Alberta has the second-largest deposit of oil in the world — only Saudi Arabia can claim a larger stockpile of crude. But 170 billion of Alberta’s 179 billion barrels of oil have the special quality of being bitumen, a resource that has been developed for decades but is only now coming into the forefront of the global energy industry, as conventional supplies — so-called “easy” oil — continue to be depleted. The figure of 170 billion barrels represents what is considered economically recoverable with today’s technology, but with new technologies, this reserve estimate could be increased to as much as 315 billion barrels.

There are three major bitumen (or oil sands) deposits in Alberta. The largest is the Athabasca deposit, located in the province’s northeast in the Regional Municipality of Wood Buffalo. The main population centre of the Athabasca deposit is the City of Fort McMurray. The second-largest oil sands deposit is referred to as Cold Lake, just south of Athabasca, with the main population centre the City of Cold Lake. The smallest oil sands deposit is known as Peace River, which is located in northwest central Alberta. A fourth deposit called Wabasca links to the Athabasca and is generally lumped in with that area.

The existence of bitumen in Alberta has been known for a long time. The first mention of it in Canadian history was in 1719, when a Cree named Wapasu brought a sample of the “gum” to a Hudson’s Bay trading post. First Nations in what is now the Wood Buffalo area had traditionally used the bitumen, which seeps from outcrops along the Athabasca River, to waterproof their canoes.

Today bitumen is produced as an energy source by two means — mining and in situ. The majority of oil sands production is done by surface mining, but this will likely change in the future, as 80 per cent of Alberta’s bitumen deposits are too deep underground to economically employ this technology.

Right now there are essentially two commercial methods of in situ (Latin for “in place,” essentially meaning wells are used rather than trucks and shovels). In cyclic steam stimulation (CSS), high-pressure steam is injected into directional wells drilled from pads for a period of time, then the steam is left to soak in the reservoir for a period, melting the bitumen, and then the same wells are switched into production mode, bringing the bitumen to the surface.

In steam assisted gravity drainage (SAGD), parallel horizontal well pairs are drilled from well pads at the surface. One is drilled near the top of the target reservoir, while the other is drilled near its bottom. Steam is injected into the top well, a steam chamber forms, and via gravity, the melted bitumen flows into the lower well and is pumped to the surface using artificial lift.

Both SAGD and CSS are used in the Cold Lake and Peace River deposits, while SAGD is the in situ technology of choice in the Athabasca deposit. The choice is based on a number of things including geology. The technologies combined currently produce just over one million barrels per day.

Research is underway on a number of other production technologies designed to optimize production and minimize water and energy use, including vapour extraction (VAPEX), and a form of in situ combustion known as toe to heel air injection (THAI).

Bitumen that has not been processed, or “upgraded,” can be used directly as asphalt. It must be diluted to travel by pipeline. Adding value, some producers upgrade their product into synthetic crude oil (SCO), which is a refinery feedstock. At these refineries it can be transformed into transportation fuels and other products.
Mapping the oil sands

Canada’s heavy oil and oil sands resources are often referred to as “the oil that technology made.” Without intensive production technology development, the industry would not exist as it does today. These technologies still continue to be advanced and optimized, improving recovery and reducing environmental impacts.

Alberta’s Industrial Heartland is over 143,815 acres in size, and is located in the northeast quadrant of the Greater Edmonton region in central Alberta. This region is key to the value-added processing of Alberta’s oil sands resources into higher valued refined petroleum products and petrochemicals.
Government update

REPORT MEASURES ALBERTA’S ABILITY TO COMPETE GLOBALLY

On Dec. 10, 2010, Alberta’s Competitiveness Council released a new benchmarking report that showed the province has a competitive edge over its closest competitors, but also identifies areas for improvement to ensure Alberta remains an attractive investment location.

Report on Competitiveness: Alberta 2010 provides quantifiable evidence of the province’s ability to compete in a world market by looking at a variety of factors crucial to success, including productivity, innovation, taxes and fiscal policy, regulation, transportation and infrastructure, labour force development and access to capital markets.

Overall, the report indicates that Alberta is performing well in comparison to 14 other provincial and international jurisdictions. Alberta ranks first or second in 24 of the 60 measures. Altogether, Alberta rates either above-average or average in 45 measures.

Areas of provincial strength include living standards, economic well-being, labour productivity, investment in machinery and equipment, and taxes and fiscal policy. According to the report, Alberta has room for improvement in productivity growth, innovation investments, non-resource exports, high-tech employment and venture capital investment.

This report provides solid information to guide the council in its work, including the development of recommendations for action expected this summer. It also provides government with the ability to better track trends and changes in Alberta’s competitiveness over time.

A copy of the report is available at www.finance.alberta.ca/competitiveness.

WESTERN PROVINCES UNITE TO IMPROVE ACCESS TO ASIAN MARKETS

Energy ministers from Alberta, British Columbia and Saskatchewan signed an agreement in December 2010 that will help expand and strengthen Canada’s position as an energy powerhouse. Arising from the New West Partnership created during the spring, the Energy Memorandum of Understanding will combine and build on the existing strengths of all three provinces to expand the region’s energy sectors — attracting new investment, stimulating job creation and strengthening the region’s economy. The three provinces will begin working immediately on a number of projects, including developing a joint strategy to target opportunities in Asia and improving consultation with industry.

AMENDMENTS GUIDE USE OF CCS TECHNOLOGY

In November 2010, through the Carbon Capture and Storage Statutes Amendment Act, the Alberta government introduced legislation that will guide how large-scale carbon capture and storage CCS projects will proceed in Alberta. It clarifies ownership of pore space, which are tiny holes in porous rock where carbon would be stored deep underground.

Under the proposed legislation, the Alberta government would accept long-term liability for injected CO₂ once the operator provides data showing that the stored CO₂ is contained. It would also establish a fund financed by CCS operators for ongoing monitoring costs and any required remediation. The legislation does not propose any changes to ownership of mine and minerals resources. This law makes Alberta the first province in Canada to introduce comprehensive legislation for this greenhouse gas reduction technology.

CCS MAJOR INITIATIVES

The Government of Alberta has signed letters of intent with the following four project proponents to implement large-scale CCS projects in Alberta:

• Enhance Energy Inc. and Northwest Upgrading: The Alberta Carbon Trunk Line, Alberta’s first CO₂ pipeline distribution system, will be capable of gathering CO₂ from sources in Alberta’s Industrial Heartland and transporting it to existing mature oilfields to be used for enhanced oil recovery.

• Shell: The Quest project will capture and store 1.2 million tonnes of CO₂ annually beginning in 2015 from Shell’s Scotford upgrader.

• Swan Hills Synfuels: The in situ coal gasification project will access deep coal seams in order to convert the coal into a clean synthetic gas known as syngas.

• TransAlta Corporation and partners: Project Pioneer will use leading-edge technology to capture CO₂ for enhanced oil recovery in nearby conventional oilfields.

Funding for these initiatives, which will reduce greenhouse gas emissions by five million tonnes annually beginning in 2015, will come from the $2-billion CCS fund announced in 2008.

Updates on Alberta’s CCS initiative are available at www.energy.gov.ab.ca/Initiatives/1438.asp.

MINISTER LIEPERT PROMOTES RESPONSIBLE DEVELOPMENT AT U.S. ENERGY COUNCIL MEETING

Energy Minister Ron Liepert discussed Alberta’s commitment to responsible energy development with government and industry representatives from across North America at the U.S. Energy Council.
meeting held in Santa Fe, New Mexico, from Dec. 9–12. Discussions at the Energy Council’s 2010 Global Energy and Environmental Issues Conference covered a range of issues pertaining to shale gas development, energy security, and renewable and clean energy technology.

As a centre of excellence for CCS, Minister Liepert took this opportunity to outline Alberta’s leading-edge work on large-scale CCS and share Alberta’s experience with other participating jurisdictions.

