



U.S. DEPARTMENT
of ENERGY



REPORT

FOSSIL ENERGY AND CARBON MANAGEMENT TRIBAL WORKING GROUP

FALL MEETING 2025

September 23 – 25, 2025
University of Oklahoma
Norman, Oklahoma

BACKGROUND – FOSSIL ENERGY & CARBON MANAGEMENT TRIBAL WORKING GROUP

The Federal Government has a treaty and trust responsibility to protect Tribal sovereignty and to revitalize Tribal communities, including through economic and energy development. Ensuring Tribal access to funding and incentive opportunities, requires sufficient outreach and coordination. As such, a Fossil Energy and Carbon Management Tribal Working Group (FECM TWG) was established in Fall 2024 to provide this outreach and coordination.

The purpose of the Tribal Working Group is two-fold:

1. Accelerate the Tribes' development of their vast energy resources and potential to contribute to American Energy Dominance
2. Empower the Tribes with fossil energy resources to gain full access to available funding and incentive opportunities.

To achieve these goals, the Working Group will provide input, local knowledge, and expertise to the Federal Government on the best ways to assist Tribes' fossil energy development efforts, as well as the utilization of their natural resources.

THE FOSSIL ENERGY AND CARBON MANAGEMENT TRIBAL WORKING GROUP MEETINGS

FECM TWG meetings, organized with assistance from the United States Energy Association (USEA) and funding provided by the U.S. Department of Energy's Office of Fossil Energy (DOE-FE), are a regular venue for dialogue with tribes on energy opportunities, options, and collaboration.

The most recent meeting, taking place on September 23 – 25, 2025, at the University of Oklahoma, was the 8th in a series dating back to the first Trump administration. The previous meetings took place in Moab, Utah in November 2019; Las Vegas, Nevada, in September 2022; Moab, Utah in March 2023; Santa Fe, New Mexico in October 2023; Jackson Hole, Wyoming in April–May 2024; in Medora, North Dakota in October 2024; and on May 7, 2025, at USEA Headquarters in Washington, D.C.

The FECM Tribal Working Group convened tribal leaders, DOE officials, and partner organizations to advance tribal energy self-determination, resource management, and capacity building. The three-day meeting emphasized moving tribes from passive royalty recipients to active owners and developers of fossil energy resources while navigating regulatory, financial, and technical barriers.

SUMMARY OF DISCUSSIONS

DAY I: Tribal Working Group (Half Day) Limited to TWG Members + I

The Fossil Energy and Carbon Management Tribal Working Group (FECM TWG) held its second formal meeting at the University of Oklahoma, gathering tribal leaders, Department of Energy (DOE) officials, and partners from the United States Energy Association (USEA). Building on the group's inaugural meeting in Washington, D.C., participants emphasized the TWG's mission to help tribes transition from

passive royalty recipients to active owners and developers of their energy resources. Throughout the day, discussions highlighted the scale of tribal fossil resources, the structural and regulatory barriers to development, and the opportunities for stronger federal-tribal collaboration under DOE's leadership. Tribal leaders underscored the importance of self-governance, capacity-building, and predictable federal policies, while DOE officials pledged deeper engagement, streamlined processes, and expanded technical and financial assistance.

Key Take-Aways from the Discussions

- **Strategic Role of Tribes in U.S. Energy**

- Tribes collectively hold a significant share of U.S. fossil resources, positioning them as critical to American energy dominance, national energy security and reliability.
- Yet, tribes remain underrepresented as owners and operators, often limited by historical policy and structural barriers.

- **Federal Partnership and DOE Engagement**

- DOE officials, including Acting Director David Conrad (Office of Indian Energy), Director of Business Operations Joseph Giove (Office of Fossil Energy and Carbon Management), and Deputy Assistant Secretary for Fossil Energy and Carbon Management Curt Coccodrilli, pledged stronger collaboration with tribes.
- Coccodrilli committed to early consultation, visits to tribal lands (beginning with the Crow Nation), and efforts to simplify permitting and grant access.
- DOE reaffirmed its focus on ensuring tribal inclusion in policy and program design.

- **Barriers and Regulatory Challenges**

- Persistent delays in BIA and interagency permitting processes (often 2–8 years) hinder energy development and investment.
- Fractionated land ownership, outdated leasing templates, and burdensome grant matching requirements complicate project execution.
- Tribes expressed the need for reforms to National Environmental Policy Act (NEPA) processes, modernize permitting, and provide consistent, long-term policy signals.

- **Capacity and Self-Governance**

- Many tribes are advancing HEARTH Act leasing, 477 funding consolidation, DEMD grants and Indian Mineral Development Agreements (IMDAs) to gain greater control over their lands and resources.
- Tribal leaders emphasized building technical expertise, financial capacity, and regulatory authority to move from reliance on federal oversight to tribal administration.
- Initiatives such as tax enforcement, workforce development, and internal energy offices are strengthening tribal governance.

- **Technology and Resource Innovation**

- Tribes are exploring advanced drilling techniques, CO₂-enhanced oil recovery (EOR), and critical mineral extraction from produced water.
- AI-driven tools, advanced geologic modeling, and partnerships with universities and federal labs are being leveraged to better map, evaluate, and manage resources.
- Energy development continues, though tribes expressed caution given shifting federal priorities for CCS, hydrogen, and renewables.

- **Policy Stability and Long-Term Planning**

- Tribal leaders expressed frustration with abrupt federal energy policy shifts, which disrupt planning and investment.
- Participants expressed a need for clearer DOE guidance on which technologies and funding streams will remain viable over the long term.

- DOE encouraged tribes to pursue strategic planning and define long-term goals, rather than “chasing every funding trend.”
- **Cultural and Historical Context**
 - Chairman Bobby Gonzalez of the Caddo Nation reminded participants of the deep historical ties tribes hold to their homelands and as a general allotment tribe without a reservation, the enduring challenges of fractionated ownership, delayed royalties, and legacy exploitation.
 - Tribes emphasized balancing the struggle for minerals development with cultural preservation, environmental protection and community health.

DAY 2: Expanded Stakeholder Engagement – Information Sharing

The second day of the meeting centered on the history and evolution of the TWG, federal updates, university research partnerships, and critical discussions on tribal energy development. Presentations from DOE, the University of Oklahoma, and the Department of the Interior highlighted both the institutional support available to tribes and the challenges of advancing energy sovereignty amid shifting federal policies. The day continued with forward-looking sessions on project finance training, clean fossil energy technologies, and enhanced oil recovery, underscoring the TWG’s role as a practical forum for building knowledge, capacity, and collaboration across Indian Country. Day 2 concluded with the group attending a session on CO2 Enhanced Oil Recovery and Sequestration: Opportunities and Challenges at a separately organized University of Oklahoma event and then tours of the Oklahoma Geological Survey and Sarkey Energy Center.

Key Take-Aways from the Discussions

- **Evolution of the Tribal Working Group**
 - DOE’s Joe Giove traced the TWG’s establishment to the first Trump Administration, continued tribal engagement meetings under the Biden Administration, and adoption of a charter and bylaws that allow candid dialogue that adhere to and avoid violation of the Federal Advisory Committee Act (FACA).
 - Despite political transitions, the DOE-FE’s tribal-focused meetings and establishment of the TWG have remained a consistent platform for tribes to engage DOE and discuss energy policy.
- **University of Oklahoma Partnerships**
 - OU researchers presented cutting-edge work on greenhouse gas monitoring, environmental resilience, and hydrogen production via methane pyrolysis.
 - Emphasis was placed on tribal data sovereignty, workforce training, and technology pathways that convert stranded gas and waste streams into economic opportunities.
 - OU positioned itself as a trusted partner for research, training, and collaboration with tribes.
- **DOE Office of Indian Energy Update**
 - Dr. Thomas Jones outlined DOE-IE’s statutory mission, its three pillars (financial assistance, technical assistance, capacity building), and 400+ projects completed.
 - Highlighted emerging opportunities for tribes in data center development, supported by DOE-IE funding, legal resources, and training.
 - Federal support aims to help tribes in establishing due diligence processes assessing developers, avoiding exploitation, and establishing protective frameworks while pursuing economic benefits.
- **Interior Department Perspectives on Self-Governance**
 - Deputy Assistant Secretary Ken Bellmard underscored Indian Country’s vast resource base and the importance of tribes exercising greater control through self-governance frameworks such as Tribal Energy Resource Agreements (TERAs).
 - Barriers include probate backlogs (40,000+), outdated systems, and understaffed BIA offices,

- though reforms such as probate strike teams are underway.
- Interior’s new posture is to “support, not block” tribal authority, with leadership pressing for faster progress on energy self-determination.
- **Building Financial and Technical Capacity**
 - USEA proposed a **Tribal Project Finance Training Program** to equip tribal professionals with hands-on skills in project structuring, financial modeling, and negotiations.
 - Participants strongly supported the initiative, stressing its importance for enabling tribes to shift from leasing arrangements toward direct ownership and operation of energy resources.
- **Tribal Energy Development and Coal’s Continuing Role**
 - Leaders emphasized the high costs and risks of energy projects, but also the long-term benefits of full ownership.
 - Coal remains a critical revenue source for some tribes; plant closures have created economic hardship, but vast reserves continue to hold strategic importance.
 - Participants called for consistent, reliable federal engagement to reduce regulatory uncertainty and “policy whiplash.”
- **CO₂ Enhanced Oil Recovery (EOR) and Carbon Management: University of Oklahoma Speaker Series**
 - Industry and academic experts highlighted opportunities to expand CO₂ EOR, convert existing fields, and develop storage hubs.
 - Research on CO₂ huff-n-puff in shales and global perspectives on sequestration underscored both the technical promise and the monitoring/accountability challenges.
 - CCUS and EOR were framed as dual pathways for revenue generation and carbon management when paired with innovation and strong safeguards.

DAY 3: Action Planning & Implementation

The final day of the meeting focused on consolidating insights from earlier discussions and charting a path forward for tribal energy sovereignty, federal engagement, and industry collaboration. USEA provided context on the TWG’s history and facilitation role, emphasizing the group’s value as a forum for open exchange. Tribal leaders, DOE officials, and technical experts engaged in candid dialogue on persistent regulatory barriers, policy instability, and emerging opportunities such as clean fossil energy development, data centers, and expanded utility and resource ownership. The session underscored the need for consistent federal support, legal clarity on new technologies, stronger workforce development, and broader tribal participation. It concluded with a commitment to keep the TWG proactive, visible, and united in advancing tribal priorities during a critical window for U.S. energy policy.

Key Take-Aways from the Discussions

- **USEA’s Role and TWG Evolution**
 - Alex Krowka outlined USEA’s century-long history, its Consensus Program with DOE, and its facilitation of DOE Tribal engagement and TWG meetings since 2019.
 - The TWG has persisted across administrations, growing from informal sessions into a formal body with elected leadership and bylaws.
 - According to various estimates, Tribes collectively may hold 20–30% of U.S. fossil energy resources but face regulatory, financial, and structural barriers to realizing their potential.
- **Barriers to Tribal Energy Development**
 - Tribal leaders highlighted “policy whiplash” from shifting federal priorities, outdated leasing templates, unresolved unit agreements, and heavy permitting burdens.
 - The Indian Mineral Development Act (IMDA) was cited as a clear legal pathway often undermined by new regulatory layers.

- Legal uncertainties – particularly around pore space ownership for carbon storage – require expert clarification in future TWG sessions.
 - **Balancing Sovereignty and Data Sharing**
 - While data sovereignty is essential, overly restrictive interpretations could block transparency, partnerships, and access to funding.
 - Participants emphasized the need for balanced frameworks that protect tribal rights while enabling investment and collaboration.
 - **Bottom-Up Engagement with Federal Agencies**
 - DOE encouraged tribes to bring well-prepared, tribal-led project proposals, which are more likely to secure support and withstand policy transitions.
 - Members stressed the importance of elevating unresolved issues – such as NEPA burdens, lease data restrictions, and inconsistent environmental rule enforcement – to DOE and DOI leadership.
 - **Strategic Opportunities and Case Studies**
 - Examples included the Navajo Nation’s potential extension of its last coal plant to meet regional demand from new data centers, and the stalled \$50M methane-reduction program originally designed for multiple tribes.
 - These cases illustrated both the scale of opportunities and the consequences of inconsistent policy support.
 - **Strengthening the TWG Process**
 - Members reaffirmed the TWG’s role in educating federal officials on the state of Tribal energy development while serving as a platform for peer exchange.
 - Semi-annual meetings, supplemented by special sessions, were deemed more practical than quarterly gatherings.
 - Proposals included holding at least one meeting per year in Washington, D.C., to engage DOE leadership and allow TWG members an opportunity to engage Congress outside of DOE meetings.
 - **Looking Ahead: Representation and Workforce**
 - Expanding participation across more of the 574 federally recognized tribes remains a top priority to ensure diverse perspectives.
 - Workforce development, training, and mentorship were emphasized as essential to building the next generation of tribal energy leaders.
 - Stronger coordination among DOE, DOI, national labs, and universities is needed to support capacity building at scale.
 - **Shared Commitment**
 - The meeting closed with agreement that the TWG must remain organized, visible, and proactive.
 - Members committed to preparing clear, collective priorities for DOE leadership, including possible early engagement through a virtual session with the Assistant Secretary.
 - Across all discussions, the central theme was strengthening tribal sovereignty while positioning tribes as critical partners in advancing American energy dominance, U.S. energy security, and economic development goals.
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ACTIONABLE ITEMS

1. **Regulatory & Policy Reform**

- Streamline permitting processes and reduce regulatory barriers.
- Address outdated leasing frameworks, unresolved unit agreements, and policy inconsistency.

2. **Tribal Capacity & Workforce Development**

- Launch USEA-led project finance training for early-career tribal professionals.
- Expand technical, legal, and financial assistance programs.
- Strengthen workforce pipelines through academic partnerships and mentorship programs.

3. **Data & Resource Management**

- Ensure data sovereignty while enabling data sharing with federal and academic partners.
- Clarify pore-space ownership and methane reduction program implementation.

4. **Engagement & Coordination**

- Federal Government leadership site visits to fossil resource tribes.
- Maintain annual TWG meetings in Washington, D.C., with rotations on tribal lands or regional hubs.
- Prepare unified project proposals and “asks” for federal leadership.
- Enhance interagency coordination across DOE, DOI, national labs, and universities.

