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Canada's Oil Sands:
Responsible Development

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Oil Sands 101, Calgary

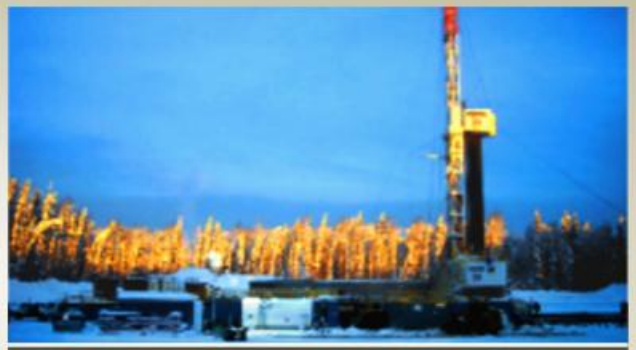
Cautionary Statement

This presentation may contain forward-looking information on future production, project start-ups and future capital spending. Actual results could differ materially due to changes in project schedules, operating performance, demand for oil and gas, commercial negotiations or other technical and economic factors.

What I'd like to discuss today

- Energy outlook
- Oil sands industry overview, including extraction techniques
- Oil sands challenges and solutions

Imperial Oil: an integrated operation



Exploration

We're unlocking Canada's energy resources

Development and production

With world-class research and advanced technology

Marketing

Delivering fuels and products across Canada

Refining and petrochemicals

Producing fuels and products that Canadians need

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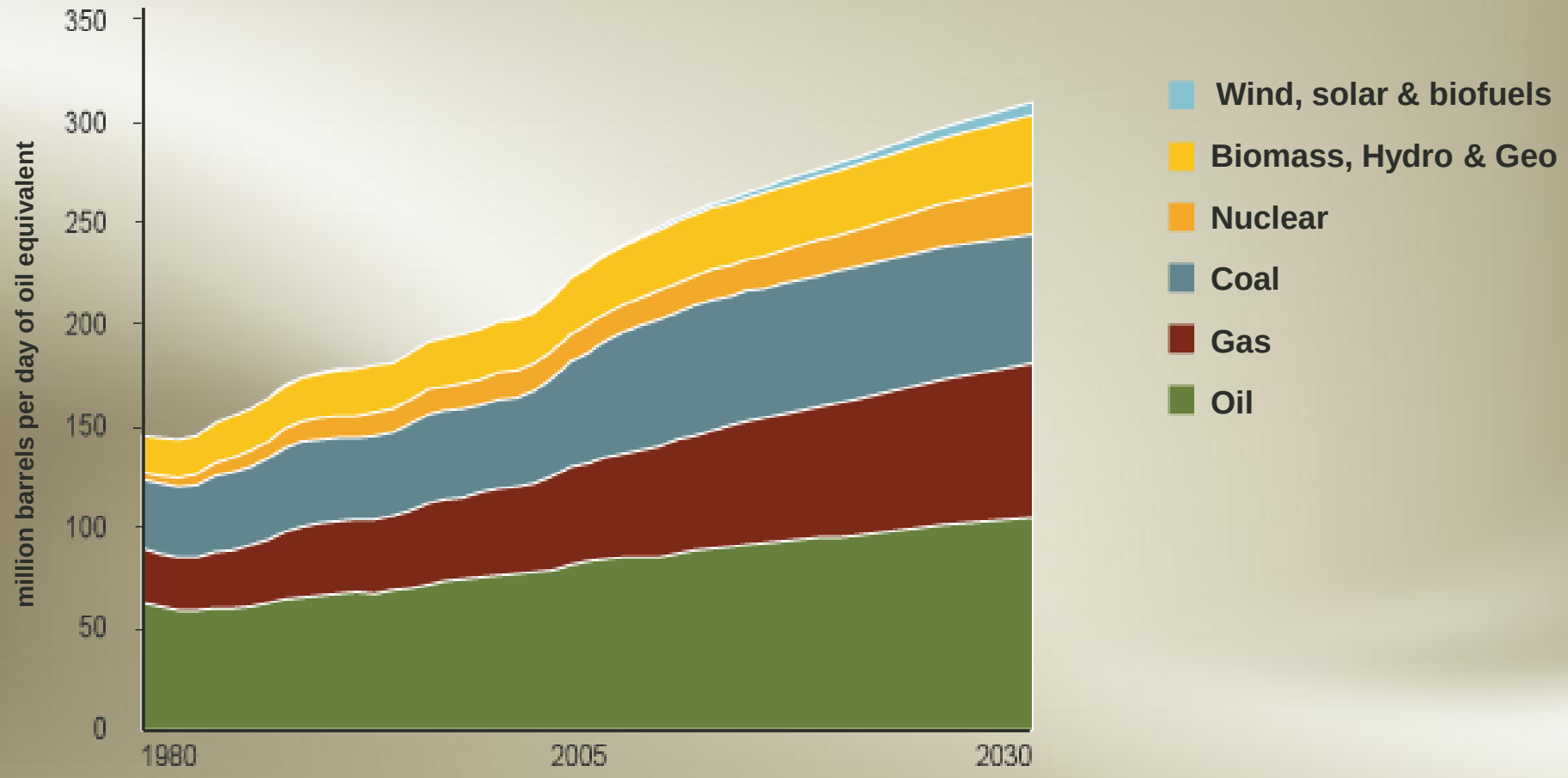
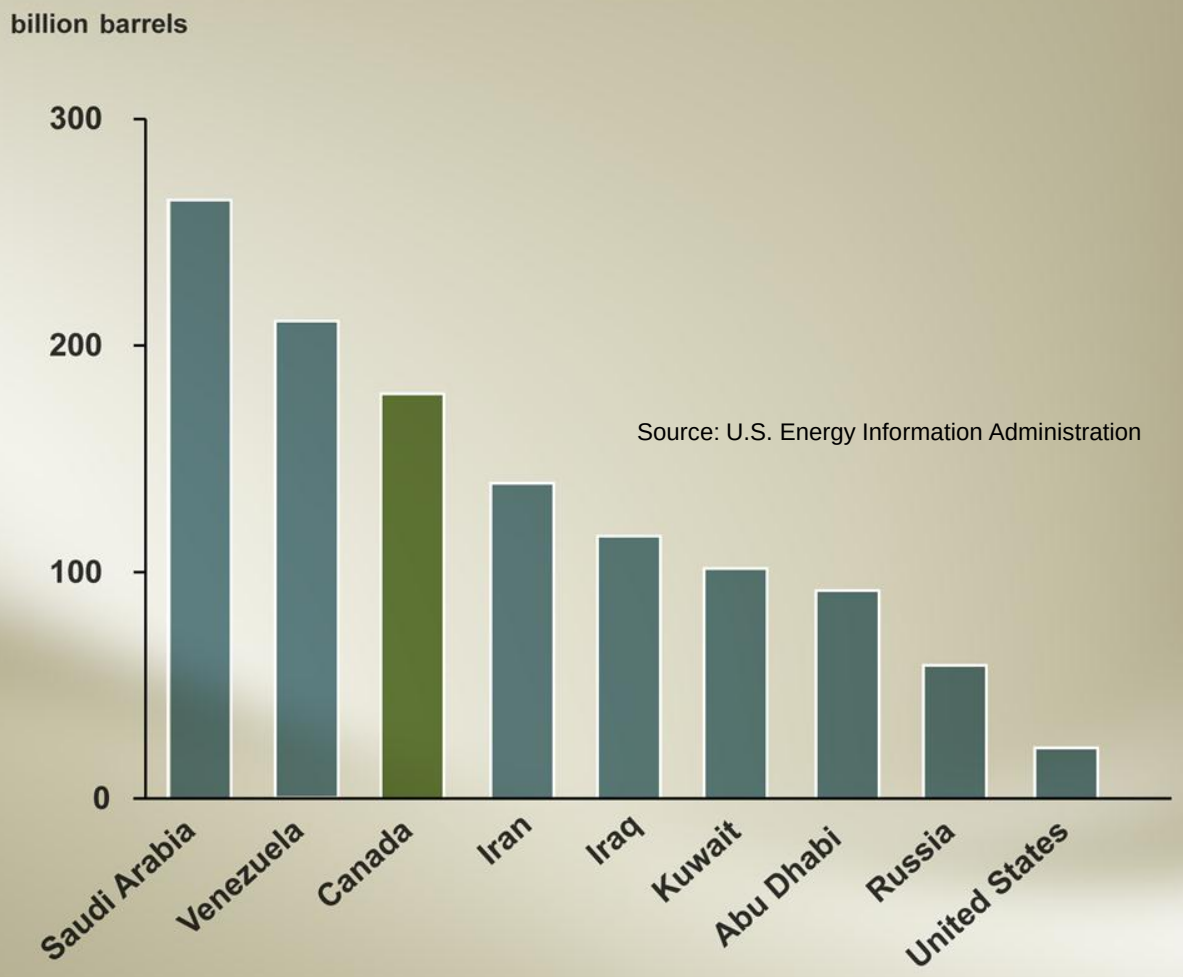
Energy demand is increasing…