The Energy Council is a legislative organization of 12 energy-producing U.S. states, along with international affiliates Alberta, British Columbia, Newfoundland and Labrador, Nova Scotia, Saskatchewan and Venezuela.

MINISTER RENNER ATTENDS CLIMATE CHANGE CONFERENCE

Environment Minister Rob Renner travelled to Cancun, Mexico, to represent Alberta’s interests and priorities for a global greenhouse gas reduction framework at the United Nation’s 16th annual climate change conference held from Nov. 29 to Dec. 10.

During his time at the conference, Minister Renner also met with other participating jurisdictions to discuss Alberta’s $2-billion investment in CCS, the province’s experience operating North America’s only emissions reduction program and Alberta’s clean energy technology fund, which has already collected $187 million.

ERCB CONDITIONAL APPROVAL OF FINAL TWO TAILINGS PLANS

In December 2010, the Energy Resources Conservation Board (ERCB) conditionally approved the final two tailings plans submitted under Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes.

The Canadian Natural Resources Horizon and Shell Jackpine plans represent the seventh and eighth tailings plans submitted to the ERCB by five oil sands operators in total. To date, the ERCB has conditionally approved tailings management plans for the Suncor Millennium/Steepbank, Suncor Fort Hills, Syncrude Mildred Lake and Aurora, Imperial Kearl and Shell Muskeg River projects.

Collectively, the five oil sands operators have committed more than $4 billion in technology, infrastructure and upgrades to meet the regulatory requirements in Directive 074. Over the life of the projects, tailings reduction at those sites will exceed Directive 074 requirements.

The tailings plan approvals end an important initial phase in the implementation of Directive 074. By Sept. 30, 2011, operators must submit annual tailings plan updates to ensure that tailings ponds are being managed in accordance with their tailings plans and that upgrades are being made on schedule.

ERCB STREAMLINES IN SITU OIL SANDS APPLICATION PROCESS

In December 2010, as part of its commitment to streamlining and improving its regulatory requirements, the ERCB issued Directive 078: Regulatory Application Process for Modifications to Commercial In Situ Oil Sands Projects. The new ERCB directive redesigns the regulatory approach to amendment applications for all commercial in situ oil sands projects.

Commercial in situ oil sands projects typically take years to construct, and they operate for several decades. As technology changes and operational experience grows, the ERCB will receive multiple amendment applications from each in situ project. The new directive will streamline the amendment application process by employing one of three regulatory categories, depending on the nature and complexity of the amendment. For additional details, go to www.ercb.ca.

The changes to the ERCB’s in situ oil sands application process complement the Government of Alberta’s Energizing Investment: A Framework to Improve Alberta’s Natural Gas and Conventional Oil Competitiveness released in March 2010. The framework aims to ensure that Alberta provides a leading competitive environment for oil and gas investment in Alberta.

ALBERTA KICK-STARTS NEW WORLD-CLASS MONITORING SYSTEM

In working to ensure that Alberta continues to be leader in responsible oil sands development, the Government of Alberta has taken steps to solicit independent expert advice on how to best set up, operate and govern a world-class environmental monitoring, evaluation and reporting system for Alberta’s oil sands. A transparent monitoring system is critical as Alberta continues the transition to a cumulative effects system of environmental management.

The expert group will also give direction for provincial action required to address and implement recommendations that arise from the provincial data review undertaken in 2010, as well as those from the federal oil sands advisory panel. The independent experts are to be in place by January 2011 and will report back to the minister of environment by June 2011. As the first area in Alberta to move towards this new system, the oil sands region will serve as a pilot for the rest of the province.
What’s new in the oil sands

Key updates from winter 2010

Husky Energy is officially going ahead with the 60,000-barrel-per-day first phase of the Sunrise steam assisted gravity drainage (SAGD) project, allocating it $415 million in 2011 spending. However, the money will come from Husky’s partner, BP, which has committed to funding the first $2.5 billion of the project. Contracts for transportation, engineering and construction, valued at approximately $2 billion, will soon be awarded.

“Sunrise represents a transformational opportunity for the company,” says Asim Ghosh, Husky’s president and chief executive officer. “Over time, Sunrise alone has the potential to deliver more than 50 per cent of our current production and is just one of several oil sands leases in Husky’s portfolio. Collectively, they will provide a source of stable growth to create substantial shareholder value in the coming decades.”

With the acquisition in early October of additional leases adjacent to its recently approved Kirby SAGD project, Canadian Natural Resources Limited is planning to increase the ultimate size of the installation. The overall target will be between 70,000 and 100,000 barrels per day, including the second and debottlenecking phase, says Canadian Natural Resources president Steve Laut. The company’s board of directors has sanctioned Kirby Phase 1 at an estimated cost of $1.5 billion, roughly $31,250 per barrel per day of capacity, which will be 40,000 barrels per day. First steam is targeted for 2013. In October, Canadian Natural purchased new assets at Kirby from Enerplus Resources Fund, adding 520 million barrels of recoverable oil at a cost of $405 million.

Bangkok, Thailand–based PTT Exploration and Production Public Company Limited has entered into a deal where it will buy a 40 per cent stake in Statoil’s Kai Kos Dehseh oil sands assets for $2.3 billion. Statoil will remain as operator.

The 10,000-barrel-per-day first phase of Kai Kos Dehseh, Leismer, achieved first steam injection in September 2010. Production is expected to commence during first quarter of 2011. Statoil has filed applications for 230,000 additional barrels per day of production under the Kai Kos Dehseh project umbrella.

As Imperial Oil continues construction on the first phase of its Kearl oil sands mining project, the company is reconfiguring the development plan to minimize facility requirements and potentially reduce the plant’s footprint.

The initial plan was to develop the $8-billion project in three phases with ultimate production of about 330,000 barrels per day by about 2020, says Imperial spokesman Pius Rolheiser. While plans still call for the initial phase of 110,000 barrels per day to be on production at the end of 2012, Imperial is looking at a combination of debottlenecking the initial facilities, then expansion, then potentially another debottlenecking to achieve the total resource development in about the same time period. Production, in fact, may be slightly higher at about 345,000 barrels per day near 2020, says Rolheiser.

Flint Energy Services has been awarded a contract to fabricate production modules for Suncor Energy’s Firebag SAGD project.

Work on the fixed-price contract valued at $18.5 million starts immediately, and work will continue through to the second quarter of 2011, employing up to 200 workers at Flint’s fabrication facilities in Sherwood Park, Alberta.

Flint also reports that its subsidiary company, Flint Transfield Services, has negotiated an extension to its Suncor maintenance agreement, which will run until 2016. The maintenance agreement, which has been in place since 2007, is a five-year rolling, performance-based relationship that delivers base maintenance services to Suncor’s upgrading operations in Fort McMurray, Alberta, the Firebag SAGD operations north of Fort McMurray and the Sarnia refinery in Ontario.

The maintenance agreement covers asset management services and other service agreements, which have a potential value in excess of $2.2 billion over the five-year period.

TransCanada Corporation now expects to receive a U.S. presidential permit in the first half of next year for its proposed Keystone Gulf Coast expansion from Alberta to Port Arthur, Texas.

The company expects the final environmental impact statement from the Environmental Protection Agency by the end of this year or early next year, followed by the presidential permit, says Russ Girling, TransCanada president and chief executive officer.

A mid-2011 approval would still enable the southern portion of the 500,000-barrel-per-day line from Cushing, Oklahoma, to Port Arthur, Texas, to be in service by the first quarter of 2013 as requested by shippers who have contracted for 380,000 barrels per day (75 per cent) of capacity, says Alex Pourbaix, president, energy and oil pipelines.

Harvest Operations is ramping up work on its BlackGold thermal bitumen project and will spend between $450 million and $500 million on the project by the end of 2012.
Harvest, a wholly owned subsidiary of Korea National Oil Corporation, has increased its 2010 capital budget by $70 million to help fund the start of what it says will be an active winter drilling season. The budget increase brings the integrated mid-size producer’s projected 2010 spending to about $490 million, up from $233 million in 2009.