5. **Strategic Planning & Ownership**

- Support tribes in developing long-term energy strategies and investment plans.
- Encourage tribal-led initiatives in coal, oil, gas, hydrogen, and critical mineral projects.
- Promote peer-to-peer knowledge sharing and intertribal collaboration to strengthen energy sovereignty.

MEETING AGENDA

Day 1: Tribal Working Group (Half Day) Limited to TWG Members + 1

Strategic Planning Session

Reserved only for FECM TWG members and DOE Leadership

1:00 - 1:30 PM | Opening Ceremonies

- Invocation Prayer
- Welcome remarks – William D. McCabe, Navajo
- Workshop Overview & Objectives – Demi Morishige, Southern Ute Indian Tribe

1:30 – 2:30 PM | Status Update – What Tribes Can Expect Under the New Administration

- Tala Goudarzi, Principal Deputy Assistant Secretary, U.S. Department of Energy – Office of Fossil Energy (DOE-FE)
- Kurt Coccodrilli, Deputy Assistant Secretary, U.S. Department of Energy – Office of Fossil Energy (DOE-FE)
- David Conrad, Acting Director, U.S. Department of Energy – Office of Indian Energy (DOE-IE)

2:30 – 2:45 PM | Break

2:45 – 3:15 PM | Caddo Nation

- History and Cultural Context
- Federal-State Relations: Engagement with Oklahoma and BIA
- Key Historical Events Influencing Energy Development
Overview of Caddo Nation's Energy Experience and Pathways

3:15 – 4:15 PM | Current Status of Tribal Energy Led by William D. McCabe

- Permitting & Regulatory- Leasing, NEPA streamlining, interstate/cross-border issues
- Sustainable Development- CCUS, 45Q, clean coal, hydrogen development
- Financing & Investment- DOE LPO, Tribal Energy Loan Guarantee Opportunities
- Collaboration & Innovation – Coordination with tribal organization, AI & data centers

4:15 – 5:00 PM | Tribal Fossil Development – Discussion

5:00 PM | Day 1 Wrap up & Day 2 Preparation

Day 2: Expanded Stakeholder Engagement – Information Sharing

Federal agencies, industry, and academic partners join tribal representatives

9:00 – 9:45 AM | Welcome & Day 2 Opening

- Invocation Prayer
- Land acknowledgements | University of Oklahoma Welcome
- Day 2 Objectives – Demi Morishige, Southern Ute Indian Tribe
- Roundtable Introductions

9:45 – 10:00 AM | History & Establishment of FECM TWG

- Joseph Giove, Director of Business Operations, DOE- FE

10:00 – 11:00 AM | University of Oklahoma

- Dr. Steven Crossley, Sam A Wilson Professor of Chemical Engineering, Rodger and Sherry Teigan Presidential Professor (NSF RANGE project)
- Dr. Tim Filley, Professor and Executive Director of the Institute for Resilient Environmental and Energy Systems (IREES)

11:00 – 12:00 PM | Status Update

- Dr. Thomas Jones, Tribal Affairs/ Deployment Specialist, DOE-IE
- Ken Bellmard, Deputy Assistant Secretary for Policy and Economic Development, Department of the Interior – Indian Affairs

12:00 – 1:00 PM | Lunch

1:00 – 2:00 PM | Tribal Projects

- Chairman David Sickey, Coshatta Tribe
- Navajo Coal Resources
- Will Polen, Senior Director, United States Energy Association

2:00-2:15 PM | Walk Over to Speaker Series

2:30 – 3:30 PM | OU Speaker Series

- CO2 Enhanced Oil Recovery and Sequestration: Opportunities and Challenges
 - Session Chair: Runar Nygaard, University of Oklahoma
 - Vishal Gupta, Occidental
 - Chandra Rai, University of Oklahoma
 - Keith Bowman, CapturePoint Solutions
 - Sanjay Srinivasan, Penn State University

3:45 – 4:15 PM | Tour Oklahoma Geological Survey – Sarkeys Energy Center

- Dr. Molly Yunker, OGS Education and Outreach Coordinator & Dr. Carrie Miller-DeBoer, OGS Research Associate

4:15-4:45 PM | Tour IC3 Integrated Core Characterization Center

- Dr. Son Dang, Assistant Professor of Petroleum and Geological Engineering

5:00 | Reception Hosted by Caddo Nation

OU Jimmie Austin Golf Club | 4 Ranson Dr., Norman, OK 73019

Day 3: Action Planning & Implementation (half- day)
Federal agencies, industry, and academic partners join tribal representatives

9:00 – 10:00 AM | Workshop Summary

- Alex Krowka, Deputy Program Director, USEA

10:00 – 11:00 AM | Next Steps FECM TWG

- Strategic Steps for the Meeting

11:00 – 12:00 PM | Face to Face with DOE

- Feedback Based on this gathering
- Expectations and Timelines

APPENDICES

- Tribal Working Group Project Finance Training (USEA)
- Hydrogen Production and Storage: Convergence of Social Sciences, Engineering & Geoscience (Dr. Steven Crossley, the University of Oklahoma)
- Data Centers: Exploring the Opportunity (Dr. Tommy Jones, U.S. Department of Energy)

What is USEA?

The United States Energy Association (USEA) is an association of public and private energy-related organizations, corporations, and government agencies. USEA represents the broad interests of the U.S. energy sector by increasing the understanding of energy issues, both domestically and internationally.

USEA's mission is "to promote the sustainable supply and use of energy for the greatest benefit of all."



About USEA



USEA was founded in 1924 and this year marks our 100th anniversary.

USEA's mission has two pillars of equal importance.

- USEA serves as a resource, by convening energy stakeholders to share policy, scientific, and technological information to foster the advancement of the entire energy sector.
- Internationally, USEA promotes energy development by expanding access to safe, affordable, sustainable, and environmentally acceptable energy in partnership with the U.S. Government.



Mark Menezes. President and CEO, USEA

About Consensus

- Cooperative Agreement with DOE-FECM
- Builds domestic and international consensus on needs for/uses of clean fossil energy technologies
 - CCUS
 - Clean Coal
 - Hydrogen w/ CCUS
- Convening through briefings, webinars, and workshops
- Production of Research Reports and White Papers
- Bi-monthly newsletter to keep stakeholders informed
- Special interest: supporting Fossil-resource Tribes in development of their resources and engagement w/ Fed Govt. (DOE in particular)

Why Training Matters & Objectives

- Fossil resources = potential for revenue, jobs and sovereignty
- Tribes committed to balancing economic growth with cultural and environmental leadership
- Carbon management = pathways to align economic development with sustainability
- Build tribal human capital for CCUS project finance & operations
- Enable tribes to structure, finance, and manage carbon projects
- Support partnerships with U.S. government and private sector
- Foster sovereignty, sustainability, and long-term economic benefits

Long-Term Vision

- Establish cadre of tribal specialists in CCUS project finance
- Enable tribes to own and operate carbon management projects
- Create models replicable across Indian Country
- Drive long-term tribal economic growth and sovereignty while honoring cultural values

Day 1: Foundations of Project Finance & Carbon Management

- Welcome & Introductions
- Carbon Management Overview
- Project Finance Fundamentals
- Key Federal & State Programs
- Corporate Finance vs. Project Finance
- Typical Capital Structures
- Project Phases: Development, Construction, Operation
- Case Study: Energy & Carbon Projects
- Day 1 Wrap-Up: Key takeaways

Day 2: Financial Structures, Risk Management & Incentives

- Recap & Discussion
- Financial Structures for Carbon Projects
- Role of Federal Tax Incentives & Grant Programs
- Blending Public & Private Capital
- Risk Analysis & Mitigation
- Identifying Technical, Financial, Regulatory, and Market Risks
- Risk Mitigation Strategies
- Hands-On Workshop: Financial Modeling
 - Capex & Opex
 - Project Revenue Streams (carbon sales, credits, tax assignment, energy offtake)
 - Key Financial Metrics
- Day 2 Wrap-Up

Day 3: Deal Structuring, Partnerships & Negotiations

- Recap & Discussion
- Public-Private Partnerships & Tribal Sovereignty
- Negotiation Strategies & Contracts
- Closing Session & Certificates





Hydrogen production and storage
Convergence of social sciences, engineering,
and geoscience

Steven Crossley

Professor, School of Chemical, Biological and
Materials Engineering

The University of Oklahoma, Norman, OK

Supporting the next generation

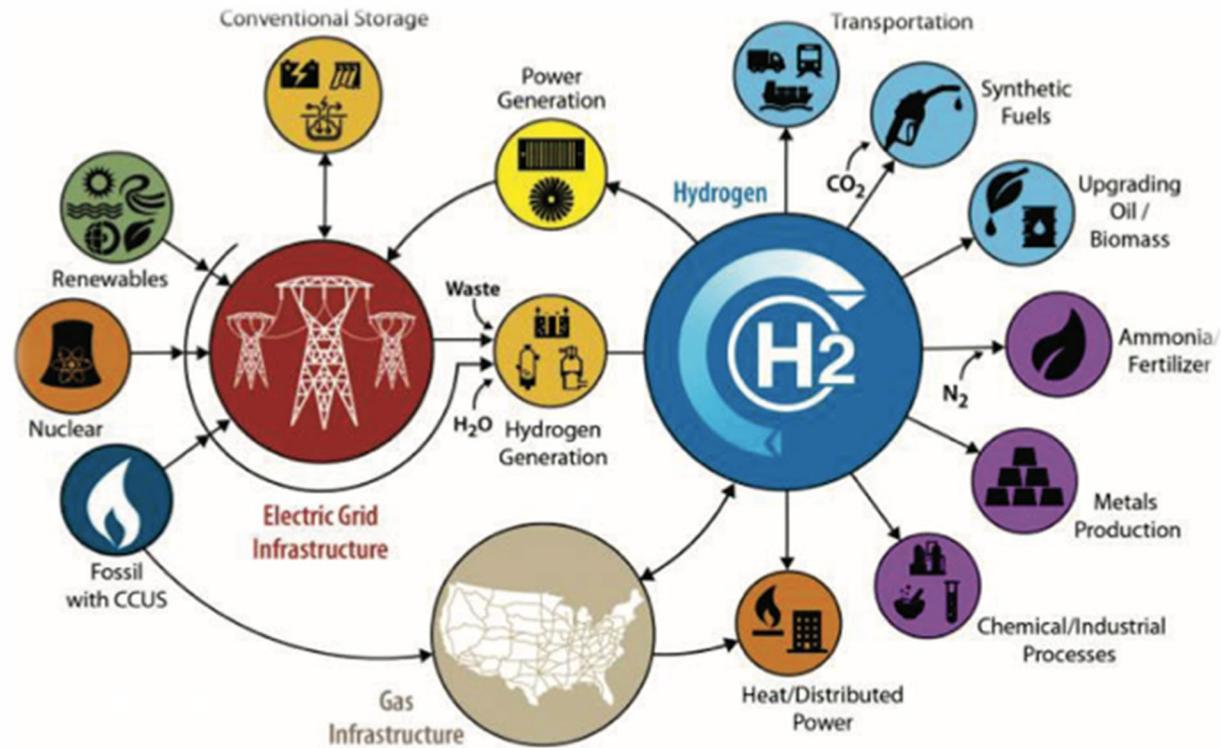


<https://ou.edu/coe/aises>



WHAT IS AISES?

H₂ economy presents many fundamental challenges



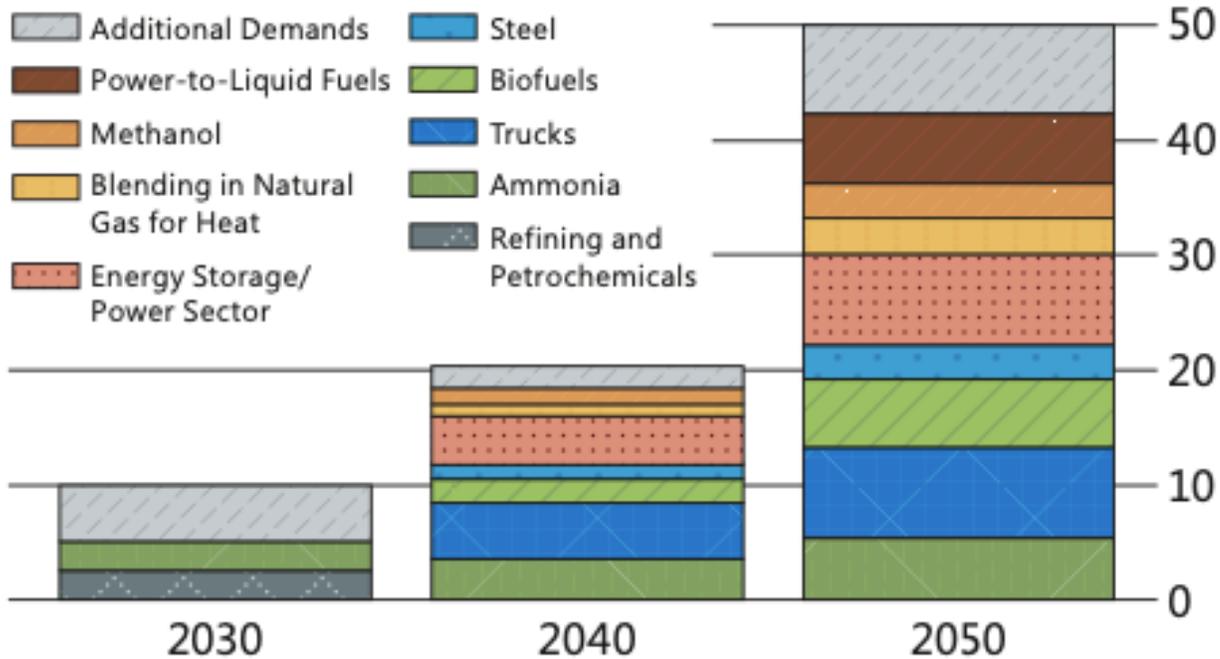
Priority Research Opportunities

- *Discover and Control Materials and Chemical Processes to Revolutionize Electrolysis Systems*
- *Manipulate Hydrogen Interactions to Harness the Full Potential of Hydrogen as a Fuel*
- *Elucidate the Structure, Evolution, and Chemistry of Complex Interfaces for Energy and Atom Efficiency*
- *Understand and Limit Degradation Processes to Enhance the Durability of Hydrogen Systems*

