

BAKKEEN

Volume 6, Issue 3 • May 2015

Breakout 2015

WBPC EDITION: ONE BASIN, TWO NATIONS

**OIL BY RAIL:
A CANADIAN PERSPECTIVE**

**CAPTURING AND
SEQUESTERING CARBON
COULD BE A WIN-WIN
FOR NORTH DAKOTA**



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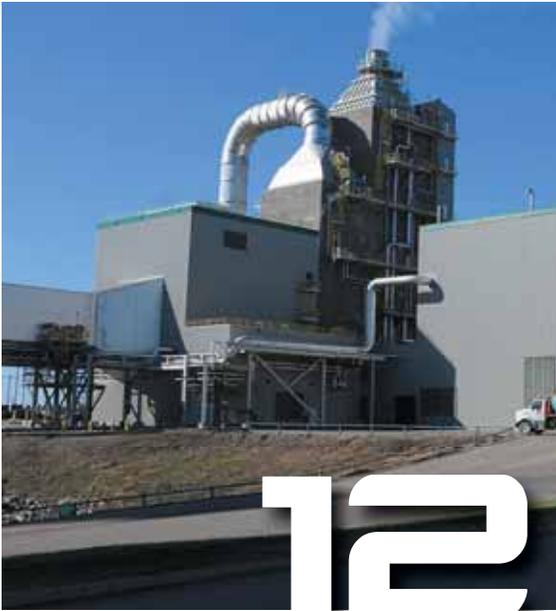
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Bobcat of Williston
13878 West Front Street
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By Brian Kroshus, Publisher

Associated Press

An Iranian oil worker walks at Tehran's oil refinery south of the capital in Iran on Dec. 22, 2014.

Depressed crude oil prices continue to create uncertainty for producers around the globe. Lack of price support, noticeably absent due to lower than anticipated global demand and current oversupply, make it unlikely crude markets will see a sustained recovery over the short-term.

Soft crude oil prices, reaching their lowest level in 6 years in March, are in part attributable to rising shale oil production in plays like the Bakken. The U.S. shale oil revolution has resulted in dramatic domestic production increases, over a relatively brief period of time.

In 2005, oil production in the U.S. was approximately 5 million barrels per day. By the end of 2014, output had risen to over 9 million barrels per day. From a pricing standpoint, the increase has been

too much of a good thing for the oil industry itself.

In addition to rising shale oil production, a stronger U.S. dollar is further pressuring oil markets at this time. Currency headwinds and cautious investment interest in oil-exchange funds, amplified as oil prices remain low, continue to exasperate an already soft crude oil market.

Adding to downward pressure — a potential nuclear accord with Iran and lifting of economic sanctions. In effect, Iranian oil is poised to be added to an already oversupplied market. Assuming an agreement is reached between Tehran and participating world powers including the United States, the outcome would negatively impact world markets from a pricing standpoint.

Even after a deal is made however, the impact of Iranian oil being reintroduced into the market likely won't be immediately felt. First, Iran will have to demonstrate it is in compliance with the agreement. Secondly, investment capital for Iranian oil fields, down due to sanctions, will have to return.

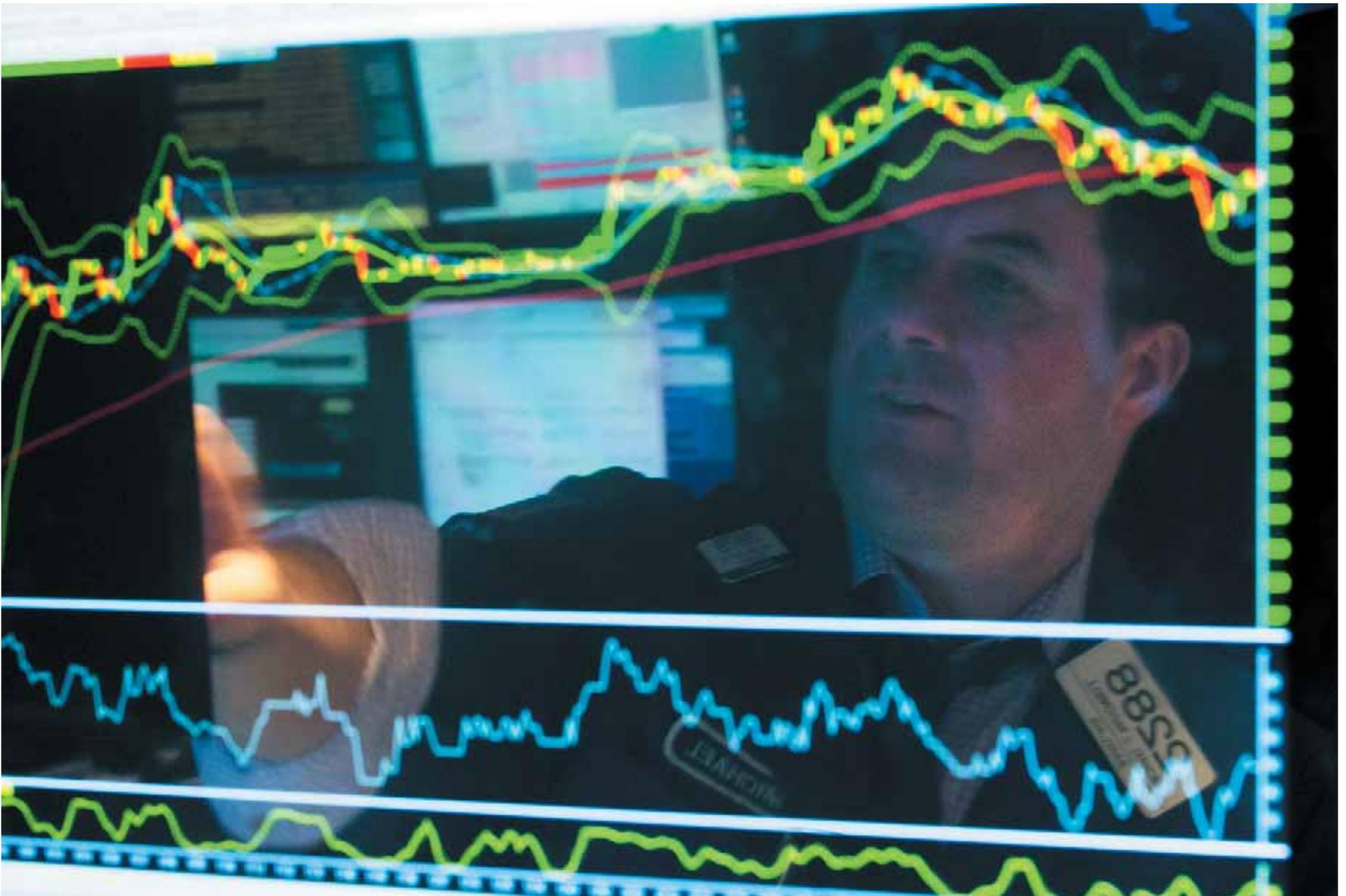
Still, it would be difficult not to recognize the impact Iranian oil production could have. In 2012, before sanctions were put in place, Iran produced 3.6 million barrels of oil per day, exporting 2.5 million barrels of that. Today, production has dropped to 2.5 million barrels per day, of which only 1.1 million barrels are exported.

While Iranian oil production and release of surplus supplies won't benefit an already saturated market, geopolitical events and instability in the Middle East

could quickly counter the cooling effect Iranian production will have on oil prices. Recent Saudi airstrikes on Yemen clearly demonstrate oil price volatility. Following the airstrikes oil prices spiked, though the rally was short-lived.

Global demand and oil output has and continues to be a primary influencer on price. If economic growth in China and Europe shows weakness, low oil prices will likely persist even if global production slows, which doesn't appear imminent. Saudi Arabia, unwilling to slow production at least yet, reported record production in March of 10.3 million barrels per day.

U.S. stockpiles also remain high. In early April, U.S. crude oil inventories rose 10.95 million barrels to a record 482.39 million barrels, according to the Energy Information Administration in its weekly



Associated Press

Specialist Michael McDonnell is reflected in a screen at his post on the floor of the New York Stock Exchange, March 20. Plunging oil prices, a surging dollar and worries about the timing of a rate hike haven't been enough to keep the stock market from rising for a ninth straight quarter from January through March — only the fourth time it's done that since World War II.

report. The oil glut at home and abroad, will take time to unwind given current conditions.

Although the market remains fundamentally oversupplied, forecast models suggest that may not be the case over the long-term as drilling activity in the U.S. continues to slow. Domestic production forecasts for the summer months indicate a slowdown will occur, largely attributable to fewer rigs actively drilling for oil.

With oil prices currently hovering near the \$50 per barrel mark and further downside potential, oil prices are likely to press the \$40 per barrel mark before eventually recovering in the second half

of 2015.

Bearishness creating ripple effect

As oil prices move lower, active rig count in the U.S. is following suit. In early April, U.S. rig declined for the 17th straight week to 1,028 compared to 1,818 the previous year, the lowest level in almost 6 years.

In North Dakota, rig count in early April stood at 90 compared to 190 a year earlier. Many producers reluctant to drill, particularly as hedges expire, are instead choosing to wait until crude markets improve.

Depressed oil prices will continue to create uncertainty for operators and

service providers alike. Fewer rigs in operation mean less need for oil-related services. In plays like the Bakken, with high extraction and shipping costs, the ripple effect is even more noticeable.

Understandably, communities in or near oil country are becoming increasingly uneasy. Distinctly aware of the impact fewer workers and weakened demand for services, directly or indirectly tied to oil production has on their local economies, they're forced to try to anticipate and prepare for the future.

In the short-term, low oil prices are offering a reprieve for both communities and operators alike from an infrastructure standpoint. In the early

Production levels in the Bakken will likely decline to below 1 million barrels per day as fewer new wells are drilled.

stages of Bakken development, infrastructure development wasn't keeping pace with demand, driving up production costs and inhibiting drilling in some areas of the play.

The recent influx of state funds, primarily targeting oil producing counties through a surge fund initiative introduced by Governor Dalrymple and approved by the North Dakota legislature totaling \$1.1 billion, will help. The initiative includes \$450 million for state highway projects, and should serve to better position Bakken operators and communities in the future.

Though not ideal, the slowdown has created an opportunity to address critical infrastructure needs and ready the play for future growth, as oil prices recover.

Challenges ahead

Flaring rules implemented by the North Dakota Industrial Commission continue to challenge new production, particularly in areas with limited gas gathering systems and downstream processing capacity.

Considering the projected lifespan of the Bakken however, gas capture in theory should not be considered a long-term inhibitor, as new infrastructure including gas processing facilities is constructed and placed into service.

Tightening federal rail car regulations, particularly as it relates to states like North Dakota where the majority of oil produced is moved by rail, could also negatively affect production in the future. Federal oversight intended to address volatility concerns of Bakken crude, will increase production costs moving forward as new stabilization requirements are established.

While it's not plausible activity in the Bakken will cease entirely, low oil prices along with flaring, rail and stabilization requirements, are all significantly impacting production levels. With considerable investment already made in the play from both public and private sectors however, drilling at least to some extent will continue.

Revenue requirements, uniquely different from operator to operator, will still mean some level of drilling activity. Depending

That sinking feeling

The price of oil may not have hit bottom.

Crude fell more than 10 percent in the first three months of this year — a third straight quarterly decline. As recently as June a barrel cost more than \$105, but worries about over supply and flagging demand have since pushed the price below \$50.

Oil wasn't the only commodity to struggle in the first quarter. Metals, agricultural products and other commodities were also weak. Economic growth has slowed around the world, curtailing demand, particularly from China and other emerging markets. The growth of developing economies has also slowed to an expected 5 percent this

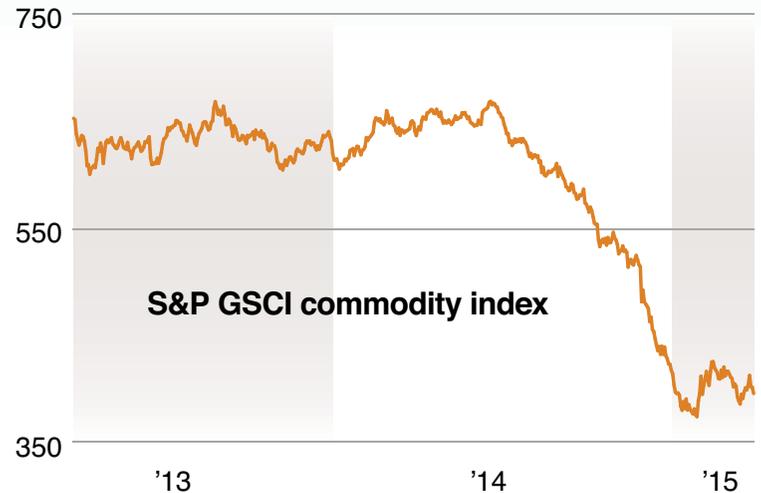
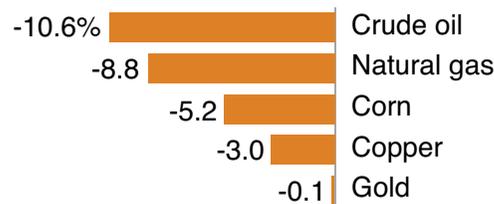
year, down from 7.3 percent a decade ago.

Some analysts expect commodities to continue to slide. The second quarter will be the weakest of the year for oil, Barclays analysts predict. The price of crude could have dropped even more last quarter if not for unplanned refinery outages around the world, a cold winter and other factors. Those concerns will go away, or at least be less impactful, this quarter.

To be sure, Barclays acknowledges that any flare up of violence in the Middle East could cause the price of oil to spike. Even so, it expects an average price of \$39 per barrel this quarter. Crude hasn't been that cheap since February 2009.



1Q loss Prices dropped — again — for all kinds of commodities last quarter.



Stan Choe: J. Paschke • AP
Source: FactSet. Data through March 31.

on individual balance sheets, not all operators can afford to wait. For some, the choice is to continue drilling believing prices will eventually recover, merge with another company, or be acquired.

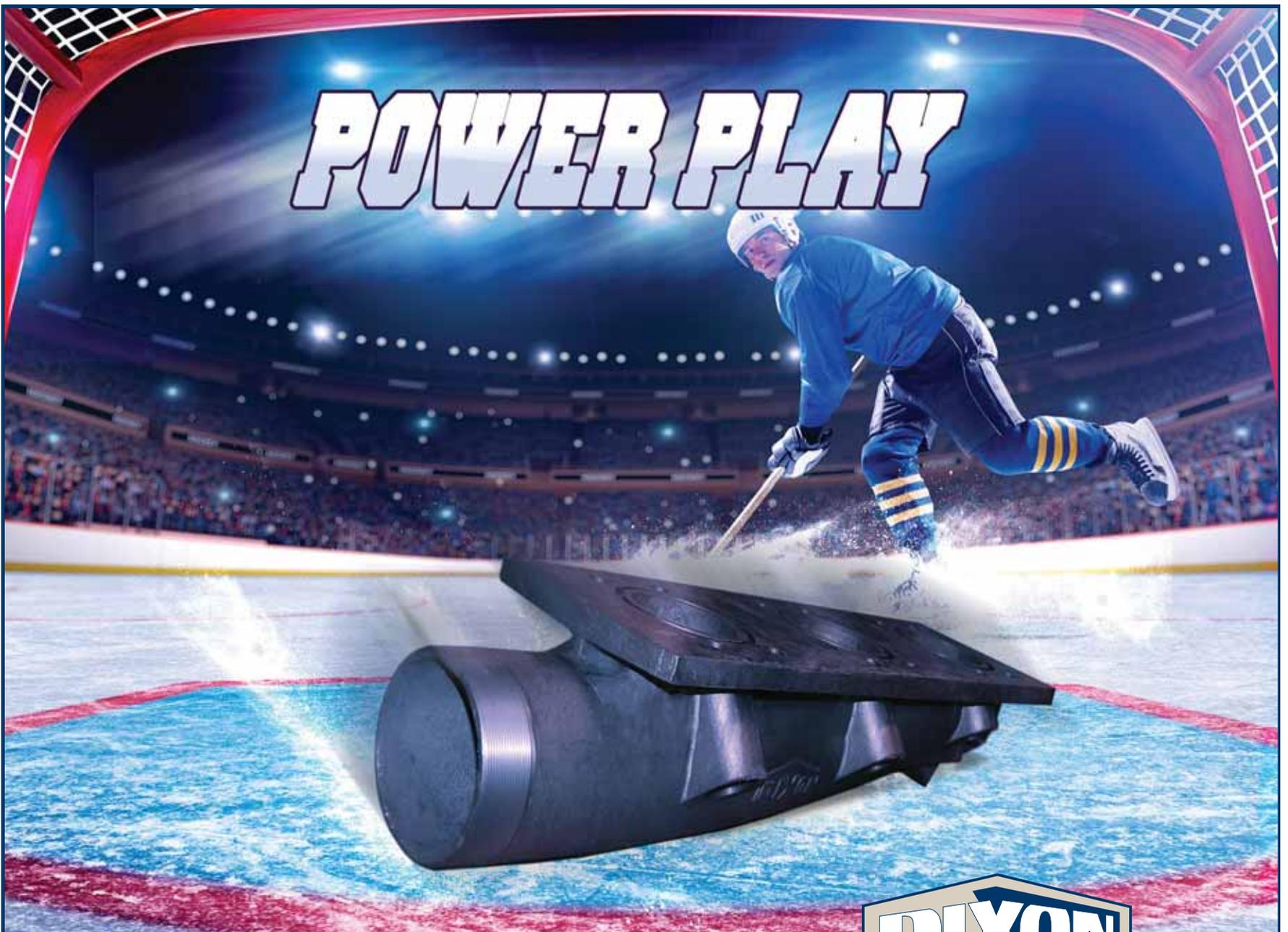
Drilling at current price levels certainly isn't attractive. On April 7, the discounted rate for Bakken crude, Flint Hills Bulletin, was \$34.75, underscoring the deep discount and spread between Bakken crude and WTI.

As a result, many producers are waiting, meaning production levels in the Bakken will likely decline to below 1 million barrels per day as fewer new wells are drilled. Legacy well depletion rates will exceed new production, despite technological advances and drilling occurring only in the most lucrative areas of the play from a geological standpoint.

Still, the future of the Bakken remains bright. Beyond constantly improving

drilling technology for new wells, increasingly encouraging re-fracturing techniques for existing wells predictably signals a new phase of oil development in the Williston Basin.

