North Dakota Department of Mineral Resources

http://www.oilgas.nd.gov

http://www.state.nd.us/ndgs

600 East Boulevard Ave. - Dept 405
Bismarck, ND 58505-0840
(701) 328-8020    (701) 328-8000
Wells

14,324 active
  2,055 conventional
  12,269 Bakken/Three Forks
1,492 inactive
  +$50 for 90 days
883 waiting on completion
  +$55 for 90 days
1,894 permitted
  +$60 for 90 days
NYMEX April 2018

13,314 increased density approved 01/15/18
31,907 total

55,000-65,000 estimated final
54 out of 56 rigs in core
January 2018
Bakken Breakeven Price Range (20% ATIRR)

Bakken Breakeven Prices
$6 - $8 Million
Completed Wells Cost
- $58-$73
- $49-$61
- $43-$52
- $39-$48
- $36-$43
- $34-$40
- $32-$38
- $28-$33
- $26-$30
October 2017 Water Disposal Trucked Loads/Day

- North Dakota
- 164
- 29
- 4
- 22
- 397
- 395
- <1
- <1
- 1,600
- <1
- 18
- 19
- 49
- 2
- 6
- <1
- <1

Legend:
- Dark Green: 164
- Light Green: 29
- Light Blue: 4
- Light Blue: 22
- Light Blue: 397
- Light Blue: 395
- Light Blue: <1
- Light Blue: <1
- Dark Green: 1,600
- Light Blue: <1
- Light Blue: 18
- Light Blue: 19
- Light Blue: 49
- Light Blue: 2
- Light Blue: 6
- Dark Green: <1
- Dark Green: <1

Note: Numbers represent the number of loads/day. Numbers in brackets denote less than 1.
October 2017 Crude Oil Trucked Loads/Day
Impact

Wells drilled and completed - $100 billion
Wells drilled not yet completed - $11 billion
Natural Gas gathering and processing - $13 billion
Rail and rail transportation facilities - $1.25 billion
Crude Oil transmission pipelines - $2 billion

Total estimate - $127 billion

This does not include the investments in housing and infrastructure made by private firms and state-local-federal government.
Coming Attractions