Ivanhoe Energy announced it has completed a major milestone towards commercial production at its Tamarack project with the submission of its regulatory application to the Government of Alberta.

The application is for development of an integrated in situ project to be built in two phases, each at 20,000 barrels per day.

“Filing this application marks the culmination of over three years of detailed environmental, engineering and geological work as well as extensive socio-economic analysis,” says David Dyck, Ivanhoe’s president and chief operating officer. “Our team has worked diligently to prepare and complete this application, and its submission to the regulatory authorities is the next critical step in our development schedule, which targets first oil in 2013.”

Nitrate-reducing bacteria that promote sedimentation could shrink oil sands tailings ponds and reduce the production and release of the greenhouse gas methane, thereby allowing companies to recycle more water from the ponds, say University of Calgary researchers.

So far, experimenting has been limited to test tubes. The next step is to further test the idea on a scale about 100 times larger than what’s been done so far, again in test tubes. It will probably be 5—10 years before it’s used in the field, says Dr. Sylvain Bordenave, research lead and a post-doctoral fellow in the Faculty of Science.

Bordenave and other scientists at the Schulich School of Engineering and the Faculty of Science at the university have been working on this for two years.

Connacher Oil and Gas has announced that combined bitumen production levels from its Pod One and Algar SAGD operations exceeded 12,000 barrels per day during September. Production recently averaged 11,691 barrels per day for the seven days ended Oct. 2.

Algar and Pod One are located on the company’s Great Divide oil sands lease block, approximately 80 kilometres southeast of Fort McMurray. Pod One began operations in 2007, while Algar was fired up in 2010. Combined capacity is 10,000 barrels per day.

Connacher says the Algar production ramp-up is ahead of other record ramp-up rates that have recently been reported for new SAGD operations.

Connacher continues to anticipate achieving a total exit bitumen production rate for 2010 of between 15,500 and 16,500 barrels per day.

Now that the focus is off the proposed Fort Hills mine, people get to see Frontier and Equinox, the primary assets of newly formed SilverBirch Energy, as legitimate mining projects, says the company’s head.

“Nobody used to ask us about our other leases,” says Howard Lutley, president and chief executive officer, formerly UTS Energy Corporation’s vice-president of mining and extraction.

Launched in early October, SilverBirch was formed as a result of a plan of arrangement between UTS and Total E&P Canada, which purchased UTS’s 20 per cent share of the Fort Hills project, operated by Suncor Energy with a 60 per cent interest. The project’s remaining 20 per cent is held by Teck Resources.

SilverBirch was formed with UTS’s remaining assets, as well as its exploration and financial teams. It was “seeded” with $50 million, enough for 18 months of planned operations, says Lutley.

The company’s focus for the next year and a half will be on Frontier, with the smaller Equinox as a satellite, and leases 418/271 further east, he said. In the next 18 months, SilverBirch plans to spend $19 million on exploration and $11 million on Frontier and Equinox, with another $6 million—$7 million on general and administrative expenses. It plans to drill 40—50 wells starting in February 2011, as soon as the weather allows it to get on the leases.

Titanium Corporation and Sustainable Development Technology Canada have announced the completion of the first phase of Titanium’s oil sands tailings pilot demonstration project.

“Now that engineering, construction and installation of the major process modules have been completed, we have commenced operations of the pilot,” says Scott Nelson, Titanium’s president and chief executive officer. “Froth treatment tailings from three oil sands operating sites are being processed over the next four months. We anticipate continuing strong performance of our technology during the program.”

Titanium’s “Creating Value from Waste” technology has been designed to recover valuable products from waste tailings and reduce environmental impacts in the oil sands industry. A consortium of oil sands operators
is providing tailings to the pilot, which will operate into early 2011.

Enbridge will undertake an expansion of its Athabasca Pipeline to accommodate recent shipping commitments by the Christina Lake SAGD project operated by Cenovus Energy. The estimated cost of the project is approximately $185 million. The Athabasca Pipeline transports crude oil from various oil sands projects to the mainline hub at Hardisty, Alberta. As a result of this expansion, which is expected to be in service in 2013, the capacity of the Athabasca Pipeline will be 430,000 barrels per day, depending on crude slate.

Enbridge has also entered into an agreement to provide pipeline and terminalling services to the proposed Husky Energy operated Sunrise SAGD project. Enbridge will construct a new originating terminal (Hartley terminal) at the Sunrise project, a 112-kilometre, 24-inch-diameter pipeline from Hartley to Enbridge’s Cheecham terminal and additional tankage at Cheecham.

The estimated cost of the project is about $475 million with an initial capacity of 90,000 barrels per day, expandable to 270,000 barrels per day. The facilities are expected to be in service in the latter half of 2013.

Heavy oil know-how is expected to flow in and out of Calgary with the establishment of the GE Global Heavy Oil Centre of Excellence.

The Alberta government and General Electric Canada have signed an agreement that will see the global innovation giant establish two new technology centres in Calgary and collaborate with the province in areas of shared expertise.

The heavy oil centre will provide and leverage engineering resources to develop solutions to the challenges of producing and upgrading heavy oil. It will be located within the GE Innovation Centre, which will showcase GE’s innovation and technology capabilities and enable collaboration on solutions to the energy, water and infrastructure challenges facing Alberta and the world.

Connacher Oil and Gas says the 13.1-megawatt cogeneration facility at its newly commissioned Algar SAGD plant in the Great Divide region of northeastern Alberta has been completed on time and on budget.

The plant, which is capable of generating 3,700 barrels per day of steam at full design rate, was commissioned in late August and was integrated with the Algar plant in early September following a short plant outage to facilitate the electrical work. Algar is now islanded from the regional electrical grid.

Athabasca Oil Sands Corporation (AOSC) and Excelsior Energy have announced that they have entered into an agreement whereby AOSC will acquire all of the issued and outstanding common shares of Excelsior by way of plan of arrangement valued at approximately $144 million.

“The addition of Excelsior’s high-quality assets to those of AOSC at Hangingstone is in line with the strategy we have presented to our investors and creates a world-class, standalone project,” says Sveinung Svarte, president and chief executive officer of AOSC. “The transaction will result in a project of critical size and an accelerated development of the area. It also gives us ownership of their proprietary COGD [combustion overhead gravity drainage] technology.”

Royal Dutch Shell, as operator of the Athabasca Oil Sands Project (AOSP), has announced the successful start of production of its 100,000-barrel-per-day Jackpine expansion.

The new Jackpine mine will combine with existing production from the Muskeg River mine to feed the Scotford upgrader, where an expansion is currently underway and scheduled to come on stream in 2011. The AOSP expansion is one of a sequence of major projects that the company says should raise Shell’s global oil and gas production by 11 per cent.

The Regional Municipality of Wood Buffalo and Total E&P Canada have reached a memorandum of understanding regarding shared commitments to mitigate the socio-economic impacts should Total’s Joslyn mining project be approved.

Under the memorandum, which the two groups hope will be adopted as part of the approval, the municipality says it is prepared to support the project, which it had previously committed to stand against during regulatory hearings.

Devon Energy’s board of directors has sanctioned the company’s third SAGD project on its Jackfish leases in the Athabasca oil sands.

Pending approval of the regulatory application filed last month, Devon expects to begin facilities construction at Jackfish 3 near the end of next year with plant start-up targeted for 2015.

Once fully operational, Jackfish 3 is expected to produce an average of 35,000 barrels of oil per day before royalties. Similar to Jackfish 1 and 2, the third phase represents an estimated 300 million barrels of recoverable oil before royalties.

Devon expects to spend US$1.2 billion on the project through start-up.

Cenovus Energy has received the regulatory go-ahead to build Phases F, G and H of its Foster Creek SAGD project, expected to boost gross production to 210,000 barrels per day from the current 120,000 barrels per day.

