



Dunleavy sworn in in Kotzebue; Tangeman named to head Revenue

Mike Dunleavy was sworn in as Alaska's 12th governor in Kotzebue Dec. 3, along with Lt. Gov. Kevin Meyer. The swearing in had been planned for Noorvik, but fog there caused a change of plans. First Lady Rose Dunleavy is from Noorvik.



GOV. MIKE DUNLEAVY

The Alaska Constitution requires that the governor be sworn in by noon on the first Monday in December, so the swearing in was held in Kotzebue, where the plane could land. The governor's party flew to Noorvik later once the weather cleared, then back to Anchorage; they later

see DUNLEAVY SWORN IN page 6

Earthquake interrupted oil and gas operations; no damage reported

With responses to the major earthquake in Southcentral Alaska on Nov. 30 demonstrating the level of preparedness and resilience in Alaska to an event of this magnitude, impacts on energy industries and energy supplies appear to have been mainly local rather than systemic.

Hilcorp: temporary shutdown

Hilcorp Alaska, which operates much of the oil and gas infrastructure in the Cook Inlet region reported no damage to its facilities as a consequence of the earthquake. Hilcorp spokeswoman Lori Nelson told Petroleum News in a Dec. 3 email that there had been no spills or injuries. Following the earthquake, Hilcorp

see EARTHQUAKE IMPACT page 8

Purpose of North Slope methane hydrate well is long-term testing

The U.S. Department of Energy has announced that a new methane hydrate test well being drilled on the North Slope will be fitted with temperature and acoustic monitoring devices to support potential long-term field experiments. The idea is to build on previous methane hydrate research conducted in the United States, Canada and Japan. The new well is designed to address the next critical step in this research: conducting field experiments of sufficient duration to determine how the depressurization of a methane hydrate reservoir can release natural gas from the hydrate, DOE says.

Drilled from existing pad

As previously reported in Petroleum News, BP is drilling the new test well from a small, existing gravel pad, adjacent the

see HYDRATE WELL page 12

Revenue's forecast preliminary pending review of oil markets

Sheldon Fisher, the outgoing Walker-administration Department of Revenue commissioner, released a preliminary fall revenue forecast Dec. 3, but said issuance of the Fall 2018 Revenue Sources Book has been delayed so the department can review recent oil market developments and the impact on the oil price forecast.

The final fall forecast and the Fall 2018 Revenue Sources Book will be released in advance of the mandated Dec. 15 deadline for release of Gov. Mike Dunleavy's proposed budget, the department said.

The preliminary forecast shows Alaska North Slope crude oil prices averaging \$76 per barrel for fiscal year 2019, which ends in June, and \$75 per barrel for FY 2020, which begins in

see REVENUE FORECAST page 9

EXPLORATION & PRODUCTION

Resource uncertainties

Houseknecht reviews knowns, unknowns of new Nanushuk/Torok oil play

By ALAN BAILEY
Petroleum News

Recent major new oil discoveries in the Nanushuk and Torok formations on the North Slope have included the Pikka discovery being pursued by Oil Search and its partners; ConocoPhillips' Willow discovery; and the oil discovery by Caelus Energy Alaska at Smith Bay. But what is the nature of these discoveries, and how much potential is there for further major finds in these exciting new plays?

On Nov. 14, during the Resource Development Council's annual conference, Dave Houseknecht, a U.S. Geological Survey expert on northern Alaska



DAVE HOUSEKNECHT

petroleum geology, talked about what is known about the discoveries and what this may mean in terms of the potential for further major oil finds.

Houseknecht said that USGS has estimated that there may be more than 8 billion barrels of undiscovered, technically recoverable oil in the new Nanushuk and Torok plays, but that many unknowns remain at this stage in the exploration and development of the plays.

"The bottom line here is that we estimate that there's a lot of oil in these plays," Houseknecht said. "However, we have a large uncertainty range around that."

see HOUSEKNECHT REVIEW page 12

UTILITIES

MOA approves ML&P sale

The next step will be to file the purchase agreement with RCA for its approval

By ALAN BAILEY
Petroleum News

During its meeting on Dec. 4 the Anchorage Assembly, in a unanimous vote, authorized the sale of electric utility Municipal Light & Power to Chugach Electric Association. The authorization was based on sale terms which have been negotiated between the Municipality of Anchorage and Chugach Electric since the Anchorage electorate voted in April to allow the municipality to proceed with the proposed sale of ML&P.

The next step will be for the municipality and Chugach Electric to sign the purchase agreement and related documents — the Chugach Electric board has already authorized Lee Thibert, the utility's CEO, to

After the April vote to allow the proposed ML&P sale to proceed, the municipality and Chugach Electric entered negotiations to refine and finalize the terms of the deal.

sign off on the deal. The terms of the deal will be filed with the Regulatory Commission of Alaska in the first quarter of 2019. Regulatory approval by the RCA could take six to nine months to complete, with the deal expected to close in the fourth quarter of 2019 or early in 2020, Chugach Electric says.

"We appreciate the hard work and diligence of

see ML&P SALE page 10

GOVERNMENT

Alberta spreads the pain

Notley imposes first oil production cuts in Canadian history; companies unhappy

By GARY PARK
For Petroleum News

Alberta Premier Rachel Notley, with the full backing of her political rivals, has gone where no previous provincial government has ventured, ordering a cut of 325,000 barrels per day of oil production in a desperate effort to shrink the crude price differential that is plaguing the industry.

"We must act immediately and we must do it together," she said in a nationally televised speech on Dec. 2.

While conceding the decision was "very difficult," she argued that "when markets aren't working ... then we have a responsibility to act. This is a critically important matter for Canada's economy, not just Alberta's economy."

The mandated reduction will start in January, low-



RACHEL NOTLEY

ering output by 8.7 percent, although the government estimates the number will drop to 95,000 bpd in the first quarter and continue at an unknown level until Dec. 31, 2019.

It will affect about 25 producers, but exempt companies that produce less than 10,000 bpd.

Initial objective

An initial objective is to eliminate 35 million barrels of crude currently in storage and end the surplus of 190,000 bpd of raw crude oil and bitumen that Alberta is unable to send to United States and offshore markets because of bottlenecks in pipelines and continued delays in the Keystone XL and Trans Mountain expansion projects.

see PRODUCTION CUTS page 11

AOGCC approves Northstar gas injection

Hilcorp plans to start injecting gas into the Kuparuk sands to push up oil production from that part of the Beaufort Sea field

By ALAN BAILEY
Petroleum News

The Alaska Oil and Gas Conservation Commission has approved Hilcorp Alaska's request to allow the injection of natural gas into the Northstar field's Kuparuk oil pool for enhanced oil recovery. In its order, issuing the approval, the commission said that reservoir modeling showed that gas injection would result in a substantial enhanced oil recovery benefit; that the maximum injection pressure would be well below a level that might cause fractures in the subsurface rocks; and that there are no underground drinking water sources that might be impacted.

The Northstar field is operated from a gravel island offshore in the Beaufort Sea, with the unit straddling state nearshore waters and waters of the federal outer continental shelf.

Since production started in 2001 oil has come from a reservoir in the Ivishak formation, equivalent to the main reservoir of the Prudhoe Bay field. However, in 2006 BP, the then field operator, began testing production from the

shallower Kuparuk sands. Sustained Kuparuk production began from a single well, the NS-08, in 2010.

Four production wells

Hilcorp continues to produce oil from the Ivishak but now produces from Kuparuk sands through four wells, the NS-08, the NS-13, the NS-15 and the NS-18. There are two Kuparuk sand units involved: the Kuparuk A and the Kuparuk C, with the C sands lying above the A sands and the sands appearing to be pressure isolated from each other. The A sands contain a gas-condensate cap over an oil rim, while the C sands only contain gas condensate. The sands lie in a four-mile by two-mile, east-southeast to west-northwest trending, faulted anticline.

