



## Hilcorp installing third polymer injection facility at Milne Point

On June 10, Hilcorp Alaska received authorization from the state of Alaska to install a third polymer injection facility in the Milne Point field, this time at F-pad, which is near the Beaufort Sea coast. F-Pad is the farthest north of the North Slope unit's production pads.

Injecting polymer and water into the field has been more successful in coaxing the viscous crude — oil with the consistency of syrup — from the reservoir than conventional waterflood, David Wilkins, Hilcorp senior vice



DAVID WILKINS

see **INJECTION FACILITY** page 8

## 3-D, well, core data, integrated in advanced reservoir imaging

A revolution in machine learning and data analytics is rapidly expanding the capabilities of scientists to integrate multi-scale subsurface data and understand critical geologic features more quickly and in more detail than what was possible just a few years ago, according to Dr. Shuvajit Bhattacharya, assistant professor of geophysics and petrophysics at the University of Alaska Anchorage.

Bhattacharya employs advanced machine learning and geostatistical algorithms for facies, fracture and rock property classification, prediction and modeling. Before joining UAA, he worked in a few oil and gas companies and research organizations, including EOG Resources, Talisman Energy (now Repsol) and Battelle. He worked in various onshore and offshore locations in

see **RESERVOIR IMAGING** page 7

## BP's 68th Statistical Review notes US has record oil, gas increases

BP released the 68th annual edition of the BP Statistical Review of World Energy June 11. Among the highlights: the U.S. had the largest-ever annual production increase, for any country, of both oil and natural gas.

But the top news wasn't all good.

Bob Dudley, BP group chief executive, said in introducing the Statistical Review that while the world needs carbon emissions to fall dramatically, they are continuing to grow, and in 2018 global energy demand and carbon emissions grew at the fastest rate in seven years, with



SPENCER DALE

see **BP STATISTICAL REVIEW** page 6

## Competition for Canadian pipeline ownership by aboriginal coalitions

Interest among aboriginal coalitions in buying the Trans Mountain crude pipeline system is gathering momentum ahead of the Canadian government's expected final decision around June 18 on tripling capacity on the link between Alberta's oil sands and tanker ports on the Pacific Coast.

The pace quickened earlier in June when a group called the Iron Coalition challenged another bidding group, Project Reconciliation, for ownership of at least 50% in the existing 300,000 barrels per day Trans Mountain pipeline and a stake in the 590,000 bpd, C\$7.4 billion Trans Mountain expansion.

Iron Coalition is led by the Alexis Nakota Sioux Nation, two

see **PIPELINE OWNERSHIP** page 4

### EXPLORATION & PRODUCTION

## 88E to drill Charlie

Targeting Brookian Torok and Schrader, picks up Heavenly prospect

By KAY CASHMAN

Petroleum News

88 Energy is planning an exploration well in its Western Play Fairway for the upcoming off-road winter drilling season on Alaska's North Slope. Charlie No. 1 will target stacked plays in the Brookian Torok and Schrader Bluff sands, general manager of operations Erik Opstad told Petroleum News in a recent interview.

"We're proceeding ahead with permitting. We have most of the operational permits in place, but we're working on minor amendments and updates to those permits as a result of refinements of the well location. The ice road to a location was origi-



ERIK OPSTAD

nally permitted last year prior to completing interpretation of the latest 3-D shoot, but those results have allowed us to refine that original location," he said.

Located approximately 30 miles west of the Dalton Highway and southeast of the Winx No. 1 well the company drilled last winter, 88 Energy shows the Charlie prospect as potentially holding as much as 304 million barrels of oil in place, a low of 126 million barrels, a gross mean of 210 million barrels with a net mean of 163 million barrels to the company.

A permit to drill application will be submitted to the Alaska Oil and Gas Conservation

see **88 ENERGY WELL** page 12

### EXPLORATION & PRODUCTION

## Alkaid going online 2021

Pantheon combines 2 Brookian prospects; Alaska tech team tackles Texas assets

By KAY CASHMAN

Petroleum News

London-based Pantheon Resources, which acquired the North Slope assets of Great Bear Petroleum in January, says it will bring its Alkaid oil field online as part of a phased production program as early as 2021.

The field is near the Dalton Highway and the trans-Alaska oil pipeline, possibly allowing for some early year-round oil sales to generate income—unusual for North Slope projects under development since most of the region has no permanent roads. (Ice roads and pads are allowed in roadless areas when the tundra is frozen



PAT GALVIN

in the winter. Great Bear was previously allowed to drill in the summer from rig mat drill pad locations along the Dalton Highway.)

In a June 6 press release and webcast, the company said its Alaska subsidiary, Pantheon Alaska Petroleum Operating, will use mobile production units to handle output from three or four delineation wells placed adjacent to the Dalton in the highway's already-established transportation corridor, trucking the oil north to Pump Station No. 1 of the trans-Alaska pipeline until full-scale development of approximately 50 wells and related infrastructure with a central processing

see **ALKAID FIELD** page 11

### GOVERNMENT

## Alberta going for jugular

Unhappy with past passive approaches, Kenney accelerates response to attacks

By GARY PARK

For Petroleum News

Tired of taking a repeated beating in the court of public opinion from those it accuses of spreading "lies and defamation" about its petroleum industry, the Alberta government is girding for battle, setting up a "war room" with a budget of C\$30 million.

The Calgary-based office, consisting of senior government officials and drawing on outside experts, will be launched within months.

"The goal of the war room will be to tell the truth about how the world needs more Canadian energy," said Premier Jason Kenney.



JASON KENNEY

"We will no longer accept the campaign of lies and defamation," he declared pointing to the most recent article in National Geographic, which has targeted the oil sands as an enemy of the global environment.

The office will "have a mandate to operate much more nimbly and much more quickly, with a higher risk tolerance than is normally the case with government communications," said Kenney.

Tim McMillan, president of the Canadian Association of Petroleum Producers, did not disagree with Kenney's assertion that the industry has not done enough to defend itself more vigorously.

see **ALBERTA BATTLE** page 12

## ● FINANCE &amp; ECONOMY

# EIA: Brent down, US crude production up

11 million bpd record last year; new record expected this year; natural gas exports at 9.9 bcf per day last year, forecast to rise

By **KRISTEN NELSON**

*Petroleum News*

In its latest Short-Term Energy Outlook, issued June 11, the U.S. Energy Information Administration dropped its 2019 forecast for Brent crude oil spot prices to \$67 per barrel, down \$3 per barrel from its May outlook. EIA is forecasting Brent to remain at that \$67 per barrel average in 2020.

“EIA now forecasts that Brent crude oil spot prices will decline from an average of \$71 per barrel in 2018 to \$67 per barrel in 2019,” EIA Administrator Dr. Linda Capuano said in a statement accompanying the June outlook.

EIA said Brent averaged \$71 per barrel in May, largely unchanged from April, and almost \$6 per barrel lower than May of 2018. But Brent fell sharply in recent weeks

reaching \$62 per barrel on June 5. “EIA’s lower 2019 Brent price path reflects rising uncertainty about global oil demand growth,” the agency said.

EIA said U.S. crude oil production was at a record 11 million barrels per day in 2018.

“EIA expects U.S. crude oil production will continue to set new records in 2019 and 2020, culminating with average production of 13.5 million barrels per day by the end of 2020,” Capuano said.

U.S. production is forecast to increase by 1.4 million bpd this year and by 900,000 bpd in 2020. The agency said that while it expects U.S. production growth to slow, the 2019 forecast would be the second largest on record, following the 2018 record growth of 1.6 million bpd,



LINDA CAPUANO

with 2020 forecast growth the fifth-largest growth on record.

## Natural gas

“U.S. natural gas exports are on pace to set new records over the next few years as additional export facilities and infrastructure come online. EIA forecasts that U.S. natural gas exports will reach almost 18 billion cubic feet per day by the end of 2020. By comparison, the United States exported roughly 9.9 billion cubic feet per day on average in 2018,” Capuano said.

The agency said the increase in exports reflects increases in new liquefied natural gas facilities and an expected increase in pipeline exports to Mexico.

U.S. dry natural gas production is forecast to average 90.6 bcf per day this year, up 7.2 bcf from 2018, and

see **EIA OUTLOOK** page 3

## contents

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### ON THE COVER

#### 88E to drill Charlie

Targeting Brookian Torok and Schrader, picks up Heavenly prospect

#### Alkaid going online 2021

Pantheon combines 2 prospects; tech team tackles Texas assets

#### Alberta going for jugular

Unhappy with past approaches, Kenney steps up response to attacks

#### Hilcorp installing third polymer injection facility at Milne Point

#### 3-D, well, core data, integrated in advanced reservoir imaging

#### BP's 68th Statistical Review notes US has record oil, gas increases

#### Competition for Canadian pipeline ownership by aboriginal coalitions

### EXPLORATION & PRODUCTION

#### 3 Hyperspectral core imaging specialist

Terracore's scanners identify and map mineralogy in drill cores and cuttings — passive, non-destructive spectroscopic methodology

#### 4 Investigative technology for geologists

### FINANCE & ECONOMY

#### 2 EIA: Brent down, US crude production up

11 million bpd record last year; new record expected this year; natural gas exports at 9.9 bcf per day last year, forecast to rise

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• EXPLORATION & PRODUCTION

# Hyperspectral core imaging specialist

*Terracore's scanners identify and map mineralogy in drill cores and cuttings — passive, non-destructive spectroscopic methodology*

By **STEVE SUTHERLIN**  
*Petroleum News*

**H**yperspectral core imaging is a passive and non-destructive spectroscopic method for identifying and mapping mineralogy in drill cores and cuttings, according to Terracore, a company that did not exist eight years ago.

