# COMPARATIVE ANALYSIS OF FISCAL TERMS FOR ALBERTA OIL SANDS AND INTERNATIONAL HEAVY AND CONVENTIONAL OILS

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***Important note:***

***This report is being provided to the Department of Energy under a consulting contract with Pedro Van Meurs.***

***The report provides a fiscal evaluation of Alberta oil sands and international heavy oil projects as well as a comparison with conventional oil regimes. The report represents the findings, analysis and interpretation of the author and does not necessarily reflect the views of the Minister of Energy or Department of Energy.***

***It is intended to provide additional information for consideration by the Royalty Review Panel.***

***The Department of Energy welcomes comments on this report by third parties.***

## EXECUTIVE SUMMARY

**The report is an economic comparison of the current fiscal terms of Alberta oil sands and international heavy oil projects. Also a brief scoping review is included to compare with conventional oil terms. This is a follow up to the earlier study entitled "Preliminary fiscal evaluation of Alberta oil sand terms (April 12, 2007)".**

**It should be noted that there are considerable differences between international heavy oil and Alberta oil sands projects. Of great importance is the high viscosity of the bitumen in the oil sands reservoirs. The oil sands bitumen do not flow to wells without heating the bitumen. Heavy oil flows to the wells. This makes Alberta oil sands relatively high cost.**

**In terms of gravity and quality Alberta oil sands are comparable to certain of the heavy oils. Oil sands in Alberta are typically 8.5 degrees API. Heavy oils could range from 0 degrees to 20 degrees API. The Venezuelan heavy oils are directly comparable to Alberta in terms of gravity, but some other heavy oils are lighter. The higher the API degree ranking the more light products can be produced through normal refining distillation and the more valuable the crude oil is.**

**Heavy oils are produced through different processes. Some of the heavy oils can be produced with "cold" methodologies, which is through horizontal or multilateral wells. Other heavy oils are produced by injecting steam. Oil sands are extracted through mining or the SAGD process.**

**The heavy oil and oil sands resources in the world are very large. Probably as much as 5000 billion barrels of oil is in place in the reservoirs. Of this total at least 40% is located in Alberta. It is clearly the next very large crude oil resource. Large scale access for new projects exists only in Alberta and Venezuela. However, due to recent political turmoil in Venezuela, foreign investment in Venezuela is low.**

**In order to compare Alberta with the international heavy oil terms, two Alberta projects from our previous study were selected: Cold Lake SAGD (600 million barrels) and Athabasca Mining + Upgrading (2200 million barrels).**

**The Cold Lake deposit was compared with three projects that produce heavy oils without requirement for an upgrader. These projects are Kern River (California), West Sak (Alaska) and Duri (Indonesia). From an economic perspective Cold Lake is most comparable to West Sak. West Sak has much higher share for government under high prices. The comparison indicates that Cold Lake would remain competitive if payments to government through royalties or other fiscal features would be increased modestly with higher prices.**

**Economically the Athabasca Mines + Upgrader project compare mostly with the Venezuelan heavy oil production also with upgraders. However, Venezuelan costs per barrel are much less than in Alberta. Therefore, Venezuela can require a much higher share for government. Venezuela has higher royalties and taxes and also requires direct participation by the State in the investments. Therefore, Alberta would not necessarily loose competitiveness with Venezuela if government revenues would be modestly increased. This is in particular true if the higher political risk is taken into account.**

**However, due to the apparent high cost escalation in Alberta relative to the many competing areas, the competitiveness of Alberta has deteriorated in the lasts few years compared to international heavy oil projects. This has also reduced substantially the income from which Alberta can obtain its share. It can therefore be recommended to consider changes to the fiscal terms in Alberta that would provide a stronger stimulus for cost efficiency.**

**Alberta was also compared with four main conventional oil producing areas: US Gulf of Mexico, the UK, Norway, and Angola.**

**In this context it should be noted that recently the UK increased their share with about ten percentage points and the US in the Gulf of Mexico by about five percentage points. Alberta terms were compared with these latest terms.**

**The great advantage of oil sands is that they are already discovered. For instance, to discover in North America the 2200 million barrels that is associated with the Athabasca Mine + Upgrader would cost at least US $ 4 per barrel or $ 8.8 billion in exploration costs.**

**In order to obtain a proper comparison it is necessary to allocate full exploration costs to conventional oil operations. This exploration includes the costs of dry holes. These costs range from US $ 2 per barrel in Africa to US $ 4 per barrel in North America.**

**Based on such a comparison, Alberta oil sands developments are very competitive. Therefore, it is possible to modestly increase government revenues, without affecting the international competitive position of Alberta with respect to conventional oil.**

**What is also important to note is that the United States (California, Alaska and Federal) and Venezuela have much higher royalties on heavy oils than Alberta on oil sands. Therefore, there is some possibility to increase the base royalty on the Alberta oil sands without loosing competitiveness.**

**In conclusion it seems that a new Alberta fiscal system should provide for a share for Albertans that would go up with higher prices, but also with higher costs. An immediate modest increase in the Alberta share is possible. If Alberta would be successful in lowering costs over time, the share for Alberta could be further increased.**

**It should be noted that such a fiscal system may include other new special taxes in addition to changes in the royalties.**

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# MAIN REPORT

## 1. INTRODUCTION

This report is provided at the request of the Department of Energy of the province of Alberta. The work is done under a consulting contract with Alberta.

The report contains a fiscal-economic comparison of Alberta oil sands terms with certain international heavy oil projects as well as a brief scoping of comparisons with conventional oil terms. The purpose of the report is to serve as back ground to an evaluation of the international competitiveness of Alberta oil sands terms.

This report is in follow up to an earlier report entitled "Preliminary fiscal evaluation of Alberta oil sand terms (April 12, 2007)

The economic analysis is based on information provided by the Department of Energy and from sources available to the consultant. The cost and revenue data for Alberta are similar to the ones published in Technical Royalty Report # 1 of the Department of Energy entitled *"Alberta's Oil Sands Fiscal System - Historical Context and System Performance"*. The international cost data are based on information from the consultant.

In view of the wide range of possible cost and price scenarios, I will use the "fiscal map" methodology. This approach was also followed by the Department to produce cost-price "maps" of the various results.

## 2. ECONOMIC FRAME WORK AND PROJECT SELECTION

### 2.1. Basic characteristics of world wide heavy oils/oil sands

There are not many projects in the world that can be used for a fiscal comparison with Alberta oil sands.

There are considerable heavy oil and oil sands resources around the world, but only some of these resources are in active development. Also within the group of heavy oils/oil sands projects there is a very wide range of different technical and economic conditions.

For the purpose of this report the heavy/oil sands oils will be defined as crude oils with a gravity between 0 and 20 degrees API (which corresponds with a density of 1.076 to 0.934 gram/cubic centimeter). Within this group one often separates heavy oils into "heavy" and "extra heavy" using the 10 degrees API as the dividing benchmark. It is customary to divide the group also in "bitumen" and "heavy oils" based on the viscosity of the crude oil in-situ in the reservoirs. If oil does not flow to the wells on the basis of primary or secondary production methods, it can be called "bitumen", otherwise it is "heavy oil".

The viscosity of the crude oil in the reservoirs is an important factor that determines project economics. Viscosity is a scientific parameter in order to indicate how easy a liquid flows. The viscosity is expressed in "centipoise" ("cp"). Following is a viscosity scale with commonly known fluids in order to illustrate the nature of viscosity. The viscosity of water is by definition 1. The other fluids indicated on the scale reflect their approximate viscosity.

| Viscosity (cp) | Liquids (solids) with this viscosity |
|---:|---|
| 1 | Water |
| 10 | Cream |
| 100 | Tomato Juice |
| 1000 | Honey |
| 10,000 | Mayonnaise |
| 100,000 | Peanut Butter |
| 1,000,000 | Chocolate |

### 2.2. Heavy oils/oil sands production methodologies

There are various methodologies to produce heavy oils/oil sands. Following is a brief review of the three main methods being used in the world to produce heavy oils/oil sands.

***Cold methods.*** Heavy oil production started around the world on the basis of production from conventional vertical wells. For instance, in Venezuela in 1980 production rates were about 100 – 200 bopd per well. However, since then technological improvements such as the use of electrical submersible pumps ("ESP's"), horizontal wells, multilateral wells and the use of diluents have been introduced. This increased production to the 1500 – 3500 bopd per well range. Venezuela is in the Orinoco Belt still largely using cold methods. This could lead to relatively low production costs per barrel. Also in the Alaska Arctic heavy oils are produced with cold methods.

Cold methods are economically preferable where:

- the viscosity in the reservoirs is relatively low, or/and
- reservoir conditions are favorable (high temperatures, high permeability, high porosity), or/and
- oil is "foamy oil" whereby associated gas comes out of solution when oil is being produced.

Under all these conditions heavy oil will flow adequately to the wells. A special method of cold production is "CHOPS" (cold heavy oil production with sand) whereby the horizontal wells are being produced by encouraging sand to actually enter in the wells along with the oil. In this way permeability is being improved around the well during production. This method is being used in Alberta with respect to some heavy oil deposits.

In general, cold methods limit the recovery factor to the 10% - 20% range.

***Steam injection.*** The viscosity of oil can be lowered significantly by increasing the temperature. This can be achieved by injecting steam. There are several production methods being used based on the injection of steam. These are:

- **Steam flood.** Traditionally, this is being done by having a 5-spot pattern of wells with four producers at each corner and a steam injector in the center. The application of steam makes the oil flow easier to the producing wells. The steam than extends through the reservoir to the producing wells. The injection of steam increases reservoir pressure which makes oil flow better to the wells. At some point in time break through of steam occurs in the producers. After that the oil is being produced through gravity. Steam injection of this type is being used in Kern River and in the Duri field in Sumatra in Indonesia.
- **Cyclic steam support ("CSS").** This was a method developed in the Lake Maracaibo area of Venezuela and in Cold Lake. In this case steam is injected in a well and subsequently oil is being produced from the same well. It is also called the "huff and puff" method. The CSS method can be applied to vertical or horizontal wells.
- **Steam Assisted Gravity Drainage ("SAGD").** This method employs two horizontal wells. The upper one injecting steam on a continuous basis and the lower one is being used to produce the oil based on gravity drainage. This is a method that is now widely used in the Athabasca oil sands and in Cold Lake for in-situ production of oil sands.

In general, steam flood and SAGD could result in a recovery factor of 30% to 70% depending on reservoir conditions. CSS has typically lower recovery factors.

As can be easily understood, the economics of all steam injection projects is very much impacted by the steam requirements per barrel of oil production and the cost of natural gas or other energy sources to produce the steam.

***Mining.*** This is the well know method used for the Athabasca oil sands whereby the bitumen is mined. This method has a recovery factor of better than 80%. Of course, the mining methodology is suitable only for areas where the overburden is relatively thin. This method is therefore limited to a small part of the Alberta oil sands.

***Other.*** Apart from the above methodologies, other methodologies can be applied and are in development, such as in-situ combustion. It is highly likely that over the next few decades, technology will continue to improve dramatically with respect to the production of heavy oils/oil sands. This may make new resources accessible and will in the long term result in lower production costs.

### 2.3. Upgrading methodologies

The main problem of heavy oils/oil sands is that in a normal distillation refining process, they produce only a small percentage of light fractions. Light fractions are gasoil (diesel), kerosene and gasoline. This percentage is typically in the range of 15% to 30%. However, these light fractions are widely in demand in the world. Therefore, some heavy oils and all oil sands are upgraded in order to make the oil more marketable and easier to transport. The purpose is to produce synthetic crude oils ("SCO") that have a higher percentage of light fractions.

There are generally three levels of upgrading that can be done:

- **Dilution.** In this case, the heavy oil or bitumen is simply mixed with diluents, such as naphtha in order to make a mixture that can be transported by pipeline and can be sold in the international markets. The aim is to produce an upgraded oil with an API content of about 16 – 20 degrees API and with light fractions of 30 – 35% of the oil.
- **Medium Upgrading.** In this case coking and thermal cracking processes are used to produce a SCO that is in the range of 21 – 25 degrees API and with light fractions of 40 – 50% of the oil.
- **Deep Upgrading.** In this case hydro-cracking is being used to create a SCO of 32- 37 degrees API and with light fractions of 60 – 80% of the oil. The process uses large volumes of hydrogen derived from natural gas.

The more the heavy oil/oil sands are being upgraded, the higher the value of the SCO. However, more intense upgrading also is more costly. Therefore, from an investor point of view there is an optimal balance between the degree of upgrading and the level of costs.

## 2.4. Heavy oils/oil sands resources

There is a wide diversity of heavy oils/oil sands around the world. Following is information from a table prepared by Amy Hinkle and M. Batzle (Colorado School of Mines, June 2006) illustrating the main characteristics of world heavy oils/oil sands deposits, with certain adjustments and information added by the author (blanks in the table means that the information was not available)

| Deposit | Country | API | Viscosity (cp) | OOIP (billion barrels) | Reservoir depth (feet) |
|---|---|---|---|---|---|
| Kern River | Cal, USA | 10-15 | 500-10000 | 4 | 700-1000 |
| Ugnu | Alaska, USA | 8-12 | 200-10000 | 2 | 2700-3300 |
| West Sak | Alaska, USA | 17-21 | 20-90 | 3 | 3700-4100 |
| Duri | Indonesia | 17-21 | 330 | 5 | 500 |
| Athabasca | Alb, Canada | 8-10 | Up to 1000000 | 2200 | 0-1300 |
| Faja del Orinoco | Venezuela | 8-10 | 100-5000 | 1360 | 1700-2700 |
| Utah heavy | Utah, USA | 8-14 | 100 | 8 | |
| Bikaner-Naguar | India | | 10000-16000 | <1 | |
| Various | China | | | 1 | |
| Offshore | Brazil | 15-20 | | | |
| Various | FSU | | | 600-1400 | |
| Various | Middle East | | | 135 | |
| Various | Africa | | | 45 | |
| Various | Other Far East | | | 32 | |
| Various | Other Venezuela and Latin America | | | 200 | |
| Various | Europe | | | 16 | |
| Various | Other USA | | | 18 | |
| **TOTAL** | | | | **4630-5430** | |

The table lists the Original Oil In Place (OOIP) with a world total of between 4630 and 5430 billion barrels. In addition to oil sands, Alberta and Saskatchewan have a variety of heavy oils, such as the Lloydminster deposits. In general, Alberta may possess as much as 40% to 50% of the OOIP in terms of heavy oils/oil sands.

In addition to the Kern River field, the USA deposits include fields such as Midway-Sunset and South Belridge in California. There are also heavy oils in other US states such as Texas and Kentucky.

Latin American deposits are several heavy oil fields in the Lake Maracaibo area, Trinidad and Tobago, Mexico, Colombia and Peru.

The Former Soviet Union has large heavy oil deposits in the Northern Caspian Basin, Azerbaijan, the Volga-Ural basin and Eastern Siberia.

Middle East deposits include large deposits in Iran, Northern Iraq, Northern Kuwait and the Neutral Zone between Kuwait and Saudi Arabia. Furthermore there are fields in Oman and smaller fields in Turkey and Syria.

European deposits include fields and deposits in the Netherlands, Sicily, Albania and Romania.

Africa has large oil sands deposits in Madagascar in the Bemolanga and Tsimiroro deposits and small heavy oil fields distributed in many parts of Africa.

Chinese fields include the Luda field in the Bohai Gulf and other fields onshore China. Other Far East fields are in Thailand and Pakistan.

How much oil will ultimately be extracted in total around the world will depend on the recovery factors which are very much influenced by new technology. However, it is not unreasonable to assume that on a world wide basis eventually 1000 billion barrels of oil may be produced with improved technology. This is equal to current world wide proved conventional petroleum reserves.

Currently, the California fields, West Sak, Duri, Athabasca, the Orinoco deposits, the Lake Maracaibo fields and a wide variety of other smaller fields around the world are under production.

Chevron is currently considering stream injection in the Wafra deposit in the Neutral Zone for the enhanced development of this field.

Occidental is going to further develop the Mukhaizna field in Oman. In order to increase production ten fold to 150,000 bopd.

Upgrading of heavy oils and bitumen occurs in Alberta and Venezuela. Other heavy oil production results in crude oil that is directly sold for refining.

## 2.5. Projects selected for analysis.

For the purpose of this report, the following projects were selected for comparison with Alberta:

- Kern River, California, USA – Heavy oil production – no upgrading
- West Sak, Alaska, USA – Heavy oil production – no upgrading
- Duri, Indonesia – Heavy oil production – no upgrading
- Orinoco, Venezuela – Heavy oil production with upgrading.

These are all projects for which considerable information is available.

In an earlier report entitled "Preliminary fiscal evaluation of Alberta oil sands terms" (April 12, 2007), the author prepared a number of cases for Alberta oil sands.

In order to create comparable international projects with Alberta, the four above projects have to be reformulated based on 2007 costs.

However, prior to this process, it might be useful to provide a more in-depth description of these projects as they are currently in operation.

### *Kern River*

Kern River in California was discovered in 1899 and has already produced in excess of one billion barrels. Peak production was initially reached in the early 1900's at a level of 40,000 bopd. Steam injection started in the 1960's and the Kern River reservoirs responded well to this practice. Peak production was reached in the mid 1980's at about 140,000 bopd.

Typical steam injection involves a 5 spot pattern of wells, with four producers at the corners and one steam injector in the middle. The efficiency of the operations is very much determined by the amount of steam that is being used, the steam/oil ratio ("SOR") whereby steam is measured in cold water barrels. Steam is generated using natural gas and the profitability of the operations therefore depends very much on the gas price. The SOR could range from 1 to 8. This would correspond with a need of about 0.5 to 3.5 Mcf per barrel.

Kern River has more than 15,000 production and injection wells and Chevron is currently operating the field. There are also a number of observation wells.

On average wells produce 14 barrels of oil per day and wells are up to 1000 feet deep.

*West Sak*

There is a wide range of heavy oils in on the North Slope in Alaska. Heavy oils ranging from 10 degrees to 23 degrees API are identified. Currently, fields at the lighter end of this spectrum have been developed, such as Polaris, Orion and Milne Schrader.

Somewhat heavier fields in the 17 – 21 degree range can be found in various fields in the West Sak reservoir and similar reservoirs. These possibilities are now being evaluated and developed.

The West Sak developments in Alaska are relatively recent and are integral to the general North Slope operations of the major oil companies, with BP as operator, although other operators, such as Kerr-McGee, have started developments in similar reservoirs. In some cases development involves the construction of offshore gravel islands.

As is clear from the above table the crude oil in the West Sak formation flows relatively easily, due to the advantageous viscosity. Therefore, this formation can be developed with cold methodologies, primarily with advanced drilling techniques, in particular with horizontal and multilateral wells.

*Duri*

The Duri field, in Sumatra, Indonesia, was discovered in 1941 and came on production in 1954. In the mid 1960's production initially peaked at 65,000 bopd based on conventional production practices. In the mid-1980's Cyclic Steam Simulation ("CSS") and subsequently steam flood was being applied and a few years ago the field reached a peak production of 230,000 bopd. Chevron is currently operating the field.

The amount of steam corresponds to an SOR of about 4. In this case a special gas line was built to supply the operations. In total there are in excess of 4000 production wells and more than 2000 injection and observation wells. Steam injection occurs on the basis of 5-, 7- and 9-spot patterns. In some parts of the Duri field recovery factors are as high as 70%. Typical reservoir depth does not exceed 750 feet.

*Orinoco*

Significant, heavy oil fields exist in Venezuela in the Lake Maracaibo area. The first heavy oil field, Mene Grande, was discovered in 1941 and was put on production based on conventional methods. Steam injection tests lead to the application of the CSS method as preferred methodology for these deposits.

The development of the Orinoco Belt started in the late 1960's. The Orinoco Belt is a large zone in Venezuela north of the Orinoco River, with 1360 billion barrels of OOIP.

Significant production can be obtained from the Orinoco Belt despite the lower API gravity because the viscosity is relatively low. By the mid 1990's the development of the Orinoco Belt begun on the basis of horizontal wells, which produced enough crude per well to make large scale development economically worth while. An important factor is the high temperature in the relatively deeper reservoirs which is about 53 degrees Celsius. This lowers viscosity and improves production.

Four large projects are currently in operation:

- Cerro Negro - Exxon, Veba and PDVSA. This project produces 120,000 bopd of heavy crude of 8.5 degrees API and is upgraded to 105,000 bopd of SCO of 16 degree API.
- Petrozuata - ConocoPhillips and PDVSA. This project upgrades 120,000 bopd of 8.3 degree API crude to 19 – 25 degree SCO.
- Sincor - Total, Statoil and PDVSA. This project upgrades 200,000 bopd of 8 – 8.5 degree API crude oil to 180,000 bopd SCO of 32 degrees API.
- Hamaca - ConocoPhillips, Chevron and PDVSA. This project produces 190,000 bopd of 8.7 API crude and upgrades to 180,000 bopd SCO of 27 degree API.

The heavy oil production from these four projects is currently about 600,000 bopd.

A number of new agreements are currently under negotiation with Petrobras, Repsol, Lukoil and CNPC.

The Petrozuata project is developed with "cold" horizontal wells, with naphtha added during the production to lower viscosity. A 16 degree API blend is send to the upgrader. The naphtha is extracted at the upgrader and send back to the field. In the late 1990's the productivity was improved by drilling wells with multilaterals.

The Sincor project is also based on cold production using a diluent and the diluent is also send back to the field from the upgrader.

The Hamaca project benefits from the fact that there is considerable natural gas in the formations which creates a "foamy oil" which is relatively easy to produce.

## 3. PRODUCTION, COSTS AND PRICE DATA

In an earlier report entitled "Preliminary fiscal evaluation of Alberta oil sands terms (April 12, 2007), five cases were evaluated for economic analysis as follows

- "Cold Lake SAGD" – Cold Lake bitumen based production based on the SAGD process. This case is for bitumen of about 11 degrees API.
- "Athabasca SAGD" - Athabasca bitumen production based on the SAGD process
- "Athabasca SAGD + Upgrading" - Athabasca SAGD bitumen production based on SAGD combined with upgrading
- "Athabasca Mine" - Athabasca bitumen production based on mining
- "Athabasca Mine + Upgrading" - Athabasca bitumen production based on mining combined with upgrading

The peak and cumulative production assumptions were as follows:

| Cases | Peak Bitumen Production | Peak Synthetic Crude Oil Production | Cumulative Bitumen Production | Cumulative Synthetic Crude Oil Production |
|---|---|---|---|---|
| | (barrels per day) | (barrels per day) | (million barrels) | (million barrels) |
| Cold Lake SAGD | 60,000 | -- | 600 | -- |
| Athabasca: | | | | |
| SAGD | 60,000 | -- | 600 | -- |
| SAGD + Upgrader | 60,000 | 51,000 | 600 | 510 |
| Mine | 200,000 | -- | 2200 | -- |
| Mine + Upgrader | 200,000 | 170,000 | 2200 | 1870 |

### 3.1. Four adjusted projects and comparison with Alberta.

In order to enhance the relevance of the comparison it is important to make the international projects as comparable as possible to the Alberta projects. Therefore, these projects were stylized as if entirely new projects would start in 2007.

With respect to West Sak projects a typical size is about 100 million barrels of heavy oil.

In Kern River or Duri there are no specific new developments on which the analysis can be patterned. Therefore, two hypothetical developments were created for economic analysis purposes. These hypothetical projects would involve a new 100 million production from a new field in Kern River and Duri areas with the respective characteristics.

In order to make the Venezuelan projects as comparable as possible a variation of the Venezuelan Sincor project was created, which would result in the same level of 200,000 bopd of heavy oil production as was assumed for bitumen production for the Mine + Upgrader projects.

In summary, the four adjusted projects were based on the following scenarios:

| Cases | Peak Heavy Oil Production | Peak SCO Production | Cumulative Heavy Oil Production | Cumulative SCO Production | Production Methodology |
|---|---|---|---|---|---|
| | (barrels per day) | (barrels per day) | (million barrels) | (million barrels) | |
| Kern River type | 16,500 | -- | 100 | -- | Steam Flood |
| West Sak type | 16,500 | -- | 100 | -- | Cold |
| Duri type | 16,500 | -- | 100 | -- | Steam Flood |
| Orinoco type | 200,000 | 180,000 | 2200 | 1980 | Cold |

The "peak" production is the level of production achieved after full development of the project. In the cash flows it was assumed that the production would be developed in two separate phases, each producing half the final "peak".

The cost estimation for the four projects above would be subject to a possible wide range. Therefore, seven levels of costs were assumed in order to reflect the entire possible range of cost possibilities if similar projects would start up today.

Although the projects are international projects for which cost data are usually expressed in US dollars, all costs in this report were expressed in Canadian 2007 real dollars in order to make comparisons with the earlier report easier.

Every heavy oil project is different. Nevertheless, broad fiscal comparisons can be made. The following comparisons will de done:

- Cold Lake - Kern River
- Cold Lake - West Sak
- Cold Lake - Duri
- Mine Athabasca with Upgrader - Orinoco with Deep Upgrading

## 3.2. Estimated expenditures

### 3.2.1. General Comments

For comparability to the earlier report entitled "Preliminary fiscal evaluation of Alberta oil sand terms (April 12, 2007) the following features were maintained:

- The capital expenditures ("Capex") per peak flowing barrel include the capital expenditures in the year that the peak production was being reached. All capital costs (facilities, drilling, capital maintenance) are included in this indicator.
- The capital expenditures are divided in "production capex" and "upgrading capex". In determining these values common costs for utilities, off sites, site preparation, etc., where reasonably allocated to "production" and "upgrading".
- Operating costs were divided in "non-energy" and "energy" per barrel. The "energy" costs are the costs of natural gas required for the operations. For convenience, electricity costs were included in "non-energy", despite the fact that electricity is also energy, of course.
- The "energy" costs were determined based on the natural gas used in terms of thousand cubic feet ("Mcf") per barrel to produce or upgrade a barrel. Despite the fact that West Sak would be "cold" production, it was assumed that small gas purchases would be required in addition to associated free gas for field operations.
- The gas price was assumed to be the WTI price expressed in Canadian dollars (a conversion rate of 0.88 was used) divided by 8 for Kern River. In other words, if the WTI was Cdn $ 40 per barrel, the natural gas price would be $ 5 per Mcf. Due to lower net back values, the gas price for West Sak was assumed to be WTI divided by 12, and for Duri and Orinoco it was assumed to be WTI divided by 18.
- All costs were escalated with 2% per year. All fiscal calculations were done based on nominal dollars. Subsequently, **all results were represented in 2007 real Canadian dollars** by discounting for an assumed 2% inflation rate.
- US and Canadian corporate income tax is calculated on an incremental basis assuming that the tax payer has sufficient taxable income to take deductions against.

### 3.2.2. Cold Lake comparison

Following tables provide for the comparison Cold Lake and three heavy oil projects without upgrading:

**Table 3.1. COLD LAKE DATA**
**(Can 2007 $)**

| | | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|
| Field Size | (million Bit barrels) | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| Peak Bitumen production | (thousand barrels per day) | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Start cash flow | (year) | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 |
| First production | (year) | 2011 | 2011 | 2011 | 2011 | 2011 | 2011 | 2011 |
| Final peak production | (year) | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 |
| Capex/peak barrel | ($/Bit bbl) | $26,167 | $23,551 | $20,934 | $18,317 | $15,700 | $13,084 | $10,467 |
| Out-of-Pocket/peak barrel | ($/Bit bbl) | $10,319 | $9,287 | $8,255 | $7,223 | $6,191 | $5,160 | $4,128 |
| Total capex/bbl | ($/Bit bbl) | $5.00 | $4.50 | $4.00 | $3.50 | $3.00 | $2.50 | $2.00 |
| Development Phases | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Total non-energy opex/bbls | ($/Bit bbl) | $6.15 | $5.59 | $5.03 | $4.48 | $3.07 | $3.36 | $2.80 |
| Energy requirement per bbl | (Mcf/Bit bbl) | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gas price | ($/Mcf) | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 |
| Bitumen Price | ($/Bit bbl) | 60% WTI | 60% WTI | 60% WTI | 60% WTI | 60% WTI | 60% WTI | 60% WTI |

**Table 3.2. KERN RIVER**
**(Can 2007 $)**

| | | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|
| Field Size | (million heavy oil barrels) | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Peak heavy oil production | (thousand barrels per day) | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |
| Start cash flow | (year) | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 |
| First production | (year) | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 |
| Final peak production | (year) | 2014 | 2014 | 2014 | 2014 | 2014 | 2014 | 2014 |
| Capex/peak heavy oil barrel | ($/peak heavy oil bbl per day) | $9,523 | $8,571 | $7,619 | $6,667 | $5,714 | $4,762 | $3,810 |
| Production capex/bbl | ($/barrel heavy oil) | $3.42 | $3.09 | $2.74 | $2.40 | $2.06 | $1.71 | $1.37 |
| Development Phases | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Prod non-energy opex/bbl | ($/barrel heavy oil) | $11.65 | $10.59 | $9.53 | $8.47 | $7.42 | $6.36 | $5.30 |
| Prod energy per bbl | (Mcf/bbl heavy oil) | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| Gas price | ($/Mcf) | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 |
| Heavy Oil price | ($/barrel heavy oil) | 85.6%WTI | 85.6%WTI | 85.6%WTI | 85.6%WTI | 85.6%WTI | 85.6%WTI | 85.6%WTI |
| Heavy Oil differential | ($/barrel heavy oil) | -$3.32 | -$3.32 | -$3.32 | -$3.32 | -$3.32 | -$3.32 | -$3.32 |

**Table 3.3. WEST SAK**
**(Can 2007 $)**

| | | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|
| Field Size | (million heavy oil barrels) | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Peak heavy oil production | (thousand barrels per day) | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |
| Start cash flow | (year) | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 |
| First production | (year) | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 |
| Final peak production | (year) | 2014 | 2014 | 2014 | 2014 | 2014 | 2014 | 2014 |
| Capex/peak heavy oil barrel | ($/peak heavy oil bbl per day) | $45,021 | $40,519 | $36,017 | $31,515 | $27,012 | $22,510 | $18,008 |
| Production capex/bbl | ($/barrel heavy oil) | $11.43 | $10.29 | $9.14 | $8.00 | $6.85 | $5.71 | $4.57 |
| Development Phases | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Prod non-energy opex/bbl | ($/barrel heavy oil) | $8.94 | $8.12 | $7.31 | $6.50 | $5.69 | $4.87 | $4.06 |
| Prod energy per bbl | (Mcf/bbl heavy oil) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| Gas price | ($/Mcf) | WTI/12 | WTI/12 | WTI/12 | WTI/12 | WTI/12 | WTI/12 | WTI/12 |
| Heavy Oil price | ($/barrel heavy oil) | 87.7%WTI | 87.7%WTI | 87.7%WTI | 87.7%WTI | 87.7%WTI | 87.7%WTI | 87.7%WTI |
| Heavy Oil differential | ($/barrel heavy oil) | -$6.73 | -$6.73 | -$6.73 | -$6.73 | -$6.73 | -$6.73 | -$6.73 |

**Table 3.4. DURI**
**(Can 2007 $)**

| | | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|
| Field Size | (million heavy oil barrels) | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Peak heavy oil production | (thousand barrels per day) | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |
| Start cash flow | (year) | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 |
| First production | (year) | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 |
| Final peak production | (year) | 2014 | 2014 | 2014 | 2014 | 2014 | 2014 | 2014 |
| Capex/peak heavy oil barrel | ($/peak heavy oil bbl per day) | $8,528 | $7,675 | $6,823 | $5,970 | $5,117 | $4,264 | $3,411 |
| Production capex/bbl | ($/barrel heavy oil) | $2.54 | $2.28 | $2.03 | $1.78 | $1.52 | $1.26 | $1.01 |
| Development Phases | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Prod non-energy opex/bbl | ($/barrel heavy oil) | $6.85 | $6.23 | $5.60 | $4.98 | $4.36 | $3.73 | $3.12 |
| Prod energy per bbl | (Mcf/bbl heavy oil) | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Gas price | ($/Mcf) | WTI/18 | WTI/18 | WTI/18 | WTI/18 | WTI/18 | WTI/18 | WTI/18 |
| Heavy Oil price | ($/barrel heavy oil) | 80.5%WTI | 80.5%WTI | 80.5%WTI | 80.5%WTI | 80.5%WTI | 80.5%WTI | 80.5%WTI |
| Heavy Oil differential | ($/barrel heavy oil) | $1.49 | $1.49 | $1.49 | $1.49 | $1.49 | $1.49 | $1.49 |

As will be immediately obvious the capital expenditures per peak barrel are much lower for Kern River and Duri. This is due to the fact that the steam flood is based on very shallow low cost wells. It was assumed that the project would require 1500 wells for the hypothetical Kern River project and 420 wells for the hypothetical Duri project.

