

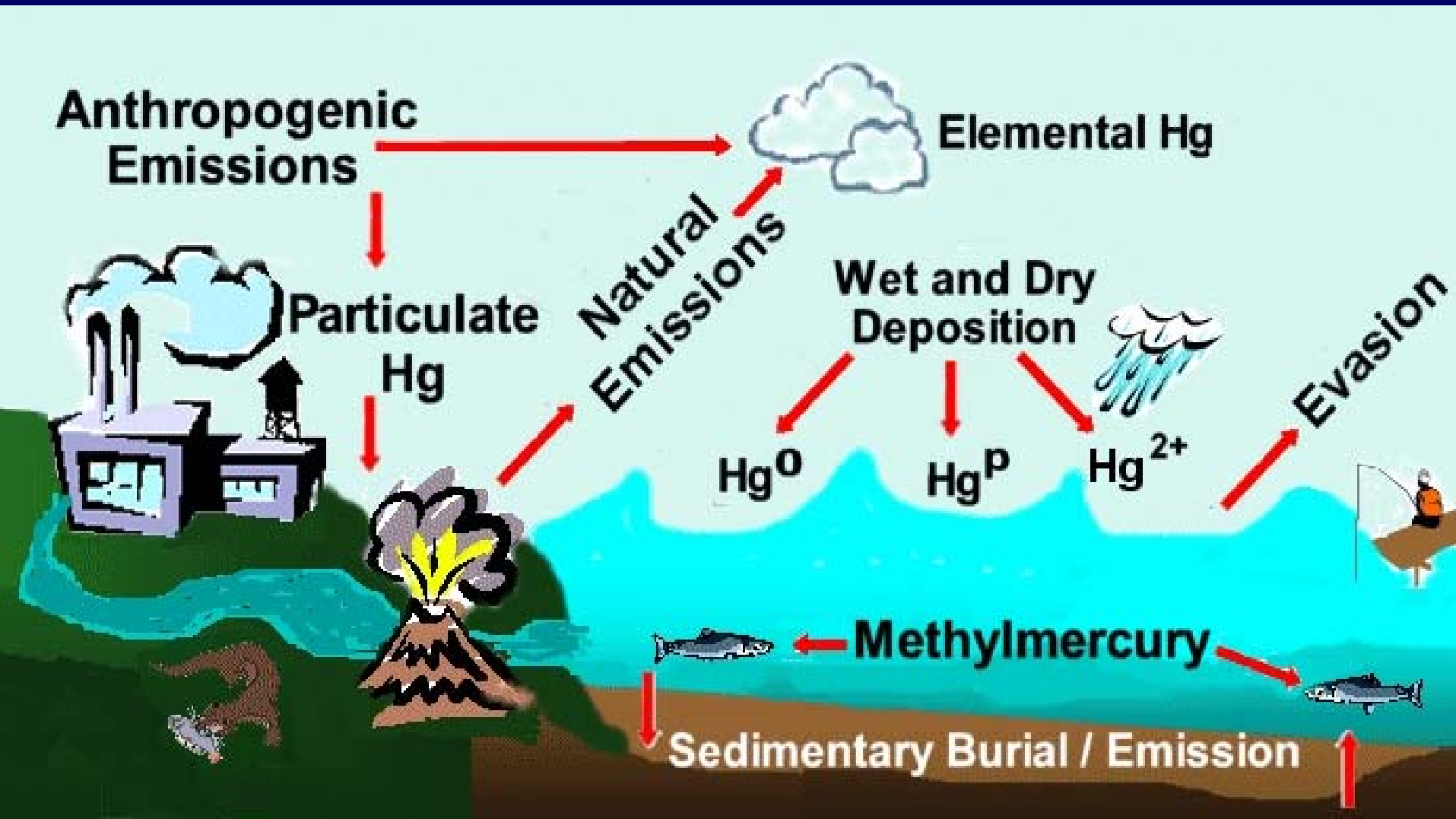
***The New Mercury Emission
from Coal-Fired Power
Plants Regulation
(March 2006)***