DOE projected role of hydrogen over the coming years



Potential Demand for Clean Hydrogen across Multiple Applications (Million Metric Tons H₂ per Year)



https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf?sfvrsn=c425b44f_5

Key considerations



-Hydrogen is an energy carrier- not a source

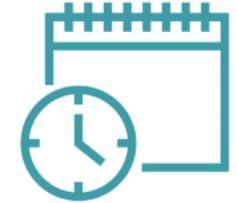
-Energy is not free



1 Dollar



1 Kilogram



1 Decade

-targets (\$\$) for clean hydrogen are very ambitious

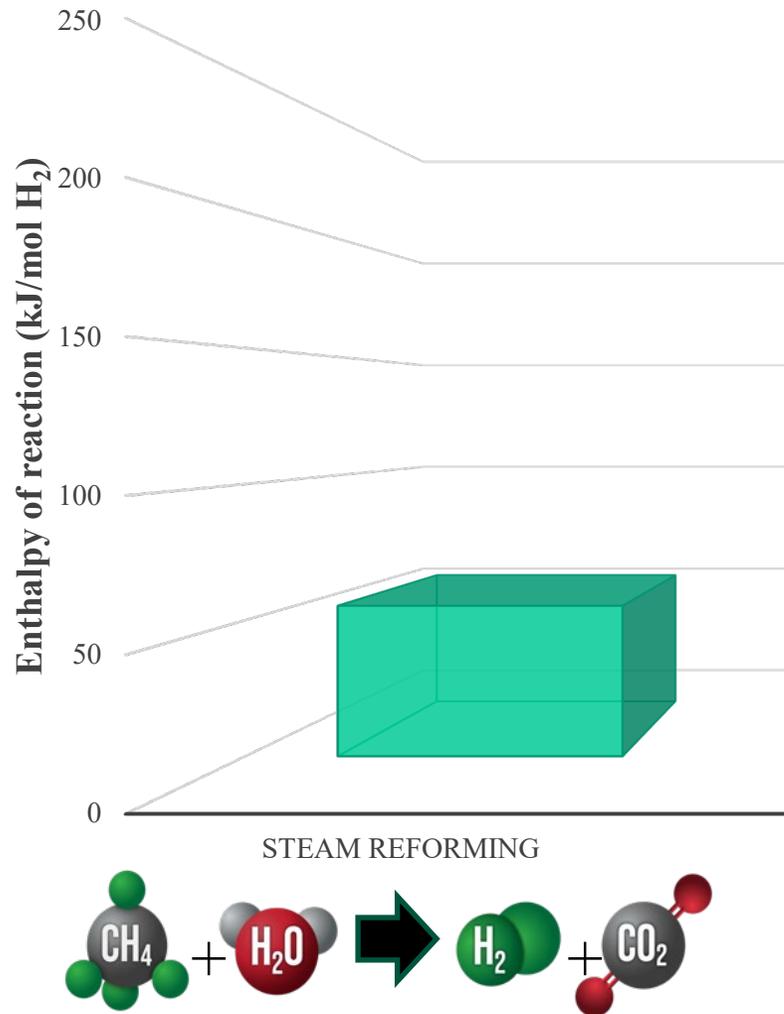
Where can hydrogen come from?



-Energy + Molecules that contain hydrogen



Minimum energy requirements depending on source



Use of natural resources

Can be extended to other waste streams

*Produces solid carbon → not CO₂
Potential green solution*

*POTENTIAL for energy needed is low
Potential to utilize renewable electricity*

Current method for H₂ production

*Why is this not the dominant mode of
hydrogen production today??
Challenge → higher energy required → \$*

Problem- produces CO₂

Need improved approaches

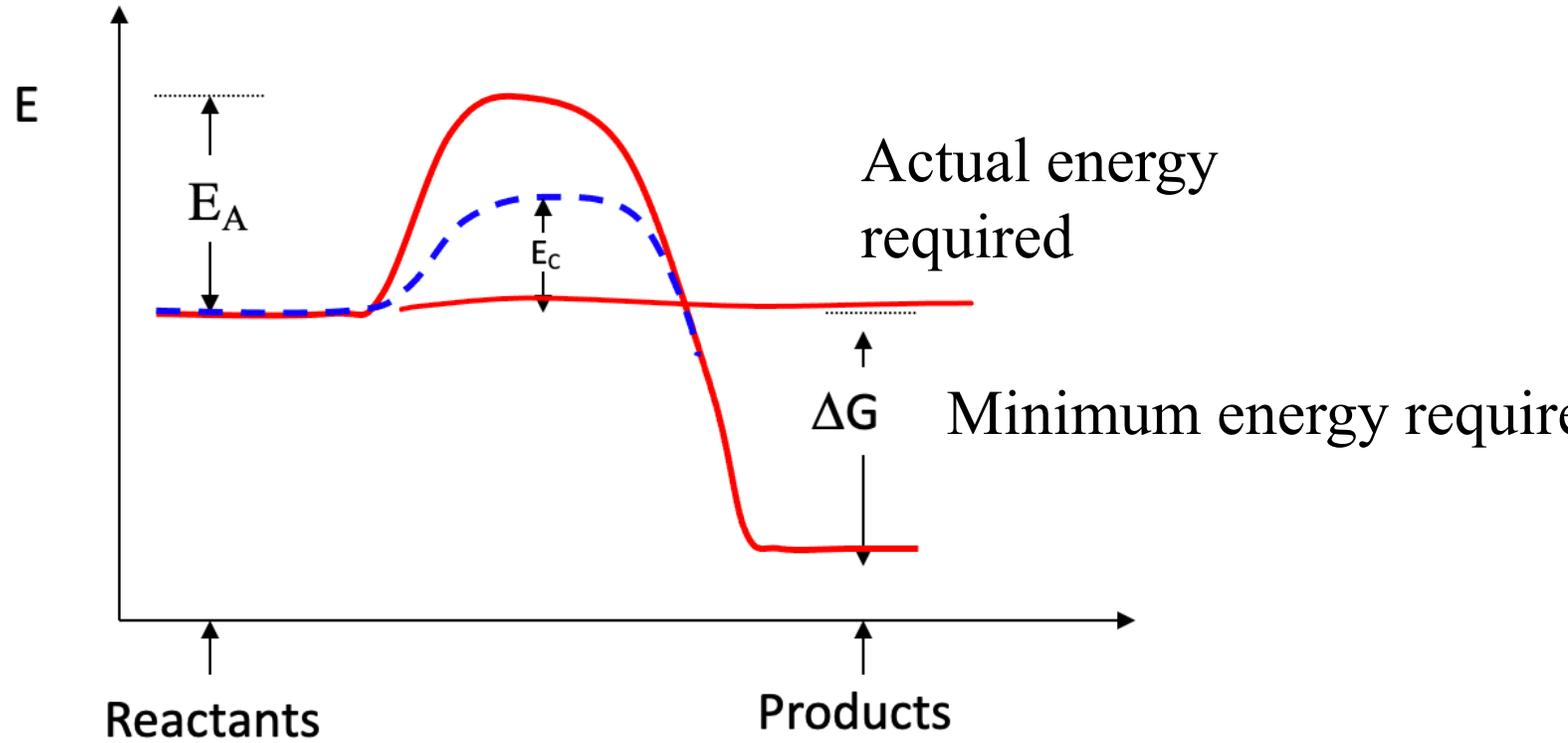
Problem



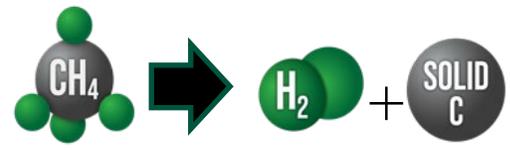
Issue doesn't lie with *minimum* required energy

Methane requires high temperatures to activate (E_a)

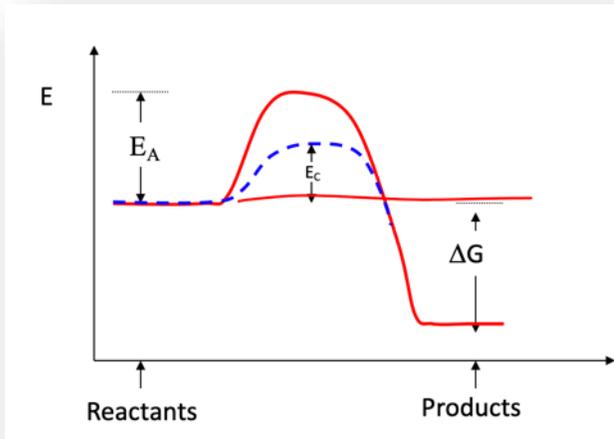
+Makes solid product



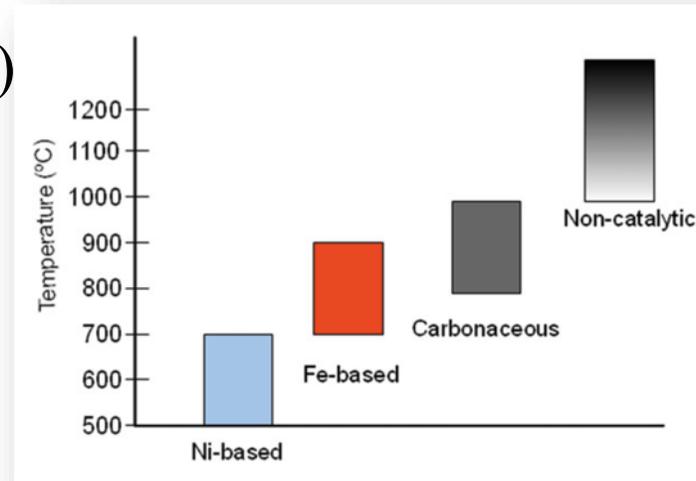
What can we do about this?



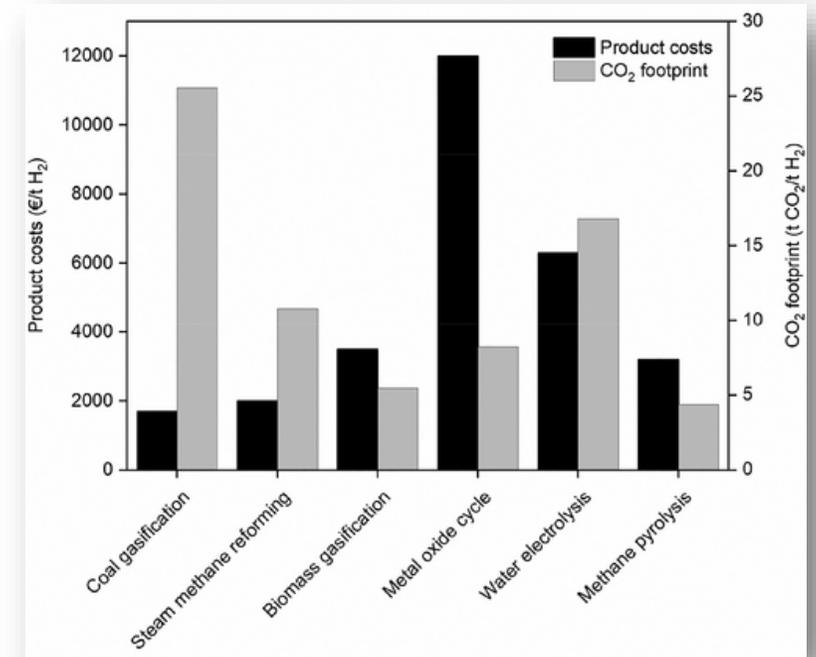
Lower kinetic barrier with catalysts



1)



2)



Catalysts that activate methane well → Difficult to separate from C product

If separation can be achieved- costs using catalysts have been proposed as competitive with SMR + CCUS³

- 1) Production of Hydrogen from Renewable Resources, Springer
- 2) Industrial & Engineering Chemistry Research, 60 (2021) 11855-11881
- 3) Chemical Engineering & Technology 40.6 (2017): 1022-1030.

Catalyst design is key for methane activation and CNT growth

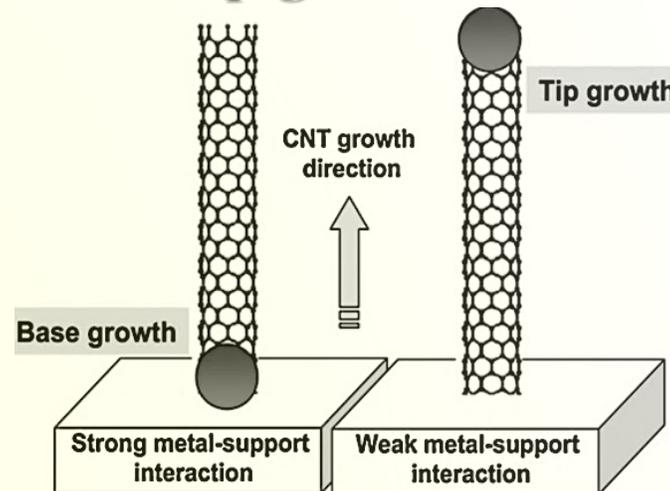
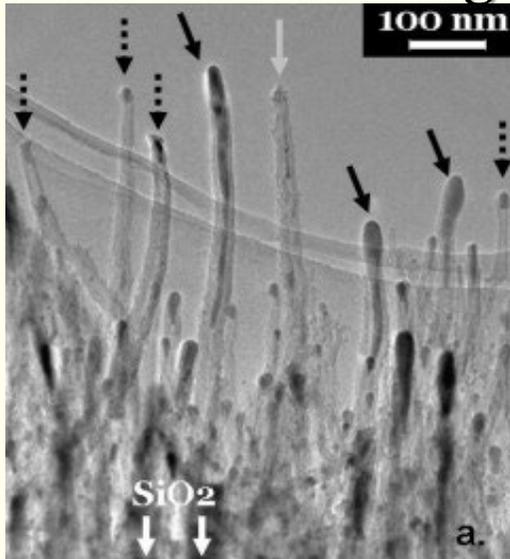