To date, gas produced from the Kuparuk has been injected into the Ivishak for enhanced oil recovery. In fact, this injection of gas into the Ivishak has restored the reservoir pressure in the Ivishak to a level close the reservoir's original pressure. This phenomenon has in turn resulted in an increase in the proportion of oil to water in production from the Ivishak, Hilcorp has told the commission.

Opportunity for gas production

But now, with more than enough gas being produced to support Ivishak production, the opportunity has arisen to start injecting gas into the Kuparuk, to increase Kuparuk oil production. Initially Hilcorp plans to convert the NS-18 for Kuparuk gas injection, but there may be further developments in the future involving the drilling or sidetracking of new wells.

The peak gas injection rate could reach 120 million cubic feet per day, with individual wells injecting at rates between 50 million and 80 million cubic feet per day. Primary oil recovery from the Kuparuk is estimated at 9 million barrels.

Gas injected at a rate of 50 million cubic feet per day could elevate oil recovery to 13 million barrels, while injection at 80 million cubic feet per day could result in recovery of 14.6 million barrels, Hilcorp has estimated. ●

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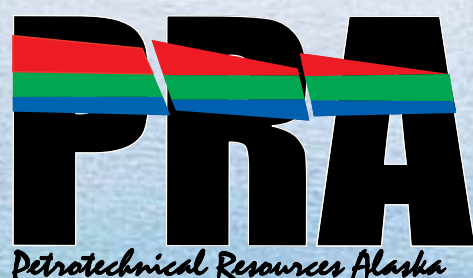
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• ENVIRONMENT & SAFETY

Feds test Arctic oil-spill-mapping robot

Department of Homeland Security working on underwater robot to help Coast Guard map oil spills under ice providing real-time data

By KRISTEN NELSON
Petroleum News

The U.S. Department of Homeland Security's Science and Technology Directorate has been working for four years on an underwater robot to help the U.S. Coast Guard map spills under ice. With the Arctic changing — ice receding and maritime activity increasing — DHS is the lead agency in planning for and responding to environmental threats under the National Oil and Hazardous Substances Pollution Contingency. The Coast Guard falls under DHS.

"Because of ice coverage and the tyranny of distance, it is difficult to get resources and assets up in the Arctic in a quick manner," Kirsten Trego, executive director of the Coast Guard's Interagency Coordinating Committee on Oil Pollution Research said in a Dec. 4 release. "With better real-time data, more effective response strategies can be developed and deployed."

With that end in mind, the DHS Science and Technology Directorate has been working on an underwater robot through a DHS Center for Excellence, the Arctic Domain Awareness Center at the University of Alaska Anchorage. The work is in partnership with the Woods Hole Oceanographic Institution and Monterey Bay Aquarium Research Institute.

Importance of mapping

"When S&T created ADAC, the Coast Guard specifically noted the importance of mapping oil spills in the Arctic as a research priority," said S&T Program Manager Theo Gemelas.

The robot is called the Tethys Long Range Autonomic Underwater Vehicle. DHS said it is helicopter-portable, a torpedo-shaped system with oil sensors and navigation capabilities. The robot can provide real-time data for first responders, the department said. It produces and transmits three-dimensional maps of crude oil, diesel, gasoline and kerosene spills.

The Arctic Domain Awareness Center, ADAC, recently tested the technology in California. More tests this year and next — including under-ice tests — are planned.

Work began in 2015

DHS said the idea for the Tethys Long

DHS said the target for testing is a large lake in New Hampshire, the Eastern Great Lakes or Alaska during the winter season.

Range Autonomic Underwater Vehicle, LRAUV, was born out of the limited abilities to measure the spill from the 2010 Deep Water Horizon in the Gulf of Mexico.

Work began on LRAUV in January 2015.

Compared to limited measurement abilities in 2010, DHS said the LRAUV can rove for 15 days and travel for 373 miles without recharging batteries. The latest prototype can travel 2-4 feet per second (1-3 miles per hour).

The LRAUV is 8 feet long, 12 inches wide and weighs 240 pounds.

It would work in tandem with buoys installed on the ice to provide information about a spill.

"This vehicle is the first of its kind. We haven't previously been able to characterize oil spills with an underwater vehicle

under solid ice pack," said ADAC Executive Director retired Major General Randy "Church" Kee.

Response capabilities

DHS said the technology opens up Coast Guard response capability. In the case, for example, of a large oil spill in the Russian Chukchi Sea with the spill drifting into U.S. waters, the Coast Guard could quickly mobilize a team to deploy the LRAUV, monitoring data transmitted from the robot at their command center. DHS said the robot would scan for oil "below and around the ice" and transmit via specially installed buoys.

The buoys, equipped with very high frequency antennas to transmit data via satellites, are important because there is no cellular coverage over the Arctic. In addition to transmitting data, the buoys would provide solar or wave power to recharge the robot's batteries.

"Solar power units are increasingly very sensitive," Kee said. "Even in dark conditions and snow-laden environments, solar panels can still capture light reflected

from the ice."

Testing

ADAC conducted an open-water test of the LRAUV prototype in Monterey Bay, California, in September. Goal of the test was to characterize an oil spill and transmit data back to shore.

"The researches showed us how LRAUV works; this was the first test with the oil sensors and data transmission in action," said Trego.

The underwater robot was equipped with chemical sensors. An oil spill was simulated with a non-toxic, neon green sea dye which, like oil, can float in the top 13 feet of the water column. The dye biodegrades in sunlight in a matter of hours.

"This specific water test was intended to check all the prior work in the newly fabricated vehicle to characterize an oil spill," Kee said.

The robot surfaced every few minutes to send and receive data and check its location with a cellular connection. DHS said

see MAPPING ROBOT page 5



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EXPLORATION & PRODUCTION

National drilling rig count down 3 at 1,076

The number of rigs drilling for oil and natural gas in the U.S. was down up by three Nov. 30 to 1,076.

At this time last year there were 929 active rigs.

Houston oilfield services company Baker Hughes reported that 887 rigs targeted oil (up two from the previous week) and 189 targeted natural gas (down five).

The company said 68 of the U.S. holes were directional, 934 were horizontal and 74 were vertical.

Among major oil and gas producing states, Wyoming was up by two rigs; Alaska and Oklahoma were each up by one.

California, New Mexico, North Dakota and Pennsylvania were unchanged.

Colorado and Texas were each down by one rig; Louisiana was down by four rigs.

Baker Hughes shows Alaska with six active rigs, up one from a year ago.

The U.S. rig count peaked at 4,530 in 1981. It bottomed out in May 2016 at 404.

—PETROLEUM NEWS

NATURAL GAS

Woodfibre LNG project close to launch

Construction could start in first quarter of year, but regulatory, aboriginal issues continue; agreement with CNOOC for offtake

By GARY PARK
For Petroleum News

More pieces have been put in place for the Woodfibre LNG project north of Vancouver that point to a possible start of construction in the first quarter of 2019.

But doubts still hang over the complex regulatory process, with one element of the aboriginal community not yet satisfied its demands have been met.

In the latest developments, Woodfibre has signed an off-take agreement with state-owned China National Offshore Oil Corp., CNOOC, covering a potential 750,000 cubic meters of LNG a year — about one third of the operation's planned storage capacity — for 13 years, starting in 2023.

That was quickly followed by word that the Squamish Nation, whose 2,600 square miles includes the Woodfibre LNG liquefaction at a former pulp mill near Squamish, voted 8-6 to support three impact benefit agreements worth C\$1.1 billion.

