

Time Series EROI for Canadian Fossil Fuels

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Introduction - Objectives

EROI Case Study:

- * Compare EROI in Canada for different fossil fuels (Coal, Oil & Gas, Tar Sands)
- * Detect temporal trends
- * Discuss potential implications

Personal/academic:

- * Address problematic issues with EROI analysis

Petroleum regions of Canada

CANADA'S SEVEN HYDROCARBON REGIONS

Percentage of Canada's estimated conventional hydrocarbon resources

Region

Western Canada Sedimentary Basin*	57%
Atlantic Margin	18%
Arctic Cratonic	10%
Arctic Margin	6%
Pacific Margin	4%
Intermontane	3%
Eastern Cratonic	2%

* Excluding oilsands bitumen

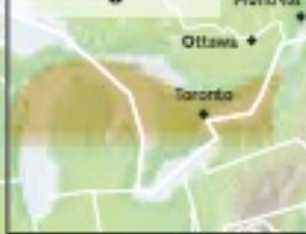


Western Canada Sedimentary Basin 1

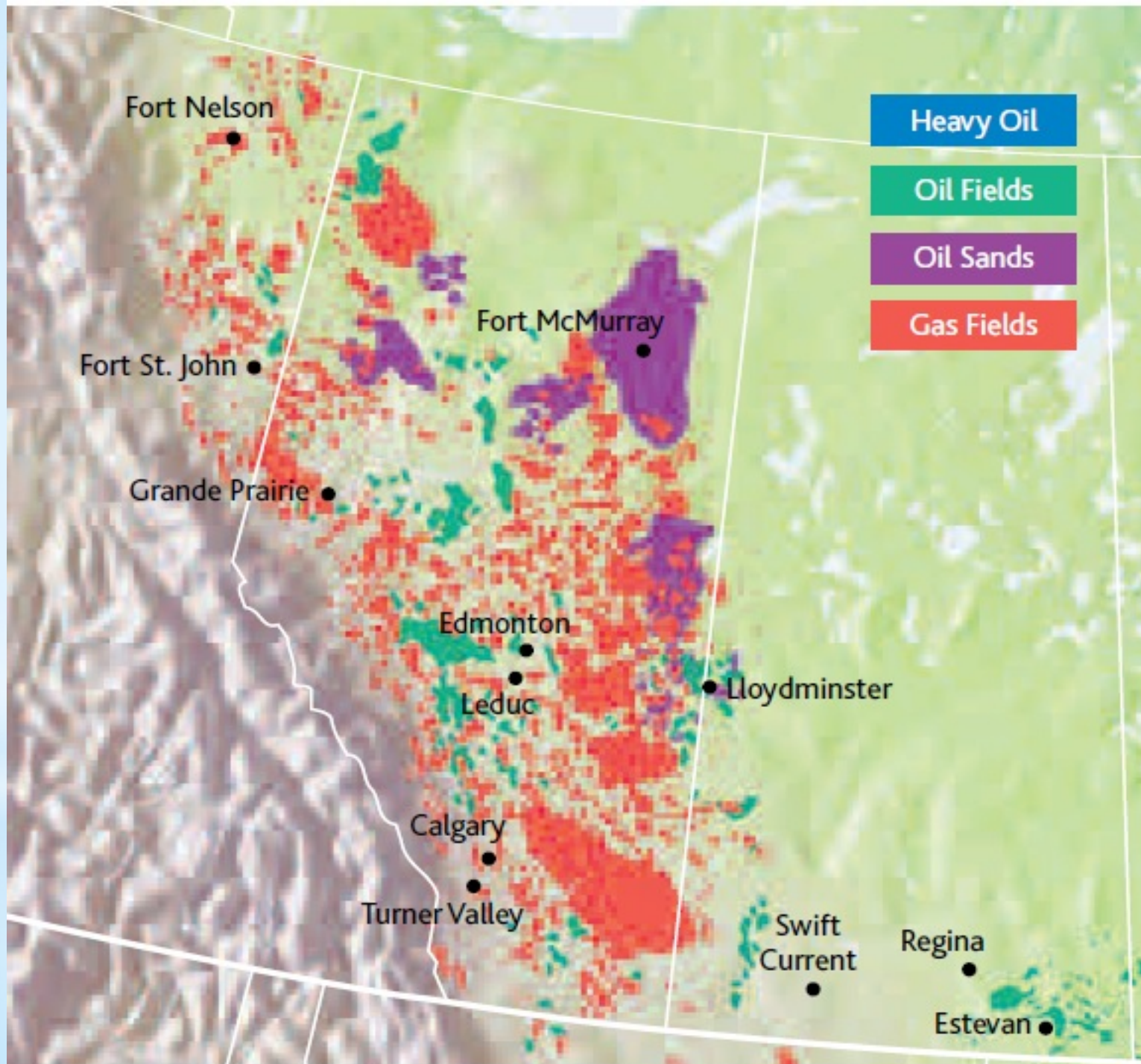


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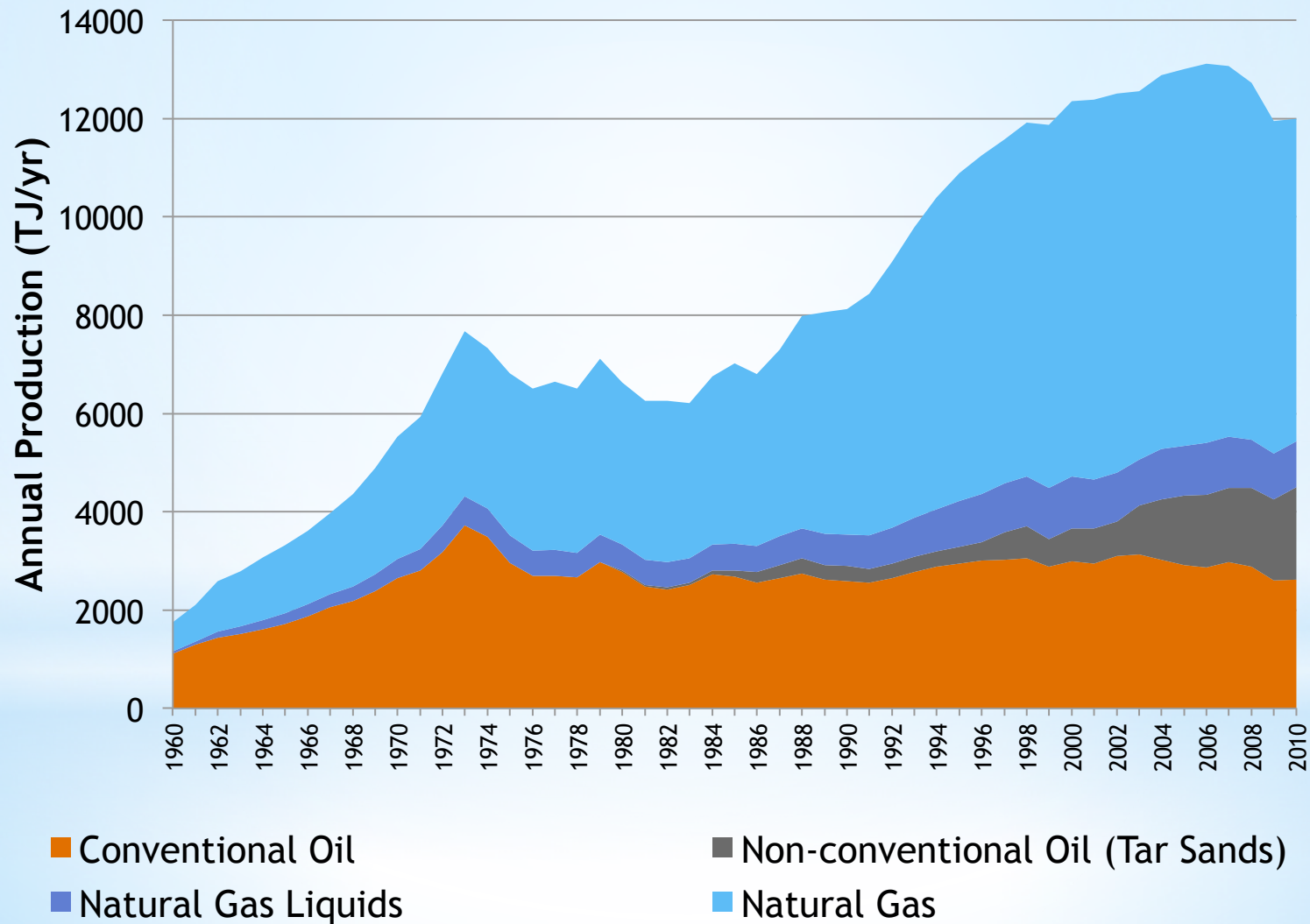
Southern Ontario Producing Areas



