Offset Quantification Protocol CO2 Capture and Permanent Storage in Deep Saline Aquifers

Air Resources Board Webinar

April 5, 2016

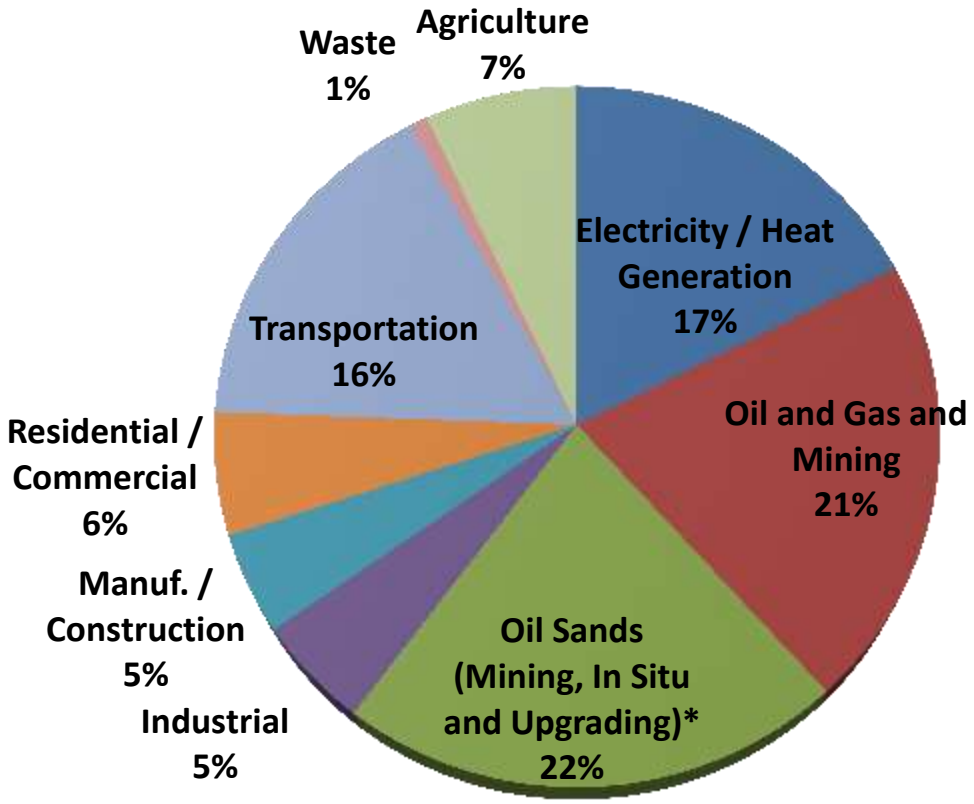
Shan Pletcher, P.Eng, MBA

Alberta Climate Change Office

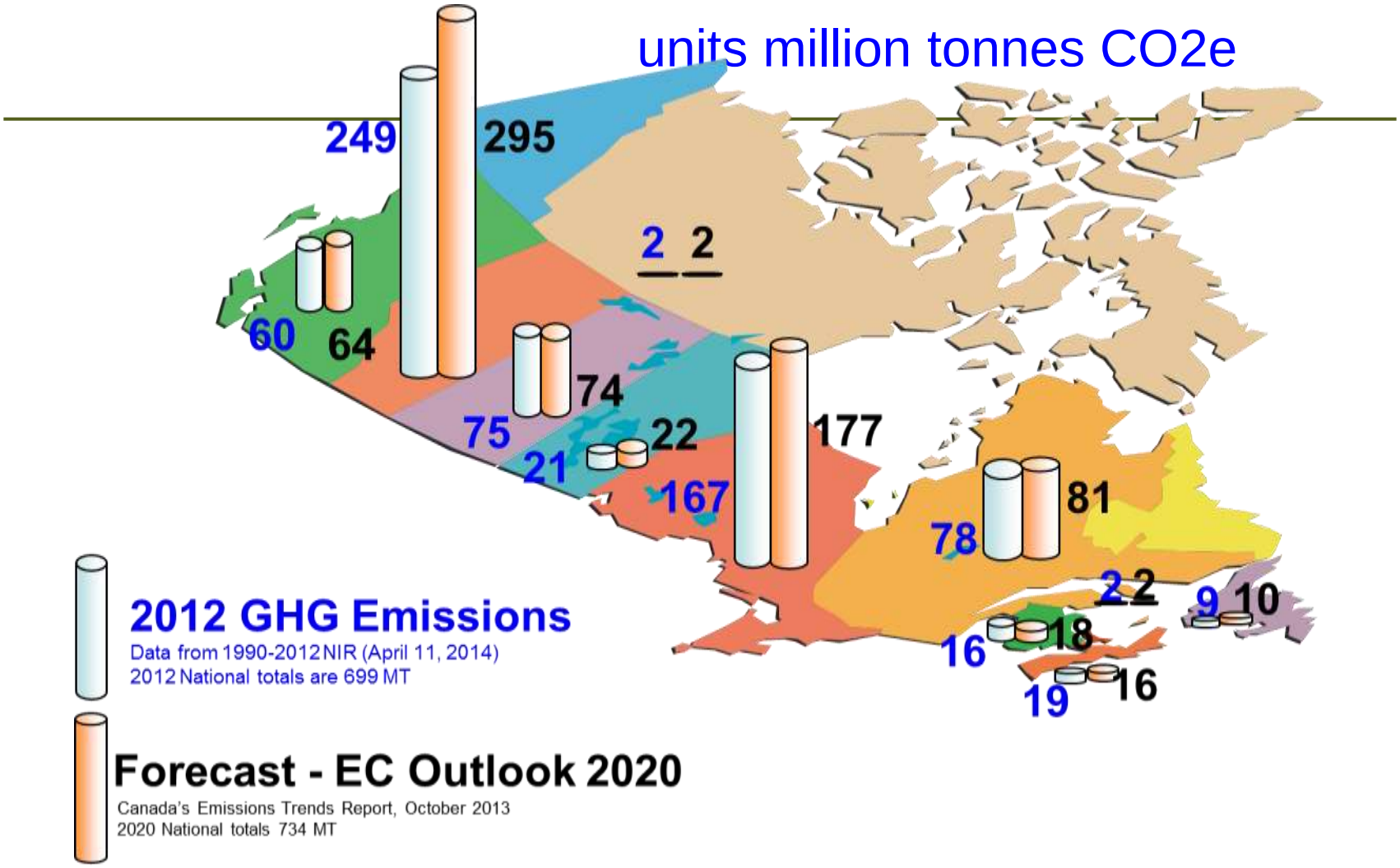
Overview

- Alberta's GHG Regulation
- Carbon Offset System
- CCS Regulatory Framework Assessment
- Highlights of the CCS Protocol