Most energy will continue to come from oil & gas



Canada's oil sands are enormous

- **Canada has third largest reserves in the world**
- **Over 97% associated with oil sands**
- **Canada has the opportunity to fill important global energy supply gaps**

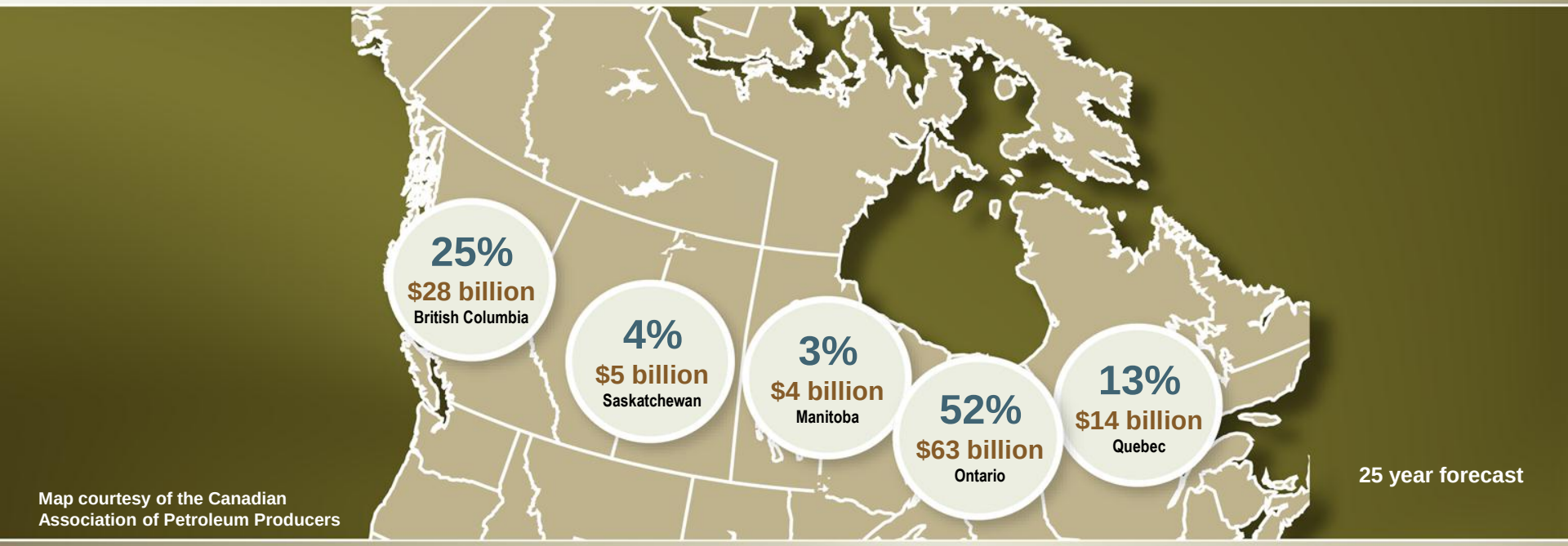


Where are the oil sands?

- Three areas in northern Alberta
- Largest: Athabasca

Economic benefits across Canada

High-quality employment and economic benefits for Canadians from coast to coast



$30 billion
in annual government revenues

126,000 jobs
will be created outside Alberta

$2.1 trillion in GDP over 25 years
(CERI 2011)

What are “oil sands”?