Terracore, of Reno, Nevada, is in the business of gathering imaging data using technology that didn't exist until fairly recently. It also provides software to analyze the results of that imaging.

Dave Browning is a co-author of the report, "Hyperspectral Core Imaging: Applications in Unraveling Deposit and Reservoir Mineralogy," by Browning and Paul Linton, Phil Harris, Chris Sherry, which he presented May 31 at the technical breakout session at the state Geological Materials Center in Anchorage. The session focused on the potential for new investigative technologies and machine learning systems to better assist geoscientists and resource companies to meet the challenges of interpreting Alaska geology.

"Terracore is a merger of two different companies, one from South Africa and one from Reno, Nevada," Browning said. It has offices in those locations.

"Both companies started in 2012 and merged in 2015," he said, adding that the company has collected more than a million meters of core over the past four years. Most of the clients have been government or industry, particularly mining.

The company can provide the scanning service or clients can buy a system and Terracore will service it.

It offers three sizes of systems; a desktop unit, a mobile unit that sets up in half a day; and a lab instrument.



**Dave Browning of Terracore at Alaska GMC.**

"With these systems, the sample sits on the table and goes underneath the camera," he said. "We're getting an entire core box at one time whatever the width of the sample ... we get through 200 or 300 boxes per day."

Terracore's IntelliCore software can be downloaded and used to explore open access data, Browning said, adding, "It's available to anybody."

"We provide the image data as well as the numerical product so we can actually support the numbers behind these images in a spreadsheet, and that's where our collaborative process comes in with companies like NER (New England Research Inc.), where we can create downhole plots," he said. "The key thing here is that this is a visual archive preservation of the core."

## Energy reflectance

Hyperspectral imaging measures the reflectance of energy off of the surface of the core, Browning said.

"We start in the visible range and we go into the infrared

about 350 nanometers to 1000 nanometers along the EMR (electromagnetic range), and then we also have a short range which goes from 1000 nanometers to about 2.5 microns," he said. "Each mineral — because it has a unique crystal structure — reflects or absorbs energy in their unique way so therefore we can create mineral maps, and we can also look at feature extraction which is looking at ... individual features."

"It's important that we're using the right wavelength ranges doing mineralogical studies," he said. "The advantage about the long-wave is it's dealing with heat reflectance as opposed to light reflectance with the short-wave, so when you have a dark material such as oil and gas rocks we often don't get a great signature off of the short-wave."

When changes in the shortwave are very subdued, they get more definition added to them based on some of the long-wave data that is provided, he said.

"In terms of our mineral processing ... this is uninterpreted data, so this is very much similar to what people do with the rock typing we can create through artificial intelligence, create classes based off this spectral data spectral variance we can provide," he said. "We can also interpret that data and those classes as well. The computer tells us these are very similar; we can go and look and say, okay, based on other data sets and talking to geologists, based on our experience, this is a muscovite or quartz or whatever it might be, and we can actually start to point out that mineralogy."

"Obviously this is very key because in two previous examples we saw today we're talking about porosity and permeability, so what we try to answer with the mineralog-

see **MINERALOGY MAPPING** page 4

*continued from page 2*

## EIA OUTLOOK

expected to grow in 2020 to an average of 91.8 bcf per day, EIA said, with another record high for production in May.

The Henry Hub natural gas spot price averaged \$2.64 per million British thermal units in May, almost unchanged from April, and EIA said it expects strong growth in U.S. natural gas production to put downward pressure on prices this year, with an average of \$2.77 per million Btu forecast, down 38 cents from 2018. That same \$2.77 per million Btu price is forecast for 2020.

## Oil price volatility

"Crude oil price volatility increased in May after declining for four consecutive months and stayed at elevated levels into the first week of June," EIA said, citing demand-side concerns as contributing to volatility and price declines.

China and the U.S. issued tariffs on each other and potential tariffs on Mexico were announced near the end of May.

In addition, the agency said, expected industrial activity measured by the manufacturing Purchasing Managers' Index declined in May across several countries, "and the U.S. manufacturing PMI fell to its lowest level since 2009. These developments are contributing to concerns that economic growth could be lower than market participants' expectations, which would cause oil demand growth to also be lower than expected," EIA said.

The agency said the lowering of its Brent spot oil price forecast "largely reflects recent global crude oil price declines as well as the uncertainty about global oil demand growth," which EIA said it expects to grow by 1.2 million bpd this year, down 200,000 bpd from the May forecast.

The Brent to West Texas Intermediate

price spread is widening, EIA said, with the futures spread at \$8.94 per barrel June 6, up 45 cents since May 1.

Logistics problems in the U.S. Midwest caused by flooding resulted in the temporary closure of some pipelines out of Cushing, Oklahoma, and likely contributed to crude oil stocks in Cushing building by 4.8 million barrels during May, EIA said, noting that Cushing typically sees a draw of 2.1 million barrels during that period.

EIA said its estimates show that U.S. crude oil inventories grew by 15.7 million barrels in May, when a five-year average for the month shows an average draw of 2.1 million barrels.

"If confirmed in monthly data, this year's stock build would be the largest for the month of May since 1991," the agency said.

## Global crude production

Globally, oil production declined in Venezuela and Iran.

Members of the Organization of the Petroleum Exporting Countries averaged only 29.9 million bpd in May, EIA said, "the lowest for any month since July 2014," partly due to Saudi Arabia producing less than the amounts agreed to in December.

There were also production shut-ins in


Russia related to contamination of the Druzhba crude oil pipeline, compounded by planned maintenance on North Sea crude oil platforms.

Some Druzhba pipeline flows had resumed but other refineries were still waiting on crude from the line. EIA said contaminated crude oil would have to be removed from the line so other flows could occur, and the contaminated crude would need to be stored for several months and then gradually blended with clean crude before the oil could be refined. ●

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**NAC**

continued from page 1

## PIPELINE OWNERSHIP

other First Nations and six Metis communities in northeastern Alberta.

Project Reconciliation is looking to assemble 200 First Nations and Metis (people of mixed indigenous and Euro-American ancestry) communities in Western Canada to back its bid, estimated at C\$6.9 billion.

Tony Alexis, the chief of the Alexis Nakota, said that if the Iron Coalition succeeds it will be just the first stage in creating "a standard" for bidding and participating in future resource projects.

He said the initiative matches the traditional indigenous pursuit of self-sufficiency.

"The intent of any project or anything that was happening within the tribe or group was always to sustain and to grow the family, tribe and nation," he said.

Alexis hopes that if indigenous communities in British Columbia — many of whom are among the strongest opponents of resource development — "follow our lead we can approach the federal government (which owns Trans Mountain) to negotiate the best deal."

Although details on how the Iron Coalition financing would be structured have yet to be released, the group is exploring options that include partnerships with institutional investors such as pension funds, Alexis said.

### Indigenous investment

Delbert Wapass, executive chairman of Project Reconciliation, said he does not view the Iron Coalition as a competitor.

Instead, he said, emergence of the group has shown the enthusiasm of indigenous people to improve their economic wellbeing.

Wapass said that if the aboriginal communities can overcome their economic starvation they can tackle the root causes of their poverty.

There has already been one major breakthrough, with Alberta's Miskew Cree and Fort McKay First Nation buying 49% of a Suncor Energy oil sands storage tank for C\$503 million, a transaction that was financed through a high-yield bond issued to more than a dozen investors and backed by a 25-year service agreement with Suncor.

The fact that potential buyers of Trans Mountain have surfaced is seen as clear proof that the pipeline expansion is financially viable, while putting more pressure on the Canadian government to promote meaningful economic development opportunities for indigenous communities.

The new Alberta government led by Premier Jason Kenney has created an Indigenous Opportunities Corp. to help aboriginal organizations interested in acquiring equity stakes in energy developments.

"For too long we've witnessed this province's First Nations being pushed to the sidelines," said a spokesman for Alberta Indigenous Relations Minister Rick Wilson.

Stephen Buffalo, chief executive officer of the Indian Resource Council of Canada, said the rising interest from various aboriginal groups illustrates that the prospect of aboriginal ownership in the resource sector must be taken seriously by the federal government.

However, Canada's Finance Minister Bill Morneau has said the timing and details of selling all or part of Trans Mountain hinges on "de-risking" such a transaction, but he did not identify which conditions would have to be resolved.

—GARY PARK

## EXPLORATION & PRODUCTION

### Investigative technology for geologists

The state Geologic Materials Center and the Alaska Geological Society, in conjunction with the 2019 Alaska Oil and Gas Association Conference, held a technical breakout session May 31 at the GMC in Anchorage.

The focus of the session was the potential for new investigative technologies and machine learning systems to better assist geologists and resource companies to meet the challenges of interpreting Alaska geology.

