Industry Perspectives on Oil and Gas Development in Canada's Arctic: Opportunities and Challenges

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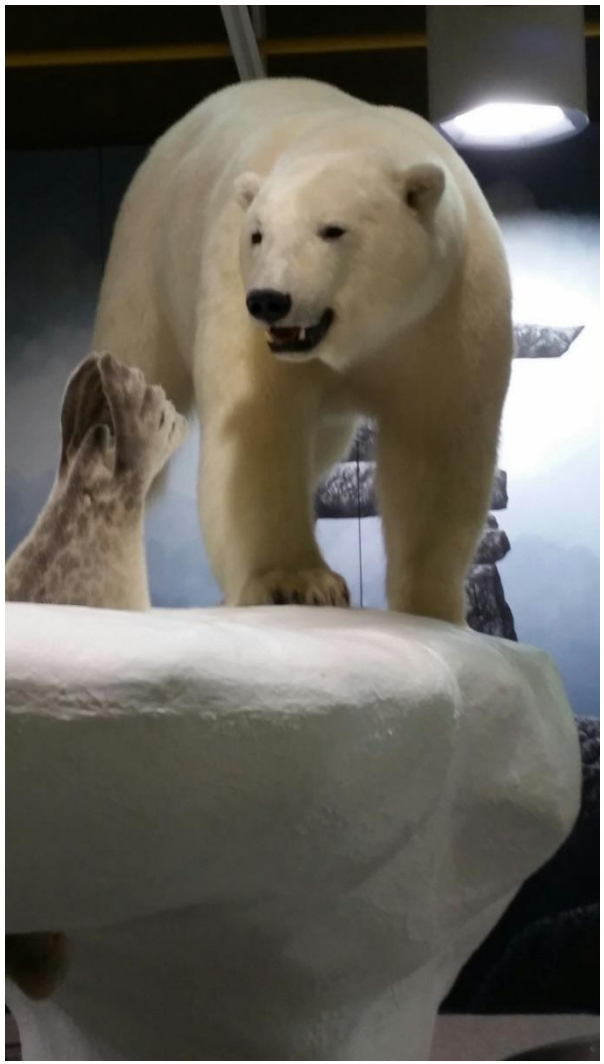
CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS

Canada's Oil and Natural Gas Producers

CAPP RESPONSIBLE CANADIAN ENERGY™

Presentation Outline

- **Context**
  - Energy demand
  - Industry benefits and capital spending
- **Overview of offshore oil and gas activity in Canada's Arctic**
- **Overcoming challenges through R&D and engagement**
- **Way forward for responsible development – trust and understanding**



Global Primary Energy Demand

Energy Demand Growth

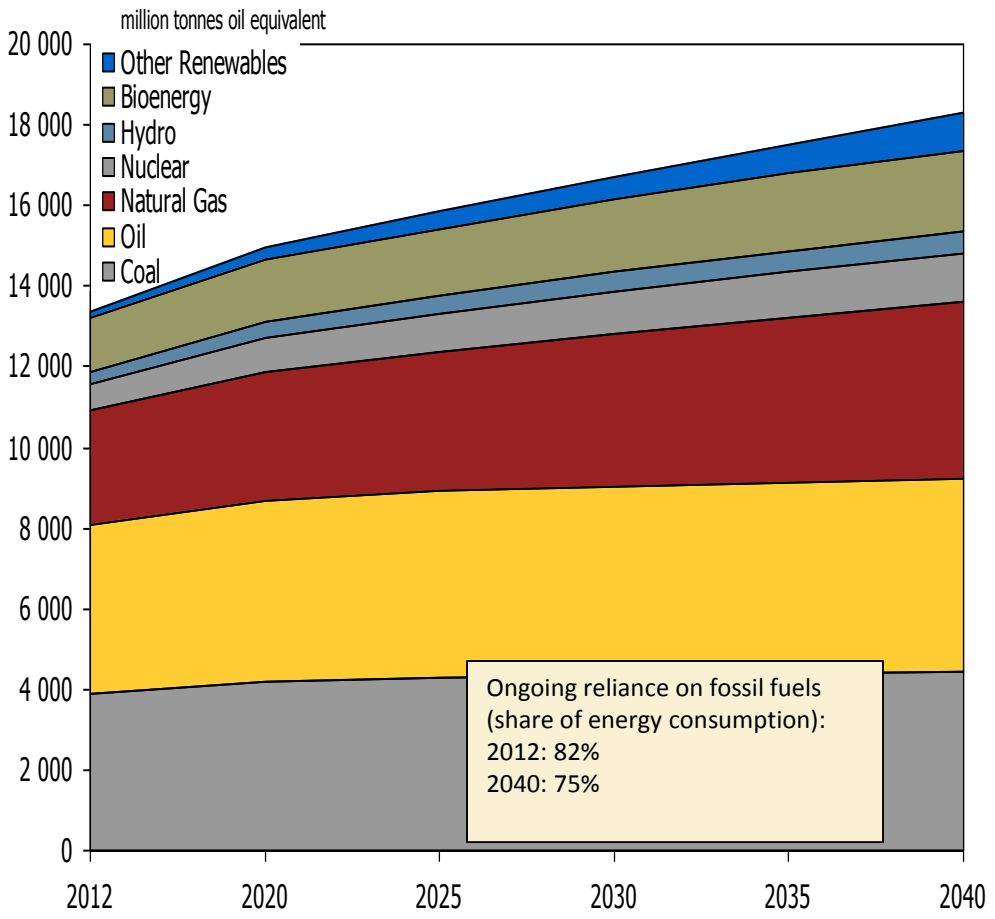
- Population growth
- Standard of living