Catalyst Requirements

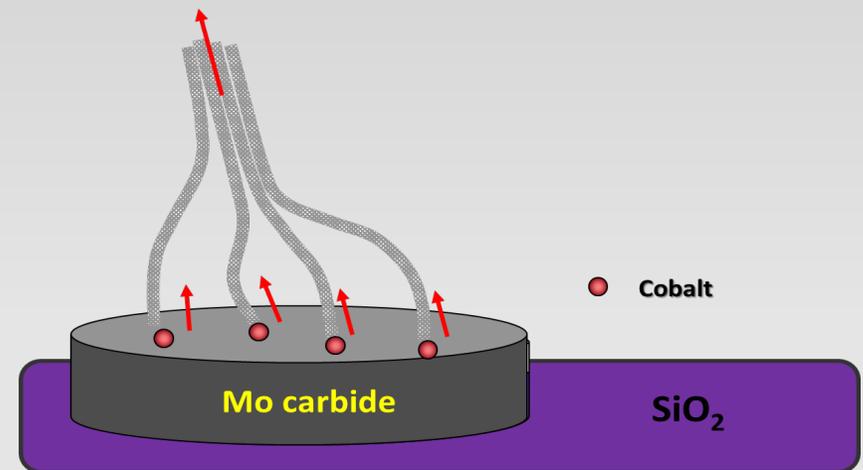
- Capable of activating methane (CH_4)
- Stable under reaction conditions (catalyst stays active)
- Allows for separation and re-use

Additives and promoters Change carbon type to tune applications

Base growth vs. Tip growth



Potential for separation and re-use



NSF grant on CO₂ free hydrogen from natural gas and biomass

DOE Interrogating complex and dynamic interfaces during carbon-free H₂ production

OU led collaboration with Brookhaven National Labs

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The UNIVERSITY of OKLAHOMA

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September 14, 2022

University of Oklahoma, Iowa State Receive \$4 Million Federal Grant for Clean Hydrogen Research

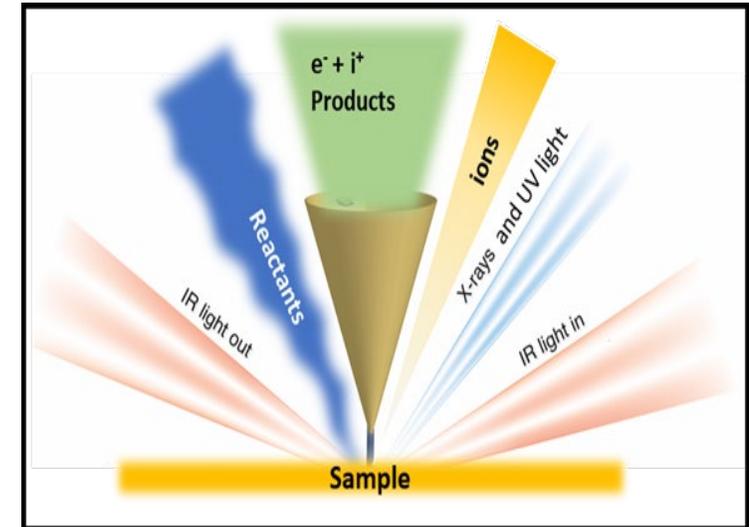
by Chelsea Julian

What if we could bring together Oklahoma's abundant natural resources, like methane, with Iowa's renewable biomass to create a better way to produce hydrogen energy?

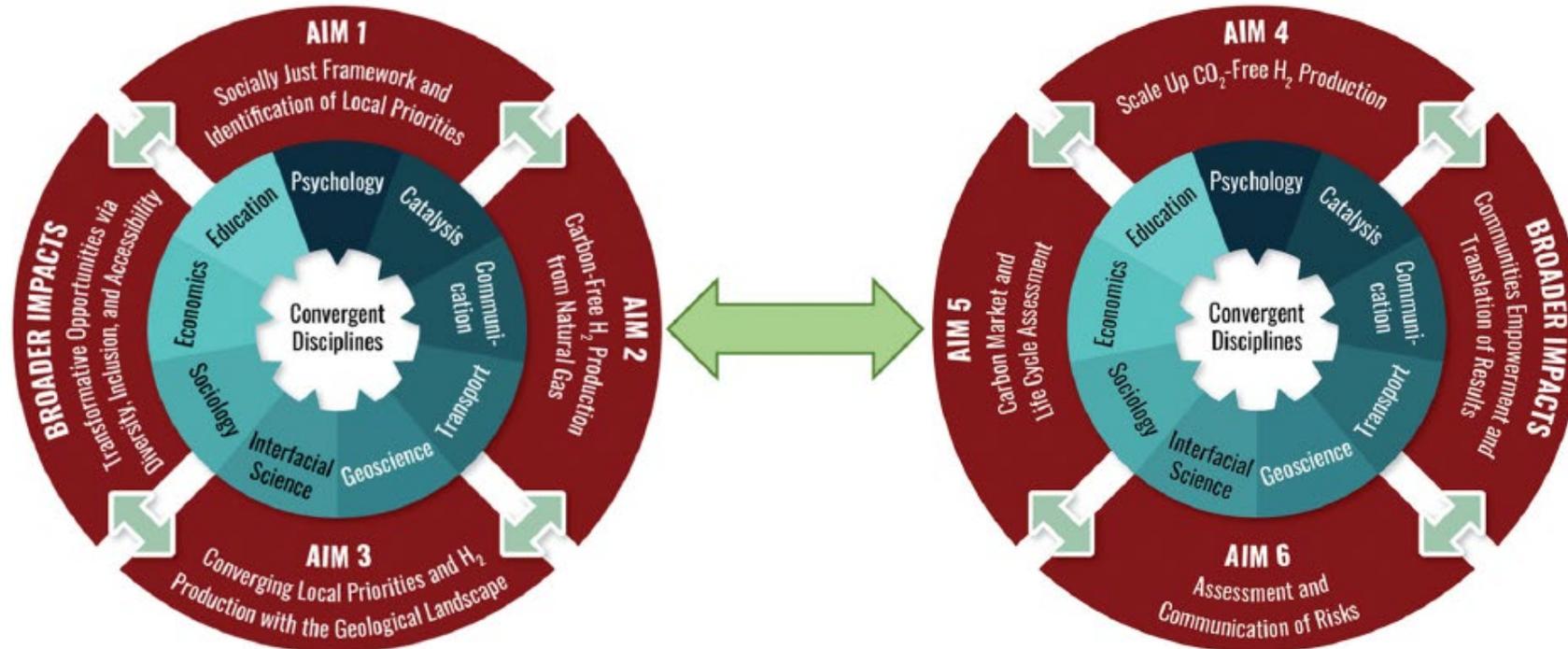
That question is the subject of a new study being explored by researchers at the University of Oklahoma and Iowa State University. The four-year project will also investigate the potential byproducts and related applications of solid carbon that might result from effectively generating carbon neutral or carbon negative hydrogen energy. The research is funded by an expected \$4 million from the National Science Foundation and is led by **Steven P. Crossley**, the Sam A. Wilson Professor in the School of Chemical, Biological and Materials Engineering, Gallogly College of Engineering, and an energy research fellow at the **OU Institute for Resilient Environmental and Energy Systems**.

"There's a strong drive to create energy without creating the side effect of global warming, but we still have a need for cost-effective energy for our society," Crossley said. "One of the really promising avenues is to convert the carbon that is in these forms of diverse natural resources into solid carbon and extract the hydrogen as our energy source."

Left to right: Daniel Resasco, Steven Crossley, Bin Wang, and Ngoc Bui



NSF GCR: Transition to green energy in gas-producing regions



Multidisciplinary project building on CHEPS team



Some accomplishments so far: Making catalysts that will enable these technologies



Pre-combustion carbon capture
Smart design of optimal catalyst
Record yields >230gC/g Ni !!



Dr. Alejandra Gomez



Ranuja Bandara



Caleb Bavlnka



Emyi Escobar

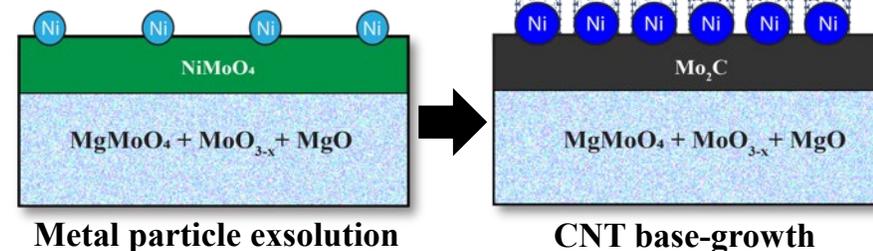
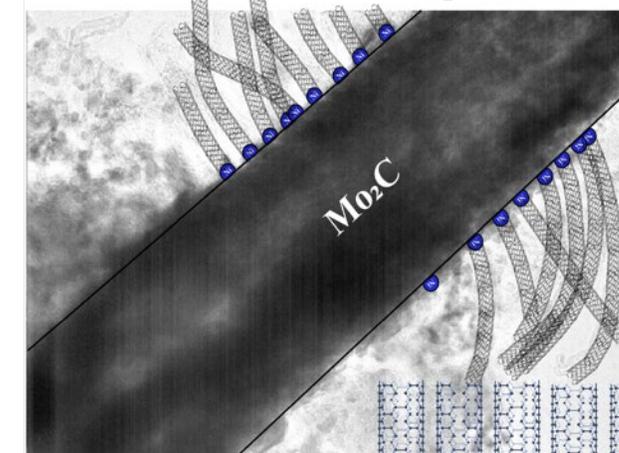
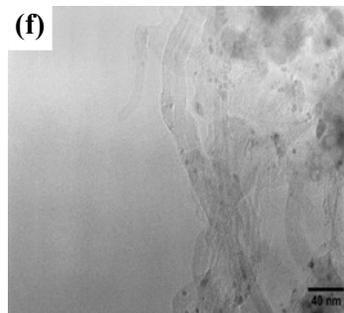
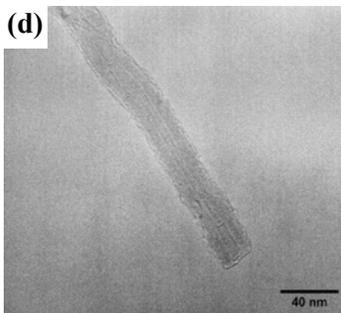
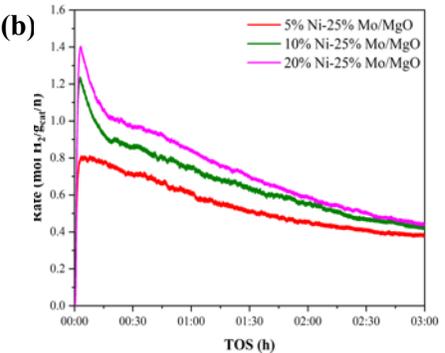
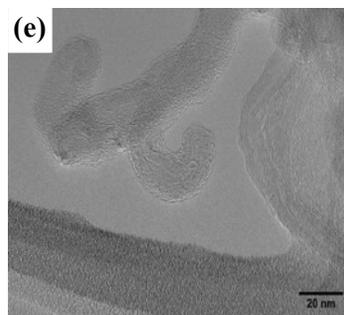
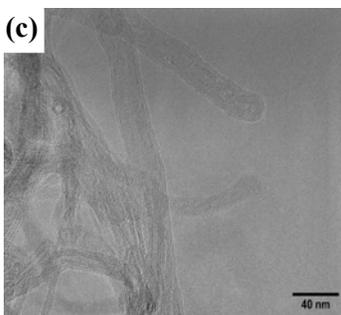
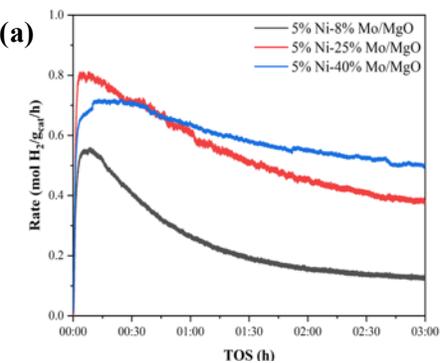


Dr. Ismael Alalq



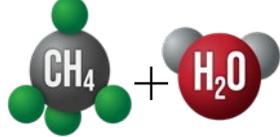
Phuong Nguyen

→ maintains catalyst on support (base growth)!
(allows us to separate and re-use catalyst!)