**Prasad Valupadas
Alberta's Environment Conference
Edmonton, Alberta
April 23, 2008**

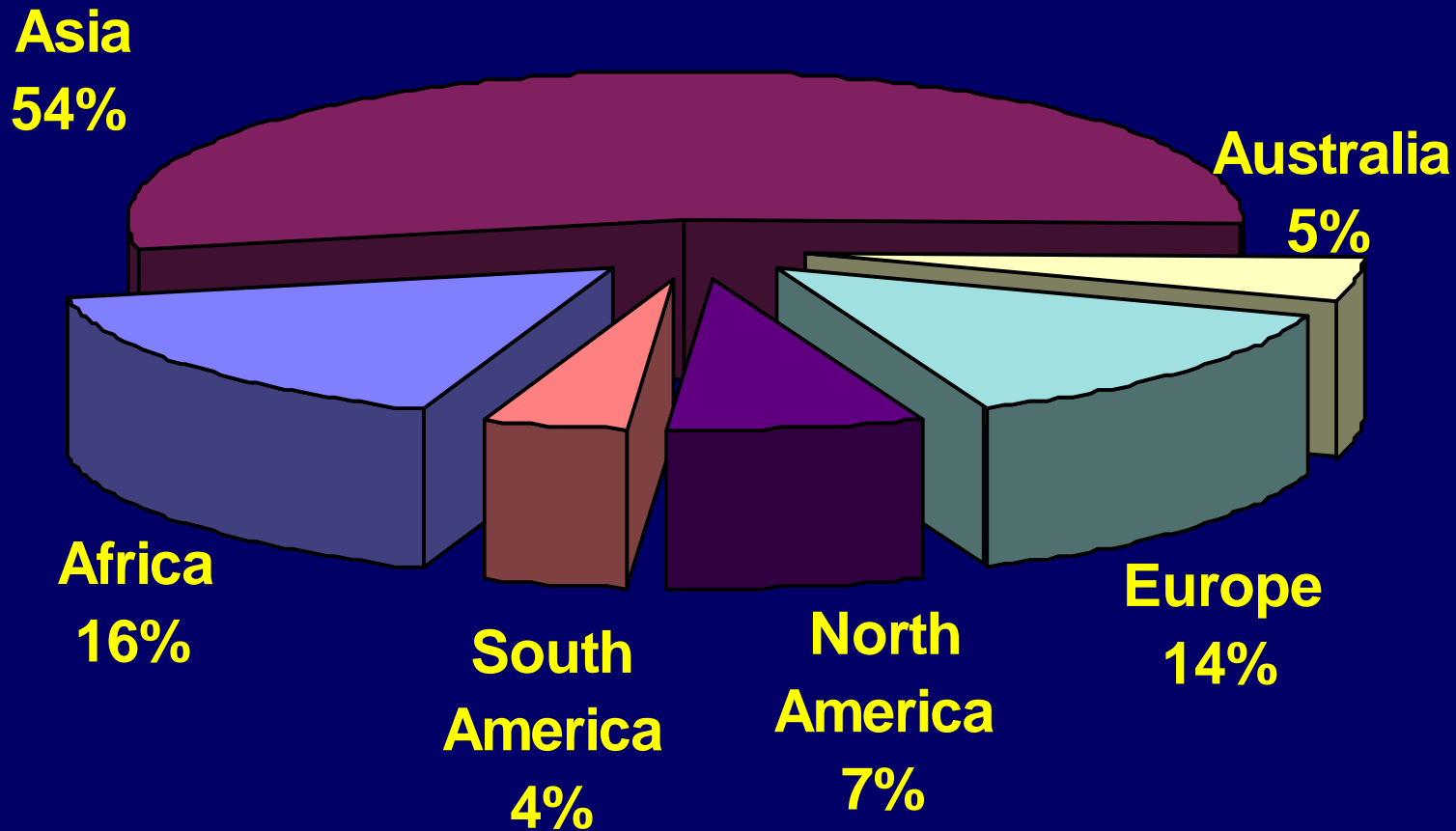
Mercury Background

- Mercury is a toxic substance that accumulates in the environment.
- Mercury emissions from power generation result from the combustion of coal, which contains mercury. These emissions can be deposited locally and transported throughout the globe.