- Alberta's Climate Leadership Plan

2013 Alberta GHG Emissions
267 Mt CO2e Total

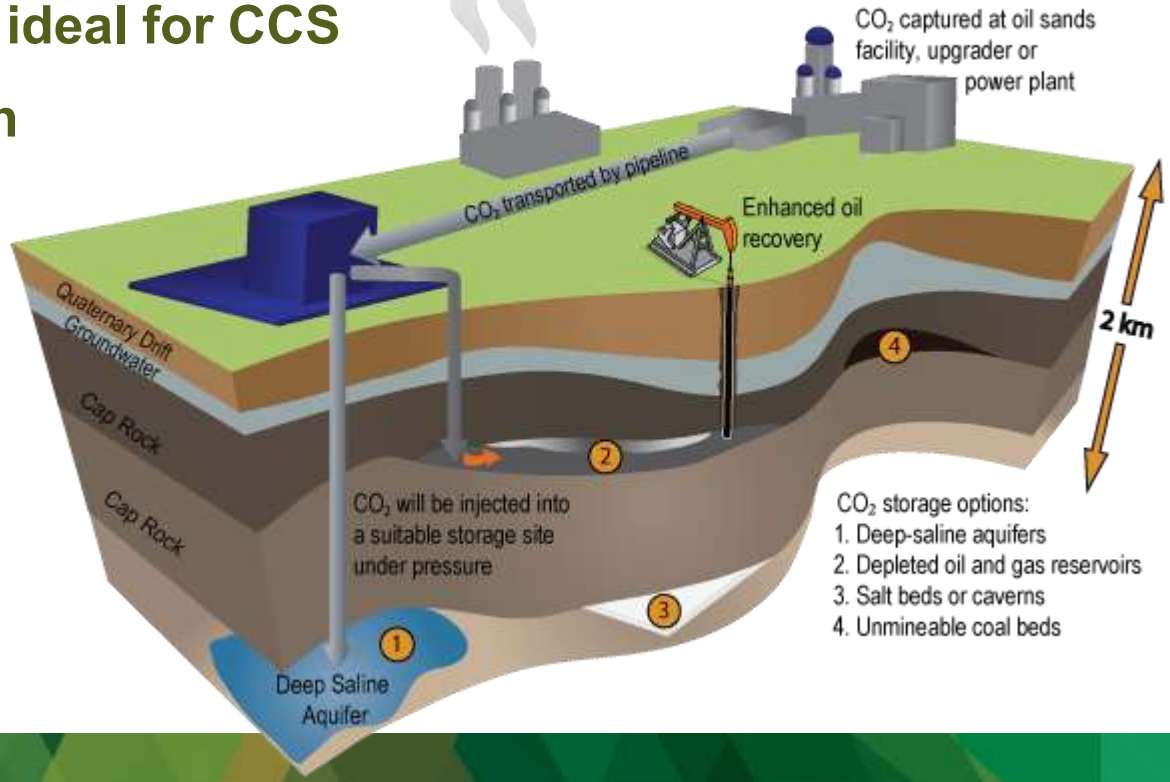


Alberta GHG Emissions in Context of Canada



Carbon Capture and Storage Target - 139 Mt by 2050

- Key element of Alberta's Climate Change Strategy
- $1.3 billion for two large-scale CCS projects
- Alberta's geology ideal for CCS
- 2.8 Mt/yr reduction



Specified Gas Emitters Regulation (SGER)