In the interim, better drilling techniques, production tax breaks and the basic fact the oil will still be there, ensures shale plays like the Bakken will remain viable for years to come. ■



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BAKKEN STOCK WATCH



Company Name	Ticker Symbol	Market Cap	Number of Outstanding Shares	Stock Price 4/2/15	52 Wk Range	Number of Employees	Website
AECOM Technology Corporation	ACM	4.83B	155.48M	30.90	24.82 - 38.24	95,000	http://www.aecom.com
American Eagle Energy Corp.	AMZG	5.24M	30.45M	0.20	0.14 - 7.51	24	http://www.eternalenergy.com
Baker Hughes	BHI	27.71B	434.53M	63.83	47.51 - 75.64	59,000	http://www.bakerhughes.com
Basic Energy Services, Inc.	BAS	314.38M	40.05M	7.20	5.00 - 29.84	5,400	http://www.basicenergyservices.com
Baytex Energy Corp.	BTE	2.77B	168.83M	16.14	12.62 - 46.46	N/A	http://www.baytex.ab.ca
Berkshire Hathaway	BRK-B	235.73M	1.64M	143.45	121.09 - 152.94	302,000	http://www.berkshirehathaway.com
Calfrac Well Services	CFW.TO	851.96M	95.40M	8.40	7.30 - 22.57	4,300	http://www.calfrac.com
Carbo Ceramics Inc.	CRR	701.07M	23.28M	30.72	27.97 - 156.00	1,025	http://www.carboceramics.com
CH Robinson Worldwide Inc.	CHRW	10.44B	146.33M	71.99	51.79 - 77.49	11,676	http://www.chrobinson.com
Chesapeake Energy	CHK	9.68B	663.32M	14.35	13.38 - 29.92	10,800	http://www.chk.com
Concho Resources	CXO	13.36B	111.91M	118.13	77.22 - 148.61	868	http://www.conchoresources.com
Conoco Phillips	COP	77.80B	1.23B	63.02	60.57 - 87.09	18,800	http://www.conocophillips.com
Continental Resources	CLR	17.00B	369.33M	45.66	30.06 - 80.91	986	http://www.clr.com
Denbury	DNR	2.74B	349.62M	7.38	6.04 - 18.59	1,498	http://www.denbury.com
Dresser Rand Group	DRC	6.22B	76.84M	80.69	56.79 - 82.95	8,100	http://www.dresser-rand.com
Earthstone Energy	ESTE	328.58M	1.74M	23.75	14.71 - 37.21	14	http://www.earthstoneenergy.com
Emerald Oil Inc.	EOX	77.36M	107.90M	0.76	0.68 - 8.63	30	http://www.emeraldoil.com
Enbridge Energy Partners LP	EET	11.87B	330.34M	35.69	26.00 - 41.68	N/A	http://www.enbridgepartners.com
Enerplus Resources Fund	ERF	2.21B	205.92M	10.44	7.75 - 25.37	707	http://www.enerplus.com
Enterprise Products Partners LP	EPD	63.13B	1.93B	32.63	17.45 - 41.38	N/A	http://www.epplp.com
EOG Resources Inc.	EOG	50.85B	548.44M	91.22	81.07 - 118.89	2,800	http://www.eogresources.com
Exxon Mobil	XOM	353.61B	4.19B	84.46	82.68 - 104.76	75,000	http://www.exxonmobil.com
FMC Technologies Inc.	FTI	8.60B	231.44M	36.96	34.85 - 63.92	19,300	http://www.fmctechnologies.com
Forestar Group Inc.	FOR	540.46M	33.44M	15.78	12.91 - 20.33	145	http://www.forestargroup.com
Halcon Resources Corp.	HK	680.66M	428.09M	1.64	1.06 - 7.50	420	http://www.halconresources.com
Halliburton	HAL	37.35B	849.67M	43.82	37.21 - 74.33	78,000	http://www.halliburton.com
Helmerich & Payne Inc.	HP	7.45B	107.64M	68.21	54.00 - 118.95	10,318	http://www.hpinc.com
Hess	HES	19.58B	282.93M	69.18	63.80 - 104.50	3,045	http://www.hess.com
Key Energy	KEG	284.09M	154.40M	1.74	1.00 - 10.52	8,100	http://www.keyenergy.com
Magnum Hunter Resources	MHR	562.62M	200.94M	2.73	1.60 - 9.10	440	http://www.magnumhunterresources.com
Major Drilling	MDI.TO	556.94M	80.14M	6.93	5.01 - 9.41	N/A	http://majordrilling.com
Marathon Oil	MRO	18.27B	674.94M	26.64	24.28 - 41.92	3,330	http://www.marathonoil.com
MDU Resources	MDU	4.24B	194.42M	21.38	21.01 - 36.05	8,451	http://www.mdu.com
Nabors Industries	NBR	4.07B	289.41M	14.08	9.91 - 30.24	24,700	http://www.nabors.com
National Oilwell Varco	NOV	20.91B	409.94M	49.92	46.08 - 86.55	54,540	http://www.natoil.com

BAKKEN STOCK WATCH



Company Name	Ticker Symbol	Market Cap	Number of Outstanding Shares	Stock Price 4/2/15	52 Wk Range	Number of Employees	Website
Newfield Exploration Co.	NFX	4.91B	135.43M	36.09	22.31 - 45.43	1,331	http://www.newfld.com
Northern Oil & Gas	NOG	501.17M	60.53M	8.01	4.79 - 17.43	23	http://www.northernoil.com
Nustar Energy LP	NS	4.83B	77.89M	62.02	50.91 - 68.33	N/A	http://www.nustarenergy.com
Nuverra Environmental Solutions	NES	101.32M	27.91M	3.62	1.65 - 21.29	2,200	http://www.nuverra.com
Oasis Petroleum	OAS	1.53B	102.45M	14.69	10.64 - 58.09	558	http://www.oasispetroleum.com
Occidental Petroleum	OXY	57.44B	770.55M	74.24	71.70 - 101.38	11,700	http://www.oxy.com
Oil States International	OIS	2.04B	51.36M	39.77	38.41 - 65.77	5,290	http://www.oilstatesintl.com
Oneok Inc.	OKE	10.02B	208.40M	48.34	39.53 - 71.19	2,269	http://www.oneok.com
Patterson-UTI Energy Inc.	PTEN	2.81B	144.95M	19.34	13.30 - 38.43	7,900	http://www.patenergy.com
PDC Energy Inc.	PDCE	1.91B	35.34M	54.03	27.91 - 70.44	343	http://www.pdce.com
Pioneer Energy Services	PES	345.64M	63.77M	5.09	3.67 - 18.40	3,400	http://www.pioneer.com
Plains All American Pipeline	PAA	18.46B	376.24M	48.72	43.61 - 61.09	5,300	http://www.paalp.com
Precision Drilling Corp.	PDS	1.92B	292.82M	6.52	4.53 - 14.65	N/A	http://www.precisiondrilling.com
QEP Resources Inc.	QEP	3.81B	175.55M	20.88	18.15 - 35.91	765	http://www.qepres.com
Quality Distribution Inc.	QLTY	274.58M	27.27M	10.32	8.32 - 15.83	N/A	http://www.qualitydistribution.com
Questar	STR	4.21B	175.49M	23.92	21.06 - 26.44	1,745	http://www.questar.com
Rosetta Resources	ROSE	1.12B	61.57M	17.39	15.92 - 55.45	318	http://www.rosettaresources.com
Schlumberger Ltd.	SLB	107.62B	1.28B	84.28	75.60 - 118.76	120,000	http://www.slb.com
Schneider Electric (Paris)	SU.PA	42.22B	571.39M	73.11	52.59 - 74.82	185,965	http://www.schneider-electric.com
SM Energy Co.	SM	3.62B	67.46M	52.57	29.41 - 90.38	896	http://sm-energy.com
Statoil ASA	STO	57.28B	3.18B	17.86	15.76 - 31.95	22,516	http://www.statoil.com
Stone Energy	SGY	820.81M	54.87M	14.76	12.07 - 50.00	384	http://www.stoneenergy.com
Superior Energy Services Inc.	SPN	3.43B	149.78M	22.88	16.70 - 37.05	14,300	http://www.superiorenergy.com
Talisman Energy	TLM	7.91B	1.03B	7.68	3.46 - 11.22	2,718	http://www.talisman-energy.com
TransCanada Corp.	TRP	30.69B	709.00M	42.60	41.51 - 58.40	6,059	http://www.transcanada.com
Triangle Petroleum Corp.	TPLM	409.10M	76.61M	5.07	3.10 - 12.48	332	http://www.trianglepetroleum.com
Unit Corp.	UNT	1.42B	49.82M	27.96	24.76 - 70.36	1,880	http://www.unitcorp.com
US Energy Corp.	USEG	30.66M	28.39M	1.12	1.05 - 5.01	15	http://www.usnrg.com
Vanguard Natural Resources	VNR	1.19B	83.87M	13.89	11.90 - 33.04	260	http://www.vnrllc.com
Weatherford International LTD	WFT	10.00B	774.28M	12.70	9.40 - 24.88	56,000	http://www.weatherford.com
Whiting Petroleum Co.	WLL	5.48B	167.04M	32.05	24.13 - 92.92	1,282	http://www.whiting.com
Williams Companies	WMB	37.62B	747.90M	50.05	39.31 - 59.77	6,742	http://www.williams.com
WorleyParsons	WOR.AX	2.29B	247.26M	9.34	8.52 - 18.97	35,600	http://www.worleyparsons.com

CAPTURING AND SEQUESTERING CARBON COULD BE A WIN-WIN FOR NORTH DAKOTA

By Dan Sharp for Bakken Breakout



Image courtesy of SaskPower

Just north of the international border, SaskPower's 110-megawatt Boundary Dam Power Plant will pipe captured carbon dioxide to a mature oil field for enhanced oil recovery.

“We live and work in a carbon-based economy, and coal is the cheapest form of carbon. So, it is in our best interest to find ways of continuing to use our massive coal resources.” Michael L. Jones, Ph.D., is vice president of research and development for the Bismarck-based Lignite Energy Council (LEC). With more than 40 years of experience in energy research, the physicist spends a major part of his work day preserving coal's place as an energy source — particularly in the face of federal action that makes coal's use more tenuous.

Carbon regulation a threat to state economy

Few state economies are as entwined with the carbon atom as North Dakota's. According to the U.S. Energy Information Administration (EIA), North Dakota pumps about 36 million barrels of oil each month into the national economy, ranking second behind Texas. The surge in oil production has led to increased natural gas volumes as well — the state now markets some 38 billion cubic feet of gas monthly, good for 10th place. With some of the most extensive coal (lignite) reserves in the nation, North Dakota's monthly production averages 2.5 million tons, 10th among coal-

producing states. These data are all the more poignant when one considers the state ranks 47th in population — only Alaska, Vermont and Wyoming have fewer people.

With production statistics like those it is understandable why the federal government's growing regulation of carbon dioxide (CO₂) causes angst among state policy-makers and energy industry officials. Carbon dioxide regulation is particularly threatening to the coal industry — to the extent that it is now nearly impossible to permit and build a new coal-fired power plant in the United States without some measure of

carbon dioxide capture and sequestration.

On January 2, 2011, by virtue of its authority under the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) began regulating CO₂ emissions from “mobile and stationary sources.” Federal incursion into the CO₂ issue goes back to the late 1990s when environmental groups began pressuring EPA to regulate CO₂ (and other greenhouse gases) because of their contended threat to human health, especially as it applies to global climate change. A 2006 Supreme Court decision affirmed that contention thereby putting

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CO2 regulation on the front burner, so to speak.

Manufacturers of most vehicles are required to meet annual standards that reduce CO2 emissions. The (mobile) standards are prescribed by EPA and get increasingly stringent on a year-to-year basis. They achieve reduction in CO2 and other greenhouse gases through improvements in fuel efficiency.

Opportunities through emerging technology

According to LEC's Jones, how the CO2 provisions of the Clean Air Act apply to existing power plants is unknown. "Our problem is we don't know the rules yet," he says. "And until we know what CO2 requirements we face with existing power plants, it is nearly impossible for operators to plan long-term and commit large sums for capital improvements and other investments."

Jones says in lieu of facility-specific rules, CO2 regulation will likely be carried out on a state-wide basis. "On June 2, 2014, EPA released its proposed standards for reducing carbon dioxide at existing plants," he says. "The proposed rules would establish different emissions targets for each state based on a number of criteria. The proposed rules would set emission limits on a per-megawatt hour basis."

He says states will be given a target CO2 emission rate and allowed the flexibility to achieve that rate based on their individual circumstances. "EPA has set an emissions reduction target year of 2030 to be achieved using four 'building blocks,'" he continues. "They include: 1) Enhanced plant efficiency, 2) Increased use of combined-cycle natural gas generation, 3) Improved efficiency by consumers, 4) Increased use of nuclear generation as well as renewables, such as

wind and solar."

While CO2 rulemaking for existing plants is still up in the air, the rules for new power plants are pretty clear. "New coal-fired units will be limited to 1,100 pounds of CO2 per megawatt hour generated," he says. "That level corresponds to the emissions of a combined-cycle natural gas power plant. Our lignite-fired plants emit about 2,300 pounds per megawatt hour. So, it is obvious new units will require some form of carbon capture and sequestration."

In early 2014, the Massachusetts Institute of Technology reported that 24 large-scale carbon capture and sequestration projects worldwide are in either the planning or construction stage. Seven are in the United States and Canada including the 110-megawatt Boundary Dam Power Station, located at Estevan, Sask., — just a stone's throw north of Noonan, N.D. About 90 percent of the carbon dioxide captured will be piped 40 miles and used in enhanced oil recovery in the Weyburn oil field. The remainder will be pumped into and sequestered in a 10,000-foot-deep sandstone unit.

The carbon capture and sequestration technology that excites Jones is called the Allam Cycle, developed by North Carolina-based Net Power. "This process uses natural gas at high temperature and pressure to generate electricity," he explains. "The generation process also allows for the easy capture of carbon dioxide (and other gases), which can then be used in enhanced oil recovery."

Jones says North Dakota lignite is particularly suited for the Allam Cycle application. "Lignite changes to synthetic natural gas very quickly because it is highly reactive. So, it might be a substitute for natural gas as the fuel

Carbon Sequestration Options

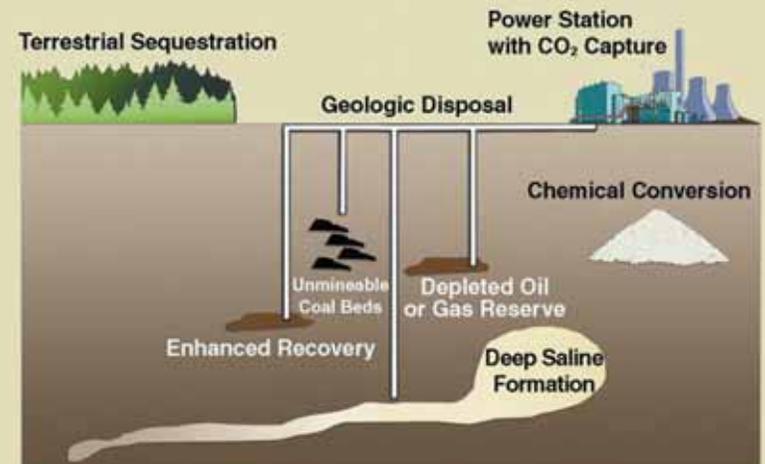


Image courtesy of Center for Environment, Commerce & Energy

How it works. Carbon dioxide captured at a power plant is injected into geologic formations where, in some cases, it will force out additional oil resources. The carbon dioxide remains in place — sequestered.



Image courtesy of UND Energy & Environmental Research Center

EERC chemist Alexander Azenkeng prepares Bakken core samples for analysis using a scanning electron microscope.

“The ideal geologic unit for sequestration would be one with high porosity, high permeability and overlain by an impervious cap rock to keep the CO2 in place. The Bakken doesn’t fit that description at all. But, keep in mind, the Bakken is where the oil is — and lots of it.”



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input. Our proximity to Williston Basin oil plays could make the captured CO₂ emissions a marketable commodity.”

Jones says Net Power, in conjunction with Toshiba, Exelon and Chicago Bridge & Iron, are planning a 25-megawatt demonstration project in Texas that will use natural gas and the Allam Cycle technology to capture CO₂. He says that successful project will be the precursor for one that uses synthetic gas from lignite.

“I hope the demonstration project is operational by 2020. If so, we could see a similar project using lignite by 2025.”

An enormous economic prize

The U.S. Department of Energy (DOE) estimates that at least 84 billion barrels of additional oil could be extracted in the United States using enhanced oil recovery methods. That is equal to about 13 times current Bakken reserve projections. The Energy and Environmental Research Center (EERC) at the University of North Dakota has been working on carbon dioxide capture and sequestration technology since 2003. EERC has subsequently embarked on research to determine how carbon sequestration might help eke out more oil from tight shale formations.

“EERC’s involvement with carbon sequestration began as a DOE-sponsored study to identify what rules, societal initiatives, and technology development are needed to reduce our carbon intensity,” says John Harju, EERC associate director of research. “According to DOE’s research blueprint, we led a team made up of state agencies, energy and energy service companies, the North Dakota Lignite and Oil and Gas Research Councils, and other non-profit enterprises to identify where the emission sources are and where the geologic units are where emissions might be sequestered — those units are called ‘sinks.’”

Harju says four initial, small-scale carbon sequestration projects were undertaken between 2005 and 2008. One project investigated the potential to use coal seams for CO₂ storage because the carbon dioxide “fixed” well to coal’s carbon molecules. However, the coal seams were found to have low

permeability, meaning they would not easily permit the injection of CO₂.

“The ideal geologic unit for sequestration would be one with high porosity, high permeability and overlain by an impervious cap rock to keep the CO₂ in place,” Harju continues. “The Bakken doesn’t fit that description at all. But, keep in mind, the Bakken is where the oil is — and lots of it. The Bakken has several hundred billion barrels of oil in place and a current recovery factor of just 3-6 percent. Every percentage point of increase through enhanced recovery methods means billions of barrels of additional oil.”

According to Harju, the Bakken in North Dakota is typically an “oil-wet” formation, meaning that the use of water for enhanced oil recovery will not likely be as effective as other flooding mediums such as CO₂. “We’ve had phenomenal recovery in the lab exposing Bakken shale samples to high-temperature, high-pressure CO₂ — yields are stunning.” He says that preliminary on-site tests by others have not yet shown commercial success, but they have been instructive and are helping understand the technological hurdles ahead.

More than a dozen years of study and research has led Harju and colleagues to an upcoming Bakken sequestration pilot project, albeit on a larger scale. “We plan to start investigating this summer how we engineer enhanced oil recovery in the Bakken that will ultimately leave the CO₂ sequestered,” Harju says. “We will work closely with Marathon, Continental Resources, Hess, Baker Hughes, CMG, XTO, Kinder Morgan and Schlumberger along with state agencies and industry associations to study the injection dynamics and modeling. We have not yet decided whether to use an existing well or one newly drilled. We believe the research will eventually result in the commercial use of carbon dioxide for enhanced oil recovery. At that point, the logical sources for CO₂ will have to be new lignite electrical generation plants. The economic prize here is enormous,” he says. “We’re looking at billions of barrels of incremental oil and the sequestration of billions of tons of carbon dioxide.” ■



Image courtesy of UND Energy & Environmental Research Center

This summer, EERC will begin field investigation of using carbon dioxide to enhance oil recovery from the Bakken. EERC geologist Kurt Eylands examines analytical core data on Bakken samples.



“We’ve had phenomenal recovery in the lab exposing Bakken shale samples to high-temperature, high-pressure CO₂ — yields are stunning.”

John Harju, associate director of research, Energy and Environmental Research Center.



“... Until we know what CO₂ requirements we face with existing power plants, it is nearly impossible for operators to plan long-term and commit large sums for capital improvements and other investments.” — *Michael L. Jones, Ph.D., vice president of research and development, Lignite Energy Council.*



Associated Press

A northbound oil train sits idled on tracks, stopped by protesters blocking the track ahead, in Everett, Wash., on Sept. 2, 2014.

By Patricia Stockdill for Bakken Breakout

When it comes to the public, the topic of oil by rail knows no governmental boundaries: It's a heated issue and it doesn't matter if it's in Canada or the United States.

It's emotional because it involves human health and safety. A 2013 Lac-Mégantic, Quebec, train derailment with the loss of 47 lives rocked people in both countries as they watched the devastation.

The controversy of oil by rail hit even closer to North Dakota shortly afterwards when a grain car jumped the tracks near Casselton, N.D., hitting a parked oil train

and creating a fireball that made national news.

After that, it was a train derailment spilling oil into a West Virginia river. More recently, an oil train derailed in northern Ontario in March 2015.