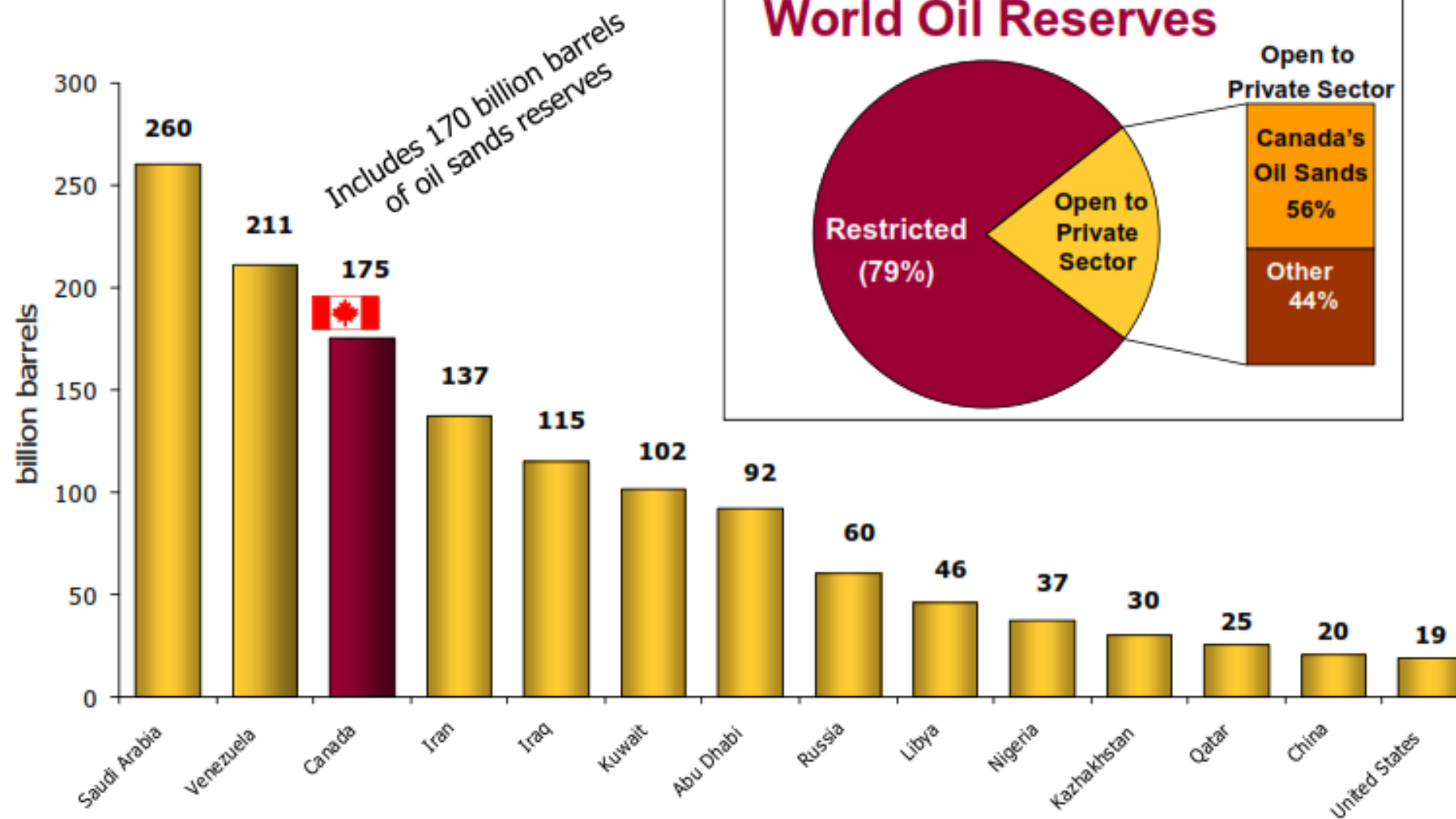
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Canadian Oil and Gas Production