NDIC Rule Changes

EOR Field Tests

$50 > $60 > $70/barrel
Coming Attractions

NDIC Rule Changes

EOR Field Tests

$50 > $60 > $70/barrel
<table>
<thead>
<tr>
<th>NDAC CITE</th>
<th>RULE</th>
<th>PROPOSED CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>43-02-03</td>
<td>Definitions</td>
<td>&quot;Treating Plant&quot; does not include treating tank bottoms at well site or facility</td>
</tr>
<tr>
<td>43-02-03</td>
<td>Enforcement of Laws, Rules, and Regs</td>
<td>Requires contractors know regs before conducting operations</td>
</tr>
<tr>
<td>43-02-03</td>
<td>Oil and Gas Metering Systems</td>
<td>Requires serial numbers of oil and gas meters to be submitted</td>
</tr>
<tr>
<td>43-02-03</td>
<td>Bond and Transfer of Wells</td>
<td>Requires principal to submit drawing identifying location of pipelines off site</td>
</tr>
<tr>
<td>43-02-03</td>
<td>Sign on Well or Facility</td>
<td>Clarifies signs must be on both the well and facility</td>
</tr>
<tr>
<td>43-02-03</td>
<td>Defective Casing or Cementing</td>
<td>Requires MIT if suspect defective casing or cementing</td>
</tr>
<tr>
<td>43-02-03</td>
<td>Safety Regulation</td>
<td>Clarifies ignition sources (not just boiler/generator) must be at a safe distance</td>
</tr>
<tr>
<td>43-02-03-30</td>
<td>Fires, Leaks, Spills, or Blowouts</td>
<td>HB1151 (Revised to involve CO, PW, NGL notification if &lt; 100,000, stays on site built &gt; 5-1-2000)</td>
</tr>
<tr>
<td>43-02-03-30</td>
<td>Leak and Spill Cleanup</td>
<td>Requires Fm 4 w/10 days of spill cleanup</td>
</tr>
<tr>
<td>43-02-03-33</td>
<td>Notice of Intention to Plug Well</td>
<td>Notice must include well bore diagram</td>
</tr>
<tr>
<td>43-02-03-34</td>
<td>Reclamation of Surface</td>
<td>SB2333 (Revised to require reclamation to original condition per 38-08-04-12 (SB2333))</td>
</tr>
<tr>
<td>43-02-03-49</td>
<td>Oil Production Equip, Dikes, and Seals</td>
<td>Requires dikes around production equipment at new production facility</td>
</tr>
<tr>
<td>43-02-03-51</td>
<td>Treating Plant Construction and Operation</td>
<td>Requires all discharged wastes to be promptly removed, not just accidently spilled</td>
</tr>
<tr>
<td>43-02-03-51</td>
<td>Treating Plant Construction and Operation</td>
<td>Requires Fm 4 w/30 days of TP construction/modification</td>
</tr>
<tr>
<td>43-02-03-51</td>
<td>Treating Plant Construction and Operation</td>
<td>Clarifies that prior approval needed before modify TP</td>
</tr>
<tr>
<td>43-02-03-51</td>
<td>Treating Plant Construction and Operation</td>
<td>Authorizes Director to shut in TP operations if noncompliant</td>
</tr>
<tr>
<td>43-02-03-51</td>
<td>Treating Plant Abandonment &amp; Reclamation</td>
<td>Removes duplication in Adm Code—language appears under 43-02-03-34.1</td>
</tr>
<tr>
<td>43-02-03-53</td>
<td>SHF Construction &amp; Operation Requirements</td>
<td>Requires Fm 4 w/30 days of TP construction/modification</td>
</tr>
<tr>
<td>43-02-03-53</td>
<td>SHF Construction &amp; Operation Requirements</td>
<td>Authorizes Director to shut in TP operations if noncompliant</td>
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<tr>
<td>43-02-03-53</td>
<td>SHF Abandonment &amp; Reclamation</td>
<td>Removes duplication in Adm Code—language appears under 43-02-03-34.1</td>
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<tr>
<td>43-02-03-55</td>
<td>Abandonment of Wells, TPs, &amp; SHFs</td>
<td>Clarifies Comm can require shut-in inj wells plugged after notice &amp; hearing</td>
</tr>
<tr>
<td>43-02-03-56</td>
<td>Special Procedures</td>
<td>Clarifies Comm must receive comments by 5pm last business day prior to hearing</td>
</tr>
<tr>
<td>43-02-05</td>
<td>UNDERGROUND INJECTION CONTROL</td>
<td></td>
</tr>
<tr>
<td>43-02-05</td>
<td>Construction Requirements</td>
<td>Requires all SWD wells to have surface casing set below Fox Hills Fm</td>
</tr>
<tr>
<td>43-02-05</td>
<td>Construction Requirements</td>
<td>Requires Director approval to perf after initial completion</td>
</tr>
<tr>
<td>43-02-05</td>
<td>Pressure Limitations (formerly Operating Regs)</td>
<td>Moves existing language to 43-02-05-12</td>
</tr>
<tr>
<td>43-02-05</td>
<td>Reporting, Monitoring, and Operating Regs</td>
<td>Identifies forms needed to report monthly injection</td>
</tr>
<tr>
<td>43-02-05</td>
<td>Reporting, Monitoring, and Operating Regs</td>
<td>Requires initial and annual press test of all inj lines leaving the pumphouse site</td>
</tr>
<tr>
<td>43-02-05</td>
<td>Reporting, Monitoring, and Operating Regs</td>
<td>Added annular injection prohibition currently residing in 43-02-05-09</td>
</tr>
<tr>
<td>43-02-06</td>
<td>ROYALTY STATEMENTS</td>
<td></td>
</tr>
<tr>
<td>43-02-06</td>
<td>Royalty Owner Information Statement</td>
<td>Requires point of sale for oil and gas</td>
</tr>
<tr>
<td>43-02-11</td>
<td>CERTIFICATION OF HORIZONTAL, RE-ENTRY, AND TWO-YEAR INACTIVE WELLS</td>
<td></td>
</tr>
<tr>
<td>43-02-11</td>
<td>Definitions</td>
<td>HB1043 (Removes reference to tax incentives repealed by HB1043)</td>
</tr>
<tr>
<td>43-02-11</td>
<td>Appt to Certify Hor, Hor RE, Two-Yr Inactive</td>
<td>HB1043 (Removes qualifying well certification for tax incentives repealed by HB1043)</td>
</tr>
<tr>
<td>43-02-11</td>
<td>Appt for Tax Exempt for Hor Well</td>
<td>HB1043 (Removes tax incentives repealed by HB1043)</td>
</tr>
<tr>
<td>43-02-11</td>
<td>Appt for Tax Exempt for Hor RE Well</td>
<td>HB1043 (Removes tax incentives repealed by HB1043)</td>
</tr>
<tr>
<td>43-02-11</td>
<td>Appt for Tax Exempt for Two-Yr Inactive Well</td>
<td>HB1043 (Removes tax incentives repealed by HB1043)</td>
</tr>
<tr>
<td>43-02-11</td>
<td>Books &amp; Records—Substantive Reports</td>
<td>HB1043 (Removes reference to tax incentives repealed by HB1043)</td>
</tr>
<tr>
<td>43-02-11</td>
<td>Appt for Tax Exempt for Shallow Gas Well</td>
<td>Removes requirement to notify all working interest owners and gas purchasers</td>
</tr>
<tr>
<td>43-05-01</td>
<td>GEOLOGIC STORAGE OF CARBON DIOXIDE</td>
<td></td>
</tr>
<tr>
<td>43-05-01-19</td>
<td>Facility Closure</td>
<td>SB2333 (Requires reclamation to original condition per 38-08-04-12 (SB2333))</td>
</tr>
</tbody>
</table>
TIMETABLE FOR ADOPTING OIL AND GAS RULES  (tentative in RED FONT)