All Forms of Energy, Developed Responsibly

- Ongoing high reliance on hydrocarbons
- Increasing role for renewables
- Shift to non-conv. oil & natural gas

Technology - Key Lever for Sustainable Growth

- Production
- Cost competitiveness
- Environmental performance



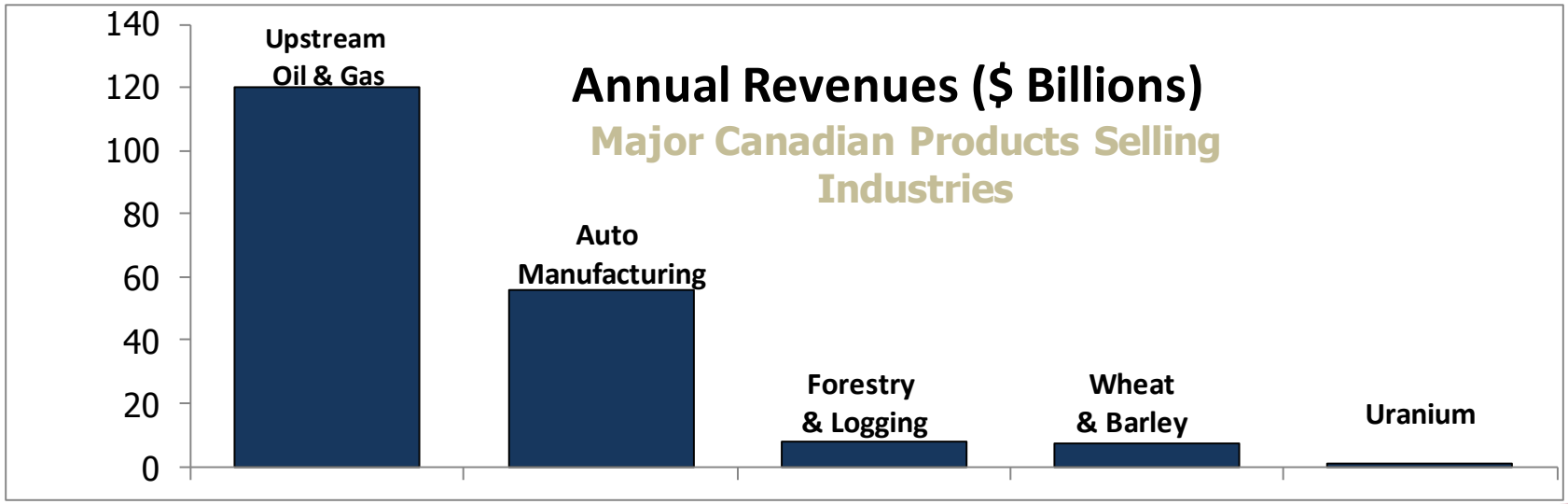
Source: International Energy Agency World Energy Outlook 2014

A Decade Makes a Difference - North American Perspective

Then	Now
➢ 60-year supply and falling	➢ 100+ years supply and growing
➢ Shale known but uneconomic to develop	➢ Flourishing production, vast shale resources now accessible
➢ Underground gas storage primarily traditional reservoir, operationally not very flexible	➢ Storage boom with more flexible salt-cavern facilities and additional market area storage
➢ Pipeline capacity growing incrementally	➢ 16,000+ miles of pipeline added since 2000
➢ Rising prices with several spikes	➢ Plentiful supplies moderate prices and provide supply diversity