Supported by DOE

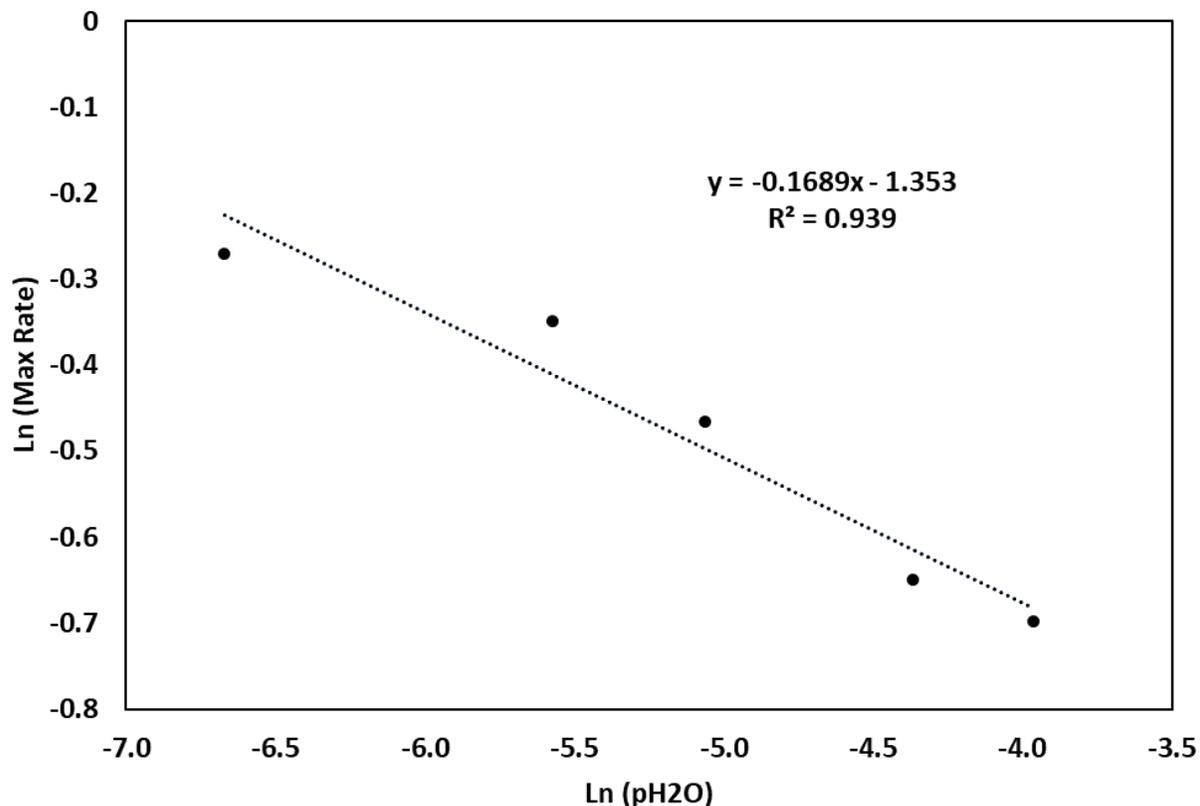
Gomez et al. Cell Reports Physical Science 6, no. 4 (2025)



Water contamination (biomass, steam, etc) → Timing is important!
Water hinders overall rate during initial stages, enhances rate after



Injecting H₂O at beginning

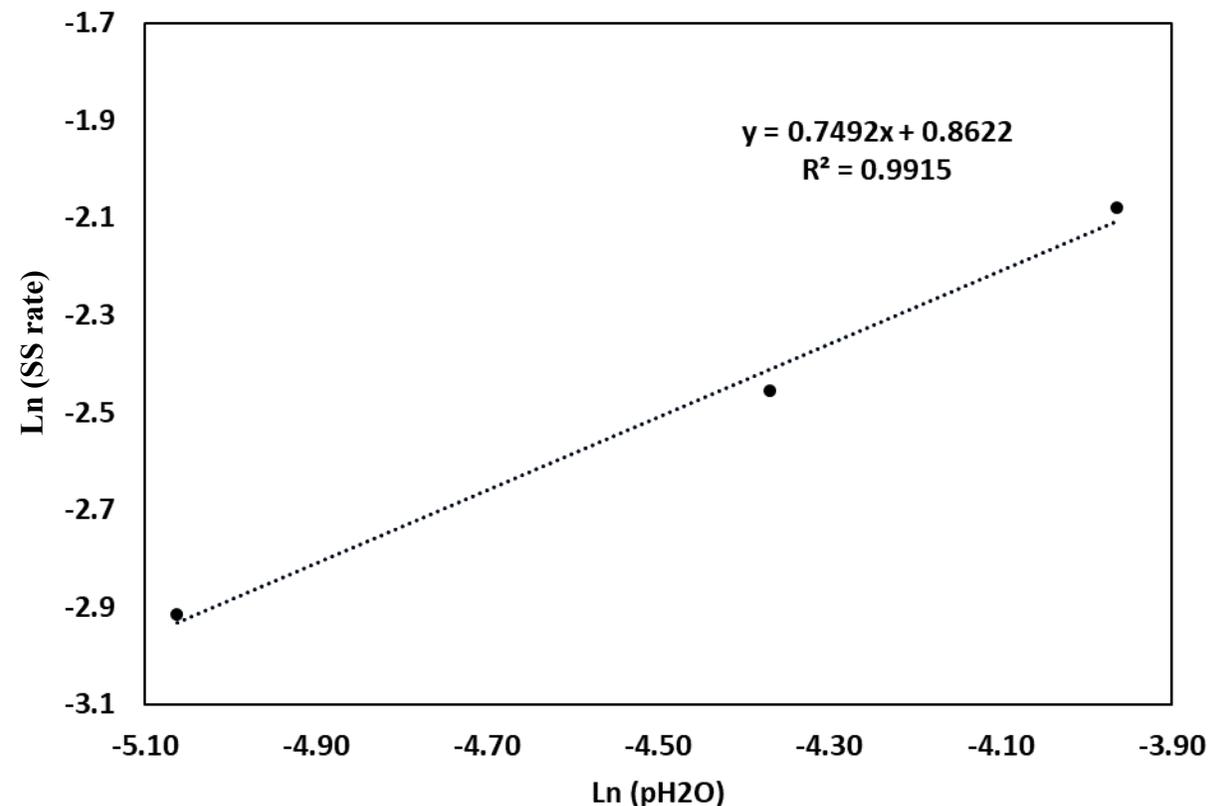


Order of reaction when co inject water with methane at beginning.

Rate of water: 0.01, 0.03, 0.05, 0.1, 0.15 (ml/h)

Temperature: 800°C, F_{CH₄} = 100 sccm

Injecting H₂O at steady state



Order of reaction when co inject water with methane at steady state.

Rate of water: 0.05, 0.1, 0.15 (ml/h)

Temperature: 800°C, F_{CH₄} = 100 sccm

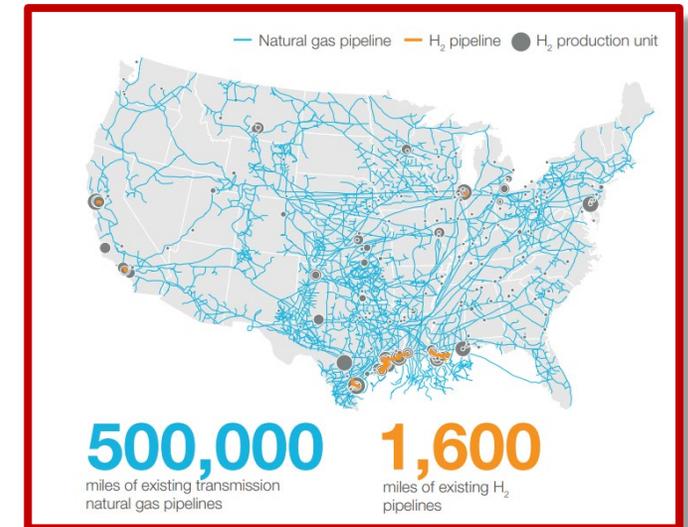
Overall Goal of the Project & Motivation



- **Grand Challenge:** Energy security with fewer carbon gas emissions
- We need affordable, new energy. Can hydrogen (H_2) be the “new oil”?
- Over 30 trillion ft^3 of natural gas still in the ground in Oklahoma!



From left to right, House Budget Chairman Kevin Wallace, Senate Budget Chairman Roger Thompson, House Speaker Pro Tempore Terry O'Donnell and Senate Floor Leader Kim David have an intense conversation before the Joint Legislative Task Force on the Grand River Dam Authority's meeting Thursday, April 29, 2021. (Tres Savage)



Research Team



Mission: To foster new energy production via community engagement for hydrogen production research and the creation of a convergent framework connecting engineering, geoscience, economics, and risk communication.

- 4 Colleges at U of Oklahoma
- 7 Disciplines
- 1 Federal Agency
- 1 State Agency
- Georgia Tech U



Project Goals

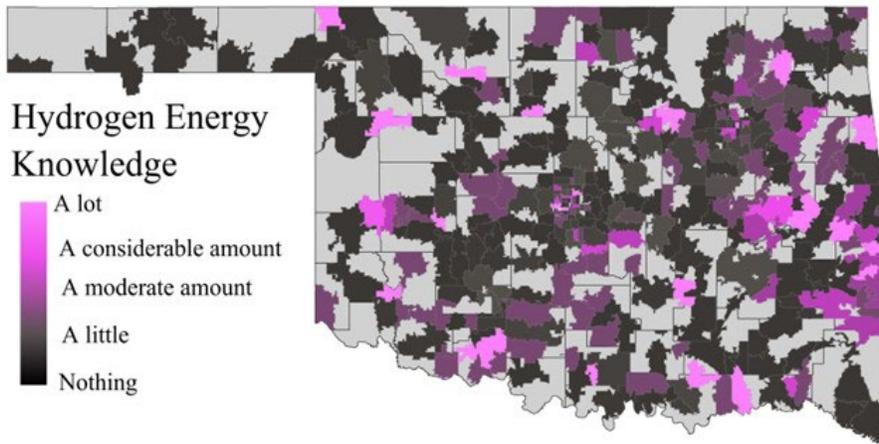


1. Co-create a community-centered framework for new energy generation and economic analysis of its drivers and effects on local communities
2. Low-CO₂ emission production of H₂ from natural gas
3. Converge local priorities and H₂ production with the geological landscape

Project Evolution



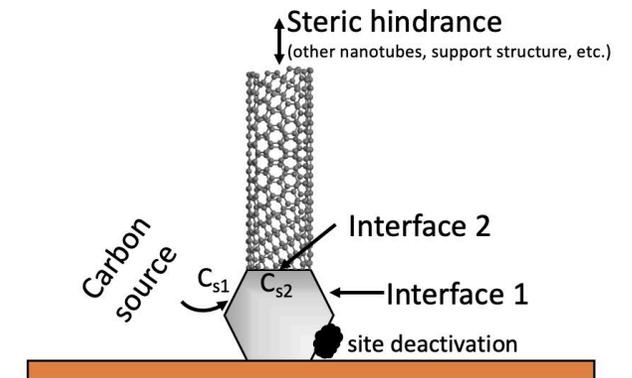
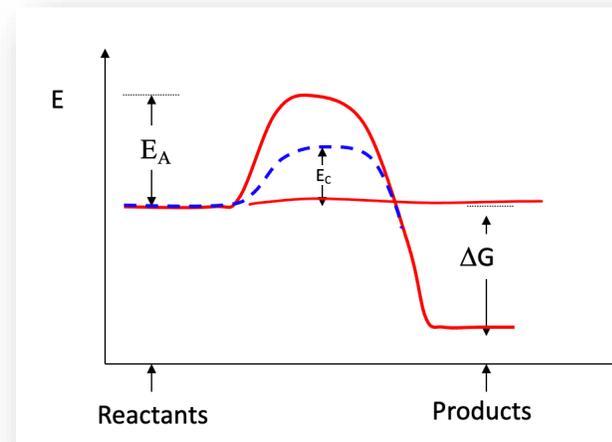
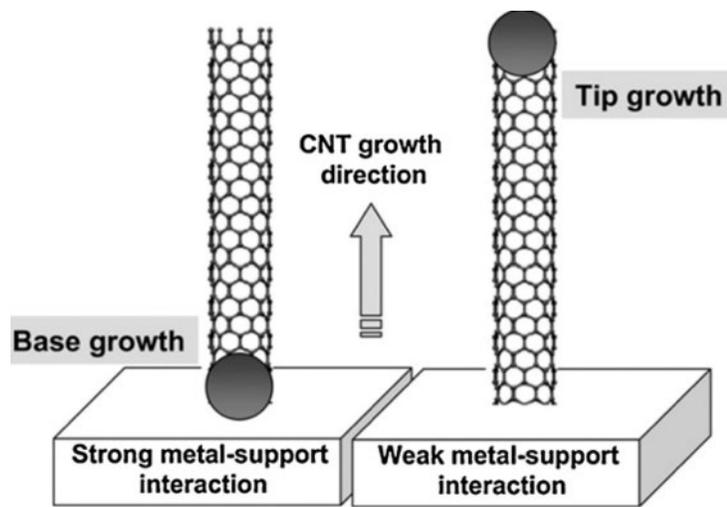
- Survey in OK indicated positive perception of innovative energy investment
- Solid carbon products improve process economics
- The Red Fork region is a great intercept between natural gas resources, access to pipelines, and community interest in energy security