The deal includes C\$225.6 million in cash payments to be made to the nation of 3,600 over 40 years, C\$16.1 million in training and education programs, and ventures for Squamish businesses worth up to C\$872.4 million.

The agreement involved the Squamish Nation, Woodfibre LNG, pipeline company FortisBC and the British Columbia government, though it is not clear how

much each of the three parties financing the C\$1.6 billion project will contribute.

The decision was a disappointment for environmental organization My Sea to Sky, which has opposed the LNG venture since it was founded in 2014.

Executive director Tracey Saxby said Squamish residents are "scared about the very real consequences that climate change is already having on our communities. We cannot build new fossil fuel infrastructure when we are facing a climate crisis."

In addition, Squamish Councilor Khelsilem (who goes by his traditional name) said his community is not yet convinced it can exert maximum influence over a project on its territory, although he did concede the Squamish were given a unique opportunity to conduct their own environmental assessment of Woodfibre's proposal.

Byng Giraud, country manager with Woodfibre LNG, said Woodfibre is the first industrial project in Canada to be awarded an environmental certificate by an indigenous government.

The LNG facility gained Canadian government approval in 2016 after it was deemed unlikely to hurt the environment.

The same year the owners announced a deal with Guangzhou Gas Group to deliver 1 million metric tons of LNG a year to the Chinese gas company. ●

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LAND & LEASING

NMFS OKs Atlantic seismic surveys

By MATTHEW DALY
Associated Press

The Trump administration on Nov. 30 authorized use of seismic air guns to find oil and gas formations deep underneath the Atlantic Ocean floor, reversing Obama administration policies and drawing outrage from critics who say the practice can disturb or injure whales, sea turtles and other marine life.

The National Marine Fisheries Service said it has authorized permits under the Marine Mammal Protection Act for five companies to use air guns for seismic surveys in the mid-Atlantic, from Delaware to central Florida.

The surveys are part of President Donald Trump's bid to expand offshore drilling in the Atlantic. The plan has drawn opposition from East Coast lawmakers and governors, who say it could hurt commercial fishing and tourism.

Seismic surveys have not been conducted in the region for at least 30 years.

Seismic air guns fire intense blasts of compressed air into the seabed every 10 to 12 seconds, for weeks or months at a time. The blasts reflect back information about buried oil and gas deposits, as well as

potential seafloor hazards and sand and gravel resources for beach restoration.

The blasts are so loud they can disturb or injure endangered whales and other marine mammals and increase the risk of calves being separated from their mothers, environmental groups say.

Industry groups counter that seismic surveys have been conducted in the U.S. and around the world for decades, with little adverse impacts.

Administration officials said that under terms of the law that protects marine life, the permits would allow "harassment" of whales and sea turtles but would not allow companies to kill them.

Survey vessels will be required to have observers on board to listen and watch for marine life and alert operators if a protected species comes within a certain distance, officials said, and acoustic monitoring will be used to detect those swimming beneath the ocean surface.

Surveys will be shut down when certain sensitive species or groups are observed and penalties can be imposed for vessels that strike marine animals, officials said.

see ATLANTIC SEISMIC page 7

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• EXPLORATION & PRODUCTION

ANS October crude up 3.5% over September

Greater Mooses Tooth volumes included for first time; Point Thomson back on production; Cook Inlet averages 14,802, basically flat

By KRISTEN NELSON
Petroleum News

Alaska North Slope crude oil production averaged 521,781 barrels per day in October, up 3.5 percent, 15,532 bpd, from a September average of 503,996 but down 3.3 percent from an October 2017 average of 539,770 bpd.

October volumes include first production from Greater Mooses Tooth 1 and a return to production at Point Thomson following maintenance.

The ConocoPhillips Alaska-operated Greater Mooses Tooth 1 in the National Petroleum Reserve-Alaska came online Oct. 5, ahead of a year-end schedule with production for October averaging 7,754 bpd. Greater Mooses Tooth is being developed as a satellite of the Colville River unit from facilities at Alpine and is connected by road to drill site CD5. Initial production is from GMT1; GMT2 received a federal record of decision and in October ConocoPhillips said a final investment decision had been made for GMT2. The Bureau of Land Management is preparing an environmental impact statement for the Willow discovery in the Bear Tooth unit.

The ExxonMobil Production Co.-operated Point Thomson field averaged 5,129 bpd in October, up 5,036 bpd from a September average of 93 bpd. Point Thomson was essentially down July through September, with the field's one production well online only one day in each of those months and production averaging fewer than 100 bpd. There have been difficulties with compressors at the high-pressure gas condensate field. The company told Petroleum News in August that the field was down for maintenance.

In October, Point Thomson was online for 30 days out of 31. The field was designed to produce 10,000 bpd of conden-

sate and reinject 200 million cubic feet of gas per day. Production began in April of 2016 and reached 9,575 bpd in November of 2017.

Production figures are compiled by Petroleum News from Alaska Oil and Gas Conservation Commission data. The commission provides volumes by well and field on a month-delay basis.

Prudhoe, Kuparuk

The BP Exploration (Alaska)-operated Prudhoe Bay field, the North Slope's largest, averaged 268,623 bpd in October (47,016 bpd of that from natural gas liquids), up 2.8 percent, 7,322 bpd, from a September average of 261,301 bpd, but down 6.9 percent from an October 2017 average of 288,557 bpd.

In addition to Prudhoe oil, production from the Prudhoe Bay field includes other pools: Aurora, Borealis, Lisburne, Midnight Sun, Niakuk, Polaris, Point

McIntyre, Put River, Raven and Schrader Bluff.

The Kuparuk River field, operated by ConocoPhillips, averaged 110,648 bpd in October, up 3.3 percent, 3,572 bpd, from a September average of 107,076 and up 0.7 percent from an October 2017 average of 109,937 bpd. In addition to the main Kuparuk pool, Kuparuk produces from satellites at Meltwater, Tabasco and Tarn, and from West Sak.

Badami, operated by Glacier Oil & Gas subsidiary Savant Alaska, averaged 1,846 bpd in October, up 2.6 percent, 47 bpd, from a September average of 1,799 bpd and up 125 percent from an October 2017 average of 819 bpd.

The Hilcorp Alaska-operated Northstar field averaged 11,103 bpd in October, up 2.2 percent, 241 bpd, from a September average of 10,862 and up 10.3 percent from an October 2017 average of 10,069 bpd.

Other fields down

Other North Slope fields had month-over-month production declines.

ConocoPhillips' Colville River unit averaged 62,266 bpd in October, down 7.8 percent, 5,299 bpd, from a September average of 67,565 and down 3.6 percent from an October 2017 average of 64,566 bpd. In addition to oil from the main Alpine pool, Colville production includes satellite production from Fiord, Nanuq and Qannik.

Ooguruk, operated by Caelus Alaska, averaged 10,025 bpd in October, down 3.4 percent, 351 bpd, from a September average of 10,376 bpd and down 16.7 percent from an October 2017 average of 12,029 bpd.

The Hilcorp Alaska-operated Endicott field averaged 7,198 bpd in October, down 1.8 percent, 133 bpd, from a September

see OCTOBER OUTPUT page 7

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MAPPING ROBOT

that after several hours LRAUV had successfully scanned the whole area and transmitted the data for analysis.

Next steps

DHS said the LRAUV is being prepared for shipment to the Woods Hole Oceanographic Institution in Woods Hole, Massachusetts. Researchers will process navigation performance data from the California test and tune the navigation algorithms.

Then three communication buoys will be built and tested with the robot under ice. DHS said the target for testing is a large lake in New Hampshire, the Eastern Great Lakes or Alaska during the winter season.

Tests, including under-ice tests, and construction of communication relay buoys will be completed by the end of June, DHS said.