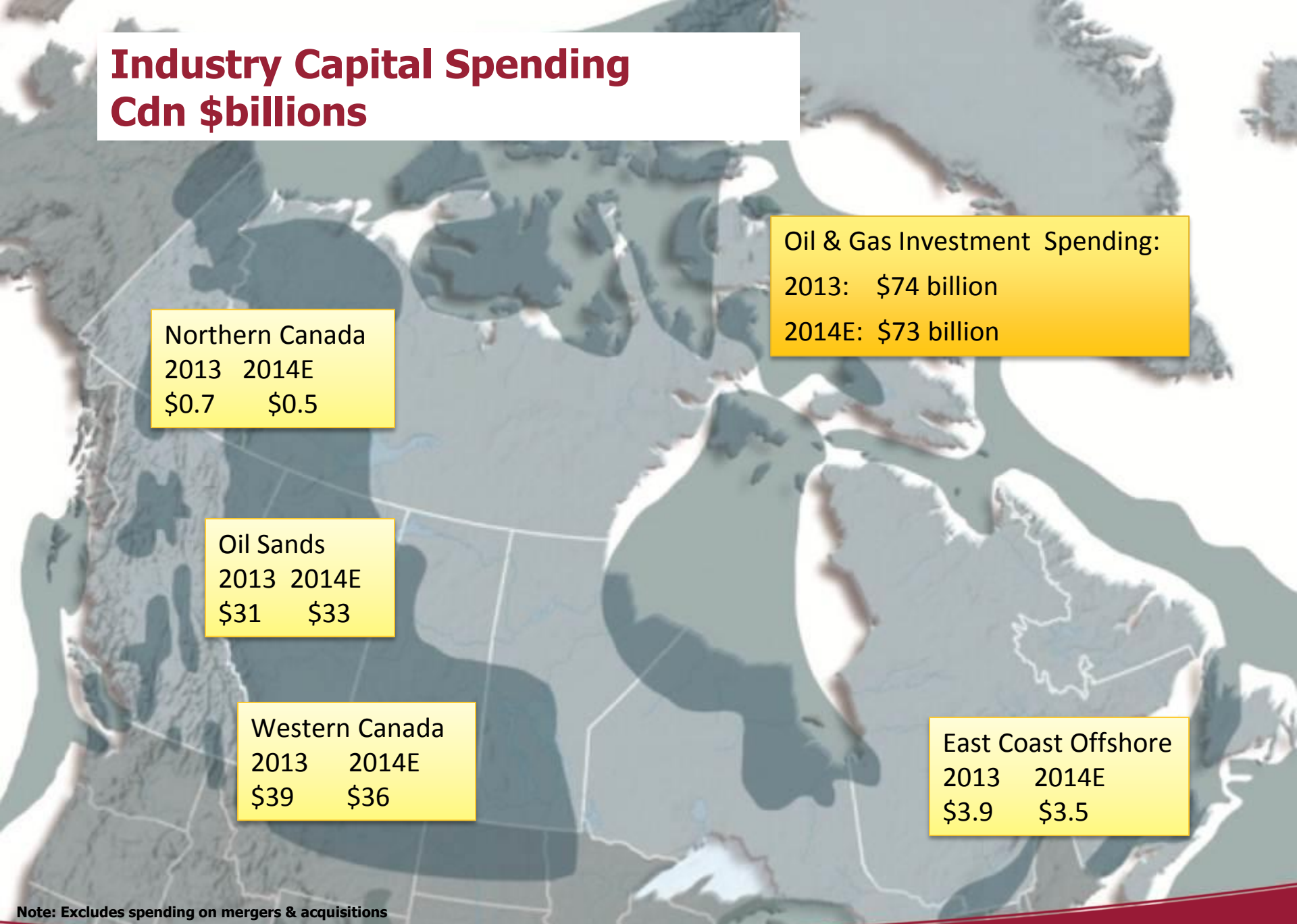
The Oil and Natural Gas Industry
A Key Driving Force in the Canadian Economy

- Invested $74 billion in Canada in 2013
  - Largest private sector investor in Canada
- Payments to governments average about $18 billion per year
- Approximately 20% of Canada's exports
- Employs more than 550,000 in Canada (direct & indirect)



Source: ARC Financial & CAPP

Industry Capital Spending
Cdn $billions



Oil & Gas Investment Spending:

