

UW School of Energy Resources

Presented to
Wyoming Mining Association

July 22, 2021



UNIVERSITY
OF WYOMING

School of
Energy Resources

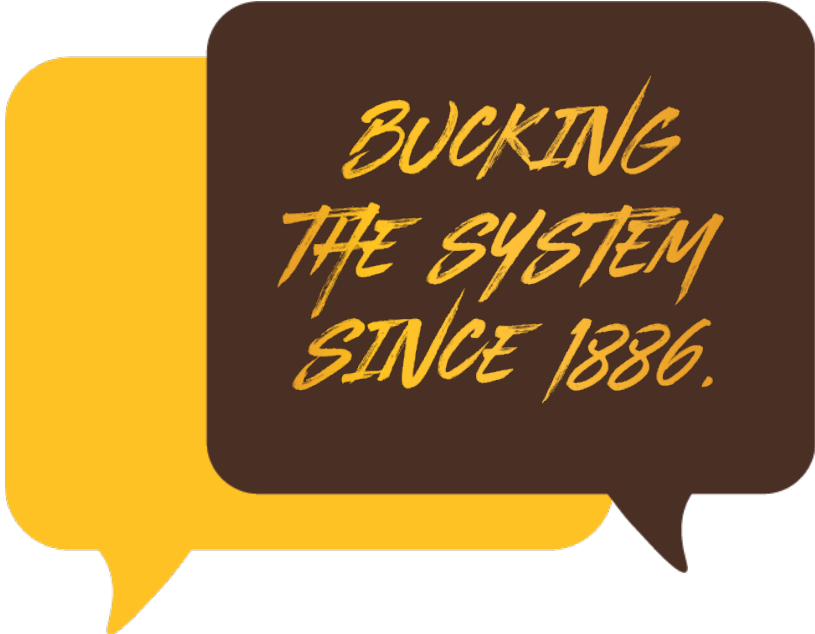
THE WORLD NEEDS MORE COWBOYS.

Topics

- SER mission and pillars
- Select research projects
 - Carbon capture, use and storage
 - Carbon engineering
 - Rare earth elements and critical minerals
- Emerging research areas
 - Nuclear
 - H₂ Center of Excellence

SER's Mission:

Energy-driven
economic
development for
Wyoming



*BUCKING
THE SYSTEM
SINCE 1886.*

SER Pillars

- **Academics**
 - Train students for careers in the Wyoming energy industries
- **Outreach**
 - Engage with stakeholders across state and beyond
 - Support elected and appointed officials
- **Research**
 - Conduct applied research focused on commercialization
 - Develop technologies to advantage utilization of Wyoming natural resources
 - Focus on economic development



