BP AND SHELL: RISING RISKS IN TAR SANDS INVESTMENTS

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SUMMARY AND RECOMMENDATIONS TO INVESTORS

THIS REPORT DETAILS THE RANGE OF EXISTING AND EMERGING RISKS THAT BP AND SHELL FACE FROM THEIR EXPANSION OF PRODUCTION IN THE CANADIAN TAR SANDS. WE BELIEVE THESE RISKS ARE SIGNIFICANT FOR BP AND SHELL SHAREHOLDERS AND THAT INVESTORS SHOULD QUESTION THE COMPANIES MORE DEEPLY ON THEIR TAR SANDS STRATEGIES AND CALL FOR GREATER TRANSPARENCY REGARDING THE ASSESSMENT OF THE MID TO LONG TERM VIABILITY OF THESE PROJECTS. INVESTORS SHOULD CALL FOR FULL DISCLOSURE OF THE RISKS INVOLVED IN THE TAR SANDS STRATEGY IN A CARBON CONSTRAINED WORLD AND THE DEVELOPMENT OF NEW TAR SANDS PROJECTS SHOULD BE HALTED.

The key findings of the report suggest that tar sands extraction threatens shareholder value in BP and Shell because:

- **Tar sands are not a quick fix for reserves shortfalls.** The companies are struggling to maintain their reserves replacement and are therefore seeking to increase access to and production from unconventional resources, particularly tar sands. The perception that 'there is no where else to go other than unconventionals' is leading to a distorted perspective from management and messages to investors and industry alike, are lacking transparency. Significant extraction expansion decisions are being made at precisely the time when the political and economic environment is shifting against these carbon intensive fuels.
- **Low carbon fuel standards close markets to tar sands.** Pressure is building in the USA against tar sands production with a Low Carbon Fuel Standard coming into effect in California in December 2008 and the possibility of matching legislation at the federal level if Barack Obama wins the November 2008 presidential election. Low carbon fuel legislation is also present in the Federal Energy Independence and Security Act (December 2007). The companies have so far not reported on the potential impact of such threats to their strategy.
- **Unproven technology is unlikely to be able to clean this fuel.** There is an unrealistic expectation of the effectiveness and affordability of carbon capture and storage (CCS) technology built into the tar sands investment case. CCS is unlikely to be operational on an industrial scale before the mid 2020s and if the optimism surrounding this technology turns out to be unfounded, tar sands projects could become stranded assets.
- **Labour and gas shortages are more a bottlestop than bottleneck.** The costs of constructing new tar sands projects are rising due to pressure on raw materials, equipment, labour and skills. Additionally, the cost of delivering new gas supplies to the region, through extensive pipeline projects from the Arctic, adds significantly to the capital expenditure and the risk of maintaining tar sands production.
- **Clean up costs will be the long term legacy.** The impact of tar sands developments on local communities is significant and opposition to these developments is growing, especially given the ongoing habitat destruction, toxification and depletion of water supplies in the region. This represents potential litigation risk and strong reputational risk for the companies. It is unclear what provision has been made to address the possibility of future litigation and clean up liabilities.
- **Climate change is a reputational challenge.** The greatest risks arise from the climate impacts of tar sands. Given the significant impacts of developing Canada's tar sands on the climate, a substantial reputational risk could extend to BP and Shell's shareholders.

In general, the companies appear unprepared to respond to the strategic challenges in the shift to a low carbon economy. Instead they are seeking to build their value by increasing their carbon intensive reserves. The scale of climate change makes it questionable to what extent these risks are in fact manageable. Investors deserve greater transparency from the companies on the risks and costs of pursuing an unconventional oil strategy and more debate over what would constitute an alternative plan.

This report is produced at a significant moment when decisions are being made about further investment in the Canadian tar sands. These decisions come at a time when industrialised countries need to reduce carbon emissions dramatically. BP and Shell shareholders have a responsibility and a role to play in the making of these decisions. The authors of the report, Greenpeace and PLATFORM, would like to encourage investors to call for Shell and BP to halt further investments in the Canadian tar sands.

WILL THE TAR SANDS BUBBLE BURST?

'At the oil sands division, Shell's big hope – accounting for 3% of earnings but 9% of capital expenditure – net production fell by a quarter after mechanical setbacks. Glitches are becoming a habit for a unit that represents about one third of Shell's proved reserves'

Financial Times Lex Column report on Shell Q1 results 30 April 2008

With mechanical shovels the size of trucks and trucks the size of houses, the story of tar sands presented by the oil companies is of a heroic adventure in the frozen forests of the West. A narrative of oilmen struggling with the most difficult circumstances in their quest to help meet the world's ever growing thirst for hydrocarbons. The companies are keen to stress their commitment. As Brian Straub, Shell Canada's Senior Vice President for Oil Sands, says, 'We're clearly putting all we have across the Shell world toward developing this resource'.[1]

But a closer look reveals that Shell and BP have advanced into tar sands because they have been forced to retreat elsewhere, that the venture illustrates not their strength but their weakness. And their proposed investments in the coming period represent an increasingly high risk strategy.

As is widely recognised, the environmental impact of extracting oil from tar sands is even worse than that of conventionally derived crude oil. The process of extracting and upgrading a barrel of tar sands bitumen is between three and five times more intensive in greenhouse gas (GHG) emissions, than extracting a barrel from an average conventional well.[2] The process of extraction also has profoundly damaging impacts on the water resources, the boreal forest habitat and the communities of Northern Alberta.[3]

However, it is the scale of tar sands' impact on the climate that has driven the increasing controversy over exploiting this resource in a carbon constrained world and threatens to alter the economic feasibility of the developments in Alberta.

In the past decade there has been a rush to develop tar sands projects. This enthusiasm for investment was the result of the following circumstances:

- The rise in the price of oil since 2004.
- The USA's intense concern over energy security combined with the continued growth of US demand for crude oil imports.
- The increasing difficulties experienced by international oil companies in accessing reserves, particularly in the Middle East, Russia and Latin America.
- The resistance of Washington to international calls to address climate change.
- A Conservative federal government in Canada which has followed in the USA's footsteps on this issue.
- The lack of international governmental opposition to tar sands.
- The lack of coordinated international civil society opposition to tar sands.

These circumstances have encouraged the development of projects that have started up in the last five years. Several more projects are planned to come on stream by 2012, including the expansion of Shell's Athabasca Oil Sands Project by 315,000 barrels per day (b/d) and BP/Husky's Sunrise tar sands joint venture, set to produce 50,000 b/d from 2012.

However the industry is currently in the process of making investment decisions on projects that will come on stream after 2012. These projects will need to be financed in an era where the circumstances listed previously no longer exist and have been overtaken by a new set of dynamics and constraints. The tailwind behind tar sands development is turning into a headwind.

INTERNATIONALLY:

- Rising energy prices are driving up the price of commodities and materials needed for constructing projects. Steel and concrete are affected directly by high energy prices and the high-tech equipment required for such projects, as well as the skilled labour to operate it, is in high demand globally.

- As climate change moves ever further up the agenda of the G8 and the wider international community, it will be increasingly understood that carbon intensive tar sands production is moving counter to the international consensus.

IN THE US:

- In response to a noticeable shift in US public opinion since Hurricane Katrina in 2005, it is widely recognised that the incoming US administration will aim to seriously address climate change from early 2009.

- There is growing opposition to the use of tar sands derived petroleum in state and city legislatures across the USA.[4]

- California has passed a Low Carbon Fuel Standard into law that will penalise fuel derived from tar sands.[5]

- The Democratic presidential candidate, Barack Obama, has proposed a national Low Carbon Fuel Standards legislation based on California's.[6]

IN CANADA:

- The Conservative government in Ottawa is under electoral threat from opposition parties that are all committed to more aggressive action on climate change.

- The strength of opposition to tar sands within Canada is increasing, particularly among communities close to the projects and First Nations.

- A May 2007 poll revealed that 71% of Albertans believe that the government of Alberta should suspend new tar sands approvals until infrastructure and environmental management issues have been addressed in areas affected by tar sands development.[7]

- The global squeeze on commodities and equipment for constructing tar sands projects is more pronounced in Canada and particularly in Alberta where the tar sands rush has created huge demand for raw materials and labour alike. This has already negatively affected a number of tar sands projects.[8]

This is the headwind into which tar sands must now travel, a phase of new and diverse challenges to investors. These challenges include political pressures, regulatory constraints, cost pressures, technological limits and reputational threats.

WILL HISTORY REPEAT ITSELF?

The oil industry arguably began in Canada 150 years ago, in Lambton County, Southwestern Ontario. The first well being drilled in 1858, a year before Oil Creek in Pennsylvania. In the century and a half since then, the industry has gone though repeated economic booms and busts, bubbles and dead ends.

We explore the emerging challenges that tar sands production will face over the coming decade, and pose the question of whether the current tar sands boom is a bubble that may one day burst.

HEROIC PROSPECTS OR DESPERATE MEASURES?

IN DECEMBER 2007, LEW WATTS, PRESIDENT OF GLOBAL ENERGY CONSULTANCY PFC ENERGY, SPOKE OF THE CURRENT INTEREST IN TAR SANDS AS 'EVIDENCE OF ANOTHER NAIL IN THE CLOSING COFFIN FOR THE INTERNATIONAL OIL COMPANIES... FOR RESERVES OF THIS SIZE, THEY'VE REALLY GOT NOWHERE ELSE TO GO... THAT IS WHY THEY ARE WILLING TO TAKE ON THE ECONOMIC AND ENVIRONMENTAL RISKS'.[9]

WHAT ARE THE CONDITIONS THAT ARE DRIVING THESE RISKS?

In 1979, the major international oil companies (IOCs) controlled around 70% of global oil reserves. Thirty years later that figure has dropped below 10%.[10] This is largely due to the decline of resources in areas where the IOCs had significant reserves and increasingly restricted access to new reserves due to increasing control over resources by states such as Venezuela and Russia.

For example, for over a year BP has faced an increasingly challenging threat to its 50% stake in Russia's third biggest oil producer TNK-BP, which in turn threatens the company as a whole. For TNK-BP represents about 25% of BP's global production and around a fifth of its reserves.[11] This level of dependence on a single investment based in a politically unreliable country explains much about BP's late but significant move into Alberta's tar sands.