2013: $74 billion

2014E: $73 billion

Northern Canada

2013	2014E
$0.7	$0.5

Oil Sands

2013	2014E
$31	$33

Western Canada

2013	2014E
$39	$36

East Coast Offshore

2013	2014E
$3.9	$3.5

Note: Excludes spending on mergers & acquisitions

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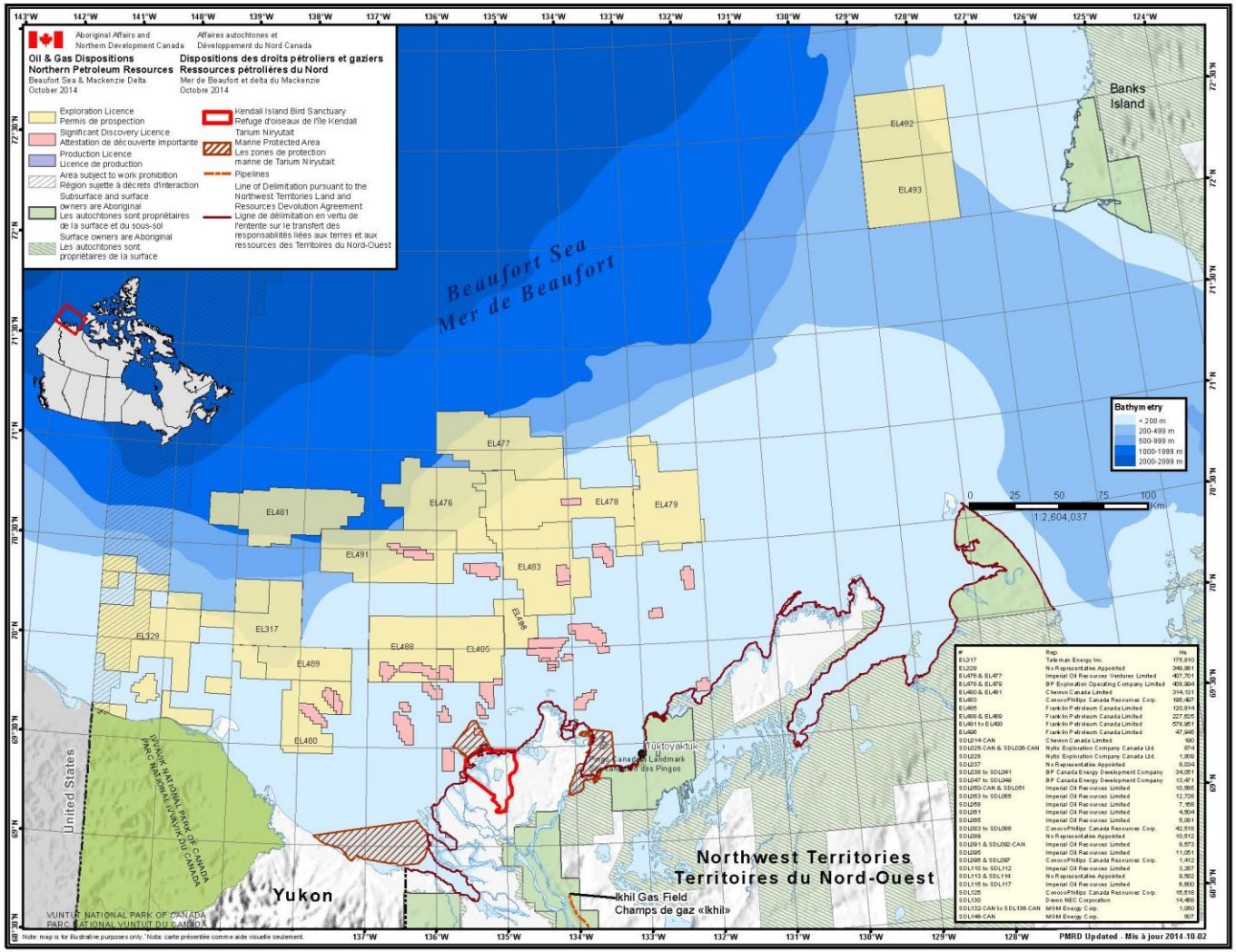
Canada's Arctic Offshore Basins

**Ultimate recoverable oil and ultimate initial marketable gas*
Source: Drummond Consulting report prepared for Indian and Northern Affairs Canada

