

Carbon Capture, Utilization & Storage (CCUS)

# The SaskPower Story



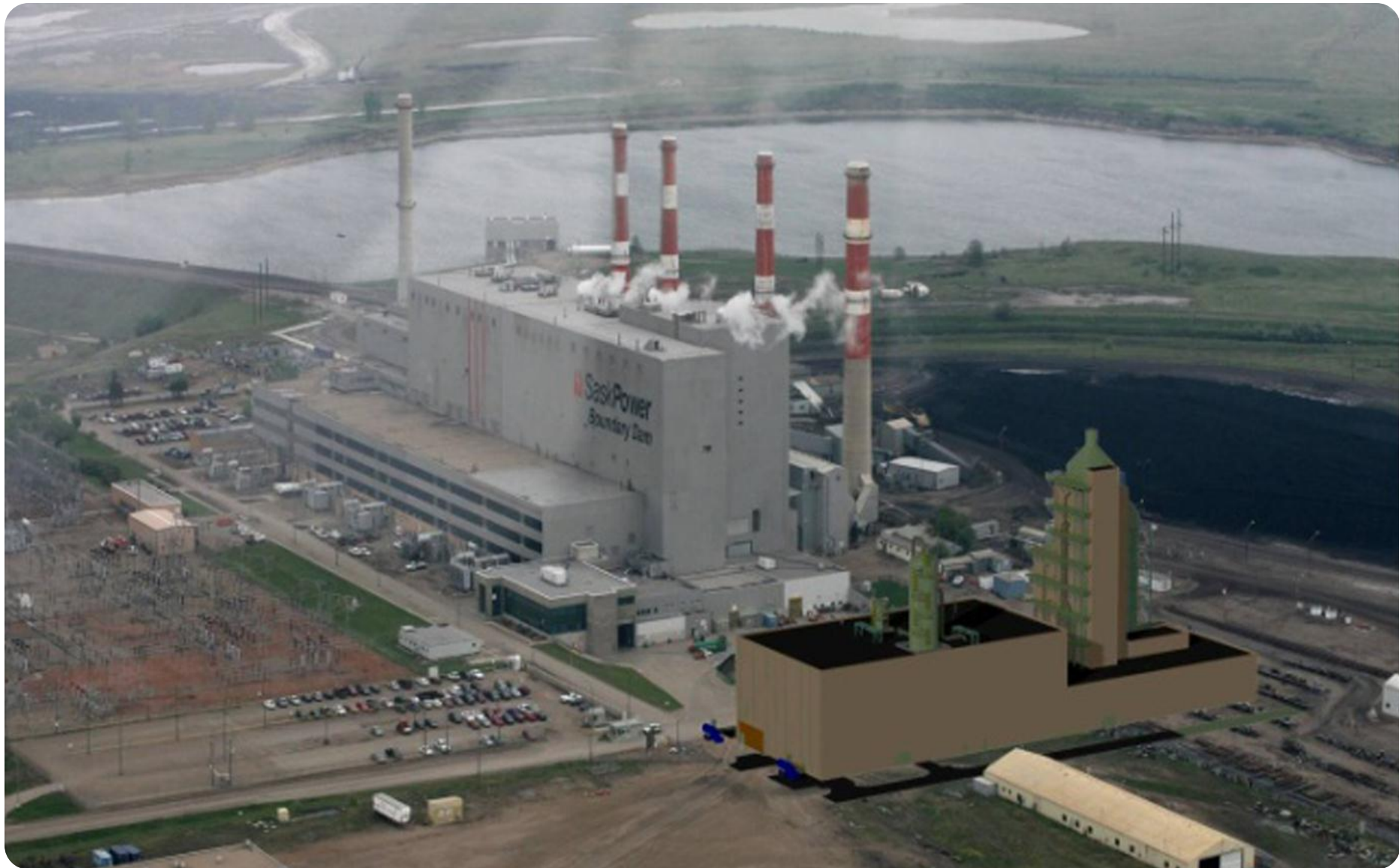
Presented by **Mike Monea**  
**President Carbon Capture and Storage Initiatives**