However, gas consumption for steam per barrel heavy oil produced is much higher than for a Cold Lake SAGD project. It was assumed to be 1.50 Mcf/bbl for Kern River and 2 Mcf/bbl for Duri.

On the other hand the capital expenditures per peak barrel are much higher for West Sak. This is due to the complex horizontal wells that are being drilled and the significant facilities required for the production of the heavy oil. On the other hand, however, the cold production methods in West Sak do not require natural gas for steam injection. Therefore overall operating costs are much less than for Cold Lake.

### 3.2.3. Athabasca Mine plus Upgrader comparison

Following are the data related to the Mine plus Upgrader from the previous report and the Orinoco data.

**Table 3.5. MINE ATHABASCA WITH UPGRADING**
**(Can 2007 $)**

| | | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|
| Field Size | (million SCO barrels) | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Peak Bitumen production | (thousand barrels per day) | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Peak SCO production | (thousand barrels per day) | 170 | 170 | 170 | 170 | 170 | 170 | 170 |
| SCO/Bitumen ratio | | 85% | 85% | 85% | 85% | 85% | 85% | 85% |
| Start cash flow | (year) | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 |
| First production | (year) | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 |
| Final peak production | (year) | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 |
| Capex/peak SCO barrel | ($/peak SCO bbl per day) | $84,361 | $75,925 | $67,489 | $59,053 | $50,617 | $42,181 | $33,745 |
| Out-of-Pocket/peak barrel | ($/Bit bbl) | $41,176 | $37,059 | $32,941 | $28,824 | $24,706 | $20,588 | $16,471 |
| Production capex/bbl | ($/SCO bbl) | $4.92 | $4.43 | $3.93 | $3.44 | $2.95 | $2.46 | $1.97 |
| Upgrading capex/bbl | ($/SCO bbl) | $4.77 | $4.29 | $3.81 | $3.34 | $2.86 | $2.38 | $1.91 |
| Development Phases | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Prod non-energy opex/bbl | ($/SCO bbl) | $11.16 | $10.15 | $9.13 | $8.12 | $7.10 | $6.09 | $5.07 |
| Upgr non-energy opex/bbl | ($/SCO bbl) | $4.81 | $4.38 | $3.94 | $3.50 | $3.06 | $2.63 | $2.19 |
| Prod energy per bbl | (Mcf/SCO bbl) | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| Upgr energy per bbl | (Mcf/SCO bbl) | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 |
| Gas price | ($/Mcf) | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 | WTI/8 |
| Bitumen price | ($/Bit barrel) | 45%WTI | 45%WTI | 45%WTI | 45%WTI | 45%WTI | 45%WTI | 45%WTI |
| Synthetic Crude Oil price | ($/SCO bbl) | 100% WTI | 100% WTI | 100% WTI | 100% WTI | 100% WTI | 100% WTI | 100% WTI |

**Table 3.6. ORINOCO WITH DEEP UPGRADING**
**(Can 2007 $)**

| | | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|
| Field Size | (million barrels heavy oil) | 1980 | 1980 | 1980 | 1980 | 1980 | 1980 | 1980 |
| Peak Heavy Oil production | (thousand barrels per day) | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| Peak SCO production | (thousand barrels per day) | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| SCO/Bitumen ratio | | 90% | 90% | 90% | 90% | 90% | 90% | 90% |
| Start cash flow | (year) | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 |
| First production | (year) | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 | 2012 |
| Final peak production | (year) | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 |
| Capex/peak SCO barrel | ($/peak SCO bbl per day) | $48,821 | $43,939 | $39,057 | $34,175 | $29,293 | $24,411 | $19,529 |
| Production capex/bbl | ($/SCO bbl) | $2.22 | $1.99 | $1.77 | $1.55 | $1.33 | $1.11 | $0.88 |
| Upgrading capex/bbl | ($/SCO bbl) | $3.57 | $3.21 | $2.86 | $2.50 | $2.15 | $1.79 | $1.35 |
| Development Phases | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Non energy prod+upgr opex | ($/SCO bbl) | $10.31 | $9.38 | $8.44 | $7.50 | $6.56 | $5.63 | $4.69 |
| Prod energy per bbl | (Mcf/SCO bbl) | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| Upgr energy per bbl | (Mcf/SCO bbl) | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 |
| Gas price | ($/Mcf) | WTI/18 | WTI/18 | WTI/18 | WTI/18 | WTI/18 | WTI/18 | WTI/18 |
| Heavy Oil Price for royalties | ($/heavy oil barrel) | 61.4%WTI | 61.4%WTI | 61.4%WTI | 61.4%WTI | 61.4%WTI | 61.4%WTI | 61.4%WTI |
| Heavy Oil differential | ($/barrel heavy oil) | $2.74 | $2.74 | $2.74 | $2.74 | $2.74 | $2.74 | $2.74 |
| Synthetic Crude Oil price | ($/SCO bbl) | 100%WTI | 100%WTI | 100%WTI | 100%WTI | 100%WTI | 100%WTI | 100%WTI |

As will be immediately obvious the capital expenditures per peak barrel for the Orinoco Upgrader operations are much less than the Mine plus Upgrader operations. The reason is that the cold production methods in the Orinoco area provide for much lower overall capital expenditures, since heavy oil can be produced through horizontal and multilateral flowing wells. Also Venezuela did not experience cost escalation to the same degree as Alberta.

### 3.3. Prices

The price correlations were carried out by William G. Matthews, Ottawa, Canada. The prices used for the various projects were based on historical actual prices and in the case of Venezuela by interpolation from the extra-heavy oil royalty formula.

*Kern River.*

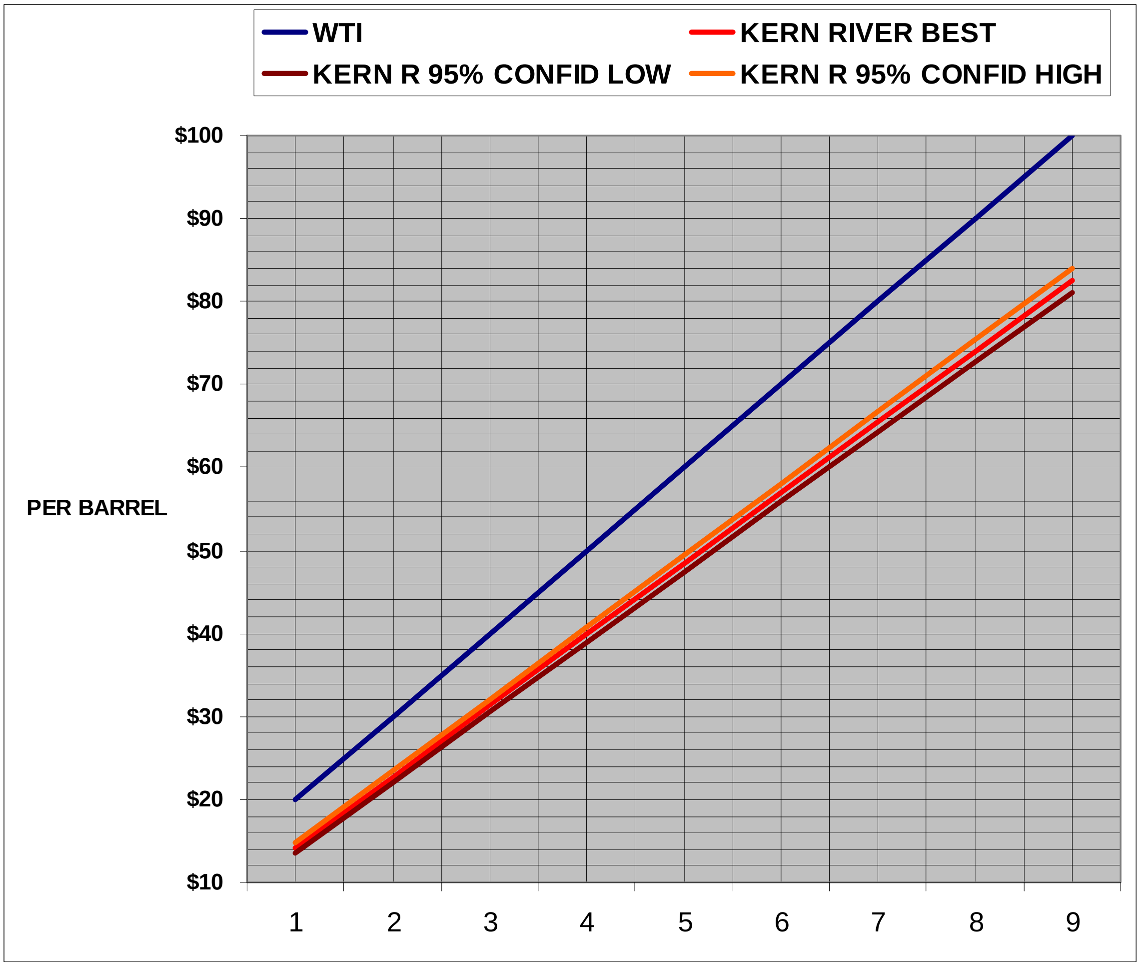
A correlation of the Kern River heavy oil values relative to WTI in US dollars provide for the following formula

Kern River = 0.856 * WTI - US $ 2.92

This results in the following table in US $:

| WTI | KERN RIVER |
|---|---|
| 20.00 | 14.19 |
| 30.00 | 22.75 |
| 40.00 | 31.31 |
| 50.00 | 39.86 |
| 60.00 | 48.42 |
| 70.00 | 56.97 |
| 80.00 | 65.53 |
| 90.00 | 74.09 |
| 100.00 | 82.64 |

And it results in the following graph:




*West Sak.*

The crude oil from the Alaska North Slope is subject to a transport differential of about US $ 5 per barrel.

Based on an analysis of possible West Sak values with ANS values, the following overall correlation with WTI in US dollars was obtained

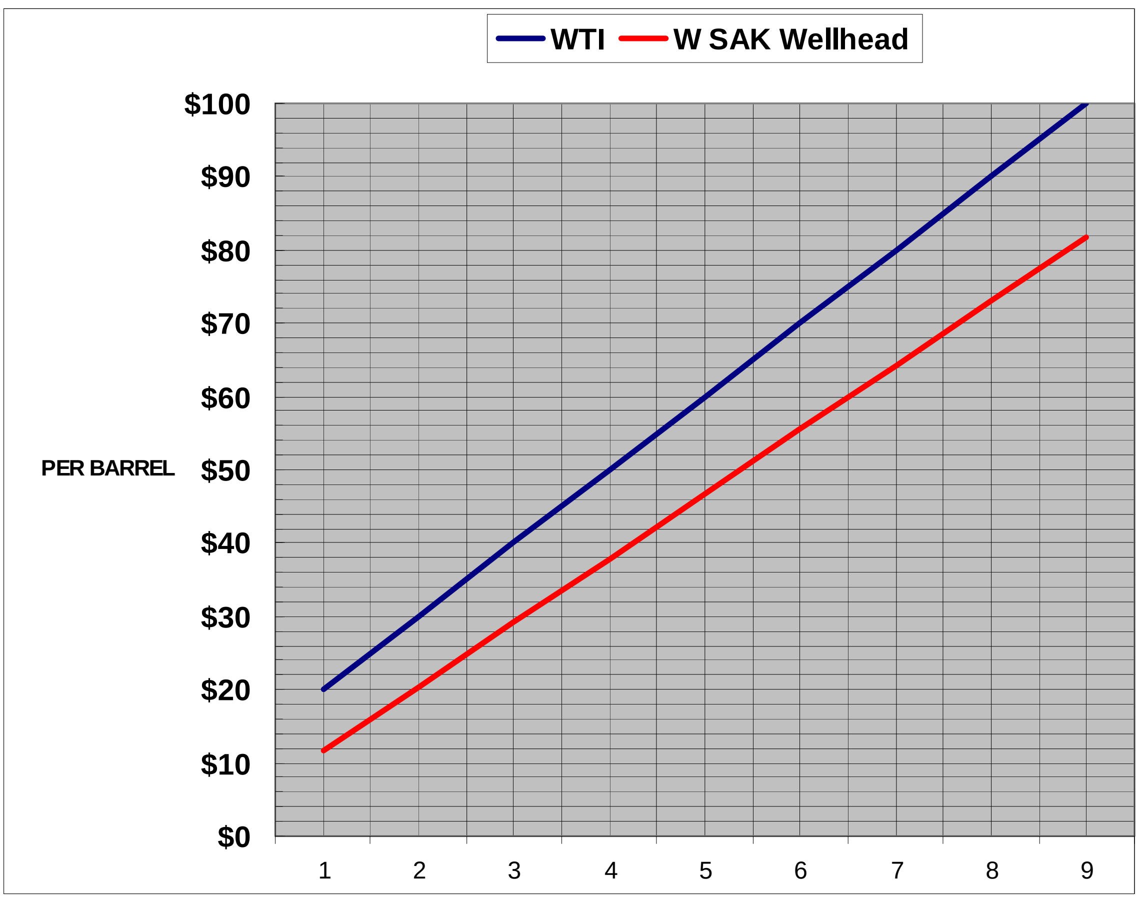
West Sak = 0.877 * WTI - US $ 5.92

The negative factor includes the transport differential

This results in the following table in US $:

| WTI | W Sak Wellhead |
|---|---|
| 20.00 | 11.62 |
| 30.00 | 20.39 |
| 40.00 | 29.16 |
| 50.00 | 37.93 |
| 60.00 | 46.70 |
| 70.00 | 55.47 |
| 80.00 | 64.24 |
| 90.00 | 73.01 |
| 100.00 | 81.78 |

And the following graph:



*Duri.*

A correlation between Duri values and WTI provided the following correlation:

Duri = 0.805 * WTI + US $ 1.31

This results in the following table in US $:

| WTI | DURI |
|---|---|
| 20.00 | 17.42 |
| 30.00 | 25.47 |
| 40.00 | 33.52 |
| 50.00 | 41.57 |
| 60.00 | 49.63 |
| 70.00 | 57.68 |
| 80.00 | 65.73 |
| 90.00 | 73.78 |
| 100.00 | 81.84 |

And it results in the following graph:


*Orinoco Extra-Heavy Oil*

Based on an analysis of the royalty formula in Venezuela, a correlation was obtained relative to WTI. The Venezuelan royalty formula is described in more detail in the following section 3.4 of this report.

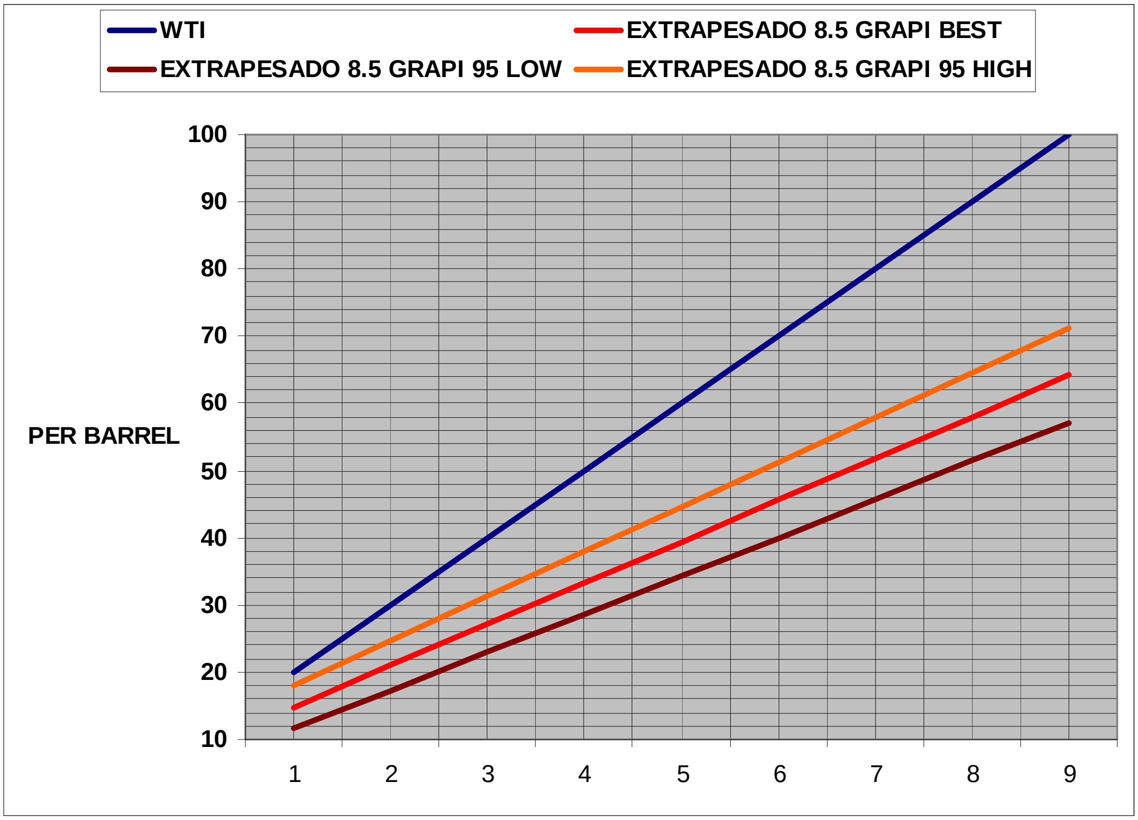
The correlation is:

Venezuelan Extra Heavy = 0.618*WTI + US $ 2.41

This results in the following table which includes the margin of 95% low and high in US $:

| WTI | EXTRAPESADO 8.5 GRAPI | | |
|---|---|---|---|
| | BEST | 95 LOW | 95 HIGH |
| 20.00 | 14.77 | 11.53 | 18.01 |
| 30.00 | 20.95 | 17.23 | 24.67 |
| 40.00 | 27.13 | 22.93 | 31.33 |
| 50.00 | 33.31 | 28.63 | 37.99 |
| 60.00 | 39.49 | 34.33 | 44.65 |
| 70.00 | 45.67 | 40.03 | 51.31 |
| 80.00 | 51.85 | 45.73 | 57.97 |
| 90.00 | 58.03 | 51.42 | 64.63 |
| 100.00 | 64.21 | 57.12 | 71.29 |

Following is the resulting graph:



### 3.4. Venezuelan royalty formula

Venezuela has established a royalty value determination procedure for bitumen. It is based on a set of formulas.

The first formula links the Extra Heavy Crude of 8.5 degrees API and 3.35% Sulphur to the Merey blend and "Mesa30".

The Merey crude is actually a blend of the extra heavy crude and the Mesa30 crude. This makes it possible to market the extra heavy crude without further upgrading.

This formula is as follows:

PPCXP = {[Merey – (1-Value)*Mesa30]/Value} + AGA - AT

In this formula:

PPCXP equals the value of extra heavy oil

Merey equals the value of Merey crude to be defined below

Mesa30 equals the value of Mesa30 crude to be defined below

Value = 0.08316/ [( 141.5/ (131.5 + API)) – 0.87292

AGA is a market adjustment to reflect the differential of the API and sulphur content variation of the Merey crude that is produced and the standard of 16.5 degrees API and 2.5% Sulphur using the extra heavy crude oil as a basis. The idea is to reflect the gravity and sulphur variations in the Gulf of Mexico

ATA is the transport differential which depends on the location of the field and is US $ 0.00125 per barrel per kilometer

In turn the value of the Merey reference crude is determined as follows:

Merey = 0.6 * (WTS + FO3) – 0.2* WTI + KMR

In this formula:

Merey equals the value of Merey crude as a reference crude with 16.5 degrees API and 2.5% Sulphur

WTS equals the value of West Texas Sour, delivered in Midland, Texas, based on the average for the month of the daily high and low spot market as published in Platts Oilgram Price Report (US $ per barrel)

FO3 equals the value of the monthly average of the high and low spot market of No 6 Fuel Oil with 3% Sulphur, Waterborne, USGC, as published in Platts Oilgram Price Report (US $ per barrel)

WTI equal the value of the monthly average of the high and low spot market of West Texas Intermediate, delivered in Cushing, Oklahoma as published in Platts Oilgram Price Report (US $ per barrel)

KMR equals a constant determined on the basis of all crude oils sold in the Gulf of Mexico with reference to Merey 16 in order to avoid price distortions and to link the Merey 16 values properly to the actual market conditions (competition, refining conditions and supply and demand conditions).

In turn the value of Mesa30 crude is determined as follows:

$$Mesa30 = 0.4 * WTS + 0.3 * (LLS + FO3) + KMS$$

In this formula:

Mesa30 equals the value of the reference crude with 30.6 degrees API and 1.01% Sulphur

WTS and FO3 have the same meanings as in the Merey formula

LLS equals the value of “Light Louisiana Sweet” delivered in St. James, Louisiana, and based on the monthly average of daily high and low spot prices as reported in Platts Oilgram Price Service (US $ per barrel)

KMS equals a constant for all Mesa30 based crudes in order to avoid market distortions and to link the Mesa30 values properly to the actual market conditions (competition, refining conditions and supply and demand conditions).

As can be seen the extra heavy Venezuelan crude oil is determined based on widely published prices, but with a “fudge factor” to ensure that these prices reflect actual market conditions from time to time.

The “Value” in the above formula of the extra heavy oil would be as follows for the various API degrees of the crude

| API | Value |
|---|---|
| 7 | 0.55909 |
| 8 | 0.58805 |
| 9 | 0.61968 |
| 10 | 0.65439 |
| 11 | 0.69264 |
| 12 | 0.73500 |
| 13 | 0.78218 |
| 14 | 0.83504 |

Following is a table based on an extra heavy crude oil of 8 degrees API and an increasing differential between Merey and Mesa30.

| PPCXP | Merey | Mesa30 |
|---|---|---|
| 26.50 | 30.00 | 35.00 |
| 23.86 | 30.00 | 40.00 |
| 22.08 | 30.00 | 45.00 |
| 21.12 | 30.00 | 50.00 |

As can be seen from this table the extra heavy crude values become less if the differential between Merey and Mesa30 increases (assuming the AGA and AT values have been set to zero). This is logical, the more light end products such as gasoline and diesel are worth in the market the higher the differential will be between Mesa30 and Merey and consequently, the less value the extra heavy crude will have.

The next table shows the same values with a slightly higher API content of 10 degrees. In this case the values extra heavy crude values are higher, as can be expected.

| ` | Merey | Mesa30 |
|---|---|---|
| 27.36 | 30.00 | 35.00 |
| 25.56 | 30.00 | 40.00 |
| 24.59 | 30.00 | 45.00 |
| 24.43 | 30.00 | 50.00 |

The same principle applies to the value of Merey crude oil. If the value of the light crude West Texas Intermediate increases relative to West Texas Sour and No 6 Fuel Oil, the value of Merey decreases.

Of course, Venezuela has an advantage over the Government of Alberta in determining "fudge factors" since Venezuela is directly and actively involved in the sale of its crude. The prices and the "fudge factors" are published on a monthly basis by the Ministry.

Another comment that can be made is that the blending of Mesa30 with extra heavy crude has limited possibilities. Venezuela has limited volumes of light crude oil available and therefore this type of blending is not an answer to long term developments. A significant expansion of the Venezuelan Orinoco heavy oil production is not possible without significant upgrading.

## 4. FISCAL TERMS

The fiscal terms that were used for the analysis are as described below.

**Kern River.** California has a sliding scale royalty based on the value of the oil. The oil prices have to be discounted with the PPI to the year 1995 prior to using the scale. Based on these 1995 prices the scale is as follows in terms of US $ per barrel:

| | |
|---|---|
| $ 0.00 - $ 13.00 | 4% royalty |
| $ 13.00 - $ 14.00 | sliding scale between 4% and 16.67% |
| $ 14.00 - $ 17.50 | 16.67% |
| $ 17.50 - $ 25.00 | sliding scale between 16.67% and 25% |
| Over $ 25 | 25% |

Furthermore, the State has a state corporate income tax with a rate of 8.84%. There is also a special environmental tax of 0.12%. Both taxes are deductible for the purposes of the US federal income tax. The US federal income tax is based on a rate of 34%, which is 35% corrected for incentives provided under the recent American Jobs Creation Act.

Separately, there are modest severance taxes in the range of $ 0.15 to $ 0.25 per barrel and there are property taxes.

**West Sak.** In Alaska royalties are different depending on the leases. However, a typical flat 12.5% royalty was assumed.

Furthermore, a profit sharing production tax of 22.5% applies. This tax was introduced in 2006. It is based on net cash flow. Investment tax credits of 20% apply for all capital expenditures. Losses can be carried forward or can be converted also into 20% tax credits. These credits are tradable and therefore investors can benefit directly from tax deductions, even if they are still in a loss carry forward position. Furthermore, over a net margin of US $ 40 per barrel, the tax rate increases with 0.25% for every dollar in excess of a margin of US $ 40. In other words, oil prices may need to be about $ 60 per barrel for this feature to “click in”.

On the North Slope the property taxes on assets have been converted to a $ 0.50 per barrel tax.

The state corporate tax rate is 9.4% and state corporate income tax is deductible for US federal corporation income tax. The US tax rate of 35% was lowered to 34% in order to account for the incentives under the American Jobs Creation Act.

**Duri.** The Duri production is subject to a traditional Indonesian production sharing contract. The investor will receive cost oil equal to costs incurred. Capital expenditures need to be depreciated in accordance with the tax depreciation rules. The Profit Oil split is 85% for Indonesia and 15% for the Contractor. There is a First Tranche Petroleum of 20%. This is an initial petroleum allocation that is split in accordance with the profit oil split.

The Contractor is obligated to deliver 10% of his petroleum to the Indonesia for a reduced price of 15% of the market price, but there is a 5 year holiday on this.

Finally, Indonesia participates for 10% in the venture.

**Orinoco – 2006 terms.** Venezuela has unilaterally changed the fiscal terms for Orinoco production.

Originally the royalty was a low 1% during a royalty holiday period, with a 16.67% royalty thereafter. The corporate income tax rate was 34%

By the end of 2006, the royalty holiday period was cancelled and the tax was increased to 50%.

Venezuela participates for certain percentages in the various projects. In this report the Sincor project is taken as a model. In this project Venezuela participates for 38%.

Furthermore, there are some surface rentals.

It should be noted that in January 2007 the President of Venezuela ordered a renegotiation of these terms. The Venezuelan objective is to establish a 60% state participation on a "mixed" company basis. This means on the basis of a joint stock company that is separate for each concession. These renegotiations are currently in progress.

**Orinoco – terms for new projects.** Venezuela is also negotiating with various oil companies on new projects.

For new projects the royalty will be 30%. For integrated operations there is a corporate income tax of 50%.

In new projects, Venezuela anticipates to participate for 60% on a "mixed company" basis.

Furthermore, there are some surface rentals.

## 5. ECONOMIC – FISCAL ANALYSIS

### 5.1. Economic Fiscal Parameters

**Profitability indicators**

The same profitability indicators will be used as in the earlier report entitled "Preliminary fiscal evaluation of Alberta oil sands terms (April 12, 2007). However, given the different sizes of the international heavy oil projects, the NPV10 will not be used. The remaining indicators were:

- Internal Rate of Return (IRR)
- Profitability Ratio discounted at 10% (PFR @10% or PFR10)
- Net Present Value @ 10% per barrel equivalent (NPV10/BOE)

The tables will be color coded in the same manner as in the previous report as follows:

| | | |
|---|---|---|
| Black | - | the project has an IRR of less than 5% in real terms. |
| Red | - | the project is typically unacceptable to the investor |
| Green | - | the project is typically acceptable to the investor |
| Blue | - | the project is attractive to the investor |
| Yellow ("Gold") | - | the project is very attractive to the investor |

It should be noted that "acceptable" or "attractive" are used here in an overall context relative to any other investment opportunity.

Of course, the higher the bitumen or SCO price, the more attractive the investment.

For instance, the following assessment was made for the IRR:

**IRR assessment**

| | |
|---|---|
| **< 5%** | |
| **< 13%** | |
| **< 20%** | |
| **< 30%** | |
| **> 30%** | |

| | | |
|---|---|---|
| IRR < 5% | - black | |
| IRR < 13% | - red | - unacceptable |
| IRR < 20% | - green | - acceptable |
| IRR < 30% | - blue | - attractive |
| IRR of 30% and higher | - gold | - very attractive |

In all our cases, the NPV10 is measured from the beginning of the cash flow, which includes some exploration. Therefore the NPV10 values are directly comparable among the projects studied in this analysis, but are somewhat low compared to NPV10 values for other development of oil and gas fields, if the NPV10 is measured from the date development commences.

**Attractiveness Indicators.**

For this international comparison, two attractiveness indicators will be used that were also used in the earlier report:

- Undiscounted government take
- Discounted government take @ 5%

It should be noted that these indicators are determined prior to any government equity participation. In other words these indicators in this report relate only to government income.

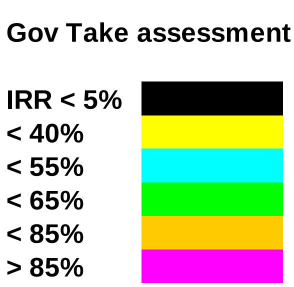
However, government equity participation could be very important in certain countries. This is, in particular the case in Venezuela. In order to broaden out the analysis a third indicator will also be used which is:

- Government revenues (income + participation) per barrel.

Furthermore, this report will for Venezuela also show the government take with participation.