"The demonstration in September highlighted the unique capabilities of LRAUV, which will be a welcome addition to the suite of tools used to deal with oil spills," Trego said. "We look forward to the further development of LRAUV's capabilities, additional testing in real world conditions, and transitioning it into operation use." ●

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continued from page 1

DUNLEAVY SWORN IN

flew on to Juneau.

The governor's office said this was the first time a U.S. governor has been sworn into office above the Arctic Circle.

Dunleavy named two more commissioners prior to taking office: Bruce Tangeman at the Department of Revenue and Julie Anderson at the Department of Commerce, Community and Economic Affairs.

Dunleavy said Tangeman and Anderson "are well known in Alaska for years of service in both the public and private sectors," and said they would "provide crucial expertise to my administration as we move Alaska forward."

After taking office, he named Doug Vincent-Lang as acting commissioner at the Department of Fish and Game.

Tangeman

Since 2017 Tangeman has been policy director for the Alaska Senate Majority. From 2014-16 he was vice president and chief financial officer for the Alaska Gasline Development Corp., and from 2010-14 he was deputy commission of the Department of Revenue. From 2008-10 he was chief financial officer for Doyon Utilities and from 2005-08 he was corporate budget officer for the Alaska Railroad Corp.

He has served on the boards of the Alaska Housing Finance Corp. and the Alaska Industrial Development and Export Authority. He has a bachelor's degree in public finance from Indiana University.



BRUCE TANGEMAN

Anderson

Anderson is currently principal at Denali Management Solutions and prior to that served as stakeholder manager and health, safety and environment officer at AIDEA.

She worked at Alyeska Pipeline Service Co. for many years as technical business strategy manager, commercial director and operations support director, among other roles. During her tenure at Alyeska she managed a team of 200 employees and contractors and developed and implemented reorganization plans.

She holds a master's degree in international management from the Thunderbird



JULIE ANDERSON

School of Global Management at Arizona State University and a bachelor's degree in business from the University of Alaska Fairbanks.

Vincent-Lang

The commissioner of the Department of Fish and Game is selected by the governor from names submitted by the Joint Board of Fisheries and Game. On Dec. 3 the joint board began a recruitment process which will run through Dec. 14.

Dunleavy named Doug Vincent-Lang acting commissioner on Dec. 3, saying in a statement that it was important that someone manage the department while the joint board goes through the process of nominating potential commissioners.

Vincent-Lang is a veteran of the department with more than three decades of expertise in wildlife research and management, and previously served as division director for Wildlife Management, special assistant and assistant director to the Division of Sport Fish and as a research biologist.

He has a B.S. degree in biology from the University of Wisconsin-Green Bay and a M.S. degree in biological oceanography from the University of Alaska Fairbanks.

Attorney General

The governor named members of his public safety team Dec. 5, including the Attorney General and the commissioners of the Department of Public Safety and the Department of Corrections, and deputy commissioners and directors in those departments.

Kevin Clarkson was named Attorney General. Clarkson is an attorney in private practice at Brena, Bell & Clarkson who has specialized in state and federal litigation throughout his career. He has worked at the administrative, pretrial,

trial and appellate levels on civil litigation, business and construction matters, contracts and others.

He was admitted to Super Lawyers in 2014-2017, a distinction the governor's office said is held by no more than 5 percent of Alaska attorneys and is "A" rated with Martindale-Hubbard.

Clarkson holds a bachelor's degree in political science from Oregon State University and a law degree from the Willamette University College of Law in Salem, Oregon.

Public Safety, Corrections

Dunleavy named Amanda Price, a victims' advocate and leader, as commissioner of the Department of Public Safety. Price last served as Gov. Bill Walker's senior advisor on violent crime response and prevention and as executive director of Standing Together Against Rape. She has also led the American Heart Association and Muscular Dystrophy Association's Alaska chapters. Price studied biological science at the University of Alaska Anchorage.

Nancy Dahlstrom, a former state legislator, was named commissioner of the Department of Corrections. The governor's office cited her years of experience in building and managing effective teams. Dahlstrom is currently a consultant for WEKA, a security, personal safety and secure transport. She was recently reelected to the Legislature, a position she will resign in order to serve as commissioner. Dahlstrom holds a bachelor's degree in human resources from Wayland Baptist University and a master's degree in organizational management from the University of LaVerne.

—KRISTEN NELSON

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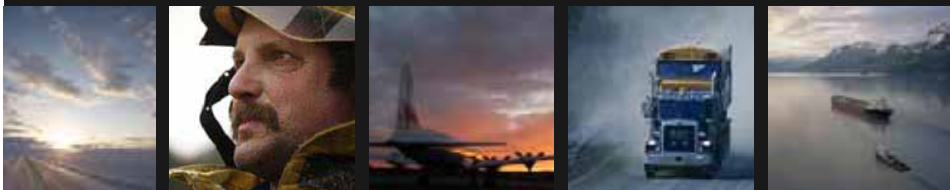
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PIPELINES & DOWNSTREAM

Judge allows preliminary Keystone XL work

A Montana judge says a Canadian company may continue preliminary work on the proposed Keystone XL oil pipeline while his order blocking construction is in effect.

U.S. District Judge Brian Morris said Nov. 28 he will clarify his Nov. 8 injunction to allow TransCanada to conduct engineering and planning activities, confirm shipper contracts, meet with different groups and acquire equipment, permits and land rights.

On Nov. 8, Morris blocked TransCanada's permit to build the pipeline from Alberta's oil sands through a half-dozen U.S. states to the Gulf of Mexico.

The judge ordered a new environmental review after saying the Trump administration had not fully considered the effects of the pipeline.

TransCanada had argued it wants to keep that preliminary work on schedule that that it can be prepared to start pipeline construction as early as mid-February.

—ASSOCIATED PRESS

LAND & LEASING

No substantial new info for AK Peninsula

The Alaska Division of Oil and Gas has issued a decision of no substantial new information for the 2019 Alaska Peninsula areawide lease sale. This sale is offered annually in the spring along with the Cook Inlet areawide sale.

There are currently no active oil and gas leases in the Alaska Peninsula sale area.

The most recent best interest finding for the area was completed Dec. 1, 2014; since then, the division has made decisions of no substantial new information four times, beginning in January 2016.

Division Director Chantal Walsh said in the Nov. 28 decision that while the comments the division received do not provide substantial new information which would justify a supplement to the 2014 best interest finding, the information received will be reviewed when the division begins drafting a new best interest finding for this lease sale area.

The Cook Inlet and Alaska Peninsula areawide sales typically occur in May or June.

—PETROLEUM NEWS

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OCTOBER OUTPUT

average of 7,331 and down 7.7 percent from an October 2017 average of 7,798 bpd.

Nikaitchuq, operated by Eni, averaged 16,091 bpd in October, down 1 percent, 162 bpd, from a September average of 16,253 and down 18.6 percent from an October 2017 average of 19,766 bpd.

The Hilcorp Alaska-managed Milne Point field averaged 21,099 bpd in October, down 0.9 percent, 196 bpd, from a September average of 21,295 bpd but up 12.6 percent from an October 2017 average of 18,738 bpd.

Cook Inlet

Cook Inlet production averaged 14,802 bpd in October, up 0.2 percent, 25 bpd, from a September average of 14,777 but down 6.9 percent from an October 2017 average of 15,890 bpd.

The largest month-over-month increase was at Redoubt Shoal, operated by Glacier Oil & Gas subsidiary Cook Inlet Energy. It averaged 1,331 bpd in October, up 10.9 percent from a September average of 1,201 bpd.

Production from the Hilcorp Alaska-operated Swanson River field averaged 1,262 bpd in October, up 3.4 percent from a September average of 1,221.

Hilcorp's Trading Bay field averaged 1,409 bpd in October, up 1.5 percent from a September average of 1,388 bpd.