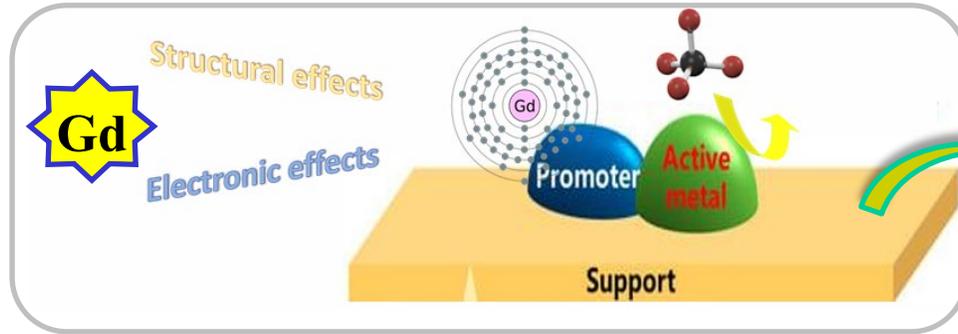
Hydrogen from natural gas



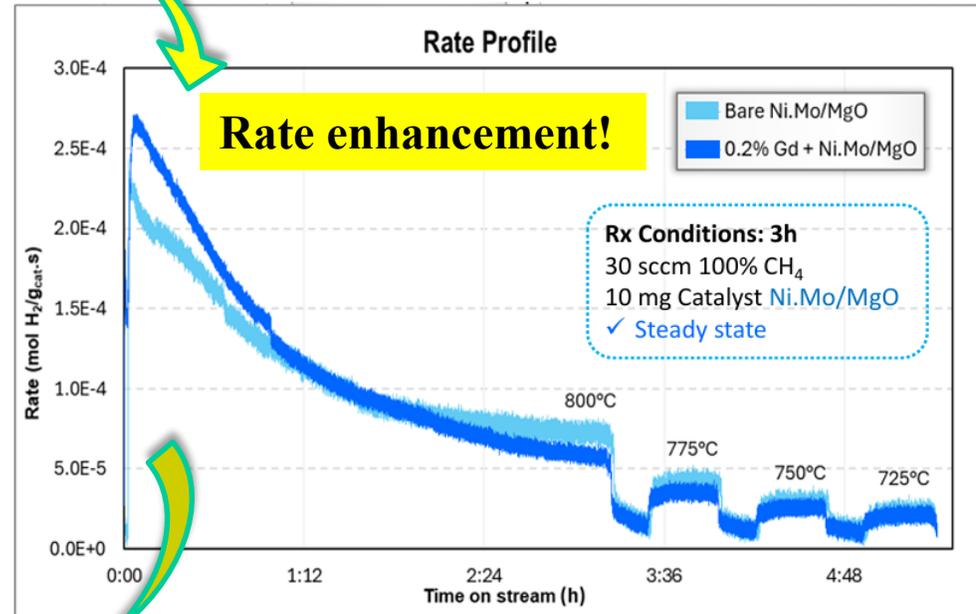
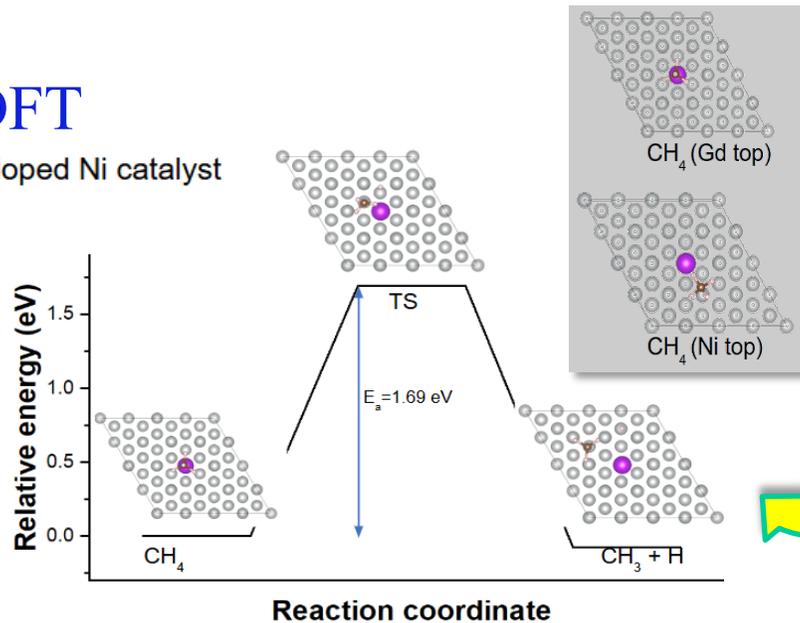
- **How does this connect with other tasks?** Mechanistic understanding allows us to:
 - Adapt catalyst choice based on regional feedstock composition
 - Impacts on both rate of hydrogen generation vs. lifetime
 - Informs strategies for catalyst reusability
 - Control over type of carbon product → potential applications (*concrete additives, water cleanup, carbon fibers, electrodes, batteries, wind turbine blades, etc.*)



Modifying Carbon Products Based on Community Input

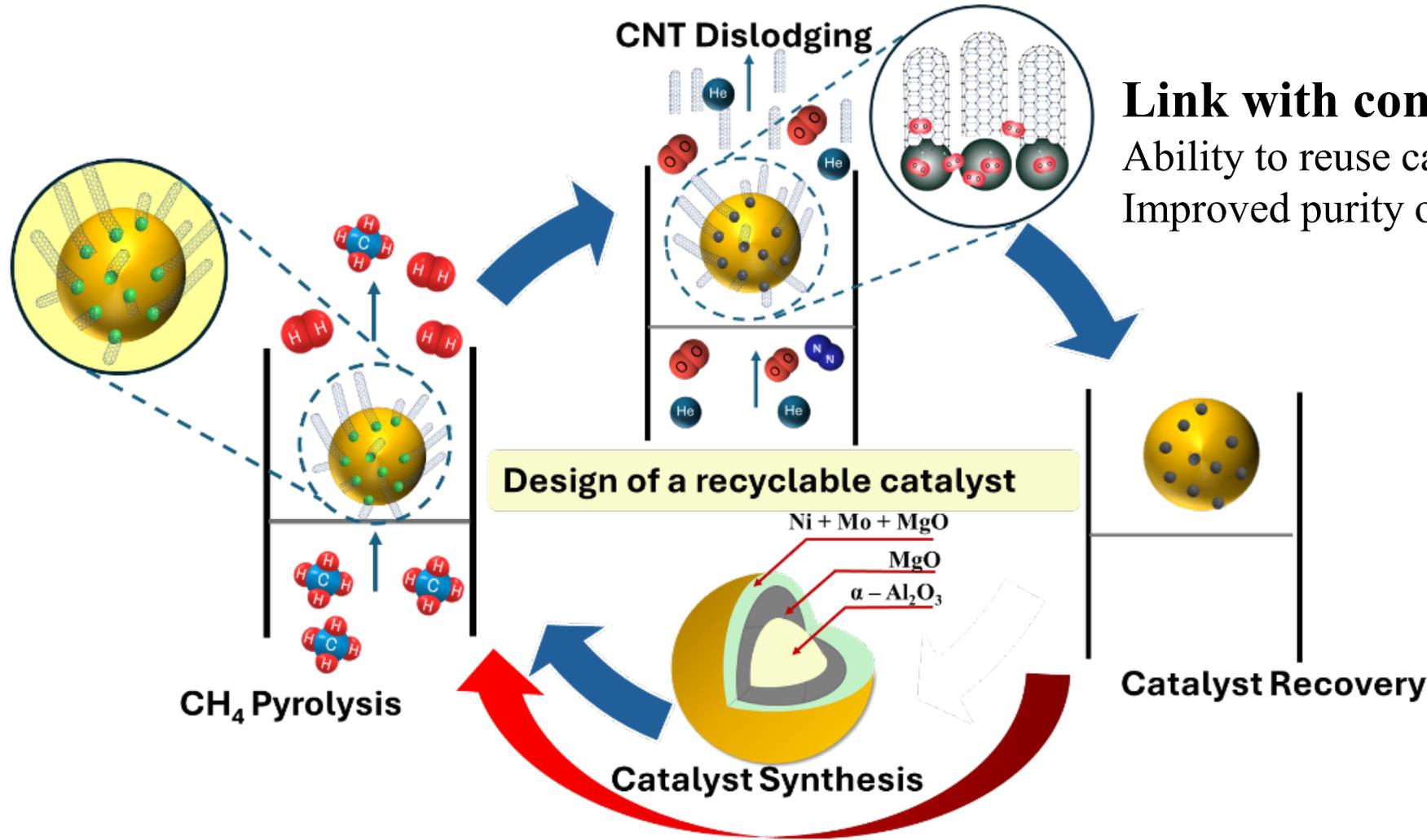


DFT
Gd-doped Ni catalyst



Dopants to control rate and carbon properties!

Catalyst Re-use



Link with community:

Ability to reuse catalyst → \$\$

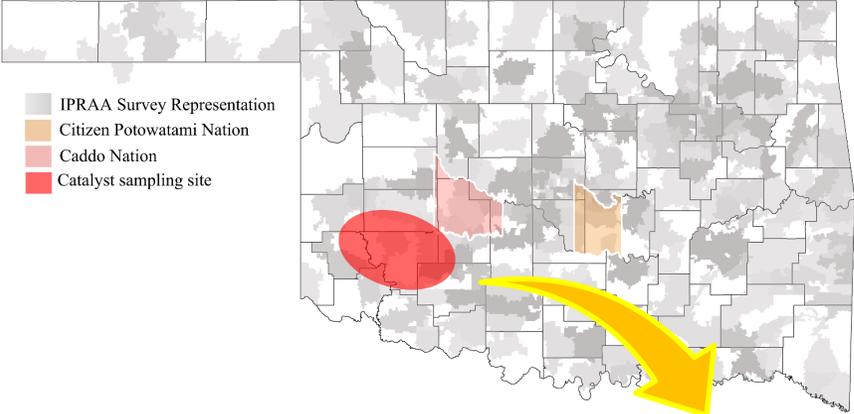
Improved purity of products → new applications

Our recent results are the most promising reported to date

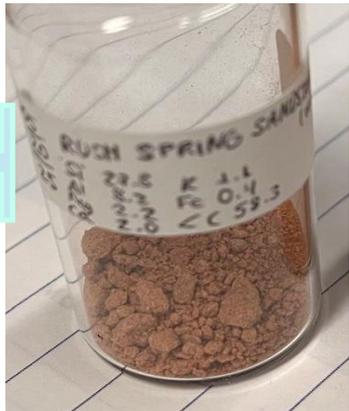
>80% C purity for multiple cycles.

>80 g C/ g Ni in separated product

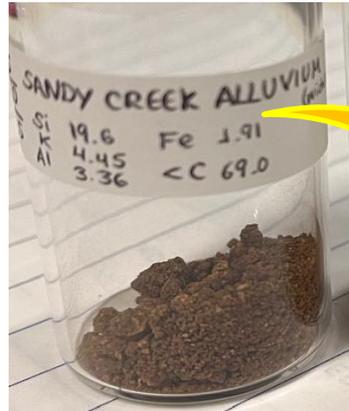
Locally Sourced Minerals as Catalysts



Content	SANDSTONE	ALLUVIUM
Si	27.9	19.6
Al	8.2	3.4
Fe	0.4	1.9
Mg	2.2	-
Ca	2	-
O	58.3	69



SANDSTONE



ALLUVIUM

Methane decomposition into carbon & hydrogen

$\text{CH}_4 \xrightarrow{\text{CAT}} \text{C(s)} + 2 \text{H}_2$

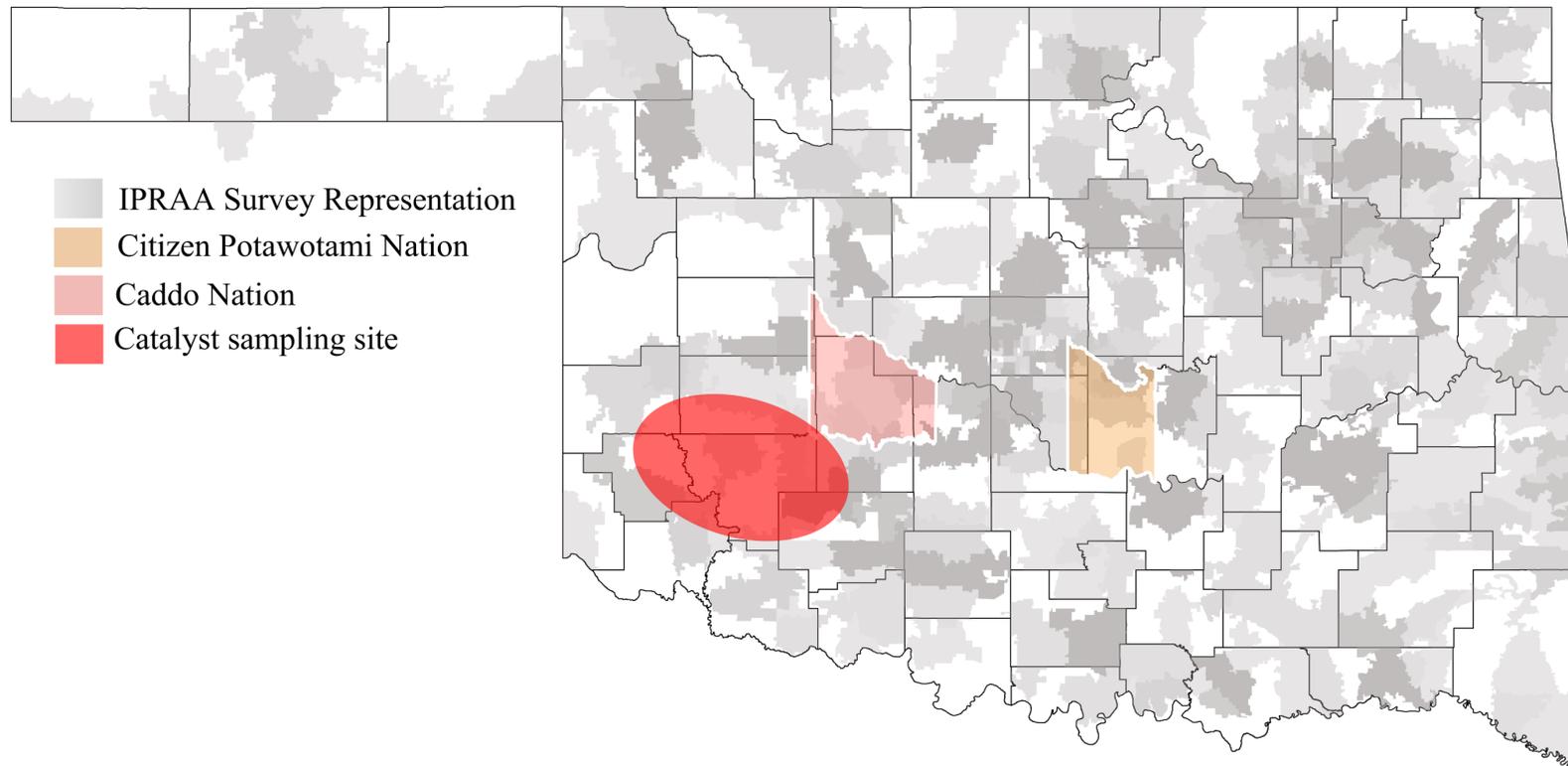
Carbon nanotubes (CNTs)

✓ Local minerals with iron content can be treated and catalyze CH_4 pyrolysis reaction for H_2 production.

