Wyoming’s Enhanced Oil Recovery Institute

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

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 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
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?
<table>
<thead>
<tr>
<th>Project</th>
<th>Project #</th>
<th>P.I.</th>
<th>EORI Priority</th>
<th>Brief Summary</th>
<th>Completion Date/Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRB Unconventionals</td>
<td>1912</td>
<td>EPR</td>
<td>1</td>
<td>Select location for a test well of the Belle Fourche &amp; Mowry intervals to examine reservoir characteristics and best completion practices</td>
<td>2024</td>
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<tr>
<td>FDL-Salt Creek ROZ</td>
<td>1906</td>
<td>GDF</td>
<td>2</td>
<td>Select location for a test of the ROZ in the Wall Creek 1 pay interval</td>
<td>2022</td>
</tr>
<tr>
<td>Glenrock Field</td>
<td>1907</td>
<td>AMF-SL</td>
<td>3</td>
<td>Detailed reservoir characterization of the Dakota Sandstone at Glenrock Field and how to improve production there</td>
<td>2021</td>
</tr>
<tr>
<td>Global Petra Project</td>
<td>x</td>
<td>GDF</td>
<td>4</td>
<td>Develop a global Petra project in which all EORI staff can share</td>
<td>2021</td>
</tr>
<tr>
<td>Minnelusa Consortium II</td>
<td>1917</td>
<td>STW</td>
<td>5</td>
<td>Reservoir characterization of the Minnelusa reservoirs at Gibbs, Kuehne Ranch, and West Rozet Fields with emphasis on EOR</td>
<td>2022</td>
</tr>
<tr>
<td>CO2 Report Publication</td>
<td>1633</td>
<td>EPR</td>
<td>6</td>
<td>Report on recent CO2-EOR projects in Wyoming and discussion of recovery effectiveness</td>
<td>mid-2021</td>
</tr>
<tr>
<td>Hyperscratcher</td>
<td>1806</td>
<td>STW</td>
<td>7</td>
<td>Report on EORI website; results of Hyperscratcher tool field tests to remedy problems related to scale, asphaltenes, &amp; paraffin</td>
<td>mid-2021</td>
</tr>
<tr>
<td>ESP Permanent Magnet Motors</td>
<td>Jeff Brown</td>
<td>1727-01</td>
<td>STW</td>
<td>Report on economic impact of using permanent magnet ESPs &amp; assessing impact for increasing recoverable reserves in BH Basin</td>
<td>2021</td>
</tr>
<tr>
<td>Viper-Thompson Creek Field</td>
<td>1727-08</td>
<td>EPR-STW</td>
<td>11</td>
<td>Results of field tests on Viper ultra-short-radius drilling in existing boreholes to remedy near-wellbore skin damage</td>
<td>2021</td>
</tr>
<tr>
<td>Carson Field-Muddy Fm</td>
<td>1824</td>
<td>AMF</td>
<td>12</td>
<td>Report on geologic mapping of the Muddy Formation at Carson Field in Powder River Basin</td>
<td>mid-2021</td>
</tr>
<tr>
<td>Rozet Field Report</td>
<td>1821</td>
<td>STW-SL</td>
<td>13</td>
<td>Report on geologic mapping of the Muddy Fm at Rozet Field in the Powder River Basin</td>
<td>2021</td>
</tr>
<tr>
<td>Tracer Survey-Spring Creek</td>
<td>1727-10b</td>
<td>STW</td>
<td>14</td>
<td>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</td>
<td>2021</td>
</tr>
<tr>
<td>Gibbs Field Report</td>
<td>1917</td>
<td>STW</td>
<td>16</td>
<td>Report on geologic mapping and reservoir simulation of the Minnelusa Fm at Gibbs Field in the Powder River Basin</td>
<td>2021</td>
</tr>
<tr>
<td>Brine Compatibility-Muddy Fm</td>
<td>1813</td>
<td>STW</td>
<td>17</td>
<td>Collecting data &amp; planning on core experimentation to determine compatible brines for water flooding certain Muddy reservoirs</td>
<td>2023</td>
</tr>
<tr>
<td>Kuehne Ranch Field Report</td>
<td>1917</td>
<td>STW-SL</td>
<td>18</td>
<td>Report on geologic mapping and reservoir simulation of the Minnelusa Fm at Kuehne Creek in the Powder River Basin</td>
<td>2022</td>
</tr>
<tr>
<td>West Rozet Field Report</td>
<td>1917</td>
<td>STW-SL</td>
<td>19</td>
<td>Conducting subsurface mapping of the Minnelusa Fm at West Rozet Field in the Powder River Basin</td>
<td>2022</td>
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<tr>
<td>Microbial Paraffin</td>
<td>1916</td>
<td>EPR-STW</td>
<td>20</td>
<td>Ongoing study detailing the results of microbial treatments in boreholes suffering from paraffin problems</td>
<td>2022</td>
</tr>
<tr>