The Cook Inlet Energy-operated West McArthur River field averaged 777 bpd in October, up 1 percent from a September

average of 769 bpd.

Hilcorp's Beaver Creek field, Cook Inlet's smallest, averaged 71 bpd in October, down 4.8 percent from a September average of 75 bpd.

Hilcorp's McArthur River field, Cook Inlet's largest, averaged 4,562 bpd in October, down 2.3 percent from a September average of 4,671 bpd.

BlueCrest's Hansen field, the Cosmopolitan project, averaged 1,176 bpd in October, down 1.8 percent from a September average of 1,197 bpd.

Hilcorp's Middle Ground Shoal averaged 1,478 bpd in October, down 1.1 percent from a September average of 1,494 bpd.

Granite Point, also operated by Hilcorp, averaged 2,736 bpd in October, down 1 percent from a September average of 2,763 bpd.

ANS crude oil production peaked in 1988 at 2.1 million bpd; Cook Inlet crude oil production peaked in 1970 at more than 227,000 bpd. ●

continued from page 4

ATLANTIC SEISMIC

None of those precautions were enough for environmental groups and East Coast lawmakers who decried the surveys as cruel and unnecessary. The Trump administration's call for offshore drilling has generated widespread, bipartisan opposition from states up and down the Atlantic seaboard.

"Seismic testing risks injuring and killing critically endangered species, severely disrupting economically important fisheries and threatening the Jersey shore," said Rep. Frank Pallone, a New Jersey Democrat who is set to lead the powerful House Energy and Commerce Committee in January.

Pallone called an environmentally sound coast critical to New Jersey's economy and said lawmakers from both parties "will work tirelessly to fight this

reckless decision by the Trump administration."

Diane Hoskins, campaign director at the environmental group Oceana, said approval of the seismic surveys "flies in the face of massive opposition to offshore drilling and exploration from over 90 percent of coastal municipalities in the proposed blast zone."

The Obama administration rejected the permits last year because of the known harm seismic air gun blasting causes, Hoskins said.

The American Petroleum Institute, the largest lobbying group for the oil and gas industry, hailed the administration's action and said seismic surveys are just "one of many steps along a rigorous permitting process" that helps to ensure that any future drilling in the Mid-and South Atlantic would be properly managed and conducted to have minimal impact on the marine environment. ●

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EARTHQUAKE IMPACT

immediately activated its post-earthquake procedures, including the temporary shutting in of some operations and the inspection of facilities, Nelson said. Once inspections had been completed, normal operations resumed.

“Our focus was to ensure the safety of all our employees as we worked to assess the impact,” Nelson said.

TAPS shut down for inspection

Although the trans-Alaska pipeline, the oil artery from the North Slope, lies at a considerable distance from the earthquake’s epicenter near Anchorage, Alyeska Pipeline Service Co. took the precaution of shutting the line down immediately after the earthquake occurred.

Workers conducted ground and air surveillance of the line and its facilities from pump station 9 near Delta Junction, south to the Valdez Marine Terminal. No problems were found and the line was restarted at 3:30 p.m. on Nov. 30, about seven hours after the earthquake happened, Alyeska reported.

“We are thankful that everyone working on TAPS and at our workplaces across Alaska are safe following today’s earthquake,” said Tom Barrett, Alyeska president. “Through their hard work, resilience and safety focus, TAPS is online again. Our top priorities remain the safety of the people working on TAPS and the operational integrity of the pipeline.”

Power outages and gas leaks

In Anchorage and the Matanuska-Susitna Borough region there were multiple local power outages and a large number of reported gas leaks. However, the major systems do not appear to have been significantly impacted. And repair crews have responded promptly to reported problems.

Enstar Natural Gas Co. brought in extra staff to respond to the numerous reports it received about gas leaks, and work continues in dealing with these issues. However,

the utility’s major gas transmission and distribution system was not damaged by the earthquake — Enstar was able to maintain its gas supply arrangements, Lindsay Hobson, Enstar communications manager, has told Petroleum News. The Cook Inlet Natural Gas Storage Alaska facility on the Kenai Peninsula was shut down briefly but was undamaged, Hobson said.

Transmission intertie

There was a media report of damage to the electrical transmission intertie between Southcentral Alaska and Fairbanks. However, the electric utilities and the Alaska Energy Authority have told Petroleum News that, although the power supply through the intertie has tripped at two different locations since the earthquake, there is no evidence linking these short-circuit incidents to the earthquake. Julie Hasquet, spokeswoman for Chugach Electric Association, told Petroleum News that, following the earthquake, the intertie was re-energized at 7:30 p.m. on Nov. 30, and that the two incidents were probably related to weather or vegetation. Because of inclement weather conditions it had not been possible to fly along the route of the intertie, to check for any damage.

Titan LNG plant

The Titan liquefied natural gas plant that produces LNG for utility gas supplies in central Fairbanks sits almost on top of the earthquake epicenter. Dan Britton, CEO of Interior Gas Utility, operator of the Titan plant, has told Petroleum News that the plant was not damaged by the earthquake. However, the plant was shut down for inspection for a few hours after the earthquake happened. The earthquake did severely damage Vine Road, a part of the route used by tanker trucks that carry LNG from the Titan plant to Fairbanks. However, the trucks have been able to re-route along the Knik Goose Bay Road, Britton said.

—ALAN BAILEY

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REVENUE FORECAST

July. Revenue said these price assumptions were finalized in late October. At that time ANS was at about \$75 per barrel. “In the month since, oil prices have trended downward,” the department said, with ANS closing below \$60 Nov. 28 for the first time since October 2017.

“Once again, Alaska is experiencing unexpected oil price volatility,” Sheldon said, “As has been our practice for the past 15 years, through the month of October the department worked with staff from Revenue, Natural Resources, Labor, the University of Alaska, OMB, and Legislative Finance, as well as a private economics firm and financial analysts to develop an oil price forecast. During November, however, the oil markets have experienced the largest monthly price decline, in percentage terms, in a decade.”

Sheldon said it appears markets are oversupplied due to Iranian oil remaining on the market despite sanctions imposed in November. He said the department assumed, in line with other analysts, that increased Saudi production would replace Iranian oil, but instead Saudi oil added supply, “which has a profound impact on price over the past month.”

Work done so far is presented as a preliminary forecast, with the delay in releasing a final forecast and the Revenue Sources Book allowing for review and potential revision of the oil price forecast.

The delay, Sheldon said, also allows incoming Commissioner Bruce Tangeman and the department “the opportunity to evaluate this situation, with an eye on whether the Saudi government is able to implement production cuts in the short to mid term.”

ANS lease expenditures, combined operating and capital, were projected at \$4.087 billion for FY 2018 in the spring forecast; the fall forecast is \$4.379 billion, an increase of \$292 million.

Revenue from Permanent Fund

The department noted that this is its first revenue projection following the passage of Senate Bill 26, which sets the procedure for transferring a portion of the earnings of the Permanent Fund to the general fund each year, with the transfer funding both the Permanent Fund Dividend and general government operations. General fund unrestricted revenue is estimated at \$6.2 billion for FY 2019, up \$3.9 billion from the spring 2018 forecast.

With Permanent Fund monies, petroleum revenue drops from 80 percent of unrestricted revenue in FY 2018 to 47 percent in FY 2019, 41 percent in FY 2020, and then into the 30 percent range through FY 2028.

Production forecast

ANS crude oil production is forecast to average 529,800 barrels per day for FY 2019 and 533,200 bpd for FY 2020, declining to 493,400 bpd by FY 2027, the department said.