Concerns about oil by rail, especially oil

tankers hauling light, sweet Bakken crude, continue escalating across the two countries' borders.

It's controversial because it involves a fossil fuel — a contentious issue in itself. When combining testy, complex environmental issues with human health and safety concerns the topic of oil by

rail heightens to even greater levels across the 49th Parallel of the United States and Canadian border.

Both countries are re-evaluating their safety standards for hauling crude oil by rail.

In July 2014, Transport Canada, the federal agency tasked with regulating the transportation industry in Canada, published final rules to build flammable liquid tank cars to higher standards, which includes thicker steel in tanks, half head shields to prevent end-to-end puncturing and top fitting protection. However, the Canadian Transportation

Concerns about oil by rail, especially oil tankers hauling light, sweet Bakken crude, continue escalating across the two countries' borders.



Associated Press

Railroad oil tanker cars are parked along Interstate 787 in downtown Albany, N.Y., on Feb. 7, 2014.

Safety Board (TSB) recommended additional, more stringent standards for transporting all flammable liquids.

Transport Canada then announced proposed tougher oil tank car standard in March 2015.

The U.S. and Canada are working together through Transport Canada, the U.S. Pipeline and Hazardous Material Safety Administration and the Federal Railroad Administration for stricter standards across North America.

Following the TSB recommendations, Transport Canada proposed additional standards requiring tank cars hauling flammable liquids to be jacketed, thermally protected with thicker steel, full head shields, top fitting protection and new bottom outlet valves. If finalized, the regulations would require

crude oil, ethanol and all other flammable liquids tankers to meet requirements by May 1, 2025, according to the Transport Canada website.

The website also said Transport Canada is considering braking requirements into certain operating rules and is in discussion with the U.S. to attain “harmonized Canada/U.S. braking requirements.”

While the derailments prompted both countries to re-assess their regulations, David Thomson, Engineered Rail Solutions president in McHenry, Ill., said the key is looking back at what caused the derailments, the history of regulations and the oil itself that dominates much of today’s oil by rail — Bakken crude.

Thomson’s company, while based in the

U.S., engineers rail systems in the U.S. and Canada. In looking at the historical railroad transportation of crude oil, regulations in both countries date back to the World War II era when heavy crude dominated in the industry, Thomson described. Both countries require testing and labeling of any hazardous material, as well as tanker car, engine, and track inspections. “That’s an industry standard,” he added.

Transporting crude oil in Canada was regulated long before the transportation of other commodities, “because of the nature of the commodity,” said James Baker, J.P. Baker Management, Inc., president, Regina, Saskatchewan.

Each physical tanker inspection at the originating terminal includes brakes, symbols identifying what the car is hauling, valves, wheels, etc. “Everything

In looking at the historical railroad transportation of crude oil, regulations in both countries date back to the World War II era when heavy crude dominated in the industry.



Associated Press

Railroad oil tanker cars are parked next to a storage facility near the Port of Albany on Feb. 7, 2014, in Albany, N.Y.

on that tanker," Thomson continued. Locomotives are inspected every 90 days and preventative maintenance is done based on the car owner's standards.

Railroad tracks are inspected visually daily. "They (track inspectors) actually ride and look at every inch of rail," Thomson described. More crude oil on tracks puts more demand on the tracks

and increased need for track inspections.

It may take 5 to 10 years to develop the advanced skills and experience to learn how to inspect tracks, Thomson said. "You get that by experience by working your way up through the seniority system at the railroads. New employees begin by being trained by fellow employees and all railroads have now instituted very

comprehensive training programs. As the employee's seniority increases, so do the jobs and experience they gain. From this trained pool, track inspectors are assigned."

Despite current regulations and self-imposed industry standards, "the industry has expressed that collectively they need to focus resources – and they have to a

major extent – on doing a better job when hauling crude," Thomson said, including additional inspections and mechanical maintenance. In addition to regulatory authorities in both countries, "the industry is actively working internally."

For example, CORE, Crude Oil on Rail Enterprises, founded in Canada and in the process of expanding to the U.S. is a

Despite current regulations and self-imposed industry standards, "the industry has expressed that collectively they need to focus resources – and they have to a major extent – on doing a better job when hauling crude."



Associated Press

A long line of rail cars containing oil sit on tracks south of Seattle on Sept. 16, 2014.

railroad industry organization focusing on testing, inspection, verification and environmental, consulting service, logistics and engineering and construction. A mid-April CORE conference included sessions relating to new regulations, driving safety, and loading and unloading best practices.

largest oil producing province, Baker described, followed by Saskatchewan. With the Bakken Play stretching into southeastern Saskatchewan, Baker said the province now produces about 450,000 barrels per day (BPD), a mix of medium-heavy crude from western Saskatchewan and medium-light crude from southeastern Saskatchewan — its

Saskatchewan," he said. For example, Enbridge and the TransCanada pipelines have been in place for decades.

Baker estimates about 10 to 15 percent of Saskatchewan crude oil moves by rail compared to more than 60 percent of North Dakota's crude moved by rail.

Transporting oil by rail evolved because of pipeline constraints in both the U.S. and Canada, Baker explained, as the Bakken Play unleashed crude in North Dakota, Montana and southeastern Saskatchewan.

Saskatchewan's Bakken oil play has experienced exponential production growth similar to North Dakota's Bakken play, Baker said. "If you can't move it by pipeline, you move it by rail," he said. Trucking is the least palatable means of long-hauling crude and is reserved for transportation from the well site to the pipeline or rail facility.

Currently TransCanada Pipeline Limited is evaluating the potential of re-purposing an existing natural gas pipeline from western Canada to eastern Canada to

move additional crude oil to refineries in Ontario and Quebec to help meet Canada's area of highest market demand, Baker said.

The industry continues efforts to beef up pipeline capacity and construction in North Dakota, but it lags behind Canada's abilities to move its oil via pipeline. That means in North Dakota, rail transportation continues playing a major role in moving Bakken crude to refineries in the U.S. and Canada.

The four derailments over the past two years prompted regulatory authorities in both countries to re-assess and update regulations, working with the public and industry alike to address concerns. Baker said he was "comfortable" with Canada's current regulations regarding crude oil transportation, but he added that it's imperative for governments in both countries to work with both local and federal governments and the railroad industry as they evaluate regulations. "I think that oil by rail regulatory enforcement really needs to be the main factor," he advised. "If you don't have a strong enforcement team ... it's not

The industry continues efforts to beef up pipeline capacity and construction in North Dakota, but it lags behind Canada's abilities to move its oil via pipeline.

Historically most crude railed in Canada was like that in the U.S. — heavy crude. Today's volume, especially in the U.S., is largely light, sweet crude oil driven by the Bakken's productivity. Chemically, light, sweet crude oil isn't identical to heavy crude. There are various studies that don't agree on the volatility of Bakken crude oil, Thomson said.

Alberta has longstanding been Canada's

portion of the Bakken.

Until the recent boom in hydraulic fracturing, both Alberta and Saskatchewan's oil production historically outpaced North Dakota's oil productivity, Baker continued, and the task of getting the oil from the wellhead to market has been in place for years in Canada. "There is a fairly mature pipeline (system) infrastructure in place in



James Baker, Regina, Saskatchewan, is the head of J.P. Baker Management, Inc., a management consulting business specializing in business development in oil and gas related initiatives.

going to work.”

Both countries already have in place stringent regulations regarding issues such as construction and operation of loading facilities, for example, Baker said. In the U.S., it's NEPA, the National Environmental Policy Act. Similar requirements are in place in Canada.



David Thomson is president of Engineered Rail Solutions, a company that deals with transportation logistics.

It comes down to finding the proper balance to address safety and environmental concerns, while meeting the needs of the North American economy. Moving crude oil is a rigorous process, Baker concluded. “It really centers on enforcement. It'll make it better but it doesn't take away all of the inherent risk.” ■

OIL BY RAIL, SOUTHEASTERN SASKATCHEWAN AND BEYOND

One of the topics during the 2015 Williston Basin Petroleum Conference in Regina, Saskatchewan, Canada features “Oil by Rail, Southeastern Saskatchewan and Beyond.” Presenters feature James Baker, J.P. Baker Management, Inc., Regina, and David Thomson, Engineered Rail Solutions president, McHenry, Ill. They will speak April 29 at the

conference, which is held at Evraz Place in Regina.

Baker is an energy consultant currently serving on the SaskEnergy and Keystone Royalty Corporation's Board of Directors. Thomson founded Engineered Rail Solutions, whose company designed the Northgate Commodities Logistics Centre, Northgate, Saskatchewan.

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CRUDE EXPORTS: AND THE BAN PLAYED ON...

By Jason Spiess for Bakken Breakout

The modern day shale play has sparked many changes within the global economy and culture. Energy executive and experts continue to summarize the scale of this paradigm shift in a way that is virtually large enough to send ripples through every industry on the planet. Ripples strong enough to create new issues, questions and industries within industries.

The hot energy topic for 2015 is in exporting crude oil, according to Dr. Daniel Yergin, vice chairman, IHS. Yergin believes this topic is more about history than anything else.

"Last year the issue was natural gas exports, 2015 will be crude oil exports," Yergin said when presenting

the finding of their May 2014 study, U.S. Crude Oil Export Decision: Assessing the Impact of the Export Ban and Free Trade on the U.S. Economy. "We are really talking about history here. Because we are talking about an artifact of history that is still in place."

For decades exporting crude was not an issue because the U.S. was importing about 60 percent of its oil. The recent sharp increase in U.S. oil production has the export ban in the spotlight once again. Only this time momentum is leaning towards lifting the ban and participating in the global free market.

"It's an archaic ban from another era. An era that is long gone," Yergin concluded about the report's findings.

According to the IHS study, U.S. oil supply has increased by 66 percent since 2008, and a majority of that growth is in light oil from shale rock. This has created an imbalance in the United States energy logistics because major investments were made to reconfigure heavy crudes.

Kelly Wilkins, senior vice president of business development, Bridger Company, understands the ban, but doesn't necessarily agree with the logic. Especially when he sees what is going on in the global marketplace.

"Currently the United States prohibits crude oil so those markets are not accessible. India for example, it's not a commonly known fact that India put on a refinery three years ago that makes

over a million-barrels-a-day, refines over a million-barrels-a-day. So they're going to have feed that," Wilkins said.

Looking at the production trends of American energy, Wilkins questions whether or not that refinery could have been built in the U.S.

"You can make the case that that refinery could have been built in the United States, where the markets are. We do receive in the United States gasoline from that refinery in India because its a global market," Wilkins said. "There's a lot of people in Asia and more and more people in China are buying bigger cars so you are going to have a huge demand there. How do you feed it?"



Associated Press

A horse grazes in an icy field with pump jacks nearby, near the oil boom city of Williston on Dec. 14, 2014.



Associated Press

Storage tanks stand in a PDVSA state-run oil company crude oil complex near El Tigre, a town located within Venezuela's Hugo Chavez oil belt, formally known as the Orinoco Belt. U.S. petroleum exports to Venezuela, much of it fuel additives to dilute the country's heavy crude, have grown 12-fold in the past decade as domestic refineries go unmaintained.

William Gilliam, CEO and president, Badlands NGL, agrees with Wilkins' refinery thinking when talking big picture of importing and exporting energy resources. Gilliam believes the U.S. needs to get serious about exporting or build a state-of-the-art "cracking refinery." "You know some folks earlier expressing concern about domestic crude prices is right now and people are saying, 'Why is this happening?'" Gilliam said. "It is an interesting thing. Look at the amount of crude oil producing in the United States today versus 10 years ago, yet we have exactly the same number of refineries. And we have a law against exporting crude. If we don't have some solutions for more refineries and the ability to exports, no matter how will we do with production, technology, this that the other thing, I fear that you know we could start seeing a real ceiling on crude prices in this country, and it's a very artificial ceiling."

Even as the oil prices drop, energy production continues and refineries will need that product. Wilkins said there is enough of a supply and demand to lift a ban on crude oil exports, but the conversation tends to get lost in the halls of Washington.

"The crude oil is up for debate. It's got to get approved," Wilkins said. "Hopefully it'll curve in the next ten years regardless of the political party. It's just a perspective, and that's the biggest

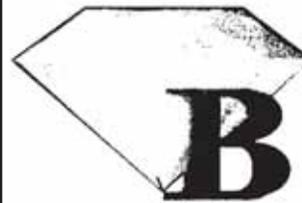
challenge. It's not a Republican or Democrat issue."

Like many other in the energy industry, Wilkins sees the modern energy scene as a global game changer and people need to embrace the change, or at least have an open mind.

"We live in a country where people are intimately involved developing resources, creating goods and services, and then there are people who are not engaged in that that and see a different perspective," Wilkins said. "So I think it is incumbent on us to show everybody much the world has changed then come to a common understanding then consensus easy at that point."

Karen Alderman Harbert, president and chief executive officer of the U.S. Chamber of Commerce's Institute for 21st Century Energy (Institute), sees the crude oil ban as more of an emotional ban whereas logic should be paving the way. On one hand there is the emotion of the environment.

"I think we have rounded the bend on natural gas and I think there's general acceptance of it, but there are certainly there are outliers. If you are somebody that does not believe in fossil fuels at all, you don't care if it's imported exported, you just don't want it used. So you're against it," Harbert said.



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**AP file photo**

A drilling rig is seen near Kennedy, Texas, on May 9, 2012. A growing push to allow oil companies to export some of the crude oil that is being produced in greater volumes domestically is sparking debate as 2014 nears. The ban on exports stems from a 1975 law passed after the nation suffered crippling shortages of oil and gas.

Then there was the generation who grew up standing in lines for gas stamps and hearing about Peak Oil.

"You know oil is going to be a little more emotional we've been brought up in a time scarcity, vulnerability. So it's going to take people a little longer to understand not because we don't want it here it's because we can't use it here," Harbert said. "We've got to be able to max our capacity our refining capacity to the type of oil it is attuned to. It's not going to be one and done, but the practical side of the American people I think will finally embrace it. As long as they understand this is international interest given what's happening in the Middle East and with Russia I think they're going to understand we would like to be in an energy superpower

status."

The IHS study concluded lifting the crude oil ban would increase the daily production supply in the United States by 1.2 million barrels a day. With enhanced oil recovery it increases another 2.3 million barrels a day. Furthermore, the study claims exporting crude oil would significantly improve the petroleum trade with an average annual savings of \$67 billion with a potential of \$93 billion.

The main driver behind those theoretical numbers is keeping the oil U.S. refineries can handle, while shipping everything else to the global marketplace.

The IHS study also projected energy security. Their claim is exporting crude oil to Europe would allow Europe to

replace Africa and Russia imports, while exporting to the Asian market would significantly reduce Middle East production. The United States would still import some oil, but the volume of production and exports would ultimately solidify the dollar once again as the global currency.

Robert Bryce has been a guest correspondent to discuss the importing and exporting topic on a number of media outlets including Al Jazeera, BBC, CNN, Fox, Fox Business, MSNBC, NPR and PBS. Bryce is an author, senior fellow for the Manhattan Institute and resident of Austin, Texas.

"My stance when it comes to importing and exporting is the market will find the best levels with all of that," Bryce said.

"We live in a country where people are intimately involved developing resources, creating goods and services, and then there are people who are not engaged in that that and see a different perspective."

**AP file photo**

General view of a meeting of oil ministers of the Organization of the Petroleum Exporting countries, OPEC, at their headquarters in Vienna, Austria, on Dec. 4, 2013. At that time, the OPEC ministers were meeting to decide on the cartel's oil output against a backdrop of slowing crude demand and unrest in member nation Libya.

"It's funny, a few years ago, six or eight years ago, energy independence, this was the big cry. We need more corn ethanol, we can't depend on the Saudis, all these other things. And look what's happened. Remarkably, due to market forces - market forces not government edict - but entrepreneurs and people operating in North Dakota and Texas and elsewhere said we can drill for shale and produce oil and gas and make money at it. So no government intervention here to speak of."

Bryce believes the overall energy policy is so outdated and misguided the lawmakers are more-or-less working against the industry.

"In fact, in many cases under the Obama administration active government hostility, and yet what's happened? Oil production is up by more

than 30 percent just in the last few years now. Natural gas the same. It is just an unbelievable turn of events," Bryce said.

In the end, Bryce believes lifting the crude oil ban would be the next logical step in revoking a 40-year-old ban against oil industry.

"When it comes to the issue of importing and exporting, the U.S. is already exporting roughly four million barrels per day of refined products. We are one of the biggest oil exporters in the world. Do we still import a lot? Sure we do. But we import and export a lot of things," Bryce said. "We are a country, in theory, that is based on free markets and free people, why would we want to be independent of the world's biggest market? The energy market. We need to be interdependent in the marketplace not independent." ■

**Associated Press**

Sen. John Hoeven, R-N.D. talks to reporters on Capitol Hill in Washington on Jan. 26. Never mind dropping oil prices. U.S. producers are pushing harder than ever for the right to sell U.S. crude oil overseas. It might seem counterintuitive: Oil prices are as low as they have been at any point since 2009 and the height of the Great Recession. Depending on the projection, prices could drop further still with slowing economies across the world. Oil producers are playing a longer game, betting that long-term demand remains strong and new markets offer lucrative rewards for U.S. producers.

ENERGY'S MODERN DAY LEWIS AND CLARK

By Jason Spiess for Bakken Breakout

It is hard to believe there are still parts of this world uncharted in almost any direction. From the early days of river boats to today's unmanned aerial vehicles, earth's landscape and its natural resources have been pretty well documented. Or have they?

A team of scientists, engineers and intellects at the Energy and Environment Research Center (EERC) in Grand Forks are embarking on a new journey that could potentially identify new oil reservoirs termed "residual oil zones," or ROZs. According to the mission of the study, their end goal is threefold — creating new oil

probability maps, quantifying the amount of oil in the identified zones and calculating, explained below, the amount of CO₂ that could be needed to extract that oil.

So what exactly is a residual oil zone?

"A residual oil zone is a stratigraphic interval where there was oil in place at one time but it has been swept," Matthew Burton-Kelly, Research Scientist, EERC, said "Down in Texas they call it 'Mother Nature's water flood.' So if there was a natural structural trap full of oil, and then had groundwater flow through that, it's essentially equivalent to what we call

'water flood' or 'secondary recovery,'" a process that oil operators use after initial production declines.

Burton-Kelly added this process leaves a lower oil saturation in the rocks.

"If you drill into an ROZ, you're going to get 20-40 percent oil saturation, which isn't going to produce," Burton-Kelly said. "But with potentially other methods you could produce the oil out of it."

Charles Gorecki, Senior Research Manager, EERC, said that generally speaking, a conventional (think non-Bakken) field would have 70-80

percent oil saturation when you discover it, whereas the residual fields would equate to about half of that.

"If you were to try and produce fluid there you would only produce water even though there is a lot of oil there," Gorecki said.

Conventional vs unconventional
Conventional oil fields represent oil accumulations that are stuck in one small area — but were generated elsewhere.

"Oil will not be generated in that rock. It will be generated someplace else and will migrate into it. So it will generate,



TOM STROMME, Tribune

A pair of pumpjacks in front of the Emmanuel Lutheran Church in rural Bottineau County churn oil to the surface in March 2014. The northern area of the state just west of the Turtle Mountains has produced oil for more than 40 years but new wells have been drilled in the past few years.

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Associated Press

Four oil wells are seen in various stages of production, from drilling to a fully functional pump producing well, in McKenzie County, N.D., in June 2014.

migrate and collect," Gorecki said. "The Bakken is a prime example of where oil is made in the ground. Oil is generated in the Bakken and through little cracks and pores in the rock it moved out of the Bakken into (for example) the Madison formation and it collects in structural traps. They will charge to about 80 percent of the rock space will be filled with oil and the rest of the space will be filled with water."