2017
Jun 27: Requested ideas f/rule changes at Annual Inspector Meeting
Jul 28: Received interoffice comments for proposed rules
Aug 22: IC meeting—received approval to proceed with proposed rulemaking
Aug 23: Sent legal ad to North Dakota Newspaper Association for rules notice
File full notice + rules w/Leg Council (LC) via hand-delivery
LC sends rules notice to interested parties w/in 15 business days after receiving them
Aug 30: Write reg analysis f/rules impacting industry > $50,000
All papers (10 daily + 42 weekly) to publish proposed rules notice Aug 30 – Sep 5
Oct 11: Rules hearing (Case 26062) @ 9 am, Oil and Gas Division Field Office, 1000 E Calgary Ave, Bismarck
Oct 11: Rules hearing @ 1 pm, Oil and Gas Division Field Office, 926 E Industrial Drive, Dickinson
Oct 12: Rules hearing @ 8:30 am, Home Place Lodge and Suites, 1505 15th Ave West, Williston
Oct 12: Rules hearing @ 2 pm, Oil and Gas Division Field Office, 7 3rd St SE, Suite 107, Minot
Minimum ten-day comment period starts (to receive input on proposed rules)
Oct 23: Comment period ends—11 days from final hearing date
Nov 27: Finalize responses to all comments rec’d (oral-hearing + written comments)
Finalize appropriate amendments to rules
Nov 28: IC approve rules w/ICO #______ (Case 26062): Prepared Aff of mailing to all parties
Nov 28: Write small entity reg analysis and small entity impact statement
Complete small entity regulatory analysis required to minimize adverse impact on small entities
Complete small entity impact statement required if has an adverse impact on small entities
Submit final rules to Attorney General (AG) for legal opinion including:
Dec 20: Receive opinion from AG’s office
File rules+AG opinion w/LC
(Rules filed w/LC b/t Nov 2-Feb 1 become effective Apr 1, 2018.)
2018
Jan 17: Notify all interested parties (+ post on web) of Adm Rules Comm hearing after LC posts agenda
Mar 14: Administrative Rules Committee Hearing (Notify all interested parties when LC posts agenda)
Apr 1: Adopt final rules
Coming Attractions

NDIC Rule Changes

EOR Field Tests

$50/barrel & $60/barrel
EOG on EOR

EOG is the first company to say it has significantly increased oil production from an unconventional play using gas injection.

Field tests since program started in 2013:

- The production increases on 15 wells indicated from 30 to 70% reserve gains.
- A 32-well test in 2016 added 300,000 bbl of oil at $6/bbl finding cost.
- Work is ongoing on 100 wells in six areas in 2017.

Inputs and Outputs

- Additional capital costs average about $1 million per well.
- The process uses associated gas from its wells.
- Production response is in 2–3 months.
- $1 invested adds $2 to net present value.

It Works if:

- The formation is able to contain high-pressure gas injection near the well.
- Wellbores contact the most productive rock.
- The completion maximizes the fractured area within a restricted zone around the wellbore.