*General comment*

The color coding of the maps will be done from an investor perspective. In general, the concept will be used that "gold" represents a low government take from an international perspective, "green" an average government take from an international perspective and "magenta" a high government take from an international perspective. For instance, the following assessment was made for the government take:



| | | | |
|---|---|---|---|
| IRR | < 5% | - black | |
| Government Take | < 40% | - gold | - very low |
| Government Take | < 55% | - blue | - low |
| Government Take | < 65% | - green | - average |
| Government Take | < 85% | - brown | - high |
| Government Take over 85% | | - magenta | - very high |

## 5.2. Cold Lake – comparisons

Following is a step by step comparison of Cold Lake SAGD with three heavy oil projects in the world: Kern River, West Sak and Duri.

*Gross Revenues per barrel*

The following maps in Table 5.1, 5.11, 5.21, and 5.31 display the net back prices for various levels of WTI prices for Cold Lake and three heavy oil projects.

For this map the color scheme is simply based on the level of net back price in Can $ as follows:

**Gross Revenues per barrel**

**IRR < 5%**
**< 20**
**< 40**
**< 60**
**< 80**
**> 80**

**Table 5.1. COLD LAKE**
**Gross Revenues ($ Cdn) per barrel of bitumen**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | $13.64 | $13.64 | $13.64 | $13.64 |
| 30 | 34.09 | $4.26 | $20.45 | $20.45 | $20.45 | $20.45 | $20.45 | $20.45 | $20.45 | $20.45 |
| 40 | 45.45 | $5.68 | $27.27 | $27.27 | $27.27 | $27.27 | $27.27 | $27.27 | $27.27 | $27.27 |
| 50 | 56.82 | $7.10 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 |
| 60 | 68.18 | $8.52 | $40.91 | $40.91 | $40.91 | $40.91 | $40.91 | $40.91 | $40.91 | $40.91 |
| 70 | 79.55 | $9.94 | $47.73 | $47.73 | $47.73 | $47.73 | $47.73 | $47.73 | $47.73 | $47.73 |
| 80 | 90.91 | $11.36 | $54.55 | $54.55 | $54.55 | $54.55 | $54.55 | $54.55 | $54.55 | $54.55 |
| 90 | 102.27 | $12.78 | $61.36 | $61.36 | $61.36 | $61.36 | $61.36 | $61.36 | $61.36 | $61.36 |
| 100 | 113.64 | $14.20 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 |

**Table 5.11. KERN RIVER**
**Gross Revenues per barrel of heavy oil ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | $16.13 | $16.13 | $16.13 | $16.13 | $16.13 |
| 30 | 34.09 | $4.26 | $25.86 | $25.86 | $25.86 | $25.86 | $25.86 | $25.86 | $25.86 | $25.86 |
| 40 | 45.45 | $5.68 | $35.59 | $35.59 | $35.59 | $35.59 | $35.59 | $35.59 | $35.59 | $35.59 |
| 50 | 56.82 | $7.10 | $45.32 | $45.32 | $45.32 | $45.32 | $45.32 | $45.32 | $45.32 | $45.32 |
| 60 | 68.18 | $8.52 | $55.04 | $55.04 | $55.04 | $55.04 | $55.04 | $55.04 | $55.04 | $55.04 |
| 70 | 79.55 | $9.94 | $64.77 | $64.77 | $64.77 | $64.77 | $64.77 | $64.77 | $64.77 | $64.77 |
| 80 | 90.91 | $11.36 | $74.50 | $74.50 | $74.50 | $74.50 | $74.50 | $74.50 | $74.50 | $74.50 |
| 90 | 102.27 | $12.78 | $84.23 | $84.23 | $84.23 | $84.23 | $84.23 | $84.23 | $84.23 | $84.23 |
| 100 | 113.64 | $14.20 | $93.95 | $93.95 | $93.95 | $93.95 | $93.95 | $93.95 | $93.95 | $93.95 |

**Table 5.21. WEST SAK**
**Gross Revenues per barrel of heavy oil ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | $14.35 |
| 30 | 34.09 | $2.84 | $24.32 | | $24.32 | $24.32 | $24.32 | $24.32 | $24.32 | $24.32 |
| 40 | 45.45 | $3.79 | $34.28 | $34.28 | $34.28 | $34.28 | $34.28 | $34.28 | $34.28 | $34.28 |
| 50 | 56.82 | $4.73 | $44.25 | $44.25 | $44.25 | $44.25 | $44.25 | $44.25 | $44.25 | $44.25 |
| 60 | 68.18 | $5.68 | $54.22 | $54.22 | $54.22 | $54.22 | $54.22 | $54.22 | $54.22 | $54.22 |
| 70 | 79.55 | $6.63 | $64.18 | $64.18 | $64.18 | $64.18 | $64.18 | $64.18 | $64.18 | $64.18 |
| 80 | 90.91 | $7.58 | $74.15 | $74.15 | $74.15 | $74.15 | $74.15 | $74.15 | $74.15 | $74.15 |
| 90 | 102.27 | $8.52 | $84.11 | $84.11 | $84.11 | $84.11 | $84.11 | $84.11 | $84.11 | $84.11 |
| 100 | 113.64 | $9.47 | $94.08 | $94.08 | $94.08 | $94.08 | $94.08 | $94.08 | $94.08 | $94.08 |

**Table 5.31. DURI**
**Gross Revenues per barrel of heavy oil ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | $19.79 | $19.79 | $19.79 | $19.79 | $19.79 | $19.79 | $19.79 |
| 30 | 34.09 | $1.89 | $28.93 | $28.93 | $28.93 | $28.93 | $28.93 | $28.93 | $28.93 | $28.93 |
| 40 | 45.45 | $2.53 | $38.08 | $38.08 | $38.08 | $38.08 | $38.08 | $38.08 | $38.08 | $38.08 |
| 50 | 56.82 | $3.16 | $47.23 | $47.23 | $47.23 | $47.23 | $47.23 | $47.23 | $47.23 | $47.23 |
| 60 | 68.18 | $3.79 | $56.38 | $56.38 | $56.38 | $56.38 | $56.38 | $56.38 | $56.38 | $56.38 |
| 70 | 79.55 | $4.42 | $65.52 | $65.52 | $65.52 | $65.52 | $65.52 | $65.52 | $65.52 | $65.52 |
| 80 | 90.91 | $5.05 | $74.67 | $74.67 | $74.67 | $74.67 | $74.67 | $74.67 | $74.67 | $74.67 |
| 90 | 102.27 | $5.68 | $83.82 | $83.82 | $83.82 | $83.82 | $83.82 | $83.82 | $83.82 | $83.82 |
| 100 | 113.64 | $6.31 | $92.97 | $92.97 | $92.97 | $92.97 | $92.97 | $92.97 | $92.97 | $92.97 |

What is clear is that Kern River, West Sak and Duri heavy oils command significantly higher net back prices than the Cold Lake bitumen. This is due primarily to the better quality of the heavy oils.

## *Total Expenditures per barrel*

The color scheme for total expenditures per barrel is as follows:

**Total Expenditures per barrel**

**< 5%**
**> 30**
**< 30**
**< 20**
**< 10**

The total expenditures per barrel in terms of capital and energy and non-energy operating expenditures are as follows:

**Table 5.2. COLD LAKE**
**Total expenditures ($ Cdn) per barrel of bitumen**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | $10.82 | $8.91 | $8.70 | $7.64 |
| 30 | 34.09 | $4.26 | $20.45 | $15.41 | $14.36 | $13.30 | $12.24 | $10.33 | $10.12 | $9.06 |
| 40 | 45.45 | $5.68 | $27.27 | $16.84 | $15.78 | $14.72 | $13.66 | $11.75 | $11.54 | $10.48 |
| 50 | 56.82 | $7.10 | $34.09 | $18.26 | $17.20 | $16.14 | $15.08 | $13.17 | $12.96 | $11.90 |
| 60 | 68.18 | $8.52 | $40.91 | $19.68 | $18.62 | $17.56 | $16.50 | $14.59 | $14.38 | $13.32 |
| 70 | 79.55 | $9.94 | $47.73 | $21.10 | $20.04 | $18.98 | $17.92 | $16.01 | $15.80 | $14.74 |
| 80 | 90.91 | $11.36 | $54.55 | $22.52 | $21.46 | $20.40 | $19.34 | $17.43 | $17.22 | $16.16 |
| 90 | 102.27 | $12.78 | $61.36 | $23.94 | $22.88 | $21.82 | $20.76 | $18.85 | $18.64 | $17.58 |
| 100 | 113.64 | $14.20 | $68.18 | $25.36 | $24.30 | $23.24 | $22.18 | $20.27 | $20.06 | $19.00 |

**Table 5.12. KERN RIVER**
**Total expenditures ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | 9.02 | 13.90 | 12.50 | 11.10 | 9.69 |
| 30 | 34.09 | $4.26 | $25.86 | 19.93 | 18.53 | 17.13 | 15.72 | 14.32 | 12.92 | 11.52 |
| 40 | 45.45 | $5.68 | $35.59 | 21.75 | 20.35 | 18.95 | 17.55 | 16.15 | 14.74 | 13.34 |
| 50 | 56.82 | $7.10 | $45.32 | 23.58 | 22.18 | 20.77 | 19.37 | 17.97 | 16.57 | 15.17 |
| 60 | 68.18 | $8.52 | $55.04 | 25.40 | 24.00 | 22.60 | 21.20 | 19.79 | 18.39 | 16.99 |
| 70 | 79.55 | $9.94 | $64.77 | 27.23 | 25.82 | 24.42 | 23.02 | 21.62 | 20.22 | 18.81 |
| 80 | 90.91 | $11.36 | $74.50 | 29.05 | 27.65 | 26.25 | 24.84 | 23.44 | 22.04 | 20.64 |
| 90 | 102.27 | $12.78 | $84.23 | 30.87 | 29.47 | 28.07 | 26.67 | 25.27 | 23.86 | 22.46 |
| 100 | 113.64 | $14.20 | $93.95 | 32.70 | 31.30 | 29.89 | 28.49 | 27.09 | 25.69 | 24.28 |

**Table 5.22. WEST SAK**
**Total expenditures ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | $8.87 |
| 30 | 34.09 | $2.84 | $24.32 | | $18.82 | $16.86 | $14.91 | $12.95 | $10.99 | $9.04 |
| 40 | 45.45 | $3.79 | $34.28 | $20.94 | $18.98 | $17.03 | $15.07 | $13.12 | $11.16 | $9.21 |
| 50 | 56.82 | $4.73 | $44.25 | $21.10 | $19.15 | $17.19 | $15.24 | $13.28 | $11.33 | $9.37 |
| 60 | 68.18 | $5.68 | $54.22 | $21.27 | $19.31 | $17.36 | $15.40 | $13.45 | $11.49 | $9.54 |
| 70 | 79.55 | $6.63 | $64.18 | $21.44 | $19.48 | $17.53 | $15.57 | $13.61 | $11.66 | $9.70 |
| 80 | 90.91 | $7.58 | $74.15 | $21.60 | $19.65 | $17.69 | $15.74 | $13.78 | $11.83 | $9.87 |
| 90 | 102.27 | $8.52 | $84.11 | $21.77 | $19.81 | $17.86 | $15.90 | $13.95 | $11.99 | $10.04 |
| 100 | 113.64 | $9.47 | $94.08 | $21.93 | $19.98 | $18.02 | $16.07 | $14.11 | $12.16 | $10.20 |

**Table 5.32. DURI**
**Total expenditures ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | $11.59 | $10.71 | $9.83 | $8.96 | $8.08 | $7.20 | $6.33 |
| 30 | 34.09 | $1.89 | $28.93 | $12.60 | $11.73 | $10.85 | $9.97 | $9.10 | $8.22 | $7.34 |
| 40 | 45.45 | $2.53 | $38.08 | $13.62 | $12.74 | $11.87 | $10.99 | $10.11 | $9.24 | $8.36 |
| 50 | 56.82 | $3.16 | $47.23 | $14.64 | $13.76 | $12.88 | $12.01 | $11.13 | $10.25 | $9.38 |
| 60 | 68.18 | $3.79 | $56.38 | $15.65 | $14.78 | $13.90 | $13.02 | $12.15 | $11.27 | $10.39 |
| 70 | 79.55 | $4.42 | $65.52 | $16.67 | $15.79 | $14.92 | $14.04 | $13.16 | $12.29 | $11.41 |
| 80 | 90.91 | $5.05 | $74.67 | $17.69 | $16.81 | $15.93 | $15.06 | $14.18 | $13.30 | $12.43 |
| 90 | 102.27 | $5.68 | $83.82 | $18.70 | $17.83 | $16.95 | $16.07 | $15.20 | $14.32 | $13.44 |
| 100 | 113.64 | $6.31 | $92.97 | $19.72 | $18.84 | $17.97 | $17.09 | $16.21 | $15.34 | $14.46 |

The maps identify that Cold Lake has generally a lower cost operation on a per barrel basis than Kern River. The higher costs in Kern River are due to the fact that more natural gas is required for the steam flood operations. Also the large number of wells in a Kern River type operation creates relatively high operating costs per barrel.

However, the maps also indicate how Cold Lake would be more expensive than Duri.

In fact, Duri is in a class by itself with respect to relatively low costs under low price conditions.

Cold Lake is less expensive than West Sak on a total expenditure per barrel basis under low prices, but more expensive under high prices, because West Sak does not require expensive natural gas for steam generation.

It should be noted that in the earlier report it was assumed that natural gas would be used no matter how high the price for gas. However, in practice it is likely that under gas prices of US $ 5 – 7 per MMBtu operators will use gasification instead and in this case the costs under high gas prices would be correspondingly less (corrected for the capital investment in gasification).

*Divisible Income per barrel*

The color coding of the divisible income is on the same basis as the gross revenues in Can $ per barrel as follows:

**Divisible Income per barrel**

| | |
|---|---|
| **IRR < 5%** | |
| **< 20** | |
| **< 40** | |
| **< 60** | |
| **< 80** | |
| **> 80** | |

The following tables provide an overview of the divisible income per barrel. These tables are simply the gross revenues per barrel less the total expenditures per barrel.

**Table 5.3. COLD LAKE**
**Divisible Income ($ Cdn) per barrel of bitumen**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | $2.82 | $4.73 | $4.94 | $6.00 |
| 30 | 34.09 | $4.26 | $20.45 | $5.04 | $6.10 | $7.16 | $8.22 | $10.12 | $10.34 | $11.40 |
| 40 | 45.45 | $5.68 | $27.27 | $10.44 | $11.50 | $12.56 | $13.62 | $15.52 | $15.73 | $16.79 |
| 50 | 56.82 | $7.10 | $34.09 | $15.84 | $16.89 | $17.95 | $19.01 | $20.92 | $21.13 | $22.19 |
| 60 | 68.18 | $8.52 | $40.91 | $21.23 | $22.29 | $23.35 | $24.41 | $26.32 | $26.53 | $27.59 |
| 70 | 79.55 | $9.94 | $47.73 | $26.63 | $27.69 | $28.75 | $29.81 | $31.71 | $31.93 | $32.99 |
| 80 | 90.91 | $11.36 | $54.55 | $32.03 | $33.09 | $34.15 | $35.21 | $37.11 | $37.33 | $38.38 |
| 90 | 102.27 | $12.78 | $61.36 | $37.43 | $38.49 | $39.54 | $40.60 | $42.51 | $42.72 | $43.78 |
| 100 | 113.64 | $14.20 | $68.18 | $42.82 | $43.88 | $44.94 | $46.00 | $47.91 | $48.12 | $49.18 |

**Table 5.13. KERN RIVER**
**Divisible Income ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | $7.12 | $2.23 | $3.64 | $5.04 | $6.44 |
| 30 | 34.09 | $4.26 | $25.86 | $5.93 | $7.33 | $8.74 | $10.14 | $11.54 | $12.94 | $14.34 |
| 40 | 45.45 | $5.68 | $35.59 | $13.83 | $15.24 | $16.64 | $18.04 | $19.44 | $20.85 | $22.25 |
| 50 | 56.82 | $7.10 | $45.32 | $21.74 | $23.14 | $24.54 | $25.94 | $27.35 | $28.75 | $30.15 |
| 60 | 68.18 | $8.52 | $55.04 | $29.64 | $31.04 | $32.45 | $33.85 | $35.25 | $36.65 | $38.05 |
| 70 | 79.55 | $9.94 | $64.77 | $37.54 | $38.95 | $40.35 | $41.75 | $43.15 | $44.56 | $45.96 |
| 80 | 90.91 | $11.36 | $74.50 | $45.45 | $46.85 | $48.25 | $49.65 | $51.06 | $52.46 | $53.86 |
| 90 | 102.27 | $12.78 | $84.23 | $53.35 | $54.75 | $56.16 | $57.56 | $58.96 | $60.36 | $61.76 |
| 100 | 113.64 | $14.20 | $93.95 | $61.25 | $62.66 | $64.06 | $65.46 | $66.86 | $68.27 | $69.67 |

**Table 5.23. WEST SAK**
**Divisible Income ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | $5.48 |
| 30 | 34.09 | $2.84 | $24.32 | | $5.50 | $7.46 | $9.41 | $11.37 | $13.32 | $15.28 |
| 40 | 45.45 | $3.79 | $34.28 | $13.35 | $15.30 | $17.26 | $19.21 | $21.17 | $23.12 | $25.08 |
| 50 | 56.82 | $4.73 | $44.25 | $23.15 | $25.10 | $27.06 | $29.01 | $30.97 | $32.92 | $34.88 |
| 60 | 68.18 | $5.68 | $54.22 | $32.95 | $34.90 | $36.86 | $38.81 | $40.77 | $42.72 | $44.68 |
| 70 | 79.55 | $6.63 | $64.18 | $42.75 | $44.70 | $46.66 | $48.61 | $50.57 | $52.52 | $54.48 |
| 80 | 90.91 | $7.58 | $74.15 | $52.55 | $54.50 | $56.46 | $58.41 | $60.37 | $62.32 | $64.28 |
| 90 | 102.27 | $8.52 | $84.11 | $62.35 | $64.30 | $66.26 | $68.21 | $70.17 | $72.12 | $74.08 |
| 100 | 113.64 | $9.47 | $94.08 | $72.15 | $74.10 | $76.06 | $78.01 | $79.97 | $81.92 | $83.88 |

**Table 5.33. DURI**
**Divisible Income ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | $8.20 | $9.07 | $9.95 | $10.83 | $11.70 | $12.58 | $13.46 |
| 30 | 34.09 | $1.89 | $28.93 | $16.33 | $17.21 | $18.08 | $18.96 | $19.84 | $20.71 | $21.59 |
| 40 | 45.45 | $2.53 | $38.08 | $24.46 | $25.34 | $26.21 | $27.09 | $27.97 | $28.84 | $29.72 |
| 50 | 56.82 | $3.16 | $47.23 | $32.59 | $33.47 | $34.35 | $35.22 | $36.10 | $36.98 | $37.85 |
| 60 | 68.18 | $3.79 | $56.38 | $40.72 | $41.60 | $42.48 | $43.35 | $44.23 | $45.11 | $45.98 |
| 70 | 79.55 | $4.42 | $65.52 | $48.85 | $49.73 | $50.61 | $51.48 | $52.36 | $53.24 | $54.11 |
| 80 | 90.91 | $5.05 | $74.67 | $56.99 | $57.86 | $58.74 | $59.62 | $60.49 | $61.37 | $62.25 |
| 90 | 102.27 | $5.68 | $83.82 | $65.12 | $65.99 | $66.87 | $67.75 | $68.62 | $69.50 | $70.38 |
| 100 | 113.64 | $6.31 | $92.97 | $73.25 | $74.13 | $75.00 | $75.88 | $76.76 | $77.63 | $78.51 |

The combination of higher net back values and lower total expenditures, for West Sak and Duri, create projects that provide for more divisible income to the host jurisdiction than Cold Lake SAGD. Despite the higher costs in Kern River, this project creates nevertheless a higher divisible income for California than Cold Lake SAGD for Alberta as a result of the higher net back for Kern River.

*Government Revenues per barrel*

The government revenues per barrel in Can $ are color coded in the following manner:

**Gov Inc+Part per barrel**

**IRR < 5%**
**< 15**
**< 30**
**< 45**
**< 60**
**> 60**

As was indicated above, these government revenues include revenues from government equity participation in projects. In the Duri project the government participates for 10%.

The following tables illustrate the total government revenues received (provincial/state and federal) in the various jurisdictions:

**Table 5.4. COLD LAKE**
**Government Income + Participation per bitumen barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | $1.29 | $2.25 | $2.36 | $2.86 |
| 30 | 34.09 | $4.26 | $20.45 | $2.36 | $2.91 | $3.41 | $3.92 | $4.83 | $4.93 | $5.43 |
| 40 | 45.45 | $5.68 | $27.27 | $4.98 | $5.48 | $5.99 | $6.49 | $7.39 | $7.50 | $7.99 |
| 50 | 56.82 | $7.10 | $34.09 | $7.55 | $8.05 | $8.56 | $9.06 | $9.96 | $10.06 | $10.56 |
| 60 | 68.18 | $8.52 | $40.91 | $10.12 | $10.62 | $11.12 | $11.63 | $12.53 | $12.63 | $13.12 |
| 70 | 79.55 | $9.94 | $47.73 | $12.69 | $13.19 | $13.69 | $14.19 | $15.10 | $15.19 | $15.69 |
| 80 | 90.91 | $11.36 | $54.55 | $15.26 | $15.75 | $16.26 | $16.76 | $17.66 | $17.75 | $18.26 |
| 90 | 102.27 | $12.78 | $61.36 | $17.82 | $18.32 | $18.82 | $19.32 | $20.22 | $20.32 | $20.82 |
| 100 | 113.64 | $14.20 | $68.18 | $20.39 | $20.89 | $21.39 | $21.88 | $22.79 | $22.89 | $23.38 |

**Table 5.14. KERN RIVER**
**Government Income + Participation per heavy oil barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | 0.80 | 1.43 | 1.98 | 2.54 | 3.09 |
| 30 | 34.09 | $4.26 | $25.86 | 5.14 | 5.69 | 6.24 | 6.80 | 7.35 | 7.90 | 8.45 |
| 40 | 45.45 | $5.68 | $35.59 | 10.52 | 11.07 | 11.62 | 12.17 | 12.72 | 13.28 | 13.83 |
| 50 | 56.82 | $7.10 | $45.32 | 15.67 | 16.22 | 16.77 | 17.33 | 17.88 | 18.43 | 18.98 |
| 60 | 68.18 | $8.52 | $55.04 | 20.29 | 20.84 | 21.39 | 21.94 | 22.49 | 23.04 | 23.60 |
| 70 | 79.55 | $9.94 | $64.77 | 24.90 | 25.46 | 26.01 | 26.56 | 27.11 | 27.66 | 28.21 |
| 80 | 90.91 | $11.36 | $74.50 | 29.52 | 30.07 | 30.62 | 31.17 | 31.72 | 32.28 | 32.83 |
| 90 | 102.27 | $12.78 | $84.23 | 34.14 | 34.69 | 35.24 | 35.79 | 36.34 | 36.89 | 37.44 |
| 100 | 113.64 | $14.20 | $93.95 | 38.75 | 39.30 | 39.85 | 40.41 | 40.96 | 41.51 | 42.06 |

**Table 5.24. WEST SAK**
**Government Income + Participation per heavy oil barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | $3.31 |
| 30 | 34.09 | $2.84 | $24.32 | | | $4.49 | $5.61 | $6.74 | $7.90 | $9.04 |
| 40 | 45.45 | $3.79 | $34.28 | $7.96 | $9.12 | $10.27 | $11.43 | $12.58 | $13.69 | $14.82 |
| 50 | 56.82 | $4.73 | $44.25 | $13.84 | $15.01 | $16.19 | $17.33 | $18.46 | $19.64 | $20.85 |
| 60 | 68.18 | $5.68 | $54.22 | $19.99 | $21.17 | $22.35 | $23.55 | $24.80 | $26.05 | $27.29 |
| 70 | 79.55 | $6.63 | $64.18 | $26.43 | $27.65 | $28.94 | $30.23 | $31.52 | $32.80 | $34.07 |
| 80 | 90.91 | $7.58 | $74.15 | $33.23 | $34.55 | $35.87 | $37.20 | $38.51 | $39.81 | $41.15 |
| 90 | 102.27 | $8.52 | $84.11 | $40.36 | $41.72 | $43.08 | $44.44 | $45.78 | $47.14 | $48.54 |
| 100 | 113.64 | $9.47 | $94.08 | $47.77 | $49.17 | $50.57 | $51.95 | $53.34 | $54.77 | $56.23 |

**Table 5.34. DURI**
**Government Income + Participation per heavy oil barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | $7.26 | $8.02 | $8.77 | $9.53 | $10.28 | $11.04 | $11.80 |
| 30 | 34.09 | $1.89 | $28.93 | $14.36 | $15.12 | $15.88 | $16.63 | $17.39 | $18.14 | $18.90 |
| 40 | 45.45 | $2.53 | $38.08 | $21.47 | $22.22 | $22.98 | $23.74 | $24.49 | $25.25 | $26.01 |
| 50 | 56.82 | $3.16 | $47.23 | $28.57 | $29.33 | $30.09 | $30.84 | $31.60 | $32.35 | $33.11 |
| 60 | 68.18 | $3.79 | $56.38 | $35.68 | $36.43 | $37.19 | $37.95 | $38.70 | $39.46 | $40.21 |
| 70 | 79.55 | $4.42 | $65.52 | $42.78 | $43.54 | $44.29 | $45.05 | $45.81 | $46.56 | $47.32 |
| 80 | 90.91 | $5.05 | $74.67 | $49.89 | $50.64 | $51.40 | $52.15 | $52.91 | $53.67 | $54.42 |
| 90 | 102.27 | $5.68 | $83.82 | $56.99 | $57.75 | $58.50 | $59.26 | $60.02 | $60.77 | $61.53 |
| 100 | 113.64 | $6.31 | $92.97 | $64.10 | $64.85 | $65.61 | $66.36 | $67.12 | $67.88 | $68.63 |

This sequence of maps clearly shows how the Alberta revenues per barrel are relatively low compared to those of other jurisdictions. At Cost level 4 and a price of US $ 60 per WTI barrel:

- Alberta and Canada receive $ 11.63 per barrel of bitumen
- California and the US receive $ 21.94 per barrel of heavy oil
- Alaska and the US receive $ 23.55 per barrel of heavy oil, and
- Indonesia receives $ 37.95 per barrel of heavy oil.

The maps also show how under high prices Alaska/US and Indonesia receive considerably more than either California/US or Alberta/Canada.

*Private Investor Net Cash per barrel*

The Net Cash per barrel is color coded in the following manner:

**Net Cash per barrel**

| | |
|---|---|
| **< 5%** | black |
| **< 5** | red |
| **< 15** | green |
| **< 30** | cyan |
| **> 30** | yellow |

Following are the Net Cash per barrel maps

**Table 5.5. COLD LAKE**
**Net Cash ($ Cdn) per barrel of bitumen**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | $1.53 | $2.47 | $2.58 | $3.14 |
| 30 | 34.09 | $4.26 | $20.45 | $2.68 | $3.19 | $3.75 | $4.30 | $5.30 | $5.41 | $5.97 |
| 40 | 45.45 | $5.68 | $27.27 | $5.46 | $6.01 | $6.57 | $7.13 | $8.13 | $8.24 | $8.80 |
| 50 | 56.82 | $7.10 | $34.09 | $8.28 | $8.84 | $9.40 | $9.96 | $10.95 | $11.07 | $11.63 |
| 60 | 68.18 | $8.52 | $40.91 | $11.11 | $11.67 | $12.23 | $12.78 | $13.79 | $13.90 | $14.47 |
| 70 | 79.55 | $9.94 | $47.73 | $13.94 | $14.50 | $15.06 | $15.62 | $16.62 | $16.74 | $17.30 |
| 80 | 90.91 | $11.36 | $54.55 | $16.77 | $17.34 | $17.89 | $18.45 | $19.46 | $19.57 | $20.13 |
| 90 | 102.27 | $12.78 | $61.36 | $19.61 | $20.16 | $20.72 | $21.28 | $22.29 | $22.40 | $22.97 |
| 100 | 113.64 | $14.20 | $68.18 | $22.44 | $22.99 | $23.55 | $24.12 | $25.12 | $25.24 | $25.80 |

**Table 5.15. KERN RIVER**
**Net Cash ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | $6.32 | $0.81 | $1.65 | $2.50 | $3.35 |
| 30 | 34.09 | $4.26 | $25.86 | $0.79 | $1.64 | $2.49 | $3.34 | $4.19 | $5.04 | $5.89 |
| 40 | 45.45 | $5.68 | $35.59 | $3.32 | $4.17 | $5.02 | $5.87 | $6.72 | $7.57 | $8.42 |
| 50 | 56.82 | $7.10 | $45.32 | $6.07 | $6.92 | $7.77 | $8.62 | $9.47 | $10.32 | $11.17 |
| 60 | 68.18 | $8.52 | $55.04 | $9.35 | $10.20 | $11.06 | $11.91 | $12.76 | $13.61 | $14.46 |
| 70 | 79.55 | $9.94 | $64.77 | $12.64 | $13.49 | $14.34 | $15.19 | $16.04 | $16.90 | $17.75 |
| 80 | 90.91 | $11.36 | $74.50 | $15.93 | $16.78 | $17.63 | $18.48 | $19.33 | $20.18 | $21.03 |
| 90 | 102.27 | $12.78 | $84.23 | $19.21 | $20.07 | $20.92 | $21.77 | $22.62 | $23.47 | $24.32 |
| 100 | 113.64 | $14.20 | $93.95 | $22.50 | $23.35 | $24.21 | $25.06 | $25.91 | $26.76 | $27.61 |

**Table 5.25. WEST SAK**
**Net Cash ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | $2.17 |
| 30 | 34.09 | $2.84 | $24.32 | | | $2.97 | $3.81 | $4.63 | $5.43 | $6.24 |
| 40 | 45.45 | $3.79 | $34.28 | $5.38 | $6.18 | $6.98 | $7.78 | $8.58 | $9.43 | $10.26 |
| 50 | 56.82 | $4.73 | $44.25 | $9.30 | $10.09 | $10.87 | $11.69 | $12.50 | $13.28 | $14.03 |
| 60 | 68.18 | $5.68 | $54.22 | $12.96 | $13.73 | $14.51 | $15.26 | $15.97 | $16.67 | $17.39 |
| 70 | 79.55 | $6.63 | $64.18 | $16.31 | $17.05 | $17.72 | $18.38 | $19.04 | $19.72 | $20.41 |
| 80 | 90.91 | $7.58 | $74.15 | $19.32 | $19.95 | $20.59 | $21.21 | $21.85 | $22.51 | $23.13 |
| 90 | 102.27 | $8.52 | $84.11 | $21.98 | $22.58 | $23.18 | $23.77 | $24.39 | $24.98 | $25.54 |
| 100 | 113.64 | $9.47 | $94.08 | $24.38 | $24.93 | $25.48 | $26.06 | $26.63 | $27.15 | $27.65 |

**Table 5.35. DURI**
**Net Cash ($ Cdn) per barrel of heavy oil**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | $0.94 | $1.06 | $1.18 | $1.30 | $1.42 | $1.54 | $1.66 |
| 30 | 34.09 | $1.89 | $28.93 | $1.97 | $2.09 | $2.21 | $2.33 | $2.45 | $2.57 | $2.69 |
| 40 | 45.45 | $2.53 | $38.08 | $2.99 | $3.11 | $3.23 | $3.35 | $3.47 | $3.59 | $3.71 |
| 50 | 56.82 | $3.16 | $47.23 | $4.02 | $4.14 | $4.26 | $4.38 | $4.50 | $4.62 | $4.74 |
| 60 | 68.18 | $3.79 | $56.38 | $5.05 | $5.17 | $5.29 | $5.41 | $5.53 | $5.65 | $5.77 |
| 70 | 79.55 | $4.42 | $65.52 | $6.07 | $6.19 | $6.31 | $6.43 | $6.55 | $6.68 | $6.80 |
| 80 | 90.91 | $5.05 | $74.67 | $7.10 | $7.22 | $7.34 | $7.46 | $7.58 | $7.70 | $7.82 |
| 90 | 102.27 | $5.68 | $83.82 | $8.13 | $8.25 | $8.37 | $8.49 | $8.61 | $8.73 | $8.85 |
| 100 | 113.64 | $6.31 | $92.97 | $9.15 | $9.27 | $9.39 | $9.51 | $9.64 | $9.76 | $9.88 |

Interestingly, the Net Cash per barrel in Cold Lake SAGD, Kern River and West Sak is very similar. Only in Indonesia is the Net Cash per barrel considerably less.