Various speakers covered a range of relevant topics in talks which will be covered in individual stories in future issue of Petroleum News:

•Kurt Johnson, curator, Alaska Geologic Materials Center, Conserving Alaska's Past, Discovering its Future;

•Dr. Shuvajit Bhattacharya, assistant professor, University of Alaska, Integration of Tax-Credit 3D Seismic, Wells, and Core Data for a Better Understanding of the Nanushuk-Torok Reservoirs;

•Dr. Ramil Ahmadov, principal scientist, New England Research Inc., Non-Destructive Automated Scanning of Fine-Scale Geological, Petrophysical and Geomechanical Rock Properties of Nanushuk Formation;

•Dave Browning, regional manager North America, Terracore Geospectral Imaging, Hyperspectral Core Imaging: Applications in Unravelling Deposit and Reservoir Mineralogy;

•Dr. Brigitte Martini, chief geologist, Corescan, Hyperspectral Core and Cuttings Imaging for Rapid, Automated Mineralogy and Lithology Logging: Applications in Alaskan Petroleum;

•Robert Chelak, Biodentify, Predicting Potential Reservoirs by DNA Fingerprinting and Machine Learning from Shallow Soil Samples;

•KD Derr, electron and X-ray microscopy specialist, Zeiss Research Microscopy, Zeiss Shale Imaging Workflow — Core to Pore Multiscale Characterization.

Contact information for each of the speakers is available at: [dggs.alaska.gov/gmc/GMC\\_tech\\_session\\_agenda\\_2019\\_05\\_31.pdf](http://dggs.alaska.gov/gmc/GMC_tech_session_agenda_2019_05_31.pdf)

—STEVE SUTHERLIN

continued from page 3

### MINEROLOGY MAPPING

ical data is what's causing this because it all comes back to the rock; it all comes back to the mineralogy," Browning said. "It's a really nice context we provide.

"With the rock typing, we can start to take these classes and create different domains ... to do this cluster analysis and get down to a really, really fine scale," he said. "Our spatial resolution is at a maximum at 1 millimeter, we often operate below that — about a half millimeter, so we can go from there and start to scale-up between different data sets."

The scanned data can be integrated into other data sets, he said.

"We've got spectral gamma ray resistivity, we've also got some porosity and permeability ... provided by NER — this was presented by a client of ours, then we have our mineralogy here as well; you can start to see these changes all the way across this log," he said. "This is just another example

of trying to understand sequence stratigraphy, so as we get these different datasets with what's happening in the mineralogy, we start to see these really fine changes and start to explain the larger picture.

"In conclusion, the core is invaluable. As Kurt (Johnson of the GMC) was saying there's \$35 billion of exploration costs sitting here in this facility; we need to archive that; we need to understand it, and we need to combine these," he said "We need to start driving exploration and get the most out of that.

"As new technology evolves, the buzzword right now is artificial intelligence, deep learning, machine learning; let's collect these data sets and as those things evolve, we can continue to interpret," he said. "We have that data set, it doesn't decay like some of the rocks might, and we can continually reprocess that data to ask questions as we're moving forward and questions come up." ●

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continued from page 1

## BP STATISTICAL REVIEW

demand driven by China, India and the U.S.

“The longer carbon emissions continue to rise, the harder and more costly will be the necessary eventual adjustment to net-zero carbon emissions,” Dudley said in a statement. “As I have said before, this is not a race to renewables, but a race to reduce carbon emissions across many fronts.”

### What drove energy increases?

Spencer Dale, BP group chief economist, noted the rapid growth in both energy demand and emissions and asked what drove the increases — a 2.9% growth in global primary energy consumption and a 2% increase in carbon dioxide emissions. This was the fastest growth since 2010 and was largely driven by China, the U.S. and India, which represented two-thirds of the growth in demand, he said.

The 3.5% growth in U.S. demand was the sharpest in 30 years, and while it was reflected across all fuels was particularly pronounced in natural gas, where demand was up by more than 5%, representing almost 45% of the entire growth last year, Dale said.

Why the strong demand? And why wasn't it predicted based on GDP growth and changes in oil price?

Dale said much of the increased energy consumption may be related to weather. There were unusually large numbers of both hot and cold days — an increase in both heating and cooling days, requiring heat or air conditioning — particularly in the U.S., China and Russia.

In the past in the U.S., Dale said, a high number of heating days tended to coincide with a low number of cooling days or vice versa.

When the large number of both heating and cooling days are thrown into the mix, it greatly reduces the surprise in last year's energy demand growth, he said, and suggests that stimulus from weather effects accounted for about a quarter of the increase in consumption.

There was also a pronounced weakness in demand in 2014-16, much of which appears to come from slow Chinese economic growth in this period, when major industrial activity in China — iron, steel and cement — slowed after 10 years of rapid growth, accounting for

*The 3.5% growth in U.S. demand was the sharpest in 30 years, and while it was reflected across all fuels was particularly pronounced in natural gas, where demand was up by more than 5%, representing almost 45% of the entire growth last year, Dale said.*

around one-quarter of China's energy growth and pulling down international growth, he said.

The scale of the Chinese slowdown suggested some might be cyclical, Dale said, and pickup began in 2017 and strengthened in 2018.

Between weather and China, that accounts for almost all of the weakness and growth in energy demand over the last four or five years. The strong demand in 2018, he said, was largely weather related (China, Russia, U.S.), with unwinding of cyclical industrial factors in China.

### Oil

It was a rollercoaster year in oil, Dale said: Prices started up, reached \$80 in October and then plunged to near \$50 at the end of the year.

Oil demand was up by 1.4 million barrels per day, with China and India accounting for two-thirds of that growth, but the U.S. also figuring in, with the largest increase in 10 years. The U.S. increase, Dale said, was related to the petrochemical sector and increased use of ethane.

On the supply side, oil production grew by 2.2 million bpd, more than double the historic level, with almost all of that increase coming from the U.S., with the 2.2 million bpd increase in U.S. production from tight oil and natural gas liquids the largest ever increase from one country, and representing an increase of more than 7 million bpd since the U.S. shale revolution began.

Production from the Organization of the Petroleum Exporting Countries was down as OPEC consistently overshot production cuts in 2017 and the first half of 2018, Dale said, volumes which largely reflect declining production from Venezuela.

The role of OPEC was very significant last year, he said, but reflects the difficulties of trying to stabilize global oil growth.

As for the future, Dale said it feels like the rollercoaster will run for some time to come.

### Natural gas

It was a bonanza year for natural gas, he said, with more than a 5% increase in both demand and output. The U.S. was the main player, with 40% of the demand increase and 45% of the global production increase, driven by shale plays.

As with oil, the U.S. had the largest ever single increase in natural gas production.

In China, gas consumption grew by 18% — a continuation of that country's environmental policy of switching from coal to natural gas — with 10 million households in China switching from coal to gas in the last two years, and an increasing use of gas in industry and buildings. Unlike the U.S., the Chinese growth in gas use had nothing to do with power use, Dale said.

Global liquefied natural gas supplies were up by almost 10%, led by Australia, the U.S. and Russia, and while the growth in LNG was absorbed in the first half of the year, Asian spot prices fell back at the end of the year, Dale said, and there is the possibility of the first meaningful curtailment of some LNG supplies over the next few years.

### Renewables

Dale said renewable energy has come of age, with renewable power growing by 14.5%, slightly below its historic average.

China was again the largest contributor to renewable growth, surpassing growth in the entire OECD (Organization for Economic Cooperation and Development).

The cost of renewable energy is falling, he said, but the issue is literally the pace at which renewable energy can expand. In both China and India renewable energy increased by more than one-quarter, but power demand is growing even more rapidly. It's very hard to grow renewables fast enough to meet the growth in demand, Dale said, and coal is being sucked in as a balancing fuel.

—KRISTEN NELSON

Contact Kristen Nelson  
at [knelson@petroleumnews.com](mailto:knelson@petroleumnews.com)

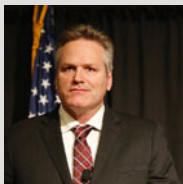


## RESOURCE DEVELOPMENT COUNCIL

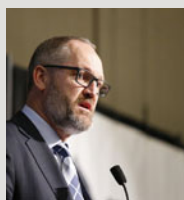
Growing Alaska Through Responsible Resource Development

# 44th Annual Membership Luncheon

Wednesday, June 26, 2019 | Dena'ina Center | Anchorage, AK



Welcoming Remarks  
Governor Michael J. Dunleavy



**Forging A Path Forward in the Nanushuk**  
Dr. Keiran Wulff, President, Oil Search Alaska LLC, Operator, Nanushuk Development  
Paul Ferneyhough, Executive Director for North America, Repsol, Partner, Nanushuk Development

continued from page 1

## RESERVOIR IMAGING

North America (e.g., Williston, Permian and Appalachian basins), Australia, South Africa and India.

Bhattacharya delivered a technical talk on “Integration of Tax-Credit 3-D Seismic, Wells, and Core Data for a Better Understanding of the Nanushuk-Torok Reservoirs,” May 31 at the technical breakout session at the state Geologic Materials Center in Anchorage. The session focused on the potential for new investigative technologies and machine learning systems to better assist geoscientists and resource companies to meet the challenges of interpreting Alaska geology.

