Developing a Carbon Capture and Storage (CCS) Blueprint for Alberta

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Alberta Energy

GOVERNMENT PRIORITY

- **Ensure Alberta's energy resources are developed in an environmentally sustainable way.**

- **Government of Alberta is investing $2 billion in Carbon Capture and Storage**

Alberta's 2008 Climate Change Strategy:

Goal -- To store large quantities of CO_2 in Alberta's geological formations instead of releasing them into the atmosphere.

Why Carbon Capture & Storage?

Carbon Capture & Storage (CCS) provides an opportunity for Alberta to reduce GHG emissions while ensuring Alberta's and Canada's economic success and growth can continue.

CCS is a scientifically proven technology that will reduce CO_2 emissions from large scale operations including: oil sands facilities, value added upgrading and coal-fired electricity generation.

Our initial goal: 5 Mt of CO_2 in the ground annually by 2015.

ALBERTA'S REDUCTION COMMITMENTS

CONSERVATION & ENERGY EFFICIENCY	24Mt
CARBON CAPTURE & STORAGE	139Mt
GREENING ENERGY PRODUCTION	37Mt
TOTAL =	200Mt

Alberta Carbon Capture & Storage Development Council

- Council's Framework: make recommendations to facilitate the immediate implementation of CCS in Alberta.
- Council includes top executives and expertise from across the industry, government and academia.
- Underlying considerations:
  - Keep industries competitive
  - Provide certainty for long-term planning
  - Meet commitment in Alberta's 2008 Climate Change Strategy

Interim Report from the Council was released on September 30th, 2008

Importance of CCS for Alberta

If CCS is going to make a substantial contribution to Alberta's future, immediate steps toward fostering CCS Development are needed now.

- Alberta relies primarily on coal fired electricity generation.
- Oil production will grow 3 fold by 2016
- Alberta and the world demand more responsible resource development

Alberta faces the challenge of being two things:

- A world class energy producer
- A leader in environmental responsibility

Alberta is ideally suited for large scale CCS

- Variety of industrial activities positioned to capture CO_2
- Alberta has deep geological formations, depleted oil and gas reservoirs, Enhanced Oil Recovery (EOR) prospects and saline reservoirs.
- Structural and other barriers in geological formations will provide containment that traps injected CO_2
- Industrial point sources close to storage sites
- Tremendous opportunities throughout Alberta – CO2 movement and financial transfers (carbon credits) with other provinces also possible.

Alberta's Industry is experienced

- 50+ years of industry "know how" in oil & gas reservoir engineering
- 20+ years in Enhanced Oil Recovery (EOR)
- Significant hydrocarbon/chemical processing & upgrading facilities, CO_2 extraction from natural gas, and gas separation and handling experience.

Alberta has the right geology, abundant CO_2 sources, value added potential and industry expertise to lead the world in CCS