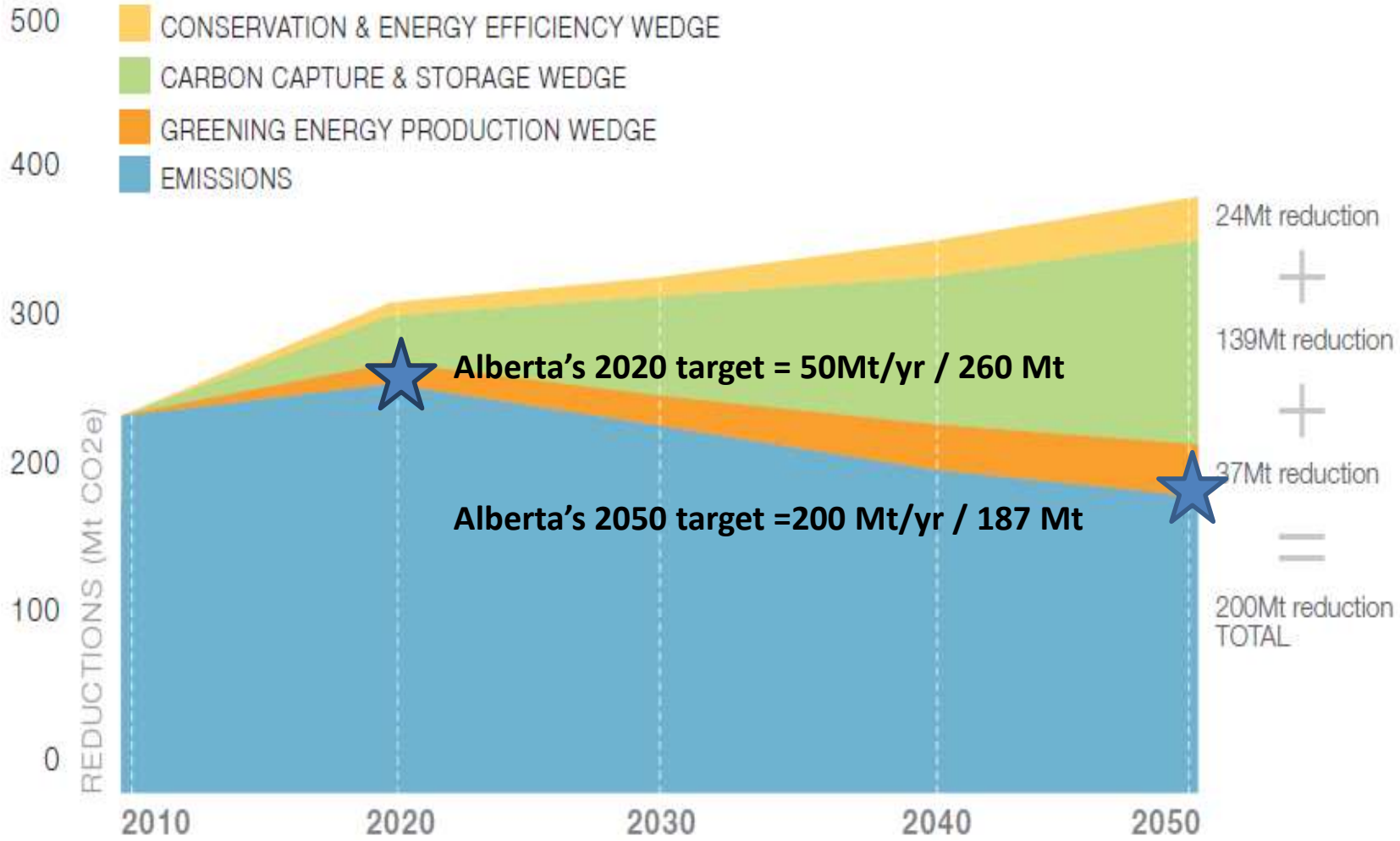
GHG Regulation Since 2007

- **Regulates large industry (>100,000 tonnes CO2eq per year)**
- **Facilities required to reduce emissions intensity by 12% (and 15% in 2016)**

Compliance Options (if unable to physically reduce emissions)

- **Pay $15/tonne into the Technology Fund**
- **Purchase emissions performance credits (from another facility below the reduction target)**
- **Purchase serialized Alberta-based carbon offset credits**

Alberta's GHG Emissions & Targets



- **2010 Target - 20 Mt reduction from BAU - met**

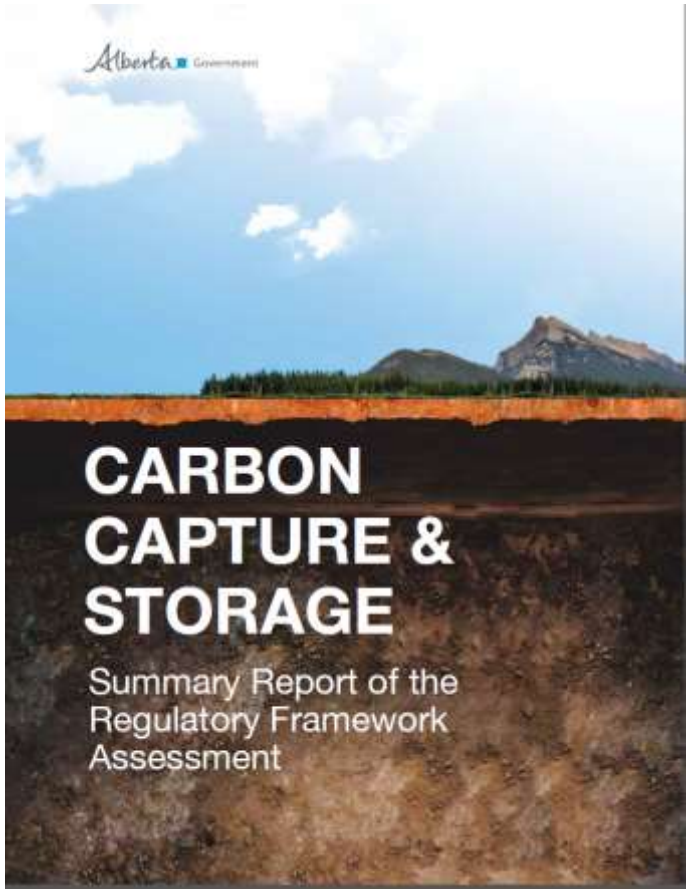
CCS Regulatory Framework Assessment

Responsibly and sustainably develop energy resources while addressing our GHG emissions

Ensure comprehensive and transparent regulations for CO2 sequestration

Multi-stakeholder and international experts, 4 working groups

71 individual recommendations and 9 conclusions = 25 Actions



Alberta's Carbon Offset System

Supports commitment to reduce provincial emissions

Provides incentives for GHG reduction activities

High level of rigour, used for industrial compliance

- **Reductions must be real, demonstrable, quantifiable and verifiable**
- **Have clearly established ownership**
- **Actions not required by law**
- **Beyond business as usual**
- **Counted once for compliance**