“The Nanushuk formation is a thick fluvial-deltaic deposit, and the Torok formation is its basinward equivalent, mostly composed of sandstone and shale — and sometimes you’ll find coal in the Nanushuk,” Bhattacharya said. “The sandstone in the Nanushuk has been described by David Houseknecht (USGS) as coming from two different directions: it’s coming from the Siberian side from the Chukotsk Highlands ... and also we have the sand coming from the southern side of the Brooks Range which were deposited in different fashions.”

Bhattacharya said the Pikka discovery is in sands deposited along the shelf-edges; the basin-floor fan is the site of the discovery in Smith Bay by Caelus Energy.

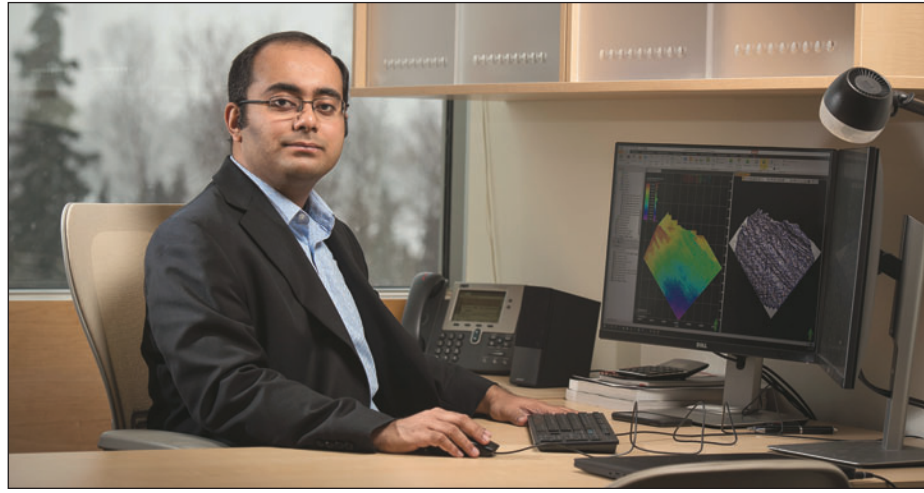
### Regular seismic data display not enough

“The goal of my work is to identify these reservoirs using the seismic, well logs and core data,” he said. “We need a combination of all these three data sources to identify the lithology, porosity and oil and for that we have to use multiple different technologies because seismic and core alone cannot do everything that we want; we may get sandstone, but we may not find the hydrocarbons in it that we are looking for.”

Bhattacharya employed 3-D seismic data released from the Alaska Department of Natural Resources, which was made public due to having been funded in part by the state’s tax credit program.

“I’m going to show you the interpretations from different seismic surveys, and some of these surveys cover the discovery wells such as the Horseshoe 1 discovery well and western portion of the Smith Bay,” he said, adding, “I have some petrophysical data from a few wells, and I will show you micro-CT (“computed tomography”) scan data from the core samples today.

“I will talk about the seismic data first to understand the regional features of the Nanushuk and Torok. Then, I will talk about the petrophysical data to understand the reservoir complexity and identify the oil-



Dr. Shuvajit Bhattacharya is an assistant professor of geophysics and petrophysics at the University of Alaska Anchorage.

saturated column in the rock. And then, I’ll show the micro-CT scan data to compute the effective porosity and fractures and use that for accurate reservoir estimates,” he said. “You cannot identify all the geologic features in the Nanushuk and the Torok formations using just one seismic survey. You have to use multiple seismic surveys to understand these formations at a regional scale and high-resolution, which may not be possible from some of the publicly available 2-D seismic lines, so I’m going to use three or four different 3-D seismic surveys and show you the results.”

Bhattacharya displayed a slide from the Horseshoe discovery in a cross-section from northwest to southeast, which featured the clinoforms as well as the Nanushuk and Torok intervals.

“The Nanushuk is expressed as the topset and the Torok and GRZ are the foreset and the bottomset,” he said.

“As a geophysicist, I’m more interested in the quantification of the reservoir, so I’ll show how we can use different types of seismic attributes to better understand the anomalies,” he said. “We computed a simple root mean square amplitude attribute ... we see all these anomalies on these clinoforms and we can map these anomalies in 3-D.

“We used some new attributes (such as coherent energy and similarity) that clearly show you the distribution of the high-energy sand bodies. You see two types of sand bars: one that’s along the shelf edges that continues for many miles, and also across the shelf-edge in the form of basin-floor fans with higher coherent energy anomalies.”

Bhattacharya said post-stack seismic amplitude anomalies, as regularly used in industry, must be calibrated and evaluated, “otherwise we might find water-saturated sandstone and that’s not what we are looking for — seismic amplitude anomalies have fooled us many times. We need to look at the pre-stack seismic data and calibrate that response with high-resolution well data.”

### Branching out

Seeking a regional scale, Bhattacharya took the study 50-60 miles or so northwest to the Smith Bay area, pulling up the north-east NPR-A 3-D seismic survey.

“It’s a really large seismic dataset,” he said. “We see both the low-stand and high-stand sand deposits, and we see the slumping of the sediment in the Torok.”

The study combined different types of seismic attributes together to better understand some of the geologic features.

“We see the nicely distributed sands along the shelf-edge and channels with high-amplitude anomalies, and we can see how this large canyon carved a deep area, transporting sand into a basin-floor fan,” he said.

“Sometimes you have the effect of the ice lakes and the permafrost on the seismic data that results in poor-quality subsurface imaging. ... At UAA we are working on some new types of algorithms to remove the effect of the ice lakes and permafrost from seismic measurements,” he said. “It is going to be very helpful for many of the operators up here.”

The study then proceeded to the Puviaq 3-D seismic survey, southwest of the north-east NPR-A survey.

“Here we see the sinuous channels, and if we look at the amplitude attributes we don’t have the anomaly all along the channels,” Bhattacharya said. “What it’s indicating is that your sand to clay ratio is changing along the channels; that’s important for your well drilling in the future.

“As a quantitative geophysicist, I get excited when I look at these channels on the seismic, so I wanted to understand or infer the thickness of the channels because that’s important to estimate the net pay and map it.”

Accordingly, the study moved to spectral decomposition testing on the Puviaq 3-D survey.

“You decompose the seismic data in three different frequency elements in the zone of interest; in each, the frequency cor-

responds to thickness; high frequency indicates a thin channel,” Bhattacharya said, adding that channels of varying thickness are present in the Nanushuk.

### Petrophysics; rock physics

The study included three wells in the area of the Horseshoe 1 discovery well, including advanced petrophysical analysis, assisted by well logs and core.

Many operators divide the Nanushuk in different zones, as many as six or more, Bhattacharya said.

In the seismic and well data he found that inside those zones were multiple sub-zones, in which the ratio of oil to water can be mapped. The ratio can vary from the top to the bottom of each zone. Oil is present in a few sub-zones only. Identification and mapping of these sub-zones at the sub-seismic scale is important. Therefore, it is critical to integrate the results from the seismic with advanced petrophysical logs such as spectroscopy and Nuclear Magnetic Resonance, NMR, and core data.

“On the NMR log display, you see there’s a bimodal amplitude distribution that is indicative of hydrocarbons. When you put a magnetic field close to fluid, the protons in the fluid will align to the magnetic field,” he said. “Cut off that magnetic field, the protons will go back to the original position. If we have oil, gas or water, we’ve got different relaxation times related to the precession behavior of protons.”

In viewing the core data from the Horseshoe 1 well core under regular light, “you see the interbedded nature of the sandstone-shale sequence in the Nanushuk, of course, you see the oil-stained reservoir,” he said. “If you look at the same core under UV light you can directly identify the oil saturated zones.

“One of the interesting things we see that’s interbedded nature of these sand-shale sequences affects your well log responses, reservoir properties, and accurate reservoir estimates,” he said.

Bhattacharya also mentioned that rock physical measurement of the compressional wave ( $V_p$ ) and shear wave ( $V_s$ ) velocities (or  $V_p/V_s$  ratio) is critical to identify the oil-saturated sandstone reservoirs. This would be very useful to upscale core and log data to seismic scale and map the prospective sand bodies at the regional scale.

### Pore visibility at the micron scale

“We wanted to go beyond the regular workflow for reservoir characterization using 3-D seismic, well-log, and limited core data. We wanted to see the pore space in the rocks,” he said, “So we did micro-CT scans of some of the wells in the Umiat and other areas.”

“Micro-CT scanning (“computed

see **RESERVOIR IMAGING** page 9



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continued from page 1

## INJECTION FACILITY

president for Alaska, said in November.

Both J-Pad and Moose Pad, which came online in June 2018 and in April of this year, respectively, already have polymer injection facilities.

