

Wyoming's Enhanced Oil Recovery Institute

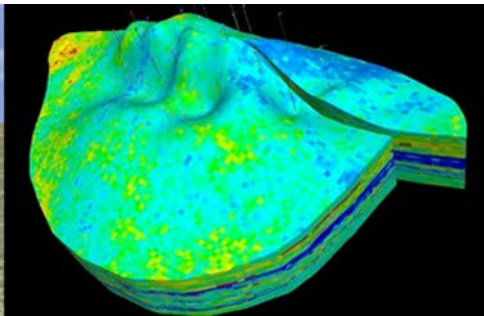


*Joint Minerals Committee Meeting
Thursday, August 12, 2021 - Laramie*



Enhanced Oil
Recovery Institute

Lon Whitman, Pet. Eng. – Outreach Manager, EORI



The History of the EORC and EORI

- The **Wyoming Enhanced Oil Recovery Commission (EORC)** was legislatively created in **2004** and is a **State Agency** under the Executive Branch of the State of Wyoming. (Agency Number: 070)
 - As per TITLE 30 - MINES AND MINERALS CHAPTER 1 - GENERAL PROVISIONS CHAPTER 8 - ENHANCED OIL RECOVERY (30-8-101), **the EORC** is mandated to collaborate with the University of Wyoming **School of Energy Resources (SER)** to develop: a research program for energy research and enhanced oil and gas recovery at SER, a program focusing on technology transfer and to facilitate the development of formal agreements between SER and EORC.
- The EORC is comprised of 8 members as designated by Wyoming State Statute
 - The **Governor, the State Geologist and one Legislative member** (appointed by the Management Council of the Legislature) are **Ex-Officio Members** of the Enhanced Oil Recovery Commission
 - The Governor appoints the remaining members of whom
 - one (1) shall be from the **public at large with experience in the oil and gas industry,**
 - one (1) shall be a **member of the Wyoming Oil and Gas Conservation Commission,**
 - two (2) shall represent the **oil and gas industry** and
 - one (1) shall be a **Representative of the University of Wyoming.**



§ 30-8-101. Enhanced Oil Recovery Commission



Governor Gordon
(Ex-Officio)



Rep. Mike Greear
Wyoming Legislature



Erin Campbell
**Wyoming State
Geologist (ex-officio)**



Ken Hendricks
Chairman
Flint Creek Consulting
WOGCC Member



Dave True
**University of Wyoming
Trustee**



Eli Bebout
Commissioner at large



Chad Brister
Commissioner at large
Merit Energy



Robert (Bob) King
Vice Chairman
Commissioner at large



The History of EORI

- The **Enhanced Oil Recovery Institute (EORI)** is the **Operating Unit** of the EORC with the **mission to facilitate a meaningful and measurable increase in recoverable oil and gas in Wyoming that may otherwise not be realized.**
- The EORC has a **current biennium Block Grant Budget** allocation of **\$4,433,633**



The Enhanced Oil Recovery Institute - EORI

- EORI was initially located at the University of Wyoming and was moved to Casper in 2015. Our offices are located at the Casper Area Innovation Center on King Boulevard.
- Under a **Memorandum of Understanding**, the **University of Wyoming** provides EORI:
 - Accounting
 - Purchasing
 - Payroll
 - HR
 - Grant Management
- EORI is a **Center of Excellence of the School of Energy Resources**
- EORI has a **staff** that includes engineers, geologists, economists and support staff
- EORI's work focuses on **Collaborative projects with Wyoming operators to find ways to improve and enhance oil and gas production in the State** and can provide operators:
 - Geology expertise
 - Reservoir Engineering including advanced modeling, and
 - Economic evaluation
- EORI works collaboratively with **SER, the Wyoming Energy Authority, the Wyoming State Geological Survey and other State Agencies**
- EORI has a **Technical Advisory Board** of leading industry professionals who provide expertise to EORI (and WY stakeholders) in areas including leading industry technologies and business trends



§ 30-8-101. Technical Advisory Board



Brad Bauer
Merit Energy Company



Mike Blicow
Blicow Consulting, LLC



Jeffrey Brown
*Research Fellow, Steyer-Taylor
Center For Energy Policy*



Charlie Carlisle
Chemical Tracers Inc.