Since Shell's reserves reporting debacle of 2004, the company has worked hard to find new assets. There was serious concern that the company's partial ejection from the Sakhalin II project, after a long battle with the Kremlin, would hamper this search to replace reserves. However in March 2008 Shell reported its reserves replacement ratio as 124%, with analysts observing that the loss in Russia had been offset in Canada – by a costly acquisition.[12] In 2007, in a move personally guided by CEO Jeroen van der Veer, Royal Dutch Shell took full control of Shell Canada via a share purchase in which the parent company paid above the market rate.[13] This mirrored an earlier purchase. In 2006 Shell raised eyebrows in the industry by offering C$2.4bn for Black Rock Ventures, which was expanding production in the Peace River tar sands area. Shell's price amounted to about C$4 a barrel of reserves, compared with the C$1.25 that Total paid in 2005 when it acquired Deer Creek Energy.[14] Canadian tar sands now constitute nearly one third of Shell's proved reserves.[15]

It is often repeated in the media that the Canadian tar sands constitute a glittering prize. They are estimated by some to contain 173–179 billion barrels of recoverable oil, a resource second only to Saudi Arabia and representing 12% of global reserves.[16] However accessing this 'unconventional oil' represents a significant shift for both BP and Shell. Both have tried to present the shift as an inevitable progression.

Around the active promotion in the finance sector of 'Shell Energy Scenarios to 2050' in February 2008, senior executives such as van der Veer and James Smith (CEO Shell UK) repeatedly talked of 'the end of the era of easy oil', emphasising tar sands as the new frontier where a company like Shell had to go in order to avoid disappointing global energy demand.[17]

But this shift is neither an inevitable, nor smooth, progression. Instead, it is a consciously chosen move into a high risk endeavour with significant global impacts.

Canadian tar sands now constitute nearly one third of Shell's proved reserves.[15]

BOX 1: WHAT ARE TAR SANDS?

Tar sands (renamed oil sands by the oil industry) are deposits of sand and clay saturated with bitumen. Bitumen is oil in a solid or semi-solid state. Because it is in this less fluid state, the bitumen requires unconventional methods to get it to flow to the surface.

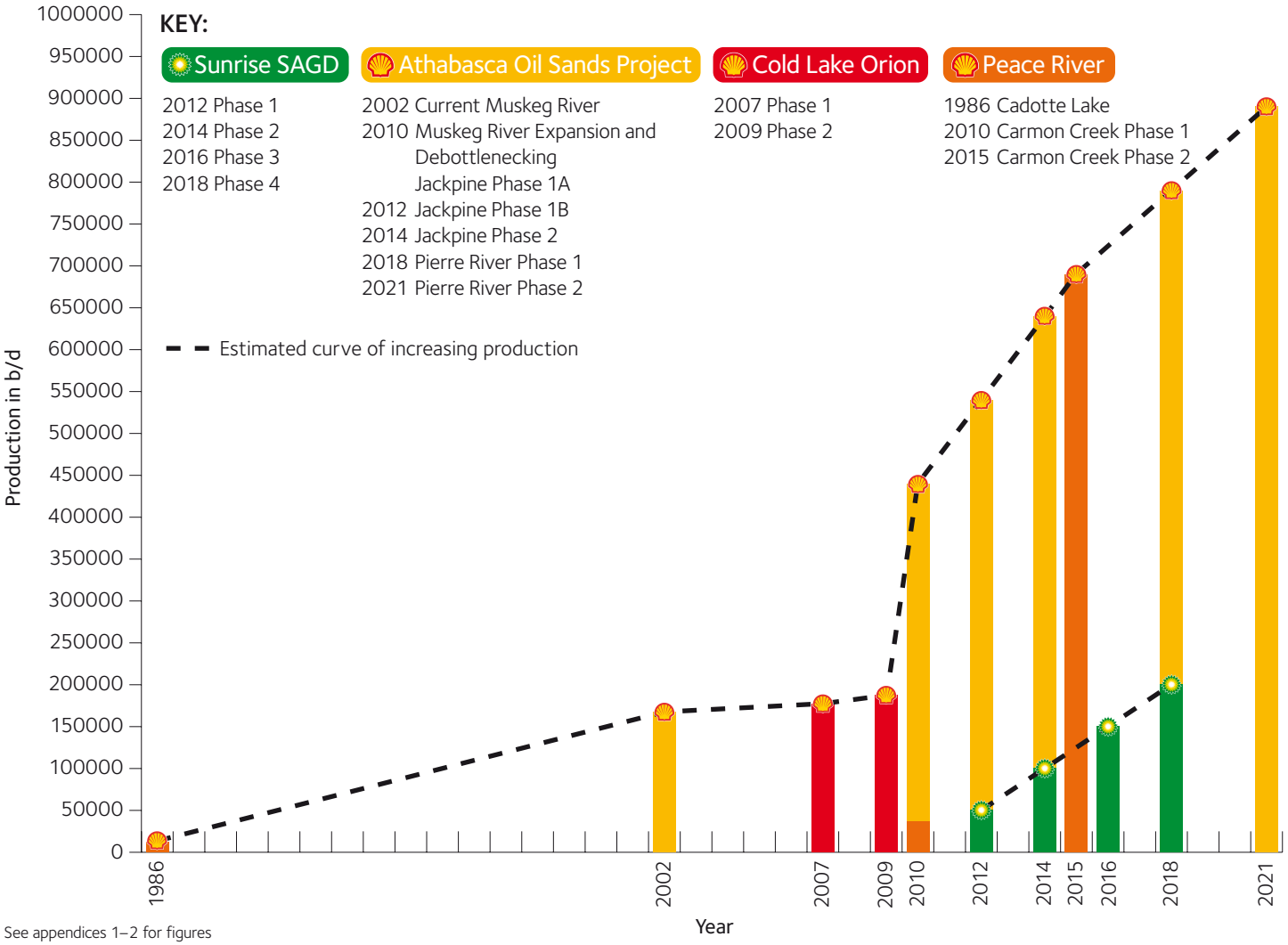
Mining: Where tar sands are close to the surface this involves excavating the bitumen out of the ground in an open cast mine. The land is cleared and the bitumen soaked sand is dug out with mechanical shovels and loaded into trucks to be taken to a separation plant. Only about 18% of the ultimately recoverable tar sands are in deposits shallow enough to be mined. The rest requires in situ production.

In situ production: More deeply buried bitumen requires drilling wells and pumping it out, somewhat like conventional oil production. However, unlike conventional production, getting the bitumen to flow more like oil generally requires injecting heat (usually steam) or solvents into the reservoir. In situ production requires power and steam generating plants, a large number of wells, often spread out in groups, and extensive roads, pipelines and product collection areas.

While some in situ production works much like conventional heavy oil production[18], most involves injecting steam into the reservoir to heat the bitumen to enable it to flow towards the production well. There are a number of different technologies for doing this, some more efficient than others, but all of these methods are extremely energy intensive and therefore generate significant CO_2 emissions. An increasingly common method of in situ production is steam assisted gravity drainage (SAGD).

Upgrading: This is the process of converting bitumen into synthetic crude oil, or syncrude, which can then be refined into petroleum products. All bitumen produced from tar sands needs to be upgraded before it can be refined into traditional petroleum products. There are a number of methods for this – all energy intensive. Shell runs a hydrogen-addition upgrader that adds hydrogen to the bitumen to break it down into a substance more like conventional crude oil.

Shell and BP's rising tar sands production



See appendices 1–2 for figures

BOX 2: INVESTMENTS IN TAR SANDS, 2000–2008

SHELL

Shell first started exploring for tar sands in the Athabasca region in the 1940s. It brought on stream the first in situ production at Peace River in 1979. However, serious investment began in 1999 when Shell started to develop the Athabasca Oil Sands Project (AOSP) integrating the Muskeg River Mine and the Scotford Upgrader. By the time AOSP started up in January 2003, Shell had invested over $3.6 billion for its 60% share in the project. This was followed by a period of slower investment with the company sinking $1.3 billion into tar sands between 2003 and 2006. 2007 has seen a sharp rise in tar sands investment for Shell with the company committing over $1.9 billion to a range of projects over the year. Shell's current 100,000 b/d expansion at AOSP could cost it up to $7.6 billion by 2010 and costs for plans for a second upgrader at Scotford have been cited at $22 billion.

BP

The BP joint venture with Husky in the Sunrise field will see investment spread over four phases to 2018. So far the companies have committed $3 billion on developing Sunrise by 2012 ($1.5 billion BP share) and $2.5 billion ($1.25 billion BP share) on expanding and sustaining heavy oil refining at BP's Toledo refinery in Ohio by 2015. However, BP has stated that it is looking at developing an in situ project on its land leases at Kirby in the near future, suggesting that significant further investment is not far away.

UPGRADING IN ALBERTA, CANADA

A TRANSCONTINENTAL INFRASTRUCTURE PROJECT

THE SKILL OF THE CONJURER DEPENDS UPON THE SPECTATOR CONCENTRATING UPON THE CONJURER'S HANDS AND IGNORING WHAT IS NOT WITHIN THEIR DIRECT FIELD OF VISION. OUR EYES ARE DRAWN TO THE TRUCKS AND STRIP MINES, AND WE ARE BARELY AWARE OF THE EMERGING WEB OF INDUSTRIAL INFRASTRUCTURE STRETCHING FROM THE ARCTIC OCEAN TO THE GULF OF MEXICO THAT IS INTEGRAL TO THE GROWTH OF TAR SANDS PRODUCTION. IT IS A SYSTEM OF UNPRECEDENTED SCALE WITH MULTIPLE MEGA-PROJECTS; A SYSTEM THAT IS EXPOSED AT EVERY POINT TO REGULATORY, FINANCIAL, ENGINEERING AND REPUTATIONAL RISKS.