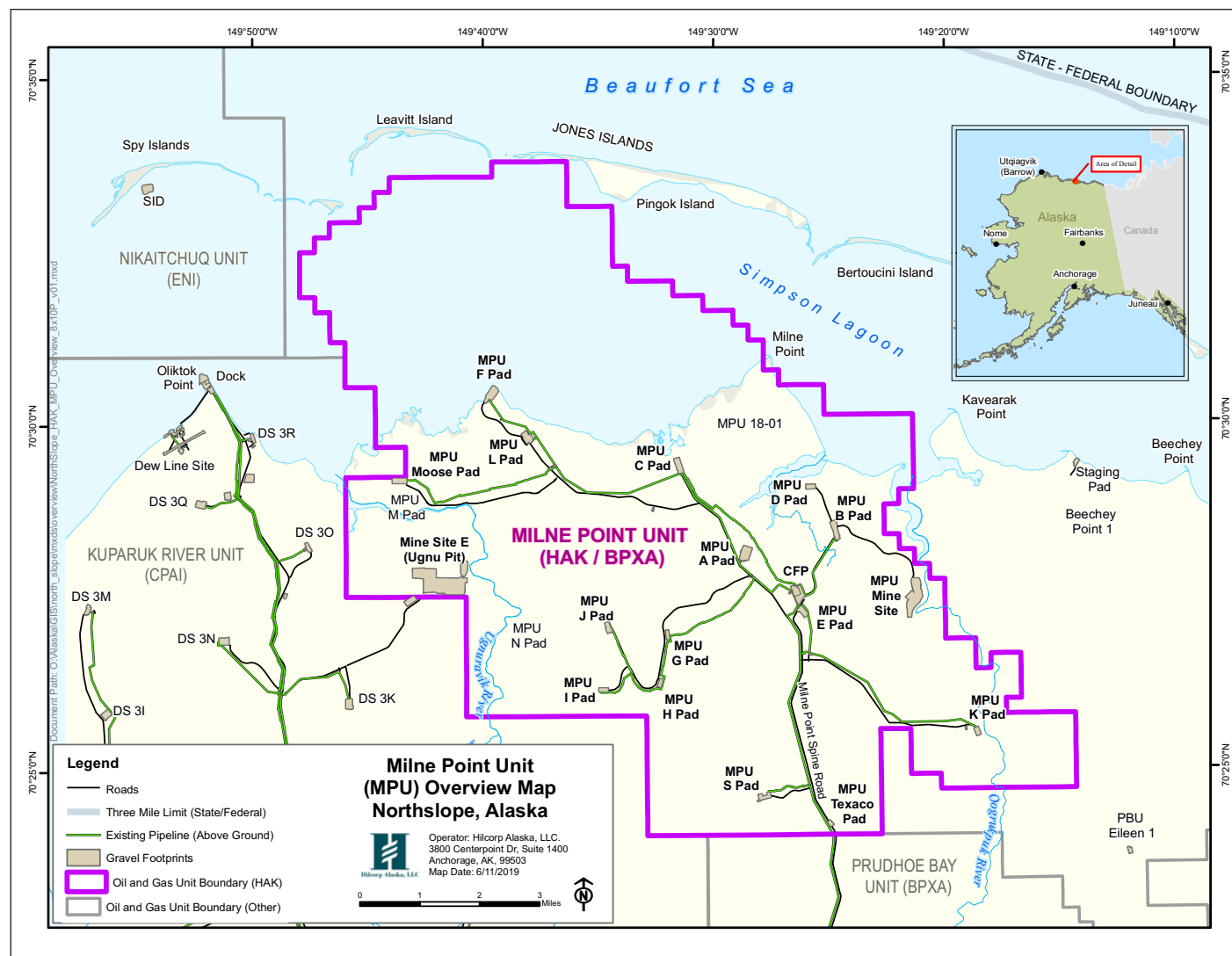
Using polymer, Hilcorp expects to increase crude recovery from 10 to 15% of the oil in place at Milne to as much as 50%, per slides Wilkins used in his presentation at the Resource Development Council of Alaska's annual conference in November.

In the amendment to the Milne Point unit's 37th plan of development, the Division of Oil and Gas described the scope of the F-Pad polymer project as a gravel expansion on the existing pad, an injection building, a high pressure water letdown building, a motor control center/utilities building and a polymer storage silo.

### Tapping into Schrader Bluff

The injection of polymer will be used to increase production from existing wells MPF-106, MPF-108 and MPF-110, which Alaska Oil and Gas Conservation Commission records show as tapping into the Schrader Bluff reservoir.

Plan activities involve the following: excavating gravel from permitted sources; placing and spreading gravel on the tundra while working from the existing gravel pad and road (the new gravel is to be level with the current pad); putting 30 foot long 6-inch thick rig mats on the pad; securing the portable modular units (injection building, high pressure water letdown building, the motor control center/utilities building and the polymer storage silo); installing self-standing exterior landings for module access; tying the new



facility into existing above-ground utilities; installing approximately 200 feet of new piping on new supports to tie in the three wells to the pump skid; connecting and installing electrical and instrumentation in the portable modular units; and putting in additional infrastructure and tie-ins as needed.

Milne produces mainly from the Kuparuk (light oil) and Schrader Bluff (viscous oil) reservoirs and will soon

again be producing from the Ugnu and Sag River (both viscous) reservoirs, per Hilcorp's 37th plan of development.

In December, total Milne Point output was 21,075 barrels per day, with light oil and viscous oil production split almost exactly in half, but as the field ages, Wilkins said, those percentages will change, and more viscous oil will be extracted.

In April, total oil production averaged 25,260 bpd, up 17.7% from April 2018.

### Big role on North Slope

Injecting polymer along with water into a reservoir for enhanced oil recovery, Wilkins said, is a technique that has a 30-year track record in other parts of the world but had not been tried on the North Slope until Hilcorp installed a small facility on J-Pad last year.

"I think it's going to play a big role on the North Slope," he said.

The company is planning for growth at Milne, he said, noting an oil processing plant that has since been built on the 14-acre Moose Pad and is capable of handling 85,000 bpd of fluids; the pad itself is designed to accommodate 25-plus producing wells (50 to 70 total wells), with peak oil output expected to be approximately 22,000 bpd.

Moose Pad is at the western edge of the Milne Point unit near the Kuparuk River field boundary.

Following on the heels of Moose Pad, which was the first new Milne pad since 2002, Hilcorp is planning to build another new pad in the unit, R-Pad, which would be south of or an extension of F-Pad.

### Started as a science project

The U.S. Department of Energy, University of Alaska Fairbanks, New Mexico Tech, Missouri University of Science and Technology, University of

North Dakota and Hilcorp are working together on the four-year pilot polymer flood program at J-Pad.

DOE's National Energy Technology Laboratory under the Office of Fossil Energy's Advanced Technology Solutions for Unconventional Oil and Gas Development is managing the program.

"The estimates of total heavy oil in place within the Alaska North Slope reservoirs amounts to about 20-25 billion barrels, with around two-thirds of the heavy oil lying under the adjacent Kuparuk River unit," NETL said at the start of the program. "Traditional water floods have yielded low oil recoveries while thermal, miscible fluids and gas injection methods are not applicable to this resource. Laboratory and simulation studies indicate that polymer flooding has great potential to enhance oil recovery from the Schrader Bluff heavy oil reservoirs. This field test will advance knowledge of heavy oil's production viability using polymer floods at ANS and across the United States. Success at this location will strengthen the viability of the Trans Alaska Pipeline System in the upcoming decade and improve royalty and other fees to the U.S. taxpayer."

Total cost-shared program funding from DOE and others at the time was approximately \$9.6 million.

According to Hilcorp there are approximately 1.3 billion barrels of viscous oil in the Milne Point unit.

Other North Slope operators BP, ConocoPhillips and Eni are also producing viscous oil from deposits in the Prudhoe Bay, Kuparuk River and Nikaitchuq units.

Operated by Hilcorp, the Milne Point field is owned 50-50 by Hilcorp and BP.

—KAY CASHMAN

Contact Kay Cashman  
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continued from page 7

## RESERVOIR IMAGING

tomography”) is an advanced non-destructive imaging technique that we can use to measure pore space in the rocks and fractures with the grain in 3-D ... for reservoir estimates and fluid flow simulations,” he said. “This is what we call digital rock physics; it’s one of the frontier areas of research now.”

The micro-CT scans of Umiat wells were displayed in video form.

The Umiat 1 well — a dry hole — had very few connected pores, compared to the Umiat 18 well. The size of the pores in the Umiat 1 well was too small to hold the hydrocarbon molecules, he said. In the Umiat 18 well, which had oil shows in the same reservoir, the technique indicated larger pore sizes of ~1 and 2 millimeters at places — good enough to hold hydrocarbon molecules, what’s more, the pores were connected to an extent, he said.

Bhattacharya moved on to an example of pore connectivity in the Torok formation, which exposed many fractures in multiple directions which help to understand the reservoir compartmentalization and mechanical issues that guide

development planning.

“You will not be able to see any of these things if you just view the cores,” Bhattacharya said. “You have to do advanced imaging to see any of these things.”

What’s more important is the meaningful integration of multi-scale data for imaging and characterizing these complex reservoirs, he said. And, this has to be done quantitatively to make informed data-driven decisions.

—STEVE SUTHERLIN

Contact Steve Sutherlin at [stevepna@hotmail.com](mailto:stevepna@hotmail.com)



## Oil Patch Bits



### RDC to hold its 44th annual membership luncheon

The Resource Development Council announced June 3 that it will hold its 44th annual membership luncheon on June 26 at the Dena’ina Center in Anchorage. This year’s keynote speakers are Dr. Keiran Wulff, president of Oil Search Alaska LLC and Paul Ferneyhough, executive director for North America, Repsol. They will address Forging a Path Forward in the Nanushuk.