Research Accomplishments (Aim 1): Understanding Community Perspectives



Survey (1755 Respondents) geographic coverage & location of Native Nation collaborators

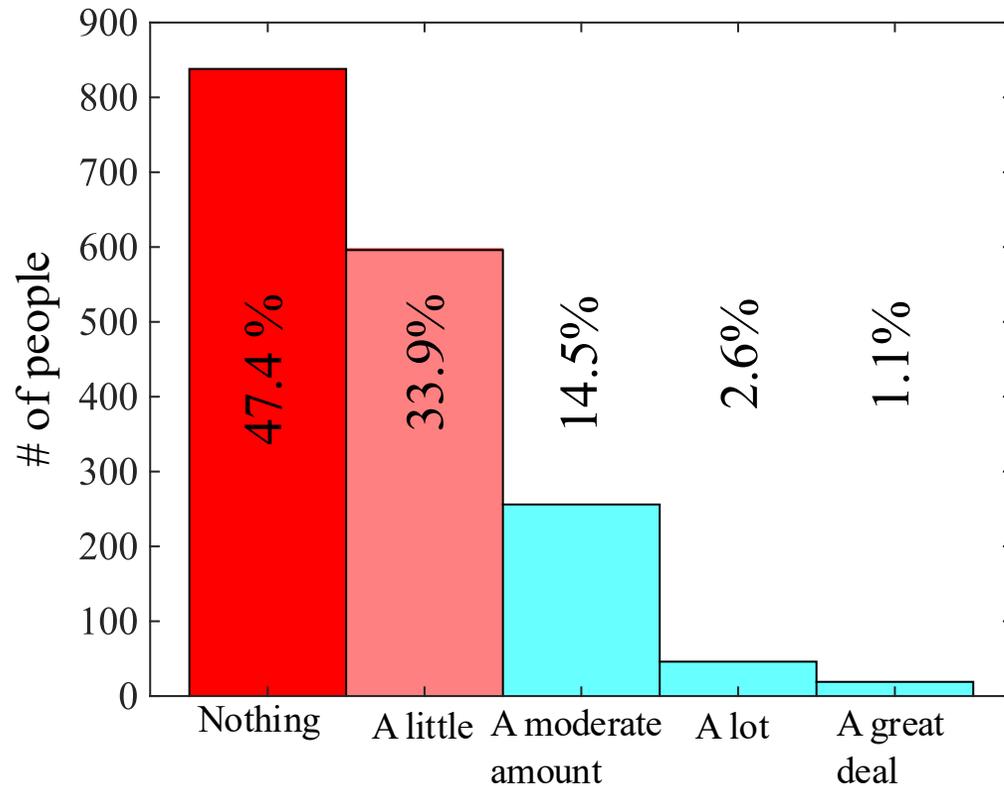


Research Accomplishments (Aim 1): Understanding Community Perspectives



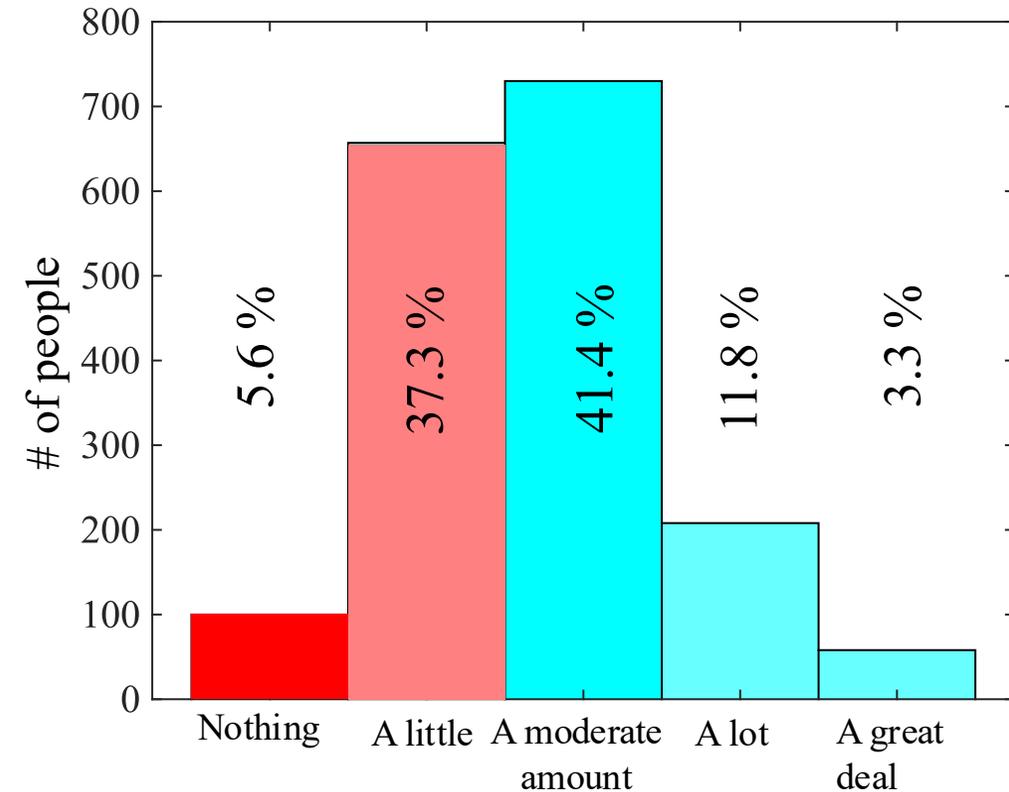
0% of OK state energy

Knowledge of H₂ Energy



>40% of OK state energy

Knowledge of Wind Energy



Building Community Connections

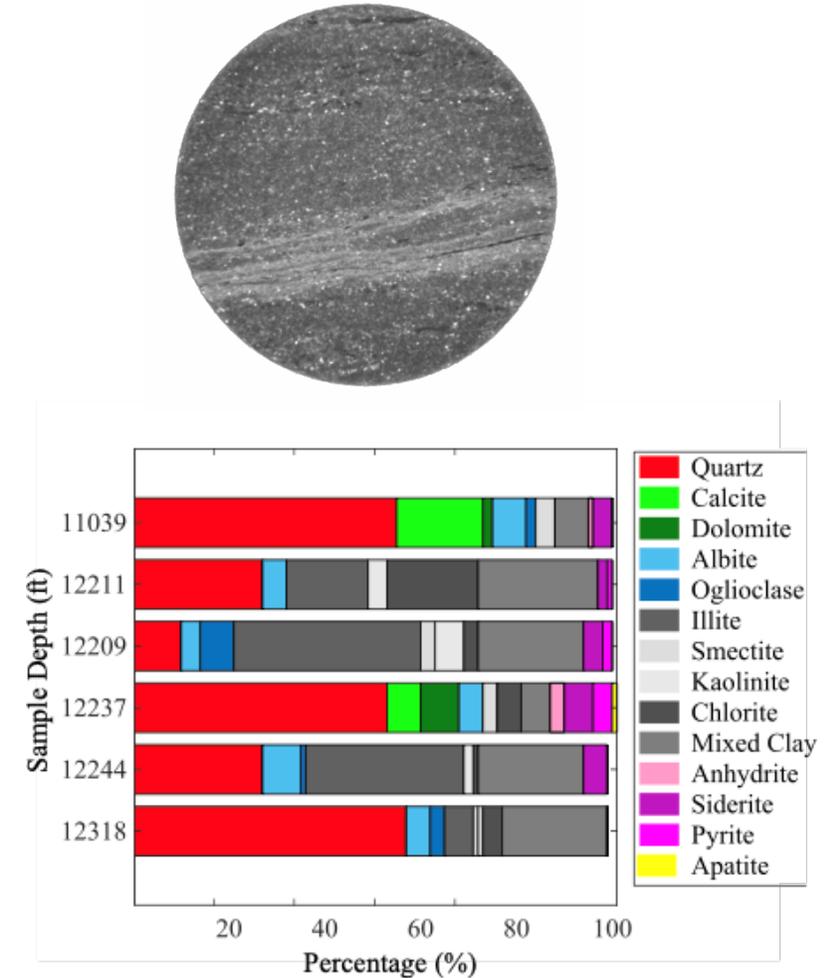
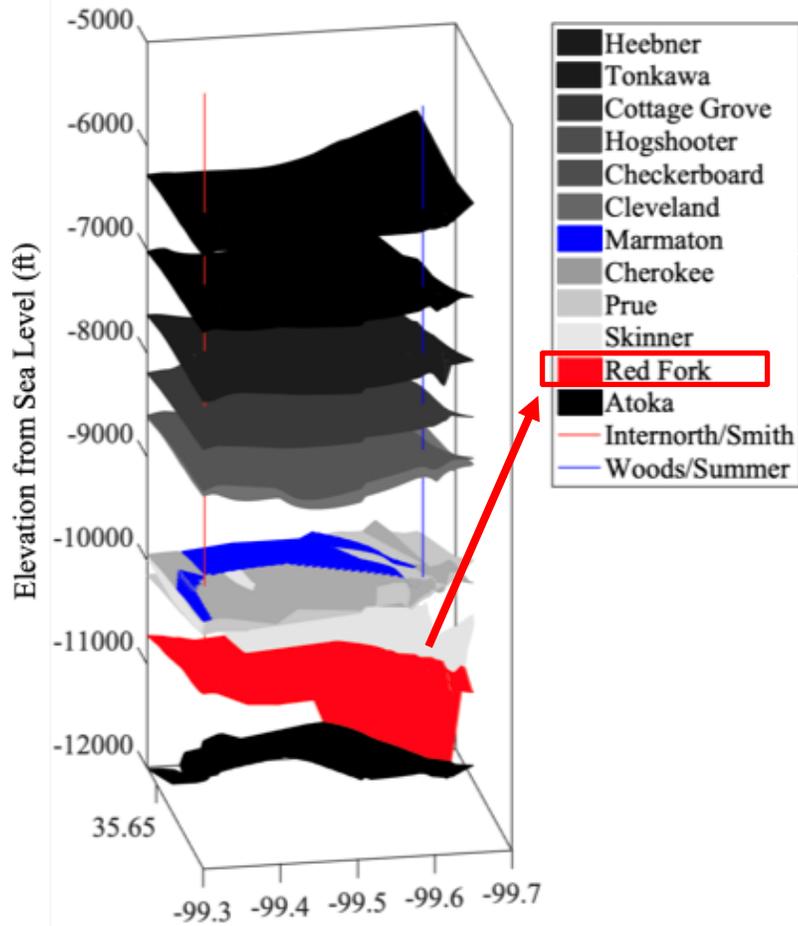


Collaborations with Native Nations in Oklahoma



The University of Oklahoma, Norman, OK

How + where do we store H₂ ?



Convergence



2023 Conference Hydrogen-Powered Future

- April 28-29, 2023

2024 OU Sustainability Forum Poster Session

- Feb. 26, 2024

2024 Sustainability Forum

- Feb. 26-27, 2024

2024 Native Renewable Energy Symposium

- Sept. 12-13, 2024

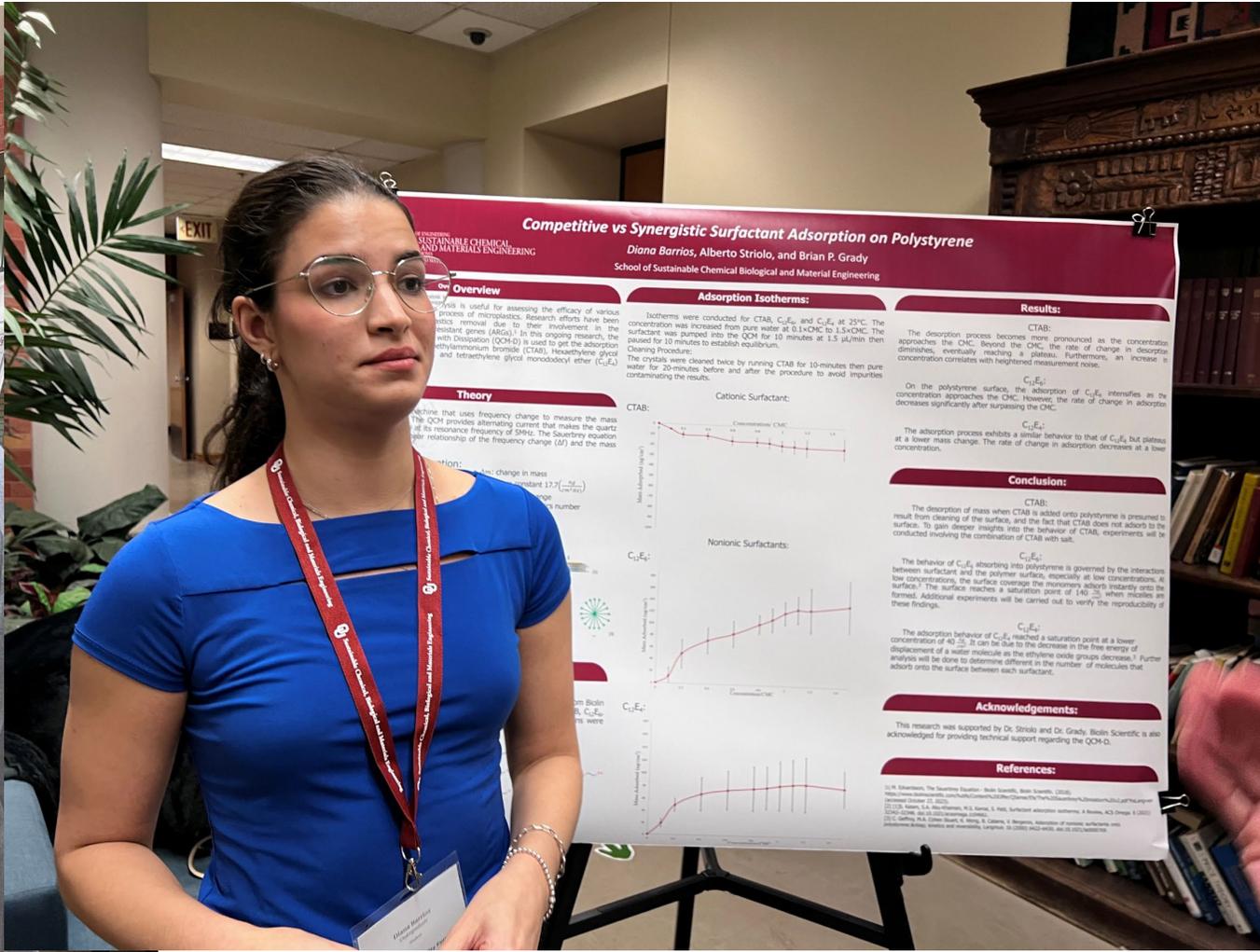


Sustainability Forum



The University of Oklahoma, Norman, OK

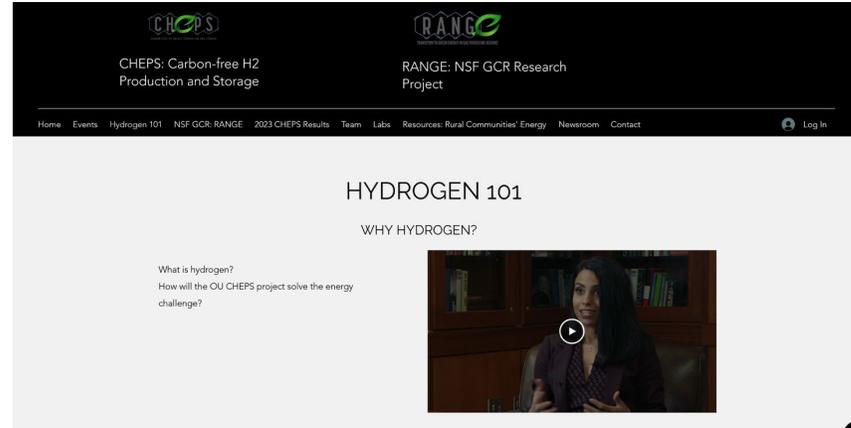
Convergence Accomplishments



Education



<https://www.ouccheps.org>



WHY OKLAHOMA?