There are three tar sands areas in Alberta: Peace River, Cold Lake and Athabasca – stretching across an area of 54,000 square miles (140,000km^2), more than the total land area of England and Wales combined. Shell has projects in all three areas, BP in Athabasca alone. Of these projects, one is a mining operation – Shell's Athabasca Oil Sands Project (AOSP). The remaining four are energy intensive in situ projects – Shell's Orion Cold Lake, Peace River and Grosmont Venture projects, and BP's Sunrise. In addition, BP has a land lease in Kirby, which if developed, would most likely be an in situ project (see maps pages 11–13).

BURGEONING GAS DEMAND A DRIVER FOR MAJOR NEW PROJECTS

In situ projects require substantial quantities of natural gas to create the steam to enable bitumen extraction. The steam is produced in on site combined heat and power (CHP) plants.

All tar sands derived bitumen, whether it has been mined or produced in situ, requires upgrading to convert it to synthetic crude oil, or syncrude, which can then be refined into petroleum products (see Box 1).

Shell's AOSP pumps diluted bitumen, via pipeline, 305 miles to the Scotford Complex at Fort Saskatchewan near Edmonton. Here the dilutant is removed, piped back to the mine, and the bitumen itself sent to the upgrader. The Scotford Complex consists of an upgrader, a refinery and a chemical plant enabling Shell to integrate its tar sands operation right through to finished products. Shell's plan to expand mining production at AOSP from the current 155,000 b/d to a total of 470,000 b/d by 2012 includes plans to build a second upgrader at the site to process the production.

Upgrading is extremely energy intensive. It takes about 500 cubic feet (cu ft) of natural gas to upgrade a barrel of tar sands bitumen – in order to get it into a state that allows it to be refined.

Between 2005 and 2007, gas consumed by Canadian tar sands projects rose from 800 million cubic feet per day (cf/d) to 1.3 billion cf/d.[19] That is enough natural gas to heat over six million typical Canadian homes – approximately half the households in Canada.[20]

Since the 1970s gas to these projects has been supplied from the fields of the Western Canadian Sedimentary Basin – where BP owns and operates eight production centres. However, the entire basin has been in decline since 1998, whilst current conventional gas production throughout Canada peaked in 2000.[21] This falling supply, combined with rising demand, is driving the development of unconventional[22] gas projects which were previously considered uneconomic. These include Shell's Sacred Headwaters coal bed methane (CBM) project and BP's Mist Mountain CBM project and BP's Noel Tight Gas Project (see map pages 12–13).

The same economics are driving the development of gas pipeline projects that will bring on stream previously inaccessible gas fields. These include the 760 mile Mackenzie Natural Gas Pipeline[23] which would access Shell's on shore Mackenzie Delta fields on Canada's Arctic coast and BP's off shore Beaufort Sea assets. The Mackenzie Pipeline, proposed by a consortium in which Shell is a major partner, has been on the drawing board for three decades.[24] Its maximum capacity of 1.2 billion cf/d is just below the level of gas consumption reached by Albertan tar sands projects in 2007.[25]

In parallel with this is BP's planned 2000 mile Trans-Alaskan/Denali Pipeline[26] which would access gas fields on the Alaskan North Slope. Just such a pipeline has been under proposition since Prudhoe Bay was developed in the 1970s. At $30 billion, this pipeline is slated to be the largest private infrastructure project ever constructed in North America.[27]

The demand for gas for tar sands production is pushing the industrial infrastructure of oil out into the waters of the Arctic Ocean and triggering peripheral projects of immense scale and environmental impact.

DEDICATED REFINERY CAPACITY

The syncrude derived from Canada's tar sands is labelled by the industry as heavy and sour. This means it is denser, has a higher viscosity and a higher degree of sulphur and other contaminants than crude oil labelled light, sweet or medium. It therefore requires more intense refining. With increasing quantities of this heavy syncrude coming into North America's refinery system, refinery refitting and new refinery construction activity is reaching an unprecedented level.

The Environmental Integrity Project – an organisation set up in 2002 by former US Environmental Protection Agency enforcement attorneys to advocate for more effective enforcement of environmental laws – reported in June 2008 that 17 refinery expansions and five new refineries are under consideration or construction in the USA.[28] A new refinery has not been built in the USA for 30 years. The majority of the new capacity proposed in both the new refineries and the re-fitted ones is targeted at processing syncrude.[29]

BP has plans to refit two refineries at Toledo, Ohio and Whiting, Indiana. Shell already has one purpose built refinery in the Scotford Complex near Edmonton, Alberta and was studying a proposal to build a new refinery and manufacturing centre at Sarnia in Ontario. In early July 2008 it shelved the Sarnia project citing a range of cost pressures from labour shortages to raw material price hikes and is reportedly looking into shifting its focus to expansions of its US refineries.[30] Similar cost pressures are adversely affecting a number of tar sands projects.

Shell is also midway through refitting its Motiva refinery in Port Arthur, Texas – on the shores of the Gulf of Mexico. 'This is all about handling the nastiest crudes', says Forrest Lauher the Motiva engineer who's in charge of the Texan expansion project.[31]

DEDICATED PIPELINES

The distinct qualities of syncrude also require dedicated pipelines between the upgraders and the refineries. One such pipeline – TransCanada's Keystone Pipeline – has just begun construction from Hardisty in southern Alberta to Cushing, Oklahoma with a branch to Patoka in southern Illinois. TransCanada is also seeking approval for a second pipeline, Keystone XL, which will take a more direct route to Cushing and continue on into Texas (see map pages 12–13).

This demonstrates that the distinct nature of tar sands as a hydrocarbon resource requires a production infrastructure that stretches from gas field to pipeline to bitumen deposit to pipeline to upgrader to pipeline to refinery. It is a system of immense complexity that stretches over 4,000 miles from the Arctic Ocean to the Gulf of Mexico. Therefore, the future of tar sands depends on a system that requires regulatory approval from two federal governments and at least 18 state legislatures.[32] This exposes the tar sands venture to many risks.


ATHABASCA TAR SANDS
PEACE RIVER TAR SANDS
COLD LAKE TAR SANDS
Pierre River Mine (AOSP)
Muskeg River Mine (AOSP)
Sunrise
Jackpine Mine (AOSP)
Fort McMurray
Peace River Complex
Grosmont Venture
Corridor Pipeline
Grande Prairie
Kirby
Orion
Edmonton
Scotford Complex
ALBERTA
SASKATCHEWAN
KEY:
Shell operated and majority owned tar sands asset
BP operated and majority owned tar sands asset
Scotford Complex: upgrader, chemical works and refinery
Pipeline
CANADA
UNITED STATES OF AMERICA

KEY:

PEACE RIVER OIL SANDS
Peace River
Seal Battery
Cliffdale Battery
Carmon Creek

ATHABASCA OIL SANDS
Muskeg River
Jackpine Mine
Pierre River
Grosmont Venture

Sunrise
Kirby

COLD LAKE OIL SANDS
Orion

SCOTFORD COMPLEX
Scotford upgrader 1
Scotford upgrader 2
Bitumen Blending Facility
Scotford refinery

BP GAS FIELDS
Chinchaga
Kaybob
Kirby/Leismer
Marten Hills
Mist Mountain
Noel Tight Gas
Ojay
Sundre
Wapita
West Pembina

PIPELINES
- Keystone Pipeline
- Proposed Keystone XL Pipeline
- Proposed Gas Pipelines
- Corridor Pipeline


Pipeline
C A N A D A
NORTHWEST TERRITORIES
Fort Simpson
PEACE RIVER TAR SANDS
ATHABASCA TAR SANDS
COLD LAKE TAR SANDS
ALBERTA
Edmonton
Scotford Complex
BRITISH COLUMBIA
Calgary
Hardisty
SASKATCHEWAN
Regina
MANITOBA
Winnipeg
ONTARIO
QUÉBEC
OTTOWA
Toronto
MONTANA
NORTH DAKOTA
MINNESOTA
SOUTH DAKOTA
WISCONSIN
MICHIGAN
UNITED STATES OF AMERICA
WYOMING
IOWA
NEBRASKA
Sarnia Manufacturing Centre
Whiting Refinery
Toledo Refinery
ILLINOIS
INDI
OHIO
Steel City
COLORADO
KANSAS
Wood River
Pakota
Martinez Refinery
MISSOURI
KENTUCKY
Cushing
ARKANSAS
TENNESSEE
CALIFORNIA
OKLAHOMA
LOUISIANA
TEXAS
Houston
Motiva Refinery
Port Arthur
Deer Park Refinery
ATLANTIC OCEAN
MEXICO

A TRANSNATIONAL FINANCE PROJECT

THE ANNOUNCEMENT ON WEDNESDAY 5 DECEMBER 2007 OF BP'S $5.5 BILLION INVESTMENT IN THE SUNRISE TAR SANDS JOINT VENTURE WITH HUSKY WAS A CAUSE FOR CELEBRATION WITHIN THE INDUSTRY. NOT ONLY BY TONY HAYWARD (CEO OF BP PLC), RANDY MACLEOD (CEO OF BP CANADA), JOHN LAU, (CEO OF HUSKY) AND GARY MIHAICHUK (VICE PRESIDENT OF OIL SANDS, HUSKY), BUT ALSO BY SHANE FILDES AND DAN BARCLAY AT FINANCIAL ADVISORS, BMO CAPITAL MARKETS.

Fildes and Barclay had led the team that had advised BP on the deal. Three years previously, that team had put together a detailed presentation at a 'beauty contest' for investment managers in London. They outlined all of BP's options from locking in long term contracts with producers of tar sands bitumen to supply their refitted US refineries, right through to acquiring full ownership of a tar sands project. Shane Fildes is quoted as having said, 'We think that was a key reason why our team got hired – we demonstrated the best expertise in the sector in terms of oil sands, plus we showed them we could help from Step 1 to Step 350'.[33]

In 1999 BP sold almost all of its interests in the tar sands province and in 2004 Lord John Browne, BP CEO, further justified the decision by stressing the value of investment opportunities elsewhere. Fildes and Barclay claim credit for lifting BP out of its skepticism about tar sands.

Much is made of the record breaking rise in the price of oil as driving the rush into tar sands, but close inspection of the Sunrise deal clearly shows the role of other drivers. BP was publicly critical of tar sands in 2004, but by mid-2007 it was in the closing stages of a deal with Husky. As the BMO team testify, their work as financial advisors drove the project in the two and a half years between these dates and prior to the sudden rise in oil prices from early 2007.