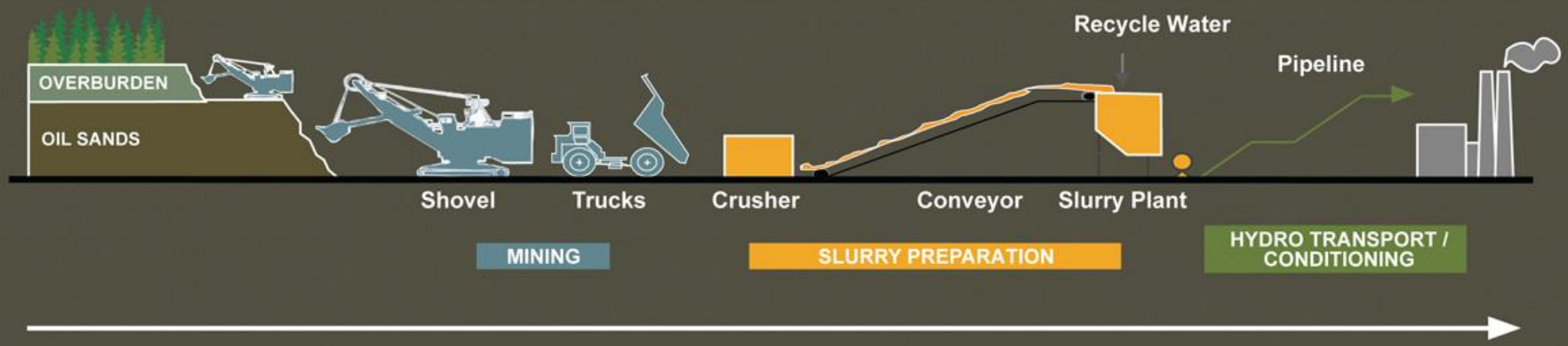
- Sand saturated with very heavy oil (bitumen)
- Bitumen is thick
- Heat and water used to produce it

Depth of resource determines recovery method

Closer to surface:

Mining

(20% of the oil sands)



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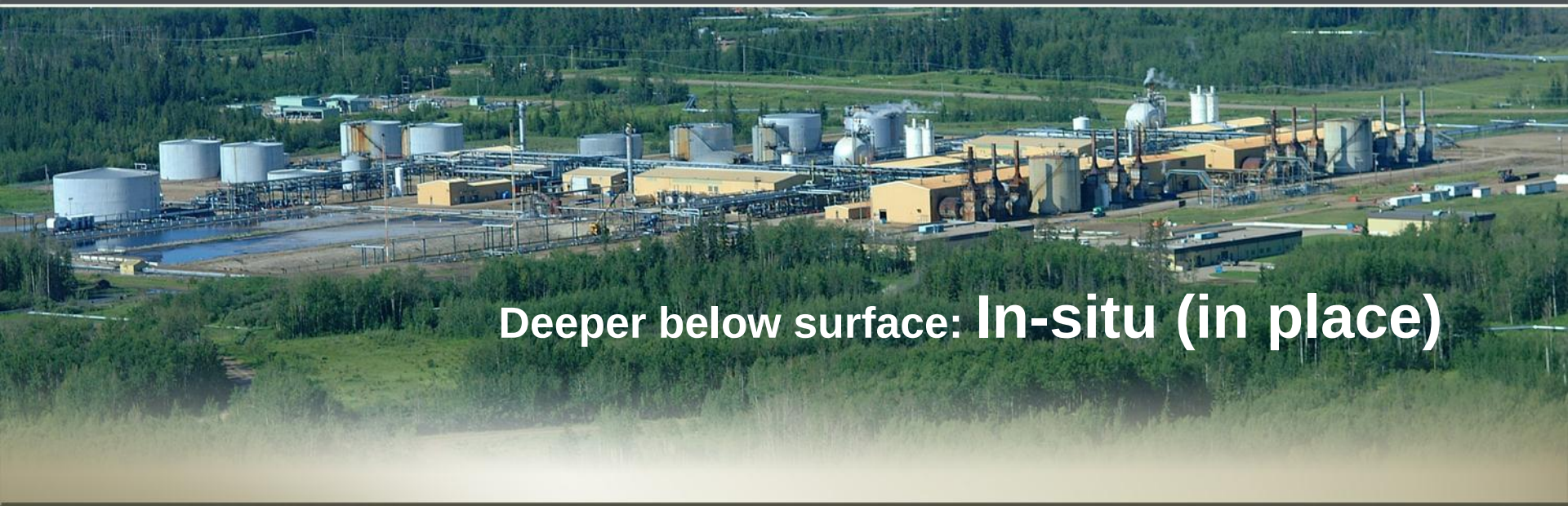
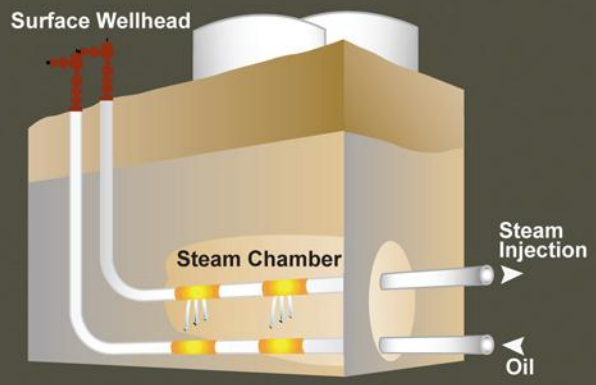
Depth of resource determines recovery method