The Atmospheric Mercury Cycle



Anthropogenic Mercury Emissions by Continent (Total = 2427 tonnes)

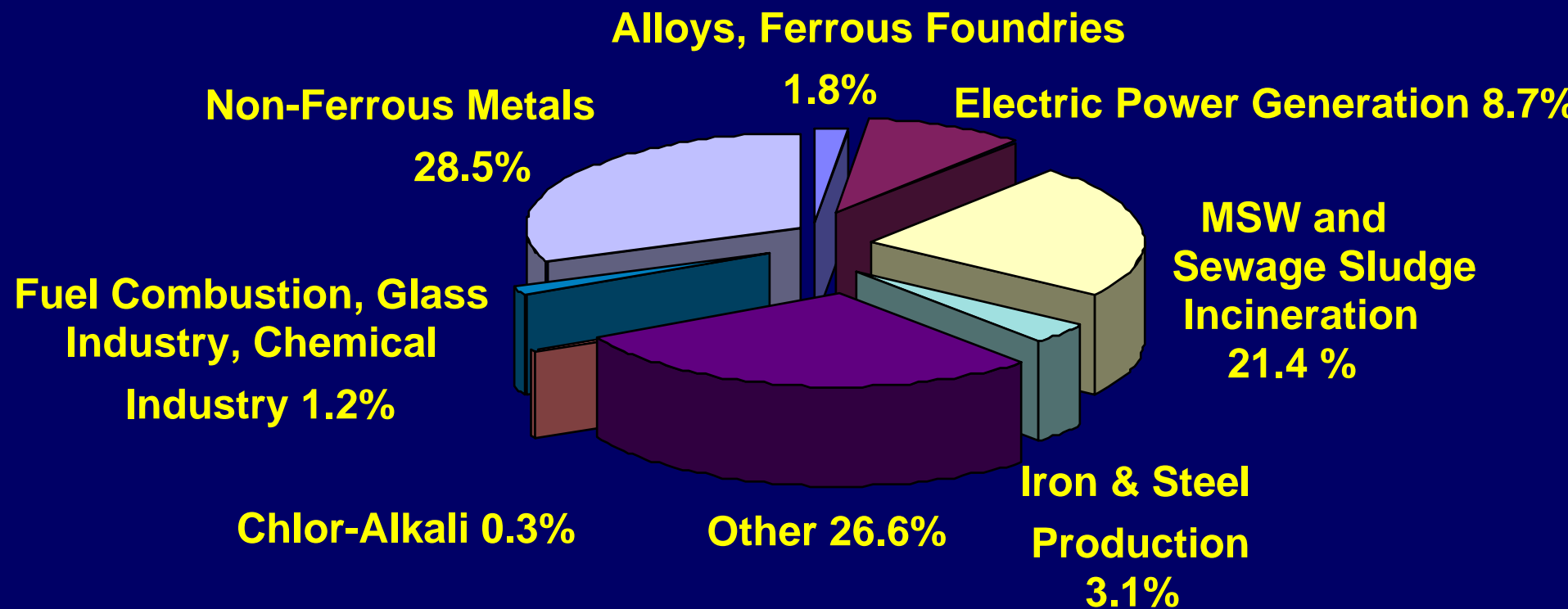


What is the Problem in Canada?

