

## Water - policy and government regulation for heavy oil and oilsands development

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### Summary

This presentation outlines policy and regulation of water use in the oil and gas industry – focusing on the oilsands and heavy oil development areas. The current policy and regulatory framework for water use and protection of water resources is described and new policy and regulatory developments are discussed, including water conservation policy and the initiation of a single regulator for the oil and gas industry. Science and water policy initiatives that will be important for future development of heavy oil resources are also discussed, including the importance of groundwater and the role of petroleum geology in groundwater and deep aquifer evaluations.

### Introduction

Oil and bitumen production from the oilsands area of Alberta is now approximately 85% of Alberta oil production and increasing rapidly, from 540 million barrels per year today to about one billion barrels per year by 2019. Water has been an essential input for oil production in Alberta for decades whether it is used for waterfloods in conventional light oil pools, separation of bitumen from oilsands or steam generation in SAGD projects. Water conservation and reuse initiatives have reduced the amount of fresh water needed to produce heavy oil on a barrel per barrel basis but the overall need for water is increasing as oil production increases.

Fresh water use for oil production is a relatively small component of the overall allocation of fresh water for all water uses at 740 million cubic metres in 2010 out of a total of 9.9 billion cubic metres. All water uses in the province continue to expand as the population grows and economic activity increases. The supply of available water resources is limited and in southern Alberta we are at the limits of increasing use of fresh surface water. We have made significant advances in water treatment and recycling over the past two decades and all industries and municipal water users are now making more efficient use of water resources. The increasing use of saline groundwater to make steam for injection in thermal injection projects is an excellent example in this industry of water conservation measures and initiatives to reduce the use of fresh water resources.

### Regulatory and policy framework

The *Water Act* provides the legislative mandate for water management and regulation for all water uses in the province. Many water uses require a site specific licence, including all uses of non-saline water by the oil and gas industry. Other water uses are authorized within the legislation and the *Water (ministerial) Regulation*. The use of saline groundwater for industrial use is exempt from licensing requirements to encourage the use of this low quality water for oil and gas activities where high quality water is not needed.

The *Environmental Protection and Enhancement Act* establishes a legislative framework for protection of water quality in aquatic ecosystems. All wastewater discharges and management of pollution incidents are addressed in this legislation and the regulations. Environmental Impact Assessments of major industrial projects are also established by this Act. All oilsands mines and commercial scale

thermal in situ projects are required to conduct an Environmental Impact Assessment that includes evaluation of impacts on surface water and groundwater resources.

Government policy and water use guidelines are also important for water management in the oil and gas industry. Policy and guidelines are not enforceable in the same way as legislative requirements, but provide a context of understanding and policy intent that frames water management decisions by government agencies and industry. *Water for Life, Alberta's Strategy for Sustainability* outlines the highest level intent and outcomes for water management in the province and remains fundamental to all water management decisions. In 2006 the *Water Conservation and Allocation Policy for Oilfield Injection* was established to encourage reduced use of fresh water for enhanced recovery projects including conventional water floods in southern Alberta and thermal in situ projects in the oilsands.

The Ministry of Environment and Sustainable Resource Development has focused environmental policy on cumulative effects management in recent years. Cumulative effects management addresses holistic environmental impacts of multiple development projects and activities within a defined area, as compared to previous management and regulatory efforts that focus on water use and other environmental impacts within a single project. The *Lower Athabasca Regional Plan* sets resource and environmental management outcomes for air, land, water and biodiversity, and will guide future resource decisions while considering social and economic impacts. The plan includes an Air Quality Management Framework, a Surface Water Quality Management Framework, and a Groundwater Management Framework.

Water use and evaluation guidelines provide the lowest level of government policy, ensuring that technical information is complete to support regulatory decisions in individual licence and Approval applications. The *Alberta Environment Guide to Groundwater Authorization* is one example of a water evaluation guideline and establishes technical procedures for testing the yield of water source wells. The *Water Conservation and Allocation Guideline for Oilfield Injection* is a companion to the water conservation policy and provides detailed instructions on the evaluation of risks and alternative sources to support an application for use of non-saline water for enhanced recovery projects. Many industry guidelines and recommended practices also support effective and efficient industry practices and water management decisions. The *Water Conservation, Efficiency and Productivity Plan – Upstream oil and Gas Industry* was developed in 2011 and is an excellent example of planning methods and water management decisions that support water conservation.