Joe D'Amico
D'Amico Technologies



Andy Finley
Goolsby, Finley & Associates, LLC



Sallie Greenberg
*Illinois State Geological
Survey/University of Illinois*



Nigel Jenvey
Carbon Solutions



George Koperna
Advanced Resources International



Steve Melzer
Melzer Consulting



Chuck Peterson
Devon Energy, Retired



Robert "Robby" Rockey
Fleur de Lis, LLC



Vicki Stamp
True Oil, LLC



Scott Stone
S2C Pacific



Current Selected Reservoir, Geology and Field Work Projects

DE-FOA-0001990 - Unlocking the Tight Oil Reservoirs of the Powder River Basin, Wyoming

A \$13M DOE-funded project with **Occidental Petroleum and EORI** to determine “best-practices” for completing horizontal wells in the Frontier/Turner, Belle Fourche, and Mowry formations in the Powder River Basin. The study will entail reservoir characterization, taking a whole, continuous core through the entire section of rock strata, completing complex rock studies on the core, and drilling and completing a lateral well utilizing the recommendations derived from these studies.

Minnelusa Consortium II – Osborn Heirs, True Oil, Urban Oil and Gas

West Rozet Minnelusa - Conduct detailed reservoir characterization of the Permian Minnelusa reservoir in West Rozet Field and make recommendations for IOR/EOR methods to improve oil recovery there.

Kuehne Ranch Complex - Conduct detailed reservoir characterization of the Permian Minnelusa reservoir in the Kuehne Ranch field complex and make recommendations for IOR/EOR methods to improve oil recovery there. The geologic work is ongoing. Reservoir modeling and simulation of different IOR-EOR strategies

Viper USR at Grass Creek - Merit Energy – Curtis Formation – Big Horn Basin

EORI is sharing in the cost with SER and WEA to implement the Viper USR drilling tool in wells producing from the Upper Triassic Curtis Sandstone Formation in **Grass Creek Field (Big Horn Basin)** to see if the method will result in improved production. A report detailing the results of these tests will be forthcoming.

Teapot Dome Huff-n-Puff - Green Energy Reserve – Shannon Reservoir – Powder River Basin

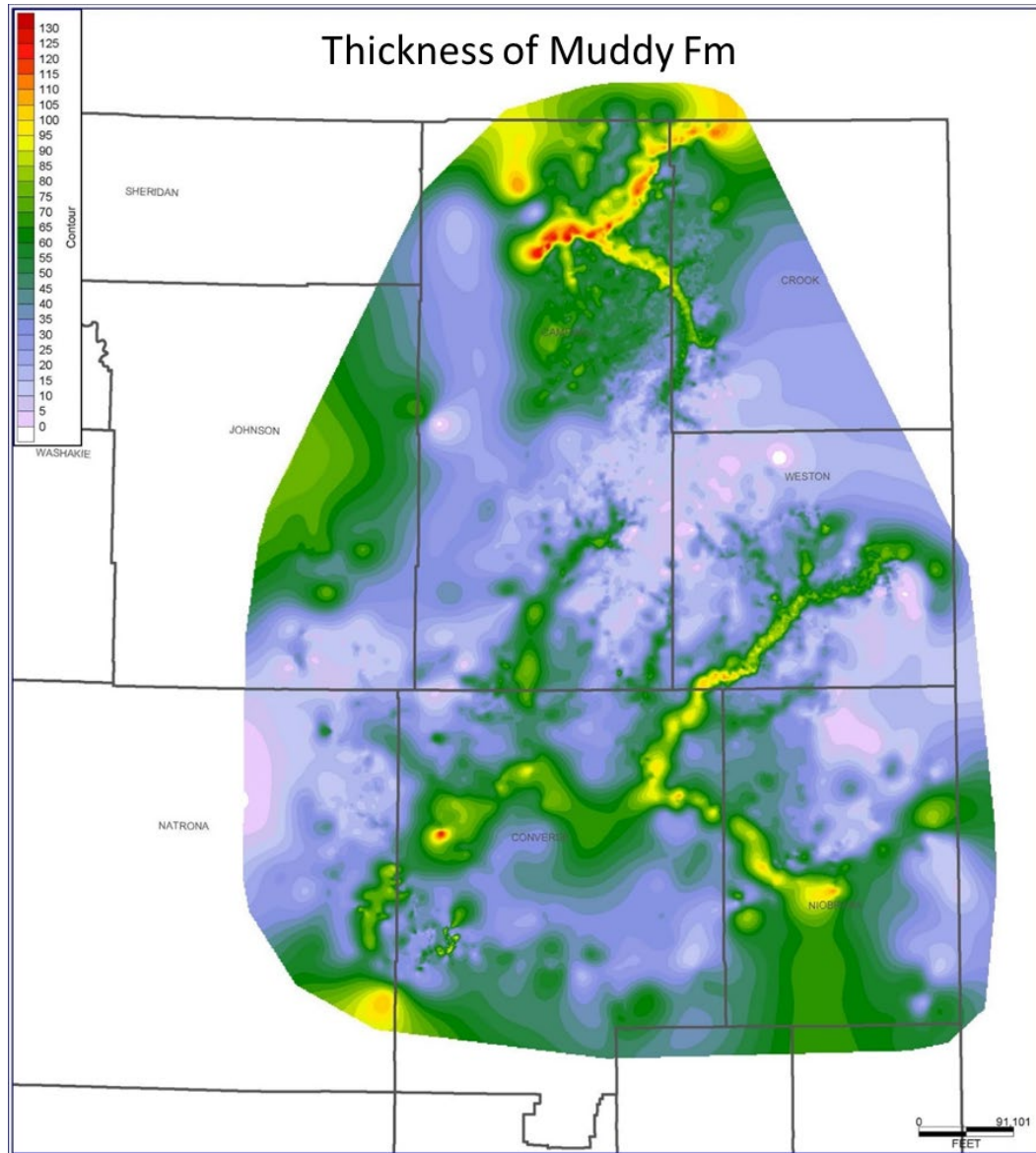
Green Energy Reserve Holdings has requested technical assistance from the EORI to help develop and monitor an air huff and puff project in the Shannon Reservoir at Teapot Dome Field in Natrona County, WY. Successful tests of this method can be used in other Wyoming reservoirs with similar characteristics.