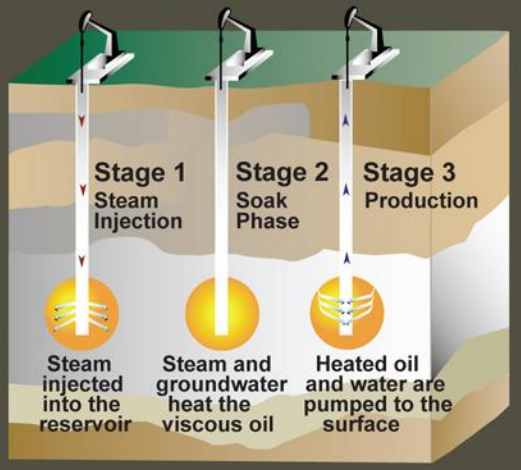


Deeper below surface: In-situ (in place)

Steam assisted gravity drainage (SAGD)

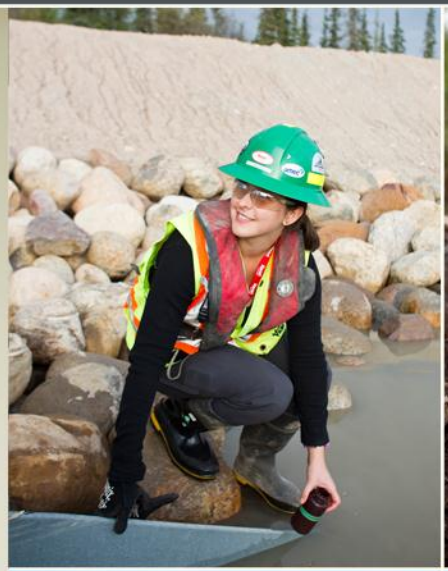


Cyclic steam stimulation (CSS)



Understanding the issues

- Continue to reduce environmental impacts
  - GHG emissions
  - Water use
  - Reclamation
  - Tailings
- Challenges can be managed
- Research and technology leadership is our strength



GHG emissions

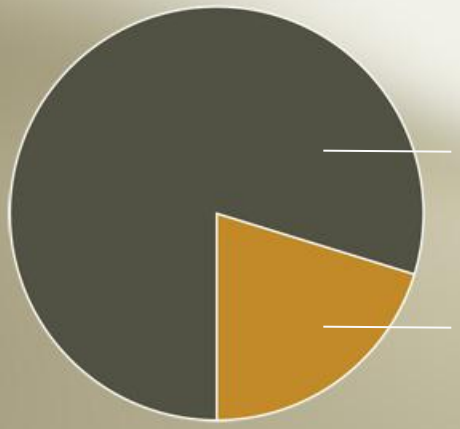
Issue: Oil sands development results in higher greenhouse gas (GHG) emissions than conventional production

6%
more GHG emissions from oil sands than US crude supply average

6.5%
of Canada's GHG emissions are from oil sands

<0.1%
of global GHG emissions are from oil sands

Summary of greenhouse gas emissions



80% Vehicle use

20% The production, transport and refining of crude oil into gasoline, diesel and other fuels

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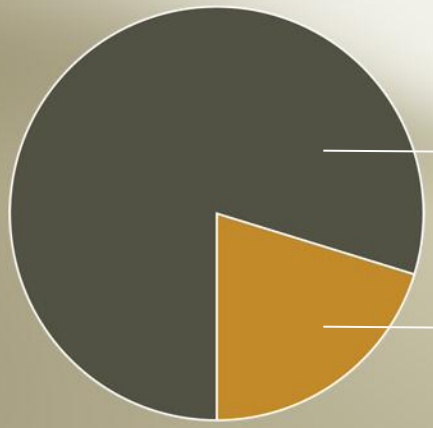