ANS production averaged 518,400 bpd in FY 2018, down 3,500 bpd, 0.7 percent, from the spring 2018 forecast of 521,800 bpd. For FY 2019, the fall forecast for ANS is 529,800 bpd, up 3,200 bpd, 0.6 percent, from a spring forecast of 526,600 bpd. From FY 2020 through FY 2026, the fall forecast for ANS production is lower than the spring

forecast by amounts ranging from 2,900 bpd in FY 2020 to 23,900 bpd in FY 2024, and then increases fall-over-spring in FY 2027 and FY 2028.

Price, expenditure forecasts

The spring 2018 forecast projected \$61 per barrel for ANS crude, a number which rises to \$63.61 in the fall preliminary forecast.

Thereafter in the preliminary forecast the ANS price is projected at \$76 in FY 2019, dropping to \$75 in FY 2020 through 2022 and then rising gradually, reaching \$86 per barrel in FY 2028.

Those projections, as Sheldon noted, come from work done in October.

ANS lease expenditures, combined operating and capital, were projected at \$4.087 billion for FY 2018 in the spring forecast; the fall forecast is \$4.379 billion, an increase of \$292 million. For FY 2019 through FY 2024, total ANS lease expenditures are estimated at less in the fall forecast, \$4.616 billion for FY 2019, down \$322 million from a spring estimate of \$4.938 billion, and ranging from a decrease of \$598 million in FY 2023 to \$58 million in FY 2021.

Deductible lease expenditures — amounts deducted against tax liability by producing companies — are \$4.066 billion in the fall forecast, up \$88 million from a spring forecast of \$3.978 billion, and dropping in FY 2019 through FY 2021, and increasing from FY 2022 through FY 2028.

—KRISTEN NELSON

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Petroleum news

Oil Patch Bits

Lynden charts two Antonovs to Kingdom of Bahrain

Lynden International said Nov. 27 that it chartered two Antonov aircraft to ship fragile tube bundles from Houston to the Kingdom of Bahrain, located just off the eastern coastline of Saudi Arabia in the Persian Gulf. Bahrain is a small archipelago of 33 islands and is seeing a resurgence in oil and gas activity.

According to Lynden International District Manager Diana Martinez, “We began working on this proposal a year ago.” Lynden was selected for the job and began the com-

plicated move by picking up eight tube bundles in Beasley, Texas, and bringing them to the Lynden warehouse for crating.

They were then moved to the airport for loading on the two chartered Antonov AN-124s. Each plane carried four tube bundles, each weighing 50,500 pounds and measuring 44 feet by 13 feet by 5 feet. Total aircraft weight: 202,000 pounds. “The tube bundles are used for heat exchangers and they are extremely fragile. The thin tubing on the inner structure is easily bent,” Diana explained. With Lynden’s careful handling, the bundles were delivered on time and in perfect condition.



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ML&P SALE

assembly members and the Chugach board of directors," Thibert said in response to the assembly vote. "We have had great discussion and dialogue, and we are looking forward to continuing to move toward a combined utility which will ultimately benefit the electric ratepayers of both organizations, the employees, and the community at large."

"The municipality just took an important step in the sale of ML&P to Chugach. The result will deliver a unified utility to the ratepayers and strengthens the municipality's financial well-being," said Anchorage Mayor Ethan Berkowitz. "A lot of people worked very hard to make this happen. I thank them and the people of Anchorage for the willingness to take this next step."

Critical issues

During a Dec. 3 meeting of the

Anchorage Chamber of Commerce Rebecca Pearson, attorney for the Municipality of Anchorage, reviewed the outcome of the negotiations that had led to the deal that has now been approved. She said that there were a few critical criteria that the deal had to meet. There was a need to ensure that Chugach Electric pays a competitive price for the municipal utility. There was a need to understand how the municipality would use the funds that it receives from the deal. There was to be no increase to the base rate for electricity for customers as a consequence of the deal. The deal was not to trigger an increase in taxes for Anchorage residents and businesses. And no ML&P or Chugach Electric employees were to lose their jobs.

In January, when the proposal for the ML&P purchase was first put to the Anchorage Assembly, the concept involved Chugach Electric ultimately making payments with an estimated net present value of a little over \$1 billion. That consisted of a

\$170 million cash payment at close of the deal, plus another \$542 million for the repayment of all of ML&P's outstanding debt. Chugach Electric was to make annual payments to the municipality amounting to a net present value of \$170 million. And, Chugach Electric would make payments in lieu of taxes for the ML&P properties to the municipality for 30 years. These PILT payments, with a net present value of \$142 million, would replace the dividend payments that the municipality currently receives from ML&P, thereby ensuring that the sale of ML&P would not trigger any tax increases in the municipality.

Any excess cash that the municipality receives as a consequence of the transaction, once ML&P's debts have been paid off, would be paid into the municipality's trust fund, a fund that creates annual dividends for the municipality — increasing the balance in the fund would increase the size of the dividends, Pearson commented. However, the PILT payments would be cash

neutral, since they would simply replace the ML&P dividend.

Refining the terms

After the April vote to allow the proposed ML&P sale to proceed, the municipality and Chugach Electric entered negotiations to refine and finalize the terms of the deal. The biggest single hurdle that the negotiators had to cross was the proposed schedule of annual payments by Chugach Electric — in effect, this was a form of unsecured financing, Pearson said. Ultimately, the negotiators came up with an alternative arrangement, under which Chugach Electric would not purchase the municipality's share of the Eklutna hydroelectric power plant, but instead would have an agreement to buy power from the facility for 35 years. In effect, this agreement would extract for the municipality value that might otherwise have been obtained from the sale of the asset, eliminating the need for unsecured payments while maintaining the overall value of the transaction. Revenues from the power purchase would be put into the municipal trust fund, Pearson said.

Thibert explained that the Eklutna arrangement is purely financial: Chugach Electric would maintain and operate the Eklutna facility on behalf of the municipality.

Pearson also pointed out that there is also an agreement with Matanuska Electric Association that allows MEA to purchase an increased share of the Eklutna plant from the municipality. That would reduce the municipality's revenues from the plant but would respond to a directive from the Anchorage Assembly to find benefit for MEA ratepayers from the sale of ML&P — some MEA ratepayers live in the northern part of Anchorage. If MEA does increase its interests in the Eklutna plant, those ratepayers would benefit from MEA's increased access to cheap hydropower, Pearson said.

PILT methodology

Also as part of the negotiations over the deal, the municipality and Chugach Electric designed a PILT methodology that would eliminate any disincentive for Chugach Electric to build new plant inside ML&P's service area, or perhaps to avoid some PILT liabilities by moving plant out of that area. Essentially, the annual PILT dues will be calculated by using the total value of the ML&P plant at the close of the sale to Chugach Electric, upping this value annually by the percentage annual increase in the value of Chugach Electric's properties, and then multiplying the result by the property tax mil rate for the year.

The negotiated agreement has also extended the period during which Chugach Electric will make PILT payments from 30 to 50 years, thus securing that source of income for the municipality for a longer period of time, Pearson said. And, to ensure that the transaction does not impact electricity base rates, consumers within the ML&P service area will initially bear the full cost of the PILT while also retaining the benefit of the relatively low cost of ML&P's share of natural gas fuel obtained from the Beluga River gas field. However, after 2033 all of Chugach Electric's customers will contribute to PILT payments while also obtaining full benefit from the use of Beluga gas.

A stronger deal

Both sides of the negotiations over the terms of the deal feel that the deal is now stronger than it was originally, Pearson said.

And the total net value of the purchase transaction has dropped, although it remains around \$1 billion. The drop primarily results from the cost of paying off the ML&P debt being lower than originally thought, although the net present value of

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WEB ADS

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PRODUCTION CUTS

Notley is making the first use by any Alberta premier of 1947 legislation to counter what she calls “fiscal and economic insanity.”