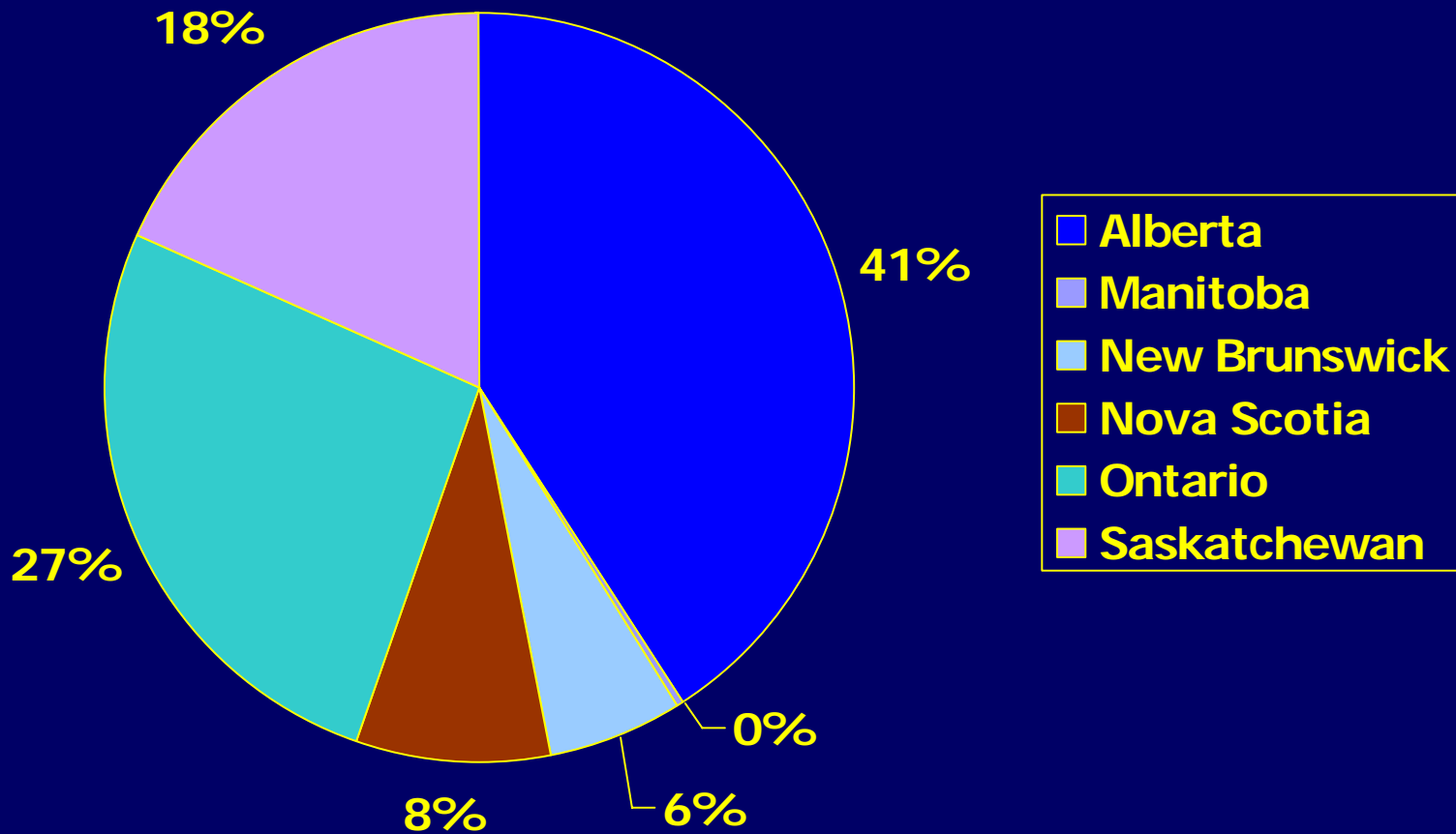
- Mercury transported by local and global air currents
 - 9 T Canadian emissions vs 100 T deposited onto Canada
- Northern and Eastern regions of Canada are net receivers.
- Canada must set example in order to influence others