Alberta Carbon Offset Credits

32 offset protocols in place

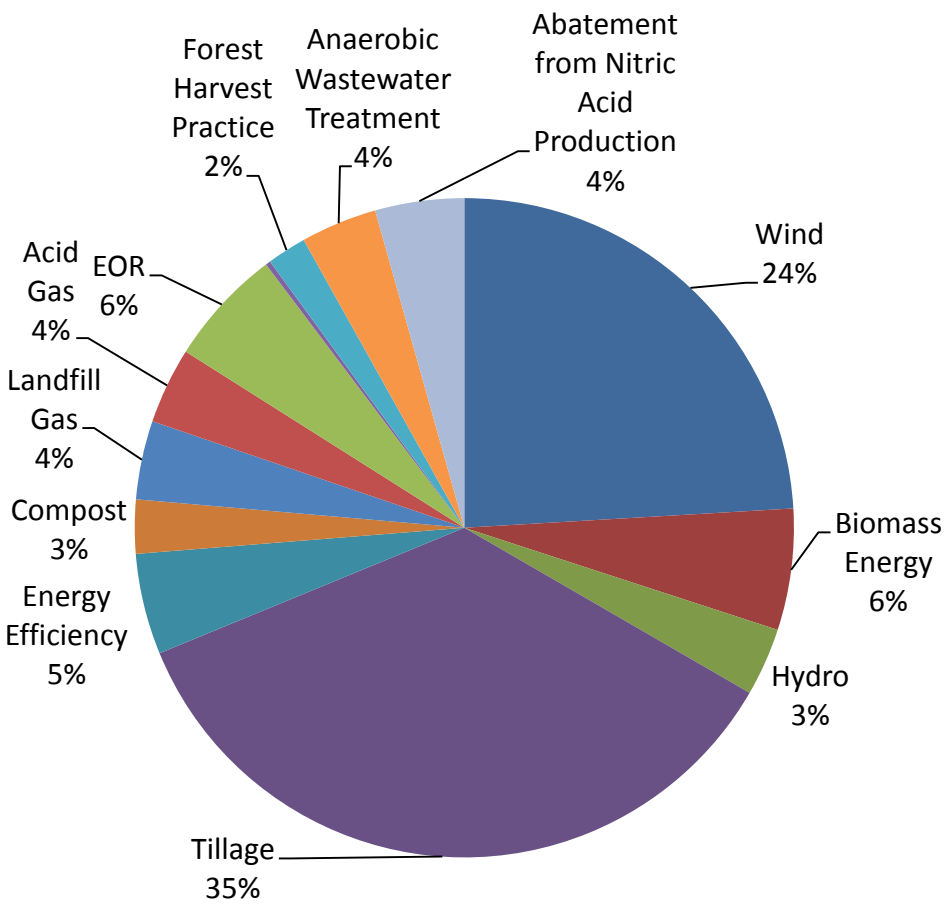
Over 33 Mt of offsets registered

22 Mt of offsets retired to date

Top offsets:

- **agriculture (tillage)**
- **wind**
- **biomass energy**
- **energy efficiency**
- **enhanced oil recovery**
- **nitric acid abatement**

Offsets Used To Date (21.8 Mt total)



CCS Offset Protocol Highlights

Creates economic value for capture & storage of CO2

- **CO2 reported as emitted by SGER facilities**
  - **Only the injected CO2 is measured in offset project**
- **Addresses reversals, permanence and long term liability**
- **Offset Credits = Injected CO2 – Project Emissions (Project emissions includes reversals)**

CCS Protocol
More Highlights

Movement of CO_2 plume outside of MMV detection area and tenure lease, would result in the CO_2 considered emitted