The program will also feature Kate MacGregor, acting deputy secretary, U.S. Department of the Interior, with welcoming remarks by Gov. Michael J. Dunleavy (invited).

The RDC annual membership luncheon is one of the largest business events held in Alaska. For more information visit <https://www.akrdc.org/annual-membership-luncheon>.

### Lynden Chairman Jim Jansen receives award

The Alaska Aviation Museum presented Lynden Chairman Jim Jansen with a Lifetime Achievement Award recently and inducted him into its Hall of Fame. The annual Hall of Fame event celebrates pilots and entrepreneurs who have shaped Alaska’s aviation history.

Jansen earned his pilot’s license in 1965. In 1967, he was driving a truck at the remote Kennecott mine and also flying people and supplies from Anchorage to the mine in a Piper Comanche. Over the past 50 years, he has flown various aircraft including the Stinson 108-3, Cessna 185, Beech Baron, Turbo Commander and King Air in Alaska. He is also type rated in the Lockheed Hercules. A 16,500-hour ATP rated pilot, Jansen has flown his Cessna 185 for 41 years and the Lynden King Air for the past 22 years. The creation of Lynden Air Cargo in 1995 combined Jansen’s love of aviation with his vision of a multi-mode transportation company in Alaska.

“The Alaska Aviation Museum greatly appreciates the tremendous contributions Jim Jansen has made to Alaska’s aviation, transportation and infrastructure development and welcomes him into the Hall of Fame,” said board member and past President Bill Odom.

### Foss welcomes new chief financial officer

Foss Maritime Co. announced June 4 that former vice president of finance at Esterline Technologies, Mike Welch, has joined the company as chief financial officer. Welch will lead the

company’s financial functions and performance while supporting the organization’s long-range strategic goals.

Prior to joining Foss, in his role as VP of finance at Esterline Control & Communication Systems, Welch oversaw the financial performance of five business units, managing roughly \$350 million in sales. He led a team of nearly 40 people including five direct reports. In his fifteen years with Esterline Welch took on numerous roles. As the VP of finance, he helped develop and implement new strategies and programs, resulting in improved profitability.

“I’m really looking forward to having Mike on our team,” said John Parrott, president and CEO of Foss Maritime. “We were impressed with his work at Esterline and are excited to have him on board.”

Along with a commitment to safeguarding company financials while building and supporting strong teams, he is also focused on operating with the customer in mind.

### Arctic Slope Regional Corp. ad campaign wins Emmy Award

Arctic Slope Regional Corp. said June 9 that it is honored to have won an Emmy Award from the Northwest Chapter of the National Academy of Television Arts & Sciences for its 2018 television commercial campaign, featuring the communities of Anaktuvuk Pass, Kaktovik and Nuiqsut. The 56th-annual award ceremony was held June 8 in Seattle, Washington.

“These beautiful commercials highlight the fact that while ASRC continues to diversify and expand its operations, our home is in Alaska and we continue to be guided by our Iñupiaq values and the lessons from our elders,” said Rex A. Rock Sr., ASRC president and CEO. “I’d like to thank Fenton Rexford, Catherine Edwards and Archie Ahkiviana for their involvement and to our external affairs team for putting the commercials together. I’m really pleased to see they’ve been so well-received.”

This is the third Emmy for the corporation. Last year, the corporation won an Emmy for its long-format documentary “True North, the Story of ASRC”, which aired statewide in 2017. ASRC also won an Emmy for its commercial campaign in 2015.

*Editor’s note: Some of these news items will appear in the next Arctic Oil & Gas Directory, a full color magazine that serves as a marketing tool for Petroleum News’ contracted advertisers. The next edition will be released in September.*

# Companies involved in Alaska’s oil and gas industry

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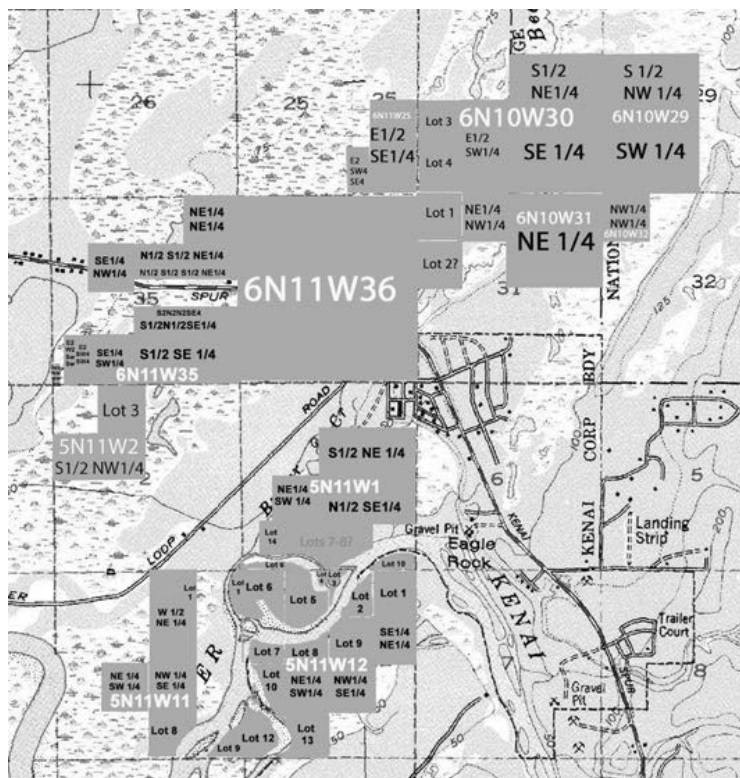
## Beaver Loop Road Area

Township 5 North, Range 11 West (Surveyed)  
 Section 1, Lots 6-8, 10, 14, S1/2NE1/4,  
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 Section 2, Lots 3 and 6, S1/2NW1/4.  
 Section 11, Lots 1, 8, 9, W1/2NE1/4,  
 NW1/4SE1/4, NE1/4SW1/4;  
 Section 12, Lots 1-13, NE1/4SW1/4,  
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 Containing 1,063.51 acres, more or less.

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 E1/2SW1/4SW1/4,  
 E1/2W1/2SW1/4SW1/4,  
 W1/2SW1/4SW1/4SW1/4, SE1/4SW1/4,  
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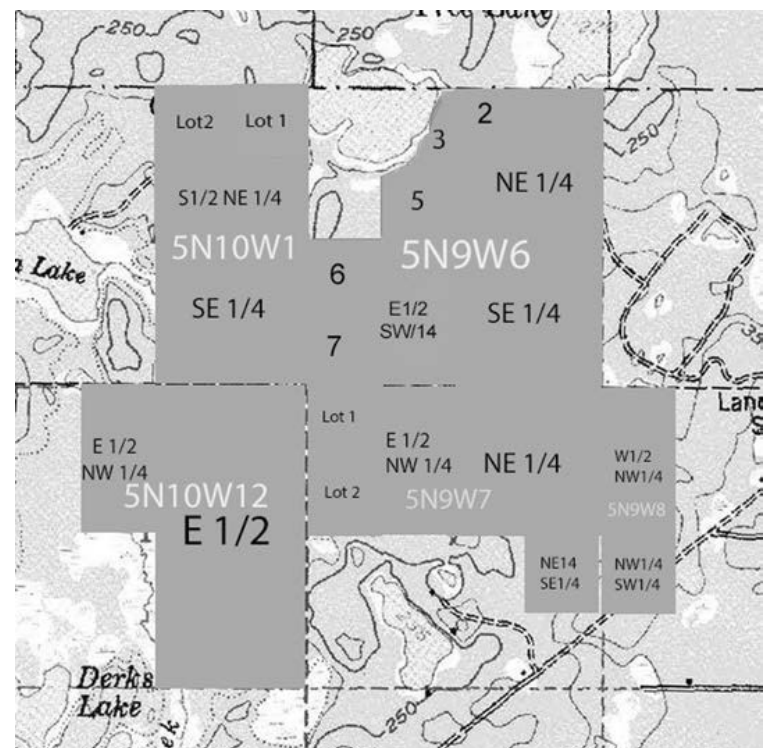


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 Containing 718.96 acres, more or less.

Aggregating 1,645.19 acres, more or less.



**These fee mineral rights have significant known hydrocarbons on or very near them. This prospect is not in a remote area. Everything is road accessible, winter and summer, with easy access to oilfield suppliers. Seismic data available.**

**Terms: \$3,000/acre, 25% royalty.**

**For more details contact Wolfpack Land Company, Houston, Texas, at [jim5thgn@outlook.com](mailto:jim5thgn@outlook.com), [jim@applecapital.net](mailto:jim@applecapital.net), or (907) 394-9148.**

continued from page 1

## ALKAID FIELD

facility can be permitted and completed.

The year-round operation of these three or four wells, from which Pantheon expects to produce about 1,500 barrels of oil per day each, will involve working with various state agencies and the U.S. Army Corps of Engineers to determine if this will be permitted at this phase of Alkaid's development.

"The opportunities of being directly under the Haul Road and the trans-Alaska pipeline system allows us to take advantage of this early production and year-round operation to avoid the restrictions that are common in Alaska — not just weather restrictions and ice road restrictions but seasonal restrictions," Michael Duncan, Pantheon's vice president of operations, said in the webcast.

