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BARRELLING AHEAD • B5

The Athabasca oil sands story

For centuries, the sticky bitumen of northern Alberta was good for little more than caulking Chipewyan Indian canoes - and leading entrepreneurs astray.

The first attempt to exploit the oil sands came nearly a century ago, when oilmen tried drilling conventional wells in the area, convinced that the bitumen on the surface must be welling up from gigantic pools of crude deep in the Earth. Two dozen wells were drilled over 11 years, with zero success.

Small-scale operations producing asphalt popped up in the ensuing decades, but cheaper sources of the product elsewhere in the world eventually bankrupted every one of those efforts.

It was not until 1967 that the oil industry began to make a business out of bitumen, when the Great Canadian Oil Sands Project, which eventually became Suncor Energy Inc., began production.

Swings in oil prices, particularly the collapse of the mid-1980s, left the sector's viability in continual question. In part because of shrinking opportunities for conventional exploration, interest in the oil sands



1967 The 10-metre diameter bucketwheel on this 10-storey high, electrically powered excavator could gauge out 20 tons of oil sand with each revolution.



2005 Scott Dadds, left, and Adam Ashley monitor hoppers and crushers from the control room at Suncor Energy's Millennium operation north of Fort McMurray.

grew, with tens of billions of dollars invested in the 1990s. Despite a record of multibillion-dollar cost overruns, that investment has pushed production of bitumen and synthetic crude past one million barrels a day - with capital spending predicted to double that to two million barrels a day over the next five years, and perhaps to

three million by the middle of the next decade. Even with that soaring growth, there are decades, and likely centuries, of production in the oil sands. The best official estimate of oil that can be profitably extracted is 175 billion barrels - second only to the reserves of Saudi Arabia.

Oil sands projects

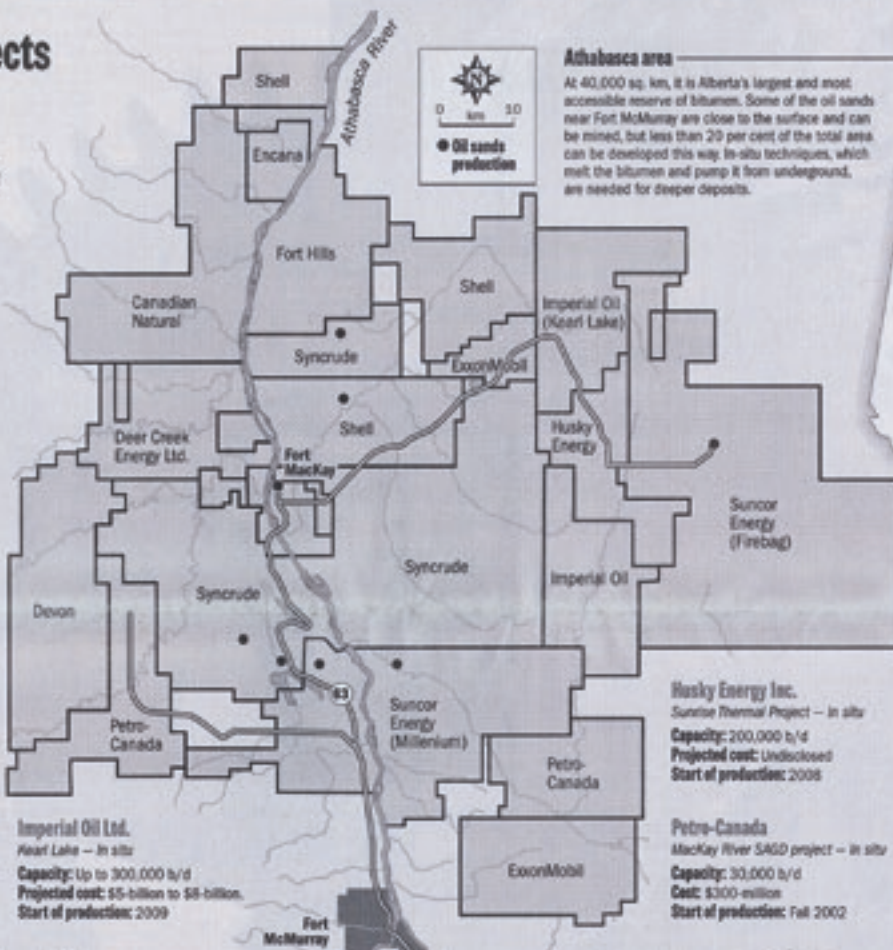
Shell Canada Ltd., Western Oil Sands Inc., ChevronTexaco Corp.
Athabasca Oil Sands Project - mining
Capacity: 155,000 barrels a day
Cost: \$5.7-billion
Start of production: January 2003