# The challenge

Moving from ideas to real-world results

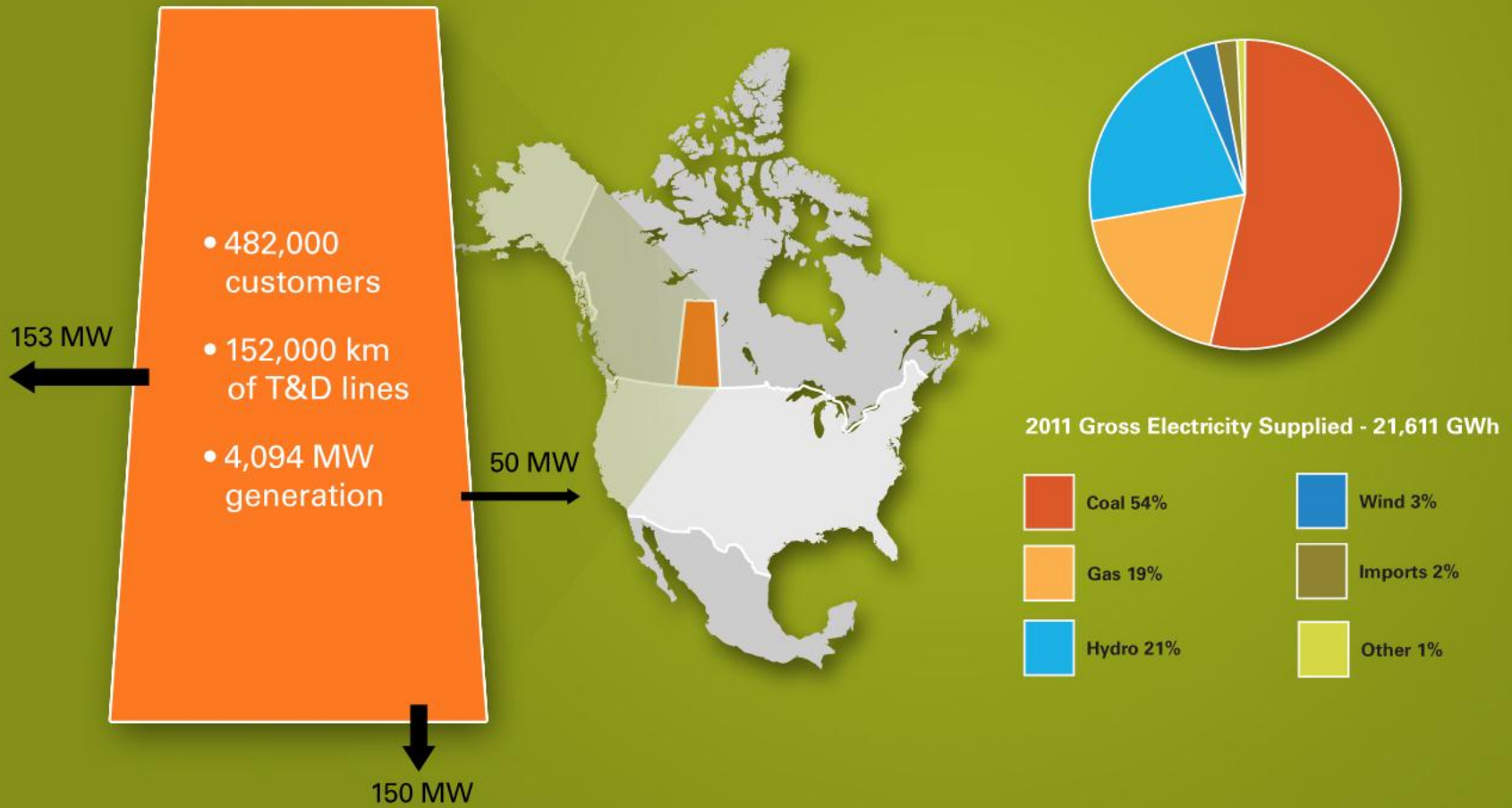
# A foothold for commercial CCUS



# Welcome to Saskatchewan

- Over 1 million people in about 651,000 square kilometres
- One of fastest growing provinces in terms of population
- 2011 increase in gross domestic product was among the highest in Canada
- Oil production second among Canadian provinces
- Home to about one-third of the world's supply of both potash and uranium
- Grain farming, livestock, natural gas and manufacturing also prominent