Source: EOG.
Coming Attractions

NDIC Rule Changes

EOR Field Tests

$50 > $60 > $70/barrel
<table>
<thead>
<tr>
<th>Region</th>
<th>Total Storage (Million Barrels)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Coast</td>
<td>12 of 20 = 60%</td>
<td></td>
</tr>
<tr>
<td>Permian</td>
<td>84 of 120 = 70%</td>
<td></td>
</tr>
<tr>
<td>Rockies</td>
<td>22 of 40 = 55%</td>
<td></td>
</tr>
<tr>
<td>Total US</td>
<td>413 of 735 = 56%</td>
<td></td>
</tr>
<tr>
<td>Cushing</td>
<td>42 of 70 = 60%</td>
<td></td>
</tr>
<tr>
<td>Gulf Coast</td>
<td>203 of 395 = 51%</td>
<td></td>
</tr>
<tr>
<td>West Coast</td>
<td>50 of 100 = 50%</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>400 of 735 = 54%</td>
<td></td>
</tr>
</tbody>
</table>

**U.S. Crude Oil Stocks**

- **Scale**: Million Barrels
- **Months**: Jun-16 to Jun-18
- **Source**: U.S. Energy Information Administration
North Dakota Oil Production

Reclaim

EOR? +++

+25%

G1  G2  G3  G4  G5  Reclaim

Barrels per Day


2,500,000 2,250,000 2,000,000 1,750,000 1,500,000 1,250,000 1,000,000 750,000 500,000 250,000 0

History  Current ND Revenue Estimate  Peak Production Estimate  Current Production Limited-No Drilling  Lower-Longer-Exhaust-Core  Rapid Recovery
North Dakota Oil Production and Price

- $140
- $120
- $100
- $80
- $60
- $40
- $20
- $0

Time: 1975 to 2020

Legend:
- $/Barrel History
- $/Barrel ND Revenue Forecast
- $/Barrel NYMEX - 12%

Note: +6%
County by County Outlook
MONTHLY OIL PRODUCTION FOR LOCAL COUNTIES

- BURKE
- wells

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
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<tbody>
<tr>
<td>1977</td>
<td>75,000</td>
</tr>
<tr>
<td>1987</td>
<td>150,000</td>
</tr>
<tr>
<td>1997</td>
<td>225,000</td>
</tr>
<tr>
<td>2007</td>
<td>500,000</td>
</tr>
<tr>
<td>2017</td>
<td>750,000</td>
</tr>
</tbody>
</table>
New-well oil production per rig
barrels/day

February-2017  February-2018

Anadarko    Appalachia  Bakken    Eagle Ford  Haynesville  Niobrara  Permian
Taxes
Permian – 3.75% to 7.5%
Anadarko – 7%
Eagle Ford – 7.5%
Appalachia – 0.2%
Bakken – 10%
Haynesville – 5% to 7.5%
Niobrara – 3% to 6%

Federal & Tribal Lands
Permian – <2%
Anadarko – <2%
Eagle Ford – <2%
Appalachia – <2%
Bakken – 9% to 30%
Haynesville – 2% to 9%
Niobrara – 36% to 48%

17 Potential unconventional oil resource Source Rock formations
Spearfish 1  Charles 2
Tyler 1  Mission Canyon 2
Lodgepole 1  Bakken 2
Birdbear 1  Duperow 1
Winnipegosis 1  Stony Mountain 1
Red River 2  Winnipeg 1
Deadwood 1
Steps to obtain a Fort Berthold Right of Way (non-sequential)

Obtain permission to survey from landowners and allotees
Survey and stake route
Conduct Onsite with BLM, BIA, Tribe, Landowners, Surveyors
If approved, submit appropriate NEPA information and obtain FONSI from BIA
If there are Tribal mineral interests in any portion, present to the MHA Natural Resources Committee
If approved, present to the MHA Tribal Business Council
If approved, present to MHA Chairman for signature
Concurrently obtain consents from owners possibly associated with each allotted tract
Typically 50 to 100 owners with small fractional interests
51% of ownership must approve to gain a right-of-way.
Submit all paperwork to BIA for approval
Approximate timeline - undetermined (due to unexpected problems)
The Tribe recognizes the issues with attaining Right Of Ways from the allotees as a major hurdle
Bakken Wells – Truckload Timeline

**Fracturing Phase** – (800 loads)
600 tank loads + 200 trucks sand per well =
(15 day average)
Some are 0 with fresh and salt water pipelines

**Drilling Preparation** = 25 loads (3 days total)

**Drilling Phase** = 165 loads total (16 day average)

**Rig down** = 6 loads for 4-8 wells
(2 days for 6 wells)

**Wait for Frack** (90-120 days)

**Production Phase**
200 loads per well 1st Year
Drops to 0 if pipelined
Total: 1,230 = (-)38%
250 with pipelines

**Production Equipment**
(14 loads over 150 days)

**Pit Reclamation** (25 total truckloads)
Williston Basin Oil Production & Export Capacity, BOPD

Barrels Per Day

Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.

JJ Kringstad - North Dakota Pipeline Authority
Solving the Flaring Challenge
Northern Border + Alliance total capacity 4,000 MMCFD