Canadian Atmospheric Mercury Releases

Total = 11-12t



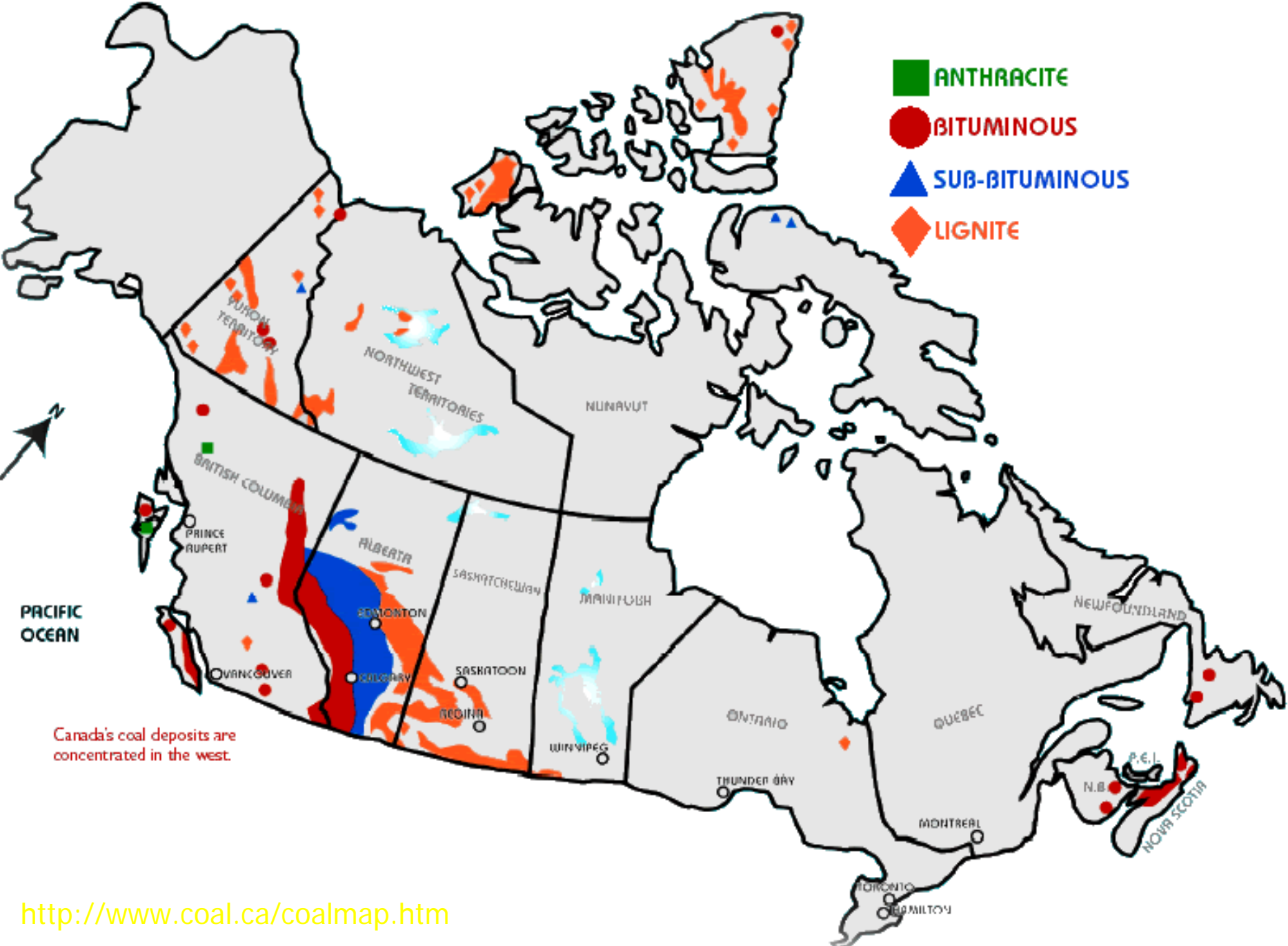
Relative Distribution of Mercury Emissions from Coal-Fired Plants in Canada



Data from: North American Power Plant Air Emissions Report,
Commission for Environmental Cooperation of North America, 2004