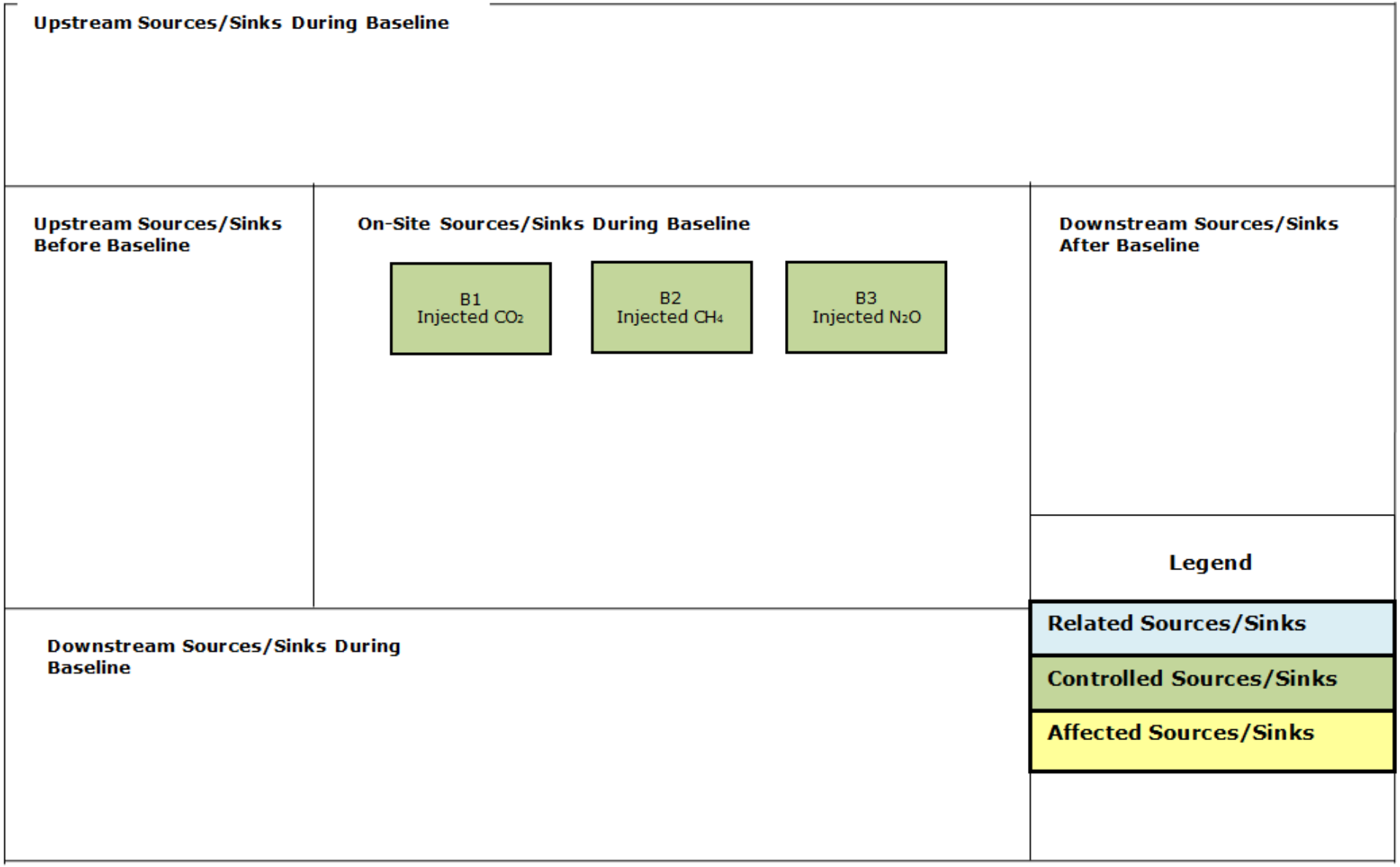
Detailed Quantification Methodology

- Injection of CO_2 only (not CH_4 or N_2O) for credits

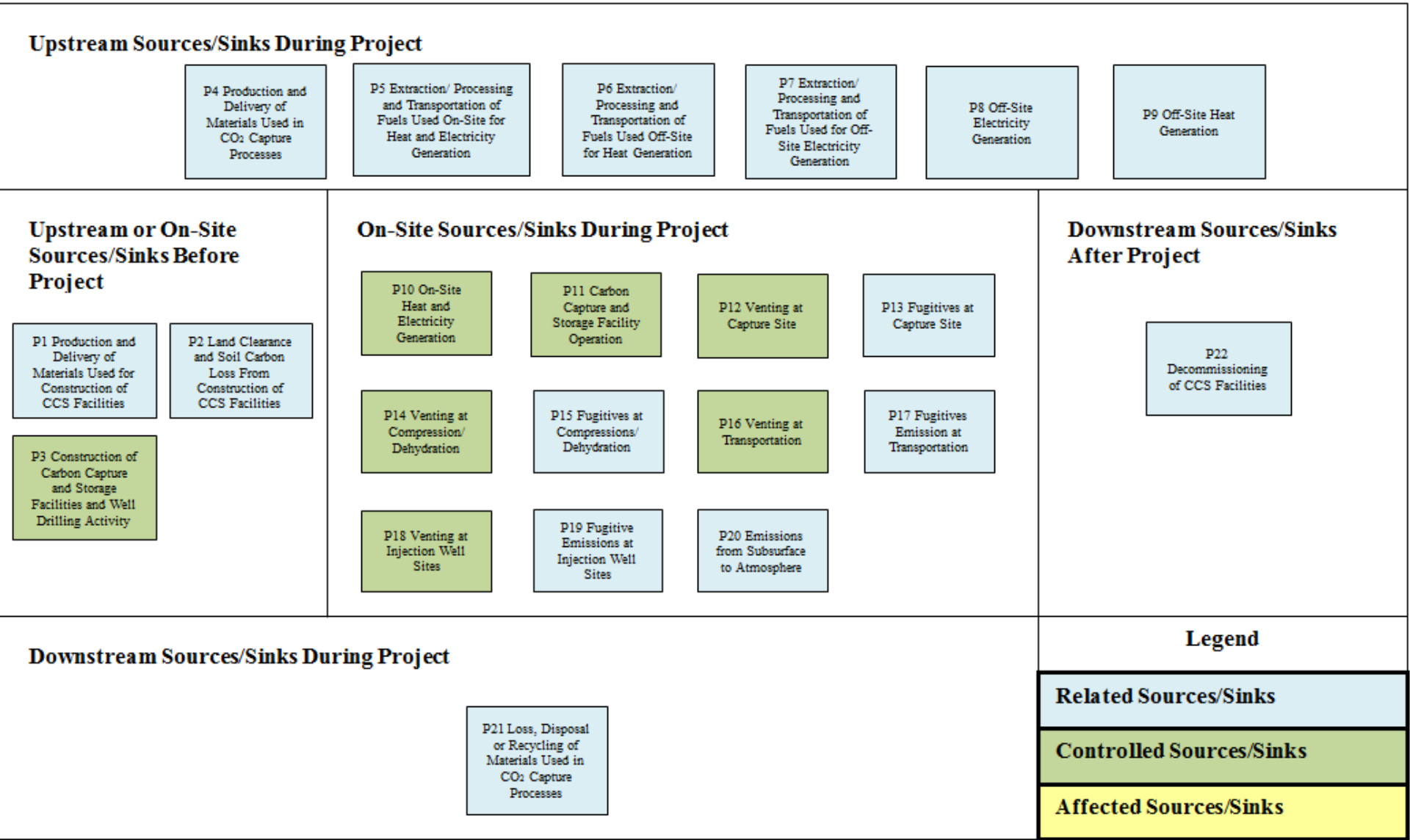
Indirect emissions included

- Electricity, Heat and Hydrogen

CCS Baseline
Sources and Sinks



CCS Project Condition Sources and Sinks



CCS Project Related and Controlled Sources and Sinks

On-Site Sources/Sinks During Project

P10 On-Site Heat and Electricity Generation	P11 Carbon Capture and Storage Facility Operation	P12 Venting at Capture Site	P13 Fugitives at Capture Site
P14 Venting at Compression/ Dehydration	P15 Fugitives at Compressions/ Dehydration	P16 Venting at Transportation	P17 Fugitives Emission at Transportation
P18 Venting at Injection Well Sites	P19 Fugitive Emissions at Injection Well Sites	P20 Emissions from Subsurface to Atmosphere	

Incremental, Directly Connected Electricity

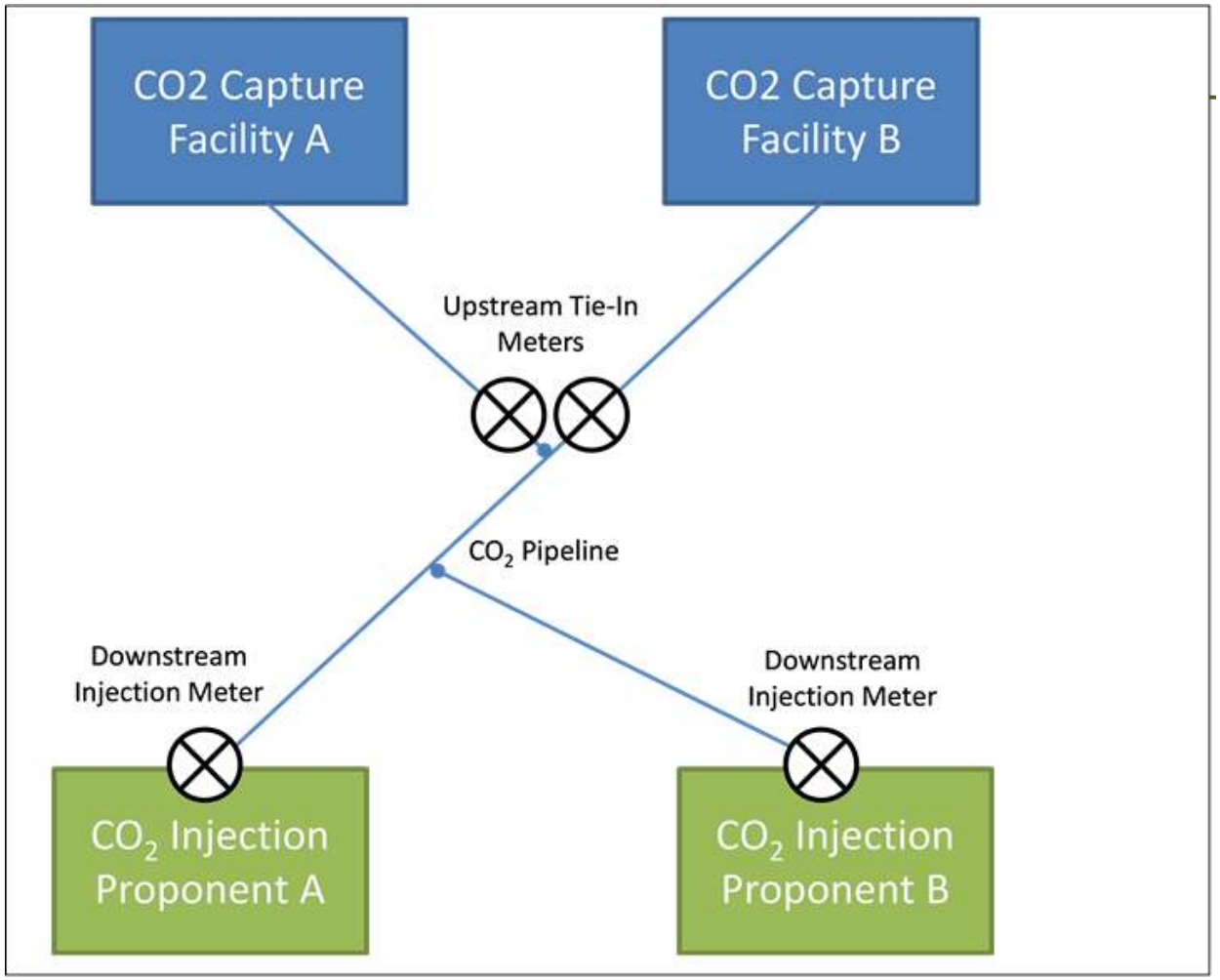
Direct Connection: directly connected to the site or through a recognized Industrial System Designation that is separate from the provincial electricity grid; and

Dedicated Electricity Contract: sourced using a dedicated electricity purchase agreement; and

Incremental Generation under Contract: must represent electricity generation that was not previously utilized; either

- Newly installed generation capacity, or
- Capacity not utilized in the average year, over 3 yr baseline

Metering for Multiple CCS Offset Projects



Next Steps

Enhanced Oil Recovery Protocol in use since 2007

- Currently under Technical Review and Revision
- Indirect emissions of heat and electricity to be included
- Further discussions on recycle, permanence and long term liability

CCS in Alberta - Website Links

Alberta Offset Protocols and Guidance Documents

http://aep.alberta.ca/climate-change/guidelines-legislation/specified-gas-emitters-regulation/offset-credit-system-protocols.aspx