IOR in Legacy Fields - Outlaw Oil & Gas – Minnelusa and Muddy Reservoirs – Powder River Basin

EORI is funding (along with SER and WEA) an IOR/EOR project involving a methodical approach to improving production in multiple reservoirs in several PRB fields. The methodology includes: creating more exposure to near-wellbore reservoir rock; strategic chemical fracs; natural gas injection; gas-lift or plunger-lift systems; stripping liquids from natural gas; strategic acquisition of abandoned/idle gas lines.



Regional Geology and Reservoir Work - Muddy Formation



- Concept has been to study various fields in order to establish regional stratigraphic relationships
 - Why are **waterfloods ineffective** in some Muddy reservoirs?
 - Are certain areas **conducive to better production?**
 - Does the **composition of brines** within the Muddy Fm vary depending on location?
 - Can we develop **compatible brines** to flood the Muddy Fm?
 - How does the Permian **salt section affect** Cretaceous Muddy **reservoir development?**

List of Projects at EORI: 2019 – Present

Project	Project #	P.I.	EORI Priority	Brief Summary	Completion Date/Publication
PRB Unconventionals	1912	EPR	1	Select location for a test well of the Belle Fourche & Mowry intervals to examine reservoir characteristics and best completion practices	2024
FDL-Salt Creek ROZ	1906	GDF	2	Select location for a test of the ROZ in the Wall Creek 1 pay interval	2022
Glenrock Field	1907	AMF-SL	3	Detailed reservoir characterization of the Dakota Sandstone at Glenrock Field and how to improve production there	2021
Global Petra Project	x	GDF	4	Develop a global Petra project in which all EORI staff can share	2021
Minnelusa Consortium II	1917	STW	5	Reservoir characterization of the Minnelusa reservoirs at Gibbs, Kuehne Ranch, and West Rozet Fields with emphasis on EOR	2022
CO ₂ Report Publication	1633	EPR	6	Report on recent CO ₂ -EOR projects in Wyoming and discussion of recovery effectiveness	mid-2021
Hyperscratcher	1806	STW	7	PowerPoint on EORI website; results of Hyperscratcher tool field tests to remedy problems related to scale, asphaltenes, & paraffin	mid-2021
Hirsch Field Area Report	2007	STW-SL	8	Report on geologic mapping & reservoir simulation of Muddy Fm at Hirsch Field in the Powder River Basin	mid-2021
ESP Permanent Magnet Motors	x	Jeff Brown	9	Report on economic impact of using permanent magnet ESPs & assessing impact for increasing recoverable reserves in BH Basin	2021
Revelant Evaluation Report	1727-01	STW	10	Report on field tests on Revelant Enercat-treated tubing tool for addressing problems with paraffin, asphaltenes, and emulsion	mid-2021
Viper-Thompson Creek Field	1727-08	EPR-STW	11	Results of field tests on Viper ultra-short-radius drilling in existing boreholes to remedy near-wellbore skin damage	2021
Carson Field-Muddy Fm	1824	AMF	12	Report on geologic mapping of the Muddy Formation at Carson Field in Powder River Basin	mid-2021
Rozet Field Report	1821	STW-SL	13	Report on geologic mapping and reservoir simulation of the Muddy Fm at Rozet Field in the Powder River Basin	2021
Tracer Survey-Spring Creek	1727-10b	STW	14	Waiting on data to generate a report on the results of an inter-well tracer survey in the Tensleep at Spring Creek Field, Big Horn Basin	2021
Little Mitchell Crk Field Report	1709	STW-SL	15	Report on geologic mapping and reservoir simulation of the Minnelusa Fm at Little Mitchell Creek in the Powder River Basin	2021
Gibbs Field Report	1917	STW	16	Report on geologic mapping and reservoir simulation of the Minnelusa Fm at Gibbs Field in the Powder River Basin	2021