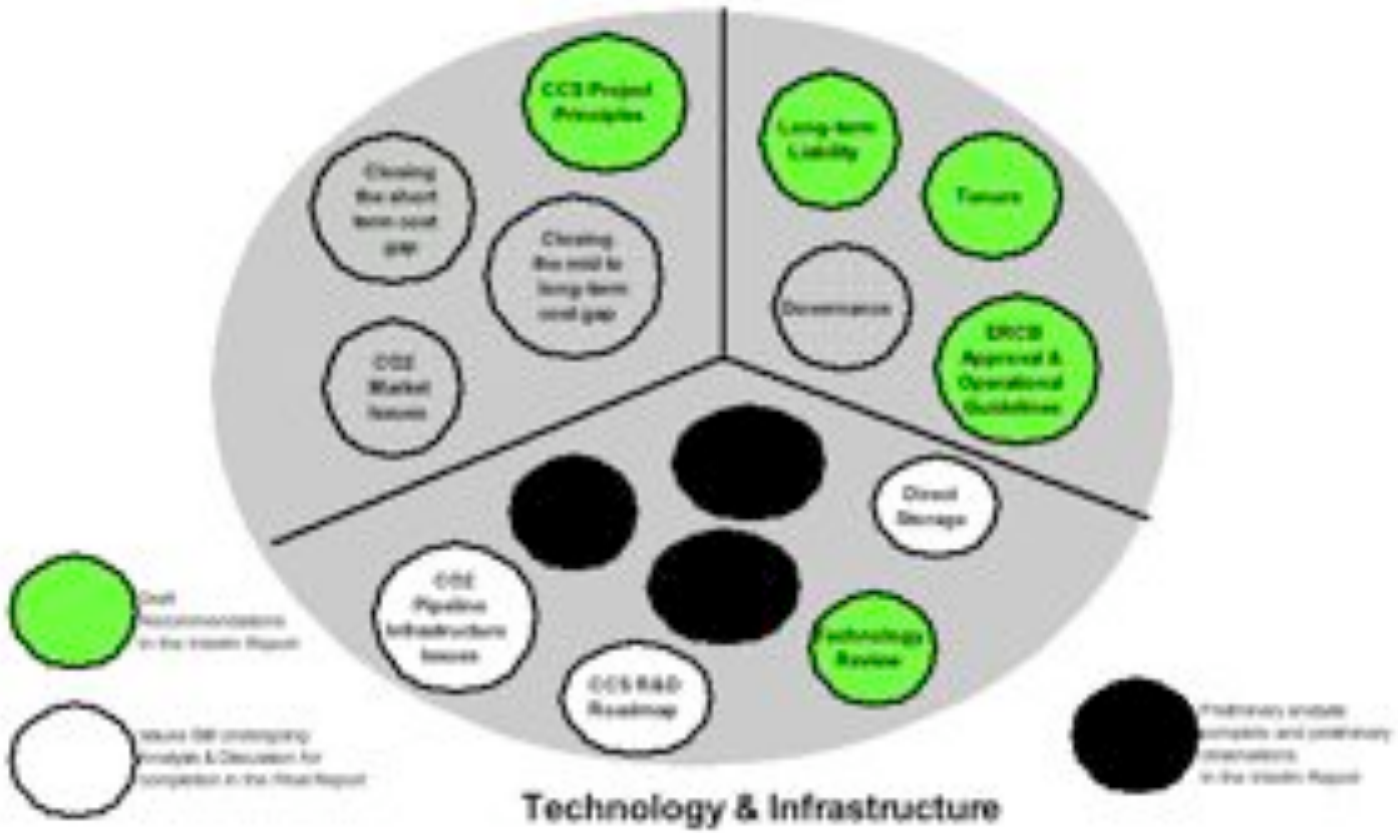
Report Identified Key Success Factors

- A robust fiscal framework
- A clear regulatory framework
- A comprehensive research, development and technology commercialization program.