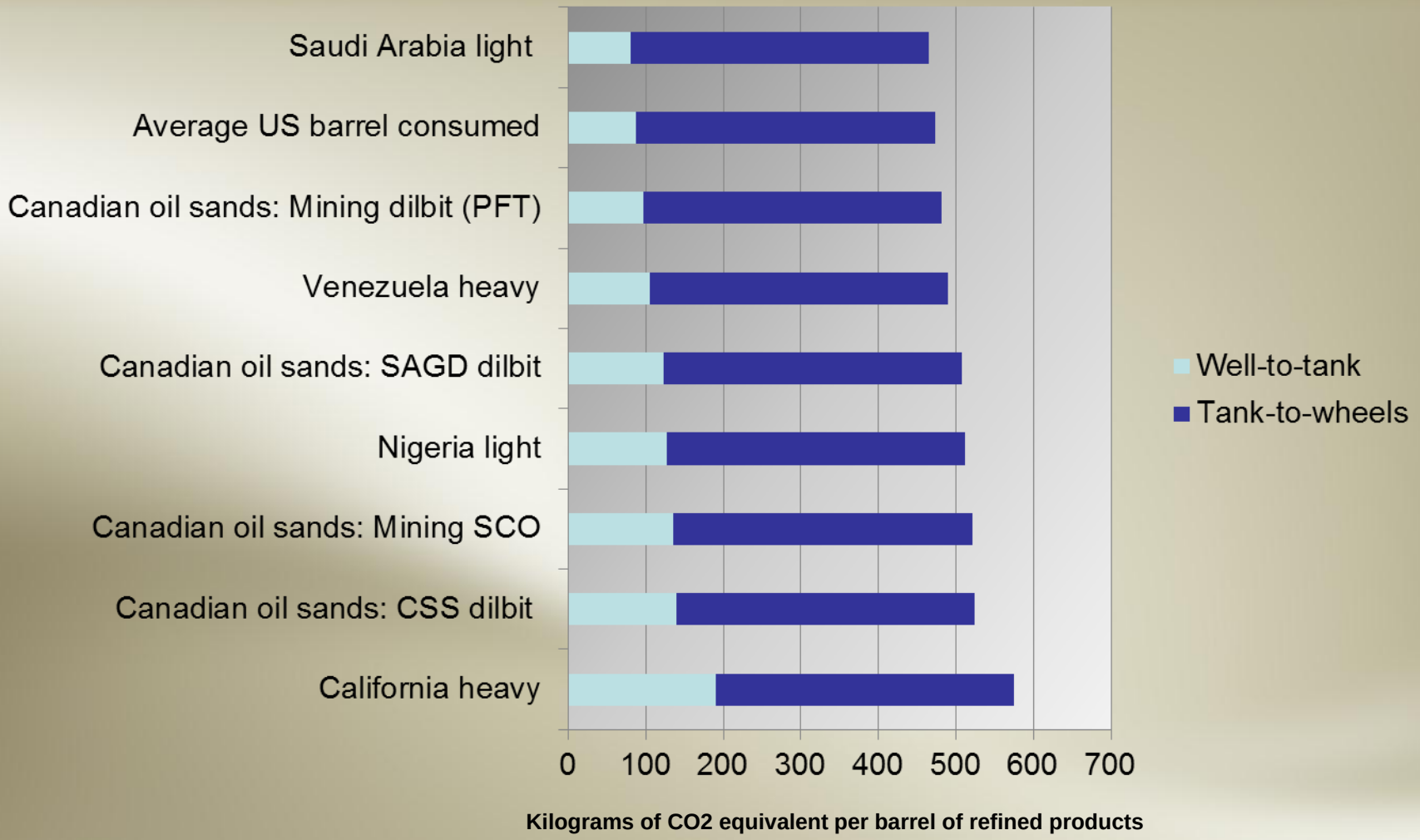
80% Vehicle use

20% The production, transport and refining of crude oil into gasoline, diesel and other fuels

At Cold Lake, **40%** reduction in CO_2 emissions through cogeneration

20% reduction in energy intensity since 2006 at Syncrude

Life cycle greenhouse gas emissions



Source: IHS CERA 2012

Water use

Issue: Oil sands operations require large amounts of water for processing

Through more than 40 years of technical innovation, Imperial has pioneered state-of-the-art water recycling technology