Her action came only three days after she announced that Alberta will pay about C\$350 million to buy 80 locomotives to raise crude-by-rail shipments by about 30 percent or 120,000 bpd, indicating a timetable should be known before year’s end.

“Alberta will buy the rail cars ourselves to move our oil,” she said. “And we’re not wasting any time.”

“Should we be selling our most valuable commodity for pennies on the dollar? No, that is stupid.”

WCS prices in slump

The rapidly gathering crisis has seen prices for Western Canada Select heavy crude slump to US\$10 a barrel and is costing the Canadian economy an estimated C\$80 million a day.

It has been compounded by new evidence that Canada has fallen out of favor with international investors and threats by some drilling and service companies to slash their 2019 capital spending plans by 80 percent, which could result in thousands of layoffs on top of the estimated 160,000 since 2014.

For the first time in a widely followed annual survey by the independent Fraser Institute, Canada has fallen out of the top 10 oil and gas jurisdictions as an attractive place to invest.

Tim McMillan, president of the Canadian Association of Petroleum Producers, said Notley’s decision “further underscores the need for Canada to increase exports of our oil and natural gas to existing and new markets, which will ultimately help meet global demand and expand our customer base.”

Integrated companies unhappy

However, the output cut got a chilly reception from Suncor Energy, Imperial Oil and Husky Energy, the three integrated companies that produce, upgrade and refine crude bitumen and benefit from the low prices for feedstock from the oil sands.

Imperial Chief Executive Officer Rich Kruger said “intervention carries trade risks and sends a negative message to investors about doing business in Alberta and Canada.”

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ML&P SALE

the PILT payments has also fallen slightly, Pearson explained. The deal, as now agreed, involves a cash payment at close of \$767.8 million and PILT payments with an estimated net present value of \$166.8 million, she said. The net present value of the Eklutna power purchases would be in the range \$48.8 million to \$75 million.

Thibert said that the utilities have also been developing plans for integrating 11 different functional areas following the close of the ML&P purchase.

“It sounds simple until you get into the details,” he said.

He confirmed that no employees will be laid off as a result of the deal, but that employment levels will drop through attrition over time. Probably over the next four to five years around 70 to 80 job positions will go, he said. ●

On the other side, Cenovus Energy CEO Alex Pourbaix said the strategy will “help balance the market in the short term until new rail and pipeline capacity comes on stream next year.”

GDP forecast lowered

The situation is so dire that ATB Financial chief economist Todd Hirsch lowered his forecast for the Alberta economy twice before he released it on Nov. 28, pegging gross domestic product growth at 2.1 percent in 2019 and targeting an unemployment average for the year of 6.1 percent.

“We are in a dramatically different oil price environment than we were two months ago,” he said. “In Alberta’s economy, we feel like we’re in suspended animation, waiting for something to happen.”

Pressure on Alberta — in the absence of any commitment by the Canadian government to set a new target date to resume construction on the 690,000 bpd expansion of the Trans Mountain system to a Vancouver tanker port — to increase rail capacity has intensified with word from the National Energy Board that Canada’s oil output will average 4.59 million bpd this year, 22,000 bpd more than expected.

However, those otherwise encouraging signs are clouded over by the annual investment survey by the Fraser Institute.

“The takeaway for Canada is that we’re becoming increasingly less attractive for (oil and gas) investors than our neighbors (in the United States),” said Ken Green, co-author of the survey.

The result was that none of the top 10 jurisdictions, as rated by 250 industry insiders, were located in Canada. Nine out of 120 were located in the U.S., with Texas, Oklahoma and Kansas leading the way.

Within Canada, only Alberta was considered a “large reserve” holder, with the oil sands identified as the third largest oil and gas basin in the world, behind Texas and Russia, but the province slumped by 10 ranking places.

Green said the “concerns” expressed by investors were “regulatory” in nature, reflecting the time needed in Canada to “weave through the regulatory forest.”

“We’re hemmed in and virtually everything we have is a drainage system right into the U.S. (which accounts for 99 percent of Canada’s oil exports),” he said.

Incentives, credits possible

In exploring other ways to throw a res-

cue line to Alberta producers, government sources told the Globe and Mail that royalty incentives and credits might be offered by the Notley administration to spur production, including the prospect of a royalty holiday.

Alberta Energy Minister Marg McCuaig-Boyd also lashed out at federal Finance Minister Bill Morneau who told the Calgary Chamber of Commerce in late November that the government of Prime Minister Justin Trudeau is not interested in “diverting our resources to ideas (such as increased rail capacity) that won’t actually have an early impact.”

McCuaig-Boyd said Morneau “doesn’t seem” to grasp the extent of Alberta’s crisis, describing him as “very tone deaf.”

Canada’s Natural Resources Minister Amarjeet Sohi reiterated his government’s refrain that the current situation is a crisis but offered no remedies.

“The status quo cannot continue,” he said, arguing the Trudeau administration has been working since it was elected more than three years ago to ensure pipeline projects “can move ahead by making the issue of market access a priority.” ●

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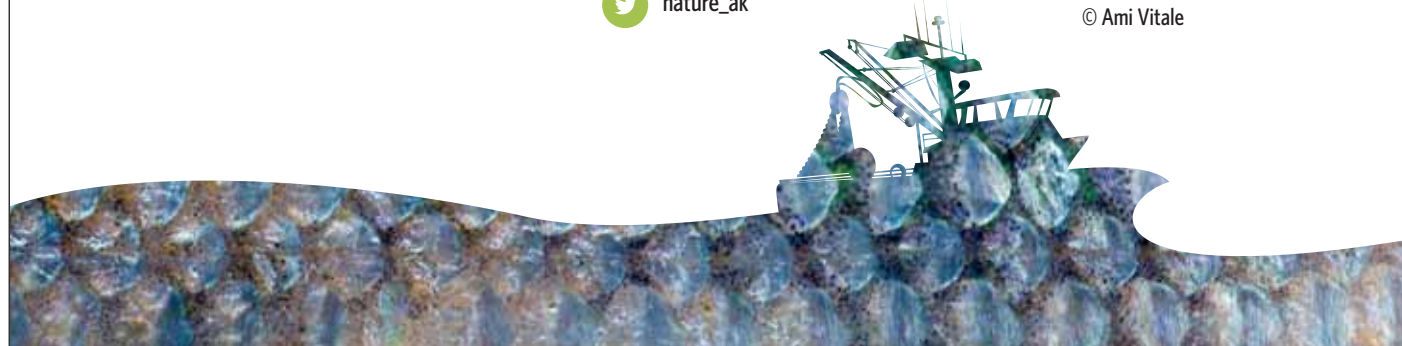
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HOUSEKNECHT REVIEW

An optimum location

A north to south cross-section of the subsurface in the region of the plays shows, in general terms, how the plays work. Three major oil source rocks — the Shublik formation, the lower Kingak formation and the Pebble Shale/gamma ray zone — are all present in the subsurface, below the Nanushuk/Torok reservoir rocks. The subsurface zone in which temperatures have reached levels conducive to the generation of oil intersect those source rocks. And the Barrow Arch, a major geologic structure in the subsurface, provides a focus for oil to migrate upwards into reservoir rock formations.

At the same time, the Nanushuk and Torok occupy a huge fairway across the region, with rocks formed from detritus from an ancient region, now part of Russia, poured into an ancient marine basin under what is now the North Slope.

“So the fairway that the Nanushuk and Torok formations lie in, in this favorable position, is up to about 80 to 100 miles wide, north-south, and extends for at least that far, and probably much farther east-west,” Houseknecht said.