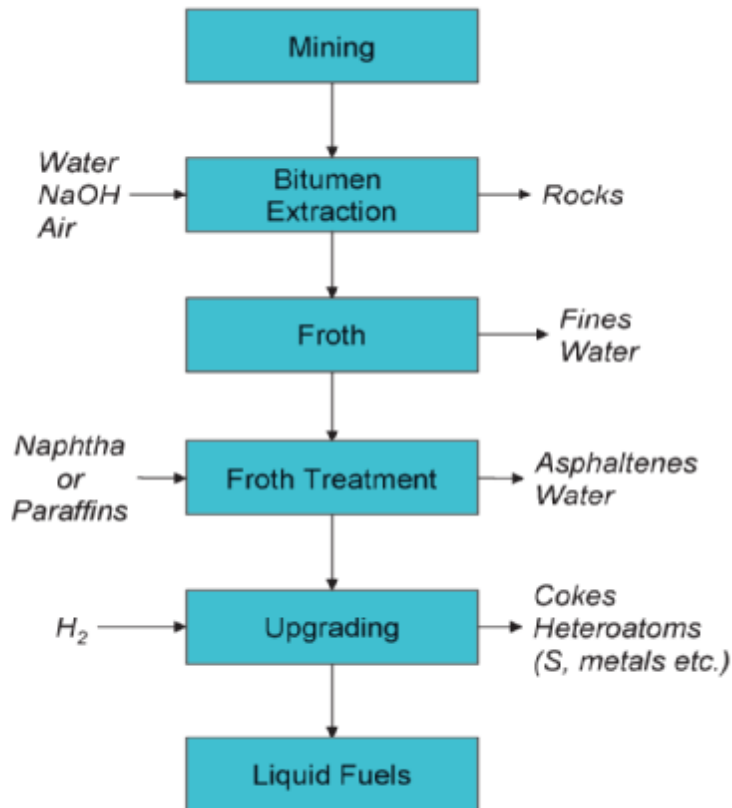


Global Crude Oil Reserves by Country

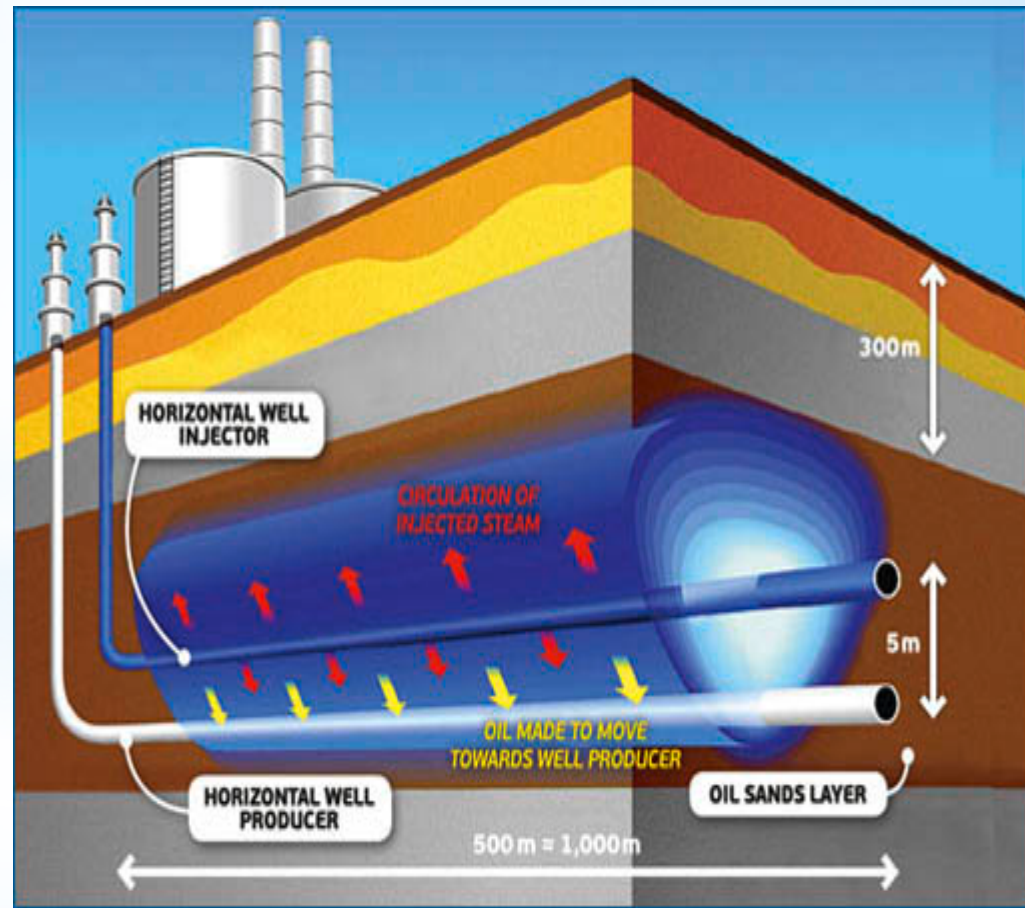


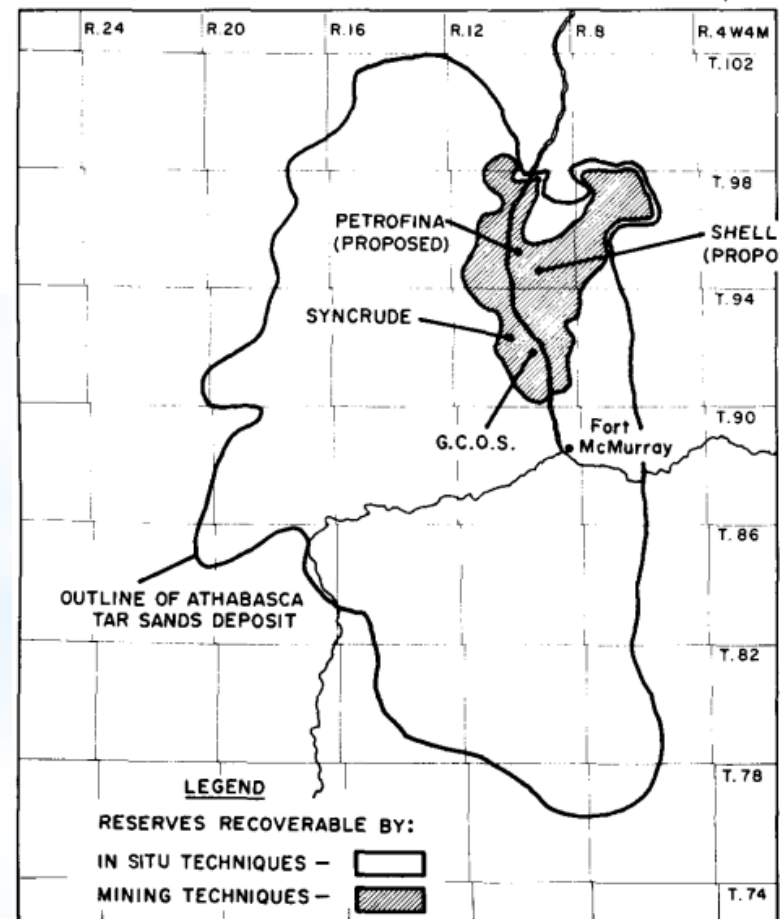
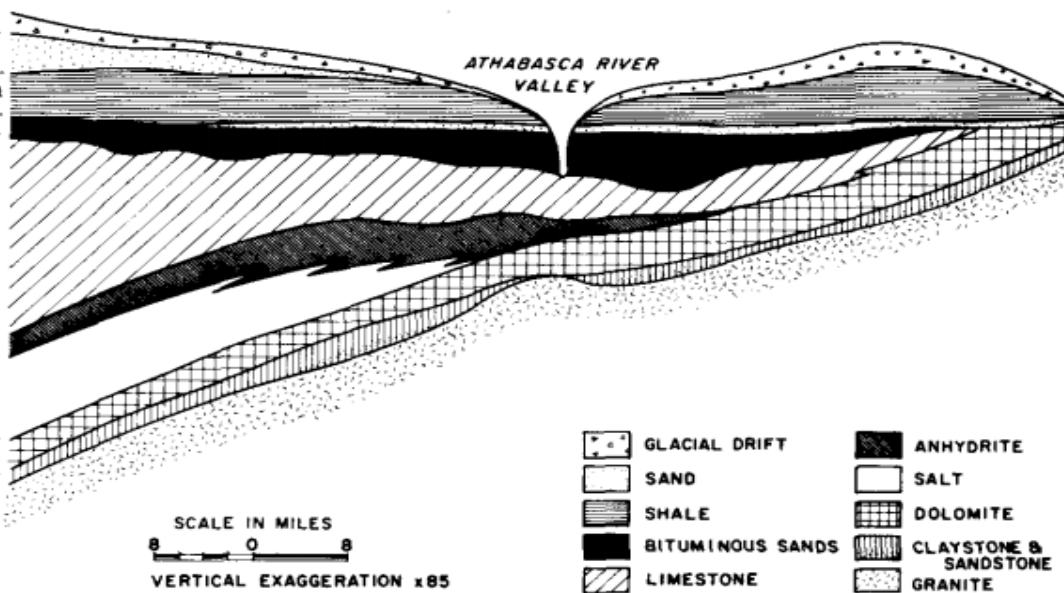
Tar Sands Extraction Techniques