# SaskPower – Saskatchewan's leading energy supplier



# SaskPower – a history of innovation

- Established in 1929, company pioneered use of a single-wire, ground-return distribution system
- One of first Canadian utilities to use fibre optic technology
- Developed only wetland in North America designed to supply cooling water to a power station
- First Canadian power utility to achieve ISO 14001 full registration of environmental management system
- Emission Control Research Facility develops particulate, SO<sub>2</sub>, NO<sub>x</sub> and mercury technologies
- First utility in the world to complete a workable design for a large-scale near-zero emissions pulverized coal plant

# The CCUS need

- Canadian GHG target: 17% below 2005 levels by 2020
- Proposed Canadian regulations to limit CO<sub>2</sub> from coal-fired electricity generation establishes performance standard of 375 tonnes CO<sub>2</sub> /GWh
- SaskPower has traditionally used a low-cost, abundant and locally available supply of coal to fuel a significant portion of our base load
- With coal supplying about 40% of the world's electricity, CCUS could have major impact on global GHG emissions

# SaskPower's CCUS objectives



- Minimize future customer cost increases related to emissions regulations
- Develop economically and environmentally sustainable electricity supply through coal
- Ensure cost of coal-fired electricity is competitive with other available options



# Boundary Dam Integrated Carbon Capture and Storage Demonstration Project

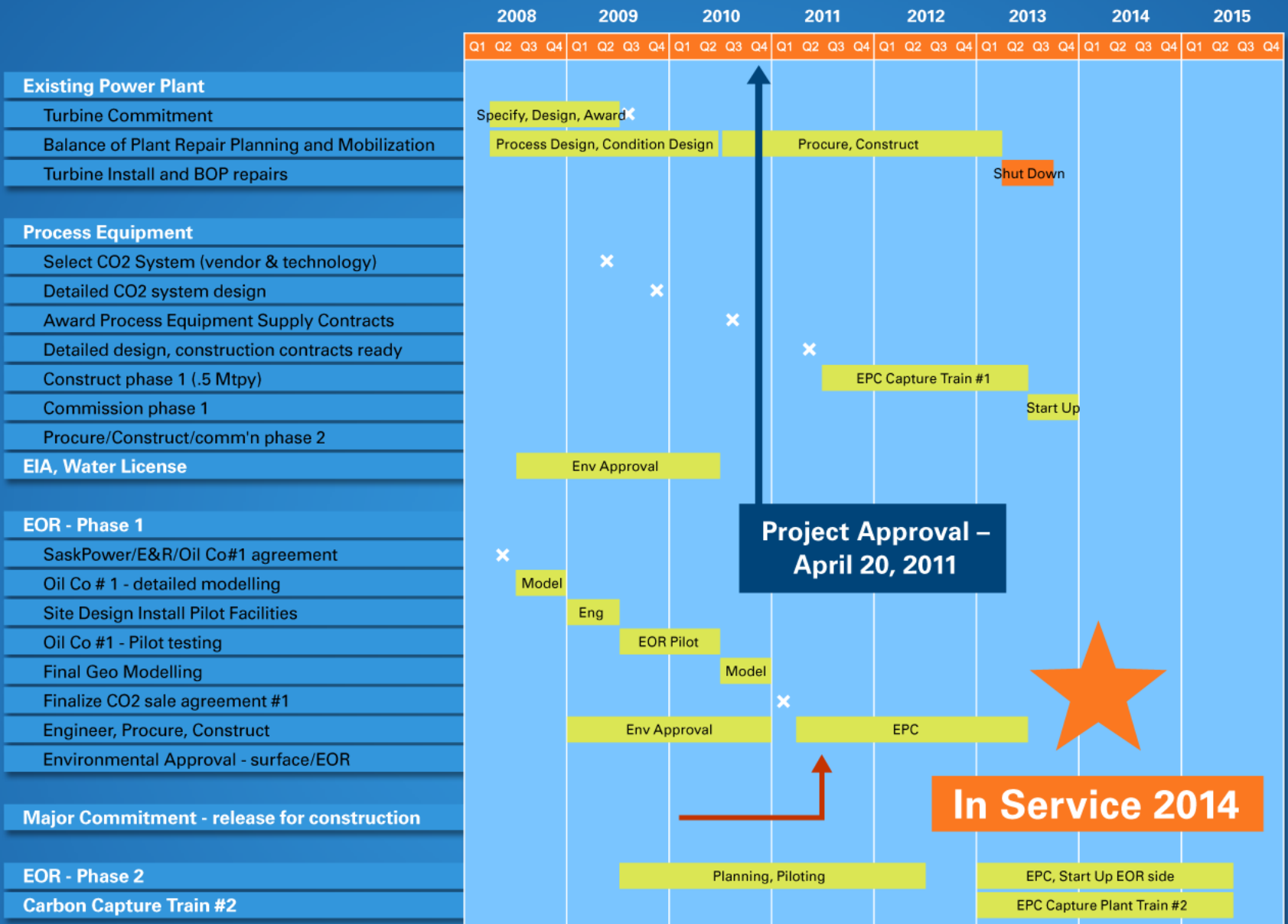


- One of the world's first and largest commercial-scale carbon capture and storage facilities
- Expected reduction of CO<sub>2</sub> emissions by more than 90%, with post-combustion capture of one million tonnes per year

# Boundary Dam project deliverables



- Life extension of existing unit
- Performance upgrades
- CO<sub>2</sub> capture technology
- Acceptable cost of electricity
- In service 2014