Engineering on Phase F is already underway and preliminary groundwork is expected to start soon. First production from this phase is anticipated in 2014. Production from the other two phases is anticipated in 2016–17.
### Project listings

**Updated status of oil sands projects in Alberta**

As of December 10, 2010.

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<th>CURRENT PROJECT</th>
<th>CAPACITY (bbl/d)</th>
<th>START-UP</th>
<th>REGULATORY STATUS</th>
<th>DEVELOPMENT PROGRESS</th>
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<td></td>
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<td><strong>CONNACHER OIL AND GAS</strong></td>
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<td>Great Divide</td>
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<td>Pod 2 (Algar)</td>
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<td>Expansion</td>
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<td>2013</td>
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<td>SAGD</td>
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</tbody>
</table>

**TECHNOLOGY LEGEND**

- **COGD**: Combustion overhead gravity drainage
- **CSS**: Cyclic steam stimulation
- **ET-DSP**: Electro-thermal dynamic stripping process
- **N-SOL V**: Heated solvent vapour extraction
- **SAGD**: Steam assisted gravity drainage
- **THAI**: Toe to heel air injection

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Alberta Oil Sands has appointed Andrew Constantinidis as vice-president of finance and business development. Most recently he was president and CFO of Eurogas. The company says his experience in large-project financing will help it accelerate development plans.

AOSC has completed its acquisition of Excelsior Energy. As of late October, the company said it would submit its Dover application by year-end 2010.

Regulatory approvals received Oct. 2010. BlackPearl plans on drilling the SAGD well pair before the end of 2010, as well as commencing construction of oil handling facilities and installation of steam-generation equipment. First steam is expected in Q1/2011, with results to follow late in the year.

Additional information is being collected to support regulatory application.

Approvals for E, F and G are expected in 2011, and a wedge-well pilot has been launched at Christina Lake. Application for Phase H to be filed in 2015.

Application to be submitted in Q3.

Cenovus has received regulatory approval to proceed with Foster Creek phases F-H. Engineering on Phase F is already underway, with preliminary ground work expected to commence in the near term.

Single well pair SAGD pilot drilling complete, awaiting Alberta Environment’s final approval.