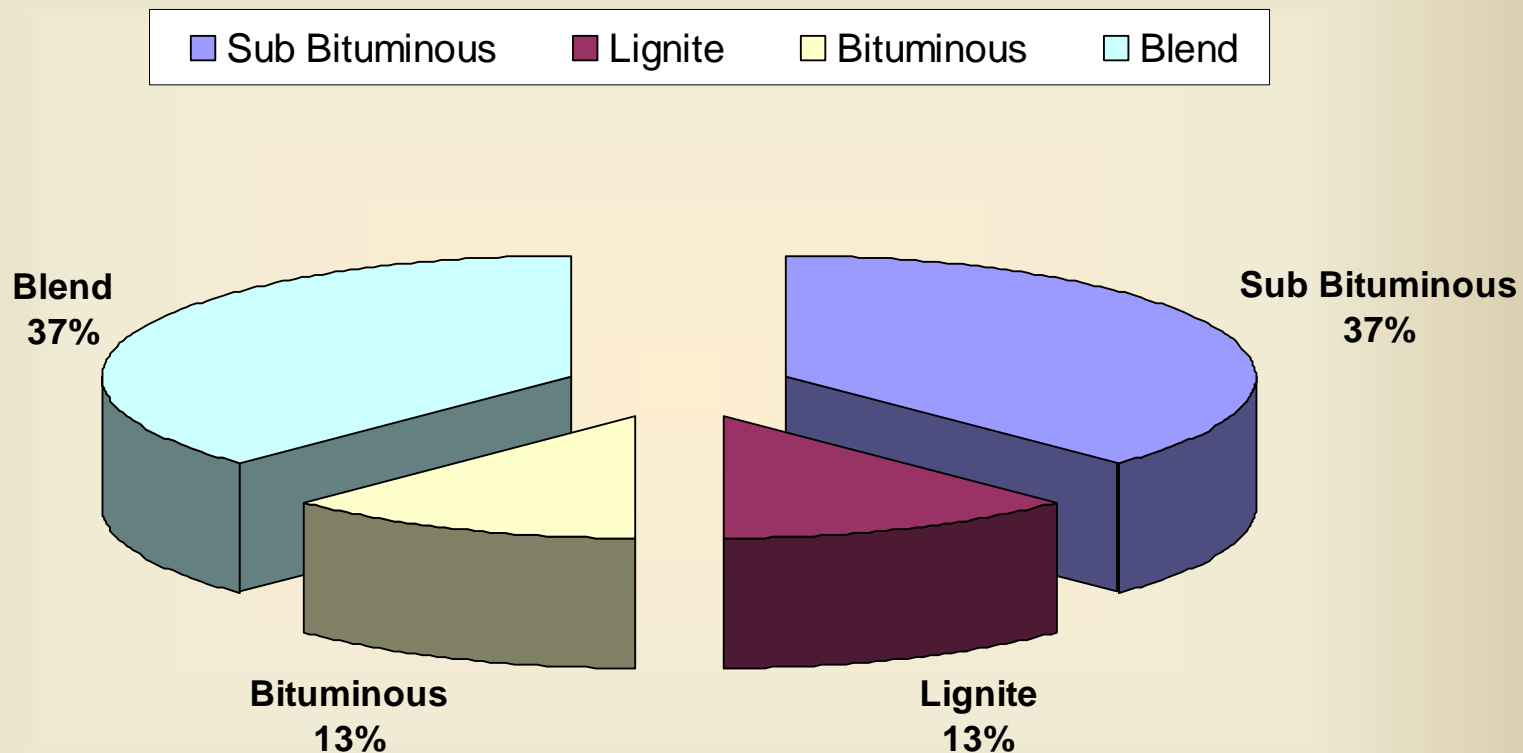
COAL DEPOSITS IN CANADA

- ANTHRACITE
- BITUMINOUS
- ▲ SUB-BITUMINOUS
- ◆ LIGNITE



Canada's coal deposits are concentrated in the west.

Distribution of Coal Used by Power Plants in Canada (based on generation)



Principal Coal Mines in Canada



BRITISH COLUMBIA

ALBERTA

SASK.

MANITOBA



Alberta Plants

- Seven coal-fired power plants
- Total generation capacity of approximately 6000 MW
- Burning primarily local area low sulphur, low chloride, higher ash subbituminous coal.
- Mercury content of coal about 0.07 ppm.
- Emit approximately 1200 kg/yr of mercury, of which about 80% is in elemental form
- Current pollution control for mercury is cold-side ESPs. One unit equipped with a baghouse.
- Current capture of mercury about 25%

Addressing Information Gaps

- Stack Hg emission and species information
- Characteristics of coal and ash
- Capability of control technology

- **Partially addressed through:**
 - Hg in air, coal and ash addressed through MOU with industry 2002-2005 monitoring program
 - Technology capability addressed by review and recommendations on a plant specific basis by EERC in 2005.
 - **Limitation on available technology was what can be achieved by 2009/10 time-frame**

Technologies Considered

- Coal cleaning
- Combustion modifications
- Activated Carbon Injection –
Electrostatic Precipitators
- ESP-ACI-Fabric Filter
- Additives (i.e. CaCl_2)

Mercury Emissions Control

**Alberta Government efforts to meet
CASA-EPT and CWS Commitments**

Review Processes

- Mercury requirements for Alberta coal-fired power plants :
 - **Canada-wide Standard commitment, and**
 - **Clean Air Strategic Alliance – Electricity Project Team commitment**
 - **Both required a standard be set in 2005**
- An Alberta Mercury multi-stakeholder advisory committee agreed on a three-phased approach to mercury requirements.