*Undiscounted Government Take*

As was indicated before, the color codes for the Undiscounted Government Take are:

**GovTake assessment**

**IRR < 5%**
**< 40%**
**< 55%**
**< 65%**
**< 85%**
**> 85%**

The following maps provide the undiscounted government takes (income only)

**Table 5.6. COLD LAKE**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | 45.74% | 47.63% | 47.71% | 47.69% |
| 30 | 34.09 | $4.26 | $20.45 | 46.86% | 47.69% | 47.65% | 47.67% | 47.69% | 47.67% | 47.64% |
| 40 | 45.45 | $5.68 | $27.27 | 47.68% | 47.70% | 47.69% | 47.66% | 47.63% | 47.64% | 47.60% |
| 50 | 56.82 | $7.10 | $34.09 | 47.69% | 47.66% | 47.67% | 47.64% | 47.64% | 47.60% | 47.60% |
| 60 | 68.18 | $8.52 | $40.91 | 47.67% | 47.66% | 47.64% | 47.64% | 47.60% | 47.60% | 47.57% |
| 70 | 79.55 | $9.94 | $47.73 | 47.64% | 47.64% | 47.63% | 47.60% | 47.60% | 47.57% | 47.56% |
| 80 | 90.91 | $11.36 | $54.55 | 47.64% | 47.61% | 47.60% | 47.60% | 47.57% | 47.57% | 47.56% |
| 90 | 102.27 | $12.78 | $61.36 | 47.61% | 47.60% | 47.60% | 47.59% | 47.57% | 47.56% | 47.54% |
| 100 | 113.64 | $14.20 | $68.18 | 47.60% | 47.60% | 47.60% | 47.57% | 47.56% | 47.56% | 47.54% |

**Table 5.16. KERN RIVER**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | 83.84% | 63.94% | 54.56% | 50.37% | 48.00% |
| 30 | 34.09 | $4.26 | $25.86 | 86.62% | 77.60% | 71.47% | 67.03% | 63.68% | 61.04% | 58.92% |
| 40 | 45.45 | $5.68 | $35.59 | 76.03% | 72.65% | 69.85% | 67.48% | 65.45% | 63.69% | 62.15% |
| 50 | 56.82 | $7.10 | $45.32 | 72.09% | 70.11% | 68.35% | 66.78% | 65.37% | 64.10% | 62.95% |
| 60 | 68.18 | $8.52 | $55.04 | 68.45% | 67.13% | 65.93% | 64.82% | 63.81% | 62.87% | 62.00% |
| 70 | 79.55 | $9.94 | $64.77 | 66.33% | 65.36% | 64.45% | 63.61% | 62.82% | 62.08% | 61.38% |
| 80 | 90.91 | $11.36 | $74.50 | 64.95% | 64.19% | 63.46% | 62.78% | 62.14% | 61.53% | 60.95% |
| 90 | 102.27 | $12.78 | $84.23 | 63.98% | 63.35% | 62.75% | 62.18% | 61.64% | 61.12% | 60.62% |
| 100 | 113.64 | $14.20 | $93.95 | 63.26% | 62.73% | 62.21% | 61.72% | 61.25% | 60.80% | 60.37% |

**Table 5.26. WEST SAK**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | 60.38% |
| 30 | 34.09 | $2.84 | $24.32 | | | 60.22% | 59.56% | 59.31% | 59.27% | 59.19% |
| 40 | 45.45 | $3.79 | $34.28 | 59.68% | 59.60% | 59.54% | 59.49% | 59.45% | 59.21% | 59.09% |
| 50 | 56.82 | $4.73 | $44.25 | 59.81% | 59.81% | 59.83% | 59.72% | 59.62% | 59.66% | 59.77% |
| 60 | 68.18 | $5.68 | $54.22 | 60.66% | 60.66% | 60.64% | 60.69% | 60.83% | 60.98% | 61.09% |
| 70 | 79.55 | $6.63 | $64.18 | 61.83% | 61.87% | 62.02% | 62.18% | 62.34% | 62.45% | 62.53% |
| 80 | 90.91 | $7.58 | $74.15 | 63.24% | 63.39% | 63.53% | 63.68% | 63.80% | 63.88% | 64.02% |
| 90 | 102.27 | $8.52 | $84.11 | 64.74% | 64.88% | 65.02% | 65.15% | 65.24% | 65.36% | 65.53% |
| 100 | 113.64 | $9.47 | $94.08 | 66.21% | 66.35% | 66.50% | 66.59% | 66.70% | 66.86% | 67.04% |

**Table 5.36. DURI**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | 87.10% | 86.88% | 86.71% | 86.56% | 86.43% | 86.33% | 86.24% |
| 30 | 34.09 | $1.89 | $28.93 | 86.53% | 86.44% | 86.37% | 86.30% | 86.24% | 86.19% | 86.14% |
| 40 | 45.45 | $2.53 | $38.08 | 86.34% | 86.29% | 86.25% | 86.20% | 86.16% | 86.13% | 86.09% |
| 50 | 56.82 | $3.16 | $47.23 | 86.25% | 86.21% | 86.18% | 86.15% | 86.12% | 86.09% | 86.06% |
| 60 | 68.18 | $3.79 | $56.38 | 86.19% | 86.17% | 86.14% | 86.12% | 86.09% | 86.07% | 86.05% |
| 70 | 79.55 | $4.42 | $65.52 | 86.15% | 86.13% | 86.11% | 86.09% | 86.07% | 86.05% | 86.04% |
| 80 | 90.91 | $5.05 | $74.67 | 86.13% | 86.11% | 86.09% | 86.08% | 86.06% | 86.04% | 86.03% |
| 90 | 102.27 | $5.68 | $83.82 | 86.11% | 86.09% | 86.08% | 86.06% | 86.05% | 86.03% | 86.02% |
| 100 | 113.64 | $6.31 | $92.97 | 86.09% | 86.08% | 86.07% | 86.05% | 86.04% | 86.03% | 86.01% |

*Structure of the government take*

The undiscounted government take maps provide an interesting comparison of the various fiscal systems. These maps do not include the 10% state participation in Indonesia.

Alberta and Indonesia have both systems that are neutral in terms of price increases or cost decreases. The government take is very similar regardless of the level of costs or prices.

California has a system that is price progressive up to about US $ 40 WTI, but then becomes price-regressive, with the government take declining under higher prices. The California system is also strongly cost regressive.

Alaska has a price progressive system over the entire range, but is neutral with respect to costs.

*Level of government take*

Alberta has a low overall government take.

California and Alaska have an average overall government take, but:

- In California there is a high government take under high costs, and
- In Alaska there is a high government take under high prices.

Indonesia has a very high government take.

*5% Discounted Government Take*

For the 5% discounted government take, the color coding is the same as for the undiscounted government take.

Following are the discounted government take maps.

**Table 5.7. COLD LAKE**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | 88.97% | 55.53% | 53.06% | 50.51% |
| 30 | 34.09 | $4.26 | $20.45 | 68.56% | 58.52% | 53.93% | 51.71% | 50.09% | 49.49% | 48.84% |
| 40 | 45.45 | $5.68 | $27.27 | 52.55% | 51.27% | 50.34% | 49.63% | 48.98% | 48.70% | 48.35% |
| 50 | 56.82 | $7.10 | $34.09 | 50.31% | 49.71% | 49.31% | 48.91% | 48.58% | 48.34% | 48.14% |
| 60 | 68.18 | $8.52 | $40.91 | 49.42% | 49.09% | 48.80% | 48.58% | 48.31% | 48.17% | 47.98% |
| 70 | 79.55 | $9.94 | $47.73 | 48.94% | 48.73% | 48.53% | 48.34% | 48.17% | 48.02% | 47.91% |
| 80 | 90.91 | $11.36 | $54.55 | 48.68% | 48.47% | 48.33% | 48.21% | 48.04% | 47.95% | 47.85% |
| 90 | 102.27 | $12.78 | $61.36 | 48.45% | 48.33% | 48.22% | 48.10% | 47.97% | 47.89% | 47.79% |
| 100 | 113.64 | $14.20 | $68.18 | 48.33% | 48.23% | 48.13% | 48.01% | 47.92% | 47.85% | 47.76% |

**Table 5.17. KERN RIVER**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | 103.26% | 68.38% | 56.87% | 51.76% | 48.87% |
| 30 | 34.09 | $4.26 | $25.86 | 89.38% | 79.53% | 72.86% | 68.05% | 64.42% | 61.58% | 59.29% |
| 40 | 45.45 | $5.68 | $35.59 | 77.20% | 73.58% | 70.58% | 68.05% | 65.89% | 64.02% | 62.39% |
| 50 | 56.82 | $7.10 | $45.32 | 72.83% | 70.72% | 68.85% | 67.18% | 65.69% | 64.34% | 63.12% |
| 60 | 68.18 | $8.52 | $55.04 | 68.99% | 67.59% | 66.31% | 65.14% | 64.06% | 63.06% | 62.14% |
| 70 | 79.55 | $9.94 | $64.77 | 66.76% | 65.72% | 64.76% | 63.86% | 63.02% | 62.24% | 61.50% |
| 80 | 90.91 | $11.36 | $74.50 | 65.31% | 64.49% | 63.72% | 62.99% | 62.31% | 61.66% | 61.05% |
| 90 | 102.27 | $12.78 | $84.23 | 64.28% | 63.61% | 62.97% | 62.36% | 61.79% | 61.23% | 60.71% |
| 100 | 113.64 | $14.20 | $93.95 | 63.52% | 62.95% | 62.41% | 61.89% | 61.39% | 60.91% | 60.45% |

**Table 5.27. WEST SAK**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | 64.33% |
| 30 | 34.09 | $2.84 | $24.32 | | | 69.77% | 63.56% | 61.41% | 60.49% | 59.82% |
| 40 | 45.45 | $3.79 | $34.28 | 64.13% | 62.57% | 61.60% | 60.94% | 60.45% | 59.75% | 59.31% |
| 50 | 56.82 | $4.73 | $44.25 | 61.80% | 61.32% | 60.95% | 60.44% | 60.00% | 59.82% | 59.76% |
| 60 | 68.18 | $5.68 | $54.22 | 61.83% | 61.48% | 61.15% | 60.96% | 60.95% | 60.96% | 60.91% |
| 70 | 79.55 | $6.63 | $64.18 | 62.50% | 62.28% | 62.29% | 62.31% | 62.35% | 62.32% | 62.25% |
| 80 | 90.91 | $7.58 | $74.15 | 63.65% | 63.66% | 63.68% | 63.71% | 63.70% | 63.63% | 63.66% |
| 90 | 102.27 | $8.52 | $84.11 | 65.01% | 65.02% | 65.05% | 65.06% | 65.02% | 65.03% | 65.12% |
| 100 | 113.64 | $9.47 | $94.08 | 66.35% | 66.38% | 66.43% | 66.39% | 66.39% | 66.47% | 66.58% |

**Table 5.37. DURI**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | 91.10% | 90.05% | 89.20% | 88.49% | 87.93% | 87.45% | 87.04% |
| 30 | 34.09 | $1.89 | $28.93 | 88.35% | 87.98% | 87.64% | 87.34% | 87.07% | 86.82% | 86.59% |
| 40 | 45.45 | $2.53 | $38.08 | 87.51% | 87.29% | 87.08% | 86.89% | 86.71% | 86.55% | 86.39% |
| 50 | 56.82 | $3.16 | $47.23 | 87.09% | 86.93% | 86.79% | 86.65% | 86.52% | 86.39% | 86.27% |
| 60 | 68.18 | $3.79 | $56.38 | 86.84% | 86.72% | 86.61% | 86.50% | 86.39% | 86.29% | 86.20% |
| 70 | 79.55 | $4.42 | $65.52 | 86.67% | 86.58% | 86.49% | 86.40% | 86.31% | 86.23% | 86.15% |
| 80 | 90.91 | $5.05 | $74.67 | 86.56% | 86.48% | 86.40% | 86.32% | 86.25% | 86.18% | 86.11% |
| 90 | 102.27 | $5.68 | $83.82 | 86.47% | 86.40% | 86.33% | 86.27% | 86.20% | 86.14% | 86.08% |
| 100 | 113.64 | $6.31 | $92.97 | 86.40% | 86.34% | 86.28% | 86.22% | 86.16% | 86.11% | 86.06% |

The discounted government take maps show slight regressivity with price and costs for Alberta and Indonesia

Kern River and West Sak show similar patterns as for the undiscounted government take, provided that for low prices and high costs the discounted government take is higher than the undiscounted government take.

*__IRR (real)__*

The following color code is used for the IRR.

**IRR**

**< 5%**
**< 13%**
**< 20%**
**< 30%**
**> 30%**

The following maps show the IRR.

**Table 5.8. COLD LAKE**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | 5.26% | 9.42% | 11.32% | 15.67% |
| 30 | 34.09 | $4.26 | $20.45 | 6.40% | 8.27% | 10.46% | 12.99% | 17.11% | 19.85% | 24.89% |
| 40 | 45.45 | $5.68 | $27.27 | 11.83% | 13.86% | 16.21% | 19.00% | 23.30% | 26.62% | 32.22% |
| 50 | 56.82 | $7.10 | $34.09 | 16.32% | 18.52% | 21.05% | 24.09% | 28.52% | 32.36% | 38.41% |
| 60 | 68.18 | $8.52 | $40.91 | 20.23% | 22.58% | 25.30% | 28.52% | 33.14% | 37.36% | 43.86% |
| 70 | 79.55 | $9.94 | $47.73 | 23.76% | 26.22% | 29.11% | 32.52% | 37.28% | 41.90% | 48.70% |
| 80 | 90.91 | $11.36 | $54.55 | 26.94% | 29.58% | 32.57% | 36.13% | 41.11% | 45.95% | 53.15% |
| 90 | 102.27 | $12.78 | $61.36 | 29.92% | 32.60% | 35.74% | 39.51% | 44.57% | 49.72% | 57.26% |
| 100 | 113.64 | $14.20 | $68.18 | 32.63% | 35.43% | 38.71% | 42.62% | 47.80% | 53.24% | 61.01% |

**Table 5.18. KERN RIVER**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | 4.38% | 16.69% | 27.59% | 39.13% | 52.81% |
| 30 | 34.09 | $4.26 | $25.86 | 12.95% | 21.17% | 29.06% | 37.48% | 46.95% | 58.08% | 71.70% |
| 40 | 45.45 | $5.68 | $35.59 | 29.85% | 36.47% | 43.73% | 51.89% | 61.30% | 72.43% | 86.03% |
| 50 | 56.82 | $7.10 | $45.32 | 42.65% | 49.10% | 56.29% | 64.44% | 73.85% | 84.96% | 98.57% |
| 60 | 68.18 | $8.52 | $55.04 | 54.90% | 61.33% | 68.53% | 76.67% | 86.08% | 97.20% | 110.81% |
| 70 | 79.55 | $9.94 | $64.77 | 65.09% | 71.53% | 78.71% | 86.86% | 96.27% | 107.39% | 121.03% |
| 80 | 90.91 | $11.36 | $74.50 | 73.83% | 80.26% | 87.44% | 95.59% | 105.00% | 116.14% | 129.80% |
| 90 | 102.27 | $12.78 | $84.23 | 81.46% | 87.89% | 95.08% | 103.23% | 112.65% | 123.80% | 137.51% |
| 100 | 113.64 | $14.20 | $93.95 | 88.25% | 94.68% | 101.87% | 110.03% | 119.45% | 130.63% | 144.39% |

**Table 5.28. WEST SAK**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | 9.96% |
| 30 | 34.09 | $2.84 | $24.32 | | | 7.13% | 9.86% | 13.09% | 17.08% | 22.47% |
| 40 | 45.45 | $3.79 | $34.28 | 9.70% | 11.82% | 14.28% | 17.23% | 20.84% | 25.79% | 32.37% |
| 50 | 56.82 | $4.73 | $44.25 | 14.97% | 17.30% | 20.04% | 23.52% | 27.87% | 33.27% | 40.38% |
| 60 | 68.18 | $5.68 | $54.22 | 19.47% | 22.12% | 25.33% | 29.11% | 33.62% | 39.37% | 47.39% |
| 70 | 79.55 | $6.63 | $64.18 | 23.57% | 26.48% | 29.70% | 33.57% | 38.35% | 44.69% | 53.44% |
| 80 | 90.91 | $7.58 | $74.15 | 27.08% | 29.96% | 33.37% | 37.47% | 42.67% | 49.62% | 58.54% |
| 90 | 102.27 | $8.52 | $84.11 | 30.06% | 33.09% | 36.67% | 41.03% | 46.70% | 53.77% | 62.77% |
| 100 | 113.64 | $9.47 | $94.08 | 32.75% | 35.91% | 39.62% | 44.40% | 50.22% | 57.28% | 66.44% |

**Table 5.38. DURI**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | 11.11% | 13.24% | 15.73% | 18.71% | 22.21% | 26.58% | 32.36% |
| 30 | 34.09 | $1.89 | $28.93 | 19.45% | 21.83% | 24.60% | 27.89% | 31.89% | 36.94% | 43.55% |
| 40 | 45.45 | $2.53 | $38.08 | 25.95% | 28.59% | 31.66% | 35.31% | 39.74% | 45.28% | 52.50% |
| 50 | 56.82 | $3.16 | $47.23 | 31.52% | 34.38% | 37.70% | 41.63% | 46.39% | 52.31% | 59.99% |
| 60 | 68.18 | $3.79 | $56.38 | 36.43% | 39.47% | 43.00% | 47.17% | 52.19% | 58.42% | 66.45% |
| 70 | 79.55 | $4.42 | $65.52 | 40.84% | 44.04% | 47.74% | 52.11% | 57.35% | 63.83% | 72.15% |
| 80 | 90.91 | $5.05 | $74.67 | 44.85% | 48.19% | 52.04% | 56.57% | 61.99% | 68.68% | 77.25% |
| 90 | 102.27 | $5.68 | $83.82 | 48.54% | 51.99% | 55.97% | 60.64% | 66.22% | 73.09% | 81.87% |
| 100 | 113.64 | $6.31 | $92.97 | 51.95% | 55.50% | 59.60% | 64.39% | 70.11% | 77.14% | 86.10% |

As can be expected, for Kern River and Duri, the early production from the very low cost shallow wells on a large project results automatically in a very high IRR.

West Sak and Cold Lake have a similar IRR.

*PFR10 (real)*

The following color coding was used for the PFR10.

**PFR10 assessment**

**IRR<5%**
**< 1.15**
**< 1.75**
**< 2.50**
**> 2.50**

The following maps provide the PFR10 information.

**Table 5.9. COLD LAKE**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | 0.77 | 0.97 | 1.07 | 1.31 |
| 30 | 34.09 | $4.26 | $20.45 | 0.83 | 0.92 | 1.02 | 1.16 | 1.40 | 1.57 | 1.93 |
| 40 | 45.45 | $5.68 | $27.27 | 1.09 | 1.20 | 1.34 | 1.52 | 1.81 | 2.07 | 2.56 |
| 50 | 56.82 | $7.10 | $34.09 | 1.35 | 1.48 | 1.65 | 1.87 | 2.23 | 2.57 | 3.18 |
| 60 | 68.18 | $8.52 | $40.91 | 1.60 | 1.76 | 1.97 | 2.23 | 2.64 | 3.07 | 3.80 |
| 70 | 79.55 | $9.94 | $47.73 | 1.85 | 2.04 | 2.28 | 2.58 | 3.06 | 3.56 | 4.42 |
| 80 | 90.91 | $11.36 | $54.55 | 2.10 | 2.32 | 2.59 | 2.94 | 3.47 | 4.06 | 5.04 |
| 90 | 102.27 | $12.78 | $61.36 | 2.35 | 2.59 | 2.90 | 3.29 | 3.88 | 4.55 | 5.66 |
| 100 | 113.64 | $14.20 | $68.18 | 2.60 | 2.87 | 3.21 | 3.65 | 4.30 | 5.05 | 6.28 |

**Table 5.19. KERN RIVER**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | 0.92 | 1.12 | 1.41 | 1.82 | 2.42 |
| 30 | 34.09 | $4.26 | $25.86 | 1.05 | 1.24 | 1.47 | 1.76 | 2.16 | 2.72 | 3.55 |
| 40 | 45.45 | $5.68 | $35.59 | 1.50 | 1.73 | 2.03 | 2.41 | 2.91 | 3.62 | 4.68 |
| 50 | 56.82 | $7.10 | $45.32 | 1.99 | 2.28 | 2.64 | 3.10 | 3.73 | 4.59 | 5.90 |
| 60 | 68.18 | $8.52 | $55.04 | 2.57 | 2.93 | 3.37 | 3.94 | 4.70 | 5.76 | 7.36 |
| 70 | 79.55 | $9.94 | $64.77 | 3.15 | 3.57 | 4.10 | 4.77 | 5.67 | 6.93 | 8.82 |
| 80 | 90.91 | $11.36 | $74.50 | 3.74 | 4.22 | 4.83 | 5.61 | 6.65 | 8.10 | 10.28 |
| 90 | 102.27 | $12.78 | $84.23 | 4.32 | 4.87 | 5.56 | 6.44 | 7.62 | 9.27 | 11.74 |
| 100 | 113.64 | $14.20 | $93.95 | 4.91 | 5.52 | 6.29 | 7.28 | 8.60 | 10.44 | 13.21 |

**Table 5.29. WEST SAK**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | 1.00 |
| 30 | 34.09 | $2.84 | $24.32 | | | 0.92 | 1.00 | 1.10 | 1.23 | 1.44 |
| 40 | 45.45 | $3.79 | $34.28 | 0.99 | 1.06 | 1.14 | 1.24 | 1.38 | 1.58 | 1.88 |
| 50 | 56.82 | $4.73 | $44.25 | 1.16 | 1.24 | 1.35 | 1.49 | 1.67 | 1.92 | 2.30 |
| 60 | 68.18 | $5.68 | $54.22 | 1.32 | 1.43 | 1.56 | 1.72 | 1.93 | 2.23 | 2.68 |
| 70 | 79.55 | $6.63 | $64.18 | 1.48 | 1.60 | 1.74 | 1.92 | 2.16 | 2.51 | 3.03 |
| 80 | 90.91 | $7.58 | $74.15 | 1.62 | 1.75 | 1.90 | 2.11 | 2.38 | 2.77 | 3.34 |
| 90 | 102.27 | $8.52 | $84.11 | 1.74 | 1.88 | 2.06 | 2.28 | 2.58 | 3.00 | 3.62 |
| 100 | 113.64 | $9.47 | $94.08 | 1.86 | 2.01 | 2.19 | 2.44 | 2.76 | 3.21 | 3.87 |

**Table 5.39. DURI**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | 1.03 | 1.09 | 1.17 | 1.27 | 1.40 | 1.58 | 1.85 |
| 30 | 34.09 | $1.89 | $28.93 | 1.29 | 1.38 | 1.49 | 1.64 | 1.83 | 2.09 | 2.49 |
| 40 | 45.45 | $2.53 | $38.08 | 1.55 | 1.67 | 1.82 | 2.01 | 2.26 | 2.61 | 3.14 |
| 50 | 56.82 | $3.16 | $47.23 | 1.81 | 1.96 | 2.14 | 2.37 | 2.69 | 3.13 | 3.78 |
| 60 | 68.18 | $3.79 | $56.38 | 2.07 | 2.24 | 2.46 | 2.74 | 3.12 | 3.64 | 4.43 |
| 70 | 79.55 | $4.42 | $65.52 | 2.33 | 2.53 | 2.78 | 3.11 | 3.55 | 4.16 | 5.07 |
| 80 | 90.91 | $5.05 | $74.67 | 2.58 | 2.82 | 3.11 | 3.48 | 3.98 | 4.67 | 5.72 |
| 90 | 102.27 | $5.68 | $83.82 | 2.84 | 3.10 | 3.43 | 3.85 | 4.41 | 5.19 | 6.36 |
| 100 | 113.64 | $6.31 | $92.97 | 3.10 | 3.39 | 3.75 | 4.22 | 4.84 | 5.71 | 7.01 |

In terms of PFR10, the Alberta Cold Lake SAGD terms seem to compare with Duri profitability. In the case of Duri the higher revenues and lower costs are offset by a much higher government take.

West Sak is clearly less attractive than Cold Lake in PFR10 terms due to the higher capital costs per peak capacity and higher government take.

Kern River remains very attractive from a PFR10 point of view.

*NPV10/BOE(real)*

The NPV10/BOE color code is as follows:

**NPV10/BOE assessm**

| | |
|---|---|
| **IRR<5%** | |
| **< 0.33** | |
| **< 1.50** | |
| **< 3.00** | |
| **> 3.00** | |

**Table 5.10. COLD LAKE**
**NPV10/bitumen barrel**

| WTI US $ | WTI Can $ | Gas Price Can $ | Bit Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $13.64 | | | | -$0.37 | -$0.04 | $0.08 | $0.29 |
| 30 | 34.09 | $4.26 | $20.45 | -$0.40 | -$0.18 | $0.04 | $0.25 | $0.55 | $0.67 | $0.87 |
| 40 | 45.45 | $5.68 | $27.27 | $0.22 | $0.43 | $0.63 | $0.84 | $1.14 | $1.25 | $1.45 |
| 50 | 56.82 | $7.10 | $34.09 | $0.81 | $1.01 | $1.22 | $1.42 | $1.71 | $1.82 | $2.02 |
| 60 | 68.18 | $8.52 | $40.91 | $1.39 | $1.60 | $1.80 | $2.00 | $2.29 | $2.40 | $2.60 |
| 70 | 79.55 | $9.94 | $47.73 | $1.97 | $2.17 | $2.38 | $2.58 | $2.87 | $2.98 | $3.18 |
| 80 | 90.91 | $11.36 | $54.55 | $2.55 | $2.76 | $2.96 | $3.15 | $3.45 | $3.56 | $3.75 |
| 90 | 102.27 | $12.78 | $61.36 | $3.13 | $3.33 | $3.53 | $3.73 | $4.02 | $4.13 | $4.33 |
| 100 | 113.64 | $14.20 | $68.18 | $3.71 | $3.91 | $4.11 | $4.31 | $4.60 | $4.71 | $4.91 |

**Table 5.20. KERN RIVER**
**NPV10/Heavy Oil Barrel**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $16.13 | | | -$0.10 | $0.14 | $0.39 | $0.65 | $0.91 |
| 30 | 34.09 | $4.26 | $25.86 | $0.08 | $0.34 | $0.60 | $0.85 | $1.11 | $1.37 | $1.63 |
| 40 | 45.45 | $5.68 | $35.59 | $0.79 | $1.05 | $1.31 | $1.57 | $1.83 | $2.09 | $2.35 |
| 50 | 56.82 | $7.10 | $45.32 | $1.58 | $1.83 | $2.09 | $2.35 | $2.61 | $2.87 | $3.13 |
| 60 | 68.18 | $8.52 | $55.04 | $2.51 | $2.77 | $3.03 | $3.29 | $3.54 | $3.80 | $4.06 |
| 70 | 79.55 | $9.94 | $64.77 | $3.44 | $3.70 | $3.96 | $4.22 | $4.48 | $4.74 | $5.00 |
| 80 | 90.91 | $11.36 | $74.50 | $4.37 | $4.63 | $4.89 | $5.15 | $5.41 | $5.67 | $5.93 |
| 90 | 102.27 | $12.78 | $84.23 | $5.31 | $5.57 | $5.83 | $6.09 | $6.34 | $6.60 | $6.86 |
| 100 | 113.64 | $14.20 | $93.95 | $6.24 | $6.50 | $6.76 | $7.02 | $7.28 | $7.54 | $7.80 |

**Table 5.30. WEST SAK**
**NPV10/Heavy Oil Barrel**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.89 | $14.35 | | | | | | | $0.00 |
| 30 | 34.09 | $2.84 | $24.32 | | | -$0.39 | -$0.02 | $0.35 | $0.70 | $1.06 |
| 40 | 45.45 | $3.79 | $34.28 | -$0.05 | $0.30 | $0.66 | $1.01 | $1.37 | $1.74 | $2.11 |
| 50 | 56.82 | $4.73 | $44.25 | $0.96 | $1.32 | $1.67 | $2.04 | $2.42 | $2.77 | $3.12 |
| 60 | 68.18 | $5.68 | $54.22 | $1.94 | $2.30 | $2.67 | $3.02 | $3.36 | $3.69 | $4.03 |
| 70 | 79.55 | $6.63 | $64.18 | $2.88 | $3.23 | $3.55 | $3.87 | $4.19 | $4.53 | $4.87 |
| 80 | 90.91 | $7.58 | $74.15 | $3.71 | $4.03 | $4.34 | $4.65 | $4.97 | $5.30 | $5.62 |
| 90 | 102.27 | $8.52 | $84.11 | $4.46 | $4.76 | $5.07 | $5.37 | $5.69 | $6.00 | $6.29 |
| 100 | 113.64 | $9.47 | $94.08 | $5.14 | $5.44 | $5.72 | $6.04 | $6.34 | $6.62 | $6.89 |

**Table 5.40. DURI**
**NPV10/Heavy Oil Barrel**

| WTI US $ | WTI Can $ | Gas Price Can $ | Heavy oil price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $19.79 | $0.03 | $0.09 | $0.15 | $0.21 | $0.27 | $0.33 | $0.39 |
| 30 | 34.09 | $1.89 | $28.93 | $0.34 | $0.40 | $0.45 | $0.51 | $0.57 | $0.63 | $0.69 |
| 40 | 45.45 | $2.53 | $38.08 | $0.63 | $0.69 | $0.75 | $0.81 | $0.87 | $0.92 | $0.98 |
| 50 | 56.82 | $3.16 | $47.23 | $0.93 | $0.99 | $1.05 | $1.10 | $1.16 | $1.22 | $1.28 |
| 60 | 68.18 | $3.79 | $56.38 | $1.23 | $1.28 | $1.34 | $1.40 | $1.46 | $1.52 | $1.57 |
| 70 | 79.55 | $4.42 | $65.52 | $1.52 | $1.58 | $1.64 | $1.70 | $1.75 | $1.81 | $1.87 |
| 80 | 90.91 | $5.05 | $74.67 | $1.82 | $1.88 | $1.94 | $1.99 | $2.05 | $2.11 | $2.17 |
| 90 | 102.27 | $5.68 | $83.82 | $2.12 | $2.17 | $2.23 | $2.29 | $2.35 | $2.41 | $2.46 |
| 100 | 113.64 | $6.31 | $92.97 | $2.41 | $2.47 | $2.53 | $2.59 | $2.64 | $2.70 | $2.76 |

The Kern River and West Sak projects do have a higher NPV/BOE than Cold Lake. Duri has a much lower NPV/BOE.