Surface Mining



In Situ (Steam Assisted Gravity Drainage)





Methods

1- Boundaries

Mine-to-Mouth

2- Data

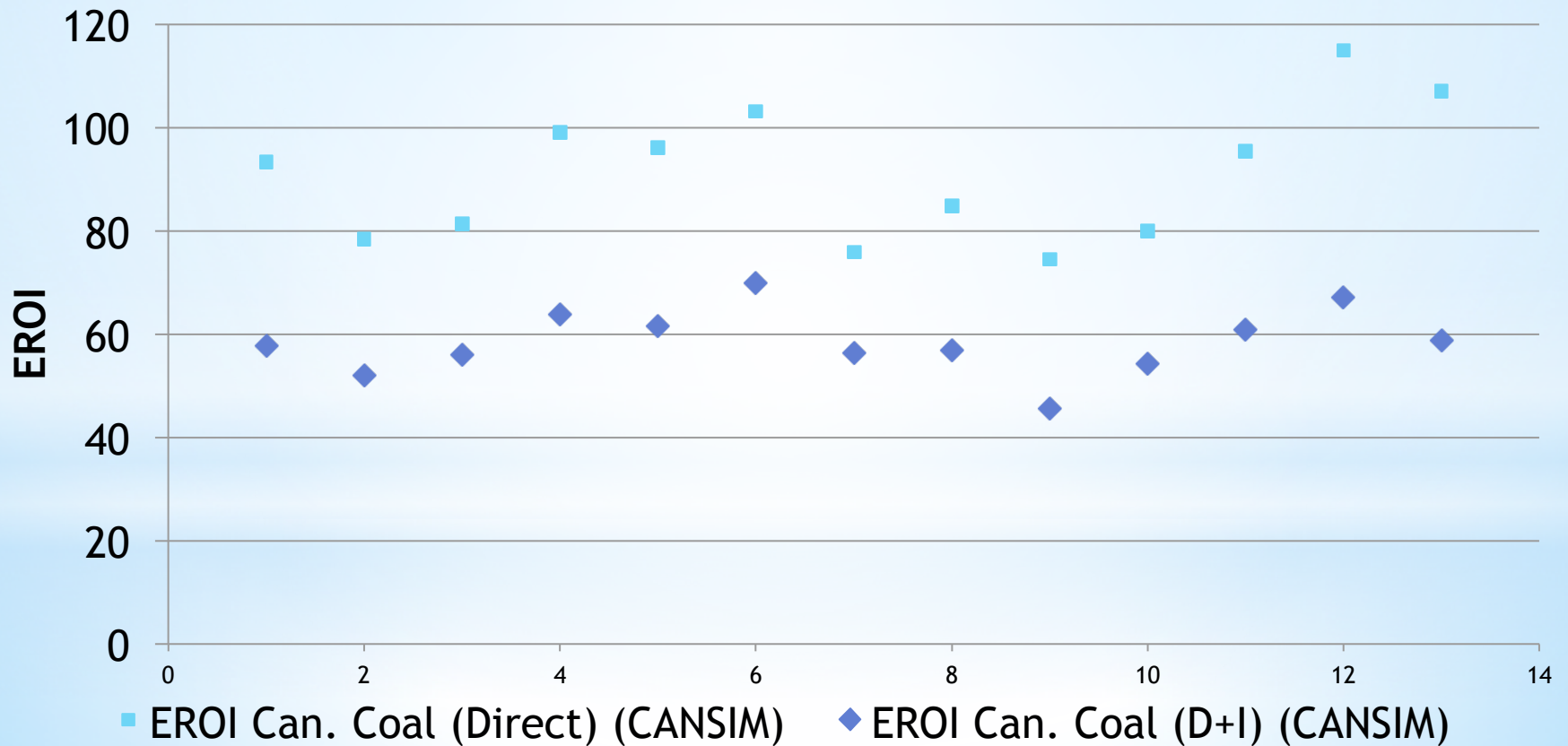
* Output Energy:

- Canadian Association Petroleum Producers (CAPP)
- NRC: Minerals Yearbook

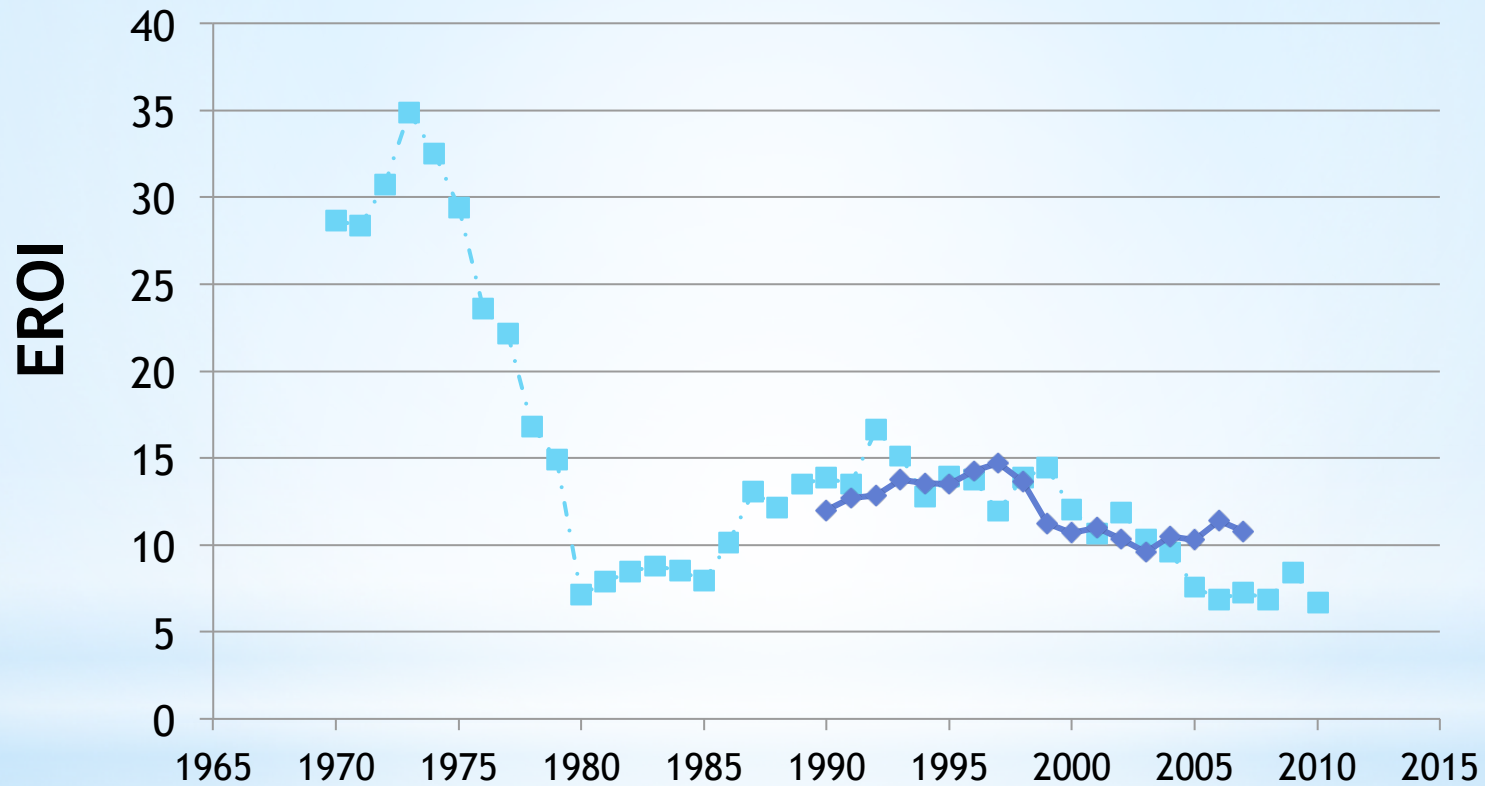
* Input Energy:

- * NRC's Annual Energy Industrial Survey
- * Statistics Canada : CANSIM data base
- * (World Bank)

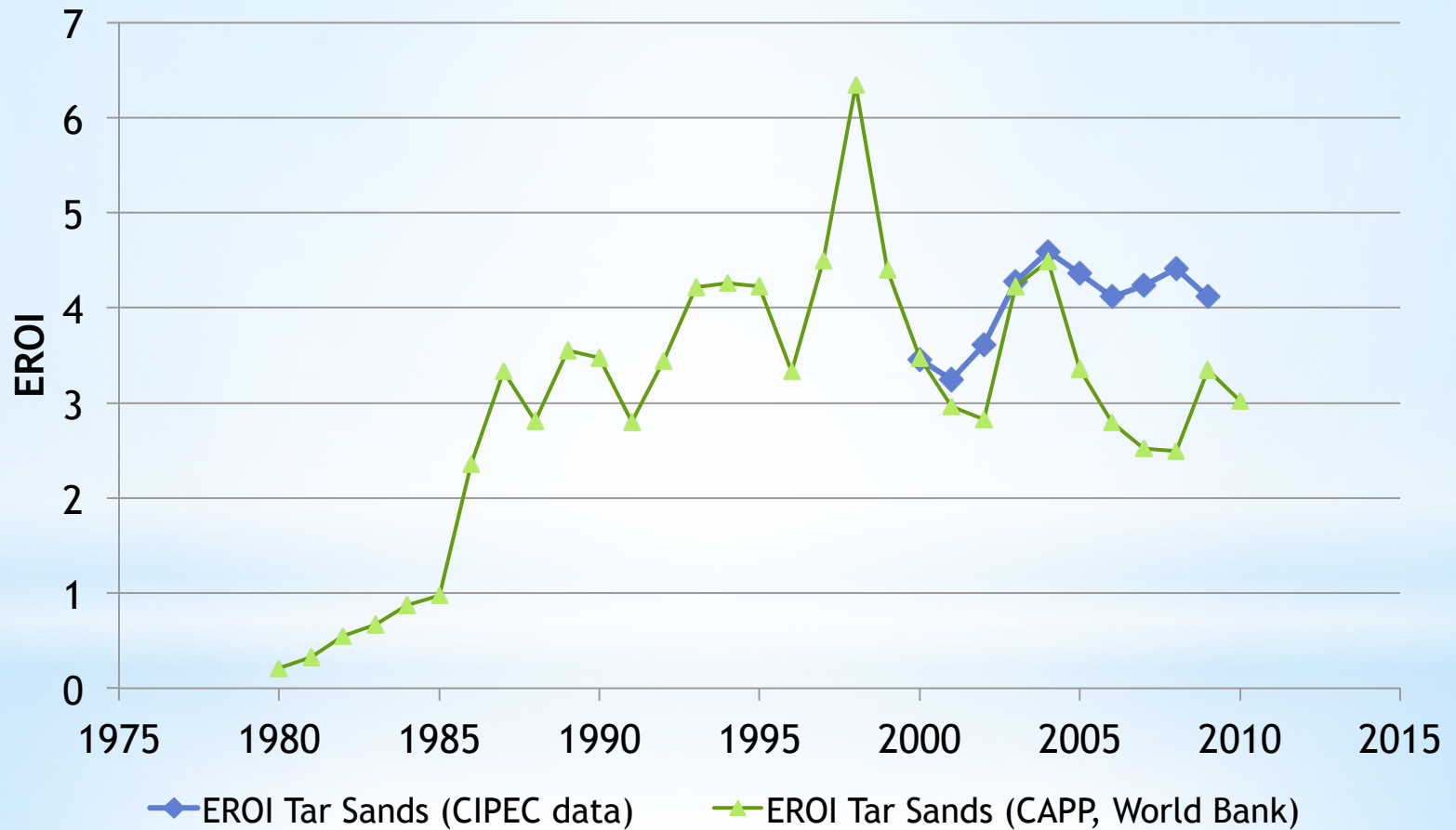
Results - Coal

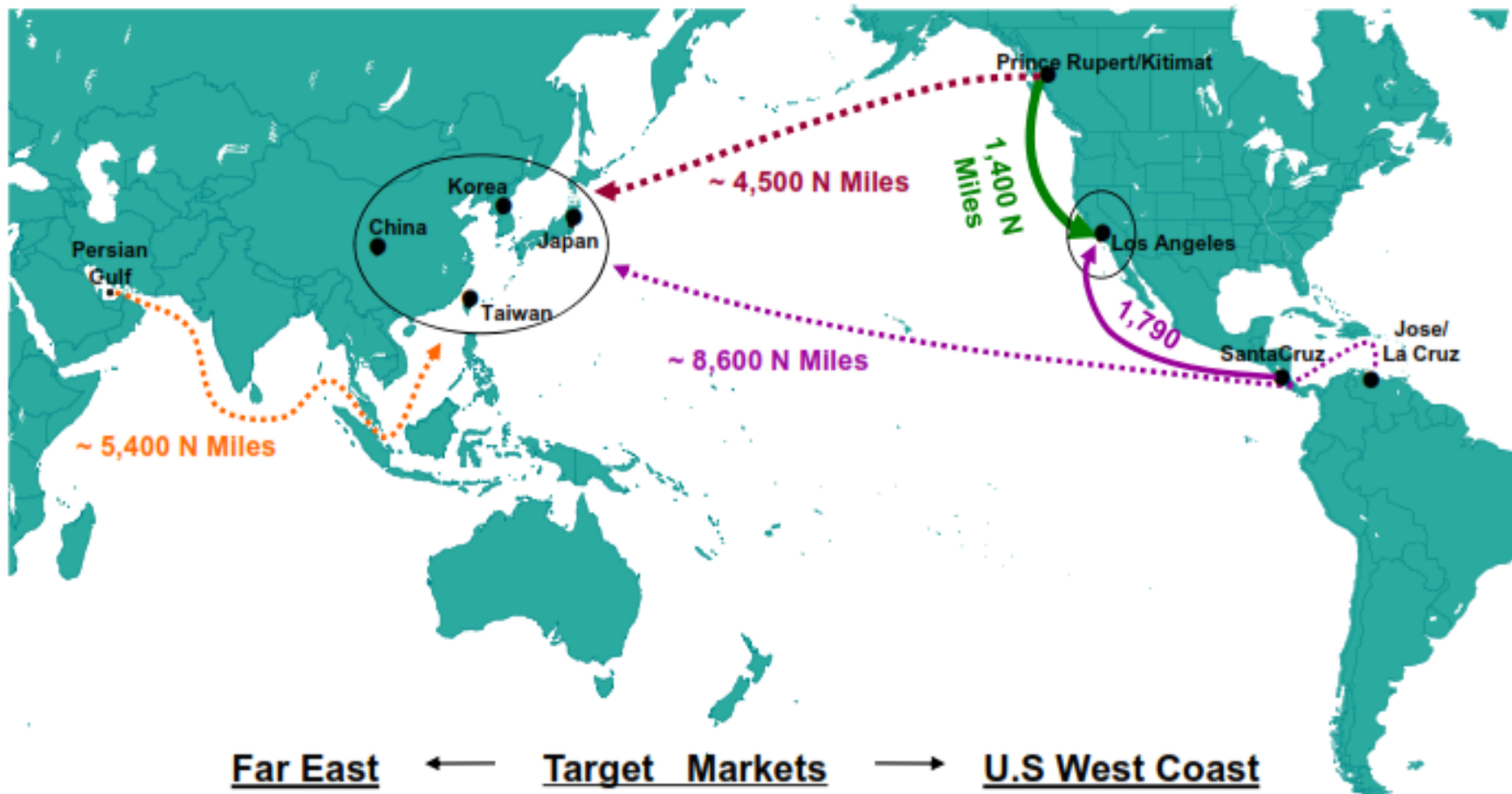