In this same period BP's share price had been falling in comparison to its rival Shell. Institutional shareholders were therefore pressuring the company to improve its long term prospects, acting – consciously or unconsciously – as another sector driving BP towards tar sands.

FINANCIAL INSTITUTIONS DIRECTLY FUNDING TAR SANDS

At least 151 financial institutions were actively engaged in the tar sands sector between 2004 and 2007. These institutions are still playing an important role in financing the activities of 35 oil and gas companies known to be extracting tar sands by providing loans, owning or managing significant numbers of shares, or by helping the companies to issue new shares or bonds.[34]

With the origins of these 151 institutions spread across 18 countries, it is clear that tar sands projects are being financed on a global scale. However, of these institutions, 15 banking groups play the most significant role: Scotiabank, Royal Bank of Canada, TD Bank Financial, CIBC, BMO Financial, BNP Paribas, RBS, HSBC, Barclays, Capital Group, Citigroup, JP Morgan Chase, Merrill Lynch, Societe Generale and Deutsche Bank. These groups are based in Toronto, New York, London, Paris and Frankfurt – the three in London being RBS, HSBC and Barclays.

A number of these banks are Equator Principles signatories, making operations funded through project finance subject to the principles. The environmental record of tar sands extraction makes it unlikely that projects would be Equator Principles compliant.

In 2005 Jim McBridge of RBS said, 'In the future, we believe there's going to be as much as $40 billion spent on oil sands development in Canada, so this is another energy financing growth area for us. In addition, in terms of coal bed methane development, Canada is probably about 15 years behind the US. Again, drilling dollars will be needed'.[35]

IN SITU PRODUCTION IN ALBERTA, CANADA

RBS has indeed provided 'drilling dollars' in the form of revolving credit, loans and bonds to expand tar sands production. Until 2007, the bank advertised 'extensive experience in providing financing to unconventional oil and gas development' on its website.

Over the past four years, the bank's Oil & Gas team developed a particularly close relationship with Opti Canada, operator of the Long Lake Oil Sands project in Athabasca. Opti Canada is an Alberta based oil company focused solely on tar sands development. In 2004 and 2006 RBS acted as lead arranger for loans and revolving credit totaling $2.3 billion, towards a total project budget of $4.6 billion for Phase 1 of the Long Lake project.[36] The bank stepped in again in 2007 as lead arranger of a $750 million bond towards developing Phase 2 of the project.[37]

SHAREHOLDERS

But while these institutions have taken on an active role in directly financing tar sands projects, many more financial institutions in London and across the world have a role in tar sands through the shares they own in the oil and gas companies involved. Shares in BP and Royal Dutch Shell (A&B) constitute 12.71% of the FTSE All Share Index or 15.43% of the FTSE 100.[38] These two companies are omnipresent in the portfolios of practically every financial institution in the UK. Therefore, the impacts of risks taken by these companies are far reaching.

The first signs of concern from institutional investors were seen on 17 April 2008 at the BP AGM. The Times wrote:

> 'A group of American and British shareholders in BP joined forces yesterday to protest over the oil company's decision to start extracting oil from Canadian tar sands. Eleven fund managers, which together manage total assets worth more than $10 billion (£5 billion), said that BP's move into tar sands last year was 'deeply disappointing' and represented a 'disturbing step backwards' for the company.'[39]

The statement submitted by the investors to BP listed four concerns. The first of these addressed the climate related economics of the company's decision, reading: 'What cost of carbon was incorporated into the valuation of this decision, and what is the sensitivity of the project to a $20 a tonne [carbon] price?'[40]

The role of London institutions in financing industrial mega-projects in North America is nothing new. One hundred and thirty years ago the largest venture on the continent, the building of the Canadian Pacific Railway – which sparked the creation of the province of Alberta – was heavily financed by the London markets. The syndicate behind the railway was led by Donald Smith, later Lord Strathcona, the first chairman of BP from 1909–1914. Though Strathcona made his fortune from the project, for many British investors the Canadian railways were a disaster as companies went bankrupt and eventually the entire system was nationalised.

Could the tale of the Canadian Pacific Railway be repeated in Alberta today? What are the challenges facing tar sands projects in the coming decade?

RISK 1 – REGULATION: TIGHTENING CONSTRAINTS

'I'D LIKE TO SAY THERE'S NO REGULATORY RISK IN ALBERTA, BUT I CAN'T ANYMORE.'
NEIL CAMARTA, SENIOR VICE PRESIDENT, PETRO-CANADA[41]

The environmental impact of tar sands production is triggering a range of regulatory controls at the point of production and in the market place.

CLIMATE CHANGE AND THE CARBON BURDEN OF TAR SANDS

Canada's emissions increased over 26% between 1990 and 2005. If left unchecked, these are estimated to rise a further 25% by 2020.

The process of extracting bitumen from tar sands and upgrading it to synthetic crude oil is three to five times more greenhouse gas (GHG) intensive than conventional crude oil extraction.[42] This is due to the large amounts of energy required in all stages of the process. The main source of that energy is natural gas. In 2007, gas consumption at tar sands projects in Alberta reached 1.3 billion (cf/d).[43]

Conventional oil extraction generates on average 28.6kg CO_2e/barrel[44] whereas tar sands extraction generates between 80 and 135kg CO_2e/barrel depending on the method of extraction.[45]

The variation resides in the different amounts of energy used in mining bitumen and extracting it in situ using steam or other forms of heat. Gas is used to generate steam or heat in the various methods of in situ production. Large quantities of gas are used in the upgrading process for both forms of production.

In 2005, the Pembina Institute estimated the GHG emissions per barrel for the main methods of tar sands production.[46]

The timeline of BP and Shell's current tar sands projects shows the probable production levels that will be reached by 2020 (see graph page 7). Together with these production increases will come burgeoning CO_2 emissions.

Some of these ventures have been in development for 30 years. However the political environment around GHG emissions has altered rapidly in the decade since the signing of the Kyoto Protocol, and will move even faster between now and COP 15 in Copenhagen in November 2009. It is these negotiations that will determine the depth of the cuts to be made after 2012.

Since 2001, energy security has trumped climate change at the top of the international agenda but there are signs that this dynamic is shifting. At its meeting in Japan in July 2008, the G8 announced agreement on a 50% cut in global CO_2 emissions by 2050. The COP 15 meeting is likely to propose deeper cuts with some developed countries aiming much higher, such as the widely anticipated move to an 80% carbon reduction target by 2050 as a result of the UK climate bill.[50]

Canada has failed to meet the targets set by the Kyoto Protocol, which should have seen it reduce emissions to 6% below 1990 levels by 2012. Instead its emissions increased over 26% between 1990 and 2005. If left unchecked, these are estimated to rise a further 25% by 2020. Tar sands production will account for over 43% of that 2005 to 2020 emissions rise, reaching a massive 108 million tons of CO_2e a year in 2020.[51] This is almost the total emissions of Belgium in 2004.[52]

The IPCC states that in order to prevent catastrophic climate change, global GHG emissions need to peak by 2015.[53] Developed countries which have the responsibility for the greatest share of emissions to date, need to reduce emissions by 25–40% of 1990 levels by 2020.[54] Canada's current proposed federal climate mitigation plan, if it is achieved, would still leave it emitting 3% more in 2020 than it did in 1990;[55] this would leave Canada significantly off target in terms of the reductions required from the world's richest countries.

Table 1: CO_2 intensity of different tar sands extraction methods

Activity	GHG intensity (kg CO_2e/barrel)	GHG intensity (kg CO_2e/barrel) including 45 kg CO_2e/barrel for ugrading of bitumen
Mining of bitumen	35	80
SAGD production of bitumen[47]	55	100
THAI production of bitumen[48]	65	110
Cyclic Steam production of bitumen[49]	90	135

Source: The Climate Implications of Canada's Oil Sands Development – Pembina Institute 29 November 2005. http://pubs.pembina.org/reports/oilsands-climate-implications-backgrounder.pdf, p10.

It is highly likely that Canada will come under increasing international pressure to make stronger commitments than these. Furthermore, with the Conservative federal government of Steven Harper currently governing without a parliamentary majority it is considered quite possible that the federal election, which has to happen by October 2009 but could happen sooner, may bring about a change of government. If Stéphane Dion's Liberal Party does come to power, it has promised that it would bring a more aggressive GHG reduction policy into force.[56]

The full details of current Canadian government policy are not expected until autumn 2008. However, it targets emissions from tar sands projects primarily through the implementation of carbon capture and storage (CCS) by 2018 for projects that start up after 2012. Through this strategy, very little if any reduction will be achieved prior to 2018. The emissions intensity reduction obligations can be met by paying for 'pre-certified investments', which amounts to putting money aside for CCS development rather than actual emissions reductions in this period.[57]

Furthermore, emission intensity reductions have very little meaning if the activity in question is growing exponentially. With tar sands production forecast to roughly treble by 2020,[58] a minor reduction in per barrel emissions still leads to a massive increase in pollution for the sector. Even in the optimistic scenario of CCS progressing at the pace outlined in the federal government's climate action plan, by 2020 the total emissions from tar sands projects would still be nearly double what they were in 2006.[59]

Doubts about the viability of the 2018 target have been expressed by one of the members of the Alberta Carbon Capture and Storage Development Council and a key figure in Canada's power sector. Don Lowry, President and CEO of EPCOR Utilities and Chair of the Canadian Electricity Association, spoke on 19 June 2008 to the Economic Club of Toronto on how Canadian policy makers can help accelerate a transition to clean energy. Regarding the timelines proposed by the federal government for CCS in coal fired power plants and tar sands projects he said:

> 'Are these timelines achievable? EPCOR's view is that the federal Clean Air Framework significantly underestimates the scale, scope, time and cost required to achieve its objectives. We have no better chance of reaching these timelines than mandating Canada's medical establishment to cure the common cold by 2012.'[60]

While tighter carbon regulation is inevitable, uncertainty still remains regarding how much more aggressive it will become. This uncertainty poses a major risk to tar sands projects. As the sector plays such a huge role in Canada's emissions growth, it will become the focus of tighter regulation as the urgency surrounding climate change deepens in both Canada and internationally. But the biggest questions surround the key technology that the industry hopes will solve the problems of tar sands emissions without requiring a scale back of production – CCS.