Brine Compatibility-Muddy Fm	1813	STW	17	Collecting data & planning on core experimentation to determine compatible brines for water flooding certain Muddy reservoirs	2023
Kuehne Ranch Field Report	1917	STW-SL	18	Report on geologic mapping and reservoir simulation of the Minnelusa Fm at Kuehne Creek in the Powder River Basin	2022
West Rozet Field Report	1917	STW-SL	19	Conducting subsurface mapping of the Minnelusa Fm at West Rozet Field in the Powder River Basin	2022
Microbial Paraffin	1916	EPR-STW	20	Ongoing study detailing the results of microbial treatments in boreholes suffering from paraffin problems	2022
Kitty Field Study & Report	1608	STW	21	Conducting detailed subsurface mapping of the Muddy Fm at Kitty Field in the Powder River Basin	2022
Gibbs/LMC Modeling Comparison	1709	SL-STW	22	Generating comparison of reservoir modeling of the Minnelusa Fm at Little Mitchell Creek fields in the Powder River Basin	2022
Minnelusa Seq Strat Report	1830	STW	23	Conducting subsurface & field mapping to propose new stratigraphic scheme for Minnelusa reservoirs & its impact on EOR	2022
Gibbs Field Tracer Study	1910	STW	24	Inter-well tracer survey in the Minnelusa reservoir at Gibbs Field; determine inter-well communication within the field	2022
Minnelusa Regional	1830	STW	25	Studies on regional geologic and engineering aspects of the Minnelusa Fm in the Powder River Basin and ways to improve production	2022
Muddy Fm Regional	1821	STW-AMF	26	Studies on regional geologic and engineering aspects of the Muddy Fm in the Powder River Basin and ways to improve production	2022
Jupiter Oxygen	2008	SC, et al	27	Work related to the CCUS FEED at Dave Johnston powerplant near Glenrock Wyoming; report submitted to Jupiter Oxygen	2021
Carbon Safe	2014	SC	28	Ongoing	unknown
Modeling of Seismic Responses	2007	SL-STW	29	Generating models and real-world examples of seismic responses to select reservoirs	2022
Waterflood Data Update	1723	AMF-STW	30	Update on analysis of fields that are prime candidates for water flooding and potential additional reserves to the state	unknown
Viper-Grass Crk Field	2103	STW	31	Evaluation of using Viper Drilling to improve producibility in U. Triassic Curtis Ss in Grass Creek Field (BHB)	2022
Teapot Dome Shannon Huff-n-Puff	2104	STW	32	Determine effectiveness of injecting air in pressure-depleted Shannon Ss with ~5% RF	2022
Northern DJ Basin Production Trends	1716	JB-STW	x	Multi-Variate Statistics study on factors most affecting optimum completions in the Codell and Niobrara Fm in northern DJ Basin	2020
Helping Conventional Oil Fields	2004	Staff	x	White Paper suggesting ways the state can encourage IOR/EOR activity in conventional oil fields at no out-of-pocket costs	2020
Impact of Biden Admin policies on WY	2102	STW, et al	x	White Paper on Impact of Biden Fed Land Policies on the development of conventional Oil & Gas resources in Wyoming	2021
Kimmeridge CBM	2019	EPR	x	Evaluate gas leakage at surface of CBM wells; part of effort to bring wells to net zero emissions; report complete	2021
Polymer Flood Minnelusa	1918	STW	x	Report on the results of polymer floods in various Minnelusa fields in the Powder River Basin; published	2021



WY Producers Engaged with EORI



Other Current EORI Projects

The Casper Log Library

The Casper Log Library (CCL) owners (Ralph Specht, Andy Finley, Steve Kirkwood and Blaine Snyder) have donated their full log collection to EORI. EORI will transform all paper logs into digital format to be made available to interested users. There are between 25-30,00 wells each with 1 to 3 logs that are currently housed at the CLL in Casper. In total, close to 50,000 logs being donated to EORI.

