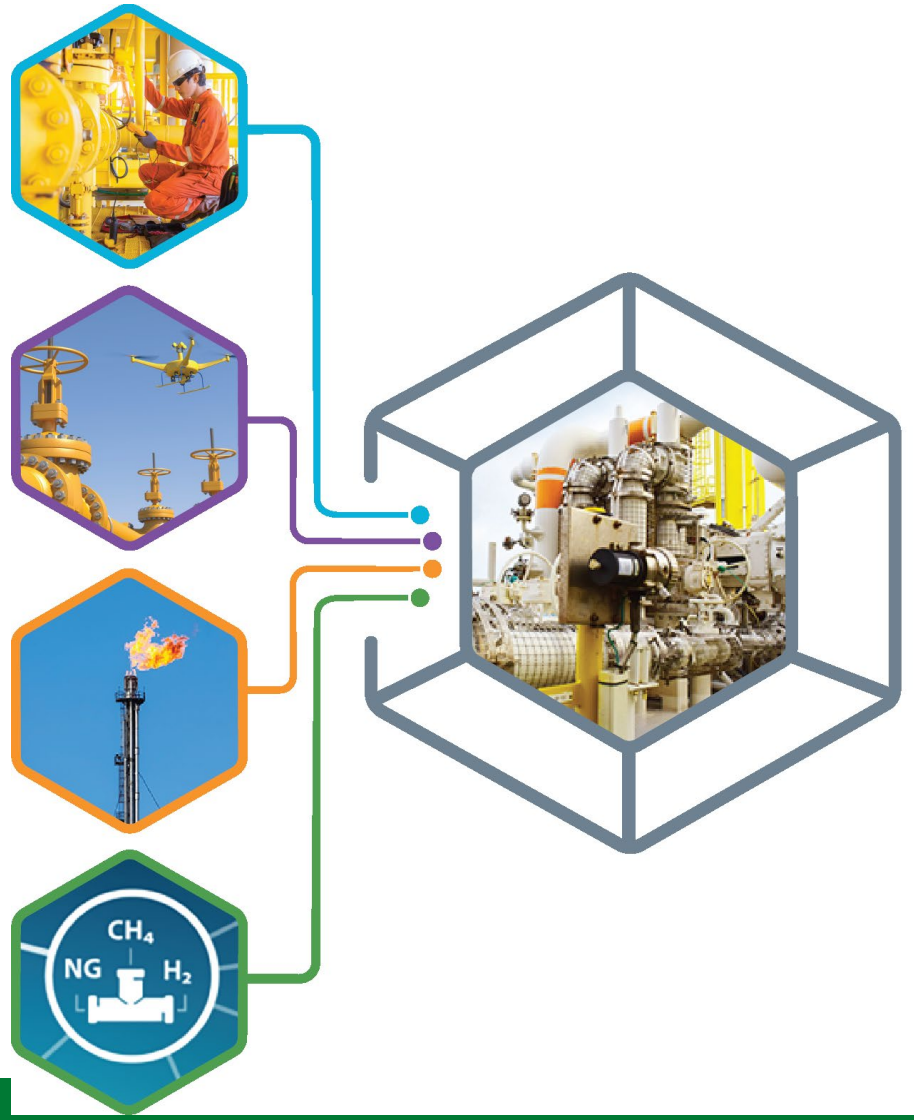
Direct and remote measurement sensor technologies and collection of data, research, and analytics that quantify methane emissions from point sources along the upstream and midstream portion of the natural gas value chain

Natural Gas Conversion

Developing low-carbon sustainable fuels and chemical products from stranded natural gas resources

Decarbonization of Natural Gas Resources

Technologies for carbon-neutral hydrogen production, safe and efficient transportation, and geologic storage technologies supported by analytical tools and models



METHANE MITIGATION TECHNOLOGIES

Minerals Sustainability

Extraction of Rare Earth Elements and Critical Materials From Fossil Fuel Wastes Such As Coal Refuse And Gob Piles, Acid Mine Drainage, And Produced Water

Pillar 1

Resource Characterization & Technology Development

- Characterization for opportunities
- Resource assessment and predictive capabilities
- Web-based platform for integrated database system with AI/ML

Pillar 2

Sustainable Resource Extraction Technology Development

- Transformation, conventional and unconventional extraction technologies
- Integration of industrial beneficiation/ concentration methods and technologies
- Remediation of existing sites and abandoned mine residuals

Pillar 3a

Processing, Refining, & Alloying Technology Development

Critical Materials

- Advanced extraction, purification, and reduction technologies through refining and alloying materials
- Enable commercial production through innovations
- First mover and second-generation large-scale pilot projects

Pillar 3b

Processing and Manufacturing Technology Development

Carbon Ore

- Housing and infrastructure development
- Advanced carbon material (carbon fiber, graphene, and nanomaterial) production
- Reinvest in critical (graphite and silicon) supply chains

International Engagements, Standards and Supply Chain Development

Ni, CO, Cr for Superalloys

- Identify co-production sources to meet increased demand in these metals
- Application of innovative processing, refining, and alloying technologies to increase purity from the waste materials

Carbon Ore to Products

- Assessment and characterization of coal and waste materials
- Environmentally responsible extraction and beneficiation
- Co-production of high purity carbon and critical material products

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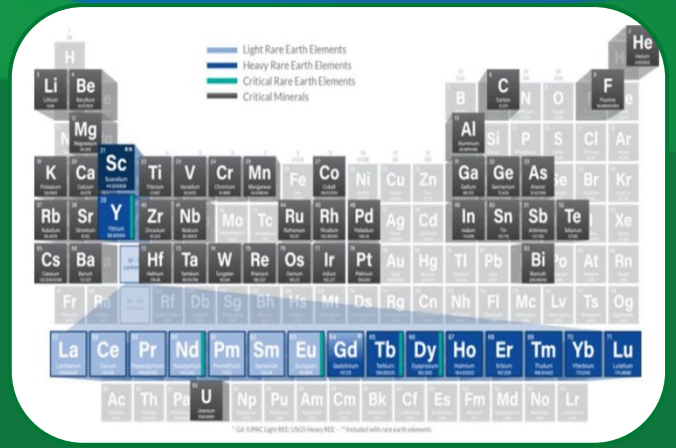
Questions?