EMD Bitumen and Heavy Oil Committee (Sharleen Overland and Steven Schamel)
Annual Council Meeting June 18, 2016

Committee events –
- Other EMD duties with Calgary ACE impacted time and resumption of updating contributors /chairs and additional resource areas can be pursued after Calgary.
- Other chair will review document after Calgary conference
- Report updates include Canada and California Reserves, general updates on activities and mention of major events impacting Alberta’s Fort MacMurray and Venezuela.

What is it?
Heavy oil and bitumen are denser than conventional crude oil and considerably more viscous, making them more difficult to recover, transport and refine.

- At ambient reservoir conditions, heavy and extra-heavy oils have viscosities greater than 100 centipoise (cP), the consistency of maple syrup. Bitumen has a gas-free viscosity greater than 10,000 cP, equivalent to molasses.
- Heavy oil is just slightly less dense than water, with specific gravity in the 1.000 to 0.920 g/cc range, equivalent to API gravity of 10° to 22.3°. Bitumen and extra-heavy oil are denser than water, with API gravity less than 10o. Extra-heavy oil is generally mobile in the reservoir, whereas bitumen is not.

What are the world’s resources?
The International Energy Agency estimates the total world oil resources are between 9 and 13 trillion barrels, of which just 30% is conventional crude oil. The remaining 70% is unconventional crude divided 30% bitumen, 25% extra-heavy oil, and 15% heavy oil.

- Bitumen and heavy oil deposits occur in more than 70 countries across the world.
- The global in-place resources of bitumen and heavy oil are estimated to be 5.9 trillion barrels [938 billion m3], with more than 80% of these resources found in Canada, Venezuela and the United States.
- Globally there is just over one trillion barrels of technically-recoverable unconventional oil: 434.3 billion barrels of heavy and extra-heavy oil and 650.7 billion barrels of bitumen.
- Western Canada has several separate accumulations of bitumen and heavy oil that together comprise 1.7 trillion barrels. The Oronoco Heavy Oil Belt is a single extensive deposit containing 1.2 trillion barrels of extra-heavy oil.
- Other countries producing significant quantities of heavy oil and/or bitumen include Russia, China, Iran, Iraq, Azerbaijan, Mexico, Colombia, Ecuador and Brazil.
- Virtually all of the bitumen being commercially produced in North America is from Alberta, Canada, making it a strategic source of bitumen and of the synthetic crude oil obtained by upgrading bitumen.

Canada Update
Estimated remaining established reserves of in-situ and mineable crude bitumen is 165 billion bbls. To date, about 5% of Canada’s initial established crude bitumen resource has been recovered since commercial production began in 1967.

- The Alberta Energy Regulator has published their reserves report in a new way as an interactive and web-based format.
- In-situ production using steam-injection overtook mined production for the first time in 2012 and continued to exceed mined production in 2013.
- Mined production did increase by 11.9% for mining projects and 7.8% for in-situ.
- Despite the significant weakness in crude oil prices marketable bitumen production rose in 2015 and in the next 10 years, projected to increase (3.8 million barrels in 2025). The growth in bitumen production in 2015 is the result or new projects coming on-stream that had been initiated before the price drop. Production growth is forecast for more of these projects are developed and brought to production, where
capital expenditures have been committed/spent. Other projects that have not progressed as far are being deferred or cancelled.

- As projects are long term investments and are less vulnerable to oil price fluctuations, halting steam flows can be more costly to restart and potentially damage the reservoir.
- The temporary shut down or rate reduction at oil sands production sites due to the fires at Fort McMurray from May to June 2016 will impact the next year’s production reporting. The EIA estimates that disruptions to oil production averaged about 0.8 million barrels per day in May.

**Venezuela Update**
The Orinoco Heavy Oil Belt in eastern Venezuela is the world’s single largest extra-heavy oil accumulation.

- The total estimated oil in-place is 1.2 trillion barrels of which 310 billion barrels is considered technically-recoverable.
- Four active heavy oil recovery projects operating in the Faja, each begun in successive years between 1998 and 2001, produce collectively about 640,000 bopd of 8.5º extra-heavy crude using cold production methods, augmented by solvent-injection.
- Venezuela lacks investment capital to expand production of syncrude for export. The recent drop in global oil price has exacerbated this situation.
- Oil production has been on steady decline, which may continue to be impacted due to recent production outages in the spring of 2016 from low power supply and low water levels at the Guri dam due to drought.

**United States Update**
The United States has an estimated 54 billion bbls of bitumen and heavy oil in nine states. Currently, commercial quantities of heavy oil are produced from sand deposits in just two areas, the San Joaquin Basin of central California and the North Slope of Alaska.

- As of 2014, the proved reserves in California were 2.8 billion bbls, over half of which is heavy oil in the southern San Joaquin Basin. Most fields are in a gradual decline, but recently a few have seen a small increase due to improved reservoir management.
- Alaska’s heavy oil and bitumen deposits on the North Slope are very large (24 to 33 billion bbls). They hold promise for sustained commercially successful development.
- So far, there is no commercial development in Utah, southwest Texas, northwest Alabama, western Kentucky, east-central New Mexico, and Wyoming – the report describes the resource potential and activity to date.

**The 2015 Annual Report had added Russia and Colombia.**

- In Russia, heavy oil and bitumen constitute 13.1% of total oil reserves. Production has been occurring for many decades from petroleum provinces west and east of the Ural Mountains.
- In Colombia, new bitumen and heavy oil projects have been responsible for turning around national oil production. There are four principal areas now in development.

**Other items reported/of note:**
- New Key publications