The Wyoming Oil and Gas Fair



**WYOMING
OIL & GAS FAIR**
SINCE 1996
ENHANCED OIL RECOVERY INSTITUTE

2021 Webinar Series

*Wyoming's Oil and Gas Industry
Its Value to the State & Future Directions*

FEATURING



**Governor
Mark Gordon**



**Dr. Glen
Murrell**

This event is **FREE** but registration is required

TUES - JUNE 22, 2021
FROM 10:45 AM TO 11:45 AM MST

Submit questions for the speakers during registration or email



Enhanced Oil
Recovery Institute

Questions? Contact Lon Whitman at
WyoGasFair@EORIWyoming.org



EORI Collaborative Work with WEA and SER

Joint Federal Leasing Ban Report ARI/SER/WEA/EORI

Kimmeridge Methane CBM Project (jointly with CAQ)

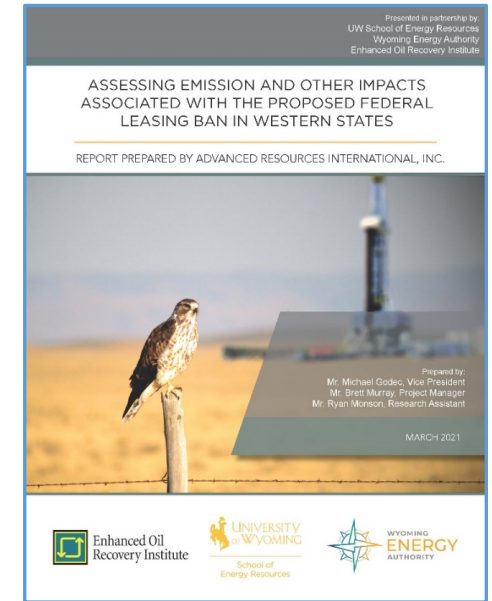
EORI (Lon) supporting WEA Outreach

Class VI Sequestration as a Service Committee

Governor's CCUS Committee led by R. Luthi & J. Beggar

Rocks to Reservoirs 2.0 (\$500k joint funding from SER/WEA/EORI)

1. **Outlaw Oil & Gas** (\$200k) Muddy and Mowry Fms; Kitty, Recluse, & Spotted Horse Fields
2. Glenrock Energy
3. **Cowboy Clean Fuels**
4. **Merit Energy** (\$100k/return) USR Drilling in Curtis Fm/BHB
5. Green Reserve Energy



EORI is supporting CCUS in Wyoming with WEA - StoryMap

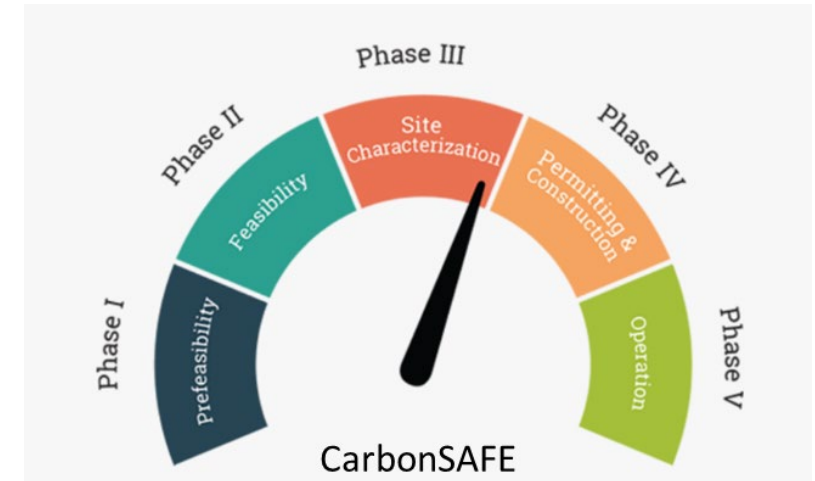
Wyoming is CCUS Ready!