35 out of 17 Algar well pairs are now on full SAGD. Connacher says that since completing construction of its cogen at Great Divide, those operations are more reliable. It has also submitted application for a SAGD/solvent injection test at Algar.
<table>
<thead>
<tr>
<th>COMPANY</th>
<th>CURRENT PROJECT</th>
<th>CAPACITY (bbl/d)</th>
<th>START-UP</th>
<th>REGULATORY STATUS</th>
<th>DEVELOPMENT PROGRESS</th>
<th>TECHNOLOGY</th>
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<tr>
<td>CONOCOPHILLIPS CANADA</td>
<td>Surmont</td>
<td>Phase 1</td>
<td>27,000</td>
<td>2007</td>
<td>Operating</td>
<td>ConocoPhillips says that increased production from Canadian SAGD projects helped offset an overall production decrease in its global exploration and production segment in Q3.</td>
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<td></td>
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<td>Phase 2</td>
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<td></td>
<td></td>
<td>Pilot</td>
<td>1,200</td>
<td>1997</td>
<td>Operating</td>
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<tr>
<td>DEVON CANADA</td>
<td>JackFish</td>
<td>Phase 1</td>
<td>35,000</td>
<td>2007</td>
<td>Operating</td>
<td>Jackfish 1 was taken offline for three weeks during Q3 for scheduled maintenance but has now been reactivated.</td>
</tr>
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<td>Phase 2</td>
<td>35,000</td>
<td>2011</td>
<td>Under construction</td>
<td>Construction on Jackfish 2 is over 90 per cent complete. Devon plans to start steam injection in Q2/2011.</td>
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<td>Phase 3</td>
<td>35,000</td>
<td>TBD</td>
<td>Announced</td>
<td>Jackfish 3 regulatory application to be filed in Q3/2010. Corporate sanction already in hand.</td>
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<td>Kirby-Pike</td>
<td>Phase 1</td>
<td>TBD</td>
<td>2015</td>
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<td>Delineation drilling expected to begin in the second half of 2010.</td>
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<td>E-T ENERGY</td>
<td>Poplar Creek</td>
<td>Pilot</td>
<td>1,000</td>
<td>2007</td>
<td>Operating</td>
<td>E-T Energy has received funding from Alberta’s Climate Change and Emissions Management Corporation to further testing.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>10,000</td>
<td>2012</td>
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<td>GRIZZLY OIL SANDS</td>
<td>Algar Lake</td>
<td>Phase 1</td>
<td>5,000</td>
<td>2013</td>
<td>Application</td>
<td>Grizzly has awarded SNC-Lavalin engineering and procurement for the first phase of the project.</td>
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<td></td>
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<td>HARVEST ENERGY TRUST</td>
<td>BlackGold</td>
<td>Phase 1</td>
<td>10,000</td>
<td>2012</td>
<td>Under construction</td>
<td>Project ground breaking celebration held Oct. 19.</td>
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<td>20,000</td>
<td>TBD</td>
<td>Application</td>
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<tr>
<td>HUSKY ENERGY</td>
<td>McNiven</td>
<td>Pilot</td>
<td>755</td>
<td>TBD</td>
<td>Approved</td>
<td>Thermal test approved during Q3/2010.</td>
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<td></td>
<td>Sunrise</td>
<td>Phase 1</td>
<td>60,000</td>
<td>2014</td>
<td>Under construction</td>
<td>Husky’s board of directors has sanctioned the Sunrise project.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phases 2–3</td>
<td>140,000</td>
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<tr>
<td>IVANHOE ENERGY</td>
<td>Tamarack</td>
<td>SAGD with HTL upgrading</td>
<td>20,000</td>
<td>2014</td>
<td>Application</td>
<td>Application filed November 2010, anticipated to take between 18 and 24 months to process.</td>
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<tr>
<td>JAPAN CANADA OIL SANDS</td>
<td>Hangingstone</td>
<td>Pilot</td>
<td>10,000</td>
<td>1999</td>
<td>Operating</td>
<td>JACOS anticipates expansion approval in Q3/2011</td>
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<td></td>
<td></td>
<td>Phase 1</td>
<td>35,000</td>
<td>TBD</td>
<td>Application</td>
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<tr>
<td>LARICINA ENERGY</td>
<td>Germain</td>
<td>Commercial demonstration</td>
<td>5,000</td>
<td>2012</td>
<td>Approved</td>
<td>Laricina has closed four equity financings since July 2010, raising in total approximately $340 million, which it says will allow it to move forward with confidence on Germain commercial demonstration project. Saleski remains on track for the fourth quarter.</td>
</tr>
<tr>
<td></td>
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<td>Phase 2</td>
<td>30,000</td>
<td>2014–2015</td>
<td>Announced</td>
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<td></td>
<td>Saleski</td>
<td>SC-SAGD pilot</td>
<td>1,800</td>
<td>2010</td>
<td>Under construction</td>
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<td></td>
<td></td>
<td>Phase 1</td>
<td>1,070</td>
<td>2013</td>
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<td>MEG ENERGY</td>
<td>Christina Lake</td>
<td>Phase 1</td>
<td>3,000</td>
<td>2008</td>
<td>Operating</td>
<td>MEG is now a public company trading on the TSX under the symbol MEG. Phase 2B to begin operations in 2013. MEG has added John Rogers (former VP of investor relations at Suncor) and James Fitzgibbon (former CEO of Oilands Quest) to executive team. MEG plans to file an application for Surmont in 2012.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 2</td>
<td>22,000</td>
<td>2009</td>
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<td></td>
<td>Surmont</td>
<td>Multiple phases</td>
<td>50,000–100,000</td>
<td>TBD</td>
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<td>NEXEN</td>
<td>Long Lake</td>
<td>Phase 1</td>
<td>72,000</td>
<td>2007</td>
<td>Operating</td>
<td>Long Lake experienced operational difficulties in Q3, but has since exceeded peak production rates set in July 2010, recently reaching 31,700 barrels per day.</td>
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<td></td>
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<td>Phase 2</td>
<td>72,000</td>
<td>2009</td>
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<td>Phase 3</td>
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<td>Long Lake South (Kinosi)</td>
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<td>Approved</td>
<td>Nexen plans to be sanction-ready for Kinosi Phase 1 in 2012.</td>
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<td>Phase 2</td>
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<td>N-SOLV</td>
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<td>PETROBANK ENERGY AND RESOURCES</td>
<td>Whitesands</td>
<td>Pilot 1,800</td>
<td>2006</td>
<td>Operating</td>
<td>Re-drilled wells taking longer than expected to establish full communication with the combustion zone. Production averaged between 100 bbl/d and 500 bbl/d during Q3, ranging from heavy oil to upgraded THAI oil.</td>
<td>THAI</td>
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<tr>
<td></td>
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<td>Expansion 1,800</td>
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<td>May River Phase 1</td>
<td>10,000</td>
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<td>Application</td>
<td>May River is currently in final detailed engineering, and orders have been placed for some long lead equipment.</td>
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<td>SHELL CANADA</td>
<td>Gasmont venture</td>
<td>Carbonate pilot</td>
<td>TBD</td>
<td>Approved</td>
<td>Approval granted Oct. 2010. Southern Pacific says it will now proceed with final financing and construction. Southern Pacific has acquired North Peace Energy.</td>
<td>SAGD</td>
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<tr>
<td>SOUTHERN PACIFIC RESOURCE</td>
<td>STP-McKay</td>
<td>12,000</td>
<td>2012</td>
<td>Approved</td>
<td>Approval granted Oct. 2010. Southern Pacific says it will now proceed with final financing and construction. Southern Pacific has acquired North Peace Energy.</td>
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<tr>
<td>STATOIL CANADA</td>
<td>Kai Kos Dehseh-Leismer</td>
<td>Demonstration</td>
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<td>SAGD</td>
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<td>Leismer Commercial</td>
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<td></td>
<td>Expansion</td>
<td>20,000</td>
<td>Application</td>
<td></td>
<td>SAGD</td>
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<td></td>
<td>Corner</td>
<td>40,000</td>
<td>TBD</td>
<td>Application</td>
<td>First steam achieved Sept. 3, 2010. First production expected after 2-3 months. Bangkok, Thailand-based PTT Exploration and Production will become a 40 per cent owner of all stages of Kai Kos Dehseh, at a cost of $2.3 million.</td>
<td>SAGD</td>
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<tr>
<td></td>
<td>Thornbury</td>
<td>40,000</td>
<td>TBD</td>
<td>Application</td>
<td></td>
<td>SAGD</td>
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<tr>
<td></td>
<td>Corner Expansion</td>
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<td>TBD</td>
<td>Application</td>
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<td>Hangingstone</td>
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<td>TBD</td>
<td>Application</td>
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<td>Thornbury Expansion</td>
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<td>Northwest Leismer</td>
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<td>South Leismer</td>
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<td>SUNCOR ENERGY</td>
<td>Chard Phase 1</td>
<td>40,000</td>
<td>TBD</td>
<td>Announced</td>
<td>Suncor has received regulatory approval for stages 4 through 6 of its Firebag project.</td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 1</td>
<td>33,000</td>
<td>2004</td>
<td>Operating</td>
<td>Firebag Phase 3 expected to be complete in the second quarter of 2011, followed by an 18- to 24-month ramp-up.</td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 2</td>
<td>35,000</td>
<td>2006</td>
<td>Operating</td>
<td>Suncor has received regulatory approval for stages 4 through 6 of its Firebag project.</td>
<td>SAGD</td>
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<tr>
<td></td>
<td>Cogeneration and</td>
<td>25,000</td>
<td>2007</td>
<td>Operating</td>
<td>Suncor has received regulatory approval for stages 4 through 6 of its Firebag project.</td>
<td>SAGD</td>
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<td>Phase 4</td>
<td>68,000</td>
<td>2012</td>
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<td>Construction of Phase 4 remains subject to Suncor board approval.</td>
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<td>Phase 5</td>
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<td></td>
<td>Lewis</td>
<td>Phase 1</td>
<td>40,000</td>
<td>TBD</td>
<td>Suncor will not be providing any further updates on next projects to move forward until late 2010.</td>
<td>SAGD</td>
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<tr>
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<td>Phase 2</td>
<td>40,000</td>
<td>TBD</td>
<td>Application</td>
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<td></td>
<td>MacKay River Phase 1</td>
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<td>2002</td>
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<td>TBD</td>
<td>Application</td>
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<td>SAGD</td>
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<tr>
<td></td>
<td>Meadow Creek Phase 1</td>
<td>40,000</td>
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<td>Approved</td>
<td>Project is expected to commence construction in 2010.</td>
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</tr>
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<td>TBD</td>
<td>Approved</td>
<td>Project is expected to commence construction in 2010.</td>
<td>SAGD</td>
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<td>SUNSHINE OILSANDS</td>
<td>Harper pilot Production mobility test</td>
<td>&lt;1,000</td>
<td>TBD</td>
<td>Approved</td>
<td>Sunshine Oilsands has increased its lease holdings to 1,078,705 acres. This is an increase of 57,118 acres. The company now owns and controls 100 per cent of 1,078,705 acres of oilsands leases, representing over 4,310 sq. km of land (1,685 sections).</td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Legend Lake Phase 1</td>
<td>10,000</td>
<td>TBD</td>
<td>Announced</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 2 (two stages)</td>
<td>40,000</td>
<td>TBD</td>
<td>Announced</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 1</td>
<td>10,000</td>
<td>2012</td>
<td>Application</td>
<td>Construction to begin in 2011.</td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 2 (two stages)</td>
<td>40,000</td>
<td>2013</td>
<td>Announced</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 3</td>
<td>30,000</td>
<td>TBD</td>
<td>Announced</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Thickwood Phase 1</td>
<td>10,000</td>
<td>TBD</td>
<td>Announced</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 2 (two stages)</td>
<td>40,000</td>
<td>TBD</td>
<td>Announced</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 3</td>
<td>25,000</td>
<td>TBD</td>
<td>Announced</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td>TOTAL E&amp;P CANADA</td>
<td>Joslyn Phase 1</td>
<td>2,000</td>
<td>2004</td>
<td>Suspended</td>
<td>Total E&amp;P Canada is in the process of determining the best way forward for the assets on its Joslyn in situ lease.</td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 2</td>
<td>10,000</td>
<td>2006</td>
<td>Suspended</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 3A</td>
<td>15,000</td>
<td>TBD</td>
<td>Withdrawn</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 3B</td>
<td>15,000</td>
<td>TBD</td>
<td>Withdrawn</td>
<td></td>
<td>SAGD</td>
</tr>
</tbody>
</table>
## Development Progress

### CSS Follow-up Process
- **2018**: 25,000 barrels per day (bbl/d)
- **2019**: 32,000 bbl/d

### SAGD Projects
- **Wolf Lake**: 13,000 bbl/d
- **Wolf Lake SAGD**: 5,500 bbl/d
- **Primrose South**: 45,000 bbl/d
- **Primrose North**: 30,000 bbl/d
- **Primrose East (Burnt Lake)**: 32,000 bbl/d
- **CSS Follow-up Process**: 25,000 bbl/d

### Technology
- **Syncrude (Mildred Lake and Aurora)**: SAGD
- **Canadian Natural Resources**: CSS
- **Suncor Energy**: CSS
- **TOTAL E&P Canada**: CSS
- **Silverbirch Energy**: CSS