### Alkaid, Phecda update

The focus of the June 6 release was a recoverable resource upgrade following completion of the petrophysical analysis and recent winter season flow-testing of the Alkaid No. 1 well, which was drilled in 2015 by Great Bear, but was never tested because of flooding on the Dalton Highway. The company had previously carried out an extensive program of 3-D seismic surveying in its acreage and had identified several oil prospects, including the Alkaid. The subsequent suspension of payments of state exploration tax credits under the administration of former Gov. Bill Walker resulted in a pause in Great Bear's exploration program.

Some of the June 6 information was previously released by Pantheon, including the fact that results from the Alkaid well had "positive implications" for the adjacent Phecda prospect, upgrading a planned exploration well there as a step out appraisal for the Alkaid discovery.

The Alkaid and Phecda prospects have been remapped, Pantheon said, which included merging in additional 3-D seismic shot subsequent to drilling. Remapping indicated Alkaid and Phecda are part of the same structural accumulation.

Combining the two prospects, P50 recoverable reserves have been increased from 59 million barrels of oil to 90-135 million barrels, Pantheon said.

The combined oil in place estimate was upgraded by the company by approximately 50%, increasing from 595 million barrels of oil to 900 million barrels.

The recovery factor for the two projects was increased from 10% pre-drill to a range of 10-15%. Pantheon said secondary recovery techniques such as waterflooding, which have been successfully applied to other Brookian accumulations on the North Slope, boost recovery factors as much as 40%.

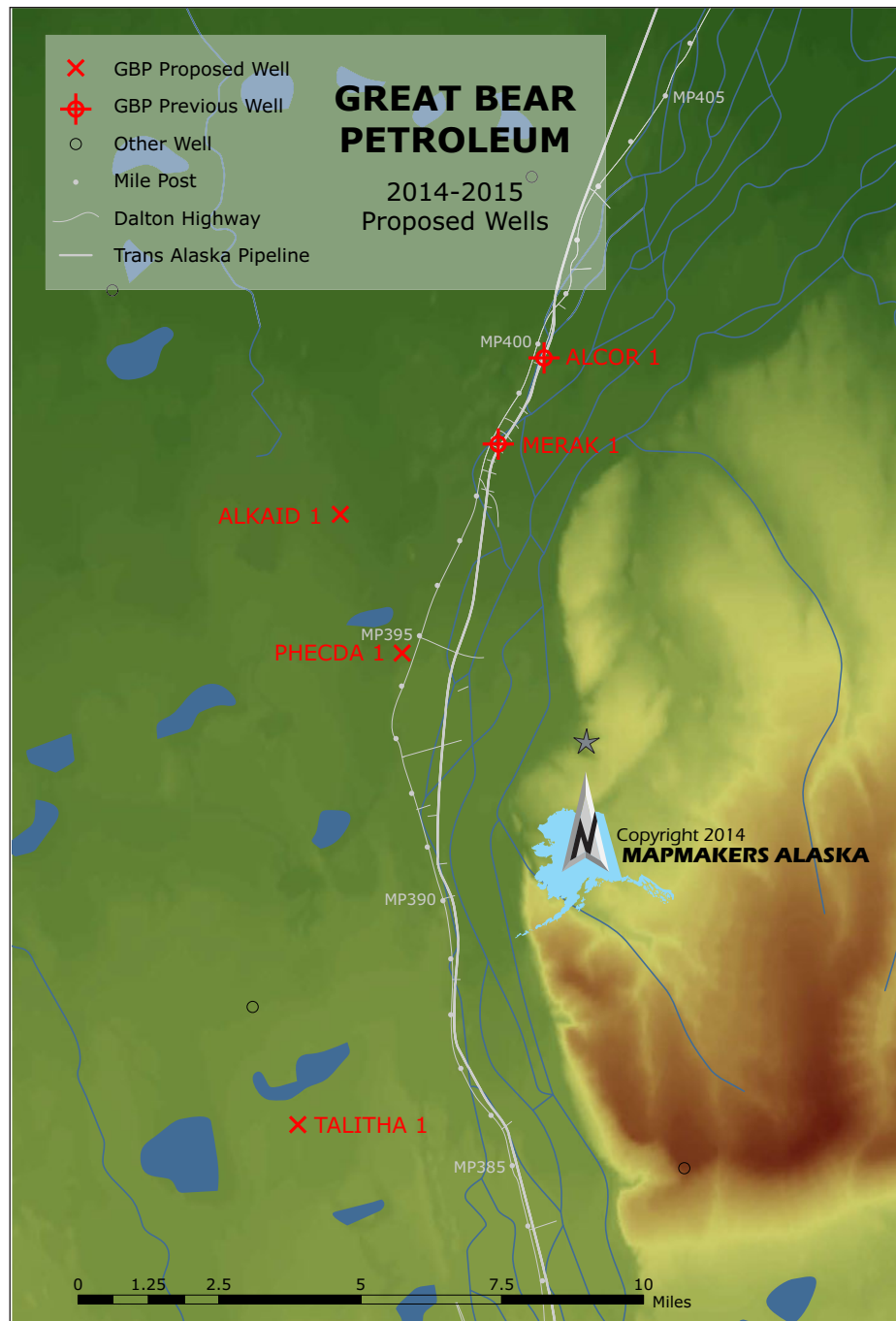
However, "for conservatism" Pantheon said it was too early to model such secondary recoveries into its base case "given such techniques have not been applied at Alkaid."

### Light, high quality oil

After first-quarter testing, the company confirmed the Alkaid well as an oil discovery in the primary target, the Brookian, at an 8,100-foot depth, flowing 80-100 barrels per day of high quality, light oil (40 API) from a 6-foot perforated interval within a 240 foot interval of net pay.

This result, Pantheon said, was "considered of great importance" because the Brookian "is the same formation that is at the heart" of recent major North Slope discoveries by Armstrong Energy, Repsol, Oil Search and ConocoPhillips.

Pantheon has several other Brookian prospects on its acreage.



Many of the Great Bear wells and prospects on this map (some locations have changed) are still of interest to Pantheon in 2019. The Alkaid No. 1 well was drilled in 2015 by Great Bear but not flow-tested until Pantheon had it done in the first quarter of 2019.

The company said Alkaid testing "confirmed the efficacy" of its high-tech geophysics analysis in modeling the Brookian — "important because the application of high-tech geophysics has been central" to the other recent major Brookian discoveries on the North Slope.

Alkaid No. 1 was drilled as a vertical test well with the objective of verifying the presence of the oil reservoir and gathering data and was not drilled to maximize production from the wellbore.

Furthermore, the well was on the edge of the reservoir and seismic shows improved reservoir characteristics moving towards the heart of the reservoir, the company said.

"Given how good our data was from this off-structure well, we're extremely excited about the potential when we move to the heart of the reservoir," Pantheon CEO Jay Cheatham said during the webcast.

Future development wells will be drilled horizontally and fracked, typical for Brookian developments on the North Slope, which "should result in vastly improved flow rates" than that of the test well, Pantheon said.

"The board believe that, in a success case, a modelled P50 well is estimated to have an estimated ultimate recovery in the range of 1.5-2.5 mmbo and an estimated potential maximum flow rate per well exceeding 1,500 barrels of oil per day."

### Boosts confidence in Talitha

The Alkaid results have also increased Pantheon's confidence in another of its Brookian prospects to the south, Talitha.

The company has said it will drill an exploratory well at Talitha in the 2019-20 off-road winter drilling season. The well will be near the Pipeline State No. 1 discovery well that was drilled in 1988 by ARCO, predecessor to ConocoPhillips.

"They didn't have 3-D at the time. Drilling technologies weren't as advanced

as they are today," Bob Rosenthal, Pantheon's technical director, said in the webcast.

"ARCO drilled the well looking for a thick, clean sand and instead found a thick zone of interbedded, laminate-type sands and shales. The sands were oil-bearing but at the time given the ... \$10 price of oil and the fact completion technology wasn't as advanced as it is today, the well was plugged and abandoned. ... With today's horizontal drilling technology we believe we have a significant discovery" at Talitha, he said.

### Alaska team tackling Texas challenges

Pantheon's main U.S. subsidiary is based in Texas, where the independent has acreage in the Eagle Ford sandstone, Austin Chalk, Wilcox and Navarro plays.

The focus of the company has recently been on Alaska, "principally because of the

requirement to achieve our objectives during the 2018-19 winter drilling season," Pantheon said in its June 6 press release.

However, East Texas "remains a core asset."

The area has "abundant nearby infrastructure and successful wells can be brought onstream and generate cashflow rapidly," Pantheon said.

The Great Bear acquisition provided the company with "a world class technical and operational team" with experience in U.S. oil and gas operations.

The new team has started a full and comprehensive technical review of the geology and operations of Pantheon's East Texas prospects, which had previously been operated by Vision.

In January, Pantheon reached an agreement with Kaiser Francis and associated limited partners to acquire controlling interest in Vision Gas and Vision Resources.

Under Vision's operatorship, six wells had been drilled in the East Texas acreage, all of which encountered "potentially significant hydrocarbons," Pantheon said. "Each however, suffered a variety of different operational issues which hampered" their success "and masked the underlying potential of those locations."