Results - Oil & Gas



Results - Tar Sands

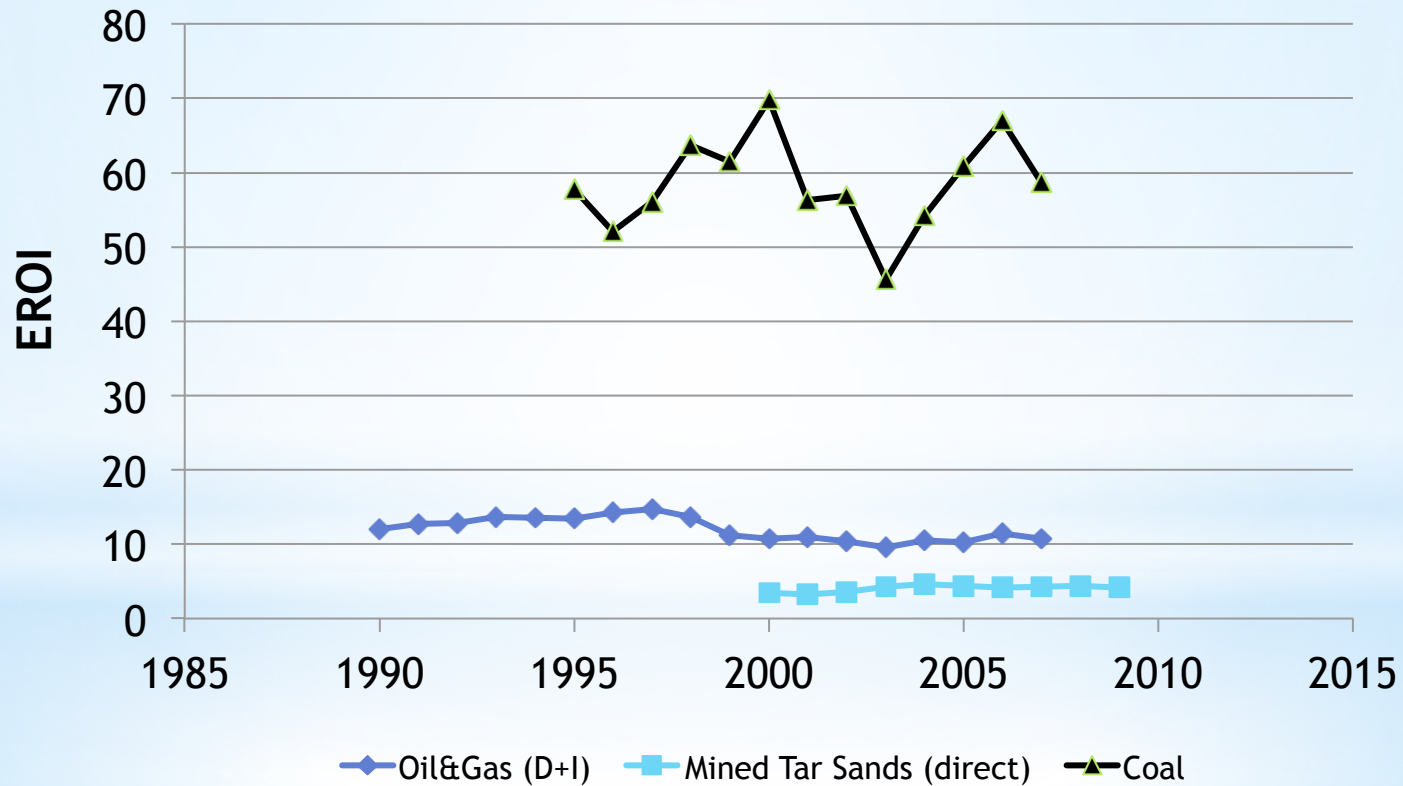




Competitive travel distances for Canadian supply to both markets

Results - Combined

EROI Canadian Fossil Fuels
(1990-2009)