### Regulatory
- **BP**: Application
- **Value Creation**: Application

### Value Creation Group
- **BP will become majority partner and operator of the Terre de Grace project.**
- **Value Creation says the project will demonstrate high-reservoir qualities and advantages of integrating SAGD with its upgrading technology.**

### Athabasca Region – Mining

#### ATHABASCA OIL SANDS PROJECT
- **Jackpine**
  - Phase 1A: 100,000 barrels per day (bbl/d)
  - Phase 1B: 100,000 bbl/d
  - Phase 2: 100,000 bbl/d

#### CANADIAN NATURAL RESOURCES
- **Horizon**
  - Phase 1: 110,000 bbl/d
  - Tranche 2: 6,000–15,000 bbl/d
  - Tranche 3: 10,000–20,000 approx.
  - Tranche 4: 105,000 bbl/d

#### IMPERIAL OIL
- **Kearl**
  - Phase 1: 110,000 bbl/d
  - Phase 2: 100,000 bbl/d
  - Phase 3: 100,000 bbl/d

#### SUNCOR ENERGY
- **Fort Hills**
  - Phase 1: 165,000 bbl/d
  - Debottlenecking: 25,000 bbl/d

- **Syncrude – original operations**
  - Millenium: 294,000 bbl/d
  - Steepbank: 4,000 bbl/d
  - Debottlenecking Phase 3: 23,000 bbl/d

- **Voyageur South**
  - Phase 1: 120,000 bbl/d

#### SYNCRUIDE (MILDRED LAKE AND AURORA)
- **Syncrude – original operations**
  - Stages 1 and 2: 290,700 bbl/d
  - Stage 3 Expansion: 116,300 bbl/d
  - Stage 3 Debottleneck: 46,500 bbl/d
  - Stage 4 Expansion: 139,500 bbl/d

#### TOTAL E&P CANADA
- **Joslyn**
  - Phase 1 (North): 50,000 bbl/d
  - Phase 2 (North): 50,000 bbl/d
  - Phase 3 (South): 50,000 bbl/d
  - Phase 4 (South): 50,000 bbl/d

- **Northern Lights**
  - Phase 1: 57,250 bbl/d
  - Phase 2: 57,250 bbl/d

#### SILVERBIRCH ENERGY
- **Frontier**
  - Phase 1: 100,000 bbl/d
  - Phase 2: 60,000 bbl/d
  - Equinox Satellite: 50,000 bbl/d

### Cold Lake Region – In Situ

#### Canadian Natural Resources
- **Primrose/Wolf Lake**
  - Wolf Lake: 13,000 bbl/d
  - Wolf Lake SAGD: 5,500 bbl/d
  - Primrose South: 45,000 bbl/d
  - Primrose North: 30,000 bbl/d
  - Primrose East (Burnt Lake): 32,000 bbl/d
  - CSS Follow-up Process: 25,000 bbl/d

### Notes:
- Canadian Natural’s Primrose production increased by approximately 30,000 barrels per day in Q3/2010 versus Q3/2009, up to 85,000 barrels per day.
- The company has received regulatory approval to commence steaming of the next cycle at Primrose East, which was suspended in Q1/2010 due to operational issues.
<table>
<thead>
<tr>
<th>COMPANY</th>
<th>CURRENT PROJECT</th>
<th>CAPACITY (bbl/d)</th>
<th>START-UP</th>
<th>REGULATORY STATUS</th>
<th>DEVELOPMENT PROGRESS</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husky Energy</td>
<td>Caribou Demonstration</td>
<td>10,000</td>
<td>TBD</td>
<td>Approved</td>
<td>Husky says that during Q3, three newly designed well pairs commenced production at Tucker.</td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Tucker Phase 1</td>
<td>30,000</td>
<td>2006</td>
<td>Operating</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td>Imperial Oil</td>
<td>Cold Lake Phases 1–10</td>
<td>110,000</td>
<td>1985</td>
<td>Operating</td>
<td>Imperial says the regulatory approval process advanced with the recent ERCB Cold Lake scheme amendment and Alberta Utilities Commission approvals. Current activities include plant site clearing, grading and road construction.</td>
<td>CSS</td>
</tr>
<tr>
<td></td>
<td>Phases 11–13: Mahikkan</td>
<td>30,000</td>
<td>2003</td>
<td>Operating</td>
<td></td>
<td>CSS</td>
</tr>
<tr>
<td></td>
<td>Phases 14–16: Nabiye, Mahikkan North</td>
<td>30,000</td>
<td>TBD</td>
<td>Approved</td>
<td></td>
<td>CSS</td>
</tr>
<tr>
<td>Koch Exploration Canada</td>
<td>Gemini Pilot</td>
<td>1,200</td>
<td>TBD</td>
<td>Application</td>
<td>According to the Cold Lake Sun, the project is nearing the end of the regulatory application process, with a planned first phase single well pair SAGD test.</td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>SGAD Project</td>
<td>10,000</td>
<td>TBD</td>
<td>Application</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td>Osum Oil Sands</td>
<td>Taiga SAGD/CSS Project</td>
<td>25,000–35,000</td>
<td>2014</td>
<td>Application</td>
<td>Osum has closed a $100-million private placement to a wholly owned subsidiary of Korea Investment Corporation, which Osum says will be directed in its in situ projects and general corporate purchases.</td>
<td>SAGD</td>
</tr>
<tr>
<td>Pengrowth Energy Trust</td>
<td>Lindbergh SAGD Pilot</td>
<td>2,500</td>
<td>2012</td>
<td>Application</td>
<td>Pengrowth says that Lindbergh is one of four major operated growth areas that will enjoy parts of its $400-million 2011 projected capital program.</td>
<td>SAGD</td>
</tr>
<tr>
<td>Shell Canada</td>
<td>Orion Phase 1</td>
<td>10,000</td>
<td>2008</td>
<td>Operating</td>
<td>Onion production averaged 2,898 barrels per day in the second quarter.</td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Phase 2</td>
<td>10,000</td>
<td>TBD</td>
<td>Approved</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td>Peace River Region – In Situ</td>
<td>Andora Energy (Pan Orient) Sawn Lake SGAD Demonstration</td>
<td>1,400</td>
<td>TBD</td>
<td>Approved</td>
<td>Andora owner Pan Orient Energy says the Sawn Lake pilot will cost approximately $15 million.</td>
<td>SAGD</td>
</tr>
<tr>
<td>Petrobank Energy and Resources</td>
<td>Dawson THAI Pilot</td>
<td>TBD</td>
<td>2011</td>
<td>Approved</td>
<td>Petrobank received regulatory approval for a two-well THAI pilot at Dawson in November 2010. It anticipates project start-up in the third quarter of 2011.</td>
<td>THAI</td>
</tr>
<tr>
<td>Shell Canada</td>
<td>Carmon Creek Cadotte Lake</td>
<td>12,501</td>
<td>1986</td>
<td>Operating</td>
<td>New application filed January 2010. Shell expects construction of first 40,000-barrel-per-day plant to commence in 2011, with a second 40,000-barrel facility three years following.</td>
<td>CSS</td>
</tr>
<tr>
<td></td>
<td>Phases 1 and 2</td>
<td>80,000</td>
<td>TBD</td>
<td>Application</td>
<td></td>
<td>CSS</td>
</tr>
<tr>
<td>Southern Pacific Resource Corp.</td>
<td>Red Earth CSS Pilot</td>
<td>1,000</td>
<td>2008</td>
<td>Operating</td>
<td>Southern Pacific and North Peace Energy have completed the plan of arrangement by which Southern Pacific acquires all issued securities of North Peace and its assets.</td>
<td>CSS</td>
</tr>
<tr>
<td></td>
<td>Expansion</td>
<td>3,000</td>
<td>TBD</td>
<td>Announced</td>
<td></td>
<td>CSS</td>
</tr>
<tr>
<td></td>
<td>Commercial Project</td>
<td>10,000</td>
<td>TBD</td>
<td>Announced</td>
<td></td>
<td>CSS</td>
</tr>
<tr>
<td>North West Saskatchewan – In Situ</td>
<td>Oilsands Quest Reservoir Test</td>
<td>600</td>
<td>2008</td>
<td>Operating</td>
<td>Oilsands Quest has announced it is pursuing strategic alternatives in order to secure funds to progress its operations. Oilsands Quest is re-abandoning core holes in the region that were not abandoned to the required standard for in situ oil sands operations. The company successfully re-abandoned 34 core holes as of Oct. 5, 2010, and planned to abandon a further five to year-end.</td>
<td>Test</td>
</tr>
<tr>
<td></td>
<td>SAGD Test</td>
<td>TBD</td>
<td>TBD</td>
<td>Application</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td></td>
<td>Commercial SAGD</td>
<td>30,000</td>
<td>TBD</td>
<td>Application</td>
<td></td>
<td>SAGD</td>
</tr>
<tr>
<td>Athabasca Region – Upgrading</td>
<td>Horizon Phase 1</td>
<td>135,000</td>
<td>2008</td>
<td>Operating</td>
<td>Maintenance complete, production ramping back near stable state levels.</td>
<td>Upgrader</td>
</tr>
<tr>
<td></td>
<td>Tranches 2 &amp; 3</td>
<td>135,000</td>
<td>118,000</td>
<td>TBD</td>
<td>Approved Canada Natural hopes to sanction Tranche 2 by the end of 2010. Tranches 3 and 4 continue to be re-profiled based on learnings from Phase 1.</td>
<td>Upgrader</td>
</tr>
<tr>
<td></td>
<td>Tranche 4</td>
<td>145,000</td>
<td>125,000</td>
<td>TBD</td>
<td>Announced Canada Natural hopes to sanction Tranche 2 by the end of 2010. Tranches 3 and 4 continue to be re-profiled based on learnings from Phase 1.</td>
<td>Upgrader</td>
</tr>
</tbody>
</table>