Energy Resource Management and Development

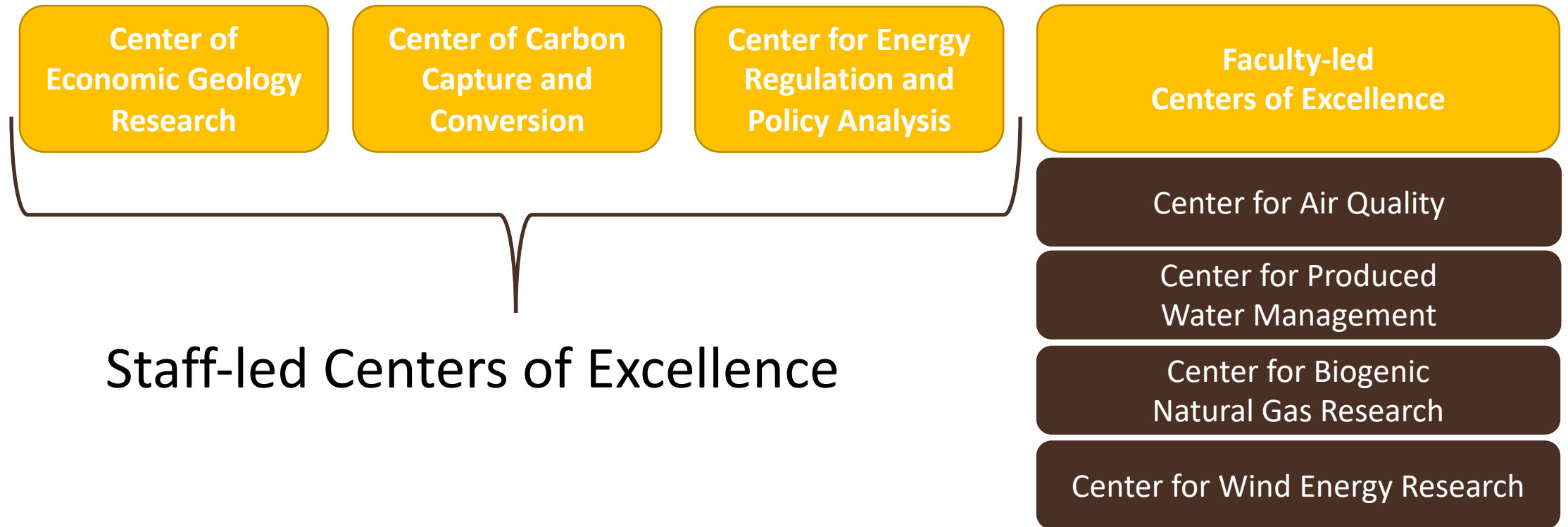


- Bachelor of Science (120 credits)
 - Professional Land Management
 - Energy and Environmental Systems
- Energy Resource Management Minor (12 credits)
- Interdisciplinary focus
- 5th highest salary of degrees at UW
- 95% placement rate

SER Research Portfolio

*THE WORLD NEEDS MORE
ADVENTUROUS SPIRIT.*

SER Research Structure



Carbon Capture, Use and Storage

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CCUS Projects

- Flameless Pressurized Oxy-combustion
- Plains CO₂ Reduction Partnership
- US-China Clean Energy Research Center
- Wyoming CarbonSAFE



Wyoming CarbonSAFE Project

*Wyoming CarbonSAFE is focused on investigating the **feasibility** of practical, secure, **permanent, geologic storage** of carbon dioxide (CO_2) emissions from coal-based electricity generation facilities near Dry Fork Station Gillette, Wyoming....*

- Over \$33.1M project (spent and committed)
 - \$26.2M federal and \$6.9M cost share
 - \$11 million with Wyoming contractors
- Phase III began October 1, 2020
- 1 of 5 projects in the country

Research activities for Phase III:

- Commercial-scale subsurface injection testing and monitoring
- Finalize geologic characterization
- Prepare and file Class VI permits
- Integrate this project with a separately funded CO_2 capture study
- Conduct the required NEPA analyses for commercialization



Wyoming CarbonSAFE Team





WYOMING CarbonSAFE

Public Outreach Day

August 3, 2021

— 6:30 PM —

Integrated Test Center at Dry Fork Station

Doors Open at 6:00 PM • Light Refreshments Provided

Carbon Engineering

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Thermo-chemical (Coal Refinery) Process Technology

The process consists of the deliberate decomposition of coal to make high-volume, environmental and health friendly, non-combustion products.



- Integrates 3 proven technology platforms to convert coal



- Products range from engineered commodities, high-value chemical compounds, and petrochemical feedstocks.
- Zero waste and low carbon footprint
- Commercial-scale conversion expected

Thermo-chemical Processing Solvent Treatment, Pyrolysis & Separation

Subject of Patent Application:
WO 2019/055529



Soil Fertility Products
Building Materials
Engineered Carbon & Char Products



Phenol, Creosote, Base Oils
Graphine Oxide
Paving and Roofing Products
Resins & Coatings
Carbon Fiber Mats



Petrochemical Feedstocks for use in
other conversion processes

Rare Earth Elements and Critical Minerals

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REE Current Work and Opportunities

- \$1.62 million collaboration with NETL, SER, Campbell County, the city of Gillette and Energy Capital Economic Development on REE pilot on coal ash
- **CORE-CM**
 - **\$1.875 million collaborative project in Powder River Basin**
 - **\$1.875 million collaborative project in Green River/Wind River Basins**
- Future opportunities
 - In-situ mining techniques of CM and REEs from coal and other sediments
 - Development of remote sensing prospecting tools
 - Drone sensing of REEs and CMs
 - Machine learning techniques using pathfinders elements
 - Phosphate REE characterization and weak acid extraction