Canadian Natural Resources Ltd.
Horizon - Mining
Capacity: 232,000 b/d
Projected cost: \$10.8-billion
Start of production: 2008

Syncrude Canada Ltd.
Stage 3 expansion - Mining
Capacity: 360,000 b/d, total
Cost or projected cost: \$7.8-billion
Start of production: 1978 for original operations

Neven Inc., OPTI Canada Inc.
Long Lake - In situ
Capacity: 60,000 b/d
Projected cost: \$3.5-billion
Start of production: 2006

Suncor Energy Inc.
Millennium, Firebag (latest expansions) - Mining and in situ
Capacity: 225,000 b/d, total
Cost or projected cost: \$3.4-billion for Millennium expansion
Start of production: 1967 for original operations



Extraction and refining

Mining

1 The mining process begins with the removal of vegetation, muck and a thick layer of clay, silt and gravel. (The soil is saved to build the tailings ponds that will hold the sands once bitumen has been extracted.)

2 Oil sands are mined using shovels with buckets that hold 100 tonnes of soil, loading huge 240- to 360-tonne trucks. The mine delivers about 450,000 tonnes of oil sand a day to the ore preparation plants, with two tonnes needed to produce one barrel of synthetic oil.

3 Crushers and screens in the preparation plants prepare the ore for delivery to primary extraction through pipelines after the ore has been mixed with water.

In situ

4 Primary extraction plants on both sides of the Athabasca River separate raw bitumen from the sand.

5 In secondary extraction, the bitumen is cleaned by removing fine clay particles and water. The thick bitumen is diluted with naphtha and treated to remove remaining minerals and water. It is then stored in holding tanks and delivered to the upgrader for processing.

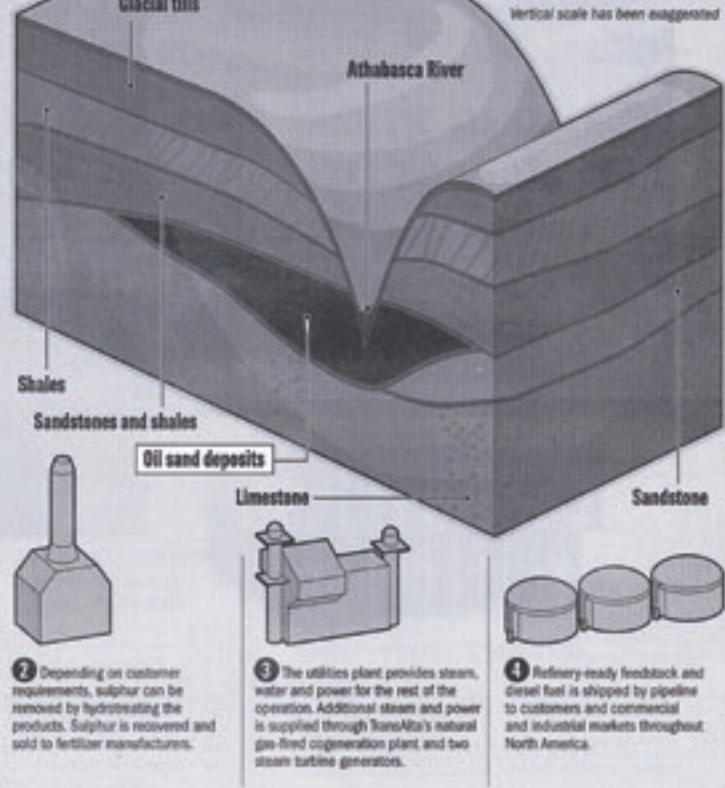
6 The water, clay, sand and tailings (residual bitumen) are pumped to holding ponds where they are treated to speed up the reclamation process that will restore the landscape.

Upgrading

1 Unlike mining, in-situ production does not disturb the top soil. Instead, steam-assisted gravity drainage (SAGD) technology uses underground wells to inject steam into the oil sands deposits, melting the bitumen and allowing it to be pumped above ground. The recovered bitumen is sent by pipeline to be upgraded.

1 In upgrading, naphtha is removed and recycled back to extraction. The bitumen is heated in furnaces and sent to drums where petroleum coke is removed. Coke, which is similar to coal, is used as a fuel source for the utilities plant.

The region in cross-section



SOURCE: STAFF RESEARCH, SUNCOR ENERGY REGIONAL MUNICIPALITY OF WOOD BUFFALO OIL SANDS DISCOVERY CENTRE, NATIONAL ATLAS OF CANADA

PATRICK BRETHOUR, MICHEL BIRD, DEAN THREED / THE GLOBE AND MAIL