Alberta Energy CCS Knowledge Sharing

http://www.energy.alberta.ca/OurBusiness/3815.asp (CCS Main Pg)

http://www.energy.alberta.ca/CCS/3845.asp (Knowledge Reports)

Specified Gas Emitters Regulation and Guidance Documents

http://esrd.alberta.ca/focus/alberta-and-climate-change/regulating-greenhouse-gas-emissions/greenhouse-gas-reduction-program/compliance-information-for-industry/default.aspx

The Future

Alberta's GHG Actions to Date

Specified Gas Emissions Regulation (SGER)

Alberta's Climate Leadership Plan

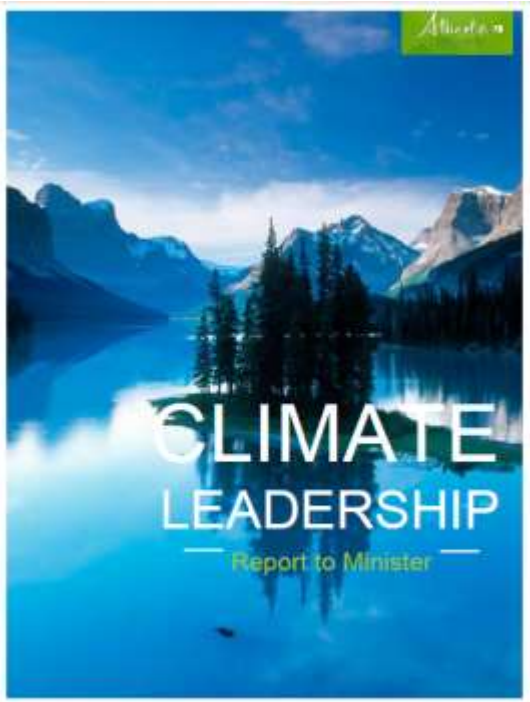
4 Key Elements

- Carbon Pricing
- Electricity
- Methane Reduction
- Oil Sands Limit

Climate Review - Advisory Panel

Chair: Dr. Andrew Leach
Panel members: Angela Adams, Stephanie Cairns, Linda Coady, Gordon Lambert

Mandate: Lead engagement with Albertans, stakeholders and Indigenous communities to inform recommendations to government on a new climate policy approach. The Panel submitted their report to the government in November.



Alberta's Climate Leadership Plan

Key Elements and Commitments:

- Carbon Pricing
  - combustion fuel pricing
  - product / sector-based performance standards
  - Revenue recycling
- Electricity
  - coal emissions phase out
  - renewable generation
- Oil Sands
  - annual emissions limit from sector
- Methane
  - reduction from oil and gas sector

Carbon Pricing - Combustion Fuel

Application:

- Transportation and heating fuels

- Fuels produced and used on site at small oil and gas facilities (not captured by performance standards) will be exempt until January 1, 2023

Price:

January 1, 2017	January 1, 2018
$20/tonne	$30/tonne

Carbon Pricing - Performance Standards

Application:

- All facilities emitting 100,000 tonnes CO2e or more annually
- Performance standards by product / sector (shift from site-specific historic baselines reduction requirement)
- Improves transparency and allows benchmarking of performance within and outside Alberta
- Compliance flexibility remains

Price:

Currently	**January 1, 2016**	**January 1, 2017**	**January 1, 2018**
$20/tonne	$20/tonne	$30/tonne	$30/tonne
SGER – 15% Reduction	SGER – 15% Reduction	SGER – 20% Reduction	Performance Standards

Electricity

Climate Leadership Plan Commitments:

1. Phase Out of Emissions from Coal Generation

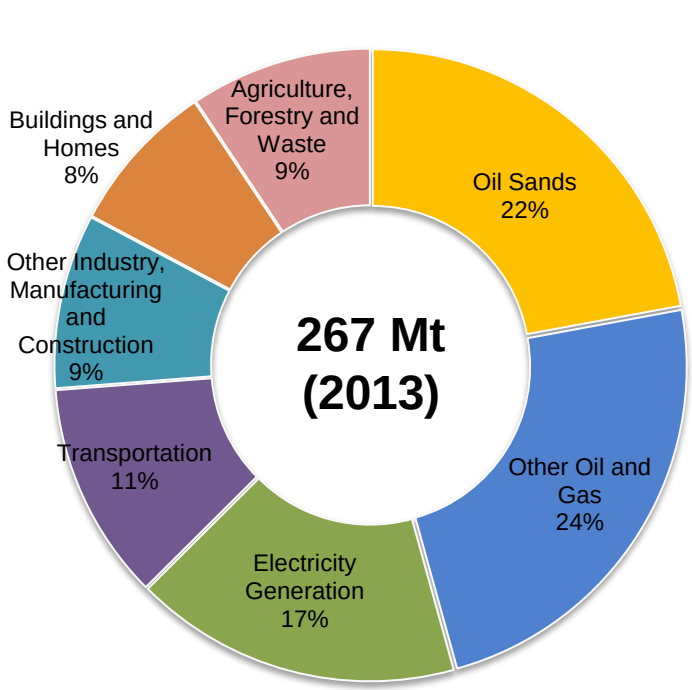
   - zero emissions from coal-fired power by 2030