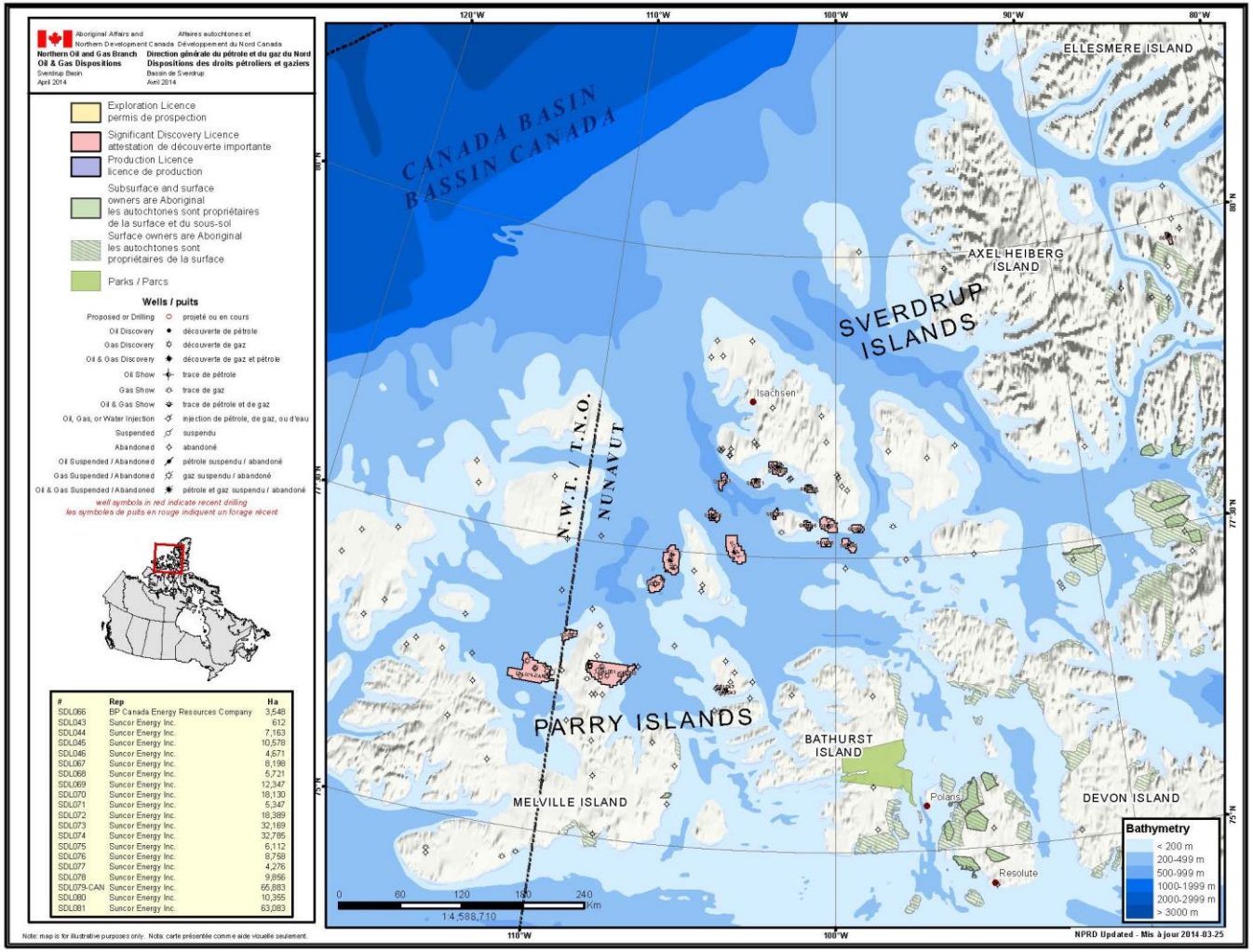
NWT - Beaufort Sea



NWT - Beaufort Sea (cont'd)

- **Drilling began in the Canadian Beaufort Sea in 1973**
- **About 100 wells have been drilled, with only one well drilled within the past 20 years**
  - Drilling has largely been in shallow waters but seismic exploration has continued and there is potential for further drilling activity
- **Two offshore seismic programs were conducted in 2012**
- **Sixteen offshore exploration licences are currently active, totaling roughly $2 billion dollars in work commitments**
- **No applications for operations authorizations have been submitted to the National Energy Board for Arctic offshore drilling**
- **One proposed project being examined**