# Virtual tour of Boundary Dam



# Construction progress



# Construction progress



# Construction progress

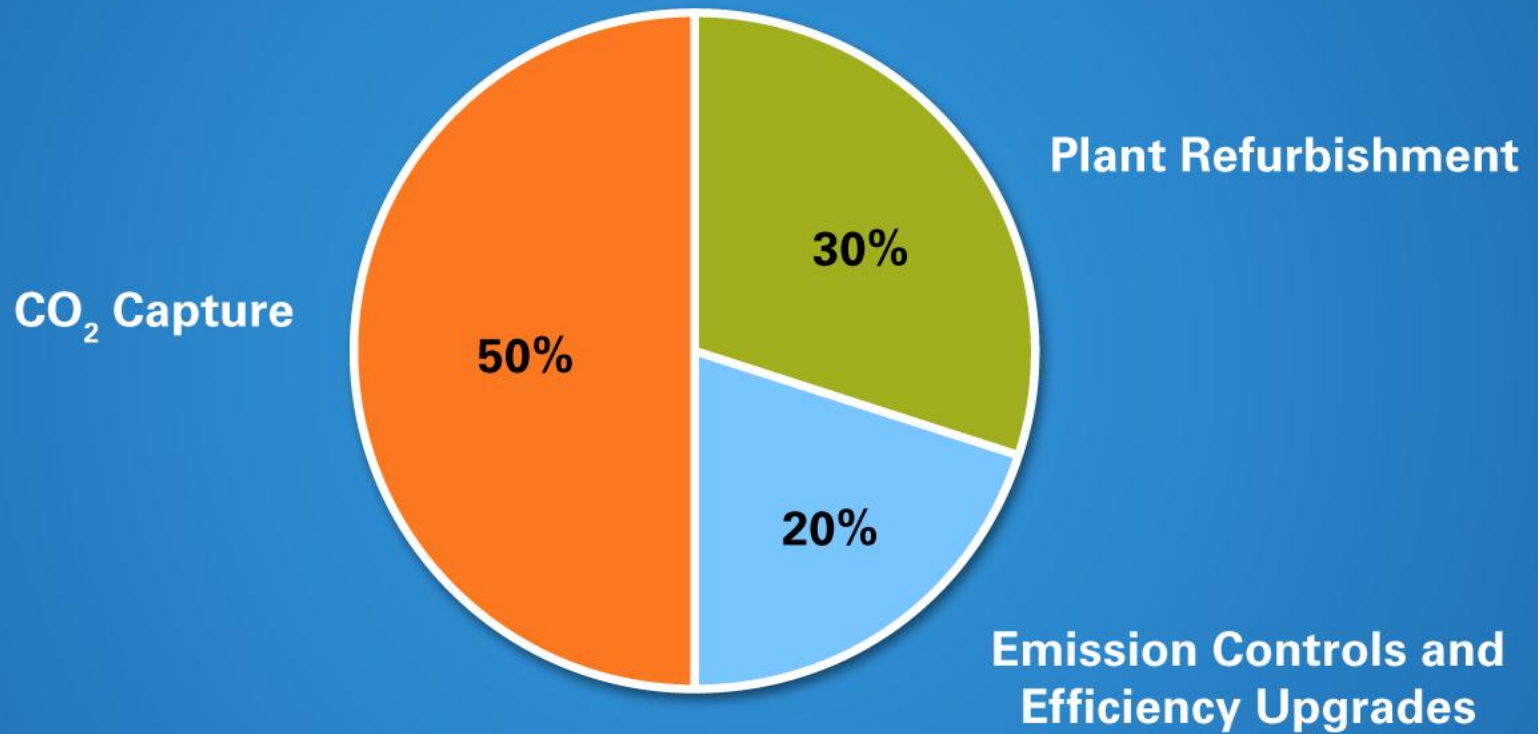


# Construction progress





# Boundary Dam project capital cost breakdown



# Boundary Dam cost model

- Government of Canada
- EOR sales