CARBON CAPTURE AND STORAGE

The federal and provincial government both depend on carbon capture and storage (CCS) to achieve the climate change plans they have proposed.

In April 2008, financial analysts at Raymond James Ltd produced an in-depth study of the impacts of the federal government's proposed legislation regarding CCS for the tars sands industry. Among their conclusions were:

- There is a lack of visibility and clarity with respect to regulatory frameworks... the timing of bringing clarity to the GHG issue as it relates to the oil sands sector is not on the horizon.
- Companies with projects coming on stream after 2012 are subject to significantly more uncertainty.
- Projects that are slated to come on stream near the 2012 timeframe will likely have to consider implementing CCS compliant processes in the design phase, which could mean additional upward pressure on project cost estimates.[61]

Clearly if CCS is mandated to be applied to BP and Shell's projects that start up after 2012 there will be significant cost pressures on those projects. BP's Sunrise deal with Husky was announced three months before the federal regulations. The project is scheduled to start up in 2012. Meanwhile Shell has about 450,000 b/d of production scheduled for development from 2012 (see graph page 7).

While the uncertainty surrounding the detail of these regulations will exist for some time, the cost implications are also unclear, creating further uncertainty around the impact CCS will have on the costs of project development and operation. The Raymond James report estimated that costs for a SAGD in situ project could range from C$0.14 to C$9 per barrel and for an integrated mining project (mine and upgrader) between C$0.23 and C$15.60 per barrel.[62]

'We've come to realise, there are many more questions than answers. In fact, the one thing we can say with absolute certainty is that the lack of visibility obfuscates the entire issue'.[63]
Raymond James report, April 2008

This lack of clarity comes despite a decade of attempts to develop the technology. Shell's 'Energy Scenario 2008'[64] talks boldly about the coming of CCS, but substantial financial support for CCS is yet to materialise from the company signifying minimal confidence among Shell's decision makers. In a presentation in London supporting the publication of Shell's latest Energy Scenarios document, Jeremy Bentham, Shell's chief economist, said that a carbon price of €100, which is four times the current European average, is needed to launch initial CCS projects.[65] Shell has co-sponsored a number of research and development efforts without committing to any large scale projects. It recently entered the second stage of the Weyburn–Midale Project in Saskatchewan as a co-sponsor.[66] This project, and much of Shell's involvement in other CCS experiments, is focused on using CO_2 for enhanced oil recovery (EOR), a technology that, while useful for oil companies, will result in little net benefit to climate change mitigation. John Barry, Shell's Vice President for Unconventionals and Enhanced Oil Recovery has described EOR as 'a niche application that only works in some kinds of oils and some kinds of reservoirs' (and is therefore unlikely to provide) 'the solution'.[67]

Meanwhile BP, which has similarly trumpeted the possibilities of CCS, abandoned the Peterhead/Miller Field CCS project near Aberdeen in May 2007, having invested $60 million. And in May 2008 they axed another CCS project in Australia, having spent tens of millions of dollars on development. The company explained that the geological formations were unsuitable to the long term storage of the gas. These closures leave BP with two remaining pilot projects in development in California and Abu Dhabi, and the experience of their Algerian CO_2 capture project.[68]

Compared to Shell, there is more outward confidence from BP about CCS: it has proposed re-starting the Peterhead/Miller Field CCS project if it should succeed in gaining a subsidy through the UK DBERR CCS demonstration competition.[69] But a significant degree of doubt within BP can be illustrated by the comments of Jan Peter Onstwedder who was BP's most senior risk manager until December 2007 when he resigned. The level of his discomfort was illustrated by his taking the highly unusual step of talking to the press. In an interview with Reuters in February 2008 he was frank about his doubts regarding CCS. 'As an investor I'd ask how comfortable are you that CCS will work. I haven't seen oil companies answer that directly' he said.[70]

REGULATORY THREATS IN THE TAR SANDS MARKET PLACE

There is increasing international pressure on Canada to deal with the climate impact of tar sands.[71] In the USA, the key market place for the product, discomfort with tar sands production is starting to manifest. Tar sands derived fuel faces climate change motivated regulations in California and potentially in a widening range of cities and states across the country.

The Californian legislature has passed a Low Carbon Fuel Standards law which comes into force in December 2008. The standards consider the CO_2 emissions of the entire lifecycle of transport fuels sold in California; their 'well-to-wheels' emissions. This will require fuel providers to 'ensure that the mix of fuel they sell into the California market meet, on average, a declining standard for GHG emissions measured in CO_2-equivalent gram per unit of fuel energy sold'.[72]

This will force suppliers of petroleum products derived from tar sands to purchase credits from suppliers who have exceeded the standard, possibly making tar sands derived products too expensive to sell in the California market. A white paper supporting the legislation specifically states an intention to prevent fuel derived from sources such as tar sands from entering the California market. The white paper states that:

> 'In the absence of a transition to clean fuels, industry is expected to develop highly polluting domestic resources, such as fuel from coal-to-liquids that doubles carbon pollution per gallon and other 'unconventional' oil resources such as tar sands and oil shale, that are not only much worse for the climate (as much as twice as polluting as conventional gasoline) but also destroy wilderness areas and use scarce water resources.[73]

California is not the only jurisdiction to announce such an initiative. Florida, Ontario, British Columbia and the European Union are all developing similar legislation with the same figure of 10% by 2020.[74] Meanwhile the states of Oregon and Washington are exploring the issue.[75]

Section 526 of the 2007 Energy Independence & Security Act signed into law by President Bush on 19 December 2007, prohibits federal agencies from, 'procuring synfuel unless its lifecycle GHG emissions are less than those for conventional petroleum sources'.[76] 'Synfuel' refers to fuels made from tar sands and gas or coal-to-liquids. This theoretically prevents the purchase of fuel produced from tar sands by all federal agencies including the US Defense Department – the world's largest single buyer of transportation fuels. The provision was actually drafted in response to US Air Force plans to build a coal-to-liquids plant. In a letter to the Pentagon, Democrat Henry Waxman, chair of the House of Representatives Committee on Oversight and Government Reform, explained that the provision was drafted to, 'ensure that federal agencies are not spending taxpayer dollars on new fuel sources that will exacerbate global warming'.[77]

While no existing or planned federal government contract can be directly linked to tar sands production, there is now significant concern within the industry regarding the potential impacts of the act. Matt Fox, senior vice-president of oil sands at ConocoPhillips told Canada's Globe & Mail newspaper that if the act is not altered, 'it could bring development to a screeching halt' and therefore, 'you'd have to think twice about oil sands development if your intention was to deliver oil to the Lower 48.'[78]

While lawyers indicate that a broad interpretation of the law could contravene free trade agreements from the World Trade Organisation (WTO) and North American Free Trade Agreement (NAFTA) and spark a trade dispute between Canada and the USA, the potential to amend the act looks stalled until the outcome of the US election.[79]

On 24 June 2008, the US Conference of Mayors meeting in Miami, approved a resolution calling on its members to, 'creat(e)... guidelines and purchasing standards to help mayors understand the lifecycle greenhouse gas emissions of the fuels they purchase.'[80] Tar sands, oil shale and coal-to-liquids were cited as the inspiration for the resolution. The conference press release stated that: 'These unconventional and synthetic fuels are derived from difficult to access, lower grade raw materials, and production can emit two to five times more global warming pollution than conventional oil'.[81]

'This resolution shows our willingness to take action to move forward, not backwards, which is where fuels such as tar sands oil will take us,' said Mayor Frank Cownie of Des Moines, Iowa.[82]

While the resolution is not an act of law it marks an increasing trend in the USA to analyse and monitor the GHG intensity of transport fuels with a view to reducing that intensity. The resolution specifically states those signatories' intention to:

- 'encourage fuel lifecycle emissions analyses that include emissions from production, not just from burning the fuel;
- support federal and state guidelines for tracking the origin of various types of fuel; and
- encourage mayors to track and reduce lifecycle emissions from their cities' municipal vehicles, paying special attention to the use of unconventional and synthetic fuels'.[83]

THE POTENTIAL IMPACT OF US VEHICLE FUEL EFFICIENCY

In the light of the US political trend highlighted by the Mayors' resolution, it is important to recognise how changes in the US transportation fleet could have a significant impact on the economic rationale for tar sands. There is a compelling argument that shows that greater fuel efficiency in the fleet, using technology that is already widely available, can achieve significant cuts in fuel use.

According to a September 2007 report from the US Environmental Protection Agency, using new methodology to calculate 'real world' fuel economy in vehicles sold in the USA, the average fuel economy of light-duty vehicles in the USA has actually been in decline since 1987. In that year, models of light-duty vehicles sold in the USA averaged 22.0 miles per gallon (mpg), up from 13.1mpg in 1975. By 2004 this had fallen to 19.3mpg. In 2007 there was a slight increase to 20.2mpg.[84] In comparison, the average fuel economy of vehicles sold in the EU-15 in 2007 was around 35mpg.[85]

Given that on an average day in 2005 drivers of light-duty vehicles in the USA drove around 7.5 billion miles,[86] the amount of oil that could be saved if efficiency rose from 20.2mpg to 35mpg, as an average across the fleet, would be over 3.7 million b/d. This is roughly equivalent to the amount of daily production expected from the Albertan tar sands by 2020.[87]

The technology to achieve 35mpg is not cutting edge, indeed the current average for new vehicles in the EU-15 is 35mpg. Furthermore, technological developments presently underway are likely to achieve a mileage per gallon that is double that. It is recognised that US drivers have a preference for big cars that are inefficient, not because they lack the latest engine technology, but because of their sheer size and weight. However, this is changing dramatically. SUV and pick-up truck sales have been falling in the USA since 2005. Sales of both categories combined dropped 24.8% in the first four months of 2008 while demand for smaller cars is on the rise.[88] In the International Energy Agency's August oil market report, figures for US sales of these big vehicles had fallen by 19% over 12 months to a 16 year low in July 2008.[89]

Additionally, US drivers have started to change their driving behaviour. US Federal Highway Administration figures show that the first drop in vehicle miles travelled on US roads since 1979 started to occur in November 2007 and has been steadily dropping since.[90] US drivers are car pooling to work, indulging in less leisure driving and increasing their use of public transport. The combination of this reduced vehicle mileage and the steady switch to more efficient vehicles has led to a reduction in oil demand of over 800,000 b/d in the USA in the first eight months of 2008.[91]

All of this points to a potential to substantially reduce oil consumption in the key market for tar sands products. While these behavioural shifts in the USA are primarily being driven by high gasoline prices, the mainstream political debate currently appears centred on opening up oil exploration and drilling in the USA in an attempt to bring those prices down. However, the factors determining retail gasoline prices are complex and the outcome of exploiting the resources available domestically in the USA is unlikely to affect prices, nor will greater dependence on unconventional sources such as tar sands. Failure to reduce gasoline prices is likely to stimulate demand for increased vehicle efficiency and consolidate the recent shift in driving patterns, further weakening the market for tar sands products.