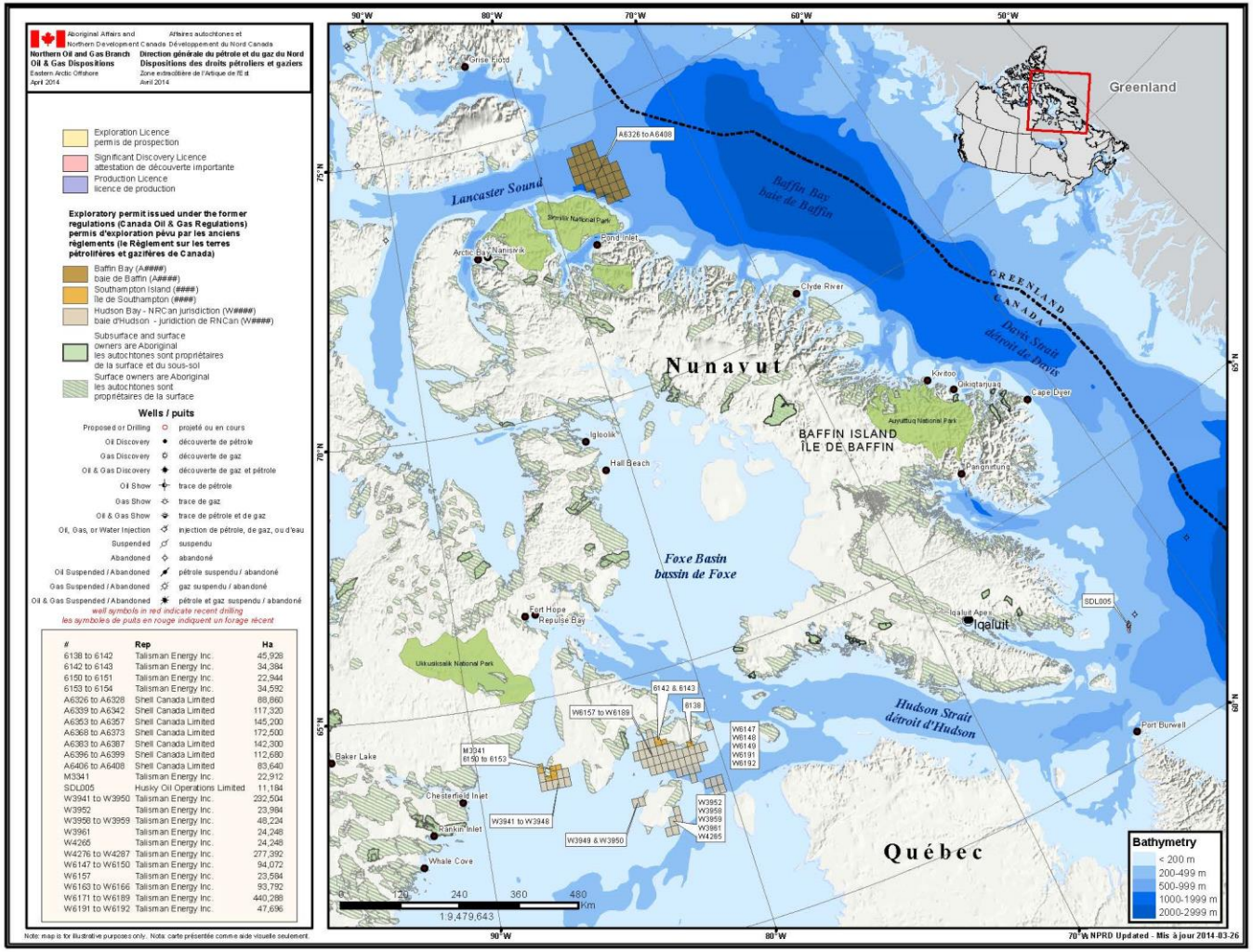
Nunavut - Sverdrup Basin



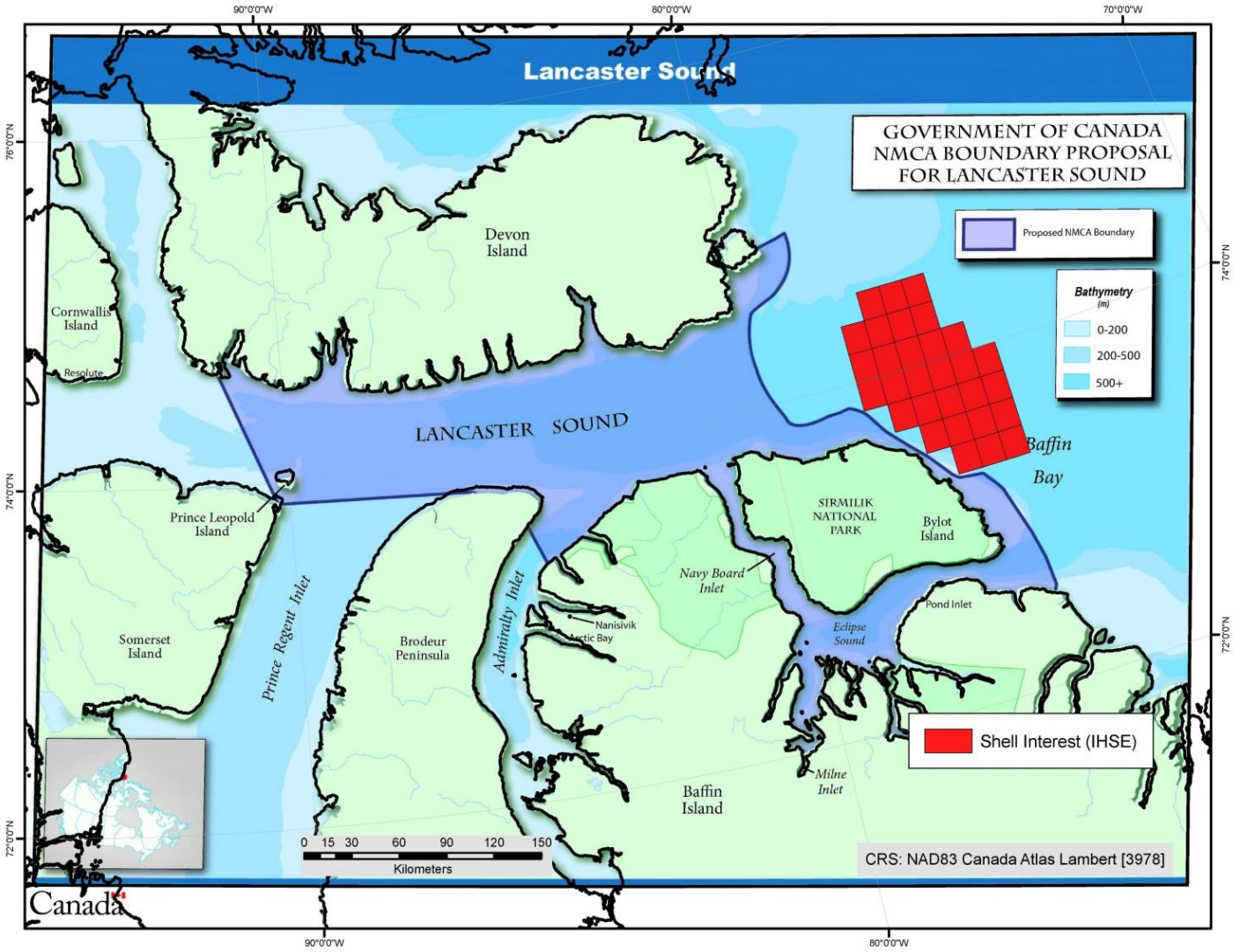
Nunavut - Sverdrup Basin (cont'd)