Since obtaining control of Vision, Pantheon has parted ways with Vision's operational team, and has tasked its new Alaska technical and "highly experienced operational team" to review and make recommendations for the Texas acreage.

### Seeking partner for Alaska

Founded in 2005 and listed on the AIM Stock Exchange, a sub-market of the London Stock Exchange, Pantheon is looking for a partner to "contribute a material up-front cash contribution towards sunk cost for entry into the project," together with an element of "carry," under which the farminee would fund part of Pantheon's development costs.

To date more than US\$80 million has been invested in seismic with over \$200 million "total sunk cost into the Alaskan project," Pantheon said.

The company's preliminary modeled Net Present Value10 per barrel of oil in the ground range was estimated at \$7-\$12.

Alaska North Slope oil trades at a premium to West Texas Intermediate and in the current environment, "we estimate a net back of c.\$55 per barrel of oil, after all transportation and pipeline charges."

Anchorage-based Patrick Galvin, former commissioner of the Alaska Department of Revenue and Great Bear's chief commercial officer and general counsel, assumed a similar title and duties with Pantheon Alaska, and is the company's top executive in Alaska. ●

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continued from page 1

## 88 ENERGY WELL

Commission when the well design is finalized, Opstad said.

Also in the Western Play Fairway, 88 Energy recently picked up 10-year leases from Arctic Slope Regional Corp. in the Heavenly prospect (see map), which is where Phillips Petroleum drilled the Heavenly No. 1 discovery well west of White Hills in 2002.

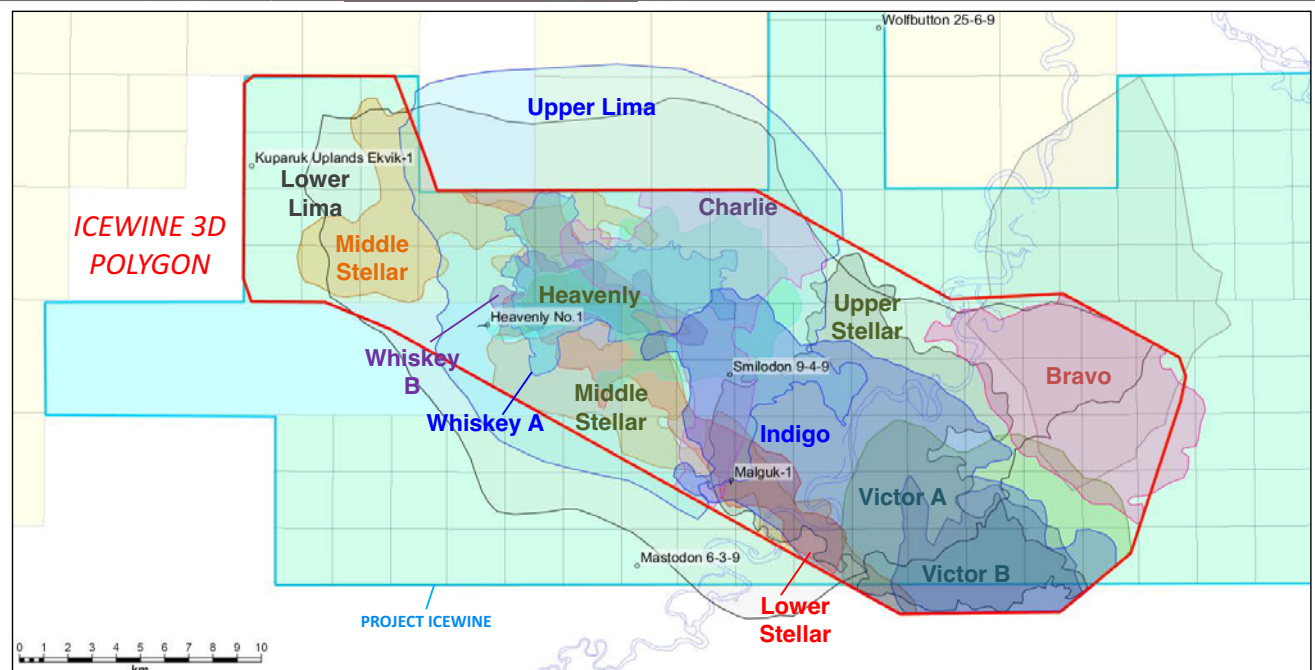
In a recent presentation, 88 Energy shows Heavenly's Torok discovery as having as much as 120 million barrels of oil, a low of 22 million barrels, a gross mean of 68 million barrels and a net mean to the company of 58 million barrels.

In its Alaska update at the end of May, the company said "good progress has been made on integration of the Winx-1 well results into the existing 3-D seismic volume. Additional data, that will aid in the evaluation process for the Western Block, has been identified. The forward program will be to access this data and reprocess and reinterpret the 3-D seismic." 88 Energy anticipated having all the evaluation work finished before the end of the year.

### Project Icewine, Yukon Gold

88 Energy said that finalization of advanced analysis using state-of-the-art technology has significantly advanced the joint venture's understanding of the nature of their HRZ play, noting that analysis has "confirmed that the HRZ is an excellent source rock with good potential as an economic shale play. The nature of the dominant kerogen in the HRZ has been demon-

## Project Icewine: Western Play Fairway Conventional Prospectivity



- Western Play Fairway ~2.4 billion barrels of gross oil resource potential matured on modern Icewine 3D data (mean unrisked)
- 1.9 billion barrel net to 88 Energy (mean unrisked)
- Reservoir quality de-risked via VpVs; AVO support – multiple drillable prospects
- Extensive hydrocarbon shows on acreage, bypassed pay and oil fields on trend – Tarn, Meltwater
- Project Icewine Conventional Farm-out negotiations ongoing with preferred bidder

strated to be prone to more rapid transformation into hydrocarbons than other shales initially used for comparison. This means that the thermal maturity window for volatile oil in the HRZ is at lower temperature than that typically seen in other plays."

To the east, the latest news on 88 Energy's Yukon leases has not publicly

changed, in that discussions have been initiated by the company with nearby lease owners to "optimize the monetization strategy for existing discovered resources" in the vicinity.

88 Energy's Yukon leases contain the 86 million-barrel Cascade prospect, which was intersected peripherally by the Yukon

Gold No. 1 well, drilled in 1994 by BP, and classified as an historic oil discovery. Near the border of the ANWR 1002 area, the leases are close to recently commissioned infrastructure. ●

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continued from page 1

## ALBERTA BATTLE

"We aren't building (oil) pipelines and we have LNG opportunities off our (Atlantic and Pacific) coasts that have been sitting idle for close to a decade," McMillan said, noting that a "very organized campaign" has been mounted in the United States, Europe and elsewhere "to limit investment" in Canada's energy sector.

### Long list of issues

While many observers doubt the strategy will have much success in swaying public opinion, the list of issues to tackle

*What the two Enbridge pipeline issues demonstrate is the full agenda facing Kenney's "war room," even though neither falls within the clear mandate of that office.*

is long and growing.

Two more pipeline projects — Enbridge's Line 3 and Line 5 — have been dealt damaging blows in June, while the Canadian Parliament is on the verge of passing Bill C-48, which would impose a moratorium on oil tankers operating off the northern coast of British Columbia, and Bill C-69, to overhaul the regulatory process for major resource

ventures.

The Minnesota Court of Appeals ruled that the Minnesota Public Utilities Commission acted in a manner that was unsupported by "substantial evidence" last year when it approved Line 3, which is designed to replace an aging transportation link to Superior, Wisconsin, and double capacity to 760,000 barrels per day of oil sands bitumen in the second half of 2020.

Line 3 was seen as the best bet to increase access to U.S. markets for oil sands production ahead of Keystone XL, operated by TC Energy (formerly TransCanada), and the Trans Mountain expansion by its owner, the Canadian

government.

It is the biggest undertaking by Enbridge since it started shipping crude to the U.S. in 1953, with a budget of C\$5.3 billion for the Canadian portion and US\$2.9 billion for the U.S. section.

### Line 5 issues

Line 5 is a planned 645-mile replacement connection carrying 545,000 bpd from Superior to the refinery region of Sarnia, Ontario.

On June 5, Enbridge got a warning from the state of Michigan to fix a date for shutting down its old line within two years, or face legal action, even though Enbridge has set a 2024 target date for installing a new, underground line.

Enbridge immediately said it would take legal action against Michigan, infuriating Gov. Gretchen Whitmer, who said it is now "abundantly clear that Enbridge ... is only interested in protecting its bottom line," issuing a reminder that Enbridge's Line 6B ruptured in 2010, spilling diluted bitumen into a tributary of the Kalamazoo River.

As a follow up to what was one of the largest inland oil spills in U.S. history, Enbridge reached an agreement with the previous state government to build a C\$500 million tunnel to house a replacement section of Line 5.

Guy Jarvis, Enbridge's executive vice-president for liquids and pipelines, said the timeline set by Whitmer is one his company "cannot possibly" comply with.

Enbridge is now asking the Michigan Court of Claims to affirm that its previous agreement is valid and enforceable.

What the two Enbridge pipeline issues demonstrate is the full agenda facing Kenney's "war room," even though neither falls within the clear mandate of that office. But they will be a chance for the Alberta undertaking to show its teeth. ●

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