Intricate system

Looked at in more detail, the Nanushuk and Torok form an intricate system, characterized by the west to east migration of an

ancient marine shelf margin, with sediment from river deltas pouring onto the top of the shelf during periods of relatively high sea level, and spreading over the basin floor as relatively thin sand layers, or turbidites, at other times. Reflections in a west to east seismic section show “snapshots” of the shelf margin at various times during its migration, with the Nanushuk towards the top of the margin, and the Torok at the base.

Within this general picture, there are detailed complications. For example, seismic data indicate that the Pikka and Willow reservoirs, while both in the Nanushuk, were formed in different settings: While the Willow reservoir is a “high stand” sand body, laid down at the top of the shelf margin, the Pikka sands appear to have been deposited a bit lower on the shelf margin, during somewhat lower sea level, Houseknecht said. However, this interpretation is based on seismic data available to the USGS, and may be subject to different interpretations, based on other data, he cautioned.

Amplitude anomalies

Seismic data can also provide other insights in the form of what are referred to as amplitude anomalies, zones of unusually high seismic amplitudes that can be indicators of the presence of hydrocarbons in the rocks. These anomalies become prime targets for exploration drilling. And there are quite a number of anomalies in the Nanushuk that have not yet been drilled but which have provided a basis for USGS scientists to make estimates of possible undis-

covered resources.

Houseknecht described one undrilled anomaly, to the west of where drilling has taken place to date. This anomaly occupies an area of about 44 square miles and could hold something in the range of 200 million to 400 million barrels of recoverable oil.

But there is much uncertainty. There are many untested seismic anomalies, but no one knows how many of these anomalies have the potential to yield economically viable discoveries. Even in the discoveries that have already been made, there will be significant uncertainty over recoverable volumes until horizontal wells are drilled through the reservoirs and production procedures are put in place, Houseknecht said.

Reservoir quality

The impact of reservoir quality on oil recoverability is also an issue. Oil reservoirs in both the Nanushuk and the Torok are in the form of what are called stratigraphic traps, hydrocarbon traps formed as a consequence of the manner in which the sediments were deposited, rather than as a consequence of later folding and faulting of the rock strata. With the Torok being buried more deeply and slightly before the Nanushuk, the reservoir quality in the Torok is typically poorer than in the Nanushuk. And reservoir quality in the Nanushuk tends to deteriorate north to south, Houseknecht said.

Given the reservoir quality comparisons, and given the locations of Nanushuk and Torok discoveries, Nanushuk stratigraphic traps will probably be the main driver for further exploration, with exploration of the Torok being more limited to areas close to

existing oil infrastructure — access to infrastructure can help mitigate reservoir quality risk, Houseknecht suggested.

Access to the prospects may also be an issue. The more westerly part of the National Petroleum Reserve-Alaska was open to oil and gas leasing a number of years ago but has since been withdrawn. Currently, it is difficult for a company to access the plays if that company is not already a leaseholder in areas that remain open, Houseknecht commented.

Upping the assessment

However, the new discoveries in the Nanushuk and Torok have triggered a major change in the USGS assessment of undiscovered oil in the NPR-A. As recently as 2010 the agency published an assessment that particularly focused on the oil potential in Alpine sands, analogous to the reservoir sands in the nearby Alpine oil field. At that time, recent exploration drilling had indicated that moving west, within 20 to 25 miles of the Alpine field, hydrocarbon traps tended to contain a preponderance of gas and condensate, rather than oil. As a consequence, lease holdings in the region dropped substantially and the USGS downgraded its NPR-A oil expectations, Houseknecht said.

However, the recent Nanushuk and Torok discoveries have upended that gloomy view, causing the USGS to significantly increase its NPR-A undiscovered oil estimates. But major uncertainty remains over exactly how much oil is there, Houseknecht cautioned. ●

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HYDRATE WELL

North Slope Spine Road, about one mile north of Z pad, in the western part of the Prudhoe Bay unit. The plan is to start drilling the well in December, with a view to completing the well and demobilizing the drilling rig by mid-January. Part of the drilling project will involve the collection of downhole samples, to confirm the presence of hydrates at the well location.

DOE says that its National Energy Technology Laboratory is funding the drilling phase of the project and that NETL, the Japan Oil, Gas and Metals National Corp., the U.S. Geological Survey and Petrotechnical Resources of Alaska are all

providing technical expertise in support of the project planning and execution. The Alaska Department of Natural Resources has also been facilitating methane hydrate evaluation in Alaska, DOE says.

Methane hydrate is a solid in which molecules of methane, the primary component of natural gas, are concentrated inside a lattice of water molecules. Huge quantities of the material, which remains stable within a certain range of relatively high pressures and low temperatures, are known to exist around the base of the permafrost under the North Slope. There are also extensive hydrate accumulations in other parts of the world, including in the seabed of the Gulf of Mexico and offshore Japan.

There is the possibility of using methane hydrate deposits as a major source of natural gas — the gas can potentially be released through some combination of depressurizing or heating the hydrate material. However, although short-term hydrate production tests have been conducted, no one has yet demonstrated long-term, sustained production. Moreover, there are questions over whether the production of gas from hydrates would be economically viable and competitive with conventional gas production. Gas production through depressurization of the hydrates, as gas is drawn off, would presumably be cheaper than production through the application of heat.

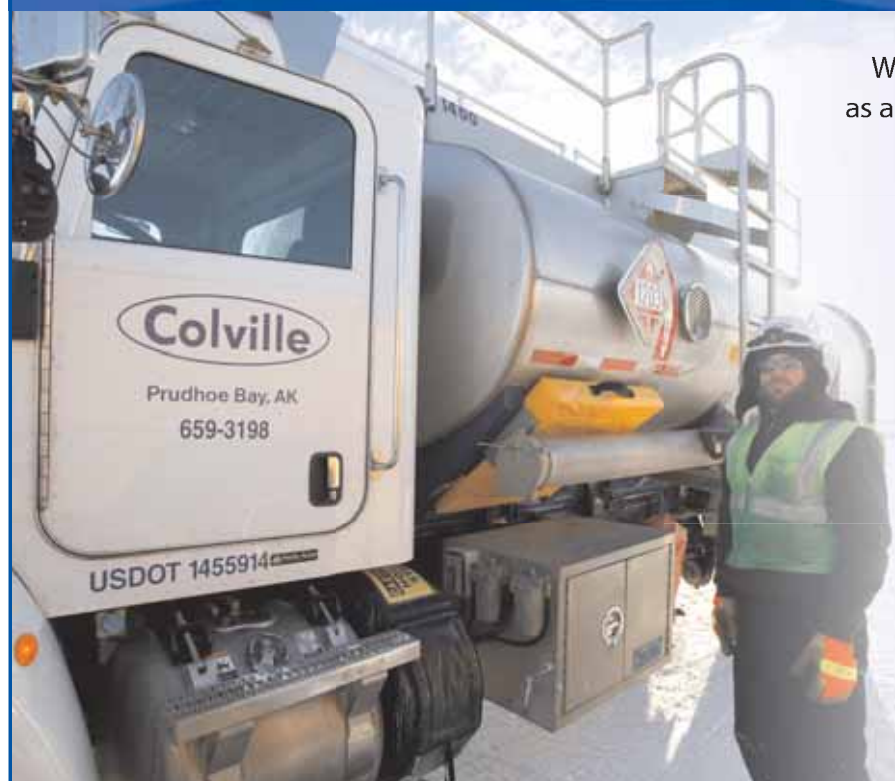
DOE says that the site of the new North Slope methane hydrate well has the potential to enable the conducting of experiments over many months, especially given the convenient location of the well site for year-round access.

“This test will move us closer to understanding gas hydrates, which have the potential to provide an enormous new energy source,” said Steven Winberg, DOE assistant secretary for fossil energy. “We look forward to working with our partners on this important project.”

—ALAN BAILEY

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