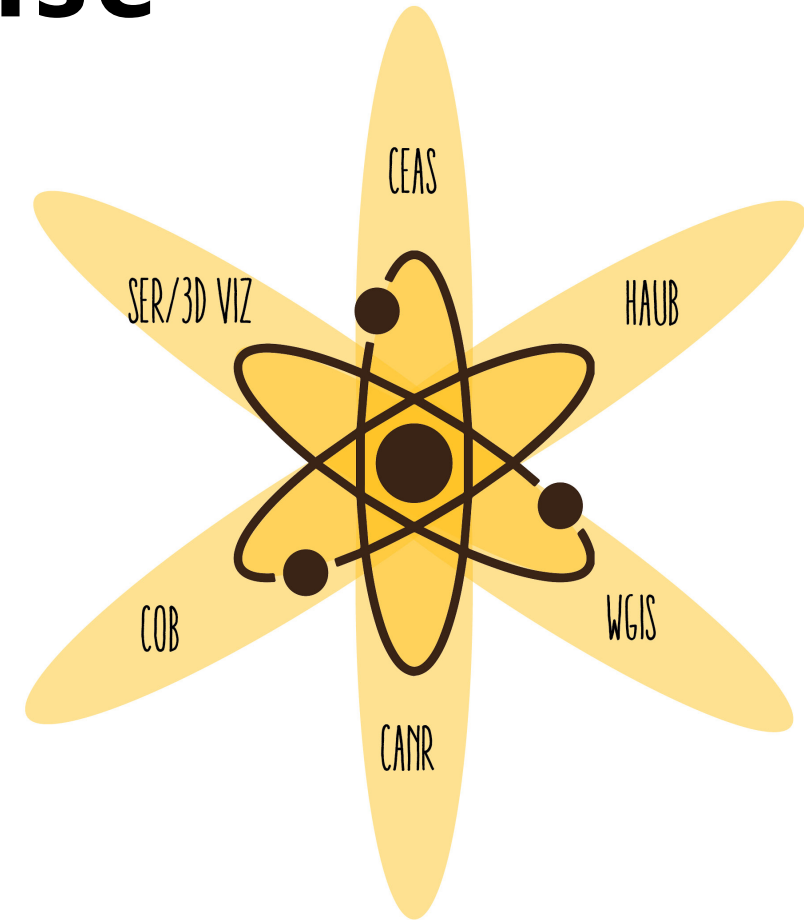


Emerging Areas

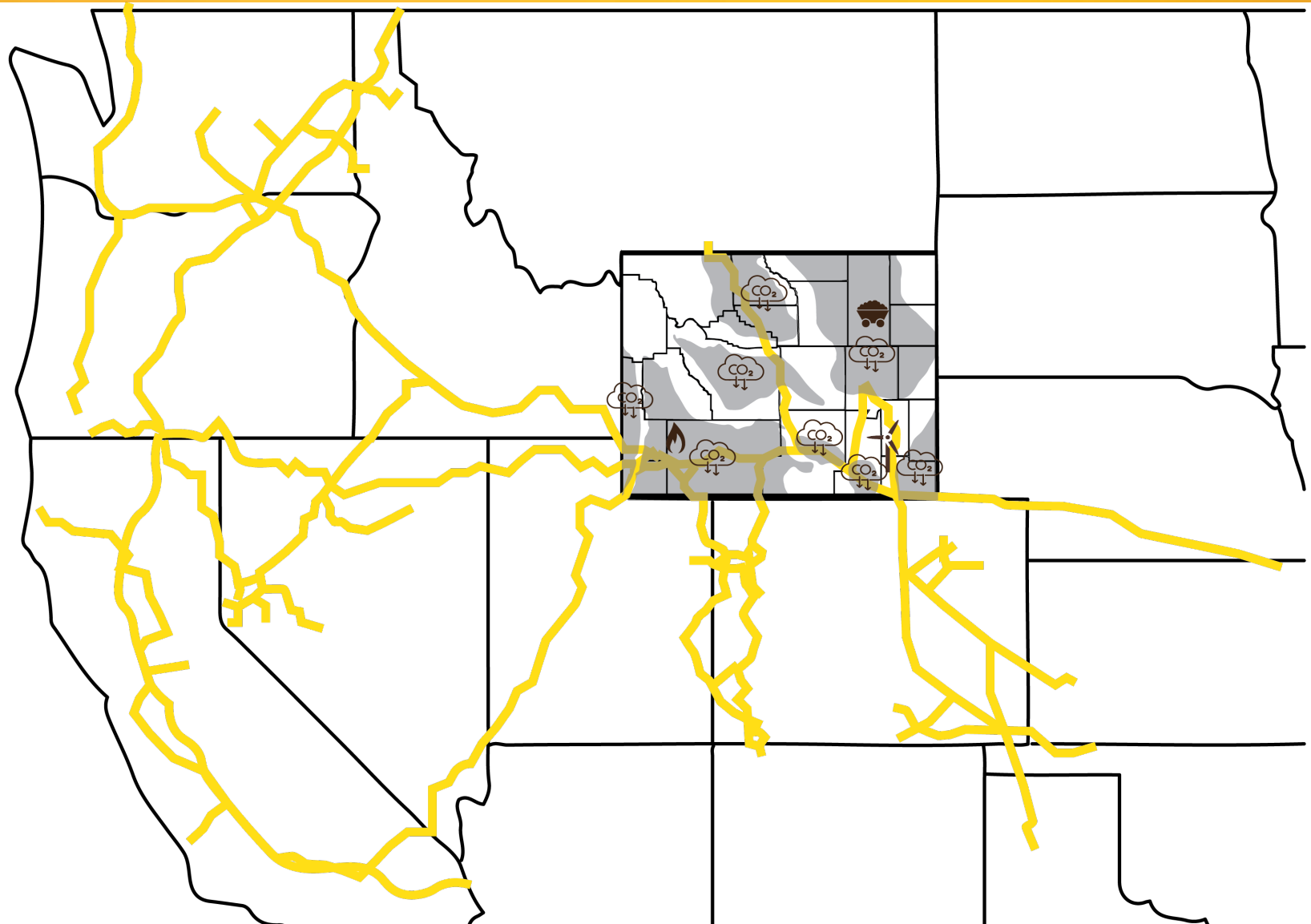
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Select UW Nuclear Expertise