# Boundary Dam CCUS vs. natural gas

BASE LOAD NATURAL GAS  
COST OF ELECTRICITY

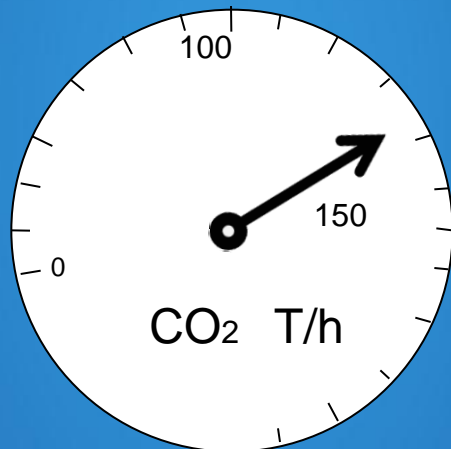
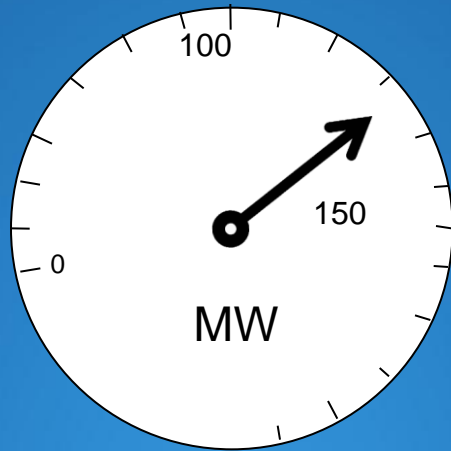


BOUNDARY DAM CCUS  
COST OF ELECTRICITY



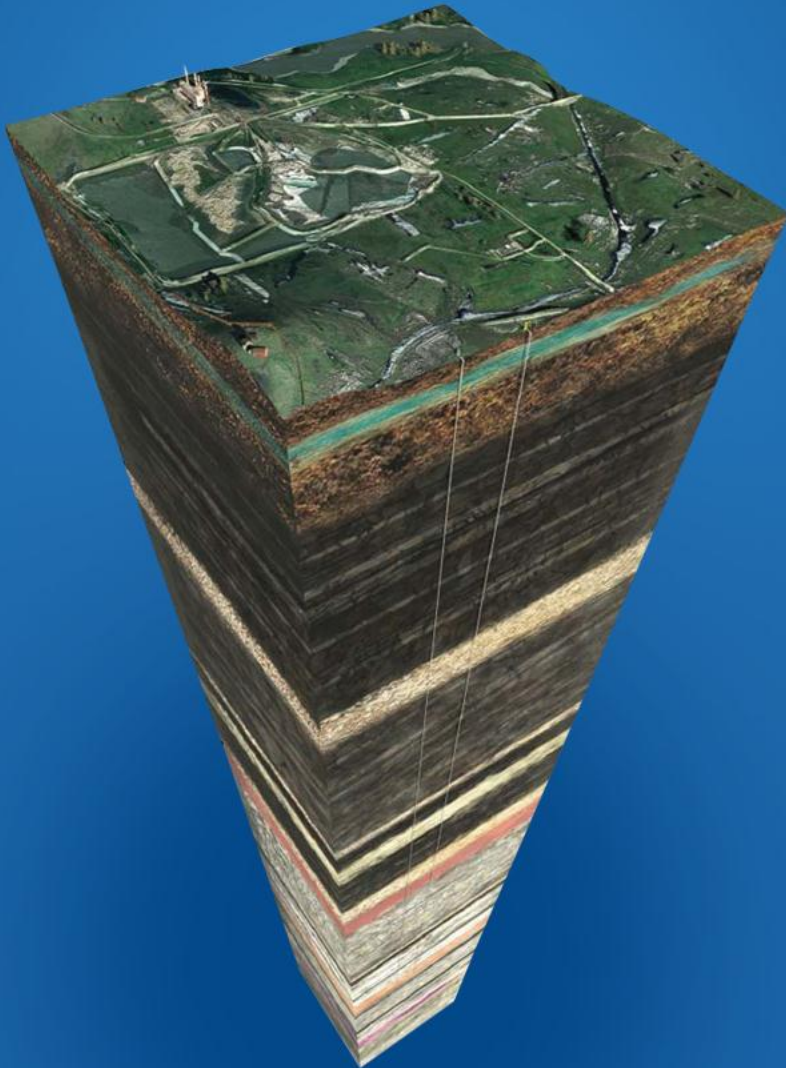
- CAPITAL INVESTMENT
- FUEL EXPENSE
- O & M