***Conclusion***

**The four projects that have been evaluated are very difficult to compare and the margins of error on estimates of expenditures is large. Therefore conclusions can only be reached with great caution.**

**The international trend is that projects with a higher net back and with lower costs typically obtain a higher government take.**

**In this respect the relatively low costs in the case of Duri stand out. This is in particular of great relevance under low price conditions. It is therefore to be expected that Duri has a much higher government take than the other three projects. As can be seen, despite the much higher government take, Duri has an attractive IRR and PFR10 relative to Cold Lake and West Sak. This seems to confirm that the terms for Cold Lake and West Sak are justified compared to Duri.**

**The comparison between Cold Lake and Kern River, is difficult because the cost structure of the two projects is very different. Furthermore, the Kern River economics are not based on new investments which are about to take place. The Kern River comparison is based on a hypothetical case. It should be noted that in the US $ 30 - $ 40 price range the divisible income for Kern River is higher. This seems to justify a higher overall government take for Kern River at these price levels. However, at high price levels of $ 50 or higher, it seems that there would be some justification for a higher government take in the case of Cold Lake on a competitive basis. Also the high royalties in Kern River under prices over US $ 40 per barrel, seems to indicate that there is some possibility for higher base royalties in Cold Lake.**

**The comparison between Cold Lake and West Sak is more relevant, because the cost structure of the two projects is similar. Both West Sak and Cold Lake are relatively unattractive projects in the US $ 20 – US $ 30 per barrel range. For prices in the US $ 40 – US $ 100 range, the undiscounted government take for West Sak is much higher. It is in the 59% - 67% range for cost level 4. Yet, the PFR10 for Cold Lake is higher in this price range. The West Sak data indicate that a somewhat lower PFR10 in Alberta would still be competitive. This in turn would permit a higher government take on Cold Lake.**

**Based on the West Sak comparison, it can be concluded that a somewhat higher government take for Cold Lake for price levels of US $ 40 - $ 100 would be justified and competitive, in particular when a government take structure would be implemented that would be price progressive. The results for Kern River and Duri do not contradict this conclusion.**

**What seems very obvious from this analysis is that the strong cost increases in Alberta over the last few years have eroded the competitive position of Alberta and the potential level of divisible income. This matter will be discussed in more detail in Section 5.4 of this report.**

## 5.3. Athabasca Mine + Upgrader – comparisons

Following is a step by step comparison between an Athabasca Mine + Upgrader development and Orinoco developments under the 2006 and possible new system.

*Gross Revenues per barrel*

The following maps show that the government revenues for Athabasca and Orinoco both with similar upgraders would be identical. This is because it was assumed that the SCO value would be equal in all cases to WTI. This is not entirely the case for deep upgrading projects and there will be some differentials between Athabasca and Orinoco. Nevertheless, for the purposes of this analysis these differences may not impact on the conclusions.

**Table 5.41. MINE-ATHABASCA-UPGRADER**
**Gross Revenues per SCO barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | $22.73 | $22.73 |
| 30 | 34.09 | $4.26 | $34.09 | | | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 |
| 40 | 45.45 | $5.68 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 |
| 50 | 56.82 | $7.10 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 |
| 60 | 68.18 | $8.52 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 |
| 70 | 79.55 | $9.94 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 |
| 80 | 90.91 | $11.36 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 |
| 90 | 102.27 | $12.78 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 |
| 100 | 113.64 | $14.20 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 |

**Table 5.51. ORINOCO**
**Gross Revenues per SCO barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | $22.73 | $22.73 | $22.73 | $22.73 |
| 30 | 34.09 | $1.89 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 |
| 40 | 45.45 | $2.53 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 |
| 50 | 56.82 | $3.16 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 |
| 60 | 68.18 | $3.79 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 |
| 70 | 79.55 | $4.42 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 |
| 80 | 90.91 | $5.05 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 |
| 90 | 102.27 | $5.68 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 |
| 100 | 113.64 | $6.31 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 |

**Table 5.61. ORINOCO (New Terms)**
**Gross Revenues per SCO barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | $22.73 | $22.73 | $22.73 | $22.73 |
| 30 | 34.09 | $1.89 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 | $34.09 |
| 40 | 45.45 | $2.53 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 | $45.45 |
| 50 | 56.82 | $3.16 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 | $56.82 |
| 60 | 68.18 | $3.79 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 | $68.18 |
| 70 | 79.55 | $4.42 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 | $79.55 |
| 80 | 90.91 | $5.05 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 | $90.91 |
| 90 | 102.27 | $5.68 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 | $102.27 |
| 100 | 113.64 | $6.31 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 | $113.64 |

## *Total expenditures per barrel*

The total expenditures compare as illustrated by the following maps.

**Table 5.42. MINE-ATHABASCA-UPGRADER**
**Total expenditures ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | $15.59 | $13.17 |
| 30 | 34.09 | $4.26 | $34.09 | | | $23.87 | $21.45 | $19.03 | $16.61 | $14.19 |
| 40 | 45.45 | $5.68 | $45.45 | $29.74 | $27.31 | $24.89 | $22.47 | $20.05 | $17.63 | $15.21 |
| 50 | 56.82 | $7.10 | $56.82 | $30.75 | $28.33 | $25.91 | $23.49 | $21.07 | $18.65 | $16.23 |
| 60 | 68.18 | $8.52 | $68.18 | $31.77 | $29.35 | $26.93 | $24.51 | $22.09 | $19.67 | $17.25 |
| 70 | 79.55 | $9.94 | $79.55 | $32.79 | $30.37 | $27.95 | $25.53 | $23.11 | $20.69 | $18.27 |
| 80 | 90.91 | $11.36 | $90.91 | $33.81 | $31.39 | $28.97 | $26.55 | $24.13 | $21.71 | $19.29 |
| 90 | 102.27 | $12.78 | $102.27 | $34.83 | $32.41 | $29.99 | $27.57 | $25.15 | $22.73 | $20.31 |
| 100 | 113.64 | $14.20 | $113.64 | $35.85 | $33.43 | $31.01 | $28.59 | $26.17 | $23.75 | $21.33 |

**Table 5.52. ORINOCO**
**Total expenditures ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | $10.83 | $9.33 | $7.83 |
| 30 | 34.09 | $1.89 | $34.09 | $17.27 | $15.77 | $14.27 | $12.78 | $11.28 | $9.78 | $8.28 |
| 40 | 45.45 | $2.53 | $45.45 | $17.72 | $16.22 | $14.73 | $13.23 | $11.73 | $10.24 | $8.74 |
| 50 | 56.82 | $3.16 | $56.82 | $18.17 | $16.68 | $15.18 | $13.68 | $12.19 | $10.69 | $9.19 |
| 60 | 68.18 | $3.79 | $68.18 | $18.63 | $17.13 | $15.63 | $14.14 | $12.64 | $11.14 | $9.64 |
| 70 | 79.55 | $4.42 | $79.55 | $19.08 | $17.58 | $16.09 | $14.59 | $13.09 | $11.59 | $10.10 |
| 80 | 90.91 | $5.05 | $90.91 | $19.53 | $18.04 | $16.54 | $15.04 | $13.54 | $12.05 | $10.55 |
| 90 | 102.27 | $5.68 | $102.27 | $19.99 | $18.49 | $16.99 | $15.49 | $14.00 | $12.50 | $11.00 |
| 100 | 113.64 | $6.31 | $113.64 | $20.44 | $18.94 | $17.44 | $15.95 | $14.45 | $12.95 | $11.46 |

**Table 5.62. ORINOCO (New Terms)**
**Total expenditures ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | $9.33 | $7.83 |
| 30 | 34.09 | $1.89 | $34.09 | | $15.77 | $14.27 | $12.78 | $11.28 | $9.78 | $8.28 |
| 40 | 45.45 | $2.53 | $45.45 | $17.72 | $16.22 | $14.73 | $13.23 | $11.73 | $10.24 | $8.74 |
| 50 | 56.82 | $3.16 | $56.82 | $18.17 | $16.68 | $15.18 | $13.68 | $12.19 | $10.69 | $9.19 |
| 60 | 68.18 | $3.79 | $68.18 | $18.63 | $17.13 | $15.63 | $14.14 | $12.64 | $11.14 | $9.64 |
| 70 | 79.55 | $4.42 | $79.55 | $19.08 | $17.58 | $16.09 | $14.59 | $13.09 | $11.59 | $10.10 |
| 80 | 90.91 | $5.05 | $90.91 | $19.53 | $18.04 | $16.54 | $15.04 | $13.54 | $12.05 | $10.55 |
| 90 | 102.27 | $5.68 | $102.27 | $19.99 | $18.49 | $16.99 | $15.49 | $14.00 | $12.50 | $11.00 |
| 100 | 113.64 | $6.31 | $113.64 | $20.44 | $18.94 | $17.44 | $15.95 | $14.45 | $12.95 | $11.46 |

As is very obvious from the graphs, the Orinoco total expenditures are considerable less than for a Mine + Upgrader in Athabasca. There are a number of important reasons. Firstly, the viscosity in Athabasca is much higher and therefore requires a mining operation (or alternatively a SAGD operation). The Orinoco heavy oil is flowing to the wells and can therefore be produced based on cold methodologies. This saves the requirement to inject steam. Relatively high flow rates per well are being obtained in the Orinoco with horizontal and multilateral wells.

Furthermore, the overall level of cost escalation in Venezuela was less than in Alberta over the last three years and therefore based on 2007 data the capital expenditures for production and upgrading are less.

There is no difference between “Orinoco” and “Orinoco (new terms)” because the only variation between these two cases are the fiscal terms.

*Divisible Income per barrel*

The following maps show the relative values for the divisible income per barrel.

**Table 5.43. MINE-ATHABASCA-UPGRADER**
**Divisible Income ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | $7.13 | $9.55 |
| 30 | 34.09 | $4.26 | $34.09 | | | $10.22 | $12.64 | $15.06 | $17.48 | $19.90 |
| 40 | 45.45 | $5.68 | $45.45 | $15.72 | $18.14 | $20.56 | $22.98 | $25.40 | $27.82 | $30.24 |
| 50 | 56.82 | $7.10 | $56.82 | $26.06 | $28.48 | $30.90 | $33.33 | $35.75 | $38.17 | $40.59 |
| 60 | 68.18 | $8.52 | $68.18 | $36.41 | $38.83 | $41.25 | $43.67 | $46.09 | $48.51 | $50.93 |
| 70 | 79.55 | $9.94 | $79.55 | $46.75 | $49.17 | $51.59 | $54.01 | $56.43 | $58.85 | $61.28 |
| 80 | 90.91 | $11.36 | $90.91 | $57.10 | $59.52 | $61.94 | $64.36 | $66.78 | $69.20 | $71.62 |
| 90 | 102.27 | $12.78 | $102.27 | $67.44 | $69.86 | $72.28 | $74.70 | $77.12 | $79.54 | $81.96 |
| 100 | 113.64 | $14.20 | $113.64 | $77.78 | $80.21 | $82.63 | $85.05 | $87.47 | $89.89 | $92.31 |

**Table 5.53. ORINOCO**
**Divisible Income ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | $11.90 | $13.40 | $14.90 |
| 30 | 34.09 | $1.89 | $34.09 | $16.82 | $18.32 | $19.82 | $21.31 | $22.81 | $24.31 | $25.81 |
| 40 | 45.45 | $2.53 | $45.45 | $27.73 | $29.23 | $30.73 | $32.23 | $33.72 | $35.22 | $36.72 |
| 50 | 56.82 | $3.16 | $56.82 | $38.64 | $40.14 | $41.64 | $43.14 | $44.63 | $46.13 | $47.63 |
| 60 | 68.18 | $3.79 | $68.18 | $49.56 | $51.05 | $52.55 | $54.05 | $55.54 | $57.04 | $58.54 |
| 70 | 79.55 | $4.42 | $79.55 | $60.47 | $61.96 | $63.46 | $64.96 | $66.45 | $67.95 | $69.45 |
| 80 | 90.91 | $5.05 | $90.91 | $71.38 | $72.87 | $74.37 | $75.87 | $77.36 | $78.86 | $80.36 |
| 90 | 102.27 | $5.68 | $102.27 | $82.29 | $83.78 | $85.28 | $86.78 | $88.28 | $89.77 | $91.27 |
| 100 | 113.64 | $6.31 | $113.64 | $93.20 | $94.69 | $96.19 | $97.69 | $99.19 | $100.68 | $102.18 |

**Table 5.63. ORINOCO (New Terms)**
**Divisible Income ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | $13.40 | $14.90 |
| 30 | 34.09 | $1.89 | $34.09 | | $18.32 | $19.82 | $21.31 | $22.81 | $24.31 | $25.81 |
| 40 | 45.45 | $2.53 | $45.45 | $27.73 | $29.23 | $30.73 | $32.23 | $33.72 | $35.22 | $36.72 |
| 50 | 56.82 | $3.16 | $56.82 | $38.64 | $40.14 | $41.64 | $43.14 | $44.63 | $46.13 | $47.63 |
| 60 | 68.18 | $3.79 | $68.18 | $49.56 | $51.05 | $52.55 | $54.05 | $55.54 | $57.04 | $58.54 |
| 70 | 79.55 | $4.42 | $79.55 | $60.47 | $61.96 | $63.46 | $64.96 | $66.45 | $67.95 | $69.45 |
| 80 | 90.91 | $5.05 | $90.91 | $71.38 | $72.87 | $74.37 | $75.87 | $77.36 | $78.86 | $80.36 |
| 90 | 102.27 | $5.68 | $102.27 | $82.29 | $83.78 | $85.28 | $86.78 | $88.28 | $89.77 | $91.27 |
| 100 | 113.64 | $6.31 | $113.64 | $93.20 | $94.69 | $96.19 | $97.69 | $99.19 | $100.68 | $102.18 |

The lower costs in Venezuela will create a higher divisible income. Based on a Cost Level of 4 and an oil price of US $ 60 per barrel, the divisible income per barrel in Athabasca is Cdn $ 43.67 per barrel and in the Orinoco Belt it is US $ 54.05 per barrel.

## *Government Revenues (incl. participation) per barrel*

The following three maps provide for the government revenues per barrel. These revenues include the revenues generated through the participation in the investments by Venezuela.

**Table 5.44. MINE-ATHABASCA-UPGRADER**
**Government Income + Participation per SCO barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | $2.64 | $3.68 |
| 30 | 34.09 | $4.26 | $34.09 | | | $3.74 | $4.80 | $5.82 | $6.83 | $7.82 |
| 40 | 45.45 | $5.68 | $45.45 | $5.92 | $6.96 | $7.97 | $8.98 | $9.97 | $10.96 | $11.95 |
| 50 | 56.82 | $7.10 | $56.82 | $10.12 | $11.12 | $12.12 | $13.11 | $14.11 | $15.09 | $16.08 |
| 60 | 68.18 | $8.52 | $68.18 | $14.27 | $15.26 | $16.25 | $17.24 | $18.24 | $19.22 | $20.21 |
| 70 | 79.55 | $9.94 | $79.55 | $18.41 | $19.40 | $20.38 | $21.38 | $22.36 | $23.35 | $24.34 |
| 80 | 90.91 | $11.36 | $90.91 | $22.54 | $23.52 | $24.52 | $25.50 | $26.49 | $27.48 | $28.47 |
| 90 | 102.27 | $12.78 | $102.27 | $26.67 | $27.66 | $28.65 | $29.64 | $30.63 | $31.61 | $32.59 |
| 100 | 113.64 | $14.20 | $113.64 | $30.80 | $31.80 | $32.78 | $33.77 | $34.75 | $35.74 | $36.72 |

**Table 5.54. ORINOCO**
**Government Income + Participation per SCO barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | $9.40 | $10.40 | $11.39 |
| 30 | 34.09 | $1.89 | $34.09 | $13.35 | $14.35 | $15.34 | $16.34 | $17.33 | $18.33 | $19.32 |
| 40 | 45.45 | $2.53 | $45.45 | $21.28 | $22.28 | $23.27 | $24.27 | $25.27 | $26.26 | $27.26 |
| 50 | 56.82 | $3.16 | $56.82 | $29.22 | $30.21 | $31.21 | $32.20 | $33.20 | $34.19 | $35.19 |
| 60 | 68.18 | $3.79 | $68.18 | $37.15 | $38.14 | $39.14 | $40.13 | $41.13 | $42.12 | $43.12 |
| 70 | 79.55 | $4.42 | $79.55 | $45.08 | $46.07 | $47.07 | $48.06 | $49.06 | $50.05 | $51.05 |
| 80 | 90.91 | $5.05 | $90.91 | $53.01 | $54.01 | $55.00 | $56.00 | $56.99 | $57.99 | $58.98 |
| 90 | 102.27 | $5.68 | $102.27 | $60.94 | $61.94 | $62.93 | $63.93 | $64.92 | $65.92 | $66.91 |
| 100 | 113.64 | $6.31 | $113.64 | $68.87 | $69.87 | $70.86 | $71.86 | $72.85 | $73.85 | $74.84 |

**Table 5.64. ORINOCO (New Terms)**
**Government Income + Participation per SCO barrel ($ Cdn)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | $11.94 | $13.11 |
| 30 | 34.09 | $1.89 | $34.09 | | $16.44 | $17.61 | $18.79 | $19.96 | $21.13 | $22.31 |
| 40 | 45.45 | $2.53 | $45.45 | $24.46 | $25.63 | $26.81 | $27.98 | $29.16 | $30.33 | $31.50 |
| 50 | 56.82 | $3.16 | $56.82 | $33.66 | $34.83 | $36.00 | $37.18 | $38.35 | $39.53 | $40.70 |
| 60 | 68.18 | $3.79 | $68.18 | $42.85 | $44.03 | $45.20 | $46.38 | $47.55 | $48.72 | $49.90 |
| 70 | 79.55 | $4.42 | $79.55 | $52.05 | $53.22 | $54.40 | $55.57 | $56.75 | $57.92 | $59.09 |
| 80 | 90.91 | $5.05 | $90.91 | $61.25 | $62.42 | $63.59 | $64.77 | $65.94 | $67.12 | $68.29 |
| 90 | 102.27 | $5.68 | $102.27 | $70.44 | $71.62 | $72.79 | $73.97 | $75.14 | $76.31 | $77.49 |
| 100 | 113.64 | $6.31 | $113.64 | $79.64 | $80.81 | $81.99 | $83.16 | $84.34 | $85.51 | $86.68 |

As can be easily seen from the maps, under the Orinoco 2006 fiscal terms Venezuela extracts far higher revenues per barrel than would be the case for Athabasca.

Under the 2006 Orinoco fiscal terms applicable to projects that are in operation, the government revenues per barrel (including participation) are 2 to 3 times as high as for Athabasca.

Under the new Orinoco terms the government revenues per barrel (including participation) would be 4 to 6 times as high as for Athabasca.

The large difference is in part due to the direct participation in the investments by Venezuela.

*Private Investor Net Cash per barrel*

The private investor net cash per barrel is displayed in the following three maps.

**Table 5.45. MINE-ATHABASCA-UPGRADER**
**Net Cash ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | $4.50 | $5.88 |
| 30 | 34.09 | $4.26 | $34.09 | | | $6.48 | $7.83 | $9.23 | $10.65 | $12.08 |
| 40 | 45.45 | $5.68 | $45.45 | $9.80 | $11.18 | $12.59 | $14.00 | $15.43 | $16.86 | $18.29 |
| 50 | 56.82 | $7.10 | $56.82 | $15.94 | $17.36 | $18.78 | $20.21 | $21.64 | $23.07 | $24.51 |
| 60 | 68.18 | $8.52 | $68.18 | $22.14 | $23.57 | $25.00 | $26.43 | $27.85 | $29.29 | $30.72 |
| 70 | 79.55 | $9.94 | $79.55 | $28.34 | $29.78 | $31.21 | $32.64 | $34.07 | $35.50 | $36.94 |
| 80 | 90.91 | $11.36 | $90.91 | $34.56 | $35.99 | $37.42 | $38.85 | $40.28 | $41.72 | $43.15 |
| 90 | 102.27 | $12.78 | $102.27 | $40.77 | $42.20 | $43.63 | $45.07 | $46.50 | $47.93 | $49.37 |
| 100 | 113.64 | $14.20 | $113.64 | $46.98 | $48.41 | $49.85 | $51.28 | $52.72 | $54.15 | $55.59 |

**Table 5.55. ORINOCO**
**Net Cash ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | $2.50 | $3.00 | $3.50 |
| 30 | 34.09 | $1.89 | $34.09 | $3.47 | $3.97 | $4.47 | $4.98 | $5.48 | $5.98 | $6.48 |
| 40 | 45.45 | $2.53 | $45.45 | $6.45 | $6.95 | $7.45 | $7.96 | $8.46 | $8.96 | $9.46 |
| 50 | 56.82 | $3.16 | $56.82 | $9.43 | $9.93 | $10.43 | $10.93 | $11.44 | $11.94 | $12.44 |
| 60 | 68.18 | $3.79 | $68.18 | $12.41 | $12.91 | $13.41 | $13.91 | $14.42 | $14.92 | $15.42 |
| 70 | 79.55 | $4.42 | $79.55 | $15.39 | $15.89 | $16.39 | $16.89 | $17.39 | $17.90 | $18.40 |
| 80 | 90.91 | $5.05 | $90.91 | $18.37 | $18.87 | $19.37 | $19.87 | $20.37 | $20.88 | $21.38 |
| 90 | 102.27 | $5.68 | $102.27 | $21.35 | $21.85 | $22.35 | $22.85 | $23.35 | $23.85 | $24.36 |
| 100 | 113.64 | $6.31 | $113.64 | $24.32 | $24.83 | $25.33 | $25.83 | $26.33 | $26.83 | $27.34 |

**Table 5.65. ORINOCO (New Terms)**
**Net Cash ($ Cdn) per barrel of SCO**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | $1.46 | $1.79 |
| 30 | 34.09 | $1.89 | $34.09 | | $1.88 | $2.21 | $2.53 | $2.85 | $3.18 | $3.50 |
| 40 | 45.45 | $2.53 | $45.45 | $3.27 | $3.60 | $3.92 | $4.24 | $4.57 | $4.89 | $5.21 |
| 50 | 56.82 | $3.16 | $56.82 | $4.99 | $5.31 | $5.63 | $5.96 | $6.28 | $6.60 | $6.93 |
| 60 | 68.18 | $3.79 | $68.18 | $6.70 | $7.02 | $7.35 | $7.67 | $7.99 | $8.32 | $8.64 |
| 70 | 79.55 | $4.42 | $79.55 | $8.41 | $8.74 | $9.06 | $9.39 | $9.71 | $10.03 | $10.36 |
| 80 | 90.91 | $5.05 | $90.91 | $10.13 | $10.45 | $10.78 | $11.10 | $11.42 | $11.75 | $12.07 |
| 90 | 102.27 | $5.68 | $102.27 | $11.84 | $12.17 | $12.49 | $12.81 | $13.14 | $13.46 | $13.78 |
| 100 | 113.64 | $6.31 | $113.64 | $13.56 | $13.88 | $14.20 | $14.53 | $14.85 | $15.17 | $15.50 |

As can be easily understood, the large difference in government revenues per barrel, create also a large difference in net cash per barrel.

The Net Cash per barrel to investors in Athabasca for an upgrader project is 2 to 3 times as high as under Orinoco 2006 terms and 3 to 4 times as high as under Orinoco new terms.

*Undiscounted Government Take*

The following maps display the undiscounted government take, excluding the take from government participation.

**Table 5.46. MINE-ATHABASCA-UPGRADER**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | 36.97% | 38.49% |
| 30 | 34.09 | $4.26 | $34.09 | | | 36.60% | 38.01% | 38.68% | 39.05% | 39.30% |
| 40 | 45.45 | $5.68 | $45.45 | 37.63% | 38.35% | 38.77% | 39.06% | 39.25% | 39.40% | 39.52% |
| 50 | 56.82 | $7.10 | $56.82 | 38.83% | 39.05% | 39.22% | 39.35% | 39.46% | 39.55% | 39.62% |
| 60 | 68.18 | $8.52 | $68.18 | 39.19% | 39.31% | 39.40% | 39.48% | 39.57% | 39.62% | 39.69% |
| 70 | 79.55 | $9.94 | $79.55 | 39.38% | 39.45% | 39.51% | 39.58% | 39.63% | 39.68% | 39.72% |
| 80 | 90.91 | $11.36 | $90.91 | 39.48% | 39.53% | 39.59% | 39.63% | 39.68% | 39.72% | 39.75% |
| 90 | 102.27 | $12.78 | $102.27 | 39.54% | 39.59% | 39.64% | 39.67% | 39.71% | 39.74% | 39.76% |
| 100 | 113.64 | $14.20 | $113.64 | 39.60% | 39.64% | 39.67% | 39.70% | 39.73% | 39.76% | 39.78% |

**Table 5.56. ORINOCO**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | 66.14% | 63.88% | 62.07% |
| 30 | 34.09 | $1.89 | $34.09 | 66.73% | 65.03% | 63.59% | 62.34% | 61.27% | 60.32% | 59.49% |
| 40 | 45.45 | $2.53 | $45.45 | 62.49% | 61.64% | 60.88% | 60.18% | 59.55% | 58.97% | 58.44% |
| 50 | 56.82 | $3.16 | $56.82 | 60.65% | 60.10% | 59.59% | 59.11% | 58.67% | 58.26% | 57.87% |
| 60 | 68.18 | $3.79 | $68.18 | 59.61% | 59.21% | 58.83% | 58.48% | 58.14% | 57.82% | 57.52% |
| 70 | 79.55 | $4.42 | $79.55 | 58.95% | 58.64% | 58.34% | 58.05% | 57.78% | 57.52% | 57.27% |
| 80 | 90.91 | $5.05 | $90.91 | 58.50% | 58.24% | 57.99% | 57.75% | 57.53% | 57.31% | 57.09% |
| 90 | 102.27 | $5.68 | $102.27 | 58.16% | 57.94% | 57.73% | 57.53% | 57.33% | 57.14% | 56.96% |
| 100 | 113.64 | $6.31 | $113.64 | 57.90% | 57.71% | 57.53% | 57.35% | 57.18% | 57.01% | 56.85% |

**Table 5.66. ORINOCO (New terms)**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | 72.74% | 70.05% |
| 30 | 34.09 | $1.89 | $34.09 | | 74.36% | 72.21% | 70.36% | 68.76% | 67.35% | 66.11% |
| 40 | 45.45 | $2.53 | $45.45 | 70.53% | 69.27% | 68.13% | 67.10% | 66.16% | 65.30% | 64.51% |
| 50 | 56.82 | $3.16 | $56.82 | 67.76% | 66.94% | 66.19% | 65.49% | 64.83% | 64.22% | 63.64% |
| 60 | 68.18 | $3.79 | $68.18 | 66.21% | 65.61% | 65.05% | 64.52% | 64.02% | 63.55% | 63.10% |
| 70 | 79.55 | $4.42 | $79.55 | 65.22% | 64.75% | 64.31% | 63.89% | 63.48% | 63.10% | 62.73% |
| 80 | 90.91 | $5.05 | $90.91 | 64.53% | 64.15% | 63.78% | 63.43% | 63.09% | 62.77% | 62.45% |
| 90 | 102.27 | $5.68 | $102.27 | 64.03% | 63.71% | 63.39% | 63.09% | 62.80% | 62.52% | 62.25% |
| 100 | 113.64 | $6.31 | $113.64 | 63.64% | 63.36% | 63.09% | 62.83% | 62.57% | 62.33% | 62.09% |

The emphasis on royalties in Venezuela makes the fiscal system regressive with respect to price and with respect to costs.

The above maps analyze the government take only on the basis of actual payments to governments by companies. The government take excludes the government revenues derived from government participation. From this view point, the government take for the Orinoco 2006 terms is "average". The new Orinoco terms are price and cost regressive, due to the high royalty and therefore the government take is "high" under low prices and "average" under higher prices.

The "average" government take under the Orinoco 2006 terms is an important item. The current joint ventures are based on joint operating agreements, whereby each partner (including Venezuela) contributes its share of the costs. Therefore each partner perceives the government take as "average" with respect to **his** share of the investments. An "average" government take for each partner for the Orinoco Belt operations may be acceptable to the current private investors.

Under the new terms, "mixed companies" have to be created. The participation of Venezuela is through shareholding by CVP (the Venezuelan government entity that participates). The capital outlays of the mixed company are heavily financed. This creates the possibility for "cross subsidization" among the shareholders. There is no longer a clear distinction between government take "without" and "with" participation. It is likely that some of the investors may simply start to regard all payments to government as effective "government take" including the dividends paid on the shares owned by CVP.

In order to show the difference, following are the same two government take maps, but now with the government participation included.