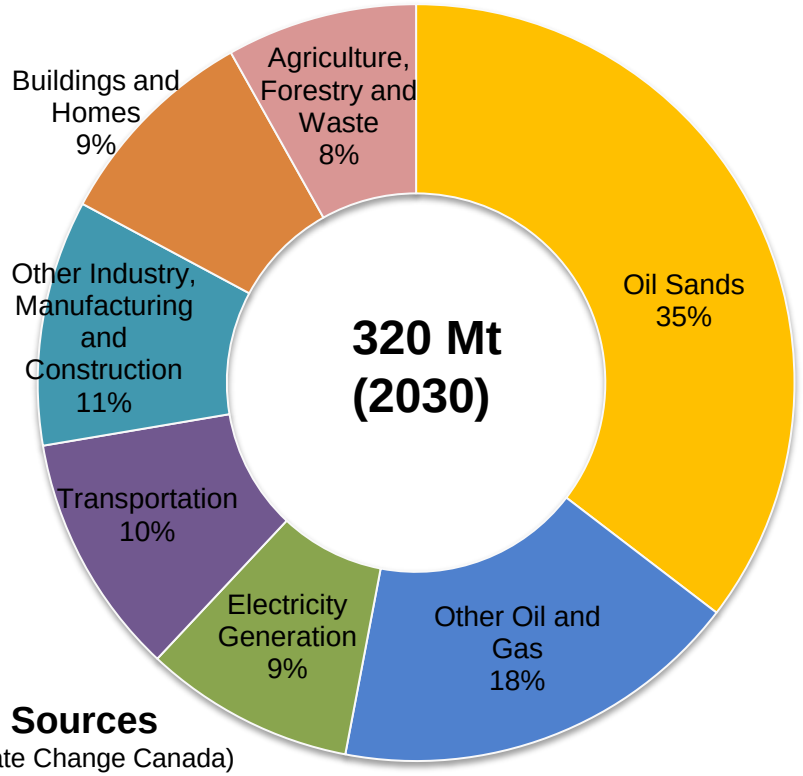
2. Renewable Generation

   - 30 per cent of total generation by 2030

Oil Sands

- **Why an emissions cap on oil sands?**





Alberta Emission Sources

(Source: Environment and Climate Change Canada)

Methane Management

Climate Leadership Plan commitments:

1. Reduction of 45% of methane from oil and gas by 2025 (from 2014 levels)

2. Requirements at existing and new facilities

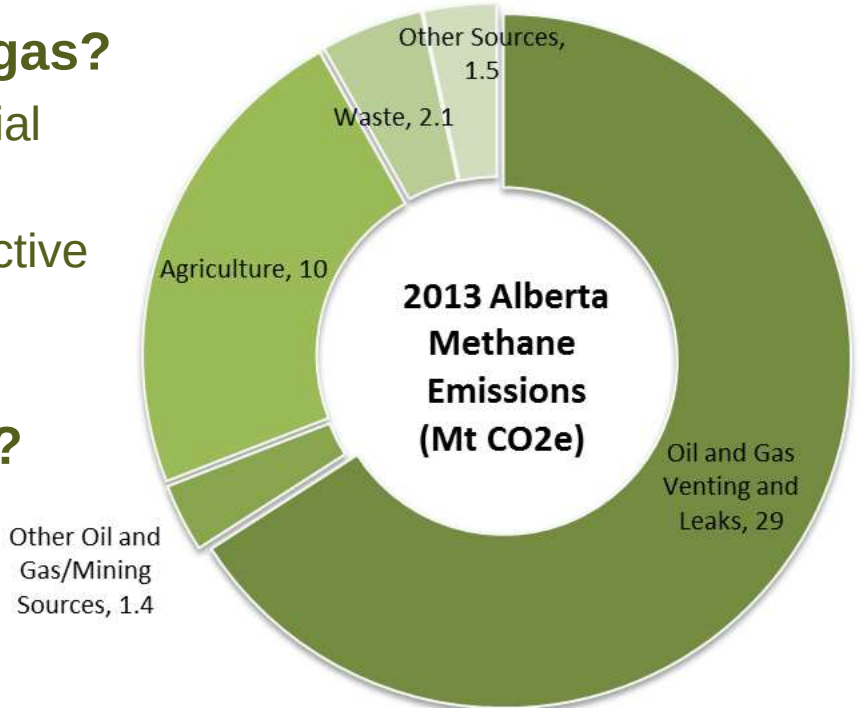
Methane Management

Why focus on methane from oil and gas?

- Oil and gas sector ~70 percent of provincial methane emissions
- Methane venting and fugitives – cost effective reductions

Methane reductions in other sectors?

- Driven by performance standard, or
- Driven by carbon pricing on fuel use
- Methane reductions in agricultural and waste sectors incented through carbon offsets protocols



Opportunities for Great Innovation

- **Reduced transportation emissions**

- **Renewable energy generation**

- **Better energy storage**

- **Energy efficiency**

Summary

- **Alberta's SGER has regulated GHG's since 2007**
  - **Offset program allows compliance flexibility**
  - **Near term reductions from CCS**
- **Alberta's Climate Leadership Plan**
  - **Economy wide coverage**
  - **Increases stringency and carbon price**
  - **Targets emissions from coal and Oil and Gas Methane**
- **The Carbon Capture and Storage Protocol**
  - **In use – Injection started August 2015**
  - **Offset credits used for compliance with SGER**

Website Links

Climate Leadership Plan

- http://www.alberta.ca/climate-leadership-plan.cfm
- End coal pollution,
- Price carbon,
- Cap O/S emissions,
- Reduce methane

Climate Leadership Report to Minister (from Review Panel)

- http://www.alberta.ca/documents/climate/climate-leadership-report-to-minister.pdf
- Online Survey results
- Technical engagement report
- Aboriginal engagement sessions
- Submission library (535 submissions)

Questions?

Shan Pletcher, P.Eng, MBA, EP(GHG)
Alberta Climate Change Office
Alberta Government

shan.pletcher@gov.ab.ca
Phone: 780-638-3628

Alberta