THE POTENTIAL IMPACT OF THE US PRESIDENTIAL ELECTIONS

The political shifts identified above do not take place in a vacuum, but in the midst of the contest between Barack Obama and John McCain for the presidency. Both have declared that tackling climate change will be one of the key ways in which they will distinguish their presidencies from that of George Bush. Obama has specifically proposed a national Low Carbon Fuel Standard, based on California's.[92]

As the Globe & Mail reported in June, the tar sands industry is watching developments in the USA with increasing concern:

'In the longer term, things are going to be very different in the United States – because of the environmental tsunami we're facing,' said Vincent Lauerman, a Calgary based global energy expert who heads up the think tank website Geopolitics Central. 'It's only a matter of time before the US government has more severe laws in place that would, in one way or another, discriminate against the oil sands.'

The investments in tar sands are based on production profiles stretching 40–50 years into the future. Regulatory changes enacted in the key market place over the next 4–5 years could place significant limits on those profiles.

RISK 2 – OPERATIONAL: MOUNTING TECHNOLOGICAL AND COST PRESSURES

AS ALREADY NOTED, ONE OF THE MOST SIGNIFICANT TECHNOLOGICAL LIMITS ON THE DEVELOPMENT OF ALBERTA'S TAR SANDS IS THE HUGE UNCERTAINTY SURROUNDING THE DEPLOYMENT OF CCS. THIS IS INHERENTLY LINKED TO THE REGULATORY ENVIRONMENT – EVEN THOUGH THE TECHNOLOGY APPEARS TO BE 'NECESSARY' TO MEET EVEN MODEST ENVIRONMENTAL GOALS, IT HAS NEVER BEEN USED IN THE TAR SANDS CONTEXT. EVEN IN THE POWER SECTOR, WIDESPREAD USE OF CCS IS NOT EXPECTED BEFORE THE MID 2020S, IF THEN.[93] THIS HOWEVER IS NOT THE ONLY TECHNICAL CHALLENGE FACED IN EXTRACTING TAR SANDS.

Shell currently has only one tar sands mining project in commercial operation. The Muskeg River Mine, connected to the Scotford Upgrader, is Shell's flagship tar sands mining project, having started up in January 2003. However the past five and half years have seen recurring problems that have led to periods of closure amounting to approximately 15 months – or 23% of the period (see box 3).

BOX 3 – EXAMPLES OF ENGINEERING FAILURES AT THE ATHABASCA OIL SANDS PROJECT

6 January 2003: Just eight days after the commercial start up of the project, a hydrocarbon leak led to a fire in the solvent recovery area of the froth treatment plant at the Muskeg River Mine. One worker sustained minor injuries and the fire lasted about two hours. Freezing conditions led to a longer and more expensive repair than originally expected and repair costs exceeded C$150 million. The project was set back about three months and full capacity was not reached until the third quarter of the year.[94]

19 October 2004: The first of a series of troubles at the Scotford Upgrader. A pump failure occurred in Residue Hydrocracker Train 1 leading to a shutdown. It was restarted in late November but while ramping up to full production, a tubing leak was detected on 8 December. It was shut down again and initially was expected to start up again in late December. However, on 21 December the company announced that, five of the coolers on RHC-1 'require extensive repairs to ensure the integrity of these assets'. Start up was further delayed to late January 2005. The upgrader ran at about 65% capacity during this time.[95]

February 2006: A tear in a conveyor belt at the Muskeg River Mine shut down production for nearly 1 month.[96]

19 November 2007: A giant fireball erupted above Shell's Scotford Upgrader near Fort Saskatchewan sparked by a leak of sour gas and hydrogen in Unit 2. The fire burned for about one hour and caused the entire upgrader to be shut down which in turn led production at the Muskeg River Mine to shut down as the bitumen had nowhere to go. There were no injuries. Unit 1 was restarted in late December and the operation was running at 50% by New Year. Full production resumed in late January 2008.[97]

COST AND RESOURCE PRESSURES

ACCORDING TO CREDIT RATINGS AGENCY, STANDARD & POOR, OPERATING COSTS AMONG A SAMPLE OF EIGHT COMPANIES WORKING IN TAR SANDS CLIMBED AT A COMPOUND ANNUAL RATE OF BETWEEN 4.7% AND 12.4% FROM 2003 TO 2006. THE STEEP RISE IN COSTS LED TO SOME COMPANIES CURTAILING CAPITAL SPENDING PLANS. STANDARD & POOR'S REPORT CONCLUDED THAT 'ALTHOUGH ROBUST COMMODITY PRICES ARE EXPECTED TO OFFSET RISING COSTS IN THE NEAR TO MEDIUM TERM... THE CANADIAN OIL & GAS COMPANIES... WILL FACE INCREASING DISPARITY BETWEEN THEIR REPORTED RESERVES AND THE TRUE ECONOMIC VALUE OF THOSE RESERVES'.[98]

In November 2007, Canada's National Energy Board reported that tar sands construction costs rose 40–50% over the previous two years on the back of high steel and concrete prices, rising labour costs and strained provincial infrastructure.[99]

On 8 July 2008, Shell announced that it was abandoning plans for a refinery expansion near Sarnia in Ontario. The proposed plant would have processed up to 250,000 b/d of syncrude from Shell's tar sands operations.[100] According to economic and financial analyst group Global Insight, the company cited 'a multiplicity of challenges, from cost inflation that has affected the industry as a whole, to the availability of raw materials, equipment, and manpower, to general market conditions'.

These cost pressures are being felt globally but the ongoing tar sands rush in Alberta is exacerbating the driving factors and presenting formidable challenges to tar sands expansion. The Canadian Association of Petroleum Producers (CAPP) said in April 2008 that rising steel prices and other construction costs have increased the cost of a 100,000 b/d integrated tar sands project (mining and upgrader) from C$3.1 billion in 2001 to over C$10 billion today.[101]

LABOUR

Fort McMurray, at the heart of the Athabasca Oil Sands Area, lies 300 miles from Edmonton, in the extremely sparsely populated boreal forest north of the 55th parallel. Until the late 1990s it had a population of 32,000. However the injection of C$59 billion between 1997 and 2006 and a further C$80 billion to 2010,[102] has led to an exponential rise in the demand for labour in the three tar sands areas. The population of Fort McMurray has doubled to 64,441, with a further 20,000 people living nearby in mining and construction camps.[103] In an attempt to relieve the labour shortage, Shell, for example, is building a new runway at the Jackpine Mine, part of AOSP, capable of handling Boeing 737s to fly in workers from Newfoundland.[104]

Not only has this rush led to an escalation of labour costs, but it has also driven up the cost of living in these remote towns, led to an acute housing shortage and put stress on local social amenities. The ratio of men to women is 30 to 1, and there is a rise in domestic violence. Despite the boost in well-paid employment, the social costs have fuelled growing opposition to tar sands developments in towns such as Grande Prairie, just south of Peace River.

In December 2007, Peter Stalenhoef, CEO of heavy industrial for PCL Constructors Inc., a company contracted on several tar sands construction projects, told Engineering News-Record, 'We need 1,500 people a day but we are 300 people short... With project managers, welders and engineers in high demand, labour costs have escalated 5–6% this year.'[105]

EQUIPMENT AND MATERIALS

After his presentation on tar sands to the assembled London audience in April 2008, John Barry, Shell Vice President of Unconventionals and Enhanced Oil Recovery, took questions. On an enquiry about the economics of Shell's Canadian projects, Barry expressed his concern about the rising costs of development, explaining that equipment in Edmonton is two and a half times as expensive as on the Gulf of Mexico.[106]

The cost of industrial equipment in tar sands areas has rapidly increased – partly on account of the infrastructure challenges in Northern Alberta and partly as an echo of rising costs throughout the industry. The latest HIS/CERA Upstream Capital Cost Index shows that costs for developing a new oil or natural gas field have more than doubled in the past four years.[107]

Geoffrey Cann, a director at oil industry consultant Deloitte Development in Toronto told Engineering News-Report: 'there are only so many manufacturers who make the equipment needed. And they are all running flat out'.[108]

These issues have almost doubled the cost and delayed start up of the Nexen/OptiCanada Long Lake joint venture from C$3.4 billion to C$6.1 billion.[109] 'There's a lot of activity with construction and drilling, so getting access to manpower and equipment continues to be a challenge,' said Nexen chief financial officer Marvin Romanow at a recent Calgary conference.[110]

GAS

Demand for gas in tar sands developments is rising – it rose 60% between 2005 and 2007 – whilst conventional gas production is falling in Canada. In the summer of 2006, as multiple tar sands projects came on stream, Alberta cut its exports to the USA by 700-800 million cf/d, and some analysts were describing it as a long term trend.[111] Predicted increases in tar sands production to 2 million b/d by 2012 and 3 million b/d by 2016 could see gas consumption rise to between 2 and 3 billion cf/d. This would be roughly equivalent to between 3.3% and 5% of 2006 North American natural gas supply.[112]