**Table 5.56-B. ORINOCO**
**Undiscounted Government Take with participation**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | 79.00% | 77.60% | 76.48% |
| 30 | 34.09 | $1.89 | $34.09 | 79.37% | 78.32% | 77.42% | 76.65% | 75.98% | 75.40% | 74.88% |
| 40 | 45.45 | $2.53 | $45.45 | 76.74% | 76.22% | 75.74% | 75.31% | 74.92% | 74.56% | 74.23% |
| 50 | 56.82 | $3.16 | $56.82 | 75.60% | 75.26% | 74.94% | 74.65% | 74.38% | 74.12% | 73.88% |
| 60 | 68.18 | $3.79 | $68.18 | 74.96% | 74.71% | 74.48% | 74.26% | 74.05% | 73.85% | 73.66% |
| 70 | 79.55 | $4.42 | $79.55 | 74.55% | 74.36% | 74.17% | 73.99% | 73.82% | 73.66% | 73.51% |
| 80 | 90.91 | $5.05 | $90.91 | 74.27% | 74.11% | 73.95% | 73.81% | 73.67% | 73.53% | 73.40% |
| 90 | 102.27 | $5.68 | $102.27 | 74.06% | 73.92% | 73.79% | 73.67% | 73.55% | 73.43% | 73.31% |
| 100 | 113.64 | $6.31 | $113.64 | 73.90% | 73.78% | 73.67% | 73.56% | 73.45% | 73.35% | 73.25% |

**Table 5.66-B. ORINOCO (New Terms)**
**Undiscounted Government Take with participation**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | 89.10% | 88.02% |
| 30 | 34.09 | $1.89 | $34.09 | | 89.74% | 88.88% | 88.14% | 87.50% | 86.94% | 86.44% |
| 40 | 45.45 | $2.53 | $45.45 | 88.21% | 87.71% | 87.25% | 86.84% | 86.46% | 86.12% | 85.80% |
| 50 | 56.82 | $3.16 | $56.82 | 87.10% | 86.78% | 86.48% | 86.19% | 85.93% | 85.69% | 85.46% |
| 60 | 68.18 | $3.79 | $68.18 | 86.48% | 86.25% | 86.02% | 85.81% | 85.61% | 85.42% | 85.24% |
| 70 | 79.55 | $4.42 | $79.55 | 86.09% | 85.90% | 85.72% | 85.55% | 85.39% | 85.24% | 85.09% |
| 80 | 90.91 | $5.05 | $90.91 | 85.81% | 85.66% | 85.51% | 85.37% | 85.24% | 85.11% | 84.98% |
| 90 | 102.27 | $5.68 | $102.27 | 85.61% | 85.48% | 85.36% | 85.24% | 85.12% | 85.01% | 84.90% |
| 100 | 113.64 | $6.31 | $113.64 | 85.46% | 85.34% | 85.24% | 85.13% | 85.03% | 84.93% | 84.83% |

As can be seen under the new terms, the government take would now be very high across the board, if the government participation of 60% is included in the government take.

*5% Discounted Government Take*

The following three maps provide the 5% discounted government take without participation.

**Table 5.47. MINE-ATHABASCA-UPGRADER**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | 50.32% | 43.01% |
| 30 | 34.09 | $4.26 | $34.09 | | | 55.40% | 45.78% | 42.88% | 41.58% | 40.86% |
| 40 | 45.45 | $5.68 | $45.45 | 48.25% | 44.60% | 42.84% | 41.85% | 41.20% | 40.78% | 40.47% |
| 50 | 56.82 | $7.10 | $56.82 | 42.83% | 42.00% | 41.45% | 41.03% | 40.73% | 40.48% | 40.29% |
| 60 | 68.18 | $8.52 | $68.18 | 41.61% | 41.22% | 40.92% | 40.67% | 40.50% | 40.33% | 40.21% |
| 70 | 79.55 | $9.94 | $79.55 | 41.11% | 40.86% | 40.65% | 40.51% | 40.35% | 40.25% | 40.14% |
| 80 | 90.91 | $11.36 | $90.91 | 40.82% | 40.64% | 40.51% | 40.38% | 40.28% | 40.19% | 40.10% |
| 90 | 102.27 | $12.78 | $102.27 | 40.63% | 40.52% | 40.42% | 40.31% | 40.23% | 40.14% | 40.06% |
| 100 | 113.64 | $14.20 | $113.64 | 40.52% | 40.43% | 40.33% | 40.25% | 40.17% | 40.11% | 40.04% |

**Table 5.57. ORINOCO**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | 87.67% | 77.88% | 71.19% |
| 30 | 34.09 | $1.89 | $34.09 | 94.16% | 85.43% | 78.96% | 73.98% | 70.03% | 66.83% | 64.17% |
| 40 | 45.45 | $2.53 | $45.45 | 75.58% | 72.27% | 69.48% | 67.08% | 65.00% | 63.19% | 61.58% |
| 50 | 56.82 | $3.16 | $56.82 | 69.15% | 67.23% | 65.53% | 64.00% | 62.62% | 61.37% | 60.24% |
| 60 | 68.18 | $3.79 | $68.18 | 65.90% | 64.58% | 63.37% | 62.26% | 61.24% | 60.29% | 59.41% |
| 70 | 79.55 | $4.42 | $79.55 | 63.93% | 62.94% | 62.01% | 61.14% | 60.33% | 59.57% | 58.85% |
| 80 | 90.91 | $5.05 | $90.91 | 62.62% | 61.82% | 61.07% | 60.36% | 59.69% | 59.05% | 58.45% |
| 90 | 102.27 | $5.68 | $102.27 | 61.67% | 61.01% | 60.38% | 59.78% | 59.21% | 58.66% | 58.14% |
| 100 | 113.64 | $6.31 | $113.64 | 60.96% | 60.40% | 59.85% | 59.34% | 58.84% | 58.36% | 57.91% |

**Table 5.67. ORINOCO (New Terms)**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | 88.93% | 80.49% |
| 30 | 34.09 | $1.89 | $34.09 | | 98.03% | 89.93% | 83.69% | 78.74% | 74.71% | 71.38% |
| 40 | 45.45 | $2.53 | $45.45 | 85.51% | 81.39% | 77.89% | 74.89% | 72.30% | 70.03% | 68.02% |
| 50 | 56.82 | $3.16 | $56.82 | 77.39% | 75.00% | 72.88% | 70.97% | 69.25% | 67.69% | 66.27% |
| 60 | 68.18 | $3.79 | $68.18 | 73.28% | 71.64% | 70.13% | 68.75% | 67.48% | 66.30% | 65.20% |
| 70 | 79.55 | $4.42 | $79.55 | 70.80% | 69.56% | 68.40% | 67.32% | 66.31% | 65.37% | 64.48% |
| 80 | 90.91 | $5.05 | $90.91 | 69.13% | 68.14% | 67.21% | 66.33% | 65.49% | 64.70% | 63.95% |
| 90 | 102.27 | $5.68 | $102.27 | 67.94% | 67.12% | 66.34% | 65.59% | 64.88% | 64.20% | 63.56% |
| 100 | 113.64 | $6.31 | $113.64 | 67.05% | 66.34% | 65.67% | 65.03% | 64.41% | 63.82% | 63.25% |

The 5% discounted government take is similar to the undiscounted government take. Generally, the discounted government take is somewhat higher. This illustrates that the Venezuelan system is rather "front end loaded". Also the cost and price regressivity is somewhat more pronounced.

*IRR*

The following three maps illustrate the IRR.

**Table 5.48. MINE-ATHABASCA-UPGRADER**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | 6.60% | 9.80% |
| 30 | 34.09 | $4.26 | $34.09 | | | 6.04% | 7.91% | 10.17% | 12.99% | 16.74% |
| 40 | 45.45 | $5.68 | $45.45 | 7.10% | 8.60% | 10.34% | 12.40% | 14.91% | 18.10% | 22.37% |
| 50 | 56.82 | $7.10 | $56.82 | 10.45% | 12.07% | 13.96% | 16.21% | 18.98% | 22.51% | 27.26% |
| 60 | 68.18 | $8.52 | $68.18 | 13.37% | 15.11% | 17.15% | 19.61% | 22.61% | 26.46% | 31.59% |
| 70 | 79.55 | $9.94 | $79.55 | 16.00% | 17.86% | 20.06% | 22.67% | 25.92% | 30.02% | 35.52% |
| 80 | 90.91 | $11.36 | $90.91 | 18.42% | 20.41% | 22.72% | 25.53% | 28.95% | 33.32% | 39.11% |
| 90 | 102.27 | $12.78 | $102.27 | 20.68% | 22.76% | 25.22% | 28.16% | 31.77% | 36.36% | 42.46% |
| 100 | 113.64 | $14.20 | $113.64 | 22.79% | 24.99% | 27.57% | 30.64% | 34.43% | 39.21% | 45.54% |

**Table 5.58. ORINOCO**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | 6.43% | 8.56% | 11.39% |
| 30 | 34.09 | $1.89 | $34.09 | 5.55% | 6.74% | 8.11% | 9.74% | 11.75% | 14.31% | 17.77% |
| 40 | 45.45 | $2.53 | $45.45 | 9.05% | 10.37% | 11.92% | 13.79% | 16.10% | 19.06% | 23.08% |
| 50 | 56.82 | $3.16 | $56.82 | 12.03% | 13.50% | 15.23% | 17.31% | 19.90% | 23.23% | 27.72% |
| 60 | 68.18 | $3.79 | $68.18 | 14.69% | 16.30% | 18.20% | 20.49% | 23.32% | 26.97% | 31.87% |
| 70 | 79.55 | $4.42 | $79.55 | 17.13% | 18.87% | 20.92% | 23.39% | 26.46% | 30.38% | 35.64% |
| 80 | 90.91 | $5.05 | $90.91 | 19.39% | 21.25% | 23.45% | 26.09% | 29.36% | 33.53% | 39.10% |
| 90 | 102.27 | $5.68 | $102.27 | 21.52% | 23.49% | 25.81% | 28.61% | 32.06% | 36.46% | 42.32% |
| 100 | 113.64 | $6.31 | $113.64 | 23.52% | 25.60% | 28.04% | 30.98% | 34.60% | 39.20% | 45.32% |

**Table 5.68. ORINOCO (New Terms)**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | 6.87% | 9.54% |
| 30 | 34.09 | $1.89 | $34.09 | | 5.25% | 6.56% | 8.11% | 10.00% | 12.42% | 15.66% |
| 40 | 45.45 | $2.53 | $45.45 | 7.51% | 8.76% | 10.23% | 12.00% | 14.16% | 16.95% | 20.71% |
| 50 | 56.82 | $3.16 | $56.82 | 10.37% | 11.76% | 13.39% | 15.35% | 17.78% | 20.90% | 25.13% |
| 60 | 68.18 | $3.79 | $68.18 | 12.91% | 14.42% | 16.21% | 18.36% | 21.03% | 24.46% | 29.09% |
| 70 | 79.55 | $4.42 | $79.55 | 15.23% | 16.86% | 18.79% | 21.12% | 24.01% | 27.71% | 32.69% |
| 80 | 90.91 | $5.05 | $90.91 | 17.37% | 19.12% | 21.19% | 23.68% | 26.77% | 30.72% | 36.01% |
| 90 | 102.27 | $5.68 | $102.27 | 19.38% | 21.24% | 23.43% | 26.08% | 29.34% | 33.51% | 39.09% |
| 100 | 113.64 | $6.31 | $113.64 | 21.28% | 23.24% | 25.55% | 28.34% | 31.77% | 36.14% | 41.97% |

Interestingly, despite the very high government revenues per barrel in Venezuela, the IRR for the Orinoco Belt is similar to the IRR for Athabasca under the Orinoco 2006 terms, but lower with the new Orinoco terms.

## *PFR10*

The following three maps illustrate the PFR10 maps.

The PFR10 is calculated on the basis of the investor share of the capital expenditures only. Not the total capital expenditures.

**Table 5.49. MINE-ATHABASCA-UPGRADER**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | | | 0.79 | 0.99 |
| 30 | 34.09 | $4.26 | $34.09 | | | 0.76 | 0.87 | 1.01 | 1.21 | 1.50 |
| 40 | 45.45 | $5.68 | $45.45 | 0.82 | 0.91 | 1.02 | 1.16 | 1.35 | 1.61 | 2.00 |
| 50 | 56.82 | $7.10 | $56.82 | 1.03 | 1.14 | 1.28 | 1.46 | 1.69 | 2.02 | 2.51 |
| 60 | 68.18 | $8.52 | $68.18 | 1.23 | 1.37 | 1.53 | 1.75 | 2.03 | 2.42 | 3.01 |
| 70 | 79.55 | $9.94 | $79.55 | 1.44 | 1.59 | 1.79 | 2.03 | 2.36 | 2.82 | 3.52 |
| 80 | 90.91 | $11.36 | $90.91 | 1.64 | 1.82 | 2.04 | 2.32 | 2.70 | 3.23 | 4.02 |
| 90 | 102.27 | $12.78 | $102.27 | 1.84 | 2.04 | 2.29 | 2.61 | 3.04 | 3.63 | 4.52 |
| 100 | 113.64 | $14.20 | $113.64 | 2.04 | 2.27 | 2.54 | 2.90 | 3.37 | 4.03 | 5.03 |

**Table 5.59. ORINOCO**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | 0.72 | 0.88 | 1.12 |
| 30 | 34.09 | $1.89 | $34.09 | 0.65 | 0.74 | 0.84 | 0.98 | 1.16 | 1.41 | 1.79 |
| 40 | 45.45 | $2.53 | $45.45 | 0.92 | 1.03 | 1.17 | 1.36 | 1.60 | 1.94 | 2.45 |
| 50 | 56.82 | $3.16 | $56.82 | 1.18 | 1.33 | 1.50 | 1.73 | 2.04 | 2.47 | 3.11 |
| 60 | 68.18 | $3.79 | $68.18 | 1.45 | 1.62 | 1.84 | 2.11 | 2.48 | 2.99 | 3.77 |
| 70 | 79.55 | $4.42 | $79.55 | 1.71 | 1.91 | 2.17 | 2.49 | 2.92 | 3.52 | 4.43 |
| 80 | 90.91 | $5.05 | $90.91 | 1.98 | 2.21 | 2.50 | 2.87 | 3.36 | 4.05 | 5.09 |
| 90 | 102.27 | $5.68 | $102.27 | 2.24 | 2.50 | 2.83 | 3.24 | 3.80 | 4.58 | 5.75 |
| 100 | 113.64 | $6.31 | $113.64 | 2.51 | 2.80 | 3.16 | 3.62 | 4.24 | 5.11 | 6.41 |

**Table 5.69. ORINOCO (New Terms)**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | 0.75 | 0.96 |
| 30 | 34.09 | $1.89 | $34.09 | | 0.63 | 0.72 | 0.84 | 1.00 | 1.22 | 1.55 |
| 40 | 45.45 | $2.53 | $45.45 | 0.80 | 0.90 | 1.02 | 1.18 | 1.39 | 1.69 | 2.14 |
| 50 | 56.82 | $3.16 | $56.82 | 1.03 | 1.16 | 1.32 | 1.52 | 1.79 | 2.16 | 2.73 |
| 60 | 68.18 | $3.79 | $68.18 | 1.27 | 1.42 | 1.61 | 1.85 | 2.18 | 2.64 | 3.32 |
| 70 | 79.55 | $4.42 | $79.55 | 1.50 | 1.68 | 1.91 | 2.19 | 2.57 | 3.11 | 3.91 |
| 80 | 90.91 | $5.05 | $90.91 | 1.74 | 1.94 | 2.20 | 2.53 | 2.97 | 3.58 | 4.50 |
| 90 | 102.27 | $5.68 | $102.27 | 1.98 | 2.21 | 2.49 | 2.86 | 3.36 | 4.05 | 5.09 |
| 100 | 113.64 | $6.31 | $113.64 | 2.21 | 2.47 | 2.79 | 3.20 | 3.75 | 4.52 | 5.68 |

The PFR10 maps indicate that the Venezuelan PFR10 values are more attractive than the Athabasca values. This is directly due to the fact that the amount of required capital expenditures is so much lower and is also caused by the fact that the PFR10 is calculated on the basis of the investor share of the investments only. In other words, it is assumed that no "cross subsidization" takes place. As discussed, this is unlikely under the New Orinoco terms.

*<u>NPV10/BOE</u>*

The next three maps are the NPV10/BOE maps.

The NPV10/BOE is calculated on the basis of the total project barrels, not the working interest barrels. Therefore, this variable indicates the opportunity for high NPV10 values net to the investor.

**Table 5.50. MINE-ATHABASCA-UPGRADER**
**NPV10/SCO bbl**

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $2.84 | $22.73 | | | | -$1.73 | -$1.14 | -$0.58 | -$0.03 |
| 30 | 34.09 | $4.26 | $34.09 | -$2.21 | -$1.63 | -$1.06 | -$0.51 | $0.04 | $0.57 | $1.10 |
| 40 | 45.45 | $5.68 | $45.45 | -$0.99 | -$0.44 | $0.10 | $0.63 | $1.17 | $1.69 | $2.22 |
| 50 | 56.82 | $7.10 | $56.82 | $0.16 | $0.70 | $1.23 | $1.76 | $2.28 | $2.81 | $3.33 |
| 60 | 68.18 | $8.52 | $68.18 | $1.29 | $1.82 | $2.35 | $2.88 | $3.40 | $3.92 | $4.44 |
| 70 | 79.55 | $9.94 | $79.55 | $2.42 | $2.94 | $3.47 | $3.99 | $4.51 | $5.03 | $5.55 |
| 80 | 90.91 | $11.36 | $90.91 | $3.53 | $4.06 | $4.58 | $5.11 | $5.63 | $6.15 | $6.66 |
| 90 | 102.27 | $12.78 | $102.27 | $4.65 | $5.17 | $5.69 | $6.22 | $6.74 | $7.26 | $7.78 |
| 100 | 113.64 | $14.20 | $113.64 | $5.76 | $6.29 | $6.81 | $7.33 | $7.85 | $8.37 | $8.89 |

Table 5.60. ORINOCO
NPV10/SCO Barrel

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | -$0.34 | -$0.12 | $0.10 |
| 30 | 34.09 | $1.89 | $34.09 | -$0.70 | -$0.47 | -$0.25 | -$0.03 | $0.19 | $0.41 | $0.63 |
| 40 | 45.45 | $2.53 | $45.45 | -$0.16 | $0.06 | $0.28 | $0.50 | $0.72 | $0.94 | $1.16 |
| 50 | 56.82 | $3.16 | $56.82 | $0.37 | $0.59 | $0.81 | $1.03 | $1.25 | $1.47 | $1.70 |
| 60 | 68.18 | $3.79 | $68.18 | $0.90 | $1.12 | $1.34 | $1.57 | $1.79 | $2.01 | $2.23 |
| 70 | 79.55 | $4.42 | $79.55 | $1.43 | $1.66 | $1.88 | $2.10 | $2.32 | $2.54 | $2.76 |
| 80 | 90.91 | $5.05 | $90.91 | $1.97 | $2.19 | $2.41 | $2.63 | $2.85 | $3.07 | $3.29 |
| 90 | 102.27 | $5.68 | $102.27 | $2.50 | $2.72 | $2.94 | $3.16 | $3.38 | $3.60 | $3.82 |
| 100 | 113.64 | $6.31 | $113.64 | $3.03 | $3.25 | $3.47 | $3.69 | $3.91 | $4.13 | $4.36 |

Table 5.70. ORINOCO (New Terms)
NPV10/SCO Barrel

| WTI US $ | WTI Can $ | Gas Price Can $ | SCO Price Can $ | COST-7 | COST-6 | COST-5 | COST-4 | COST-3 | COST-2 | COST-1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | $1.26 | $22.73 | | | | | | -$0.16 | -$0.02 |
| 30 | 34.09 | $1.89 | $34.09 | | -$0.43 | -$0.29 | -$0.14 | $0.00 | $0.14 | $0.29 |
| 40 | 45.45 | $2.53 | $45.45 | -$0.26 | -$0.12 | $0.02 | $0.16 | $0.31 | $0.45 | $0.59 |
| 50 | 56.82 | $3.16 | $56.82 | $0.04 | $0.19 | $0.33 | $0.47 | $0.61 | $0.76 | $0.90 |
| 60 | 68.18 | $3.79 | $68.18 | $0.35 | $0.49 | $0.63 | $0.78 | $0.92 | $1.06 | $1.20 |
| 70 | 79.55 | $4.42 | $79.55 | $0.65 | $0.80 | $0.94 | $1.08 | $1.22 | $1.37 | $1.51 |
| 80 | 90.91 | $5.05 | $90.91 | $0.96 | $1.10 | $1.25 | $1.39 | $1.53 | $1.67 | $1.82 |
| 90 | 102.27 | $5.68 | $102.27 | $1.27 | $1.41 | $1.55 | $1.69 | $1.84 | $1.98 | $2.12 |
| 100 | 113.64 | $6.31 | $113.64 | $1.57 | $1.72 | $1.86 | $2.00 | $2.14 | $2.29 | $2.43 |

As can be expected the NPV10/BOE values are much higher for Athabasca. These values are 1.5 to 2 times as high as in Venezuela. This is directly due to the high degree of government participation in Venezuela.

As was indicated in the previous report "Preliminary fiscal evaluation of Alberta oil sands terms (April 12, 2007)", the fact that such high NPV10/BOE values can be obtained for a very large amount of barrels is an enormous attraction for investing in Athabasca oil sands.

## ***Conclusion***

**In making a comparison between Alberta oil sands terms and Venezuelan terms it should be noted that the Orinoco 2006 fiscal terms applicable to heavy oils in Venezuela were not entered into voluntarily. These terms were imposed on the four consortia after the main investments had been made.**

**The four consortia that are currently operating in the Orinoco Belt, started operations in the 1990's and early part of this decade on the basis of a royalty system that provided for royalty holiday period with a very low royalty. Also the**

**corporate income tax rate applicable to production and upgrading was 34%, not 50%. There is therefore no evidence that the current terms would be acceptable to the four consortia if investments in new heavy oil projects would be considered starting today (as is the economic assumption in this report).**

**However, it would be my assessment that companies would be willing to accept these current terms in Venezuela if they were offered new projects in a hypothetical environment of much lower political risk.**

**With respect to the new terms, it should be noted that these terms are under negotiation. No new large integrated investment projects have been announced based on these terms. Also the companies that are in negotiation on these terms, such as CNPC, Lukoil, Repsol and Petrobras, do not have extensive experience in heavy oil operations. Therefore, there is potentially strategic value for such companies in commencing their first large heavy oil project, or simply obtaining access to large resources.**

**Therefore, conclusions need to be reached with caution.**

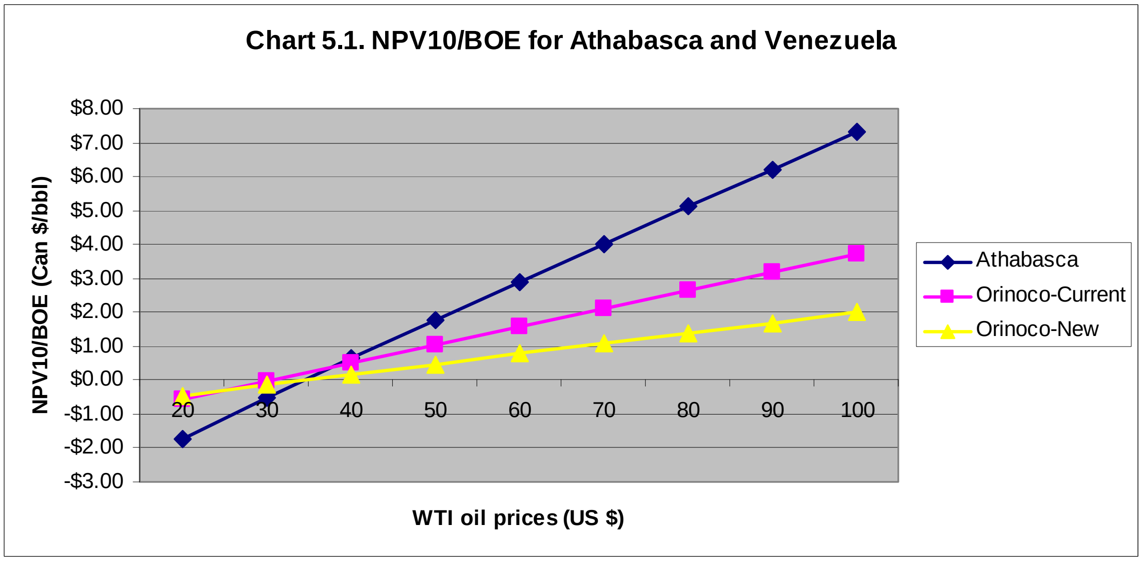
**It seems that the very low government take in Alberta in general seems competitive with the average government take (excluding participation) in the Orinoco Belt based on the current fiscal system, since the IRR and PFR10 in Venezuela are still comparable.**

**Nevertheless, at the same time it seems that the NPV/BOE differential increases very significantly with price.**

**Chart 5.1 illustrates this rapid divergence of the NPV/BOE between Athabasca and the Orinoco.**

**The divergence commences at about US $ 40 WTI per barrel.**

**It we would assume that new agreements would be entered into somewhere between the "Orinoco-Current" and "Orinoco-New", than there is a very large divergence indeed.**




**Based on this aspect Alberta could take a progressively higher government share with price over US $ 40 per barrel. Such a system would not impede the competitive position of Alberta relative to Venezuela. This would be true in particular if the political risk factor is taken into account.**

**The Venezuelan system is for an important part based on royalties and is therefore cost regressive. This creates, in principle, some possibility for Alberta to take a somewhat more cost regressive approach without endangering the competitive position of Alberta in terms of world wide heavy oils/oil sands developments.**

**This conclusion seems particularly relevant if it is taken into consideration that apart from Venezuela, there are no other possibilities in the world for very large resource access to heavy oils/oil sands under similar terms.**

**In the case of the comparison with Venezuela, the matter of strong cost escalation over the last few years in Alberta proves to be very important. It is clear that the competitive position of Alberta has eroded considerably. This matter will be discussed in more detail below.**

## 5.4. Effect of recent Alberta cost escalation

### 5.4.1. General relationship between competitive government take, revenues and expenditures.

Prior to discussing the effect of the Alberta cost escalation, it is beneficial to make a few comments on the relationship between competitive government take, revenues and costs.

The "competitive government take" is the maximum government take that can be extracted from the petroleum operations based on certain assumptions about minimum profitability on the part of the investors.

The "minimum level of profitability" can be a fixed benchmark, such as 20% IRR, or it could be a series of values, whereby the IRR or other profitability indicator is a variable depending on price, for instance.

The level of competitive government take depends on a number of factors:

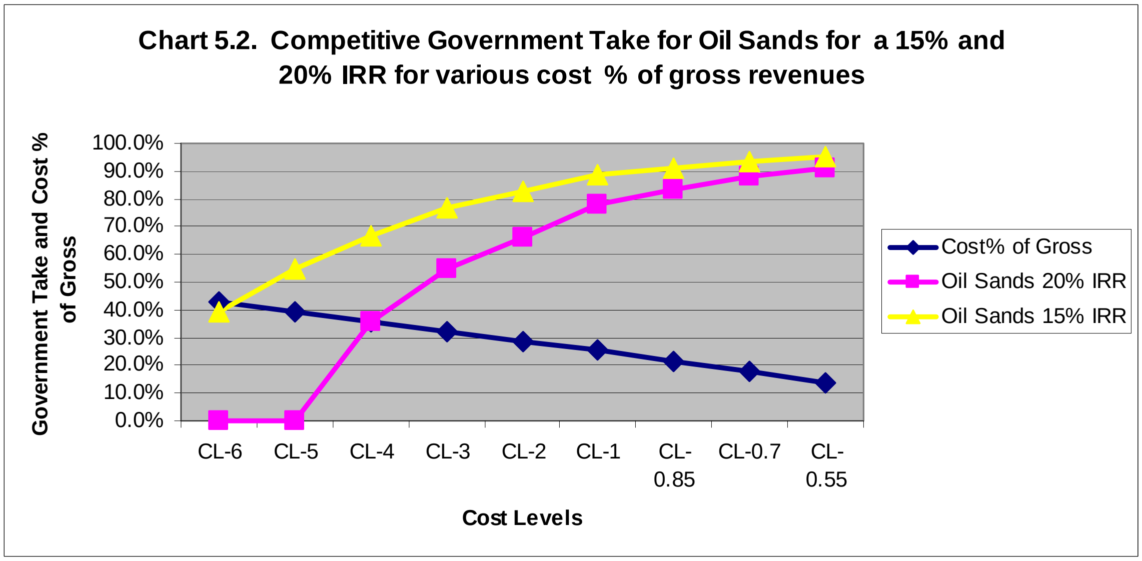
- The relationship between costs and revenues
- The minimum level of profitability
- The timing of the cash flow, and
- The profitability indicator that is used for analysis.

***Fixed Benchmarks***

First the minimum level of profitability will be evaluated based on fixed benchmarks.

The relationship between revenues and total expenditures can be illustrated by expressing expenditures as a percentage of the revenues. For instance, if a target oil price is US $ 60 per barrel and the total expenditures are US $ 12 per barrel, the costs per barrel are 20% of the gross revenues.

Chart 5.2. illustrates the relationship of the competitive government take and the expenditures as a percentage of the costs. This chart was generated on the basis of US $ 60 per barrel and the cost scenarios that have been used in the previous and this study for Alberta oil sands. To expand the graph also lower costs of 85%, 70% and 55% of Cost Level -1 were evaluated.




As can be expected, as the level of expenditures goes down the level of competitive government take goes up.

If total capital and operating expenditures for a typical oil sand project would be about Can $ 10 per barrel (approximately 55% of Cost Level -1) and the average price expectation would be US $ 60 (Can $ 68.18 per barrel) per barrel, the province of Alberta would be able to extract a 91% undiscounted government take if the investors need a 20% IRR. The province would be able to have a 95% government take if the investors need 15% IRR.

On the other hand if cost levels are about 40% of revenues, the government take would have to be 0% if the investor needs a 20% IRR at US $ 60 per barrel, but could be 55% if the investor needs a 15% IRR.

As can be seen the level of competitive government take is very sensitive to the cost/price relationship and the profitability requirements.

Under current international competitive conditions it would not be unreasonable for an investor to require 20% IRR under US $ 60 per barrel. Based on these criteria, the current level of government take of about 39% would permit an investor to invest in projects up to a Cost Level of 4. If Alberta would insist on a flat government take of 55% the marginal project for such an investor would be a project with a Cost Level of 3 and if Alberta would insist on a 66% government take, the maximum Cost Level would be 2.

For instance, Norway has a government take of about 75% (depending on uplift assumptions) and the UK 50% on an undiscounted basis. This means that investors will be able to undertake projects with a higher level of cost in the UK. This is indeed the case. The average fields in the UK are smaller and have a higher costs per barrel than the fields in Norway.

Chart 5.3 is the same chart as Chart 5.2, but now based on Canadian dollars per barrel. Also the net cash flow of the investor is now displayed as well as the Alberta government revenues. It can be seen how the Alberta government revenues per barrel are very sensitive to the level of costs.

Between Cost Level 2 and Cost level 4, for every dollar cost increase, the total government revenues have to be reduced by $ 3 and the Alberta revenues by $ 4 in order to have a competitive system that provides a 20% IRR at a price level of US $ 60 (Can $ 68.18).

The chart also shows how the net cash flow requirements to maintain 20% IRR increase very strongly with cost increases. The reason is that higher costs (under the same price) create a longer payout time and therefore a disproportionately higher level of net cash flow is required in order to maintain a 20% IRR. From Cost Level 2 to Cost Level 4, the investor needs to increase his net cash flow per barrel from about Can $ 16 per barrel to Can $ 28 per barrel in order to maintain 20% IRR.