<td>Kitty Field Study &amp; Report</td>
<td>1608</td>
<td>STW</td>
<td>21</td>
<td>Conducting detailed subsurface mapping of the Muddy Fm at Kitty Field in the Powder River Basin</td>
<td>2022</td>
</tr>
<tr>
<td>Gibbs/LMC Modeling Comparison</td>
<td>1709</td>
<td>SL-STW</td>
<td>22</td>
<td>Generating comparison of reservoir modeling of the Minnelusa Fm at Little Mitchell Creek fields in the Powder River Basin</td>
<td>2021</td>
</tr>
<tr>
<td>Minnelusa Seq Strat Report</td>
<td>1830</td>
<td>STW</td>
<td>23</td>
<td>Conducting subsurface field mapping to propose new stratigraphic scheme for Minnelusa reservoirs &amp; its impact on EOR</td>
<td>2022</td>
</tr>
<tr>
<td>Gibbs Field Tracer Study</td>
<td>1910</td>
<td>STW</td>
<td>24</td>
<td>Inter-well tracer survey in the Minnelusa reservoir at Gibbs Field; determine inter-well communication within the field</td>
<td>mid-2021</td>
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<tr>
<td>Minnelusa Regional</td>
<td>1830</td>
<td>STW</td>
<td>25</td>
<td>Studies on regional geologic and engineering aspects of the Minnelusa Fm in the Powder River Basin and ways to improve production</td>
<td>2022</td>
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<tr>
<td>Muddy Fm Regional</td>
<td>1821</td>
<td>STW-AMF</td>
<td>26</td>
<td>Studies on regional geologic and engineering aspects of the Muddy Fm in the Powder River Basin and ways to improve production</td>
<td>2022</td>
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<tr>
<td>Carbon Safe</td>
<td>2014</td>
<td>SC</td>
<td>28</td>
<td>Ongoing unknown</td>
<td>unknown</td>
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<tr>
<td>Modeling of Seismic Responses</td>
<td>2007</td>
<td>SL-STW</td>
<td>29</td>
<td>Generating models and real-world examples of seismic responses to select reservoirs</td>
<td>2022</td>
</tr>
<tr>
<td>Waterflow Data Update</td>
<td>1723</td>
<td>AMF-STW</td>
<td>30</td>
<td>Update on analysis of fields that are prime candidates for water flooding and potential additional reserves to the state</td>
<td>unknown</td>
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<tr>
<td>Viper-Grass Crk Field</td>
<td>2103</td>
<td>STW</td>
<td>31</td>
<td>Evaluation of using Viper Drilling to improve productivity in U. Triassic Curtis Ss in Grass Creek Field (BHB)</td>
<td>2022</td>
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<tr>
<td>Teapot Dome Shannon Huff-n-Puff</td>
<td>2104</td>
<td>STW</td>
<td>32</td>
<td>Determine effectiveness of injecting air in pressure-depleted Shannon Ss with ~5% RF</td>
<td>2022</td>
</tr>
<tr>
<td>Northern DJ Basin Production Trends</td>
<td>1716</td>
<td>JB-STW</td>
<td>x</td>
<td>Multi-Variate Statistics study on factors most affecting optimum completions in the Codell and Niobrara Fm in northern DJ Basin</td>
<td>2020</td>
</tr>
<tr>
<td>Impacting Conventional Oil Fields</td>
<td>2004</td>
<td>Staff</td>
<td>x</td>
<td>White Paper suggesting ways the state can encourage IOR/EOR activity in conventional oil fields at no out-of-pocket costs</td>
<td>2020</td>
</tr>
<tr>
<td>Kimmeridge CBM</td>
<td>2019</td>
<td>EPR</td>
<td>x</td>
<td>Evaluate gas leakage at surface of CBM wells; part of effort to bring wells to net zero emissions; report complete</td>
<td>2021</td>
</tr>
<tr>
<td>Polymer Flood Minnelusa</td>
<td>1918</td>
<td>STW</td>
<td>x</td>
<td>Report on the results of polymer floods in various Minnelusa fields in the Powder River Basin; published</td>
<td>2021</td>
</tr>
</tbody>
</table>
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 25-30,000 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

2021 Webinar Series
Wyoming’s Oil and Gas Industry: Its Value to the State & Future Directions

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 WyoGasFair@EORIWyoming.org

FEATURING
Governor Mark Gordon
Dr. Glen Murrell

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
EORI is Curating WPA and Oil & Gas Data
Thank You

Enhanced Oil Recovery Institute
Helping improve Oil and Gas production in Wyoming

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