**Alberta Oil Sands Industry Quarterly Update**

**COMPANY CURRENT PROJECT**

**CAPACITY BITUMEN**

**CAPACITY PRODUCTS**

**START-UP**

**REGULATORY STATUS**

**DEVELOPMENT PROGRESS**

**TECHNOLOGY**
**Long Lake**

- **Phase 1**: 72,000 barrels per day in 2008 (Operating)
- **Phase 2**: 72,000 barrels per day (Approved)
- **Phase 3**: 72,000 barrels per day (Announced)
- **Phase 4**: 72,000 barrels per day (Announced)
- **Phase 5**: 72,000 barrels per day (Announced)
- **Phase 6**: 72,000 barrels per day (Announced)

Long Lake experienced operational difficulties in Q3, but has since exceeded peak production rates set in July 2010, recently reaching 31,700 barrels per day. During the third quarter, Long Lake sold premium synthetic heavy when unable to sell premium sweet crude.

**Suncor – original operations**

- **Base U1 and U2**: 281,000 barrels per day in 1967 (Operating)
- **Millennium Vacuum Unit**: 43,000 barrels per day in 2005 (Operating)
- **Millennium Coker Unit**: 116,000 barrels per day in 2008 (Operating)

Suncor says its remaining 2010 capital growth spending will be directed towards completion of a naptha unit at Upgrader 2, which is expected to increase the value of its product mix. The project is expected to be complete by the end of the fourth quarter of 2011.

**Voyageur**

- **Phase 1**: 156,000 barrels per day (Suspended)
- **Phase 2**: 78,000 barrels per day (Approved)

Capital plans and sequencing for the next stages of Suncor’s growth to be announced in Q4-2010.

**Syncrude**

- **Stages 1 and 2**: 290,700 barrels per day in 1978 (Operating)
- **Stage 3 Expansion**: 116,300 barrels per day in 2006 (Operating)
- **Stage 3 Debottlenecking**: 46,500 barrels per day in 2006 (Announced)
- **Stage 4 Expansion**: 139,500 barrels per day (Announced)

Majority owner Canadian Oil Sands says that the nearest term-value opportunity for Syncrude rests in improving the reliability of operations rather than expansions.

**Suncor Energy**

- **Fort Hills Upgrader**: 165,000 barrels per day in 2003 (Operating)
- **Phases 2 and 3**: 175,000 barrels per day (Announced)

Capital plans and sequencing for the next stages of Suncor’s growth to be announced in Q4-2010.

**Voyageur**

- **Phase 1**: 156,000 barrels per day (Suspended)

**Syncrude**

- **Stage 3 Expansion**: 116,300 barrels per day (Operating)
- **Stage 3 Debottlenecking**: 46,500 barrels per day (Announced)
- **Stage 4 Expansion**: 139,500 barrels per day (Announced)

Syncrude says the nearest term-value opportunity for Syncrude rests in improving the reliability of operations rather than expansions.

**Value Creation**

- **Terre de Grace Upgrader**
  - **Phase 1**: 2,000 barrels per day (Application)
  - **Phase 2**: 10,000 barrels per day (Application)

BP will become majority partner in Terre de Grace project for $900 million.

- **TriStar Pilot**: 1,000 barrels per day (Application)

Value Creation says the project will demonstrate high-reservoir qualities and advantages of integrating SAGD with its upgrading technology.

**Industrial Heartland Region – Upgrading**

**BA Energy**

- **Heartland Upgrader**
  - **Phase 1**: 54,400 barrels per day in 2013 (Approved)
  - **Phase 2**: 54,400 barrels per day (Approved)
  - **Phase 3**: 54,400 barrels per day (Approved)

Construction suspended.

**North West Upgrading**

- **Upgrader**
  - **Phase 1**: 50,000 barrels per day in 2013 (Approved)
  - **Phase 2**: 50,000 barrels per day (Approved)
  - **Phase 3**: 50,000 barrels per day (Approved)

In November 2010, North West said it anticipated negotiations with the Alberta government under its bitumen royalty-in-kind program to be complete by year-end.

**Shell Canada**

- **Scotford Upgrader 1**
  - **Expansion**: 155,000 barrels per day in 2003 (Operating)
  - **Phase 1**: 100,000 barrels per day in 2010 (Under construction)

Mining feed for upgrader expansion now in operations. Upgrader expansion to come onstream in 2011.

- **Scotford Upgrader 2**
  - **Phase 1**: 100,000 barrels per day in 2010 (Withdrawn)
  - **Phase 2**: 100,000 barrels per day (Withdrawn)
  - **Phase 3**: 100,000 barrels per day (Withdrawn)
  - **Phase 4**: 100,000 barrels per day (Withdrawn)

Shell has withdrawn the application for Scotford Upgrader 2.

**Suncor Energy**

- **Fort Hills Upgrader**
  - **Phase 1**: 165,000 barrels per day in 2013 (Approved)
  - **Phases 2 and 3**: 175,000 barrels per day (Announced)

Capital plans and sequencing for the next stages of Suncor’s growth to be announced in Q4-2010.

**Statoil Canada**

- **Upgrader**
  - **Phase 1**: 75,000 barrels per day (Withdrawn)
  - **Phase 2**: 175,000 barrels per day (Withdrawn)

Application on hold indefinitely.

**Total E&P Canada**

- **Northern Lights Upgrader**
  - **Phase 1**: 56,600 barrels per day (Withdrawn)
  - **Phase 2**: 56,600 barrels per day (Withdrawn)

The ERCB has approved the Total upgrader, under seven conditions. Total says it must study the decision report in order to consider its next steps.

- **Total Upgrader**
  - **Phase 1**: 150,000 barrels per day (Approved)
  - **Phase 2**: 95,000 barrels per day (Approved)
  - **Debottlenecking**: 50,000 barrels per day (Approved)
Glossary of oil sands terms

API
An American Petroleum Institute measure of liquid gravity. Water is 10 degrees API, and a typical light crude is from 35 to 40. Bitumen is 7.5 to 8.5.