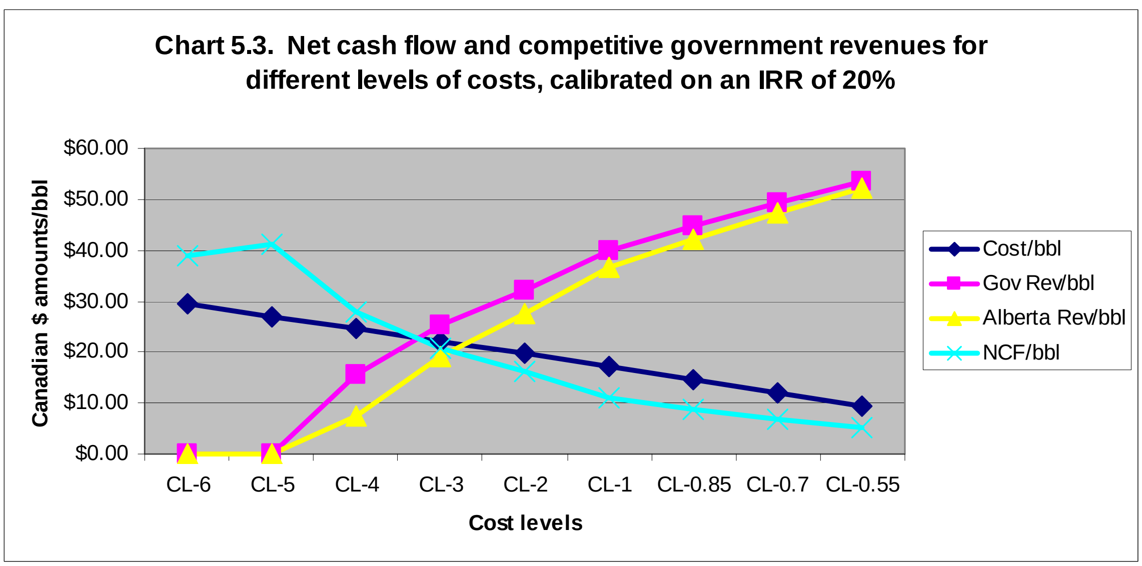
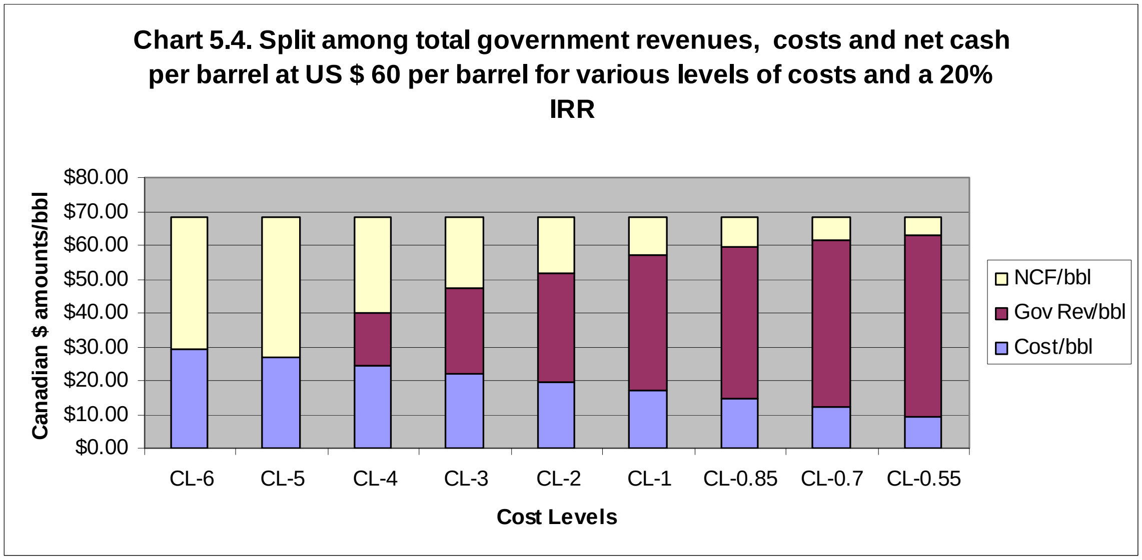



Chart 5.4 shows the percentage distribution how the total gross revenues of Can $ 66.18 per barrel are distributed between expenditures, net cash flow and government revenues.

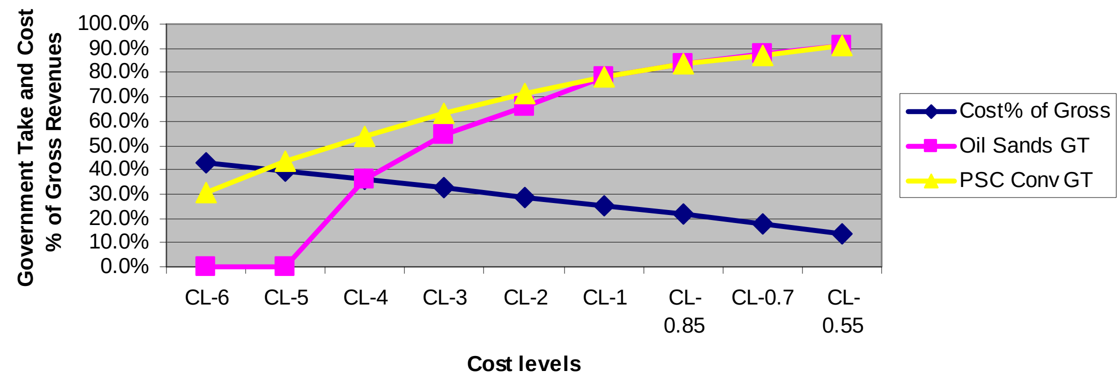



The competitive government take depends very much on the timing and nature of the cash flow. For instance, in conventional oil fields, where payout is much faster than for oil sands projects, the IRR of 20% is reached much faster for the same cost/revenue relationship.

Therefore, the competitive government take is much higher for typical conventional oil fields. This is illustrated in Chart 5.5, which provides the competitive government take for a conventional oil field under a typical Egyptian production sharing contract.

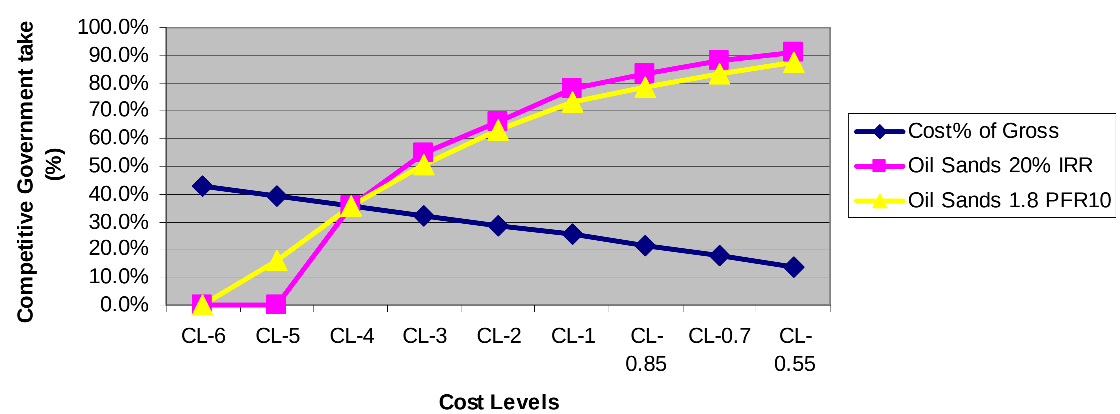
It can be seen, how in this case the competitive government take under low cost conditions is nearly identical. However, as costs increase, the competitive government take on oil sands drops much faster than for a conventional oil field.

**Chart 5.5. Competitive Government Take for oil sands and a conventional oil PSC calibrated at 20% IRR for different levels of cost as % of gross revenues**




The level of competitive government take also depends on the profitability indicator that is being used. Chart 5.6 compares the results for a 20% IRR benchmark and a PFR10 of 1.80. The PFR10 would permit a higher competitive government take under high cost conditions, in fact a government take of 16% is now possible under Cost Level 5. However, the PFR10 would require a lower government take under low cost conditions. Nevertheless, the overall profile is rather similar.

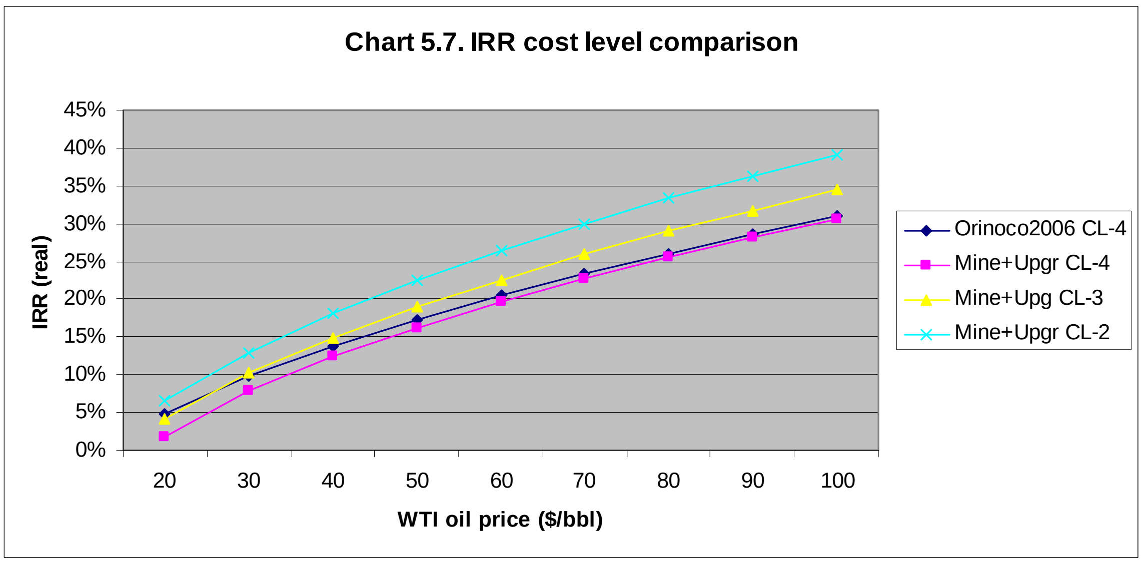
**Chart 5.6. Competitive government take for various cost/revenue relationships based on 20% IRR and a PFR10 of 1.80.**



### ***Variable Benchmarks***

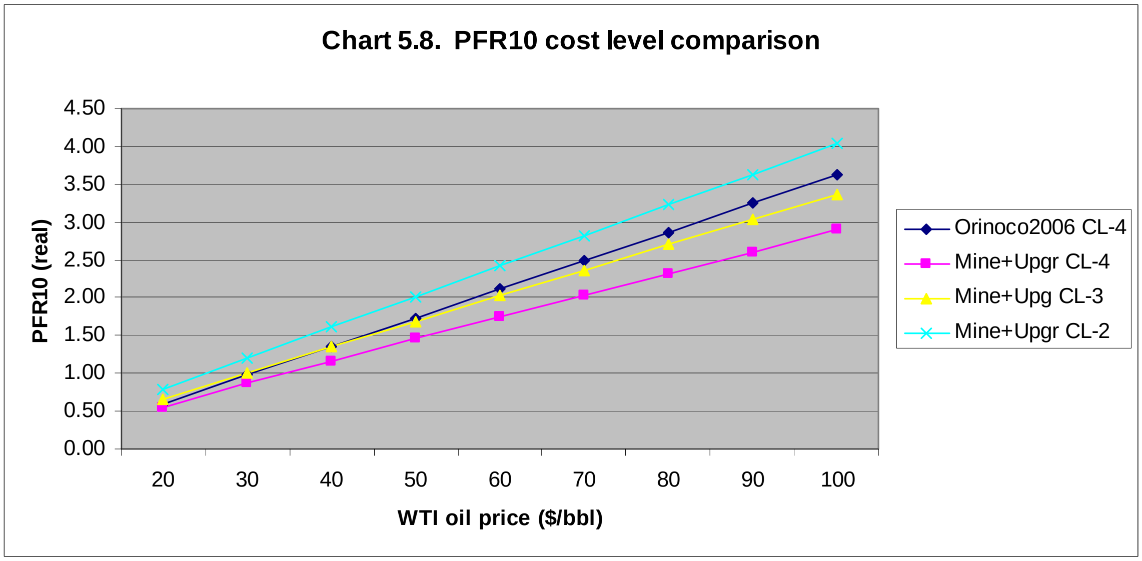
It is possible to compare the projects also over an entire range of prices.

For instance, the Venezuela project under Orinoco2006 terms and Cost Level 4 could be used as a benchmark. From Chart 5.7 it can be seen that the IRR moves from about 5% to 30% for an WTI oil price moving from US $ 20 to US $ 100. This entire range of IRR's can now be compared with an Alberta Athabasca oil sand project as is done in Chart 5.7.



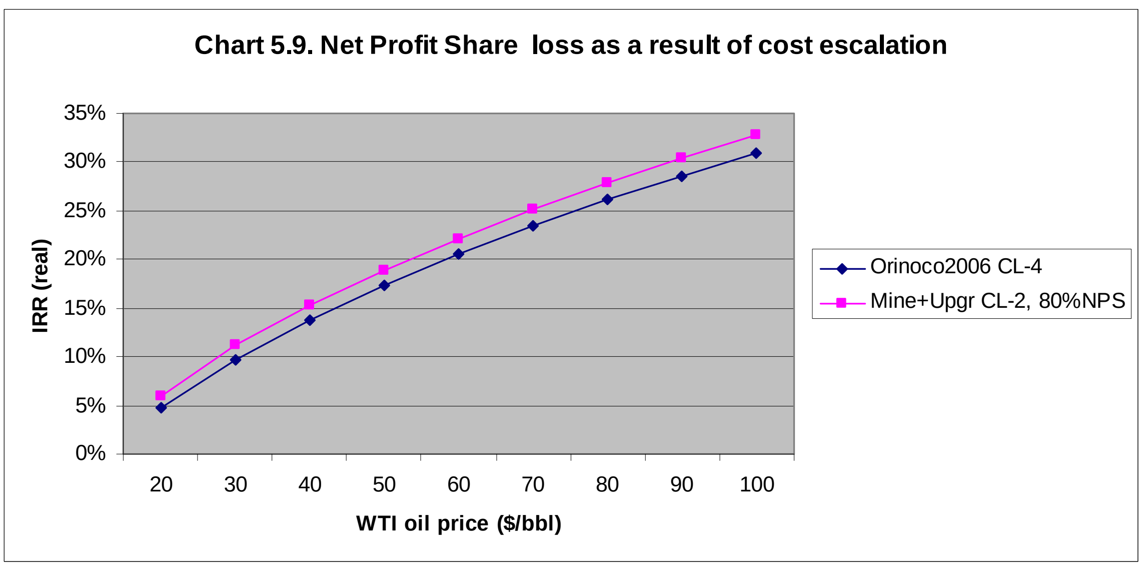

This chart shows how Cost Level 2 under Alberta terms would be more attractive than Cost Level 4 under Venezuelan terms. At Cost Level 4 the two projects are about equal.

Chart 5.3 illustrates the same for the PFR10.




We could now analyze a competitive fiscal system for different cost levels for the entire IRR range with price.

An Athabasca oil sands project with Cost Level 2 could have a Net Profit Share of 80% instead of 25% and still be competitive with Venezuela as Chart 5.9 illustrates.



With respect to the interaction of competitive government take and cost/revenue levels various strategies are possible:

1. **Governments could employ a relative low flat (or even regressive) level of government take.** This will make projects with high cost levels attractive. It will also result in the government earning far less than the competitive government take on lower cost projects. In other words, the government leaves government take on the table. However, these systems may be appropriate where a government wishes to strongly stimulate development of a limited resource. Such systems are typically applied by importing jurisdictions or jurisdictions which aim for energy self sufficiency as would be the case for the Gulf of Mexico or the UK offshore.
2. **Governments could employ a relatively high flat level of government take.** This will only make projects with a relatively low cost level attractive. It will result in an adequate government take on low cost projects, although still some competitive government take loss would occur under very low cost projects. It also means that higher costs resources will be kept for future development when oil prices may be higher or when technology has advanced sufficiently to make such projects less costly. Nations have to have a large resource base to employ such a strategy, since only a fraction of the resources will be developed. Norway and many large exporting jurisdictions are employing this strategy.
3. **Government could employ a variable level of government take.** Governments could also design a system with a variable government take, whereby the government take is adjusted with the cost/revenue relationship. A high government take applies for low cost projects and a low government take applies for high cost projects. These are the progressive systems that are aimed at trying to obtain a competitive government take for every level of the cost/revenue relationship. These systems result in the possibility to develop a wide range of projects. In general the level of resource development is slower than under strategy 1, since no extra profits can be made by investors.

As a result of the sudden oil price increases, Alberta has essentially followed for the last three years strategy 1. This has resulted in an economic boom and a very strong development in view of the very large resource base. Investors have therefore migrated to opportunities with Cost Level 4 or higher, depending on their profitability criteria. With the lower overall government take that has developed over the last decade, companies have been able to invest in projects that have a higher cost/revenue relationship. This now locks Alberta into a situation that is difficult to get out of. With projects with a high to very high cost/revenue relationship under development, it would not be possible to increase government take substantially for all projects with a flat government take without affecting these projects very negatively.

It seems that given the large resource base in Alberta an overall strategy for the longer term future should be aimed at strategy 2, with maybe possible elements of 3. This would slow down the boom and permit Alberta to extract a higher level of competitive government take. However, this is difficult to achieve under current circumstances and would require time.

### 5.4.2. Effect of Alberta cost escalation

The relationship between competitive government take and cost/revenues is very sensitive for the Alberta oil sands. Due to the long payout times, compared with international projects, the competitive government take that can be obtained by Alberta diminishes very rapidly with higher costs.

Costs have escalated over the entire world relatively strongly due to the higher oil prices, which stimulated more development. However, there is considerable evidence that costs have escalated in Alberta far stronger than in most competing areas.

As a result the investors are now faced with relatively much higher costs than in competing areas. This results in a further significant loss of competitive government take opportunities.

***Conclusion***

**It seems that if Albertans want to obtain a significant share of the oil sands wealth over the coming decades, the core strategy of the Alberta government will have to be to cost reduction.**

**From a fiscal design perspective this would indicate a fiscal system that strongly encourages cost efficiency. This means a fiscal system that is more cost regressive, for instance through higher base royalties.**

**It would also indicate that a strategy aimed at trying to produce every marginal barrel with a flat government take is the wrong one for the Alberta oil sands. This is a good strategy for an importing jurisdiction with a limited resource base. It is not a good fiscal strategy for an exporting jurisdiction which has a very extensive resource base that cannot be fully produced in the next fifty or hundred years.**

**Instead it seems that Alberta should focus its fiscal system on stimulating a level of activity that is consistent with the maximum possible extraction of the resource wealth. This means a higher government take over a less rapidly expanding**

**production, which would induce much lower costs, which in turn justifies such a higher government take.**

**The higher cost resources would be kept for later once technologies and cost efficiencies have developed or oil prices have increased that make these resources economic under a higher level of government take.**

**In other words, with potentially more than fifty years of oil sand oil production available in the subsoil it would make sense to orient the fiscal strategy at producing the low cost oil sands first and keep higher cost oil sands for later.**

# 6. REVIEW OF SOME OTHER FISCAL SYSTEMS APPLICABLE TO CONVENTIONAL OIL

## 6.1. Comparisons with conventional oil

In the earlier report entitled “Preliminary fiscal evaluation of Alberta oil sands terms” (April 12, 2007) it was discussed how oils sands are rather different from conventional oil. This makes the fiscal terms for oil sand projects very difficult to compare with those designed for conventional oil.

For convenience, some of the text of this earlier report is hereby repeated. The main differences are:

*Exploration*

The first difference is, of course, that the Alberta oil sands do not need to be discovered. The resources have already been identified. It is not necessary to have a high risk exploration program to discover the oil as would be the case for most international developments. This makes the risk profile of Alberta oil sand development fundamentally different from most international developments.

There are few other opportunities in the world for developments of oil that has already been discovered. The projects that are most similar in size and nature are the Orinoco heavy oil developments in Venezuela. Also in the former Soviet Union there were a number of oil fields that had already been discovered for which development contracts were concluded, such as the Tengiz oil field in Kazakhstan. Also some countries are offering EOR contracts or opportunities for fields that have already been producing, such as Kern River in California or Duri in Indonesia. Nevertheless, development opportunities for oil that has already been discovered are rare outside Alberta.

*Reserve size*

Secondly, the individual Alberta projects are of a large size compared to possible international oil field developments. In this report projects of 510 and 1870 million barrels of synthetic crude oil will be discussed. Projects of this size are typical for oil sand developments.

It should be noted that outside Alberta, new development opportunities of crude oil reserves in excess of 500 million barrels are rare. At this time at best about 15 oil projects are in current development or planned by private investors that are in excess of this size.

Internationally, there are even less new development opportunities of crude oil projects in excess of 2 billion barrels reserves. There are probably no more than 5 projects of this scale existing outside Alberta in current development or planned by private investors.

The Alberta oil sands therefore present a unique opportunity for investors for large scale access to oil resources. The number of projects in excess of 500 million barrels in development or planning stage inside Alberta is probably already more than all similar reserve size opportunities combined that exist for private investors in the rest of the world.

*Production profile*

The production profile of Alberta oil sands projects is rather different from typical conventional oil projects, such as large deep water oil fields. Most conventional fields start at a relatively high level of production and feature a relatively steep decline curve within a short period of time. Large conventional oil fields may produce as much as 7 – 10% of the reserves in the first year of peak production. In the case of oil sand developments the first year peak production upon the termination of the last development phase is typically 3 – 5% of the reserves. In general, therefore Alberta oil sand projects compared with the development of conventional oil fields (not including exploratory risk):

- have a lower IRR for the same reserve size, and
- have an attractive NPV10 for the same level of peak production.

Many deep water conventional oil projects often require all main floating facilities to be in place at peak production. Alberta oil sands can be developed in several phases with peak production only being achieved after the second or third phase. This permits cost savings and technological adjustments during the second or third phase and lowers the overall project risk. Also the second and third phases are paid for from cash flow and do not require or require only modest "out-of-pocket" investments.

Therefore, in general, the capital expenditures at the final peak production for Alberta oil sands are high compared to conventional deep water oil fields. However, the "out-of-pocket" capital expenditures prior to the first production are typically modest or average compared to such fields.

*Conclusion*

It is very difficult to compare oil sand projects with conventional oil. However, it may be helpful to explore in the very summary way the range of government take and profitability for large fields in case of conventional oil in order to complete the framework provided in this report.

A comparison will be made with four areas which are under very active exploration and development today, as follows:

- US Gulf of Mexico – Deep Water
- United Kingdom
- Norway
- Angola

### 6.2.Cost and Price Data

In order to make the analysis as comparable as possible with oil sands development, a large 500 million barrel field was used as a basis.

An important difference between the oil sands and conventional oil is that one needs to discover conventional oil. Therefore, reasonable overall exploration costs need to be included in the analysis of conventional oil. These exploration costs should include the dry holes. Exploration costs per barrel are reported in detail by the financial community. Therefore, these data can be used. It was assumed that the following overall exploration costs and appraisal costs would apply:

- For the US Gulf of Mexico and the UK – US $ 4 per barrel
- Norway – US $ 3 per barrel
- Angola – US $ 2 per barrel

It was assumed that these amounts would be incurred in the first three years of the cash flow.

The cash flows start in 2007 and it was assumed that also in this case first production would occur in 2012. This makes NPV10 data as comparable as possible with the heavy oils/oil sands results.

Subsequently, in a rather generic way, a cost range of US $ 2 to US $ 8 per barrel capex, and US $ 2 to US $ 8 per barrel opex was reviewed. This reasonably spans the range of current costs of deep water oil fields. Norway is currently at the upper end of this range, while Angola is still at the lower end of this range.

All fiscal systems will be compared on the basis of the same price-cost maps. For conventional oils the net back differentials are modest. The net backs differentials relative to WTI were assumed to be zero for the US Gulf of Mexico, $ 1 per barrel for Norway and the UK and $ 2 per barrel for Angola.

The fiscal systems of the US Gulf of Mexico and Angola feature signature bonuses. For economic comparison, the signature bonuses were set at zero, since in all cases they are freely biddable or negotiable.

## 6.3.Fiscal terms

**US Gulf of Mexico.** The deep waters of the US Gulf of Mexico have been an area of intensive oil activity and therefore, the fiscal terms are attractive for the environment. The Gulf of Mexico is for US oil companies a direct alternative to Alberta.

The fiscal regime in the Gulf of Mexico changed in early 2007.

Prior to 2007, the area has a favorable royalty regime of 12.5%. An initial royalty suspension volume of 87.5 million barrel equivalent of oil was applicable. Furthermore, the area is subject to the Federal corporate income tax, as well as rentals and bonuses. The US Federal corporate income tax was set at 34%, rather than 35%, in order to take account of the American Jobs Creation Act benefits.

From 2007 onwards the fiscal regime consists for deep water of a 16.67% royalty, while the royalty suspension volume has been reduced to 9 million barrel equivalent.

The Federal Government of the United States does not provide fiscal stability on its terms.

The following two tables show the increase in overall government take for a 500 million barrel field as a result. This increase is about five percentage points.

**Table 6.1-B US-GULF OF MEXICO - DEEP**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 48.35% | 45.79% |
| 30 | 34.09 | | 52.37% | 49.60% | 47.52% | 45.91% | 44.61% | 43.56% |
| 40 | 45.45 | 48.56% | 47.15% | 45.97% | 44.97% | 44.11% | 43.37% | 42.72% |
| 50 | 56.82 | 46.00% | 45.19% | 44.47% | 43.83% | 43.26% | 42.75% | 42.28% |
| 60 | 68.18 | 44.72% | 44.16% | 43.65% | 43.19% | 42.76% | 42.37% | 42.01% |
| 70 | 79.55 | 43.95% | 43.53% | 43.14% | 42.78% | 42.44% | 42.12% | 41.83% |
| 80 | 90.91 | 43.44% | 43.10% | 42.79% | 42.49% | 42.21% | 41.95% | 41.70% |
| 90 | 102.27 | 43.07% | 42.79% | 42.53% | 42.28% | 42.04% | 41.81% | 41.60% |
| 100 | 113.64 | 42.80% | 42.56% | 42.33% | 42.11% | 41.91% | 41.71% | 41.52% |

**Table 6.1 US-GULF OF MEXICO - DEEP -2007**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 56.34% | 52.45% |
| 30 | 34.09 | | | 58.16% | 55.01% | 52.56% | 50.60% | 49.00% |
| 40 | 45.45 | 56.55% | 54.41% | 52.62% | 51.11% | 49.82% | 48.69% | 47.71% |
| 50 | 56.82 | 52.66% | 51.43% | 50.34% | 49.38% | 48.51% | 47.74% | 47.04% |
| 60 | 68.18 | 50.71% | 49.87% | 49.10% | 48.40% | 47.76% | 47.16% | 46.62% |
| 70 | 79.55 | 49.54% | 48.91% | 48.32% | 47.77% | 47.26% | 46.78% | 46.34% |
| 80 | 90.91 | 48.76% | 48.25% | 47.78% | 47.33% | 46.91% | 46.51% | 46.13% |
| 90 | 102.27 | 48.21% | 47.78% | 47.38% | 47.01% | 46.65% | 46.30% | 45.98% |
| 100 | 113.64 | 47.79% | 47.43% | 47.09% | 46.76% | 46.44% | 46.15% | 45.86% |

**United Kingdom.** The UK fundamentally changed its fiscal system in the North Sea in 1993 when it removed the Petroleum Revenue Tax and established that for new licenses the only applicable fiscal terms would be corporate income tax and some rentals. A surcharge was established for corporate income tax, creating a total rate of 40%. In December 2005 the UK proposed to increase the surtax, so that the total tax rate is now 50%. The UK change in fiscal terms is an important indication of the world wide trend to a higher government take.

It should be noted, however, that the UK offshore went through a very rapid development in only four decades and that as a result the remaining prospects are small and marginal. As a result, the discovery of a 500 million barrel field would be a very rare event.

The UK does not provide fiscal stability on its terms.

**Norway.** Norway typically has a high cost environment. Also Norway has seen over the last decade a gradual outflow of capital from the major oil companies and therefore Norway has recently taken some steps to increase the interest of new investors. One of these measures was to provide new investors with a tax rebate equal to the tax value of their losses in case their operations in Norway would be unsuccessful.

The terms of Norway are a basic 28% corporate income tax and a 50% hydrocarbon tax. The hydrocarbon tax has a 30% uplift which can be earned over a 4 year period. Furthermore, there are modest surface rentals.

Norway does not provide fiscal stability on its terms.

**Angola.** Angola Deep offshore has been a prime area of development, in particular for large companies that work also in Alaska, such as BP and ExxonMobil. Angola has a rather progressive system, which in particular under current high oil prices will result eventually in a high government take for most fields, if prices continue.

The Angolan terms are based on a production sharing agreement. These agreements are different from block to block. Following are representative terms. It is assumed that there is a cost oil limit of 50%. The profit oil is based on an IRR sliding scale and moves from 20% profit oil for government to 80% profit oil for government depending on profitability. There is a 45% uplift on capital expenditures. The corporate income tax is 50%. **It should be noted that very high bonuses were paid for the blocks offshore Angola.** A negative feature of the Angola system is that each development area is ring-fenced for production sharing and tax purposes.

Angola provides for near complete fiscal stability on its terms.

The Angola contracts are ring-fenced this means that dry hole costs outside the production sharing contract in which production takes place cannot be deducted or recovered.

### 6.4.Economic-fiscal review

*Undiscounted Government Take*

Following four maps provide undiscounted government take for the four jurisdictions.