What puts Oklahoma in a unique position to take on this project? Drs. Trachtenberg and Papavassiliou answer the question in this video.



As RANGERS, we embrace the cutting-edge technology and love experimenting. Check out our new AI-generated podcast and video to learn about the project and tell us what you think.



Deep Dive Conversations:
RANGE podcast



The University of Oklahoma, Norman, OK

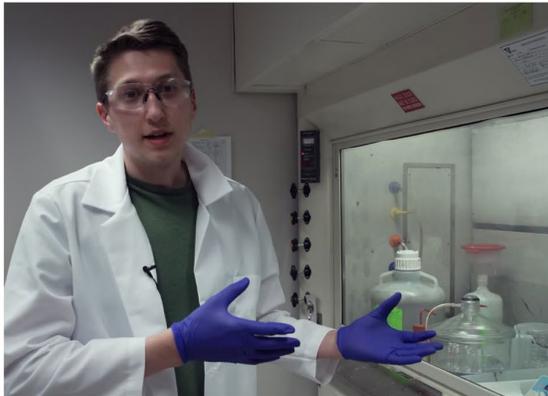
Convergence Team Building



OUR MEDIA ROOM

NEWS

Information & Images



VIDEOS



NEWS RELEASES AND
IMAGES



LABS

Team members run a number of labs at the University of Oklahoma. Here are some examples of past and current research generated in our team labs.



Colloid and Interface Science
Engineering



Heterogeneous Catalysis Engineering

The University of Oklahoma, Norman, OK



THANK YOU!



Gradthriving:
<https://gradschoolthriving.com>

CHEPS:
<https://www.ouccheps.org>

AISES:
<https://ou.edu/coe/aises>

Group Page:
<https://www.ou.edu/coe/cbme/ccng>



U.S. DEPARTMENT OF
ENERGY

Office of
Science

The University of Oklahoma, Norman, OK



U.S. DEPARTMENT
of **ENERGY**

Office of Indian Energy
Policy and Programs

Data Centers: Exploring the Opportunity

Fossil Energy Tribal Leader Working Group

Dr. Tommy Jones, Tribal Affairs Specialist

September 24, 2025

Office of Indian Energy Mission

The Office's mission is in its Congressional authorizing statute:

- **Promote** Tribal energy development, efficiency, and use.
- **Reduce** or **stabilize** energy costs.
- **Enhance** and **strengthen** Tribal energy and economic infrastructure.
- **Electrify** Indian lands and homes.

The Office of Indian Energy was established by Congress in the Energy Policy Act of 2005 under 45 USC 7144e & 25 USC 3502(b).



U.S. Department of Energy (DOE) Office of Indian Energy (IE) Deputy Director, David Conrad, and staff visited the San Manuel Band of Mission Indians in Highland, CA

Who the Office of Indian Energy Supports

The Office of Indian Energy supports **Indian Country**, specifically:

- Indian Tribes
 - Federally recognized Indian Tribes
 - Alaska Native Corporations
- Intertribal Organizations
- Tribal Energy Development Organizations.

Eligible entities listed under (25 USC §3502(b)(2))



Daniel Rich, Mayor of Ouzinkie, leads a tour of the Village off Ouzinkie on **Kodiak, Alaska**. Diesel Power Plant. (Dennis Schroeder / NREL)

Igiugig, AK installed its first RivGen in 2019 with support from DOE Water Power Technologies Office. In 2021 the Village began installing a second device co-funded by the Office of Indian Energy. Photo from ORPC



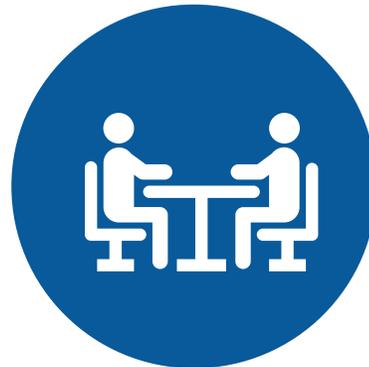
How the Office of Indian Energy Supports Indian Country

Financial Assistance



Cost-share leveraged grant funding to support Tribal energy development

Technical Assistance



No-cost planning, analysis, commerce, and engineering support for successful project outcomes

Capacity Building



Capacity building to enable Tribes to fully participate in unleashing American energy

Data Centers

Type	Typical Workload	Operator Type	Use Cases
Modular / Container <i>Portable and scalable</i> 0.1-2 MW	Temporary deployments, disaster	Enterprises, service providers	Rapid setup in remote or emergency scenarios
Edge / Micro <i>Small, modular units</i> < 1 MW	Real-time analytics, IoT processing	Telecom providers, cloud vendors	Low-latency services close to users and data sources
Enterprise <i>Medium-to-large</i> 1-10 MW	Internal IT services, business applications, and databases	Owned and operated by a single organization	Secure, customized infrastructure for large organizations
Colocation (Multi-Tenant) <i>Large, shared facilities</i> 5-50 MW	Web hosting, cloud services, enterprise applications	Third-party provider with tenant businesses	Cost-effective infrastructure for multiple businesses
Hyperscale <i>Extremely large</i> 50-200+ MW	Cloud computing, big data analytics, AI workloads	Tech giants	Massive-scale operations with high efficiency



Above: Proposed hyperscale data center campus in Douglasville, GA. Rendering from the Atlanta Journal-Constitution.

Below: Interior of a data center in Columbus, OH. Photo by Associated Press.

AI & Data Centers: The Opportunity

- Energy used by data centers is expected to **triple** by 2028, primarily driven by AI.
- Access to power is a challenge for many data center developers.
- Tribes that can provide access to resources (power, water, fiber) may be able to partner with a data center developer for new centers.

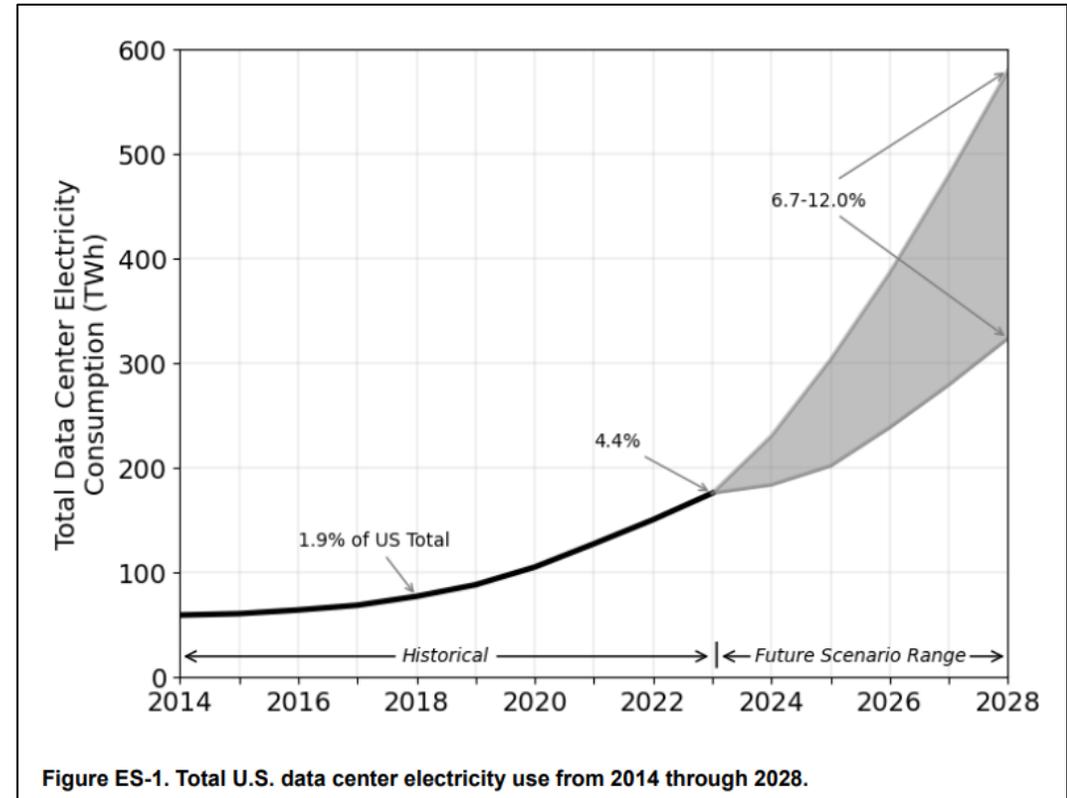
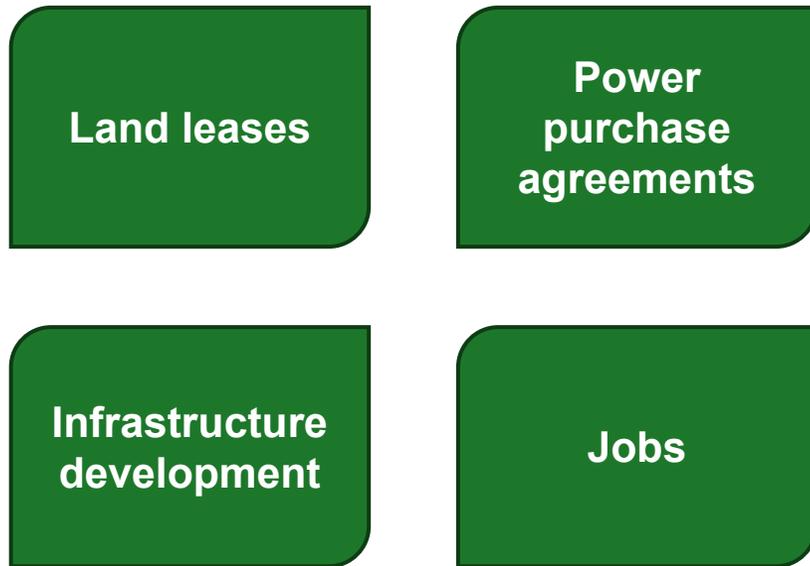


Figure ES-1. Total U.S. data center electricity use from 2014 through 2028.

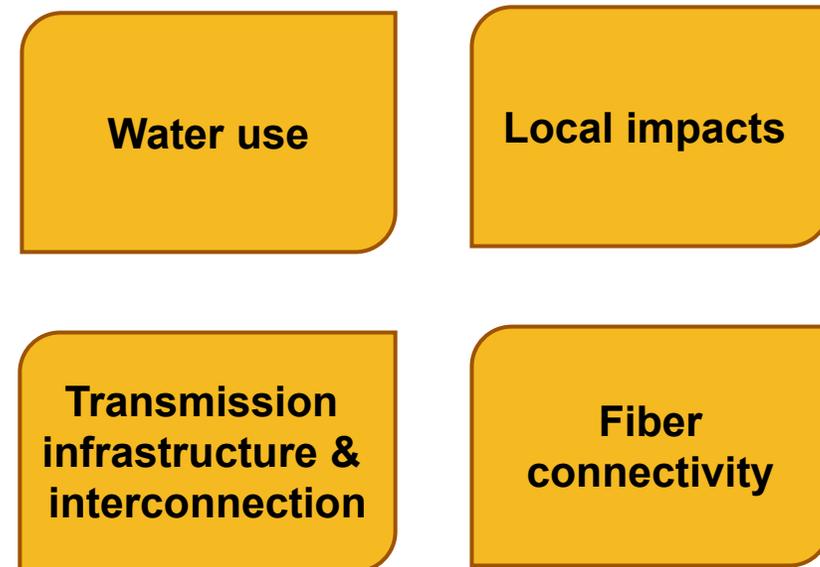
U.S. Data Center Energy Usage Report by Lawrence Berkeley National Laboratory

AI & Data Centers: The Opportunity

Partnering with a data center developer could mean:



Considerations for whether a data center could be a good fit:



Speed is a key selling point for data center developers

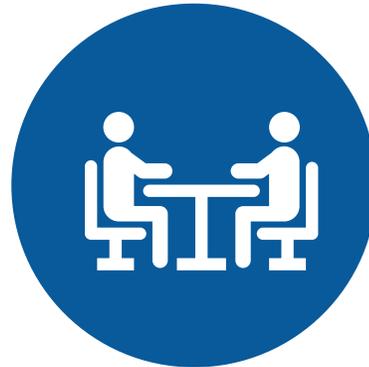
How the Office of Indian Energy Can Help

Financial Assistance



Funding for enabling energy projects

Technical Assistance



Technical, planning, and legal support for siting, evaluation, and negotiations

Capacity Building



Resources to connect with partners, developers, and other funding sources

New Technical Assistance Offering

Enabling a Competitive Business Environment

In partnership with the U.S. Department of Commerce Commercial Law Development Program, the Office of Indian Energy provides legal and regulatory technical assistance to:

1. **Advance high-value energy projects**, such as utility-scale generation, transmission, data centers, or critical minerals.
2. **Evaluate** high-value energy project proposals or deals.
3. **Modernize** legal, regulatory, and contractual frameworks.
4. **Support** Tribal capacity to implement complex energy projects and effectively participate in power markets.



Attendees at the 2015 Community-Scale Renewable Energy Project Development and Finance Workshop. Photo by John De La Rosa, NREL.

Support at Various Stages

The Office of Indian Energy can support many different stages of the planning process.



Curious whether you have a good site for a data center?



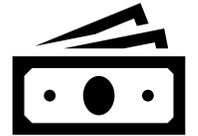
Approached by a developer?



Interested in finding a developer to partner with?



Considering legal, regulatory, and/or utility impacts of a data center?



Looking for energy project funding?

Contact the Office of Indian Energy to discuss your needs!

Stay Connected!



Office of Indian Energy

(240) 562-1352

indianenergy@hq.doe.gov
energy.gov/indianenergy



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Thank you!



U.S. DEPARTMENT
of **ENERGY**

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Policy and Programs