These dynamics mean that the development of unconventional gas fields is an imperative for the tar sands project as a whole – hence Shell and BP's engagement in projects such the Mackenzie Delta Gas Fields and the Sacred Headwaters CBM. However such ventures will again create a demand for labour and supplies, further pushing up costs in the tar sands area prior to any ability to relieve costs through the opening up of these new gas deposits. The longer the delay in these fields coming on stream, the further the rise of tar sands costs. But the development of such deposits faces local opposition as at the Sacred Headwaters, which has significantly slowed development.[113]

WATER

Water is required in huge quantities to process tar sands – both to create steam for in situ production and in the upgraders. Consequently, each barrel of oil produced from the deposits requires between 2 and 4.5 barrels of water.[114] There are currently licenses granted by the Albertan government to remove 349 million cubic metres of water per year from the Athabasca River for use in tar sands extraction and this figure is expected to rise to 529 million cubic metres. Although this is only a portion of the water used by the three tar sands areas, it is more than that used by the entire city of Toronto. And whereas municipalities recycle water, tar sands extraction industries are unable to do so due to high levels of pollution.[115]

Every day 1.8 billion litres of toxic tailing waste are added to the 50km^2 of tailings ponds that have built up around the Athabasca tar sands development. These ponds – the size of large lakes – are acutely toxic to aquatic life and bird scarers have to be used to keep birds away. The death of 500 birds in the Aurora North tailing pond in April 2008, raised considerable media and public attention.[116]

If tar sands extraction continues to develop at current rates, the ponds are expected to expand to 220km^2 before tar sands are exhausted.[117] Meanwhile there is a growing risk that the pollutants will migrate into the groundwater system or leak into surrounding surface water.[118]

Concerns are rising about the toxicity of the Athabasca River into which flows the Muskeg River which drains the area of Shell's AOSP and BP's Sunrise projects. Data going back to the mid-1990s, recorded by the Canadian government and private companies, reveals that concentrations of toxic polycyclic aromatic hydrocarbons in the sediments of the Athabasca River have increased steadily. Meanwhile in Fort Chipewyan, 160km further north, at the mouth of the Athabasca, there has been a rise in serious illnesses. Five incidents of bile-duct cancer among the 1,000 residents, when the illness is so rare it is usually seen in no more than one case in 100,000 people. Inhabitants of the town now drink bottled water and catch an increasing number of fish with deformities.[119]

RISK 3 – REPUTATIONAL: WEAKENING PUBLIC ACCEPTANCE

IN RECENT MONTHS, TAR SANDS PRODUCTION HAS ATTRACTED SIGNIFICANT NEGATIVE PUBLICITY, PARTICULARLY IN THE KEY MARKET OF THE USA. IMAGES OF THE DEVASTATED LANDSCAPES OF THE TAR SANDS MINES AND THE SPEWING CHIMNEYS OF UPGRADER COMPLEXES ARE UNDOUBTEDLY DRAMATIC. DETAILS OF THE INCREASED GHG EMISSIONS PRODUCED FROM TAR SANDS PRODUCTION ARE FUELLING CONCERN OVER WHETHER THE USA IS DEEPENING THE CLIMATE CHANGE PROBLEM IN ITS PURSUIT OF ENERGY SECURITY, JUST WHEN IT IS BEGINNING TO TAKE THE NEED FOR ACTION ON CLIMATE SERIOUSLY.

The introduction of a Low Carbon Fuels Standard by California, a bill sponsored by both Senators McCain and Obama for a national equivalent and the resolution at the recent Mayor's conference in Miami (see page 20) all cited the climate impact of tar sands production as one of the issues the proponents were attempting to address.

Most recently in mid August 2008, Shell had an attempt to portray its tar sands production positively in the Financial Times rebuked by the Advertising Standards Authority. Following a complaint by WWF-UK, the ASA ruled that the advertisement, which ran in the FT once to coincide with Shell's annual results for 2007, was misleading in its description of Shell's tar sands production as sustainable. In reviewing the Muskeg River mine the ASA stated that, 'We also noted that we had not seen data from Shell that showed that their various voluntary emissions projects had, or were in the process of, reducing the levels of GHG produced by their oil sands projects, or that demonstrated that their advanced technology would reduce CO_2 emissions by 10% compared with the previous technology.'[120] The ruling generated significant press coverage in the UK, USA and Canada.[121]

This wave of negative publicity has triggered major publicity campaigns by the tar sands industry. The Alberta government launched a C$25 million campaign in April 2008 to counter negative publicity building in the USA. Only days later, the death of 500 ducks on a toxic tailings pond at one of Syncrude Canada's mining operations stole the headlines.[122] Tar sands companies including Shell,[123] launched a website in June called Canada's Oil Sands: a different conversation.[124] The website aims to 'listen and respond more effectively to concerns about the environmental and social impacts of developing Canada's oil sands.' Visitors can post their answers to questions posted on the front page of the site or sign up to participate in an ongoing discussion forum.

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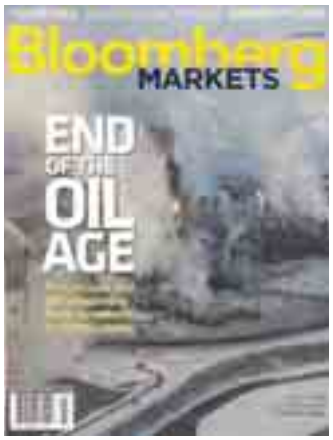

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It is probable that section 526 of the US Energy Security Act (see page 19), the California Low Carbon Fuel Standard and the US Mayor's resolution has caused such anxiety among industry proponents. While many of the big oil and gas companies involved in tar sands, such as Shell, BP, ExxonMobil and Chevron, are adept at handling protests from local communities and international environmental groups, the scale and spread of the tar sands footprint is potentially exposing them to a variety of threats that they may have to fight on multiple fronts. Box 4 lists some of the significant civil society opposition to tar sands development.

BOX 4: PROTEST AROUND THE TAR SANDS FOOTPRINT

In May 2008, Canada's largest integrated oil company, ExxonMobil subsidiary Imperial Oil, was ordered by the federal court to explain how compliance with 'intensity based' GHG emissions targets adequately mitigates the emissions from its $8 billion Kearl Lake tar sands mining project. The case was brought by a coalition of environmental groups challenging the claim by the projects Joint Review Panel that emissions intensity targets adequately supported the legal test of 'no likely significant adverse effects'.[125] The project has also suffered significant delays due to water permit issues and further work may not proceed until 2009.[126]

The Beaver Lake Cree filed a potentially groundbreaking suit against both Alberta and the federal government in June 2008. The action challenges past and future tar sands developments asserting that hunting and trapping rights guaranteed in constitutional treaties signed in the 19th century are being rendered meaningless by tar sands extraction.[127] Beaver Lake Chief Lameman said, 'Governments and industry ignore our concerns. This is our home. This is where we live. We have a responsibility to our children, and to our children's children, to see that the lands where the Cree live, and will always live, remain inhabitable.'[128]

ConocoPhillips' plan to refit its Roxana, Illinois refinery to process tar sands derived syncrude were derailed on 5 June 2008 when the US Environmental Protection Agency appeals board upheld a challenge by environmental groups led by Natural Resources Defense Council (NRDC) and Sierra Club.[129]

Residents of Whiting, Indiana, have been protesting against BP's proposed expansion of the refinery in their neighbourhood to process up to 400,000 b/d of tar sands derived syncrude. They oppose the increase in emissions into the air and Lake Michigan. Local Senators and Representatives have actively supported the opposition, whilst the Mayor of Waukegan, Richard Hyde says: 'How did they get a permit to dump in the lake in the first place? How does anybody get a permit to dump anything into Lake Michigan?'[130] BP secured a permit from the Indiana authorities in May but now faces an appeal in federal courts by NRDC that will be heard in June 2009.[131]

Since 2005 the Sacred Headwaters of the Stikine, Seena and Nass rivers in British Colombia have been the site of a stand off between members of the Tahltan First Nation and Shell. The Tahltan have been doggedly blocking access roads to their land, preventing machinery entering Shell's coal bed methane development. In December 2007, Shell lost a second high court injunction against the First Nation.[132]

Shell's Carmon Creek project in Peace River is the subject of a suit by the Woodland Cree First Nation who are suing the provincial government for not consulting them.[133]

In June 2008 the Chipewyan Prairie Dene First Nation, led by Chief Janvier, filed a case against the Albertan government over the tar sands project run by MEG Energy at Christina Lake. 'Our lakes, our land and the animals and fish we have relied on for thousands of years to support our way of life and cultural values are being destroyed by out of control oil sands developments' said Chief Janvier.[134]

On 17 April 2008, protestors from Citizens Concerned about Coal Bed Methane travelled to the BP AGM in London from the Mist Mountain area in British Colombia, to draw attention to the opposition of the City of Fernie to the company's planned project in their area. At the time of writing, the British Colombian legislature has still not granted BP tenure.

This spread of protest and negative publicity potentially adds to the ongoing attacks on BP and Shell's 'social license to operate' in key states – in particular Canada, the USA and the UK. This can erode support from the political establishment, the media and elements of the finance sector. In addition, it can undermine staff morale.