Gorecki added that a structural trap can be thought of as an inverted bowl — the oil floats up into the bowl and can't escape, and below the oil is water. John Harju, Associate Director for Research, EERC, continued in more detail.

"What you have are structural highs in the porous rock where hydrocarbons have accumulated," Harju said. "What they coincide with is some sort of fold in the rocks, an anticline. The anticline has created a place where those hydrocarbons that are migrating across an otherwise fairly flat stretch get

trapped."

"When we go to conventionally produce it, we would drill a well or a bunch of wells and they will produce oil. This is the historical production in North Dakota since the '50s," Gorecki said. "They will produce that for a number of years until the pressure falls off. Then they will inject water to keep that pressure up."

This method allows oil companies to continue production in plays like the Madison for decades.

"They still continue to produce out of the Madison formation in North Dakota today," Gorecki said. "Quite a bit of oil, but nothing like the Bakken."

Then, there is the unconventional field. Gorecki said the Bakken would be considered unconventional because the oil hasn't moved before being extracted.

"It is much different. Instead of having these traps, which are oil fields, the

Bakken makes oil, and we can pull that oil out directly" Gorecki said. "So it is essentially a continuous oil play."

Gorecki said that ROZs can be thought of as any leftover oil that didn't make it all the way from the source rock to a trap.

"The oil is generated in a source rock like the Bakken, it moved to another location. It then gets trapped," Gorecki said.

How do you find an ROZ?

Now that Mother Nature's role in the study has been introduced, Father Time needs to be addressed.

"Through time all kinds of things can happen. An oil trap can get shifted and is no longer a trap and Mother Nature will push the oil out," Gorecki said. "But it can only push out a certain portion of it. Roughly half of that oil can leak out, and the rest gets trapped in kind of a residual state."

Residual oil zones have traditionally been

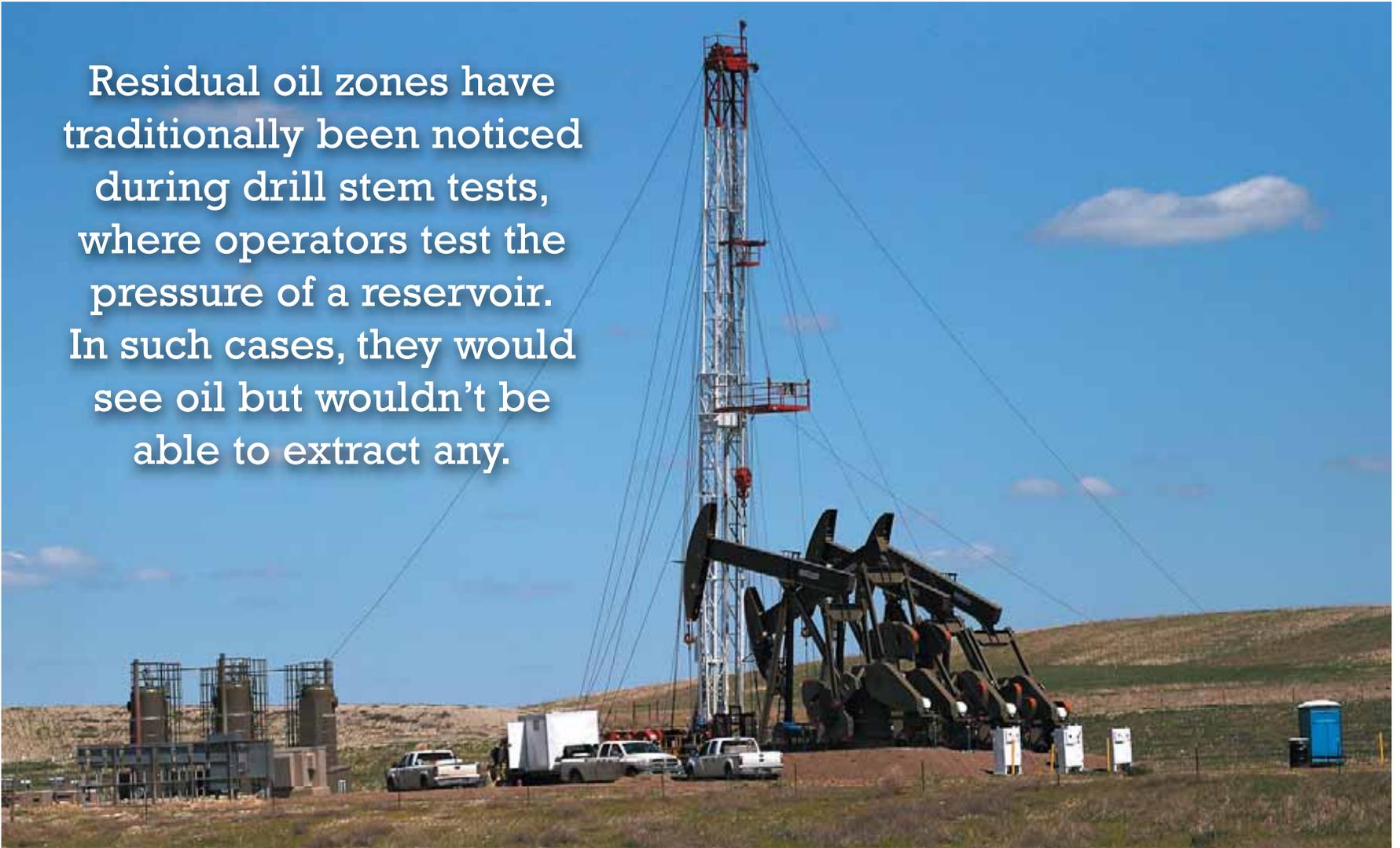
noticed during drill stem tests, where operators test the pressure of a reservoir. In such cases, they would see oil but wouldn't be able to extract any. There are now other ways to find and explore residual oil zones, including a new method by the EERC using computer software to simulate oil generation and migration.

"Because the chemical changes can be mathematically reproduced, we can do the chemistry and figure out how fast this carbon can change into that oil, and what pressure and temperature it is going to take to do that," Burton-Kelly said. "We are essentially modeling the evolution of the Williston Basin and the Powder River Basin."

Burton-Kelly continued explaining what the software and theory will accomplish.

"What the software allows us to do is model the changes that the organic matter goes under to turn into oil and then where it ends up," Burton-Kelly said.

Residual oil zones have traditionally been noticed during drill stem tests, where operators test the pressure of a reservoir. In such cases, they would see oil but wouldn't be able to extract any.



Associated Press

An oil rig and pumps near Watford City in June 2014.

"We are modeling both the generation of hydrocarbons and migration of them either along the same rock horizon or into multiple other horizons."

Gorecki said the next layer to the research is verifying against historical data.

"Modeling is part of it but we are also using historical data to calibrate," Gorecki said. "So I mentioned the drill stem tests and looking at the well logs. We are proposing to log promising wells as calibration tools and as validation that there is an actual residual oil zone."

How do you extract oil from an ROZ?

According to Gorecki, certain well logs can indicate fluid saturation behind the casing. He also added with enhanced oil recovery there could be an additional 10 percent more with residual oil zones, but there will also be some left behind.

"You will still leave some oil behind. We haven't been able to figure out how to get it all out yet for a couple of reasons," Gorecki said. "First, have a hard time sweeping all those area of rock."

Gorecki pointed out that the distance between the wells makes injecting a fluid to move more fluid underground is a difficult task. Oil gets caught "in the corners" between wells.

"The closest wells are 400 yards apart and the far ones are farther out. So it's hard to get all that oil out," Gorecki said. "Unless you put a well everywhere and that would be cost prohibitive."

Currently in West Texas there are residual oil zones producing. Injecting CO₂ is going to be how we use residual oil zones, according to Gorecki.

"There are multiple residual oil zones

with CO₂ currently being injected into them (Permian Basin) and they are producing meaningful volumes of oil," Gorecki said. "At present time there has been speculation of whether there are residual zones in the Williston Basin and Powder River but none of them have been quantified or the size determined."

One main task of the EERC project is to quantify how much CO₂ will be needed to access the oil in newly identified residual oil zones.

"If you had CO₂ or something like CO₂ as an enhanced oil recovery technique, how much oil could you get out of the ground and how much CO₂ do you need?" Gorecki said. "These are the questions we are trying to answer."

Gorecki added that although there is still much research left to do in the Permian Basin in Texas, the process and science

involving residual oil zones and CO₂ could prove to be beneficial in the Williston Basin as well.

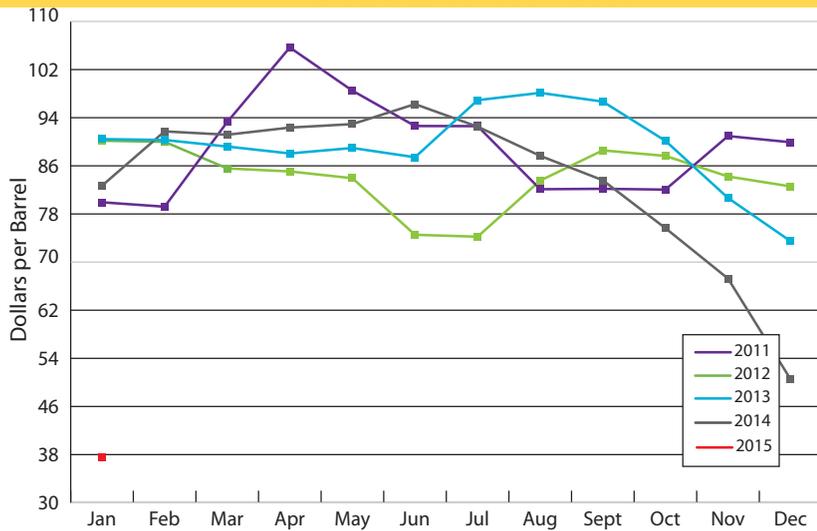
"So at the end of the day we identify and quantify the size of the residual oil zones. Oil Company X could start doing some leasing for those residual oil zones. Essentially it could lead to more plays," Gorecki said.

Harju said that although the study will focus on the potentials of the Williston Basin and the Powder River Basin, and that Bakken data will be used, it really isn't a Bakken study.

"Residual oil zones could significantly increase the amount of oil production in North Dakota and neighboring states. This is not just a Bakken study, it is an industry wide study," Harju said. ■

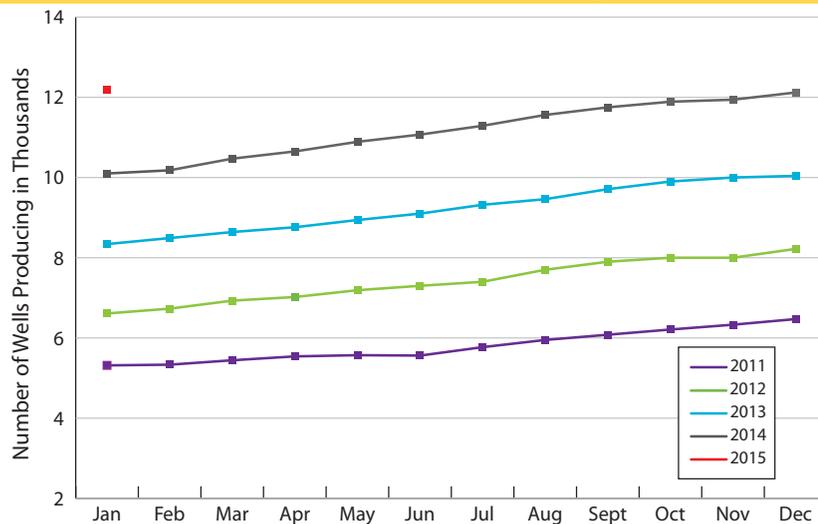
BAKKEN BRIEFS

North Dakota Crude Oil Prices



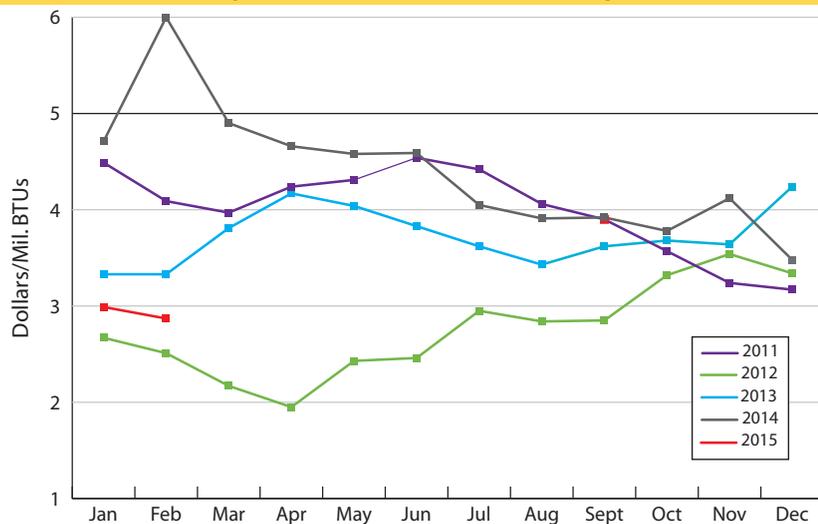
Source: U.S. Energy Information Administration

North Dakota Wells Producing



Source: Industrial Commission of North Dakota, Oil & Gas Division

Henry Hub Gulf Coast Natural Gas Spot Price



Source: U.S. Energy Information Administration

North Dakota loses lowest jobless rate
 BISMARCK (AP) — For the first time in more than six years, North Dakota doesn't have the lowest unemployment rate in the nation, due in part to sliding oil drilling activity spurred by low crude prices.

U.S. Bureau of Labor Statistics data released March 27 show North Dakota's jobless rate in February was 2.9 percent, up from 2.8 percent in January. Nebraska now has the lowest unemployment rate in the nation at 2.7 percent.

"Second place is still a very, very positive position to be in," said Michael Ziesch, a manager for the state's employment agency, Job Service North Dakota in Bismarck. "We still have an incredibly low unemployment rate, but the depressed price of oil has had an influence on us, certainly."

North Dakota is the No. 2 oil producer behind Texas. North Dakota's unprecedented oil bonanza began in 2008, the same year the state grabbed the title of having the lowest jobless rate in the nation, Ziesch said.

N.D. growth top in nation

McKenzie County, in the center of the Bakken boom, was named the nation's fastest growing county in the 10,000-and-under population category and the cities of Williston and Dickinson were named nation's first and second fastest growing micro areas.

The U.S. Census Bureau released the latest population estimates March 26, which show estimated population changes for the year ending July 2014 compared to the year before.

McKenzie County experienced 18.3 percent growth, gaining 1,669 new residents in that period, according to the Census Bureau.

Williston micro area gained 2,567 new residents or 8.7 percent growth, while the Dickinson micro area gained 1,995 new residents, or 7 percent growth.

A micro area is defined as between 10,000 and 50,000 population. Metro areas are larger than 50,000 population.

The report also showed that the Bismarck metro area ranked as 22nd fastest

growing, with 2,604 more residents. The Fargo area gained 4,438 new residents.

Thirty-two of North Dakota's 53 counties experienced growth in the period, according to Kevin Iverson, manager of the North Dakota Census, who said the statewide population has increased by 9.9 percent since the 2010 Census, more than any other state. For the year ending July 2014, the state's population grew 2.2 percent.

As recently as 2007, the North Dakota was still reporting a net out-migration, Iverson said.

— Lauren Donovan

Legality of local landfill controls debated

MANNING — Residents of Dunn County once again packed a meeting room in hopes of asserting local control over special waste landfills for oil and gas waste. However, they learned that giving landowners living alongside proposed special waste landfill sites the ability to approve or disapprove of such projects may not be legal.

The previous week, about 150 residents persuaded the county zoning board to reinstate a rule in which 60 percent of landowners within a half-mile of the landfill would have the up-or-down control.

The zoning board recommended that the Dunn County Commission put the rule back in place, but the process has become mired in opposing legal views on such an action.

With about 90 residents packed into the courthouse meeting room March 18, the commission decided to hold off for at least a month before moving in any direction.

Dunn County will investigate whether approval procedure would hold up in court.
 — Lauren Donovan

Revenue hit expected for state budget

An updated state revenue forecast released March 18 revealed a hit to projected state oil tax revenue and a slight increase from earlier projections in general fund revenue for the next two years.

The March Office of Management and Budget revenue forecast for the 2015-17 biennium showed an \$870 million decrease in oil tax revenues from a legislative

forecast in late January. The group also forecast a \$131 million increase in general fund revenue largely resulting from sales tax compared to January.

Lawmakers packed the Brynhild Haugland Room, some expressing concerns over the accuracy of sales tax projections in light of declining oil prices, reduced drilling activity and fewer people working in the oil patch.

For the 2015-17 biennium, the budget group forecasts that oil and gas tax revenues will be about \$3.4 billion. This is down from the \$4.27 billion forecast in January and \$8.32 billion in December.

A slightly improved picture emerged from general fund collections. The January forecast had adjusted general fund revenues down \$550 million from the \$7.2 billion in general funds as forecast in the governor's executive budget.

March 18's forecast showed the reduction would be about \$419 million. The \$131 million improvement from January largely comes from sales tax revenue.
— Nick Smith

\$1.1B in fast-track funding disbursed
State Treasurer Kelly Schmidt says \$1.1 billion in fast-track funding for highways and communities affected by North Dakota's exploding growth is being distributed.

Schmidt said the funding started going out March 6.

The fast-track legislation includes \$450 million in funding for state highway projects. It includes \$240 million for the 10 biggest oil-producing counties, \$112 million for non-oil-producing counties, \$100 million for cities in oil-producing counties, and \$198 million for other cities outside the oil patch.

Gov. Jack Dalrymple signed the bill last month at a ceremony at the state Capitol.

Dalrymple called the bill "a great legislative accomplishment" that had strong bipartisan support.
— Associated Press

Canada seeks tougher oil tank car standards

TORONTO (AP) — The Canadian government has proposed tough new standards for rail tank cars used to transport crude oil in response to a string of fiery crashes.

The proposal, posted online March 11 by Transport Canada, would require the cars to have outer "jackets," a layer of thermal protection, and thicker steel walls.

The requirements are tougher than the oil industry wanted. But the proposal doesn't

include electronically controlled brakes that automatically stop train cars at the same time instead of sequentially, which are opposed by freight railroads. Regulators said they will take that issue up separately.

Final regulations are expected by mid-May. U.S. officials have been working closely with Canada on the regulations and the White House is reviewing a draft proposal.

Report due on Minn. oil pipeline effects
ST. PAUL, Minn. (AP) — Minnesota officials will learn more this week about the health, economic and environmental effects of pipelines carrying crude oil from North Dakota and Canada through Minnesota.

A recent report prepared by several state agencies shows about 3.3 million barrels of crude oil cross Minnesota every day. About 80 percent of that oil is being transported by pipeline. The rest moves by train.

The Minnesota Legislature enacted new rail safety laws to respond to potential spills, but a new state report says such measures should be extended to pipelines to both prevent spills and respond to any that do happen.

Minnesota saw 80 oil spills over 10,000 gallons from 1960 to 2012.

Poll finds support for tougher flaring rules

A North Dakota poll commissioned by two environmental watchdog groups finds that a majority of residents wants more stringent rules for flaring natural gas from oil wells.