Implementation by Regulation

- Regulation only applies to seven existing plants
 - **New plants-follow EIA and approval processes (apply BATEA of the day)**
 - **New units at existing plants may follow new mercury regulation**
- Focus on actions to be taken by industry between 2005-2013
- Regulation also covers all aspects of mercury monitoring (i.e. emissions, soil, water, etc.)
- **Designed to meet both CASA-EPT and CWS commitments**

Regulation Highlights

- Phase 1 – Submission of proposals for mercury control
 - April 1, 2007- submit proposal for control technology to achieve a minimum mercury capture target of 70%.
 - Proposal must be approved by Director
- Phase 2 – Add mercury emission limits to approval
 - Review effectiveness of technology
 - After Jan 1, 2010, Director may impose emission limits on existing plants at any time
- Phase 3 – Continuous improvement on mercury control
 - December 31, 2010/12 - submit proposal to improve mercury control to target 80% capture by:
 - Optimizing existing processes and controls
 - Proposals form part of information used for 2013 BATEA review of standards.

Regulation Highlights

- All mercury monitoring and reporting now covered under the regulation
 - Includes stack, ambient air and water, soil, sediment, plants, and wildlife.
- Emission control proposals require stakeholder consultation prior to submission.
 - Some units may be exempt from requirements.
 - Mercury control on a plant basis not unit by unit basis.
- Includes an amendment process for handling any issues with “approved proposals”.
- Standard compliance and enforcement requirements (Admin. Penalties, fines, and EPEA requirements).

Implications of Regulation

- **Information submissions -**
 - **After April 2007 - seven proposals need to be quickly reviewed and approved so industry can meet installation deadlines.**
 - **By 2010 - seven data submissions must be reviewed so emission limits can be set in approvals.**
 - **By 2012 - Optimization proposals need to be reviewed and form part of 2013 review.**

Canada-wide Standard Proposed Caps for Existing Coal-fired Plants

Province	Estimated Emissions (kg/yr)	2010 Cap (kg/yr)
Alberta	1,180	590
Saskatchewan	710	430
Manitoba	20	20
Ontario	380	TBD
New Brunswick	140	25
Nova Scotia	150	65
<i>Total</i>	<i>2,580</i>	<i>TBD</i>

Canada-wide Standard Proposed for New Plants

New facilities

- Application of “best available technology economically achievable”

Coal type	Percent capture in coal burned	Emission rate (mg/MWh)
Bituminous	85	3
Sub-bituminous	75	8
Lignite	75	15
Blends	85	3

Developing a Mercury Emissions Monitoring and Reporting Protocol

- CCME recently has released the "Monitoring Protocol in Support of the Canada-wide Standards for Mercury Emissions from Coal-fired Electric Power Generation Plants" (August 2007).
 - Will require on-going stack analysis and/or mass balance to establish emissions until Continuous Emissions Monitoring Systems (CEMS) are operational.
 - Alberta will require installation of CEMS by 2010.
 - Reporting yearly (possibly also monthly) emissions to Alberta Environment and every two years for CCME (national).

Update on Implementation

- Proposals received from all companies by April 1, 2007.
- Deficiencies in the proposals are to be addressed by January 1, 2009.
- EPCOR Genesee Power Plant proposal:
 - Genesee Station targeting 70% capture, of mercury from the coal burnt using brominated activated carbon injection.
 - On the older PC Units 1 and 2 with ESPs, augment this with combustion optimization.
 - The combustion optimization will be completed on one unit this winter and tested next year. The results will determine whether the second unit will also be modified.
 - A full-scale ACI test is scheduled in 2008 on the newer PC supercritical Unit 3, which is equipped with an SDA and baghouse.

Update

- **TransAlta Sundance and Keephills Power Plants proposals:**
 - **TransAlta completed a 30 day ACI injection program on their Sundance Unit 5 in 2006.**
 - **A similar testing program, injecting activated carbon, was undertaken on Keephills Unit 2 at the beginning of August 2007, for 10-12 months. A variety of different sorbents and feed rates will be tested during the first 4-6 weeks of the program.**
 - **Company intends to select the sorbent producing the most favorable results and continue with a steady state of operations for an extended period of time. This will enable an assessment of the effect of seasonal weather conditions on the effectiveness of the activated carbon.**

Update

- ATCO – Battle River Power Plant
 - **In 2008, ATCO is planning an extended test on BR5. This will involve injection of BAC in front of the ESP. The test will address specific concerns, as well as others identified by testing being done at the TransAlta plants.**

Thank-You!

Prasad Valupadas, M.Eng., P.Eng.

Section Head, Policy Research

Alberta Environment

Ph: (780) 427-8565

Prasad.Valupadas@gov.ab.ca