- Design and modeling
- Value of ramping/energy storage capability to support grid
- GIS support for siting
- Social license to operate and Wyomingite education
- Uranium extraction and processing
- Importance and value of Wyoming-produced fuel
- Jobs and tax revenue
- Retraining workers
- Tracking of carbon-free electricity and recruiting of data servers/crypto mining to zero-carbon energy from plant
- Other uses for nuclear-generated heat
 - H₂, carbon engineering
 - Agriculture
 - ...



Wyoming as a H₂ Headwaters State

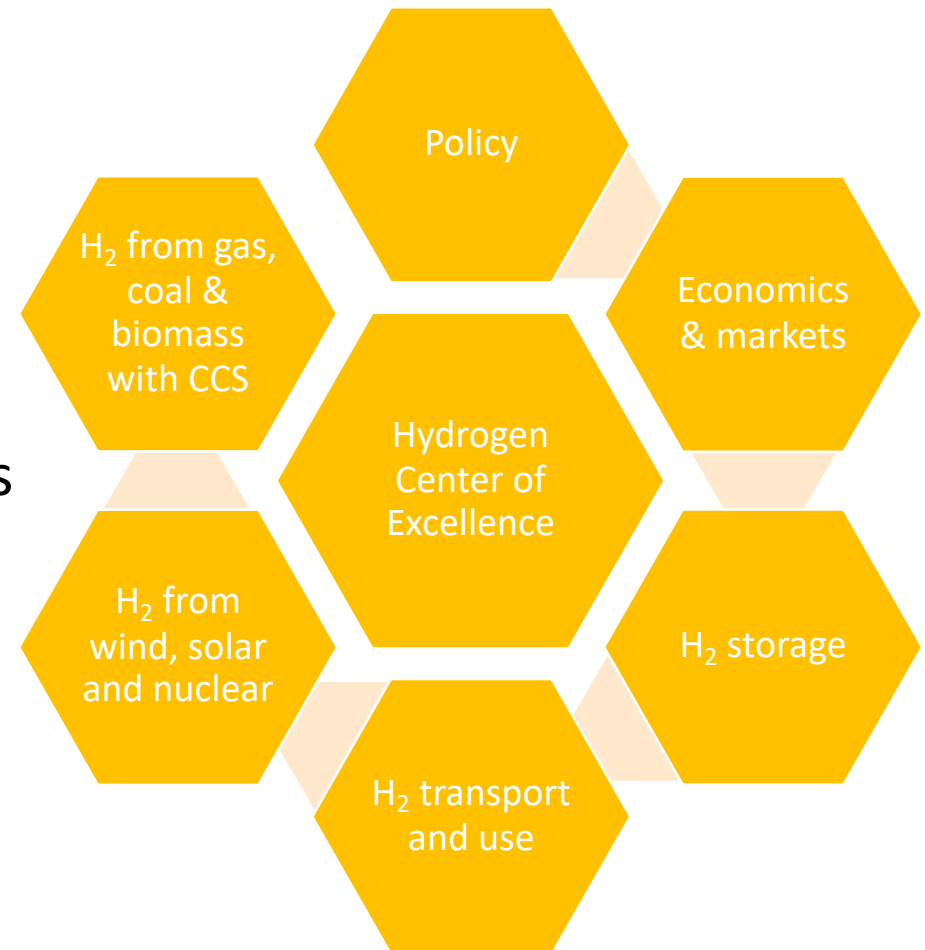


H₂ Center of Excellence

Select areas of interest:

- Quantify costs of Wyoming-produced hydrogen
- Identify and map potential markets
- Identify sources of produced water
- Map CO₂ storage sites near potential hydrogen hubs
- H₂ storage opportunities and seed studies
- Pipeline blending and retrofitting studies

Talk to us about opportunities to support this new center!



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