The Energy Resources Conservation Board has a fundamental regulatory role in all aspects of the oil and gas industry. Many aspects of water management and environmental protection are regulated collaboratively by the Ministry of Environment and Sustainable Resource Development and the Energy Resources Conservation Board. Following the recent establishment of a single regulator for the oil and gas industry the regulatory mandate of the Energy Resources Conservation Board will expand to include the *Water Act*, the *Environmental Protection and Enhancement Act*, and the *Public Lands Act*.

Monitoring and reporting of water use, environmental impacts and performance measures of policy objectives is an essential component of government regulation. Government agencies are responsible for ensuring compliance with legislation within individual authorizations and Approvals and industry is responsible for providing the essential information to establish that the environment is protected during their operations. All water use and hydrocarbon production is reported to the Petroleum Registry under the authority of the Energy Resources Conservation Board. Licensed non-saline water use is also reported to the Ministry of Environment and Sustainable Resource Development. In addition to monitoring requirements in individual regulatory instruments the regulatory agencies conduct audits and independent monitoring of the state of the environment, including monitoring of surface water quality,

river flows and groundwater resources. The internet-based Oilsands Portal is one example of reporting and evaluation of water use activities in the oilsands area that is available to the public. The State of the Environment website managed by the Ministry of Environment and Sustainable Resource Development is another example. Multi-stakeholder groups such as the Cumulative Environmental Management Association also provide essential environmental monitoring information to industry, government and the public.

## **New Regulatory and Policy Considerations**

The fundamental legislative framework provided by the *Water Act* and the *Environmental Protection and Enhancement Act* has been established for many years and is unlikely to change in the near future. The highest level policy in *Water for Life* is also very well established and ongoing.

The *Water Conservation and Allocation Policy for Oilfield injection* has been under review during 2011 and 2012 and will be updated during 2013. The policy has been successful over the past six years and potentially will be expanded to apply to all upstream oil and gas operations. The updated policy will maintain key principles from the 2006 policy and build on past successes, such as technology improvements, expanded use of saline groundwater and recycling improvements. The new policy may focus to a greater extent on the water needs and opportunities of specific sub-sectors of the oil and gas industry. Specific sub-sector guidelines are being drafted for oil sands mining, thermal in situ projects, conventional water flooding and the use of multi-stage hydraulic fracturing in unconventional resource development. A specific guideline for thermal projects where non-saline groundwater is in direct contact with the oilsands is also under development.

The policy and guideline documents associated with water conservation policy will be finalized in 2013 following multi-stakeholder consultations with industry, environmental interest groups, first nations and the public.

Another guideline currently under development is the *Groundwater Monitoring Directive*, which sets out technical procedures for monitoring of groundwater quality at industrial sites regulated under the *Environmental Protection and Enhancement Act*.

Changes in the water conservation policy and guidelines will be integrated with ongoing implementation of the *Lower Athabasca Regional Plan*, within the surface Water Quality Framework and the Groundwater Management Framework. Improvements to data management and public access to information are important in both the regional plan and the water conservation policy. Monitoring initiatives such as the new monitoring agency being developed by the Ministry of Environment and Sustainable Resource Development and expanded federal and provincial monitoring of air and water in the oilsands area will support effective water management decisions and public acceptance of further development.

More effort will be needed by government agencies and industry to manage cumulative effects and work collaboratively to achieve expanded oil production with the lowest possible increase in environmental impacts. Matching low quality water sources and needs, and the use of wastewater or excess water from one project at adjacent projects is one example of effective collaboration that may be more feasible in future. The potential use of tailings pond waste water for steam injection at regional thermal in situ projects has been evaluated by industry and is strongly supported by government. Regulatory changes may be needed to enable or encourage some of the most effective collaborative water management options.

One of the important regulatory changes in 2012 was the creation of a single regulatory authority for the oil and gas industry. The *Responsible Energy Development Act* establishes the “Alberta Energy Regulator” as an independent authority with a broad mandate including the mandate of the previous Energy Resources Conservation Board and new authority under the *Environmental Protection and Enhancement Act*, the *Public Lands Act*, the *Water Act*, and Part 8 of the *Mines and Minerals Act*.