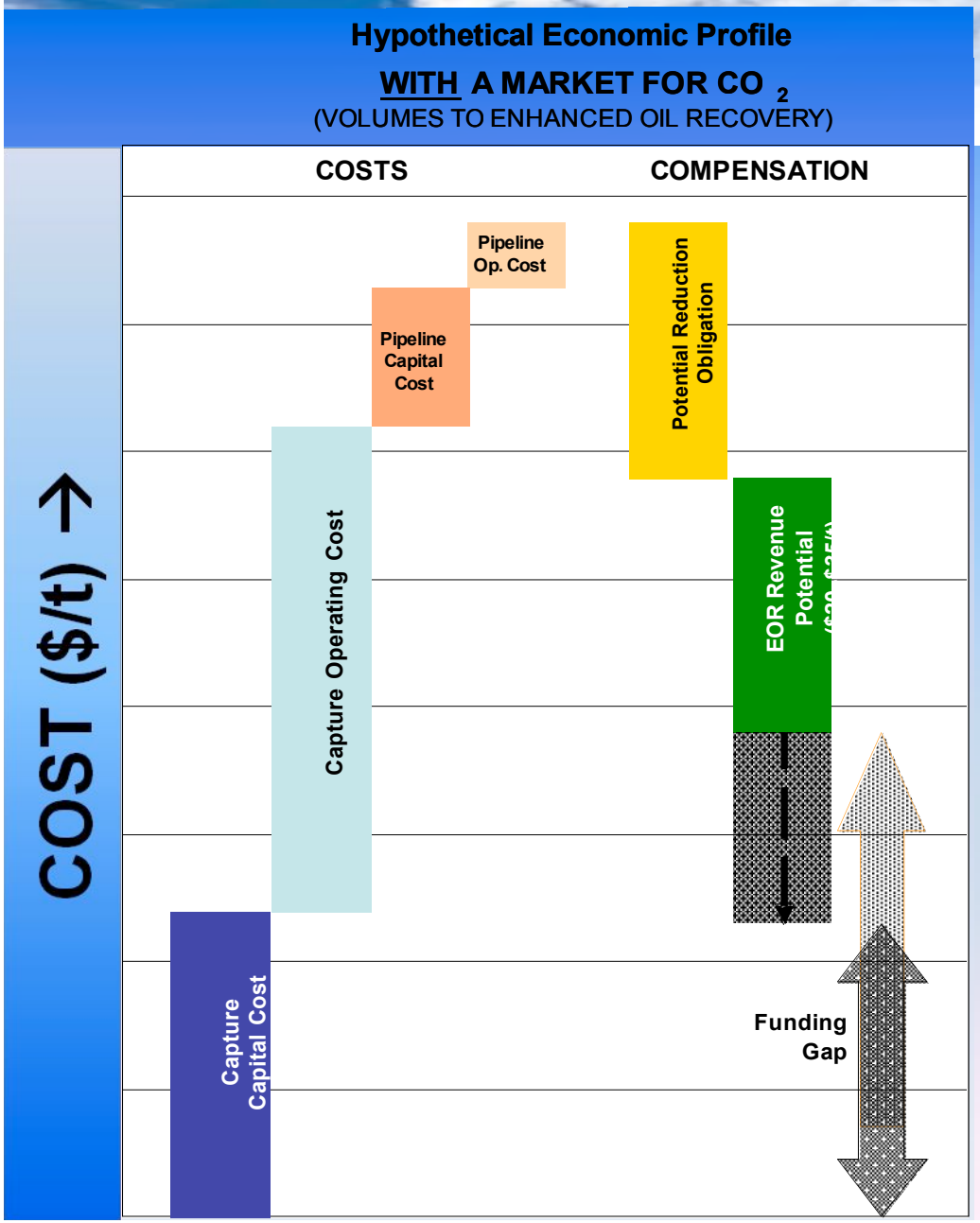
Preliminary Recommendations

- A set of principles to consider in providing public support for CCS projects;
- A recommended approach to CCS/CO_2 long-term liability and tenure issues;
- Recommended site/operational guidelines;
- A preliminary review of CO_2 supply costs;
- A review of the key CCS technology challenges to be focused upon;
- A preliminary review of EOR demand and economics

CCS Blueprint



Business Case/Fiscal



- Closing the cost gap may well be the single largest challenge
- Public funding will be required until international carbon price is high enough
- Alignment with Federal Regulation will be essential to provide investment and policy certainty

Final Report

- Expected in January 2009
- Key recommendations will include:

Policy & Regulatory	Technology & Infrastructure
- Details on tenure - Details on liability framework - CCS Application Guide from ERCB - Governance: maintaining the CCS momentum	-Final recommendations on technology/R&D -Capture technology and costs -CO_2 supply curve -Enhanced Oil Recovery demand curve -Recommendations on direct/saline storage -Recommendations on pipeline system

Oil Sands Growth Potential

1993 - approximately 200,000 barrels per day (bpd)

2007 - approximately 1.2 million bpd

2030 - may produce up to 5 million bpd

Recoverable: 174 billion barrels of a 1.7 trillion barrels of "oil in place"

Size of the economic prize: $12.2 Trillion (assuming oil at $70 bbl)

CCS Fund Update

- The Alberta Government's $2B CCS Program:
  - Full Project Proposals expected in April 2009
  - Projects that demonstrate promising technologies from more than one industry sector
  - Projects that offer cost effectiveness and the potential for broader application
  - Projects that have the potential to contribute to the cost-effective development of medium-term transportation, sequestration and enhanced oil recovery (EOR) infrastructure within Alberta
  - Projects that have risk mitigation plans

Conclusions

CCS development will take a long & sustained effort that has:

- The right policies, regulations & incentives in place to close the cost gap over many years
- Technology costs will come down over time
- Clarity and supportive project-based regulations
- Ongoing private/public partnership to coordinate and manage CCS development
- The Council is on track to complete its work by end of January 2009.

Government Cooperation

Alberta is working closely with the Government of Canada on streamlining regulatory frameworks which will:

- Help build public confidence
- Create certainty for investors
- Clarity for industry

We are securing future prosperity for generations of Canadians.

Thank You.

Len Webber, MLA
Parliamentary Assistant - Energy
Government of Alberta

Back-up Slides

CCS Development Council Membership

Government:

- Len Webber, MLA
- Peter Watson, AB Energy Dept.
- Jim Ellis, AB Environment Dept.
- Ian Shugart, Environment Canada
- Cassie Doyle, NRCan