Carbon Capture, Utilization and Storage

May 29, 2021

Wyoming has immense opportunities for Carbon Capture, Utilization and Storage technologies to lower carbon emissions and create jobs

Interactive Maps



Regulatory Support

- WY Stat § 30-5-501:** Oil and Gas activities at Geologic Sequestration Activities - Clarifies that via-in-situ storage rights, production rights are dominant but cannot interfere with storage.
- WY Stat § 30-5-502:** Certifications of carbon dioxide incidentally stored during enhanced recovery operations - Provides a certification procedure for CO2 incidentally stored during EOR.
- WY Stat § 34-1-152:** Ownership of Pore Space Underlying Surfaces - Specifies who owns the pore space.
- WY Stat § 34-1-513:** Clear delineation of liability - Specifies that the injector, not the owner of pore space, is generally liable.
- WY Stat § 35-11-313:** Establishes clear permitting procedures and requirements for CCUS/CCUS sites.
- WY Stat § 35-11-315:** Utilization of geologic sequestration sites; agreements, application for permit, contract - Provides a mechanism for utilization of storage interests.
- WY Stat § 35-11-318:** Geologic sequestration special revenue account - Provides a mechanism for post-closure MRV via a trust fund approach.


EORI is Curating WPA and Oil & Gas Data

THE POPULAR

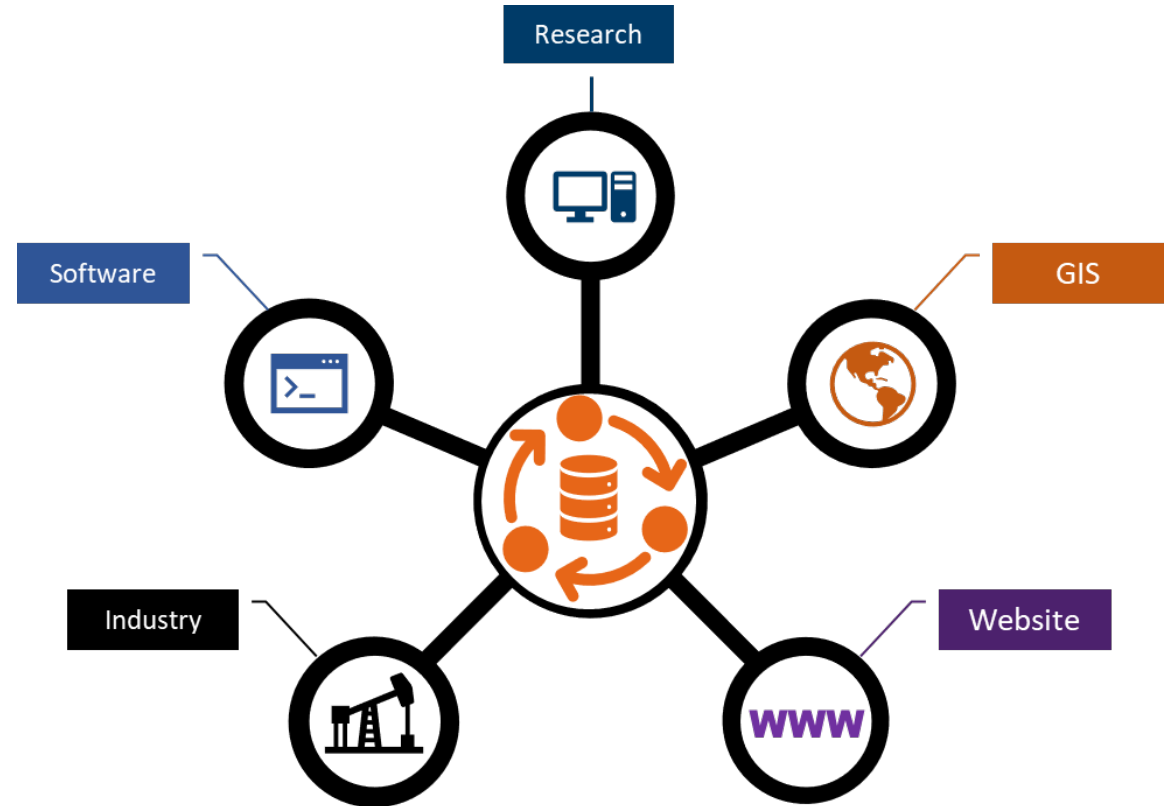
Interactive Energy Map Applications

Wyoming pipeline infrastructure, oil & gas rig locations, oil & gas fields & other energy related maps are still available online.

[View Maps](#) [Next](#)



Enhanced Oil Recovery Institute



Thank You



Enhanced Oil Recovery Institute

Helping improve Oil and Gas production in Wyoming

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