- 140 Exploration wells have been drilled in the Sverdrup basin since the 1970's
- 20 significant oil and gas discoveries and 1 commercial oil discovery
- Ultimate Initial Marketable Gas estimated at 49 Tcf; Ultimate Recoverable Oil estimated at 8 billion barrels
- Is thought that extended reach drilling from land could tap into a number of the offshore discoveries
- No industry activity is currently planned

Nunavut - Eastern Arctic



Nunavut - Eastern Arctic (Lancaster Sound)



Nunavut - Eastern Arctic (cont'd)

- **Area of high potential hydrocarbon resources**
  - Ultimate Initial Marketable Gas estimated at 16.7 Tcf
  - Ultimate Recoverable Oil estimated at 0.8 billion barrels
- **Recently a consortium of Norwegian companies wanted to conduct a 5 year series of seismic programs off the east coast of Baffin Island**
- **NEB approved but decision being legally challenged. Several communities, Inuit groups and the Nunavut ERB have concerns**
- **Government of Canada plans to conduct a SEA in the area**
- **Industry has expressed concerns of a proposed NMCA in Lancaster sound**
  - NMCA would remove more than 44,000 square kilometres of offshore hydrocarbon potential from Nunavut's exploration portfolio
  - Industry proposing an MPA which would allow for regulated protection of certain marine species while still allowing for oil and gas and other industrial related activities, with appropriate measures to protect marine life and its habitat

Challenges to Arctic Offshore Oil and Gas Activity

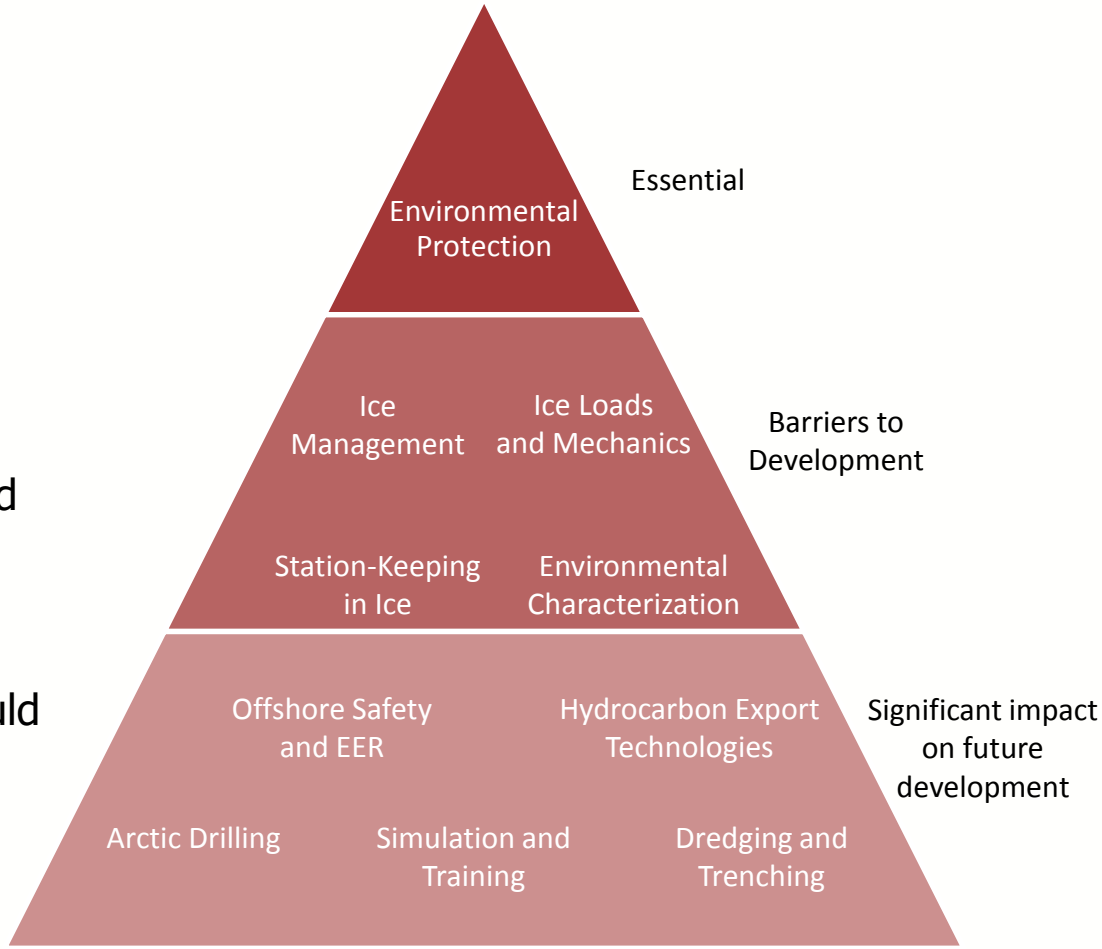
- **Physical**
  - Low temperatures
  - Sea ice (including extreme ice features up to 30M thick)
  - Icebergs and / or ice islands
  - Ice scour of the seabed
  - Permafrost and / or icing
  - Seabed hazards, including gas hydrates and shallow gas
  - Winter darkness (particularly for high latitudes)
  - Weak soil and seabed conditions
  - Distance to facilities / markets
- **Holistic**
  - Economic
  - Technical
  - Human factors
  - Regulatory
  - Socio-economic
  - Environment
  - Geopolitical