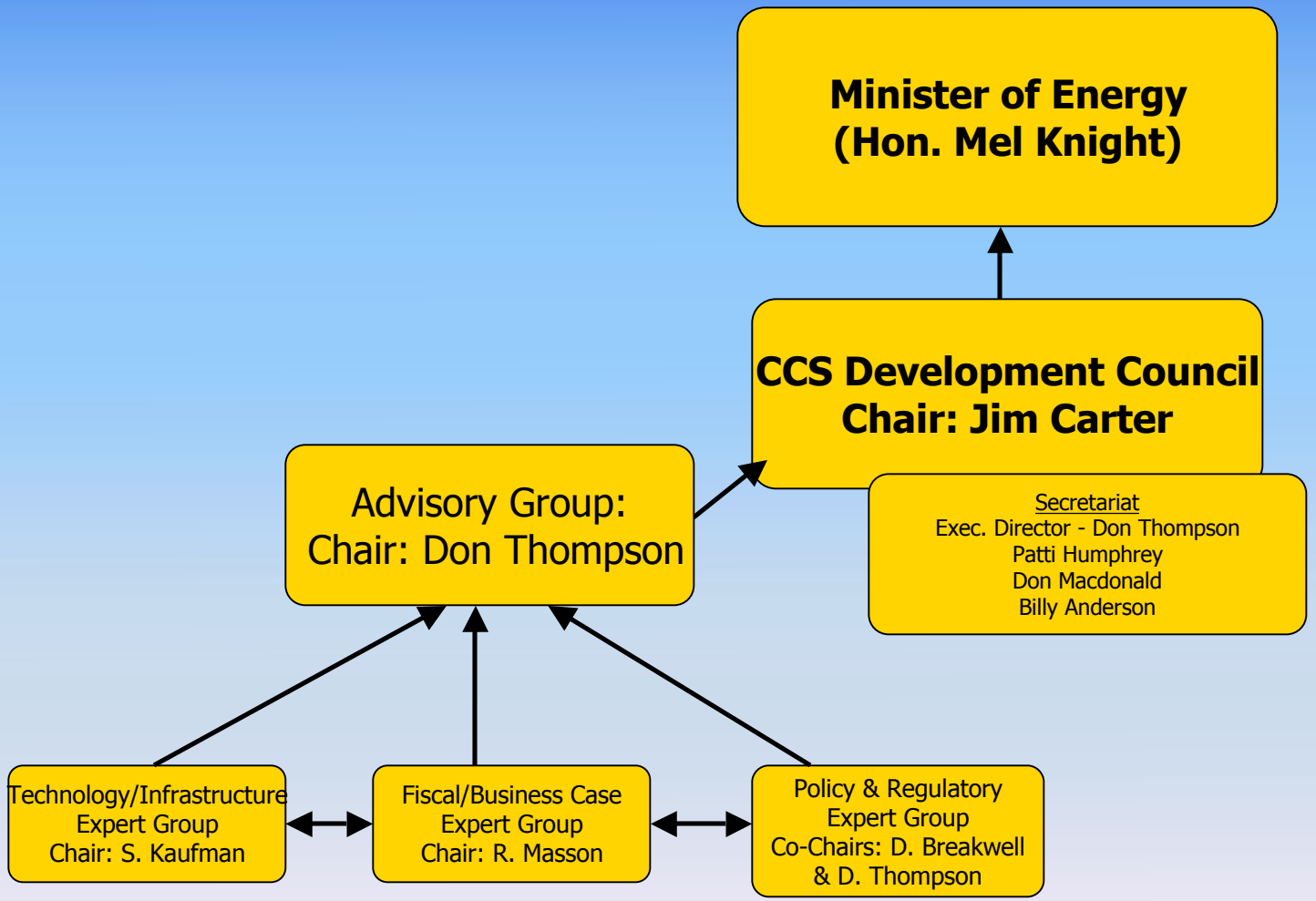
Academia:

- Mike Percy, U. of A.
- David Keith, U. of C.

Industry:

- Jim Carter, Chair
- Don Lowry, EPCOR
- Roger Thomas, Nexen
- Steve Williams, Suncor
- Bill Andrew, Penn West
- Dave Collyer, Shell
- Kathy Sendall, Petro-Canada
- Art Meyer, Enbridge
- John Brannan, EnCana

Organization & Reporting Structure



Initial High-level Observations

- *Greenhouse gas (GHG) emissions will continue to grow before they start to fall* – CCS emissions reduction is an immediate challenge that requires ongoing and sustained commitment
- *Technical, economic and schedule risks* – large-scale CCS will take time to properly implement
- *Alberta leadership* – needed in the development of CCS technologies and implementation given the immensity of projected energy developments
- *Unique opportunity* – in Alberta to implement a broad-based CCS network given the large number of single point GHG emission sources and reservoirs
- *Strong regulatory base* – related to hydrocarbon emissions and storage from which to grow a CCS regulatory framework
- *Strong CCS R&D and technology* leadership base that needs to continue to grow to meet Alberta's sustainability challenge

SUMMARY

Alberta has made a commitment to implement Carbon Capture & Storage as part of its sustainable development mandate.

Without Carbon Capture & Storage it will be impossible to meet our emissions targets with other technologies.

Alberta has the right geology, abundant CO2 sources, value added potential and industry expertise to lead the world in CCS.

Without government support Carbon Capture & Storage is “unlikely” to overcome the Technological, Regulatory and Economic barriers quickly enough to produce desired results by 2015.