Barrel
The traditional measurement for crude oil volumes. One barrel equals 42 US gallons (159 litres). There are 6.29 barrels in one cubic metre of oil.

Bitumen
Naturally occurring, viscous mixture of hydrocarbons that contains high levels of sulphur and nitrogen compounds. In its natural state, it is not recoverable at a commercial rate through a well because it is too thick to flow. Bitumen typically makes up about 10 per cent by weight of oilsand, but saturation varies.

Condensate
Mixture of extremely light hydrocarbons recoverable from gas reservoirs. Condensate is also referred to as a natural gas liquid, and is used as a diluent to reduce bitumen viscosity for pipeline transportation.

Cyclic steam stimulation
For several weeks, high-pressure steam is injected into the formation to soften the oilsand before being pumped to the surface for separation. The pressure created in the underground environment causes formation cracks that help move the bitumen to producing wells. After a portion of the reservoir has been saturated, the steam is turned off and the reservoir is allowed to soak for several weeks. Then the production phase brings the bitumen to the surface.

Density
The heaviness of crude oil, indicating the proportion of large, carbon-rich molecules, generally measured in kilograms per cubic metre (kg/m³) or degrees on the American Petroleum Institute (API) gravity scale; in western Canada, recoverable reserves that are interpreted to exist, based on geological, geophysical, or similar information, with reasonable certainty.

Established recoverable reserves
Reserves recoverable under current technology and present and anticipated economic conditions specifically proved by drilling, testing, or production, plus the portion of contiguous recoverable reserves that are interpreted to exist from geological, geophysical, or similar information with reasonable certainty.

Extraction
A process, unique to the oilsands industry, which separates the bitumen from the oilsands using hot water, steam, and caustic soda.

Froth treatment
The means to recover bitumen from the mixture of water, bitumen, and solids “froth” produced in hot water extraction (in mining-based recovery).

Gasification
A process to partially oxidize any hydrocarbon, typically heavy residues, to a mixture of hydrogen and carbon monoxide. Can be used to produce hydrogen and various energy byproducts.

Greenhouse gases
Gases commonly believed to be connected to climate change and global warming. CO₂ is the most common, but greenhouse gases also include other light hydrocarbons (such as methane) and nitrous oxide.

Initial established reserves
Established reserves prior to the deduction of any production.

Initial volume in place
The volume calculated or interpreted to exist in a reservoir before any volume has been produced.

In situ
Latin for “in place.” In situ recovery refers to various methods used to recover deeply buried bitumen deposits.

In situ combustion
A displacement enhanced oil recovery method. It works by generating combustion gases (primarily CO and CO₂) downhole, which then “pushes” the oil towards the recovery well.

Lease
A legal document from the province of Alberta giving an operator the right to extract bitumen from the oilsand existing within the specified lease area. The land must be reclaimed and returned to the Crown at the end of operations.

Muskeg
A water-soaked layer of decaying plant material, one to three metres thick, found on top of the overburden.

Oil Sands
Bitumen-soaked sand, located in four geographic regions of Alberta: Athabasca, Wabasca, Cold Lake, and Peace River. The Athabasca deposit is the largest, encompassing more than 42,340 square kilometres. Total deposits of bitumen in Alberta are estimated at 1.7 trillion to 2.5 trillion barrels.

Overburden
A layer of sand, gravel, and shale between the surface and the underlying oilsand. Must be removed before oil sands can be mined. Overburden underlies muskeg in many places.

Pilot plant
Small model plant for testing processes under actual production conditions.

Proven recoverable reserves
Reserves that have been proven through production or testing to be recoverable with existing technology and under present economic conditions.

Reclamation
Returning disturbed land to a stable, biologically productive state. Reclaimed property is returned to the province of Alberta at the end of operations.

Remaining established reserves
Initial reserves less cumulative production.

Royalty
The Crown’s share of production or revenue. About three quarters of Canadian crude oil is produced from lands, including the oil sands, on which the Crown holds mineral rights. The lease or permit between the developer and the Crown sets out the arrangements for sharing the risks and rewards.

Steam assisted gravity drainage (SAGD)
An in situ production process using two closely spaced horizontal wells: one for steam injection and the other for production of the bitumen/water emulsion.

Synthetic crude oil
A manufactured crude oil comprised of naphtha, distillate, and gas oil-boiling range material. Can range from high-quality, light sweet bottomless crude to heavy, sour blends.

Tailings
A combination of water, sand, silt, and fine clay particles that is a byproduct of removing the bitumen from the oilsand.

Tailings settling basin
The primary purpose of the tailings settling basin is to serve as a process vessel allowing time for tailings water to clarify and silt and clay particles to settle, so the water can be reused in extraction. The settling basin also acts as a thickener, preparing mature fine tails for final reclamation.

Thermal recovery
Any process by which heat energy is used to reduce the viscosity of bitumen in situ to facilitate recovery.

Toe to heel air injection (THAI)
An in situ combustion method for producing heavy oil and oilsand. In this technique, combustion starts from a vertical well, while the oil is produced from a horizontal well having its toe in close proximity to the vertical-air-injection well. This production method is a modification of conventional fire flooding techniques in which the flame front from a vertical well pushes the oil to be produced from another vertical well.

Truck-and-shovel mining
Large electric or hydraulic shovels are used to remove the oilsand and load very large trucks. The trucks haul the oilsand to dump pockets where it is conveyed or pipelined to the extraction plant. Trucks and shovels are more economic to operate than the bucket-wheel reclaimers and draglines they have replaced at oil sands mines.

Upgrading
The process of converting heavy oil or bitumen into synthetic crude either through the removal of carbon (coking) or the addition of hydrogen (hydroconversion).

Vapour extraction (VAPEX)
VAPEX is a non-thermal recovery method that involves injecting a gaseous hydrocarbon solvent into the reservoir where it dissolves into the sludge-like oil, which becomes less viscous (or more fluid) before draining into a lower horizontal well and being extracted.

Viscosity
The ability of a liquid to flow. The lower the viscosity, the more easily the liquid will flow.
Oil Sands Producers

- Alberta Oilsands
- Albian Sands Energy
- Andora Energy
- Athabasca Oil Sands
- Baytex Energy
- Canadian Natural Resources
- Cenovus Energy
- Chevron Canada
- Conacher Oil and Gas
- ConocoPhillips Canada
- Devon Canada
- Enerplus Resources Fund
- E-T Energy
- Excelsior Energy
- Husky Energy
- Imperial Oil
- Ivanhoe Energy
- Japan Canada Oil Sands
- Korea National Oil Corporation
- Laricina Energy
- Marathon Oil
- MEG Energy
- Nexen
- North Peace Energy
- North West Upgrading
- N-Solv
- Occidental Petroleum Corporation
- Oilsands Quest
- Opti Canada
- OSUM Oil Sands
- Pan Orient Energy
- Patch International
- Pengrowth Energy Trust
- Petro-Canada
- Petrobank Energy and Resources
- Shell Canada
- Southern Pacific Resource
- Statoil Canada

- Suncor Energy
- Sunshine Oilsands
- Syncrude
- Talisman Energy
- Teck Cominco
- Total E&P Canada
- UTS Energy
- Value Creation Group

Associations/Organizations

- Alberta Building Trades Council
- Alberta Chamber of Resources
- Alberta Chambers of Commerce
- Alberta Energy
- Alberta Energy Research Institute
- Alberta Environment
- Alberta Finance and Enterprise
- Alberta Research Council
- Alberta’s Industrial Heartland Association
- Canadian Association of Geophysical Contractors
- Canadian Association of Petroleum Producers
- Canadian Heavy Oil Association
- Canadian Oil Sands Network for Research and Development
- Energy Resources Conservation Board
- In Situ Oil Sands Alliance
- Lakeland Industry and Community Association
- Natural Resources Conservation Board
- Oil Sands Developers Group
- Oil Sands Leadership Initiative
- Petroleum Technology Alliance Canada

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