Shell's struggle to deal with the double impact in 1995 of Brent Spar and the execution of Ken Saro-Wiwa illustrates this process. Support for the company from the political establishment was fractured as MPs and ministers publicly condemned the events taking place in the North Sea and Nigeria, whilst Shell was hounded in the media. This in turn impacted on employees, as was later recognised by the company. 'I did not like to mention I was employed by Shell. I knew people would turn their noses up disapprovingly' ran a quote in a Shell report of 2000.[135]

In order to counter these impacts Shell embarked on 'a long term campaign on the communications front'[136] diverting £20 million and extensive human resources into rebuilding the company's reputation.[137] The strategies implemented by Shell to counter this reputational damage are being echoed by the tar sands industry today. A major element of Shell's communications campaign was the Tell Shell website where members of the public could join in debate about Shell's operations and its social and environmental impact. The tar sands industry's different conversation campaign mentioned previously mirrors this. Likewise, Shell's strategy of taking journalists on tours of its operations in the Niger Delta in 1996[138] has been repeated recently by the company in Alberta.[139]

Shell has, to some extent, been able to rebuild trust and change public opinion in relation to Brent Spar and Nigeria, convincing stakeholders that it is a leader in its sector on social and environmental issues. BP embarked on a similar strategy from the mid-1990s, partly driven by the fear of reputational damage related to its projects in Colombia and partly as a result of witnessing Shell's woes. However, for both companies their leadership on environmental issues now runs directly counter to their investments in tar sands and their retreat from investments in renewable energy projects. In April 2008, Shell announced it was pulling out of the London Array wind farm, set to be the world's largest off shore wind project.[140] James Smith, Chairman of Shell UK, told Reuters that Shell was 'disappointed to pull out of (the London Array)' and that Shell's investments in tar sands were, 'not a good thing' for the climate.[141] Similarly, BP has suggested that it may sell all or part of its renewable energy assets in order to 'realise value for shareholders'.[142]

Tar sands are the most developed of a range of energy resource options categorised by the industry as unconventional. The others include coal-to-liquids, gas-to-liquids and oil shale in terms of conventional oil replacements and coal bed methane and tight gas as conventional gas alternatives. International oil companies such as BP and Shell are increasingly looking to these resource options as their choices for maintaining and growing their otherwise diminishing hydrocarbon reserves. All of these have significantly greater impacts on the environment and on climate in particular, than conventional oil and gas production.[143] The implications of this retreat into unconventional oil and gas for these companies' carbon footprint, their claims of leadership on environmental issues and for international efforts to prevent catastrophic global climate change, are something that investors need to consider very carefully. There is significant brand-risk associated with tar sands production that threatens to undermine the efforts these companies have made to build reputational value.

CONCLUSION

Faced with decreasing access to oil and gas reserves that are relatively simple to extract, Shell and BP have chosen to engage in capital intensive and highly polluting tar sands production. The situation illustrates the tenuous position of international oil companies in a changing world order.

Following a period in which investments in tar sands were assisted by a tailwind, the circumstances are changing and projects are increasingly facing a headwind.

Due to its high greenhouse gas (GHG) intensity, a significant increase in the pressure to reduce GHG emissions in Canada and across the developed world is the source of considerable uncertainty for the future of the industry. For Canada to meet any international targets for GHG emissions reduction it must address the emissions from tar sands.

Government proposals for achieving this are subject to huge uncertainties due to their dependence on a technology – carbon capture and storage (CCS) – that is so far unproven in the industry. One Canadian industry leader has compared the proposed 2018 timeline for widespread implementation of CCS to 'mandating Canada's medical establishment to cure the common cold by 2012'.[144]

Evidence of the risk posed by the lack of a clear strategy to address tar sands emissions is beginning to appear in the tar sands' key market place, the USA. Faced with eight years of inaction on climate change at the federal level, state and city legislatures have found tar sands to be a popular focus for action. Low Carbon Fuel Standard legislation soon to be enacted in California, under consideration in other states and proposed as a national policy by Barack Obama, potentially poses a threat to the tar sands industry. Proposed action by the USA Conference of Mayors and controversy over Section 526 in the federal 2007 Energy Independence and Security Act has raised significant questions about whether tar sands could be penalised for its GHG intensity in the US market.

As a result the public relations war has begun and the tar sands industry can now add multi-million dollar publicity campaigns to its expense account.

In addition to these challenges, the scale of the infrastructure development needed to sustain tar sands exposes investors to risk on a variety of fronts. Two thousand mile gas pipelines from the Arctic and refinery expansions across the USA are all likely to accentuate the labour, equipment and material shortages that are driving costs up at infrastructure projects globally and in Alberta specifically. They are all also subject to multiple regulatory hurdles yet to be crossed. Already, the added pollution associated with refining tar sands derived syncrude is causing significant challenges to companies seeking permits in the USA.

Shell and BP are no strangers to risk. The oil and gas industry is renowned for its epic gambles. However, it is worth noting that tar sands and unconventionals generally signal new territory for the industry. They have entered the unconventional realm because their options are decreasing. Meanwhile the cost of doing so is continually spiralling upwards. Simultaneously, the international regulatory environment is moving with increasing speed to constrain CO_2. How much CCS will cost and whether it can be implemented in time to have a meaningful impact are questions that will remain open for some time to come. As Jan Peter Onstwedder, formerly BP's most senior risk manager told Reuters in February 2008, 'As an investor I'd ask how comfortable are you that CCS will work. I haven't seen oil companies answer that directly.'[145]

APPENDICES

Appendix 1: BP investments

BP project	Phase	Capacity b/d	Target start up date
Sunrise	1	50,000	2012
SAGD	2	50,000	2014
	3	50,000	2016
	4	50,000	2018

Appendix 2: Shell investments

Shell project	Phase	Capacity b/d	Target start up date
Athabasca Oil Sands	Current Muskeg River	155,000	2002
Project (AOSP)	Muskeg River expansion & debottlenecking	115,000	2010
	Jackpine Phase 1A	100,000	2010
	Jackpine Phase 1B	100,000	2012
	Jackpine Phase 2	100,000	2014
	Pierre River Phase 1	100,000	2018
	Pierre River Phase 2	100,000	2021
Cold Lake Orion	Phase 1	10,000	2007
	Phase 2	10,000	2009
Peace River	Cadotte Lake	12,500	1986
	Carmon Creek Phase 1	37,500	2010
	Carmon Creek Phase 2	50,000	2015

Appendix 3: BP assets

Asset	Production method	Current production capacity (b/d)	Possible recovery capacity barrels	Start date	Partners	Development
In situ projects						
Sunrise	SAGD	60,000	2.25 billion	2012	50% Husky	Up to 200,000 b/d between 2015–2020
Kirby	Probably SAGD	60–70,000 estimated potential	?	?		BP owns land leases and recently announced it is seeking partners to develop a project here. No firm deal exists yet but BP has referred to its potential on a number of occasions
Refinery projects						
Toledo Refinery		155,000 of which 60,000 is currently heavy oil		1919	50% Husky	170,000 by 2015 of which 120,000 will be syncrude
Whiting Refinery		405,000 of which 95,000 is currently heavy oil		1890	100% BP	Currently awaiting regulatory approval for $3.8billion reconfiguring to increase syncrude refining by 260,000 b/d by 2011
Gas projects						
Trans-Alaska-Denali Pipeline	Gas pipeline			2019?	ConocoPhillips	In April 2008, BP and ConocoPhillips announced they are pushing ahead with this major gas pipeline
Mist Mountain	Coal bed methane	?	?	?	?	BP is spending $100 million on exploring this coal field and plans to invest $3billion if it goes ahead. The June announcement of the BC government granting tenure has been delayed
Noel Tight Gas	Tight gas	?	?	?	?	

Appendix 4: Shell assets

Asset	Production method	Current production capacity (b/d)	Start date	Partners	Expansion potential
Mining projects					
Athabasca Oil Sands Project: Muskeg River Mine Jackpine River Mine Pierre River Mine	Mining	155,000	2003	Chevron Canada (20%) Marathon Oil Sands (20%)	Up to 770,000 b/d. See Appendix 2 for details of expansion phases.
In situ projects					
Orion Cold Lake	Steam Assisted Gravity Drainage (SAGD)	10,000	2007	Shell 100%	20,000 b/d approved with potential for 40,000 b/d
Peace River Complex: Seal Battery Cliffdale Battery Carmon Creek Project	Primary (conventional) and thermal production	12,000 of thermal and around 10,000 primary production	1979	Shell 100%	At least 100,000 b/d. In December 2006, Shell applied for regulatory approval for maximum production of 100,000 b/d at its Peace River Complex.
Grosmont Venture	Experimental In situ	?	?	Shell 100%	Construction of test site to begin in 2009 to assess production potential.
Upgrading projects					
Scotford Upgrader 1	Hydrogen Addition	155,000	2003	Chevron Canada (20%) Marathon Oil Sands (20%)	100,000 b/d expansion under construction scheduled to start up in March 2010.
Scotford Upgrader 2 (including Bitumen Blending Facility)	Hydrogen Addition	N/A	2012	Shell 100%	400,000 b/d Shell has filed for regulatory approval for this upgrader expansion but following the cancellation of the Sarnia refinery expansion (see below), has suggested it may look elsewhere for upgrading capacity.
Scotford Refinery	N/A	Processes 100,000 b/d of syncrude from the Scotford Upgrader	1984	Shell 100%	Currently at full capacity. No expansion plans.
Refinery projects					
Sarnia Manufacturing Centre	Refinery and manufacturing centre	72,000 b/d processing some syncrude	Built 1952 purchased by Shell in 1963	Shell 100%	Shell was exploring expansion potential at Sarnia to handle up to 250,000 b/d of syncrude. On 8 July 2008, Shell announced it was not taking the expansion forward due to rising cost pressures.
Motiva Refinery, Port Arthur, Texas		285,000 b/d	Built by Texaco in 1903	50% Saudi Refining Inc (Saudi Aramco)	$7 billion expansion currently under construction, scheduled for completion by 2010. Much of the 315,000 b/d of new capacity will process heavy crude initially from Saudi Aramco's Manifa field. Shell has suggested that once a pipeline is in place to bring syncrude to Texas, Motiva will be ready to handle it.
Deer Park Refinery, Texas		340,000 b/d	Built by Shell in 1929	50 % Norteamerica, S.A. de C.V., a subsidiary of Petroleos Mexicanos (Pemex)	Following cancellation of the Sarnia expansion, Shell named this as one of the sites it is exploring for potential upgrading and refining of syncrude.
Shell Martinez Refinery, California		165,000 b/d	Built in 1915	Shell 100%	Following the cancellation of the Sarnia expansion, Shell named this as one of the site it is exploring for potential upgrading and refining of syncrude.
Gas projects					
Klappan, Sacred Headwaters	Coal bed methane	N/A	?	Shell 100%	
Mackenzie Gas Pipeline	On shore gas extraction and pipeline transport	1.2 billion (cf/d)	Proposed and applied	ExxonMobil, Imperial Oil, ConocoPhillips and Aboriginal Pipelines Group	
Prudhoe Bay Gas Fields	Off shore gas	?	?	Will be developed in line with Denali Pipeline	

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