Discussion - Conclusion

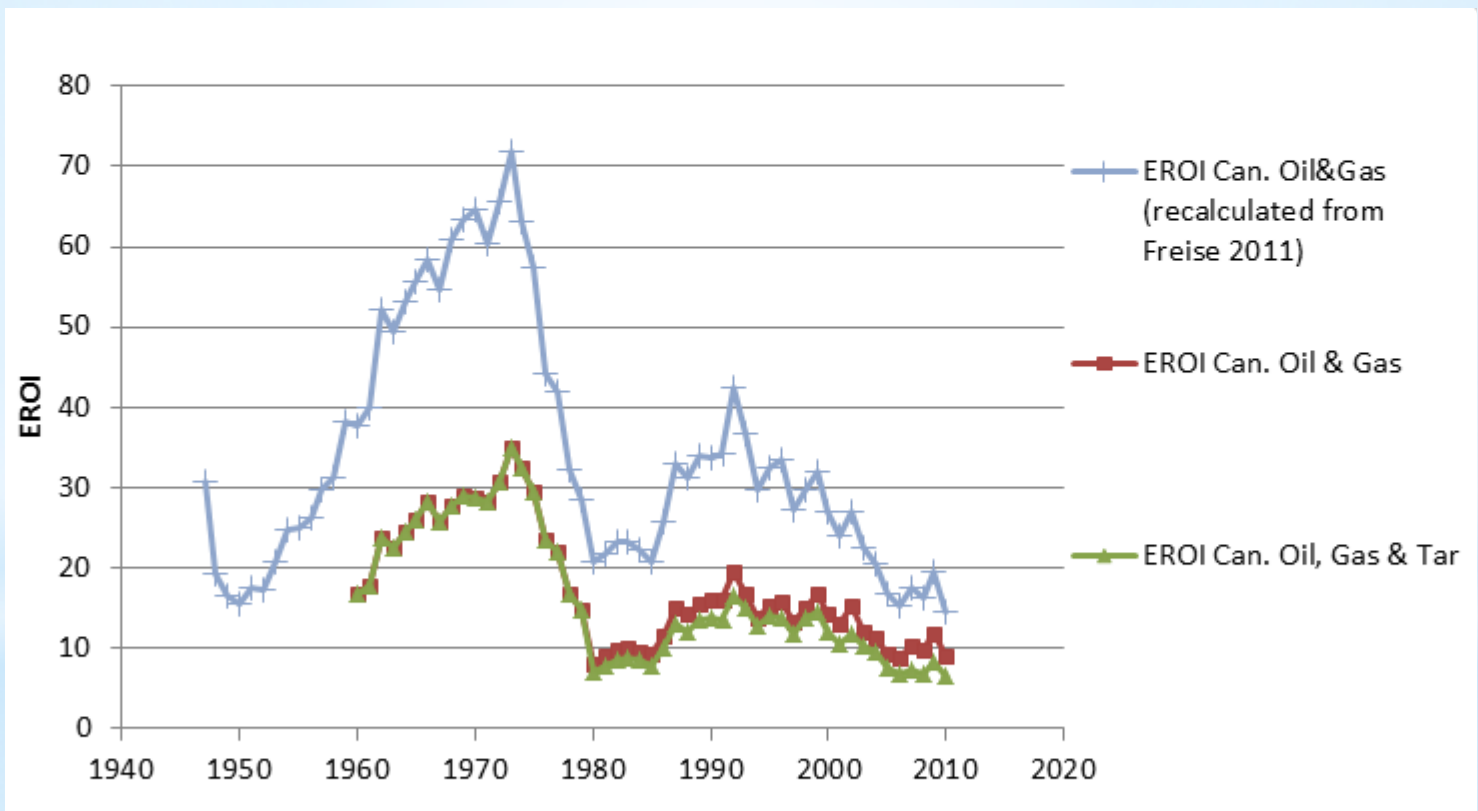
Underlying causes?

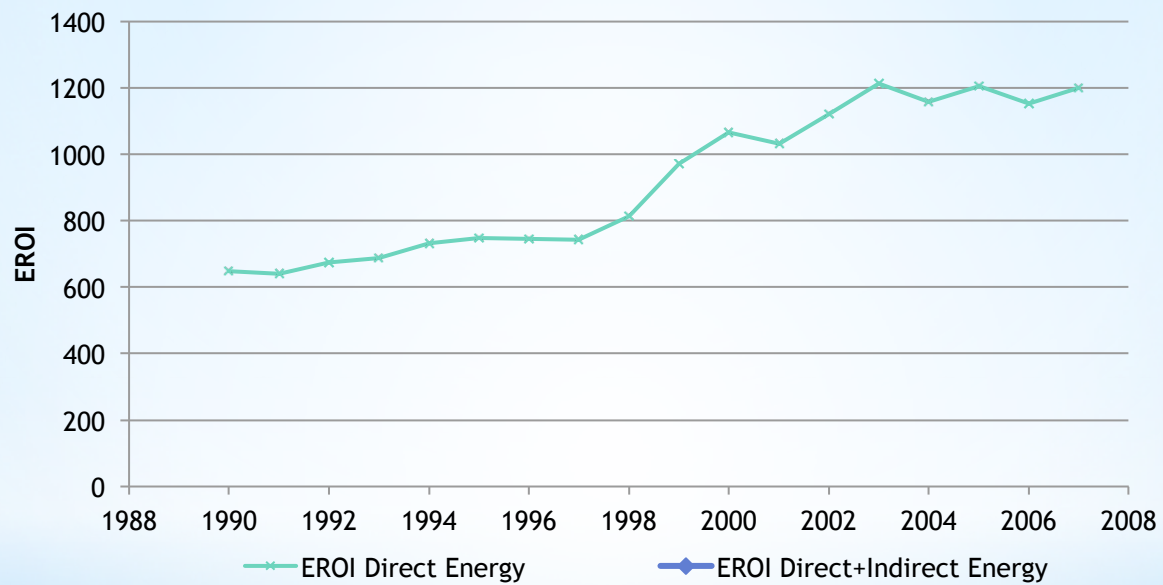
- * Efficiency - stochasticity - depletion

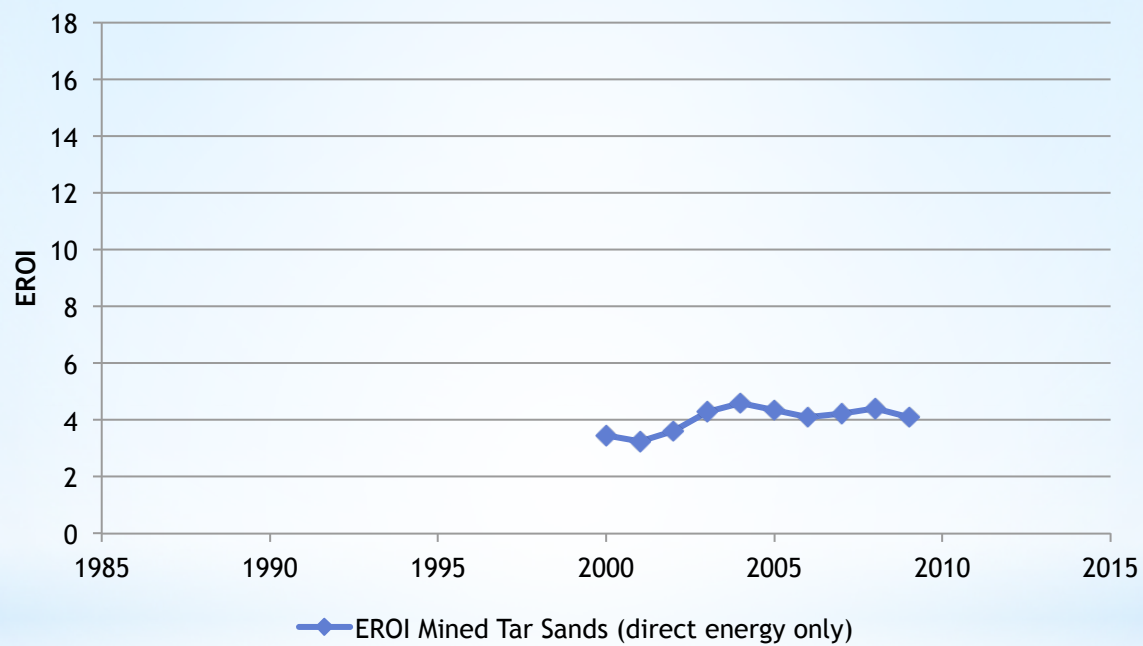
Limitations of Interpretation

- * More detailed process-level data
- * Better Uncertainty Analysis
- * Confounding factors? oil price

