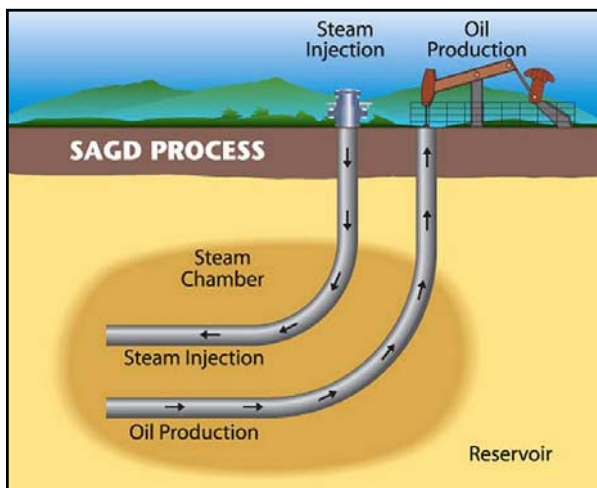


# Steam Assisted Gravity Drainage Facts and Stats

## Steam Assisted Gravity Drainage Process

- In Alberta, 80 per cent (132 billion barrels) of the oil sands are buried too deep below the surface for open pit mining and can only be extracted by in situ (in place) methods such as Steam Assisted Gravity Drainage (SAGD).
- SAGD involves drilling a pair of 1 km long horizontal wells, one about 5 m above the other, from a central well pad. In a plant nearby, salty (not fresh) water is recycled, cleaned and heated to become steam. The steam then travels through pipelines to the well pair, where it is injected into the upper well. The steam heats the bitumen to a temperature at which it can flow by gravity into the producing (bottom) well. The steam injection and oil production happen continuously and simultaneously.
- The resulting oil and condensed steam emulsion is then piped from the producing well to the plant, where it is separated and treated. The produced water is recycled for generating new steam.



Source: Canadian Centre for Energy Information

## Facts about SAGD

- There are currently 31 active (producing or under construction) and 15 approved (approvals in place but construction not yet started) SAGD projects in Alberta.
- Currently SAGD produces approximately 970,000 barrels per day of bitumen, which is 38 per cent of Alberta's total bitumen production.
- The surface disturbance associated with SAGD operations is significantly less than that of conventional oil and gas operations.
- Alberta Government regulations stipulate that all projects must recycle 90% of the water used in SAGD extraction. Only non-potable water can be used to generate steam for SAGD.
- On average, approximately 2.6 barrels of steam are required to produce one barrel of bitumen (termed the Steam to Oil Ratio).
- New iterations of SAGD-type technology are currently being developed and tested. These require no water/steam use, instead using solvents and/or electricity to produce a high quality bitumen with (ultra) low green house gas emissions.



Well pads with SAGD drilling rigs at Cenovus Energy's Christina Lake oil sands operation in northern Alberta.