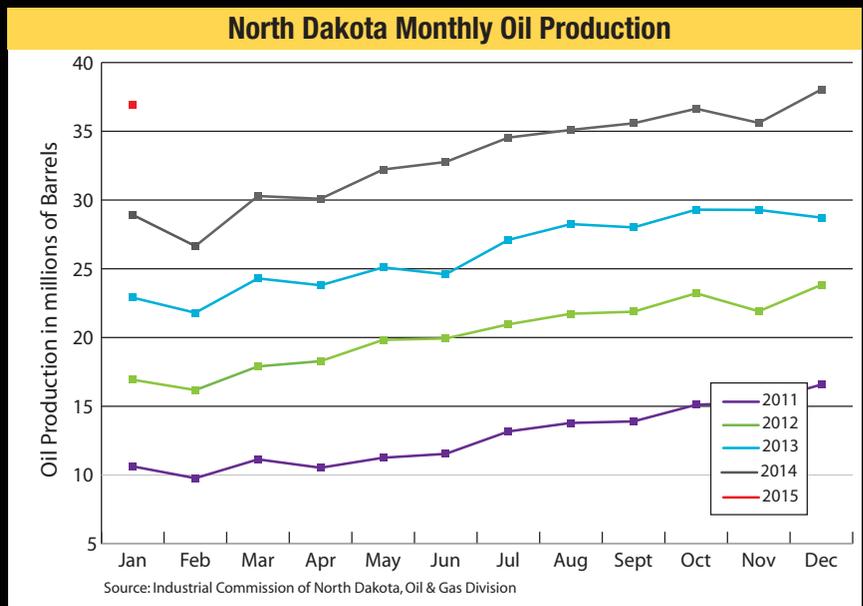
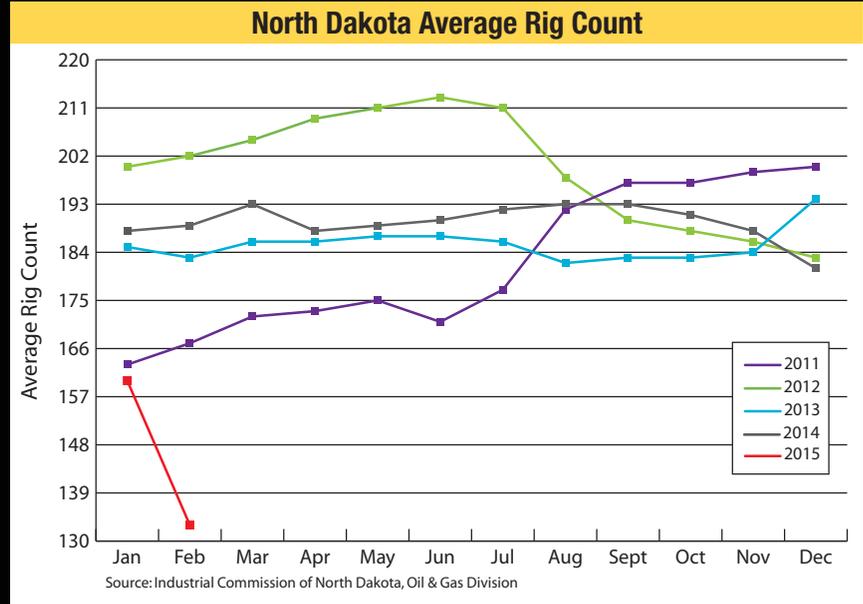
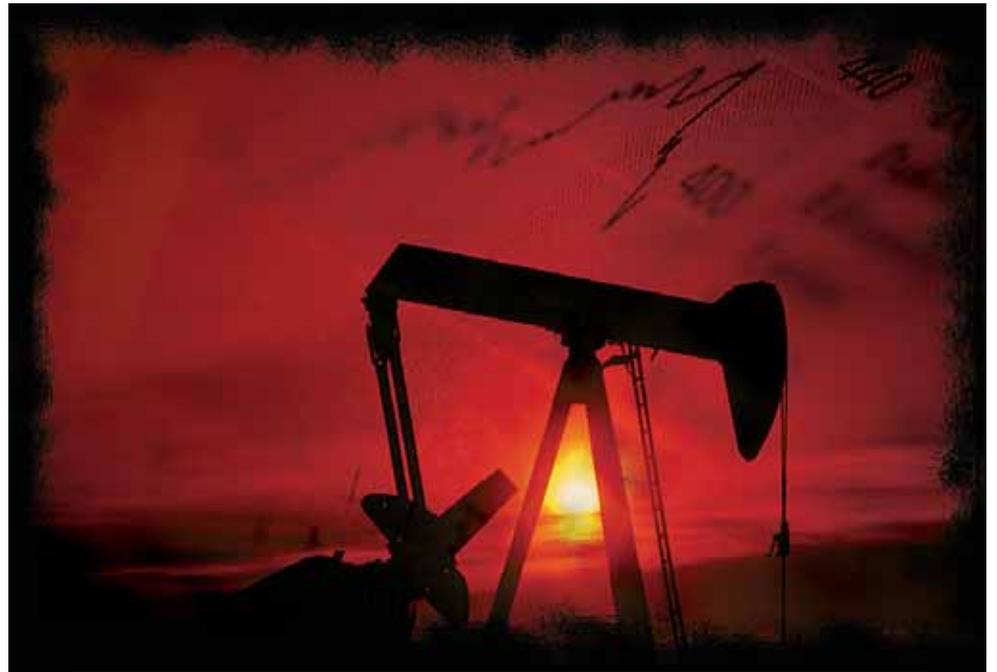
The Dakota Resource Council and the Dacotah Chapter of the Sierra Club hired the Social Science Research Institute at the University of North Dakota to learn how North Dakotans feel about paying mineral owners for flared gas and about rules for how long companies can legally flare their gas.

The poll of 901 residents on cellphones and landlines found that 65 percent think mineral owners should be paid for wasted gas, rather allowing oil companies to obtain exemptions and waivers to continue flaring.

The groups say the poll also found that 58 percent of those polled support withholding drilling permits until companies show plans to capture and market gas.

The Industrial Commission recently moved to change its flaring policy, limiting legal flare time to 90 days instead of one year. The Senate took out the 90 days and the House Energy and Natural Resources Committee was asked to restore the shorter flaring window in committee March 12.

— Lauren Donovan ■



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In the Bakken, Aqua Terra currently operates two salt water disposal facilities in North Dakota and is set to launch two new facilities in S.E. Saskatchewan in the spring of 2015. These new Saskatchewan facilities will be added to the existing 15 facilities Aqua Terra operates throughout North America.

When asked about the company's motto "Partnering with Producers" an Aqua Terra representative stated "We understand the difficult economic climate we are all currently dealing with and we feel that our motto of partnership is more important than ever. We see our role during this trying time is to work with our customers to ensure that their operations are successful and remain economically viable. We are a different type of disposal company and welcome building sustainable relationships with our customers in good times and in bad."

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SHALE PLAY COMPARISON

IS NIOBRARA THE

NEOBAKKEN?

By Dan Sharp for the Tribune

Strike a 500-mile-long line due south from Williston (along the 103rd west meridian), and you'll eventually light in an area that is a near mirror-image of Bakken country. Just a few dozen or so miles east of the Rocky Mountain Front, the prairies of eastern Colorado, western Nebraska and Kansas, and southeastern Wyoming are home to an oil and gas play that has all of the earmarks of the Bakken, including technology, infrastructure and the companies punching holes. The play is called the Niobrara and it is so much like the

Bakken that it's been tagged with the moniker "NeoBakken."

Niobrara geology

The Niobrara is one of North America's most extensive geologic formations. It underlies much of the American Great Plains, Rocky Mountain basins and northward into the Canadian prairies. In fact, if you're standing anywhere in North Dakota west of the Red River Valley, the Niobrara is somewhere under foot. Unlike the Bakken, however, the Niobrara is actually exposed at the surface, primarily in a thin belt from

Cavalier County in the north to Sargent and Dickey Counties in the south. Whisk away the overlying glacial debris here and there, and you can easily see and touch the Niobrara.

The Bakken was more than a quarter billion years old when the Niobrara was deposited between 87 million and 82 million years ago. Geologists call that period the "Cretaceous" (Latin for "chalky"). At that time, North America was split by the Western Interior Seaway, which extended from what is now the Arctic

Ocean to the Caribbean. The seaway endured for some 40 million years and reached depths of 2,500 feet and a width of up to six hundred miles.

In those days, what is now North America was much closer to the Equator, so the Seaway teemed with subtropical marine life ranging from microscopic plants and animals to sharks and mosasaurs (giant marine reptiles). While the eastern region of the Seaway bordering the Appalachians was relatively quiet, the western area received a near-continuous supply of sediments being

The Niobrara is one of North America's most extensive geologic formations. It underlies much of the American Great Plains, Rocky Mountain basins and northward into the Canadian prairies. In fact, if you're standing anywhere in North Dakota west of the Red River Valley, the Niobrara is somewhere under foot.

AP file photo

An oil rig drills a well for QEP Resources Inc., on ranch land a few miles west of Cheyenne, Wyo., on Sept. 30, 2010.

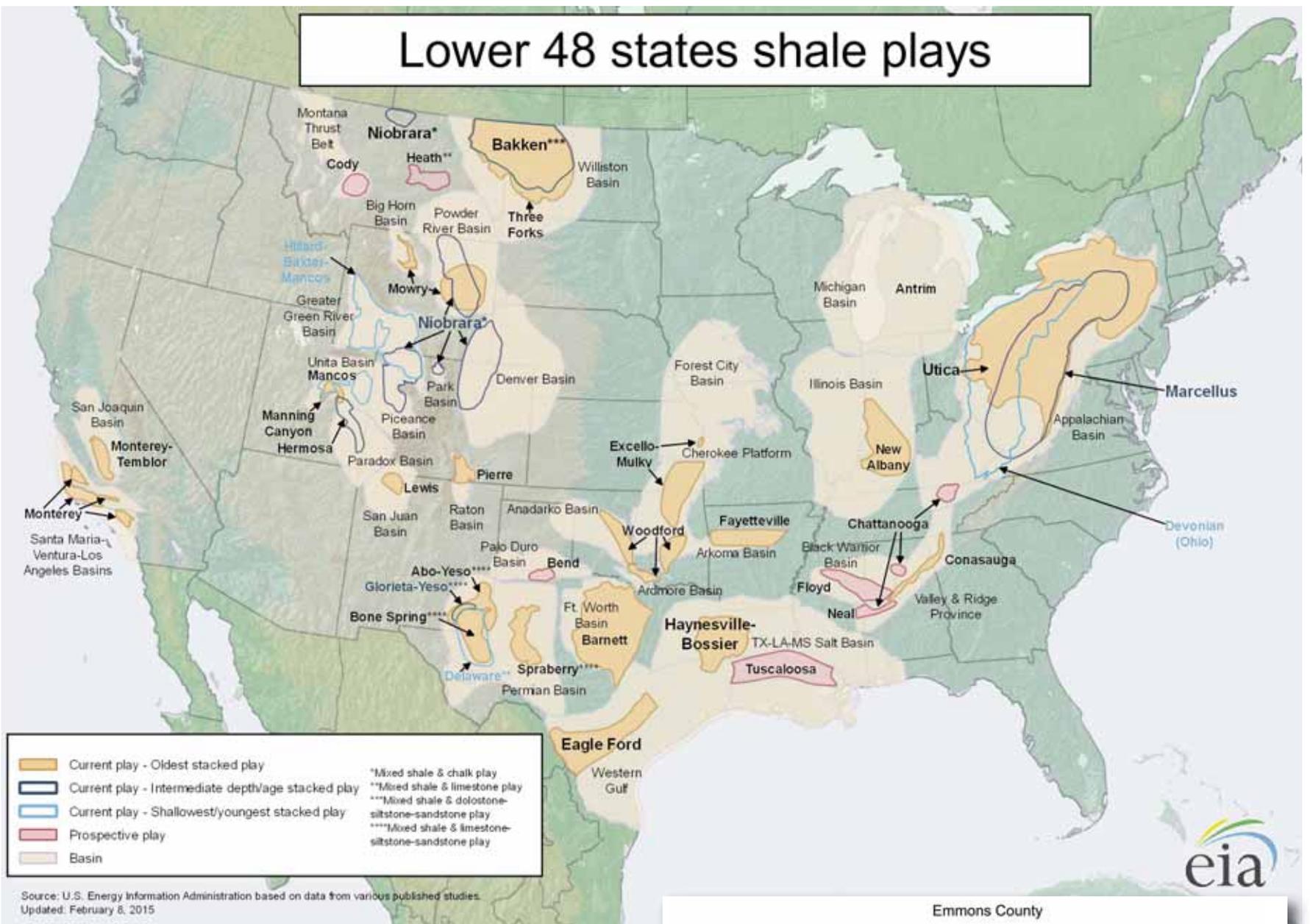


Image courtesy of U.S. Energy Information Administration

The Niobrara has productive fields in Colorado, Nebraska, Kansas and Wyoming.

washed in from the highlands to the west in what would later become the Rockies. The microscopic marine life mixing with sediments and rising and falling sea level was the perfect recipe for the formation of oil and natural gas — right out of a Geology 101 textbook.

Current oil and gas activity in the Niobrara is centered in the Denver-Julesburg Basin, a deep geologic structure that underlies eastern Colorado and adjacent parts of Wyoming, Kansas, and Nebraska. The basin is nestled against the Rockies to the west. The City of Denver is situated above its thickest point — some 14,000 feet, which is comparable to the Williston Basin's

thickest point in northwestern North Dakota.

The Niobrara (sometimes called the Niobrara shale) is made up of two general units. The Fort Hays limestone (including shale layers), the lower unit, ranges between 10 feet and 60 feet in thickness. The Fort Hays is overlain by the Smoky Hills chalk, 200 feet to 1,400 feet thick. The Niobrara is found at depths of 8,000 feet (northwest of Denver). It outcrops in central Kansas and eastern Nebraska, as it does in North Dakota and South Dakota.

A long production history
Geologists have studied the Niobrara for

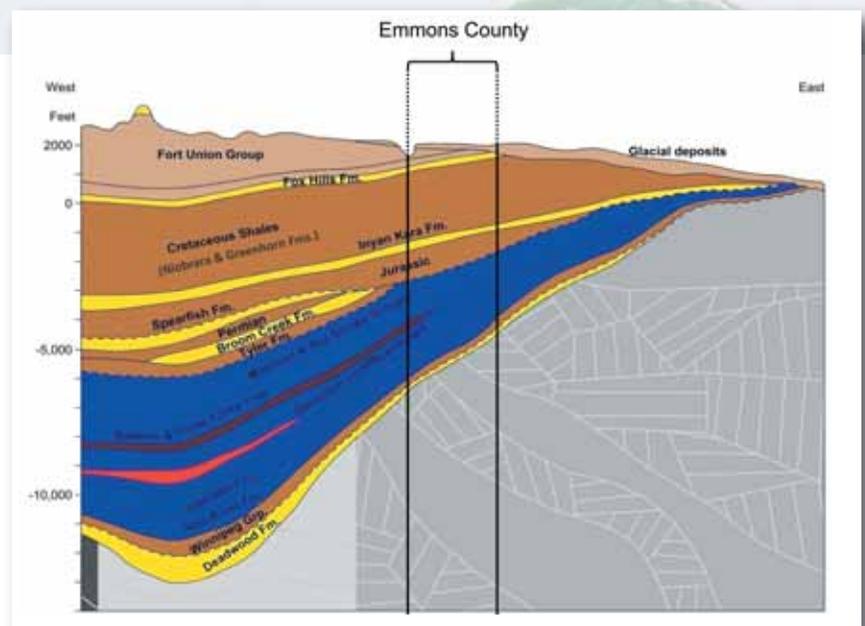


Image courtesy of North Dakota Geological Survey

The Niobrara formation is quite shallow in Emmons County at 1,200 feet below the surface which keeps it from generating oil and gas based on elevated temperatures which happens at much greater depths.

nearly a century and a half. But it wasn't oil or natural gas that first caught their eye — it was chalk. During the 1870s, they discovered the immensity of fossil remains well preserved in the soft Niobrara chalk. Their detailed investigation led to commercial interest in the chalk as a source of Portland cement, which is used as a base in the manufacture of concrete. Chalk mines are currently still active in Nebraska and Colorado. (A kiln using Niobrara chalky shale also operated between 1899 and 1909 at Concrete, N.D., in eastern Cavalier County.)

In 1876, oil was first observed seeping from the Niobrara just southwest of Colorado Springs. Wildcatters first hit oil in the Niobrara in the early 1920s and exploration and production started shortly thereafter in northwestern Colorado (Rio Blanco, Moffat and Routt Counties).

Niobrara discoveries were not made in the Denver-Julesburg Basin until the early 1950s. Activity picked up into the mid-1970s in Weld and Morgan Counties (just a short distance northeast of the Denver Metro area). Most of the oil produced came from parts of the Niobrara that have good natural permeability due to faulting and fracturing. Drillers used traditional vertical drilling techniques. Like the Bakken, the Niobrara is very tight and does not have good granular permeability ("granular permeability" referring to the interconnections between the tiny particles that make up rock units).

According to the U.S. Energy Information Administration (EIA), the Niobrara is ranked as having the 10th largest natural gas reserves in the United States. Natural gas has been produced in association with oil since the early years, however, in the mid-1980s — with the gradual federal deregulation of wellhead prices — exploration for natural gas ramped up, especially in Yuma County, 100 miles east of Denver on the Kansas state line. Here the Niobrara is fairly shallow and drillers have used vertical drilling with

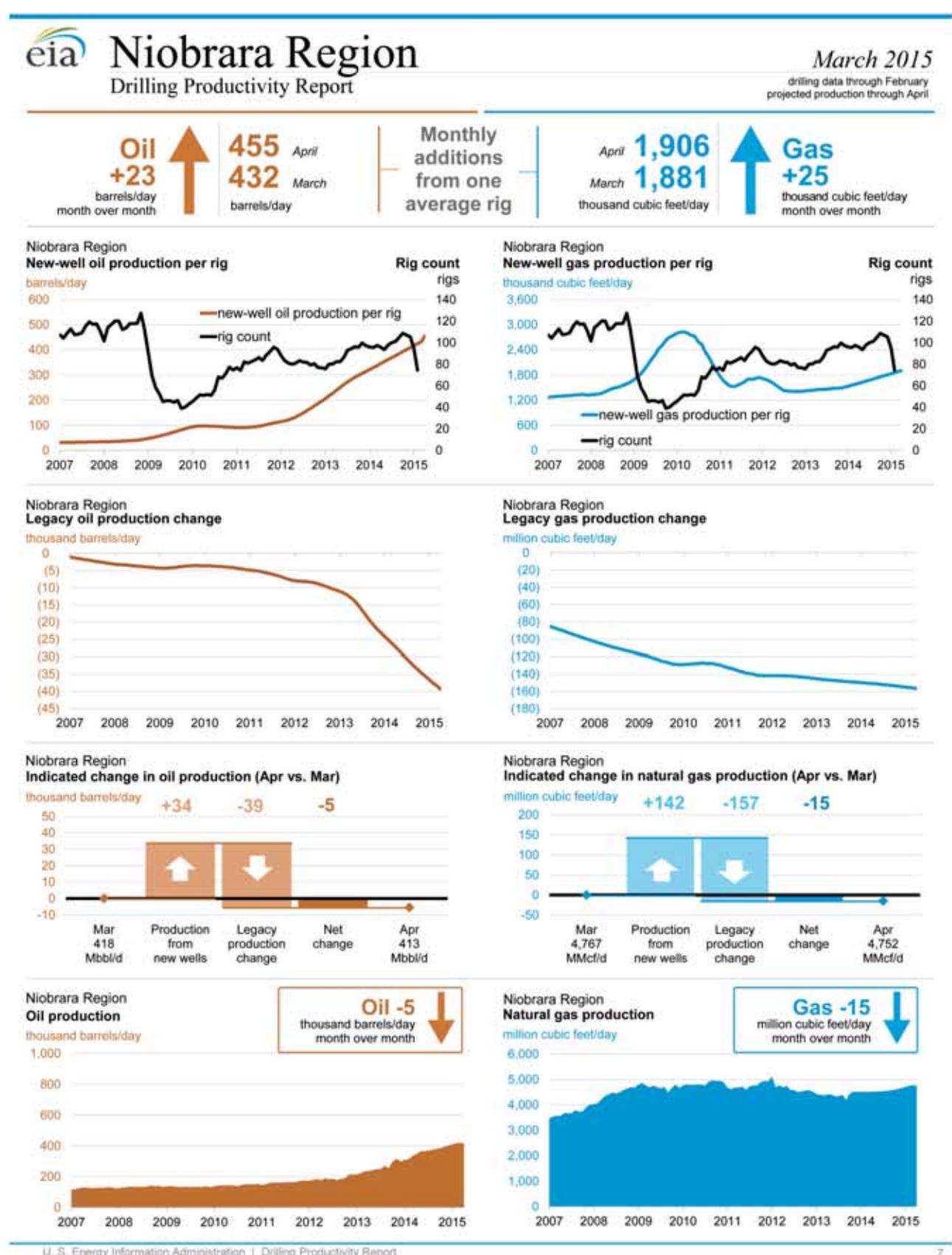


Image courtesy of U.S. Energy Information Administration

According to the U.S. Energy Information Administration (EIA), the Niobrara is ranked as having the 10th largest natural gas reserves in the United States.