R&D Plays a Vital Role in Overcoming Challenges

- **Fills gaps in knowledge and understanding, technology & methodology and training requirements**
- **Researchers need to consider this multi-dimensional (physical & holistic) environment**
- **Solutions that focus on multiple-dimensional facets are most favored**
- **BREA, CHARS, ESRF, PERD all focused on northern energy R&D for the benefit of Northerners**

Top Priority Issues – Arctic Offshore Oil and Gas R&D

- **Highest priority issues identified; organized into three tiers:**
  - Top tier – Essential issues that must be addressed for development to proceed
  - Middle tier - highly important issues where R&D can reduce substantial fundamental gaps and uncertainties
  - Bottom tier - highly important issues for which technological solutions exist; advancement could significantly influence future development

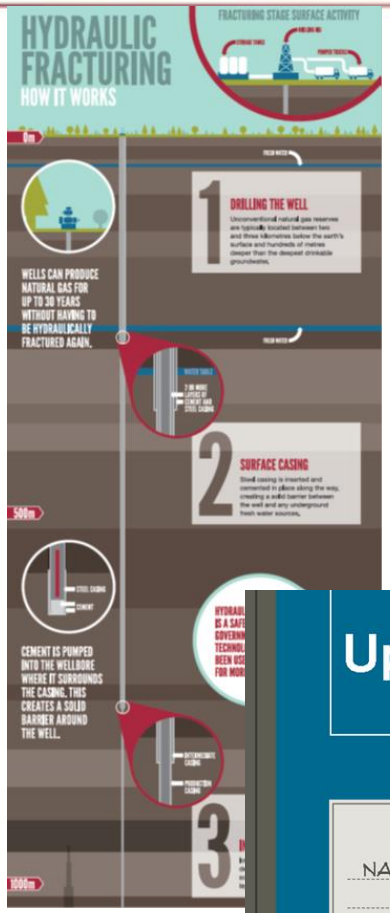


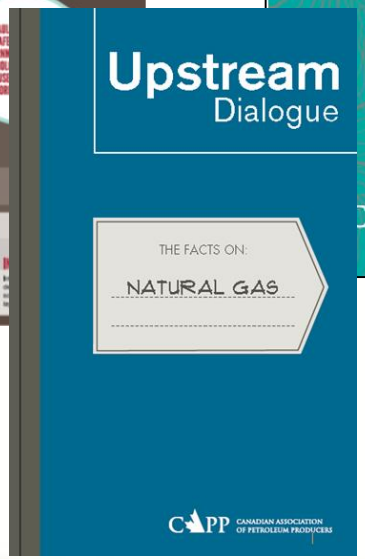
Source: C-CORE

Building Understanding and Trust

- **Performance:**
  - Continuous ***environmental & social performance improvement*** (across the value chain).....including monitoring, timely & transparent reporting
  - Clear line of sight to ***economic and social benefits*** to the public
  - World class ***policy & regulatory system***
  - ***Solutions-oriented advocacy*** for balanced policy and regulation
- **Communications & Outreach:**
  - Sustained communications grounded in performance improvement
  - Strong focus on outreach & engagement
- **Requires leadership & collaboration**

Communication Outreach: Processes, Practices & Responsibility





The Way Forward:
Opportunity, Collaboration & Responsible Development

- **Seizing the Opportunity**
  - Developing a competitive and reliable supply to meet market demands
  - Capture economic benefits and opportunities
  - Market growth and diversification
- **Building Public Trust and Understanding**
  - Industry performance, transparency and communication
  - Solid performance plus continuous improvement/ technological advances, and strong regulatory framework
  - Collaborating within sector, with government, stakeholders, and aboriginal communities
- **Responsible Development is in everyone's best interests**