**Table 6.1 US-GULF OF MEXICO - DEEP -2007**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 56.34% | 52.45% |
| 30 | 34.09 | | | 58.16% | 55.01% | 52.56% | 50.60% | 49.00% |
| 40 | 45.45 | 56.55% | 54.41% | 52.62% | 51.11% | 49.82% | 48.69% | 47.71% |
| 50 | 56.82 | 52.66% | 51.43% | 50.34% | 49.38% | 48.51% | 47.74% | 47.04% |
| 60 | 68.18 | 50.71% | 49.87% | 49.10% | 48.40% | 47.76% | 47.16% | 46.62% |
| 70 | 79.55 | 49.54% | 48.91% | 48.32% | 47.77% | 47.26% | 46.78% | 46.34% |
| 80 | 90.91 | 48.76% | 48.25% | 47.78% | 47.33% | 46.91% | 46.51% | 46.13% |
| 90 | 102.27 | 48.21% | 47.78% | 47.38% | 47.01% | 46.65% | 46.30% | 45.98% |
| 100 | 113.64 | 47.79% | 47.43% | 47.09% | 46.76% | 46.44% | 46.15% | 45.86% |

**Table 6.11 UK-OFFSHORE**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | 51.80% | 51.11% | 50.67% |
| 30 | 34.09 | | 51.86% | 51.37% | 51.01% | 50.74% | 50.53% | 50.35% |
| 40 | 45.45 | 51.21% | 50.97% | 50.77% | 50.61% | 50.47% | 50.34% | 50.24% |
| 50 | 56.82 | 50.79% | 50.66% | 50.54% | 50.43% | 50.34% | 50.26% | 50.18% |
| 60 | 68.18 | 50.59% | 50.50% | 50.41% | 50.34% | 50.27% | 50.20% | 50.14% |
| 70 | 79.55 | 50.47% | 50.40% | 50.34% | 50.28% | 50.22% | 50.17% | 50.12% |
| 80 | 90.91 | 50.39% | 50.33% | 50.28% | 50.23% | 50.19% | 50.14% | 50.10% |
| 90 | 102.27 | 50.33% | 50.29% | 50.24% | 50.20% | 50.16% | 50.13% | 50.09% |
| 100 | 113.64 | 50.29% | 50.25% | 50.21% | 50.18% | 50.14% | 50.11% | 50.08% |

**Table 6.21 NORWAY**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | 63.55% | 68.37% | 71.26% | 73.18% |
| 30 | 34.09 | 66.45% | 69.17% | 71.12% | 72.58% | 73.72% | 74.63% | 75.37% |
| 40 | 45.45 | 72.22% | 73.19% | 73.99% | 74.67% | 75.25% | 75.75% | 76.19% |
| 50 | 56.82 | 74.15% | 74.69% | 75.17% | 75.59% | 75.97% | 76.31% | 76.62% |
| 60 | 68.18 | 75.11% | 75.48% | 75.81% | 76.12% | 76.40% | 76.65% | 76.89% |
| 70 | 79.55 | 75.69% | 75.96% | 76.22% | 76.45% | 76.67% | 76.88% | 77.07% |
| 80 | 90.91 | 76.07% | 76.29% | 76.50% | 76.69% | 76.87% | 77.04% | 77.20% |
| 90 | 102.27 | 76.35% | 76.53% | 76.70% | 76.86% | 77.01% | 77.16% | 77.30% |
| 100 | 113.64 | 76.56% | 76.71% | 76.85% | 76.99% | 77.12% | 77.25% | 77.37% |

**Table 6.31 ANGOLA**
**Undiscounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | 89.98% | 67.95% | 65.78% | 72.21% |
| 30 | 34.09 | 83.99% | 69.99% | 62.18% | 61.58% | 64.12% | 68.93% | 71.15% |
| 40 | 45.45 | 59.92% | 59.69% | 59.94% | 64.81% | 67.52% | 69.23% | 76.08% |
| 50 | 56.82 | 58.83% | 61.16% | 64.77% | 66.73% | 68.15% | 72.25% | 77.48% |
| 60 | 68.18 | 62.43% | 64.69% | 66.23% | 67.43% | 68.43% | 75.22% | 81.72% |
| 70 | 79.55 | 64.60% | 65.88% | 66.88% | 67.75% | 73.27% | 76.28% | 84.35% |
| 80 | 90.91 | 65.63% | 66.48% | 67.27% | 71.18% | 74.78% | 76.87% | 85.39% |
| 90 | 102.27 | 66.17% | 66.90% | 67.63% | 73.45% | 75.63% | 82.19% | 86.12% |
| 100 | 113.64 | 66.62% | 67.23% | 72.15% | 74.53% | 76.22% | 83.62% | 86.47% |

*Government take structure.* The US Gulf of Mexico system is slightly regressive with respect to price and costs. The structure of the government take of the UK provides for a system that is essentially neutral. The system of Norway is slightly progressive with respect to cost and price. The system of Angola is strongly progressive with respect to costs and price.

*Government take level.* The government take of the US Gulf of Mexico is low. The UK has also a low government take, but higher than the US Gulf of Mexico. Norway has a high government take. Angola has a government take that is average for high cost and low prices, but moves progressively to a very high government take for low costs and high prices.

*<u>5% Discounted Government Take.</u>*

The following four maps provide the results for the discounted government take.

**Table 6.2 US-GULF OF MEXICO - DEEP-2007**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 83.07% | 65.36% |
| 30 | 34.09 | | | 85.40% | 71.48% | 63.14% | 57.58% | 53.62% |
| 40 | 45.45 | 75.18% | 67.59% | 62.19% | 58.13% | 54.98% | 52.47% | 50.41% |
| 50 | 56.82 | 61.66% | 58.46% | 55.86% | 53.68% | 51.85% | 50.27% | 48.91% |
| 60 | 68.18 | 56.46% | 54.55% | 52.90% | 51.46% | 50.18% | 49.05% | 48.04% |
| 70 | 79.55 | 53.71% | 52.38% | 51.19% | 50.12% | 49.15% | 48.27% | 47.47% |
| 80 | 90.91 | 52.01% | 51.00% | 50.08% | 49.23% | 48.45% | 47.74% | 47.07% |
| 90 | 102.27 | 50.85% | 50.04% | 49.29% | 48.59% | 47.95% | 47.34% | 46.78% |
| 100 | 113.64 | 50.01% | 49.34% | 48.71% | 48.12% | 47.56% | 47.04% | 46.55% |

**Table 6.12 UK-OFFSHORE**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | 82.81% | 59.36% | 53.93% |
| 30 | 34.09 | | 71.47% | 61.34% | 56.85% | 54.31% | 52.69% | 51.55% |
| 40 | 45.45 | 58.51% | 56.12% | 54.46% | 53.24% | 52.31% | 51.57% | 50.97% |
| 50 | 56.82 | 54.55% | 53.57% | 52.78% | 52.13% | 51.58% | 51.11% | 50.70% |
| 60 | 68.18 | 53.10% | 52.52% | 52.02% | 51.58% | 51.20% | 50.86% | 50.55% |
| 70 | 79.55 | 52.35% | 51.95% | 51.58% | 51.26% | 50.96% | 50.70% | 50.45% |
| 80 | 90.91 | 51.90% | 51.59% | 51.30% | 51.04% | 50.81% | 50.59% | 50.39% |
| 90 | 102.27 | 51.59% | 51.34% | 51.11% | 50.89% | 50.69% | 50.51% | 50.34% |
| 100 | 113.64 | 51.37% | 51.16% | 50.96% | 50.78% | 50.61% | 50.45% | 50.30% |

**Table 6.22 NORWAY**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | 35.68% | 66.00% | 70.48% | 72.28% |
| 30 | 34.09 | 70.37% | 73.00% | 74.05% | 74.62% | 74.97% | 75.21% | 75.39% |
| 40 | 45.45 | 76.09% | 76.15% | 76.20% | 76.24% | 76.27% | 76.29% | 76.31% |
| 50 | 56.82 | 76.91% | 76.87% | 76.84% | 76.81% | 76.79% | 76.77% | 76.75% |
| 60 | 68.18 | 77.23% | 77.18% | 77.14% | 77.10% | 77.07% | 77.04% | 77.01% |
| 70 | 79.55 | 77.41% | 77.36% | 77.32% | 77.28% | 77.24% | 77.21% | 77.18% |
| 80 | 90.91 | 77.52% | 77.48% | 77.43% | 77.40% | 77.36% | 77.33% | 77.30% |
| 90 | 102.27 | 77.60% | 77.56% | 77.52% | 77.48% | 77.45% | 77.42% | 77.39% |
| 100 | 113.64 | 77.65% | 77.61% | 77.58% | 77.55% | 77.51% | 77.48% | 77.46% |

**Table 6.32 ANGOLA**
**5% Discounted Government Take (Income only)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 91.58% | 86.71% |
| 30 | 34.09 | | | 92.53% | 79.32% | 74.84% | 76.48% | 77.10% |
| 40 | 45.45 | 82.18% | 74.45% | 70.16% | 71.39% | 72.58% | 73.36% | 78.73% |
| 50 | 56.82 | 68.49% | 67.70% | 69.52% | 70.52% | 71.30% | 74.04% | 79.27% |
| 60 | 68.18 | 67.19% | 68.38% | 69.25% | 69.96% | 70.63% | 76.26% | 81.96% |
| 70 | 79.55 | 67.63% | 68.38% | 68.99% | 69.58% | 73.86% | 77.02% | 84.37% |
| 80 | 90.91 | 67.76% | 68.28% | 68.83% | 71.57% | 75.12% | 77.42% | 85.33% |
| 90 | 102.27 | 67.74% | 68.26% | 68.85% | 73.51% | 75.83% | 81.50% | 86.03% |
| 100 | 113.64 | 67.82% | 68.30% | 72.03% | 74.46% | 76.33% | 82.92% | 86.32% |

On a 5% discounted government take bases, the systems of US Gulf of Mexico and the UK are regressive with respect to costs and prices. Norway is slightly regressive with costs, but progressive with prices. Angola remains strongly progressive.

*IRR*

The following four maps provide the IRR.

**Table 6.3. US-GULF OF MEXICO- DEEP-2007**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 5.98% | 8.15% |
| 30 | 34.09 | | | 5.95% | 7.57% | 9.32% | 11.21% | 13.26% |
| 40 | 45.45 | 7.22% | 8.60% | 10.08% | 11.66% | 13.37% | 15.21% | 17.20% |
| 50 | 56.82 | 10.62% | 11.99% | 13.45% | 15.02% | 16.70% | 18.50% | 20.45% |
| 60 | 68.18 | 13.50% | 14.87% | 16.32% | 17.88% | 19.54% | 21.32% | 23.23% |
| 70 | 79.55 | 16.03% | 17.40% | 18.84% | 20.39% | 22.03% | 23.79% | 25.67% |
| 80 | 90.91 | 18.30% | 19.65% | 21.10% | 22.63% | 24.26% | 26.00% | 27.85% |
| 90 | 102.27 | 20.35% | 21.70% | 23.14% | 24.66% | 26.28% | 28.00% | 29.83% |
| 100 | 113.64 | 22.22% | 23.58% | 25.01% | 26.52% | 28.13% | 29.84% | 31.65% |

**Table 6.13. UK-OFFSHORE**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | 5.35% | 7.30% | 9.46% |
| 30 | 34.09 | | 6.13% | 7.60% | 9.20% | 10.93% | 12.83% | 14.91% |
| 40 | 45.45 | 9.04% | 10.40% | 11.87% | 13.45% | 15.17% | 17.04% | 19.07% |
| 50 | 56.82 | 12.52% | 13.89% | 15.35% | 16.93% | 18.64% | 20.48% | 22.47% |
| 60 | 68.18 | 15.49% | 16.86% | 18.33% | 19.90% | 21.60% | 23.42% | 25.38% |
| 70 | 79.55 | 18.09% | 19.47% | 20.94% | 22.51% | 24.19% | 25.99% | 27.93% |
| 80 | 90.91 | 20.42% | 21.80% | 23.26% | 24.83% | 26.50% | 28.29% | 30.20% |
| 90 | 102.27 | 22.53% | 23.91% | 25.37% | 26.93% | 28.60% | 30.37% | 32.26% |
| 100 | 113.64 | 24.46% | 25.84% | 27.31% | 28.86% | 30.51% | 32.27% | 34.15% |

**Table 6.23. NORWAY**
**IRR (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | 6.30% | 7.93% | 9.94% | 12.52% |
| 30 | 34.09 | 6.58% | 7.68% | 8.96% | 10.45% | 12.25% | 14.46% | 17.27% |
| 40 | 45.45 | 9.54% | 10.73% | 12.10% | 13.72% | 15.65% | 18.02% | 21.01% |
| 50 | 56.82 | 12.02% | 13.29% | 14.75% | 16.47% | 18.52% | 21.02% | 24.13% |
| 60 | 68.18 | 14.19% | 15.53% | 17.07% | 18.88% | 21.02% | 23.62% | 26.85% |
| 70 | 79.55 | 16.13% | 17.53% | 19.14% | 21.03% | 23.25% | 25.94% | 29.25% |
| 80 | 90.91 | 17.89% | 19.35% | 21.03% | 22.98% | 25.28% | 28.04% | 31.42% |
| 90 | 102.27 | 19.52% | 21.03% | 22.76% | 24.77% | 27.14% | 29.96% | 33.41% |
| 100 | 113.64 | 21.03% | 22.59% | 24.37% | 26.44% | 28.86% | 31.74% | 35.24% |

**Table 6.33. ANGOLA**
**IRR (real, 2007 Cdn $)**

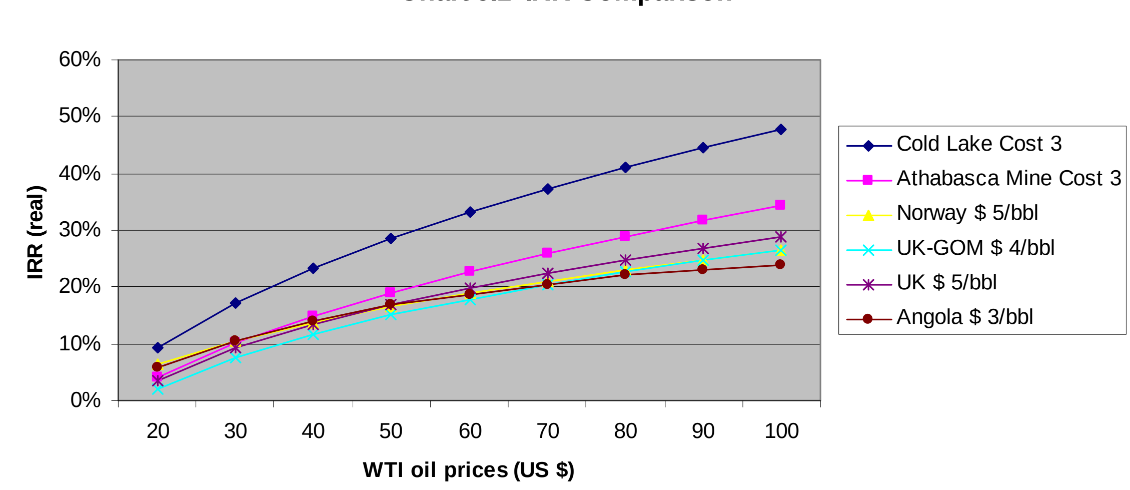
| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 5.80% | 7.12% |
| 30 | 34.09 | | | 5.63% | 7.50% | 9.23% | 10.42% | 11.74% |
| 40 | 45.45 | 6.89% | 8.50% | 10.13% | 11.43% | 12.68% | 14.01% | 14.56% |
| 50 | 56.82 | 10.60% | 12.00% | 13.13% | 14.35% | 15.65% | 16.79% | 16.87% |
| 60 | 68.18 | 13.37% | 14.48% | 15.66% | 16.91% | 18.21% | 18.67% | 18.58% |
| 70 | 79.55 | 15.58% | 16.71% | 17.93% | 19.18% | 20.00% | 20.48% | 19.62% |
| 80 | 90.91 | 17.58% | 18.75% | 19.95% | 21.02% | 21.59% | 22.13% | 20.78% |
| 90 | 102.27 | 19.44% | 20.59% | 21.77% | 22.44% | 23.09% | 23.04% | 21.86% |
| 100 | 113.64 | 21.13% | 22.27% | 23.13% | 23.81% | 24.47% | 23.98% | 23.03% |

As can be expected the IRR is directly affected by the fiscal terms. The US Gulf and the UK provide for the most attractive IRR, while Angola has the least attractive IRR. The unattractiveness of Angola is primarily due to the fact that exploration costs outside the production sharing contract are not recoverable.

The cost range considered for conventional oil is wider than was considered for Cold Lake and the Athabasca Mine+ Upgrader.

Chart 6.1. compares the IRR for Cost 3 for Cold Lake and a Mine + Upgrader in Athabasca with $ 5 per barrel capex and opex for Norway and the UK, $ 4 per barrel for the US Gulf of Mexico and $ 3 per barrel for Angola. Cost 3 level would be relatively favorable in Alberta, while the assumptions for the other jurisdictions represent relatively low costs in each of these jurisdictions.

**Chart 6.1 IRR Comparison**



This chart shows that the Alberta oil sands terms compete rather well with all four jurisdictions if the full costs of exploration is taken into account.

## *PFR10*

The following maps show the four jurisdictions from a PFR10 point of view.

**Table 6.4. US-GULF OF MEXICO DEEP -2007**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 0.78 | 0.89 |
| 30 | 34.09 | | | 0.79 | 0.86 | 0.96 | 1.08 | 1.22 |
| 40 | 45.45 | 0.85 | 0.92 | 1.00 | 1.10 | 1.22 | 1.37 | 1.55 |
| 50 | 56.82 | 1.04 | 1.12 | 1.22 | 1.34 | 1.49 | 1.66 | 1.88 |
| 60 | 68.18 | 1.22 | 1.32 | 1.44 | 1.58 | 1.75 | 1.95 | 2.21 |
| 70 | 79.55 | 1.41 | 1.53 | 1.66 | 1.82 | 2.01 | 2.25 | 2.54 |
| 80 | 90.91 | 1.60 | 1.73 | 1.88 | 2.06 | 2.27 | 2.54 | 2.87 |
| 90 | 102.27 | 1.79 | 1.93 | 2.10 | 2.30 | 2.54 | 2.83 | 3.20 |
| 100 | 113.64 | 1.97 | 2.13 | 2.32 | 2.54 | 2.80 | 3.12 | 3.53 |

**Table 6.14. UK-OFFSHORE**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | 0.81 | 0.88 | 0.97 |
| 30 | 34.09 | | 0.84 | 0.89 | 0.96 | 1.05 | 1.15 | 1.27 |
| 40 | 45.45 | 0.96 | 1.02 | 1.09 | 1.18 | 1.28 | 1.41 | 1.57 |
| 50 | 56.82 | 1.13 | 1.20 | 1.29 | 1.39 | 1.52 | 1.67 | 1.87 |
| 60 | 68.18 | 1.30 | 1.38 | 1.49 | 1.61 | 1.76 | 1.94 | 2.16 |
| 70 | 79.55 | 1.46 | 1.57 | 1.69 | 1.83 | 2.00 | 2.20 | 2.46 |
| 80 | 90.91 | 1.63 | 1.75 | 1.88 | 2.04 | 2.23 | 2.47 | 2.76 |
| 90 | 102.27 | 1.80 | 1.93 | 2.08 | 2.26 | 2.47 | 2.73 | 3.06 |
| 100 | 113.64 | 1.97 | 2.11 | 2.28 | 2.47 | 2.71 | 3.00 | 3.35 |

**Table 6.24. NORWAY**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | 0.90 | 0.95 | 1.00 | 1.07 |
| 30 | 34.09 | 0.90 | 0.93 | 0.97 | 1.01 | 1.07 | 1.14 | 1.23 |
| 40 | 45.45 | 0.99 | 1.02 | 1.07 | 1.12 | 1.19 | 1.28 | 1.39 |
| 50 | 56.82 | 1.07 | 1.11 | 1.17 | 1.23 | 1.31 | 1.42 | 1.55 |
| 60 | 68.18 | 1.15 | 1.20 | 1.27 | 1.34 | 1.44 | 1.56 | 1.71 |
| 70 | 79.55 | 1.24 | 1.30 | 1.37 | 1.45 | 1.56 | 1.70 | 1.87 |
| 80 | 90.91 | 1.32 | 1.39 | 1.47 | 1.56 | 1.68 | 1.83 | 2.03 |
| 90 | 102.27 | 1.40 | 1.48 | 1.57 | 1.67 | 1.81 | 1.97 | 2.19 |
| 100 | 113.64 | 1.49 | 1.57 | 1.67 | 1.78 | 1.93 | 2.11 | 2.36 |

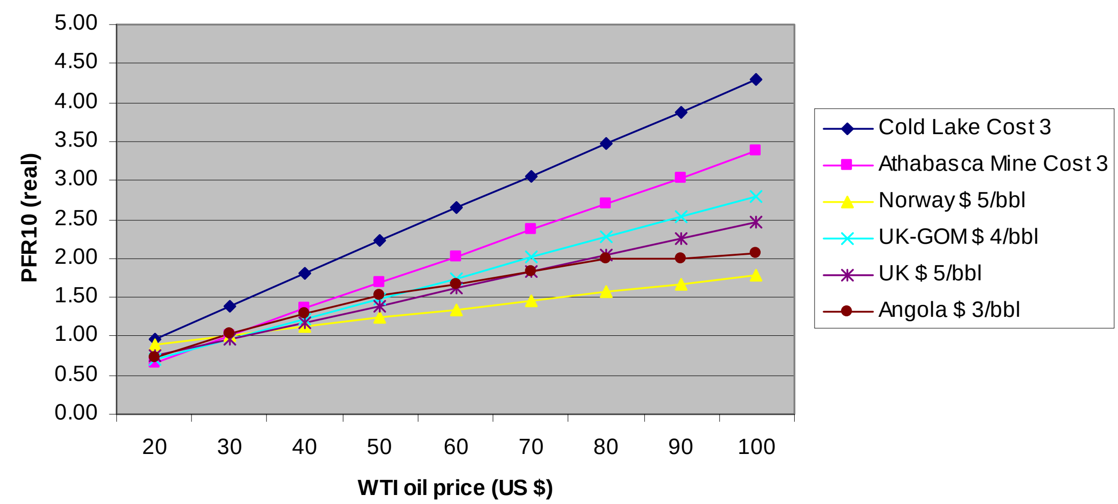
**Table 6.34. ANGOLA**
**PFR10 (real, 2007 Cdn $)**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | 0.72 | 0.81 |
| 30 | 34.09 | | | 0.71 | 0.83 | 0.95 | 1.03 | 1.13 |
| 40 | 45.45 | 0.80 | 0.90 | 1.01 | 1.10 | 1.19 | 1.30 | 1.34 |
| 50 | 56.82 | 1.04 | 1.14 | 1.21 | 1.30 | 1.42 | 1.52 | 1.54 |
| 60 | 68.18 | 1.23 | 1.31 | 1.40 | 1.51 | 1.64 | 1.67 | 1.66 |
| 70 | 79.55 | 1.38 | 1.47 | 1.58 | 1.71 | 1.77 | 1.84 | 1.72 |
| 80 | 90.91 | 1.53 | 1.63 | 1.75 | 1.85 | 1.90 | 2.01 | 1.82 |
| 90 | 102.27 | 1.68 | 1.79 | 1.93 | 1.96 | 2.05 | 2.00 | 1.92 |
| 100 | 113.64 | 1.82 | 1.95 | 2.00 | 2.08 | 2.19 | 2.07 | 2.03 |

The fiscal terms have an important impact on the PFR10. Again the US Gulf of Mexico and the UK are the most attractive and Angola the least attractive.

A comparison for Cold Lake and Athabasca of the PFR10 is provided in Chart 6.2.

**Chart 6.2. PFR10 comparison**




Also for the PFR10, the Alberta oil sands terms are competing well with all four jurisdictions if exploration costs are fully taken into account.

*NPV10/BOE*

The following four charts provide the maps for the NPV10/BOE.

**Table 6.5. US-GULF OF MEXICO-DEEP -2007**
**NPV10/barrel**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | | -$1.37 | -$0.61 |
| 30 | 34.09 | | | -$1.82 | -$1.05 | -$0.28 | $0.48 | $1.25 |
| 40 | 45.45 | -$1.49 | -$0.73 | $0.04 | $0.81 | $1.57 | $2.34 | $3.11 |
| 50 | 56.82 | $0.36 | $1.13 | $1.90 | $2.66 | $3.43 | $4.20 | $4.96 |
| 60 | 68.18 | $2.22 | $2.99 | $3.75 | $4.52 | $5.29 | $6.05 | $6.82 |
| 70 | 79.55 | $4.08 | $4.84 | $5.61 | $6.38 | $7.14 | $7.91 | $8.68 |
| 80 | 90.91 | $5.93 | $6.70 | $7.47 | $8.23 | $9.00 | $9.77 | $10.54 |
| 90 | 102.27 | $7.79 | $8.56 | $9.32 | $10.09 | $10.86 | $11.63 | $12.39 |
| 100 | 113.64 | $9.65 | $10.41 | $11.18 | $11.95 | $12.72 | $13.48 | $14.25 |

**Table 6.15. UK-OFFSHORE**
**NPV10/barrel**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | | -$1.36 | -$0.75 | -$0.14 |
| 30 | 34.09 | | -$1.50 | -$0.90 | -$0.29 | $0.32 | $0.93 | $1.54 |
| 40 | 45.45 | -$0.43 | $0.17 | $0.78 | $1.39 | $2.00 | $2.61 | $3.21 |
| 50 | 56.82 | $1.25 | $1.85 | $2.46 | $3.07 | $3.68 | $4.28 | $4.89 |
| 60 | 68.18 | $2.92 | $3.53 | $4.14 | $4.75 | $5.35 | $5.96 | $6.57 |
| 70 | 79.55 | $4.60 | $5.21 | $5.82 | $6.43 | $7.03 | $7.64 | $8.25 |
| 80 | 90.91 | $6.28 | $6.89 | $7.50 | $8.10 | $8.71 | $9.32 | $9.93 |
| 90 | 102.27 | $7.96 | $8.57 | $9.17 | $9.78 | $10.39 | $11.00 | $11.60 |
| 100 | 113.64 | $9.64 | $10.24 | $10.85 | $11.46 | $12.07 | $12.68 | $13.28 |

**Table 6.25. NORWAY**
**NPV10/barrel**

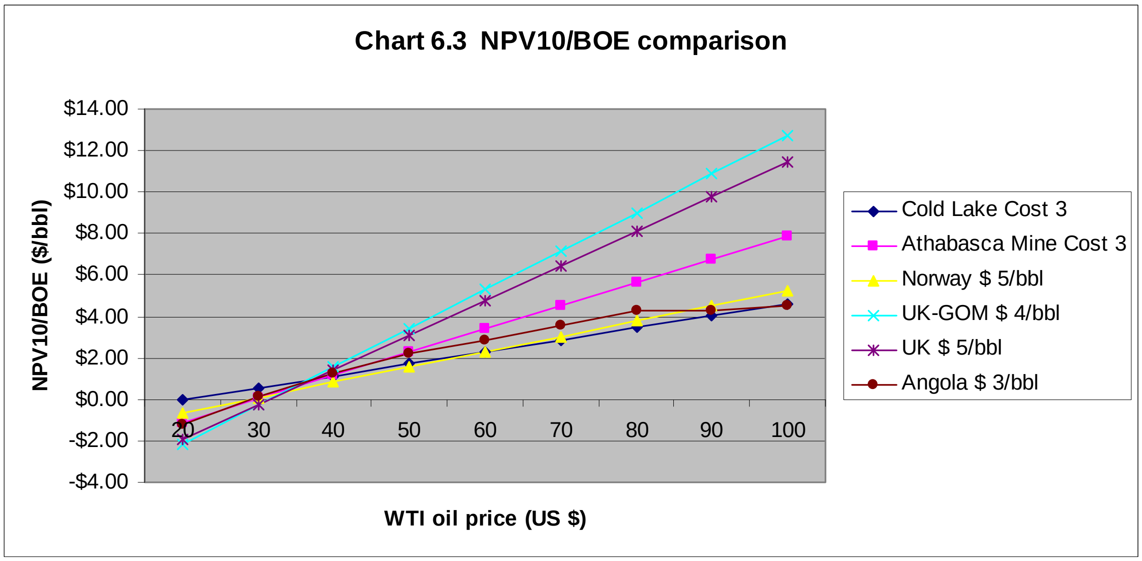
| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | -$0.65 | -$0.33 | -$0.01 | $0.31 |
| 30 | 34.09 | -$0.87 | -$0.55 | -$0.23 | $0.09 | $0.41 | $0.73 | $1.05 |
| 40 | 45.45 | -$0.13 | $0.19 | $0.51 | $0.83 | $1.15 | $1.47 | $1.79 |
| 50 | 56.82 | $0.61 | $0.93 | $1.25 | $1.57 | $1.89 | $2.21 | $2.53 |
| 60 | 68.18 | $1.35 | $1.67 | $1.99 | $2.31 | $2.63 | $2.95 | $3.26 |
| 70 | 79.55 | $2.09 | $2.41 | $2.72 | $3.04 | $3.36 | $3.68 | $4.00 |
| 80 | 90.91 | $2.82 | $3.14 | $3.46 | $3.78 | $4.10 | $4.42 | $4.74 |
| 90 | 102.27 | $3.56 | $3.88 | $4.20 | $4.52 | $4.84 | $5.16 | $5.48 |
| 100 | 113.64 | $4.30 | $4.62 | $4.94 | $5.26 | $5.58 | $5.90 | $6.22 |

**Table 6.35. ANGOLA**
**NPV10/barrel**

| WTI US $ | WTI Can $ | $8.00 | $7.00 | $6.00 | $5.00 | $4.00 | $3.00 | $2.00 |
|---|---|---|---|---|---|---|---|---|
| 20 | 22.73 | | | | -$3.11 | -$2.07 | -$1.19 | -$0.68 |
| 30 | 34.09 | -$3.90 | -$2.85 | -$1.83 | -$0.95 | -$0.26 | $0.12 | $0.46 |
| 40 | 45.45 | -$1.59 | -$0.71 | $0.06 | $0.55 | $0.93 | $1.26 | $1.21 |
| 50 | 56.82 | $0.32 | $0.96 | $1.36 | $1.73 | $2.07 | $2.21 | $1.91 |
| 60 | 68.18 | $1.77 | $2.16 | $2.53 | $2.87 | $3.18 | $2.84 | $2.34 |
| 70 | 79.55 | $2.97 | $3.33 | $3.68 | $3.99 | $3.80 | $3.55 | $2.55 |
| 80 | 90.91 | $4.13 | $4.48 | $4.80 | $4.81 | $4.48 | $4.26 | $2.89 |
| 90 | 102.27 | $5.29 | $5.61 | $5.89 | $5.42 | $5.18 | $4.26 | $3.23 |
| 100 | 113.64 | $6.41 | $6.72 | $6.39 | $6.11 | $5.89 | $4.53 | $3.65 |

As can be expected the NPV10/BOE is dramatically impacted by the fiscal terms. The US Gulf of Mexico and the UK have the most attractive terms and Angola the least attractive.

Chart 3 provides the comparison with Cold Lake and Mine + Upgrader in Athabasca.




The Mine + Upgrader in Athabasca results is a much better NPV10/BOE than Norway and Angola. Cold Lake has a similar NPV/BOE.

***Conclusion***

**As indicated in this chapter it is very difficult to compare Alberta oil sands with international conventional oil.**

**However, it seems that Alberta terms are certainly competitive with exporting jurisdictions if the full costs of exploration is taken into account. This is in particular the case with exporting jurisdictions with a relatively high government take such as Norway and Angola.**

**Similar results would be obtained when Alberta oil sand terms would be compared with other exporting jurisdictions with a relatively high government take, such as Indonesia, Malaysia, Russia, Azerbaijan, Algeria, Libya, Egypt, etc. even if we assume lower costs for some of these jurisdictions.**

**Therefore, this brief international scoping provides some evidence that a modest upward adjustment of government take, in particular under high prices, could be**

**achieved while maintaining the competitive position of Alberta relative to many other oil exporting jurisdictions. Such upward adjustment also could create somewhat more cost regressivity if so desired.**

***Overall Conclusion***

**From the evidence of this report it can be concluded that a desirable new fiscal system for Alberta would be a system whereby the government take would increase with higher prices, but also with higher costs. A modest immediate increase in government take is possible. It would also be possible to increase the government take over time if the Alberta fiscal strategy would be successful in lowering costs.**

**In order to achieve these objectives new special taxes should be considered in addition to changes to the royalty system.**