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artificial fracturing to produce gas from the chalk. During this century's first decade, more than 2,700 natural gas wells were drilled into the Niobrara.

Oil- and gas-bearing formations are characterized by a measure called "total organic carbon," or TOC. It is simply the amount of carbon in a rock unit expressed as a percentage of the unit's volume. The Niobrara's TOC is generally less than 10 percent, with 1-4 percent being fairly typical. That compares to the Bakken's TOC as high as 14 percent and generally above 10 percent. By way of comparison, the Utica shale in Pennsylvania averages about three percent. Similar to the Utica, however,

billion cubic feet of natural gas per day in February 2015.

A detailed assessment of the play's recoverable reserves is still in the offing. However, industry analysts estimate the figure is between two and three billion barrels — compared to the Bakken's 6.7 billion barrels. Current activity is hottest in Weld County, Colo., where more than 33,000 wells are now producing — the majority from the Niobrara. Activity is also strong across the Wyoming state line in Laramie County.

While small compared to Colorado, interest in the Niobrara in Kansas and Nebraska is gaining momentum.

As with other tight plays around the country, horizontal drilling and hydraulic fracking have taken the Niobrara to a new level of exploration and production.

the Niobrara's thickness (up to 10 times that of the Bakken's) makes up for its relatively low TOC.

Jake sets the pace

As with other tight plays around the country, horizontal drilling and hydraulic fracking have taken the Niobrara to a new level of exploration and production. In 2009, two Houston-based companies announced initial success with the formation's first horizontal wells. EOG Resources' "Jake," a 7,000-foot well drilled in Weld County (the play's sweet spot), just south of the Wyoming state line, produced an average of 555 barrels per day during its first three month of production. (EOG is the nation's largest on-shore oil producer.) On Jake's heels, Noble Energy announced "Gemini" — another Weld County well, which produced an average of 500 barrels per day through its first 60 days of production. Five years later, more than 30 companies have joined the Niobrara fray including Bigs such as Chesapeake Energy, Whiting Petroleum, Continental Resources and Anadarko Petroleum. According to EIA, the play's production averaged 400,000 barrels of oil and five

Exploration has been limited to counties bordering Colorado and Wyoming. Cheyenne County in Kansas; Perkins, Chase, Dundy, and Hitchcock Counties in Nebraska. Shallow gas production from the Niobrara in these counties has been ongoing for more than 40 years.

Sleeping Giant

The Niobrara is getting attention in North Dakota as well. On June 20, 2014, Denver-based Strata-X Energy spudded its Rohweder #1-11, a proof of concept well in Emmons County. The well is part of the company's Sleeping Giant Gas Project, which will target natural gas from the Niobrara. Strata-X has lease holdings on approximately 120,000 acres. The North Dakota Industrial Commission has granted the company three additional permits in Emmons and McIntosh Counties.

Strata-X subsequently announced the Rohweder results were encouraging. Drilled to 1,450 feet, the well showed gas over an 80-foot reservoir interval. Emmons County has been the site of previous drilling projects with disappointing results. ■



Image courtesy of Kansas Geological Survey

Unlike the Bakken, the Niobrara outcrops at the surface, mostly as a chalk that is mined in Colorado and Nebraska and used in the manufacture of concrete.



Image courtesy of Andarko Petroleum

Houston-based Anadarko Petroleum Corp. one of Colorado's largest oil and gas operators, announced 2014 production in Weld County's Wattenberg field averaged 60 thousand equivalent barrels per day (primarily natural gas and condensates), a 55 percent increase over the previous year.



Image courtesy of Strata X Energy

In late June 2014, Denver-based Strata X Energy spudded its Rohweder #1-11 well into the Niobrara formation in Emmons County, North Dakota — a rare drilling venture outside of traditional Williston Basin plays.



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UNCERTAINTY MAKES LAWMAKERS MORE CONSERVATIVE, MORE PRAGMATIC

By Ken Rogers for Bakken Breakout

The North Dakota Legislature, typically, becomes more pragmatic as its 80-day limit gets closer. Concern about the end balance for the general fund fuels this nuts-and-bolts focus. And while not everything is about money, when it comes to lawmaking, directly or indirectly, mostly it is.

Following the March 18 update of the state revenue forecast, members of the House and Senate settled on a \$200 million end balance for the state's general fund for the next

biennium. Two years ago, when lawmakers crafted a 2-year state budget, no one was worried about the state's end balance because of a much higher price of oil that supported stronger state tax revenue forecasts.

Rep. Jeff Delzer, R-Underwood, chairman of the House Appropriations, Committee, was reported in the Tribune (March 26) saying it would "give us a little more cushion if the forecast turns out to be a little more aggressive than our revenues are." The lower end balance has meant reducing expectation. It hasn't turned

lawmakers to cutting budgets, rather, it has reduced the size of any budget increase.

The mid-March forecast from the Office of Management and Budget, based on analysis from Moody Analytics, projected oil tax revenues at \$3.43 billion, down from \$8.32 billion in December. That's a decline of 59 percent in about 3 months. It speaks to the recent volatility in oil markets and amps up uncertainty.

What's important during the legislative session, especially in the

final weeks, changes from day to day. This summary of lawmaker issues and attitudes was written during the Easter break and, because a great deal could have changed in the weeks since, it should be considered in that light.

The formula

Arguably, the largest impact from lower oil-tax revenues will be felt in changes in the makeup of the funding formula, which returns state oil tax revenues to cities, townships and counties in the oil patch.

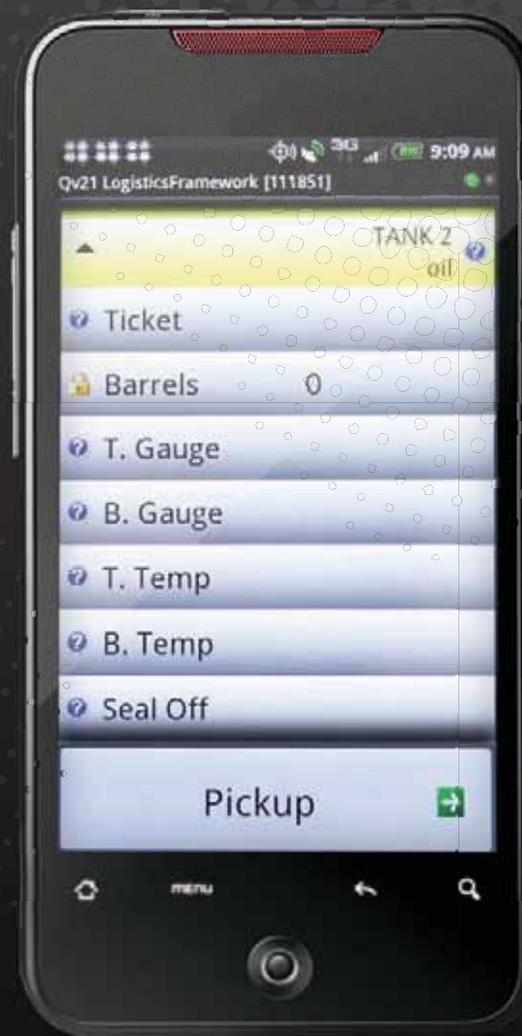
TOM STROMME, Tribune

Ann Hafner, a paramedic from Killdeer Area Ambulance Service, testified on HB1176 March 30 in front of the Senate Appropriations Committee. Hafner, who acknowledged being nervous, told the committee members: "I'd much rather be in the back of an ambulance 55 miles per hour doing CPR."

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MIKE McCLEARY, Tribune

Gov. Jack Dalrymple, right, reads over penalty provisions to oil companies proposed by Lynn Helms, left, director of the state Department of Mineral Resources during the March 24 Industrial Commission meeting at the state Capitol in Bismarck.

The formula distributes funds from the oil and gas gross production tax. In the past, 25 percent of the money collected by the state was returned to local government. The original bill, HB 1176, raised the local share to 60 percent; but once House members began to digest the consequences of lower oil prices, the local share was reduced to 30 percent. As passed by the House, local governments in the oil patch would split \$720 million, up from \$574 million over the past two years. The remaining funds would go to the state.

One of the sticking points with the formula has been changes in how local government jurisdictions qualify for hub-city funds. One change proposed has

been setting the number of oil and gas-related jobs needed for a city to be considered in this category. The formula, as it left the House, set 7.5 percent oil-related employment as a standard, which meant Mandan, because of its refinery, would be a hub city, along with Williston, Dickinson and Minot. Adding Mandan to the hubs has generated strong opposition.

Expect changes to be made by the Senate (probably late in the session), with the House having a second go at it in the final days.

Cost vs. benefit

Although the state's general fund does not rely heavily on oil tax revenues, the

forecast does establish an overall picture of the state's economy for the next two years, and, in doing so, colors lawmaker actions. It means lawmakers, among other things, are loathe to increase costs for the oil industry, and regulations are seen as increased expenses.

For instance, a bill to track water used for oil and gas development looked like it was going to pass before the last revenue forecast. House Bill 1145 would have required any hydraulic fracturing operation have a record of permits for any water used in the process. The bill passed the House with a clear 91-3 majority and was sent to the Senate. But post-revenue forecast, the Senate voted

Arguably, the largest impact from lower oil-tax revenues will be felt in changes in the makeup of the funding formula, which returns state oil tax revenues to cities, townships and counties in the oil patch.



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MIKE McCLEARY, Tribune

Rep. Roscoe Streyle, R-Minot, hands his testimony to members of the Senate Industry, Business and Labor Committee on March 25 at the state Capitol. The bill challenges orders recently made by the Industrial Commission as overreaching its authority.



MIKE McCLEARY, Tribune

House Majority Leader Al Carlson, R-Fargo, second from right, was critical of the projected revenue forecast presented by Dan White with Moody's Analytics, via speaker phone, during the March 11 Advisory Council on Revenue Forecasting at the state Capitol in Bismarck. On the far left is Lt. Gov. Drew Wrigley, Jeff Delzer, chair of the House Appropriations Committee, second from left, and Lynn Helms, director of North Dakota's Department of Mineral Resources.

the bill down with 9-37. The quality or source of the water did not change, but the revenue forecast did.

On the other hand, Senate Bill 2167 sought to do a management study for the establishment of a "one-call excavation notice system." The idea was to figure out a means to avoid damaging underground pipes and lines as contractors

work across the oil patch — a way to call one number to determine if the way below is clear. However, it also would likely involve penalties for failure to comply. It would make work easier for the industry — if the cost of setting it up was not onerous.

The one-call study bill passed the Senate 47-0, the House 88-3 and was signed into law by Gov. Jack Dalrymple before Easter. Granted it's only a study, but it seems

destined to add regulations, and cost, to the industry, but for industry benefit. It's pragmatic and pro-industry.

There are exceptions to this rule of thumb. The state has been discouraging the flaring of natural gas, and one strategy for solving this problem would be to construct a more extensive network of pipelines. There was a bill (Senate Bill 2034) to provide a sales tax exemption on material used in the transmission of gathering lines. It seemed a sensible incentive and the Senate passed it 46-1.

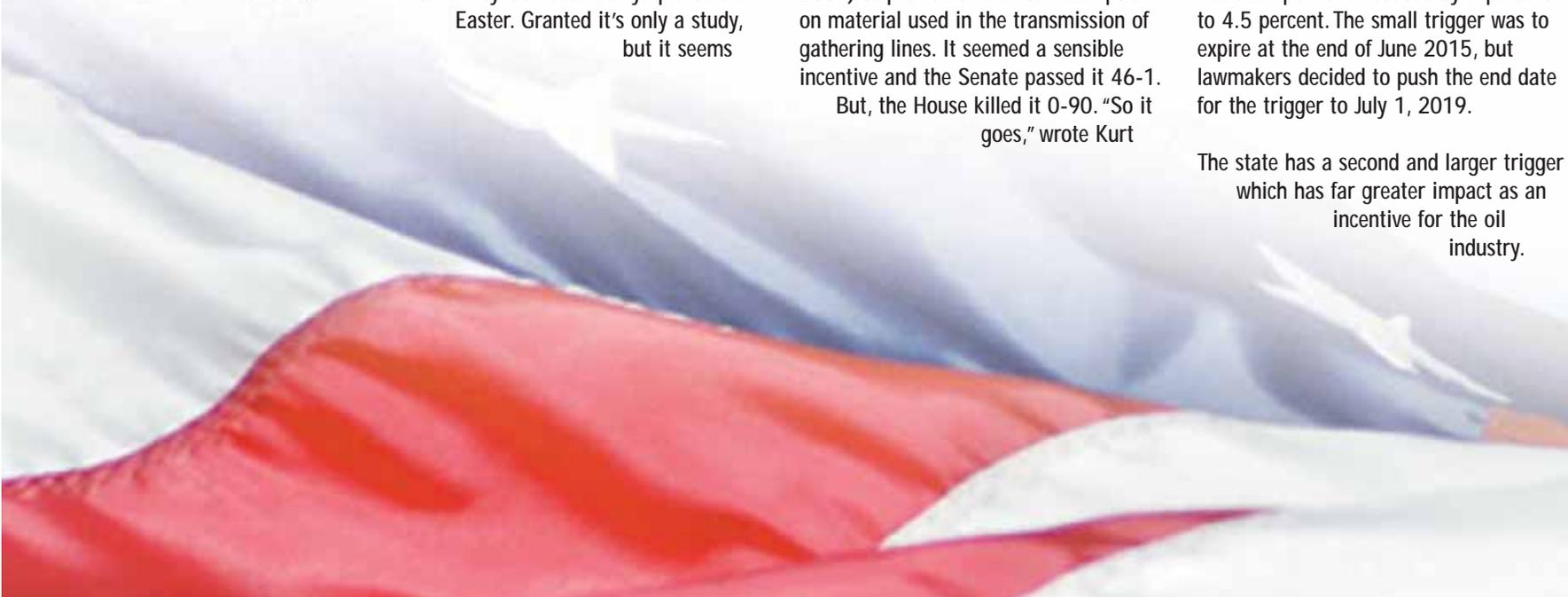
But, the House killed it 0-90. "So it goes," wrote Kurt

Vonnegut in Slaughterhouse-Five.

The small trigger

Then too, the Senate and House voted to extend what's known as the small trigger. It reduces the oil extraction taxes on new wells when the price of oil drops below \$55 a barrel, and kicks off when the price of oil increases to \$70. The tax rate during the period when the trigger has been pulled is reduced by 2 percent to 4.5 percent. The small trigger was to expire at the end of June 2015, but lawmakers decided to push the end date for the trigger to July 1, 2019.

The state has a second and larger trigger which has far greater impact as an incentive for the oil industry.





MIKE McCLEARY, Tribune

Pam Sharp, director of the state Office of Management and Budget, listens during the March 11 state Advisory Council on Revenue Forecasting meeting at the state Capitol in Bismarck. To the left is state Tax Commissioner Ryan Rauschenberger.

It also would have a greater impact on the state, in terms of tax revenue.

The small trigger was “pulled” by the price of oil in February. The larger trigger remains on the horizon, making speculation about oil commodity prices ripe.

Nuts and bolts

Before “cross over,” the House took five bill dealing with a range of practical oil-and-gas issues and combined them into a single bill — HB1358. The bill deals with:

- the operation of underground gathering pipelines and sharing of information with surfaces

owners,

- exceptions to confidentiality of well data, including release of information on saltwater spills,

- underground gathering pipeline bonds,

- and, use of the abandon oil and gas well plunging and site reclamation fund.

HB 1358 has been amended in the Senate and been given a “do pass” recommendation from the Senate Energy and Natural Resources Committee, before being sent to the Senate Appropriations Committee. The bill was developed in consultations between lawmakers and

members of the oil industry, and it represents the most practical changes for the industry that will come out of the legislative session.

Lawmakers did pass an interesting study

connected to a retail natural gas distribution system puts some state residents at a disadvantage when heating their homes during North Dakota’s cold winters. Senate Bill 2276 passed the Senate by a vote of 44-2, and the House

Lawmakers did pass an interesting study bill which would look at providing natural gas to “underserved communities” in the state.

bill which would look at providing natural gas to “underserved communities” in the state. Not being

by a vote of 80-11. It will not be one of the things that lawmakers look at during the interim.



TOM STROMME, Tribune

House Majority leader Rep. Al Carlson, R-Fargo, left, and Rep. Roscoe Streyle, R-Minot, questioned the numbers in state budget revenue projections announced March 18.

Follow up

The Senate defeated an effort by some lawmakers to rein in the Industrial Commission, specifically when it comes to setting rules for the flaring of natural gas. House Bill 1187 would, if passed, “void” orders given by the three-member industrial commission, if commissioners did not follow the formal rule-making process and instead applied “field rules.” The House, earlier, pass the bill on a 61-27 votes, but the Senate kicked it back on 0-47 tally.

Gov. Dalrymple spoke against the bill, as did Lynn Helms, director of the Oil and Gas Division of the Industrial

Commission. The field rules are more flexible and can be applied with less lead time.

The bill set out a conflict between the Industrial Commission and legislators, in particular, Rep. Roscoe Streyle, R-Minot, who testified in favor of the bill in both House and Senate hearings.

“The Industrial Commission has overstepped its authority and went around the legislative process,” Rep. Roscoe Streyle, R. Minot, told the Senate Industry Business and Labor Committee during a March hearing.

Efforts by lawmakers to modify the membership of the Industrial Commission have been rebuffed by the majority.

What the Legislature has passed is a bill requiring the Industrial Commission report to the Legislature anytime a commission action results in a “fiscal effect or estimated fiscal effect on the state in excess of \$20 million in a biennium.” The governor also opposed this bill and had not signed it at this writing. ■

“
The Industrial Commission has over-stepped its authority and went around the legislative process.”