We are steadily reducing the amount of water we need

~3%
of the Athabasca River flow is allocated; less than half used

>90%
of produced water recycled at Cold Lake

88%
of water recycled at Syncrude

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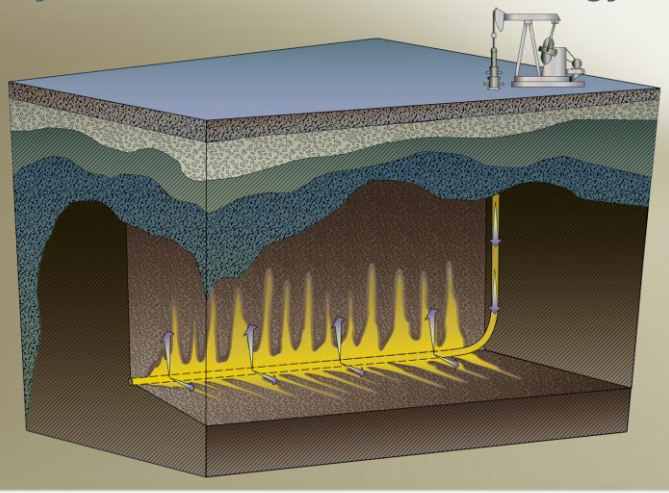
Cyclic Solvent Process technology



- Non thermal process
- Reduced energy

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of produced water recycled at Cold Lake

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of water recycled at Syncrude

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Tailings

Issue: Oil sands mining operations produce tailings ponds

Reducing our footprint

Issue: Oil sands operations disturb the boreal forest during development

In more than 40 years of oil sands mining, less than 0.02 % of Canada's boreal forest has been disturbed for development.

1 million trees planted at Cold Lake

5 million trees planted at Syncrude

Reducing our footprint

Issue: Oil sands operations disturb the boreal forest during development

In more than 40 years of oil sands mining, less than 0.02 % of Canada's boreal forest has been disturbed for development.

Before: Lease 17 (Gateway Hill)

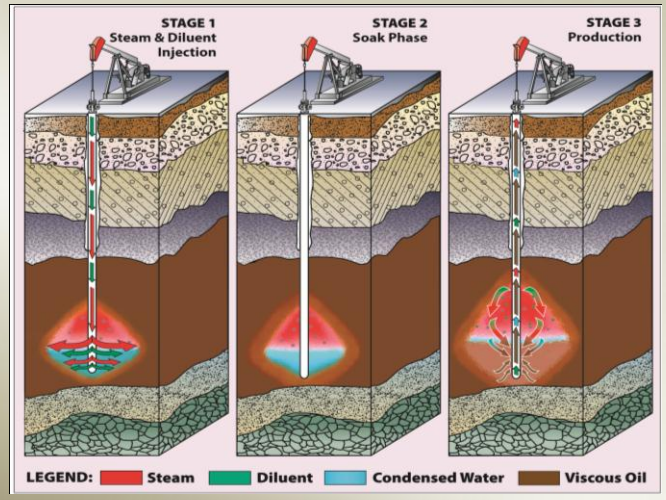
After: Lease 17 (Gateway Hill)

104 hectares permanently reclaimed at Syncrude in 2008 (certified by government)