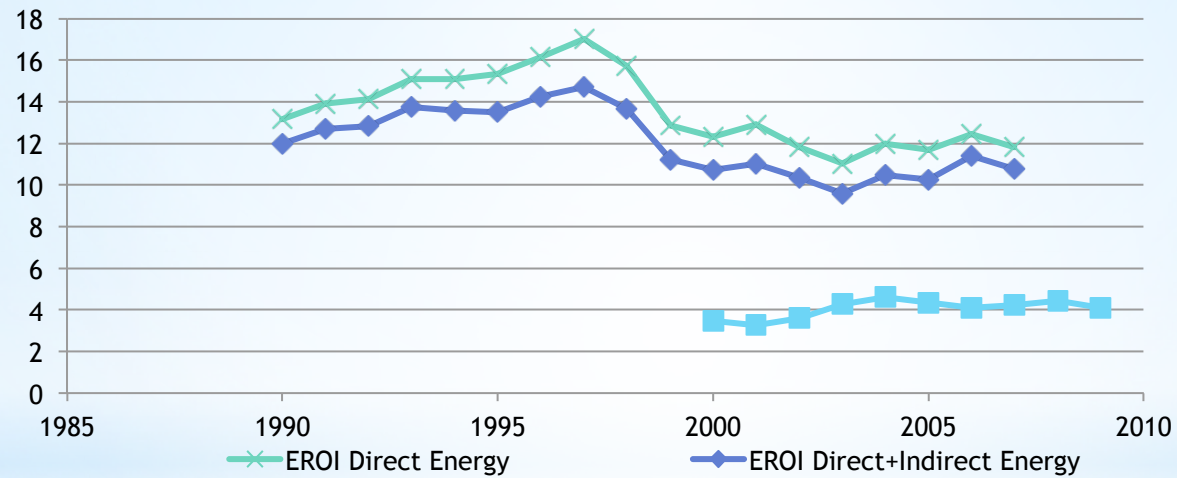
Questions

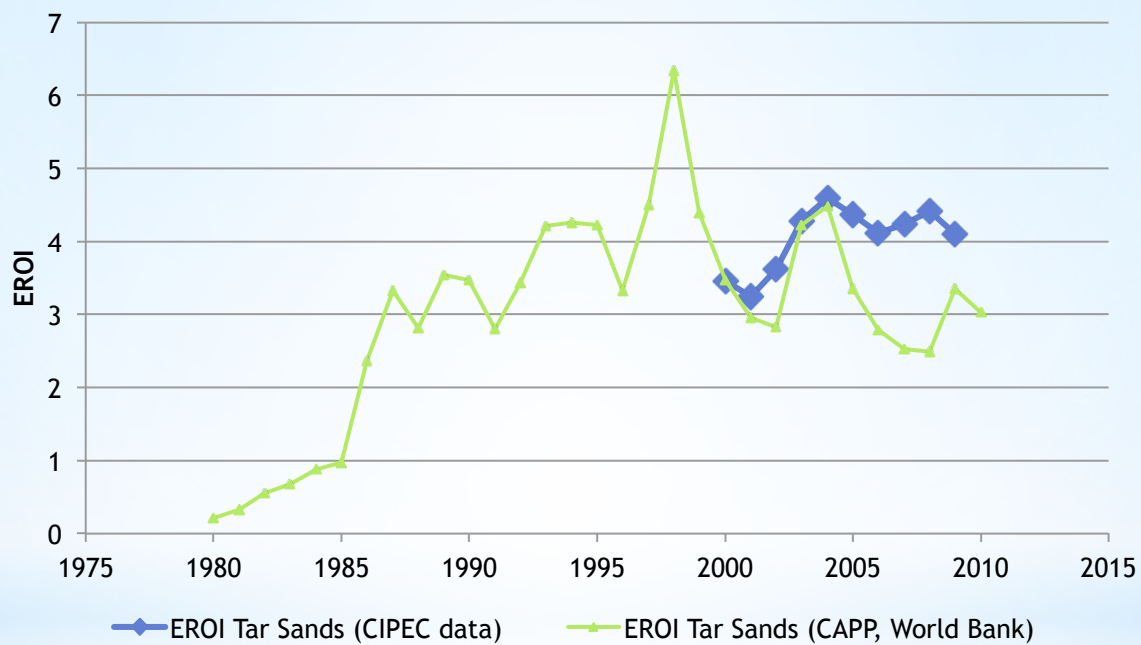


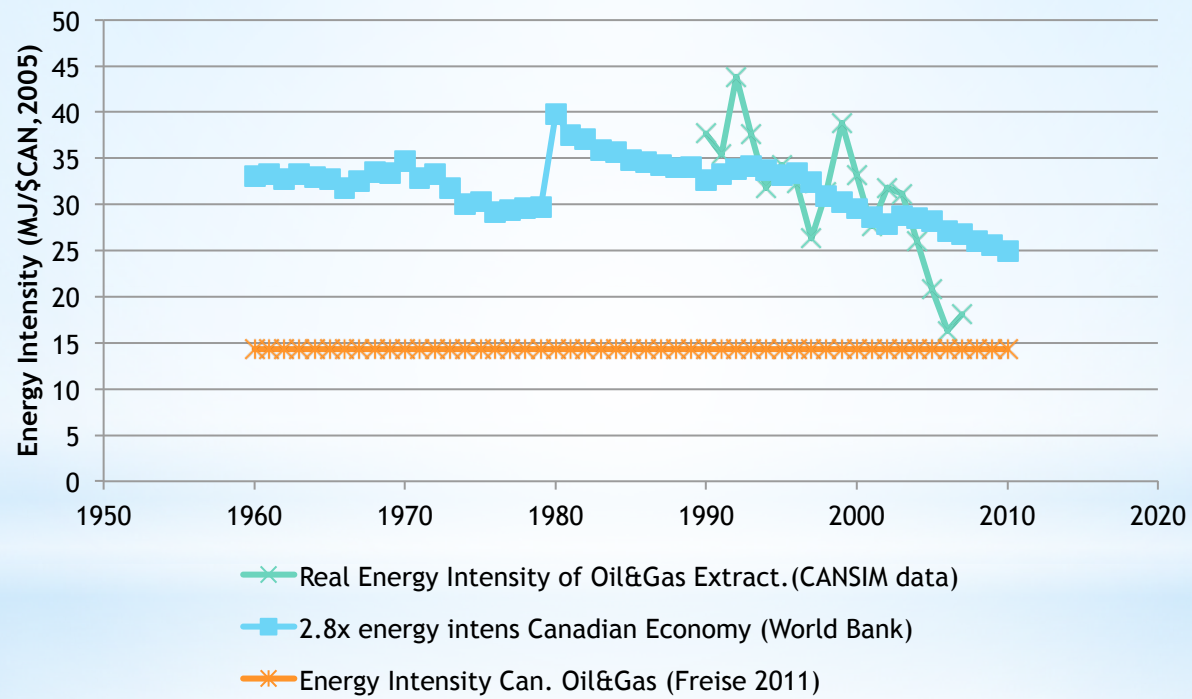




EROI Canadian Oil, Gas, Tar: Direct + Indirec Energy Use







Definitions

Energy Inputs

Conclusions

Who Cares ?

- * “Coal is still king” ?
- * Need Better Uncertainty Analysis
- *

Literature Review