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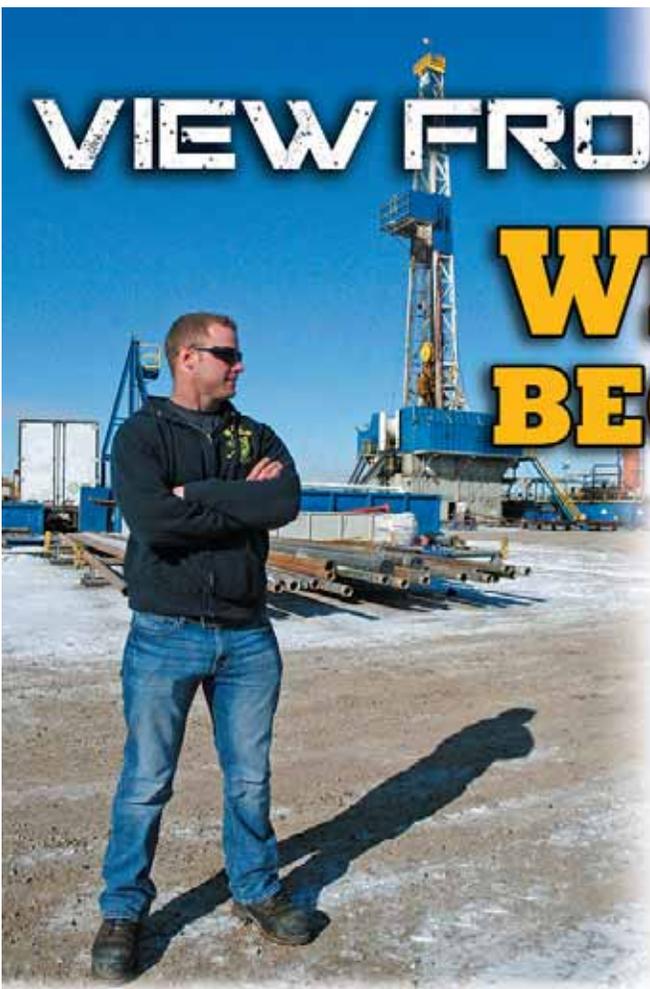
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Associated Press

Patrick Johnsen stands by an oil rig similar to the one he works with outside Williston on Feb. 25, 2014.



By Tessa Sandstrom
North Dakota Petroleum Council



VIEW FROM THE OIL PATCH: WHEN "BIG OIL" BECOMES YOU AND ME

For many of us growing up in Small Town, North Dakota, the opportunities for staying in your hometown after high school or even after college were fairly limited. Apart from working in retail (if your small town was so lucky to have retail stores), you might have been able to become a teacher to stay at home. Or, you could marry a farmer. For men, you could also try to find a teaching job or you could farm or work for the local construction firm. The opportunities for something more specialized like engineering, marketing, finance or public relations were slim, even in our larger cities. Today, that's not the case, and anyone who has read this column has heard me preach it time and time again.

Yet, I always find myself coming back to this point because it seems like this is something that is so often lost in the rhetoric of politics and activism that surrounds oil. Upon the release of a study outlining the contributions of oil and gas development in our state and communities, many of these thoughts and ideas resurfaced.

In case you missed it, the researchers at North Dakota State University found that the oil and gas industry contributed \$43 billion to the state's economy in 2013. About \$25.3 billion of this was in secondary impacts, or the re-spending of the \$17.7 billion spent directly by the industry. The largest benefactor of these dollars was retail trade, or the businesses that sell the products and services needed by the industry and employees. They pulled in a whopping \$11.3 billion of that total. Households (or individuals), were the second largest, bringing in \$9.3 billion in salaries, wages, royalties and other income. Government revenues

were slightly behind the finance, insurance and real estate industry at \$4.4 billion. Seven other industries also pulled in almost a billion or more each.

Most will agree that these are significant sums, but even I find myself numbed to those figures because these are sums that are just incomprehensible to me. What does this mean to me? What does it mean to you?

The short answer is "A lot."

For starters, that \$9.3 billion that went to households includes \$6.3 billion paid out in salaries and wages alone. That represents 35.9 percent of all private sector salaries and wages paid in the entire state. This should come as no surprise if you consider that the 81,000 jobs supported by oil and gas in 2013 represents about 20 percent of the entire North Dakota workforce. Those salaries spent by those 81,000 people are being spent in our business, our restaurants and our towns, sending ripple effects through the entire state's economy. Again, a lot of numbers, but what's important is not necessarily the numbers, but the human factor that is behind each one of them.

"Six degrees of separation" is a theory that most of us are likely familiar with and it states that every person is only six people or steps away by introduction to another person. In North Dakota, we're more accustomed to about two or three degrees of separation. Chances are high that any stranger you meet knows someone you know.

I would predict the same goes for the oil industry.

Even if you don't know have an immediate family member or friend employed in or by the oil industry, chances are your friend or family member does.

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TOM STROMME, Tribune

Target Logistics operates a man camp near Williston that is home to oil field workers from a number of companies operating in the Bakken field of North Dakota.

Even if you don't know have an immediate family member or friend employed in or by the oil industry, chances are your friend or family member does.

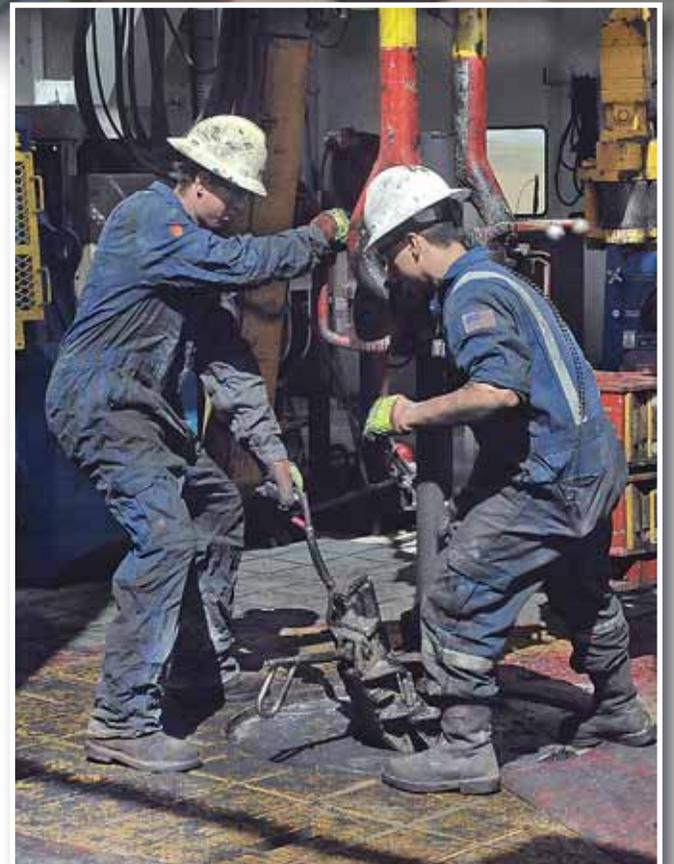
In my hometown, many of my friends not only work in the oil industry, but they own their own businesses and employ dozens of other individuals. For this very reason, when I hear accusations or derogatory comments lodged at "Big Oil," I can't help but be slightly offended.

For me, the oil industry doesn't represent some faceless out-of-state corporation; it represents Devin, Loren, Jake or James — all individuals who started their own businesses to support activities in the oilfield and created dozens of jobs at the same time. Since they are not large corporations, but rather small business owners, I would guess they are not considered "Big Oil." If not, at what point do they become "Big Oil"? After all, the companies considered "Big Oil" started out as small businesses and it was through success and hard work that they

became the larger corporations that they are today. I can only wish the small business owners in North Dakota the same success.

The oil industry to me also represents Garrett, Josh, Drew and Kyle who work for major operators. It is their job to help ensure development is done as responsibly as possible and to ensure their and their neighbors' homes, farms and water resources are protected. Are they just "Big Oil" or are they exempt because they were born and raised in western North Dakota?

You see, with an economic impact of \$43 billion, "Big Oil" is made up of each and every one of the individuals who have found an opportunity to make a living or start their own businesses. It's made up of individuals who care about their hometowns and want to do the best job possible while providing a valuable resource to our state and nation. "Big Oil" is not some faceless entity located elsewhere. No, big oil is you and me. ■



TOM STROMME, Tribune

A pair of North Dakota oil field roughnecks work on removing drilling pipe on a drilling rig near Belfield.



AP file photo

An unidentified worker passes a truck owned by Halliburton while being used at a remote site for natural-gas producer Williams in Rulison, Colo., in April 2009.

BIG OIL LOOKS TO OLD WELLS

By Collin Eaton
New York Times News Service

Sunken crude prices are forcing the engineers of the shale energy boom to abandon frenzied wildcatting and take a more scientific approach to the oil field, armed with designs to goose more oil from the ground for less money.

"It means questioning everything," said Hans-Christian Freitag, vice president of integrated technology at Baker Hughes.

With U.S. oil below \$50 a barrel, wildcatters who want to stay in the game are being forced to rethink their entire approach to the oil field. They are diving deeply into reservoir data and attempting to squeeze more crude out of some existing wells with another round of hydraulic fracturing, called "re-fracking" — the process that blasts powerful slurries of water, chemicals and sand into a well to form cracks in shale formations and release hydrocarbons.

Thanks to recent technological breakthroughs, re-fracking in some cases has restored well output to initial levels or even beyond and has stemmed rapid production declines, said David Adams, vice president of operations technology for Halliburton.

That could have a major impact on a firm's bottom line, Adams said, as re-fracturing an older well costs about a fourth of the \$8 million it takes to drill and complete a new horizontal well.

"The door is open for more of this now," he said. "This is a huge opportunity for the oil industry."

Breakthroughs in hydraulic fracturing and horizontal drilling by Halliburton, Baker Hughes and their rivals forced oil from dense shale formations in Texas, North Dakota and elsewhere. The new U.S. production over the past decade rocked the global oil landscape, contributing to a worldwide glut that pushed crude prices from above \$100 a barrel in



Associated Press

Traders gather at the post that handles Baker Hughes on the floor of the New York Stock Exchange, on Nov. 17, 2014.

June 2014 down to less than \$50 a barrel in March 2015.

But shale formations are stubborn, and most oil companies can't afford as much of the expensive drilling now that prices are so much lower.

The reservoirs often release just a fraction of the oil and gas buried underground. With prices so high, the industry's old answer was to keep drilling new wells, over and over — a hit-or-miss strategy that might open nothing but a dry hole.

To get it right in today's market, major oil tool suppliers say, the first step is sifting through thousands of data points gushing out of the oil patch and diagnosing various glitches in the wells.

Horizontal shale wells typically give up only 6-8 percent of their reserves, compared to conventional vertical wells that can pump 40 percent of the subterranean crude, Freitag said.

"People said we have to live with that," he said. "But we need to change our mindset."

Deeper data analysis could lead engineers back to re-fracture some more rock in an old well. Or it could persuade operators to clean rock debris out of a well using coiled tubing, or use electrical submersible pumps to artificially lift a well's natural output.

A scientific approach, using secondary fracturing and data from U.S. oil wells with the highest production rates, can yield much bigger hauls of crude than

the blind "cookie-cutter" strategy often used in fracturing, Freitag said.

"Maybe this is a wake-up call for the industry - to think about how drilling more and more wells isn't the answer."

• • •

Ambitions to rejuvenate old wells come as oil traders are watching for signs that U.S. crude production will falter, which could alleviate a global supply glut and lift petroleum prices out of their slump.

Oil companies have idled hundreds of U.S. drilling rigs and may have to cut spending by \$70 billion to keep their debt levels flat, if oil hovers around \$60 a barrel this year, according to Wood Mackenzie.

But the remaining drilling units are migrating to the most lucrative, productive regions in places like the Eagle Ford in South Texas and the Bakken Shale in North Dakota, in a bid to get more oil out of the least stubborn rock.

With 80 percent of the nation's output stemming from just a third of these shale plays, output growth could continue to be resilient.

"People are laying down rigs, but we're not seeing production fall off too fast yet," said Steve Trammel, research director at IHS.

Oil companies are also delaying hooking up newly drilled wells to gathering pipelines and other processes that prepare a well to flow oil, a stage the

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industry calls completion, which make up more than 50 percent of the cost of developing new wells, according to IHS.

State regulators say that in January and February, well completions were off by 44 percent compared to the same period the year before.

So while drilling rigs are sent to the sidelines and even newly drilled wells lie fallow, bolstering production from existing wells seems to be one of the few avenues producers have to increase their output.

Analysts aren't predicting a re-fracturing boom, and they say the current level of re-fracturing isn't enough to keep the nation's oil production from leveling off, probably later this year, after years of growth.

But bolstering production is an all-important task for some debt-laden explorers. "Improved productivity is a great way to survive this downturn," Trammel said.

"Super-frac" jobs — which use more

ingredients in the powerful hydraulic fracturing slurry, including more sand or other material called proppant that keeps reservoir fissures open after fracturing — have boosted output as much as 30 percent in some wells in the Eagle Ford and the Bakken Shale, Trammel said.

From 2011 to late 2014, 50,000 wells in North America have been hydraulically

fractured, but only 1,100 of those have been fractured a second time — but that figure has been growing over the past few years, according to analytics firm PacWest.

"That's almost a sideshow, and not a very big sideshow, at least not yet," said

Marshall Adkins, an analyst with Raymond James.

• • •

Still, industry observers say tapping into old wells could bring big rewards for the company that puzzles out how to do it well. And the industry already has made some technological advances in hopes of

for another dose of the blast.

"This is still in experimental stages," Carbrey said. "I think there is a large opportunity out there for the company that can figure out how to do this cost-effectively, but I do not see it making a significant impact on production anytime soon."

NCS Multistage, an oil field services company, has developed a technology that can close off sections within a wellbore and that, in a re-fracturing job, will enable producers to target specific zones where they think they can goose the most oil.

"In the history of downturns, you typically will see a lot of reworks happening," said Joe DeGeare, vice president of sales and operations at NCS Multistage.

"We're seeing an increased amount of customers wanting to discuss re-fracs," he said. "The technology still has a lot of improvement to be had, and we're constantly looking at new technologies for that." ■

So while drilling rigs are sent to the sidelines and even newly drilled wells lie fallow, bolstering production from existing wells seems to be one of the few avenues producers have to increase their output.

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BUSINESS BRIEFS



Tioga airport adds aero center for aviation services

TIOGA (AP) — A gradual startup led to Tioga Aero Center becoming established in January as a fixed-base operator providing aviation services at the airport.

The middle of winter might not seem an ideal time to launch an aero center, but owner Kathy Neset said it couldn't wait.

"Right now is when we needed this," she said. "I was just really anxious to get it up and going. I am hoping we will continue to grow and have more air travel and be able to help and service the industry."

"It's about improving what was here and making it more friendly for the aviation community," said Chris DeCrescente, general manager for the aero center. "An airport is a gateway to the community, and Tioga is the oil capital of North Dakota. We need to make it more inviting, more welcoming."

In the past, crews and guests flew into an unattended airport, refueled their own planes, and if they needed a rental vehicle, they took a chance on the airport vehicles available for that purpose. The airport's older general aviation building has offered only a place for pilots and their passengers to get out of the elements and have a cup of coffee. There is Wi-Fi but no computer equipment. Many flights were landing in Williston or Minot and people were driving to Tioga, DeCrescente said.

Bakken housing contract renewed

A company that provides workforce housing says it has renewed contracts with two global oil field service companies operating in western North Dakota's Bakken oil patch.

Target Logistics says the contracts total about \$50 million over the next three years. Officials did not name the oil field service companies.

Target Logistics President and Chief Operating Officer Brad Archer says extending the relationships is "especially significant" given the recent downturn in oil prices.

— Associated Press

Hogan Lovells sends energy lawyers to N.D. shale fields

DENVER — Hogan Lovells is pleased to announce the expansion of its legal practice into the booming North Dakota oil and gas market. The move will provide vital legal advice to the firm's many clients already doing business in the state.

Scot Anderson and Andrew Lillie, partners in the firm's Energy and Natural Resources Group in Denver, have become the first Hogan Lovells lawyers licensed in North Dakota. The duo brings powerful transactional, regulatory, project

development and litigation experience to the region.

"Our team in Denver is among the best in the energy business, and has been working on shale matters for years," said Hogan Lovells CEO Steve Immelt. "We are excited to further enhance our oil and gas capabilities across North America and offer invaluable counsel to clients on the ground in North Dakota."

Company to get decision on Williams County project

WILLISTON (AP) — An international real estate company has succeeded in pressing Williams County officials to make a decision on approving a proposed \$500 million development on the outskirts of the oil patch hub.

Swiss-based Stropiq last month asked the Williams County Commission to force its planning and zoning committee to make a recommendation on Williston Crossing.

The project would include 1 million square feet of retail, entertainment, office and hotel space, and the committee had tabled a recommendation to allow more time to study the proposal.

The commission last week directed the committee to make a recommendation on the project before the commission's next meeting, on April 7.

Target Logistics extends relationships with two customers

THE WOODLANDS, Texas — Target Logistics, a global provider of workforce housing and one of the largest operators of turnkey solutions in North America, announced March 30 it has secured key contract renewals with two global oil field service companies totaling approximately \$50 million over the next three years. Target Logistics will continue to provide workforce housing to these companies in the Bakken Shale area, as it has since 2010.

"Extending these relationships are especially significant wins given the downturn in oil prices," says Target Logistics President and Chief Operating Officer Brad Archer. "Listening to and understanding our customers' needs, coupled with creative thinking, were the main factors for these contracts being renewed in a mutually beneficial manner."

Oil company requests to flare 140 wells

North Dakota's new policy for exempting oil wells from gas-flaring rules will soon be put to the test as XTO Energy is requesting exceptions for 140 oil wells in Dunn and McKenzie counties.

According to the request, the company says it has nowhere to take the gas because OneOK, a gas-processing company, was unable to secure an easement agreement for one final tract and can't

build a 20-mile pipeline expansion. The easements are complicated by the need to cross the Fort Berthold Indian Reservation or U.S. Forest Service land, according to documents filed with the case.

The request was heard March 26 by the Oil and Gas Division and will be forwarded to the State Industrial Commission for action. Earlier last week, the three-man board more clearly defined gas-capture rules, imposing penalties for noncompliance and establishing flexibility to cover extenuating circumstances.

The pipeline would have moved 40 million cubic feet per day to the company's Garden Creek gas plant in McKenzie County, according to OneOK.

The gas company expects the situation to continue until late 2016 when a proposed Bear Creek gas-processing plant in Dunn County goes into service. XTO wants the exception until then.

— Lauren Donovan

GO Wireline LLC honored

The Association of Energy Service Companies recently honored GO Wireline LLC of Williston with a safety award for outstanding accident prevention in oil and gas wireline operations for 2014. Daniel Comalander, President of the AESC, presented the 2014 Group IV Gold Award to Mark Gjovig at a February ceremony held in conjunction with the Association's National Winter Meeting held in San Antonio, Texas.

Energy service companies representing 45 well servicing companies and reporting a total of more than 45 million man-hours worked participated in the association's safety award program by following strict reporting guidelines. Winners were awarded in five groups according to the number of man-hours worked. The Group IV is awarded for 300,001-2,500,000 man hours worked.

The Association of Energy Service Companies is a trade organization which represents oil and gas well servicing contractors who service the Energy Sector. In addition to contractors, the AESC's membership includes companies that manufacture and supply equipment, products and services to the oil and gas exploration & production industry.

Basin plans to add gas-fired electricity

A public hearing will be held March 26 in Watford City for the Public Service Commission to take comment on a plan by Basin Electric Power Cooperative to build three, 45-megawatt gas-fired turbines at its Lonesome Creek Station 14 miles west of Watford City.

The co-op would add the three turbines to three existing turbines to bring the total output to 270 megawatts.

The \$99 million project will also include two

waste-collection tanks and a warehouse within the 48-acre facility.

The hearing will be held at 9 a.m. at Teddy's Residential Suites on U.S. Highway 85 business loop on the south side of Watford City.