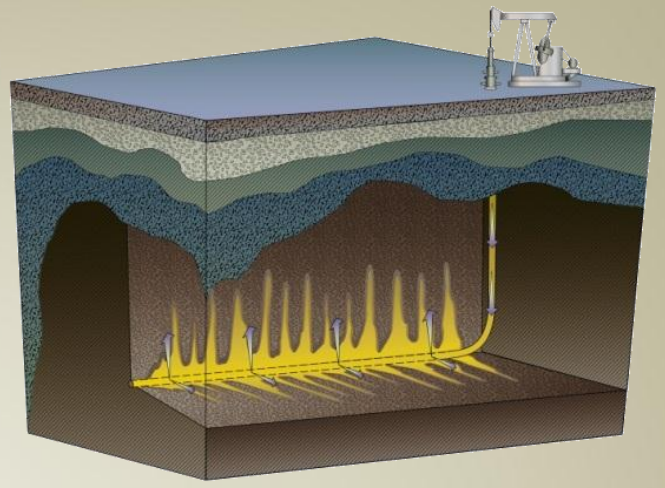
1 million trees planted at Cold Lake

5 million trees planted at Syncrude

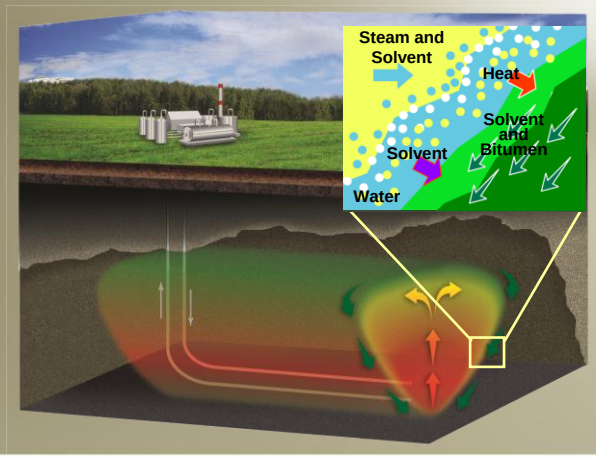
LASER



CSP



SA-SAGD



- **Solvents aid recovery**
- **Reduce or eliminate water use**
- **25-90% GHG intensity reduction**

Non Aqueous Extraction

Oil Sands

Bitumen

“Dry” Tailings

- **90% fresh water reduction**
- **No wet tailings ponds**
- **Progressive reclamation**
- **High bitumen recovery**

A few final thoughts

The oil sands are a significant engine of economic growth for Canada.

Research and development activities are focused on improving environmental performance through:

- **reducing GHG emissions**
- **continued reduction of water use**
- **minimizing our footprint**

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Thank you.

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Questions

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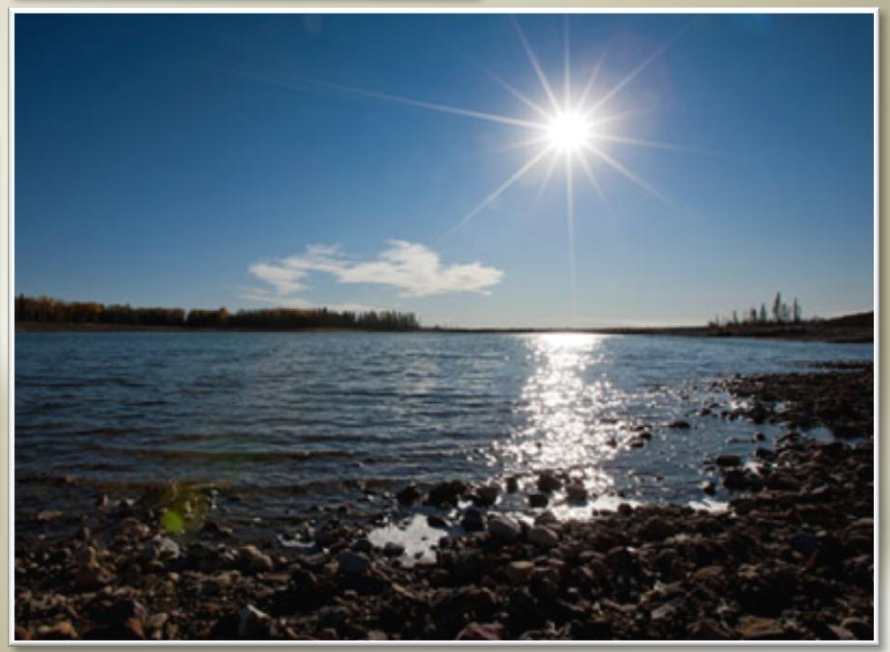
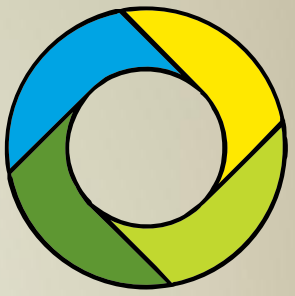
Kearl oil sands project



Canadian Oil Sands Industry Alliance

- 13 oil sands producers working together on environmental issues
  - Tailings, water, land, and greenhouse gas emissions
  - Accelerate the pace and scope of environmental innovation

- Build on the successes achieved by earlier collaborative groups
  - Canadian Oil Sands Network for Research and Development (CONRAD)
  - Oil Sands Leadership Initiative (OSLI)
  - Oil Sands Tailings Consortium (OSTC)



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