# Boundary Dam project – knowledge expected



- Will performance match engineering predictions?
- Will integrated operation perform as intended?
- Were the risk models actually of value in managing the project?
- Can some of the opportunities which were bypassed on this project be brought into future projects?
- What new opportunities for cost and performance improvements will be uncovered?

# Aquistore



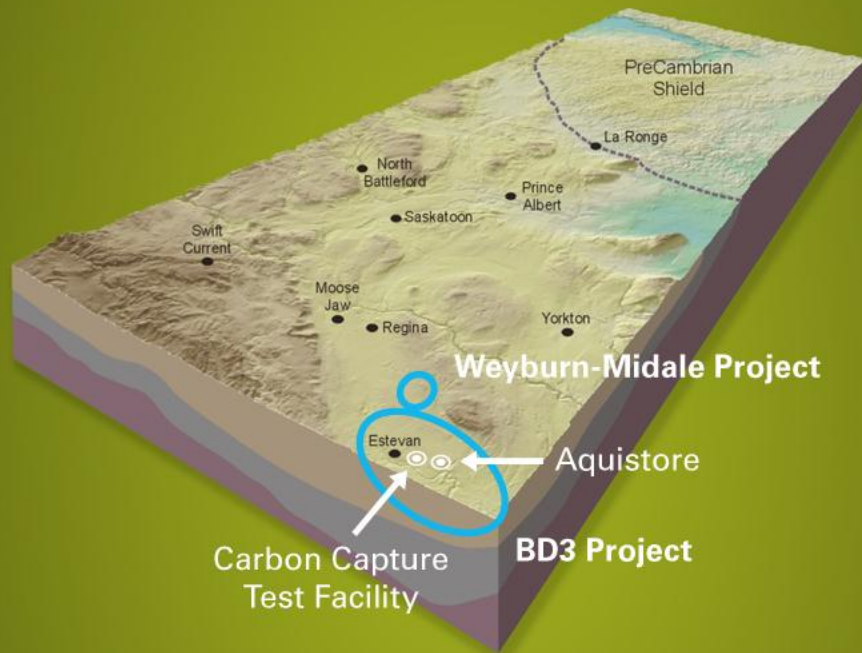
- Storing CO<sub>2</sub> 3 km underground
- Pipeline to site less than 2 km away
- Pilot underway in 2013

# SaskPower Carbon Capture Test Facility



- Located at SaskPower's 276-MW coal-fired Shand Power Station
- Neutral platform for vendors to verify and improve post-combustion technologies in commercial setting
- Primary test unit CO<sub>2</sub> capture capacity of 120 tonnes per day
- Hitachi Ltd.'s proprietary amine technology will be the first tested

# Saskatchewan: a centre of CCUS innovation



- SaskPower Boundary Dam Integrated Carbon Capture and Storage Demonstration Project
- SaskPower Carbon Capture Test Facility
- International Energy Agency GHG Weyburn-Midale CO<sub>2</sub> Monitoring & Storage Project
- Aquistore Deep Saline CO<sub>2</sub> Storage Project
- Petroleum Technology Research Centre (PTRC)
- International Performance Assessment Centre for Geological Storage of CO<sub>2</sub>
- International Test Centre for CO<sub>2</sub> Capture

Image modified from  
**Geoscape Southern Saskatchewan**

# CCS Intelligence

- A global carbon capture utilization and storage knowledge platform
- A central repository for world-leading CCUS innovation
- Participants gain access to CCUS expertise in:
  - Technology
  - Research
  - Procurement
  - Supplier management
  - Project management
  - Training
  - Regulatory affairs
  - Government relations



# Contact us

Handouts with detailed information on our projects are available.

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