— Lauren Donovan

New fuel source expanding in oil patch

North Dakota's only plant that converts a natural gas feedstock into a motor fuel is expanding its capacity at its site near Tioga.

North Dakota LNG went on line in September and is well into its second phase. The company recently completed an expansion of its capacity from an original 10,000 gallons a day to 76,000 gallons, according to CEO Paul Burns.

The plant is located near the Hess gas processing facility outside Tioga and utilizes methane from Hess' facility.

North Dakota LNG essentially super cools methane into a liquid state — that requires cooling to negative 250 degrees — allowing it to be transported to a location, where it is regasified, according to Burns.

The product is gaining in popularity because it burns cleanly and emits less carbon than other fuels sources.

Burns said additional capacity will be added depending upon market conditions.

— Lauren Donovan

Oil and gas economic output increases 750% since 2005

BISMARCK — The oil and gas industry has seen its economic output rise by 750 percent to \$43 billion since 2005, according to a study conducted by the North Dakota State University's Department of Agribusiness and Applied Economics. The study also found that the industry directly supported 55,137 full time equivalent jobs and supported another 26,403 secondary full-time jobs. This increase represents the growing importance oil and gas development has on the state's overall economic health.

Because the industry relies on hundreds of contractors and subcontractors, the economic contributions extend beyond the mining and extraction industries. According to the study, retail trade once again saw the largest impact, taking in \$11.3 billion of the \$43 billion. Households, or personal income, saw the second-largest impact at \$9.3 billion, and the Finance, Insurance and Real Estate industry (\$4.5 billion) overtook the government (\$4.4 billion), which was the third-largest beneficiary in 2011. More than six other industries in North Dakota also benefitted from oil and gas development.

BUSINESS BRIEFS

Oil and Gas Awards announces 2015

Rocky Mountain winners

- Award for Drilling Excellence - Pioneer Energy Services
- Award for Excellence for Corporate Social Responsibility - Anadarko Petroleum Corporation
- Award for Excellence in Health & Safety - CDM Resource Management, LLC
- Award for Excellence in Well Completion - Calfrac Well Services
- Breitling Energy Future Industry Leader Award - Patrick E. Hughley - Enbridge
- Construction Company of the Year - Loenbro
- Consultancy of the Year - Total Safety
- Engineering Company of the Year - Samuel Engineering, Inc.
- General Industry Service Award - Well Master
- Industry Leader - James J. Volker - Whiting Petroleum Corporation
- Industry Supplier of the Year - Border States Electric
- Loenbro Midstream Company of the Year - Crestwood Midstream Partners, LP
- Manufacturer of the Year - Kerr Pumps & FlowValve

- New Technology Development of the Year - General / Products - Applied Control Equipment
- New Technology Development of the Year - Software - Oildex
- Oilfield Services Company of the Year - Fortis Energy Services, Inc.
- The Oil & Gas Financial Journal Transaction of the Year - Over \$1Bn - Whiting Petroleum Corporation
- The Oil & Gas Financial Journal Transaction of the Year - Under \$1Bn - Legacy Reserves, LP
- Themark Corporation E&P Company of the Year - EOG Resources
- Trucking Company of the Year - Presented by Kenworth - Cruz Energy Services
- VZ Environmental Award for Excellence in Environmental Stewardship - LT Environmental
- Water Management Company of the Year - Themark Corporation

To submit oil & gas industry news to Bakken Breakout, send press releases to editor@bakkenbreakout.com ■

BAKKEN EVENTS

April 28-30

2015 Williston Basin Petroleum Conference
Regina, Saskatchewan
www.wbpc.ca

May 19-20

Bakken Artificial Lift Cost Reduction & Production Optimization 2015
Denver
www.bakken-production.com

May 25-27

2nd Oil and Gas Transportation Canada Summit
Calgary, Alberta
www.oilandgastransportation.com

May 31-June 3

AAPG 2015 Annual Convention & Exhibition (ACE)
Denver
<http://ace.aapg.org/2015>

June 24-25

Energy Exposition
Billings, Mont.
<http://energyexposition.com>



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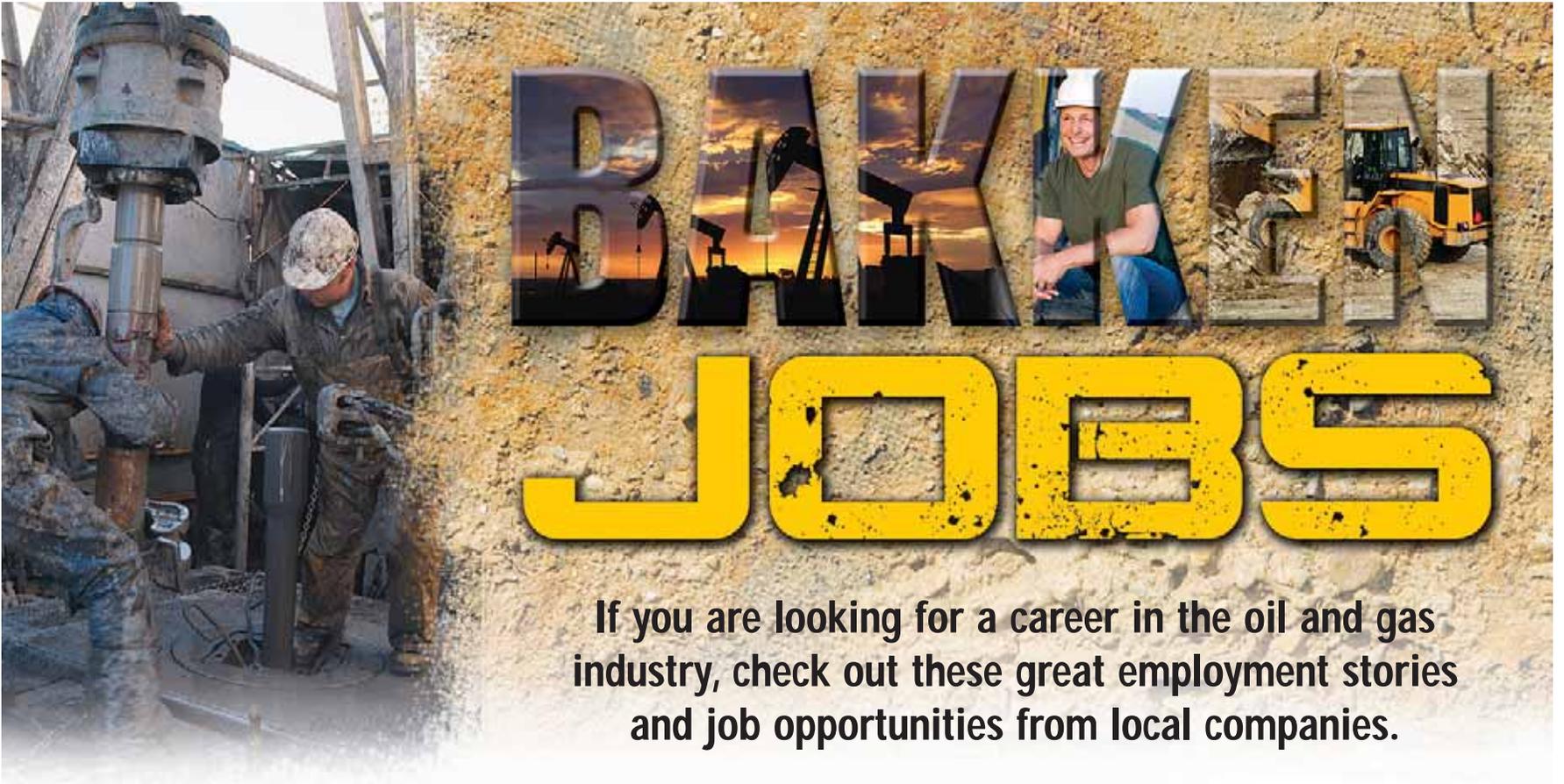
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BAKKEN JOBS

If you are looking for a career in the oil and gas industry, check out these great employment stories and job opportunities from local companies.



100

POTENTIAL INTERVIEW QUESTIONS



By Thad Peterson
Monster Staff Writer

While there are as many different possible interview questions as there are interviewers, it always helps to be ready for anything. So we've prepared a list of 100 potential interview questions. Will you face them all? We pray no interviewer would be that cruel. Will you face a few? Probably. Will you be well-served by being ready even if you're not asked these exact questions? Absolutely.

Basic Interview Questions:

- Tell me about yourself.
- What are your strengths?
- What are your weaknesses?
- Why do you want this job?
- Where would you like to be in your career five years from now?
- What's your ideal company?
- What attracted you to this company?
- Why should we hire you?
- What did you like least about your last job?
- When were you most satisfied in your job?
- What can you do for us that other candidates can't?
- What were the responsibilities of your last position?
- Why are you leaving your present job?
- What do you know about this industry?
- What do you know about our company?
- Are you willing to relocate?
- Do you have any questions for me?

Behavioral Interview Questions:

- What was the last project you headed up, and what was its outcome?
- Give me an example of a time that you felt you went above and beyond the call of duty at work.
- Can you describe a time when your work was criticized?
- Have you ever been on a team where someone was not pulling their own weight? How did you handle it?
- Tell me about a time when you had to give someone difficult feedback. How did you handle it?
- What is your greatest failure, and what did you learn from it?
- What irritates you about other people, and how do you deal with it?
- If I were your supervisor and asked you to do something that you disagreed with, what would you do?
- What was the most difficult period in your life, and how did you deal with it?
- Give me an example of a time you did

something wrong. How did you handle it?

- What irritates you about other people, and how do you deal with it?
- Tell me about a time where you had to deal with conflict on the job.
- If you were at a business lunch and you ordered a rare steak and they brought it to you well done, what would you do?
- If you found out your company was doing something against the law, like fraud, what would you do?
- What assignment was too difficult for you, and how did you resolve the issue?
- What's the most difficult decision you've made in the last two years and how did you come to that decision?
- Describe how you would handle a situation if you were required to finish multiple tasks by the end of the day, and there was no conceivable way that you could finish them.

Salary Questions:

- What salary are you seeking?
- What's your salary history?
- If I were to give you this salary you requested but let you write your job description for the next year, what would it say?

Career Development Questions:

- What are you looking for in terms of career development?
- How do you want to improve yourself in the next year?
- What kind of goals would you have in mind if you got this job?
- If I were to ask your last supervisor to provide you additional training or exposure, what would she suggest?

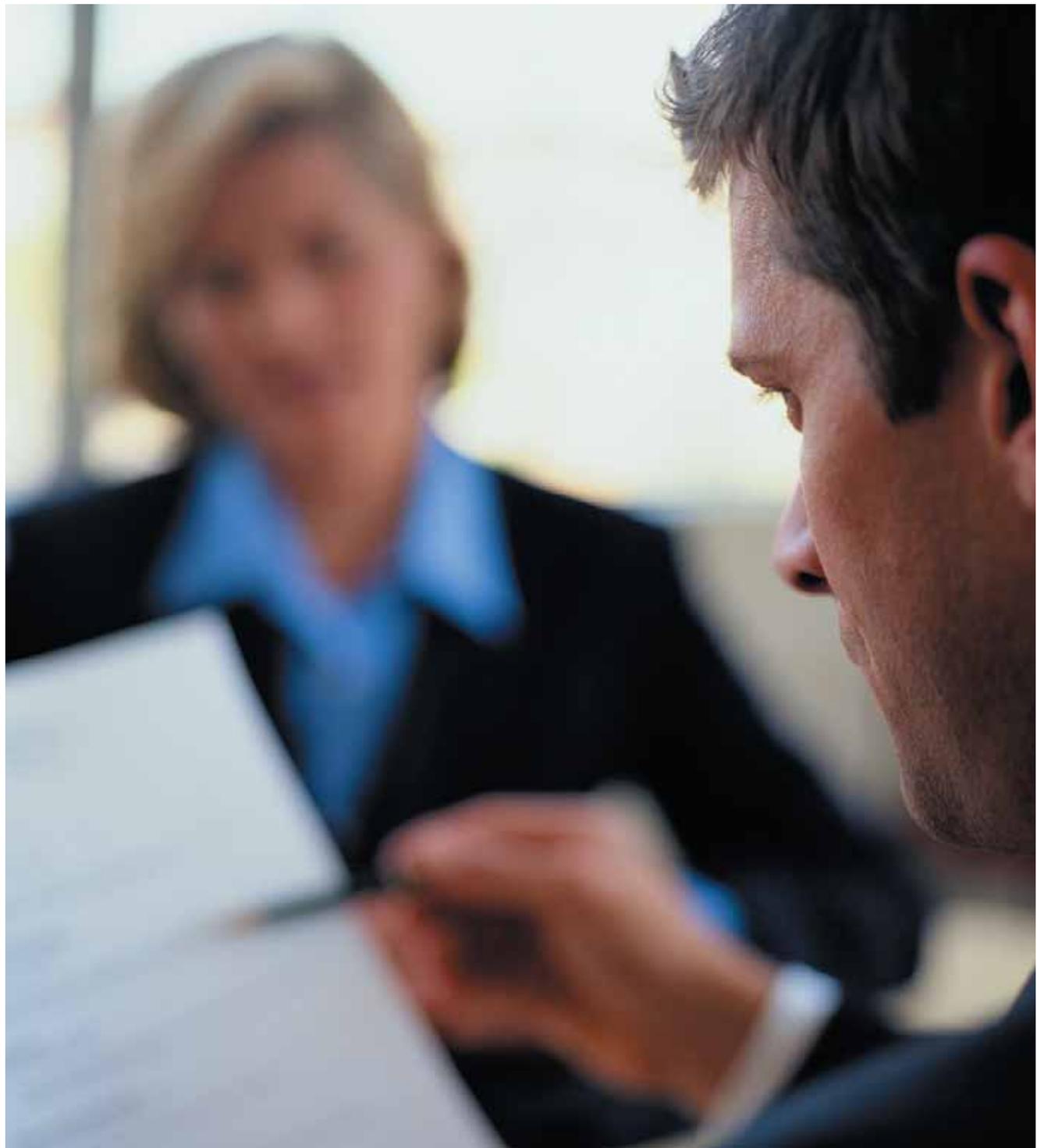
Getting Started Questions:

- How would you go about establishing your credibility quickly with the team?
- How long will it take for you to make a significant contribution?
- What do you see yourself doing within the first 30 days of this job?
- If selected for this position, can you describe your strategy for the first 90 days?

More About You:

- How would you describe your work style?
- What would be your ideal working environment?
- What do you look for in terms of culture — structured or entrepreneurial?
- Give examples of ideas you've had or implemented.

- What techniques and tools do you use to keep yourself organized?
- If you had to choose one, would you consider yourself a big-picture person or a detail-oriented person?
- Tell me about your proudest achievement.
- Who was your favorite manager and why?
- What do you think of your previous boss?
- Was there a person in your career who really made a difference?
- What kind of personality do you work best with and why?
- What are you most proud of?
- What do you like to do?
- What are your lifelong dreams?
- What do you ultimately want to become?
- What is your personal mission statement?
- What are three positive things your last boss would say about you?
- What negative thing would your last boss say about you?
- What three character traits would your friends use to describe you?
- What are three positive character traits you don't have?
- If you were interviewing someone for this position, what traits would you look for?
- List five words that describe your character.
- Who has impacted you most in your career and how?
- What is your greatest fear?
- What is your biggest regret and why?
- What's the most important thing you learned in school?
- Why did you choose your major?
- What will you miss about your present/last job?
- What is your greatest achievement outside of work?
- What are the qualities of a good leader? A bad leader?
- Do you think a leader should be feared or liked?*
- How do you feel about taking no for an answer?
- How would you feel about working for someone who knows less than you?
- How do you think I rate as an interviewer?
- Tell me one thing about yourself you wouldn't want me to know.
- Tell me the difference between good and exceptional.
- What kind of car do you drive?



- There's no right or wrong answer, but if you could be anywhere in the world right now, where would you be?
- What's the last book you read?
- What magazines do you subscribe to?
- What's the best movie you've seen in the last year?
- What would you do if you won the lottery?
- Who are your heroes?
- What do you like to do for fun?
- What do you do in your spare time?
- What is your favorite memory from childhood?

Brain teaser Questions:

- How many times do a clock's hands overlap in a day?
- How would you weigh a plane without scales?
- Tell me 10 ways to use a pencil other than writing.
- Sell me this pencil.
- If you were an animal, which one would you want to be?
- Why is there fuzz on a tennis ball?
- If you could choose one superhero power, what would it be and why?
- If you could get rid of any one of the

US states, which one would you get rid of and why?

- With your eyes closed, tell me step-by-step how to tie my shoes.

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6 THINGS TO NEGOTIATE WHEN AN EMPLOYER WON'T BUDGE ON PAY

By Catherine Conlan
Monster Contributing Writer



You've done the research, brushed up your skills and made the business case for getting more pay than you currently do. But there may come a time when your employer won't budge on the pay it's offering. If you're negotiating a new job offer and aren't prepared to walk away, you'll have to be flexible and consider negotiating on one or more of these other points.

Job title

Sprucing up your job title can strengthen your resume, says Jason Carney of WorkSmart Systems Inc. "‘Receptionist’ may not sound glamorous, but ‘corporate executive assistant’ has a nice ring to it, don't you think?" Have a couple of suggestions ready when you're in negotiations, and be sure you can back up the title by showing the extra value you bring to the position, especially if others share your position.

Allowances and reimbursements

Clothing allowances, transportation reimbursements and other subsidies can help take the edge off the unavoidable expenses related to doing your job. "If you're a young professional, the office wardrobe can be very expensive, especially if the company attire is

business formal," Carney says.

More time off

One of the most popular things to negotiate for is more time off, says Mike Zaremski, accounting and finance division president of Windsor Resources. Employers would much rather budge on that rather than on things such as 401(k) matches, which are harder to customize for individual employees.

Flexible schedule

Hoping to work from home part of the time or work flexible hours? Now is the time to ask. Zaremski says he was working with an employer who was looking for a tax director, but was looking to pay about 15 percent below market. "This was going to be tough, but they decided to offer candidates the ability to work remotely two days a week and by doing so, they greatly enhanced the appeal to candidates seeking a work-life balance and were able to fill the job quickly."

Equipment upgrades

Compared to a raise, an investment in new technology might seem more affordable to an employer. If your position requires certain software or that you must be on call at all times, your

employer may be open to providing you with upgrades and a company cell phone, says Stacia Pierce, career expert and CEO of Ultimate Lifestyle Enterprises.

Training and education

Getting your employer to invest in your education can be a good way to augment your salary. Negotiate having your employer pay for you to attend workshops, seminars or trainings or to provide education reimbursements. "Requesting opportunities for advancement signals your dedication to doing well and grow professionally within the company," Pierce says.

More negotiation tips

If you don't ask, you don't get, says career coach Day Merrill of 2BDetermined. Here are some tips for negotiating for things besides salary:

- Consider your needs and wants well in advance, and figure out how to balance them, so you won't be tempted to accept an offer that doesn't meet your requirements, Merrill says.

- If you're negotiating as a new hire, remember your bargaining power is at its peak after the offer is made and before you accept it, Merrill says. At this point,

the company is convinced you're the one they want for the job, so they may be more flexible.

- If you're negotiating as a long-term employee, understand that fear of losing something is a bigger human motivator than the possibility of gaining something, says Alan O'Rourke, director of marketing at Work Compass. "When you are negotiating with your boss you must allay ALL fears that the manager will be losing a resource."

- "Everyone can negotiate something," Merrill says, whether it's the start date or some unpaid vacation to attend a planned family event later in the year. "Start with the assumption that everything is negotiable. It's not, but you'll find out soon enough where the give is."

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