The *Alberta Energy Regulator* will assume the previous responsibilities of the Ministry of Environment and Sustainable Resource Development for authorizations and approvals under the *Environmental Protection and Enhancement Act*, the *Public Lands Act*, and the *Water Act* in regard to energy development activities. This change provides a “one window” regulatory approach that will improve regulatory efficiency and oversight for the industry. Government will continue to set water and energy policy at the provincial level and the Energy Regulator will make single project regulatory decisions and ensure safe operating practices in the industry. Compliance and enforcement actions will continue with the Energy Regulator as with the previous Energy Resources Conservation Board. The extensive collaboration between government staff and Energy Resources Conservation Board staff will continue. The transition to the new authority is ongoing with many of the staff and regulatory procedures in place at the new authority now.

### **Science and policy initiatives**

The ongoing development of unconventional oil and gas in low permeability formations is an exciting opportunity for Alberta. The resource base is extensive and the resource evaluation and development challenges we are facing provide an extraordinary opportunity for petroleum geologists to utilize and expand their skills. The resource base of unconventional resources does not overlap with the heavy oil and oilsands areas but many of the water management, cumulative effects and development pressure issues appear to be similar for the development of unconventional resource plays and the intensive oilsands development in the northeast part of the province. Challenges include the development of new water supplies, collaborative development and cumulative effects management efforts and the safe disposal of wastewater in deep formations. Engineering innovations to increase process water recycling have been valuable in oilsands developments over time and will also be essential in unconventional resource development as the industry matures.

For exploration geologists there is an increasing need for evaluation of deep saline groundwater sources for oilsands development and hydraulic fracturing operations. Innovations in water treatment are increasing the salinity content that is useable for oil and gas development and our understanding of the full range of groundwater resources in both shallow and deep aquifers needs to be improved. Water management policy will increasingly emphasize the use of low quality groundwater as a replacement for surface water and non-saline groundwater.

Project development geologists and reservoir engineers are needed to inform teams of development planners and water management plans that will emphasize collaborative work between oil and gas operators working in the same area. Geologists are needed to work with government agencies and multi-stakeholder groups to inform policy development and regional planning initiatives. Monitoring and reporting of environmental conditions and development impacts includes groundwater monitoring of shallow aquifers and groundwater surface water interactions and evaluation of groundwater flow systems that present risks for migration of contaminant plumes from surface or underground sources.

In Alberta science informs policy and the development of regulations for industry follows a rational approach that includes technical expertise and a broad range of input from parties with an interest in the outcomes and protection of the environment. The knowledge and expertise of geologists is needed

to provide a long-term science based perspective that can be made accessible to the public and other stakeholders with completely different perspectives and skills.

### **Future Hydrogeology Challenges**

There are several new and emerging science challenges for groundwater management that involve both hydrogeologists and petroleum geologists in the oilsands area and across Alberta. The potential to use aquifers as a water storage medium has been studied in the oilsands area and in one or two other locations, however a great deal remains to be done to bring aquifer storage and recovery to its full potential as a water management option. The monitoring of potential groundwater leakage from tailings ponds and shallow SAGDS developments presents some special challenges for hydrogeologists in the oilsands area. Across Alberta the evaluation of deep geological formations for disposal of CO<sub>2</sub> and wastewater is a continuing task with some new issues in the future. In some areas deep disposal operations that have been considered very isolated in the past may become less isolated if multi-stage hydraulic fracturing operations may also occur within the adjacent cap-rocks. In addition the characterization of deep saline aquifers with water supply potential and the improvement in our understanding of shallow aquifer flow systems is an ongoing task that will continue for many years in Alberta. We have a good basis for understanding deep aquifers from the long-term exploration for oil and gas in the province, but the more we learn the more we understand the gaps in information and knowledge to truly understand these resources.

### **Conclusion**

Water management and water policy for the oil and gas industry is well developed and effective with many years of experience in both industry and government agencies. New challenges and issues continue to arise as development pressures increase with ongoing expansion of the oilsands and new resource development in other areas of the province.

Government agencies and regulatory authorities will continue to work with the oil and gas industry to develop a regulatory framework that supports development and provides assurance to Albertans that the environment is protected. Petroleum geologists and hydrogeologists working in industry have an essential role in developing new groundwater resources and providing assurance that development does not impact aquifers and aquatic ecosystems. Scientists in both industry and government need to provide their perspective to inform policy development and the public regarding development issues that are complex and long term.