

# Marine Seismic Surveys: The Search for Oil and Gas offshore Atlantic Canada

Presentation to oversight hearing on "The  
Science behind Discovery: Seismic Exploration  
and the Future of the Atlantic OCS"

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OF PETROLEUM PRODUCERS



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## Overview

- Who is CAPP
- Atlantic Canada Offshore Overview
- What is a marine seismic survey?
- Why are seismic surveys conducted?
- What are the impacts of seismic surveys?
- Environmental protection during seismic surveys
- Impact on fishing and other marine activities

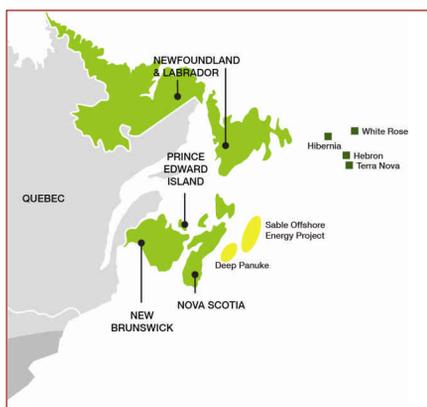
## Canadian Association of Petroleum Producers (CAPP)

- Represents Canadian upstream oil & gas sector (~ 100 member companies)
- Members explore for, develop and produce natural gas, natural gas liquids, crude oil, and oil sands throughout Canada
- Members produce about 90 per cent of Canada's natural gas and crude oil
- Key focus areas:
  - § Education
  - § Communications & outreach
  - § Policy & regulatory advocacy
  - § Industry performance
- Offices in St. John's, Ottawa, Calgary and Victoria

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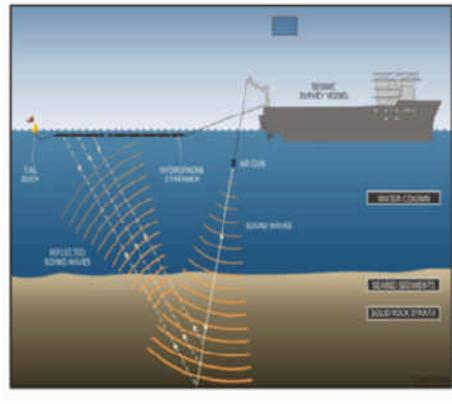
## Atlantic Canada Offshore



- Bringing substantial benefits to region:
  - § Directly employs over 7,000 people (thousands more indirectly)
  - § Supports over 800 local supply/service companies
  - § Cumulative expenditures since 1996 - over \$31 billion in NL, over \$8 billion in NS
  - § Impact of production on provincial Gross Domestic Product (GDP)
    - Oil production accounts for 30% GDP in NL
    - Mining and oil and gas production account for 2% of GDP in NS
- Five producing projects
- Exploration ongoing

## What is a marine seismic survey?

- Uses sound energy to map geological structures under the seabed
- Vessels tow devices that use compressed air to produce pulses of high energy, low frequency sound waves
- Sound waves can penetrate more than 6,000 metres below the sea floor
- Travel through the water and into the rock layers beneath the seabed
- Bounce back to receivers (“hydrophones”) that measure strength and return time



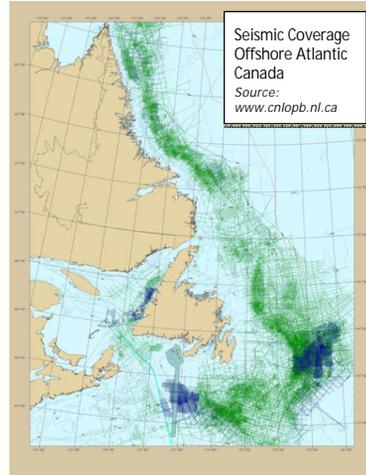
Source: Sikumiut Environmental Management

## What is a marine seismic survey (cont'd)

- **Types of seismic surveys:**
  - § Two dimensional (2D): Uses one sound source and one set of receivers
  - § Three dimensional (3D): Uses multiple synchronized sound sources and hydrophones
  - § Four dimensional (4D): Uses multiple synchronized sound sources and hydrophones with the added dimension of time (i.e.: a 3D survey is conducted multiple times over the same location at different periods to compare data)
  - § Geohazard or well site survey: Uses one sound source and one set of receivers towed over a small area prior to drilling to check for possible hazards
  - § Vertical Seismic Profiles: Hydrophones are lowered into a drilled well and sound is produced at the surface to give a detailed view of the geology near the well bore

## Why are seismic surveys conducted?

- Seismic surveys provide information on the depth, position and shape of underground geological formations that may contain oil or gas
- Data is processed to improve the quality and filter out background "noise"
- End result is a detailed picture of the structures and rock formations in the survey area
- Geophysicists look for specific features that could indicate whether oil or gas might be present:
  - § Sedimentary basins
  - § Faults
  - § Ancient reefs or buried former beaches



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## Why are seismic surveys conducted

- Seismic surveys help companies decide whether:
  - § The available information is sufficient to justify drilling an exploratory well
  - § Additional surveys are needed to better define the structures before drilling
  - § The features present are not attractive enough to warrant further interest
- Survey results do not show definitively whether oil or gas are present



Photo courtesy of Schlumberger

## What are the impacts of seismic surveys on marine life?

- Substantial research has been conducted to determine whether seismic surveys have an impact on ocean life and additional research is ongoing:
  - § Current research indicated there is minimal risk of mortality in marine mammals, fish and invertebrates
  - § Marine mammals, depending on species and proximity, can experience temporary changes to hearing thresholds and in some extreme cases these effects can be permanent
  - § Laboratory research conducted in NL show no mortality among invertebrates (crab, shrimp scallop etc.) but showed some non-life threatening physical effects
  - § Governments, academia and industry continue to invest in research related to seismic impacts to further broaden the body of knowledge
- Carefully designed mitigation measures are applied to seismic surveys to minimize risk to marine life

## Environmental protection

- Comprehensive Environmental Assessments (EAs) are completed prior to conducting surveys which must be approved by regulators
- Seismic vessels and their operators are guided by the *Statement of Canadian Practice with Respect to Mitigation of Seismic Sound in the Marine Environment*
  - § Outlines mitigation measures that must be considered in the planning of seismic surveys
  - § Examples:
    - Air source arrays must be shut down immediately if an endangered marine mammal or sea turtle is observed within 500 metres
    - Surveys must be planned to avoid dispersion of groups of spawning fish from known spawning areas

## Impact on fishing and marine industries



Photos courtesy of Schlumberger

- Seismic surveys in the Atlantic Canada offshore must be scheduled during optimal weather conditions (June to Sept) because:
  - § Surveys cannot take place if waves are higher than 3 metres
  - § Rough seas affect quality of data
- June to Sept is also peak fishing season in Atlantic Canada
- Effective communication and coordination between petroleum and fishing industries is critical

## Proactive mechanisms in place to minimize potential conflicts between both industries

- Fishing industry advised of marine seismic survey activity through direct communication and communiqués with fishing industry members, public service announcements etc.
- In NL a single point of contact is appointed by the operator that fishers can go to for precise information about geographic location and potential impacts
- A fisheries liaison officer (FLO) may be required on board the seismic vessel - the FLO communicates directly with fishing vessels in the field to resolve situations where overlap and conflicts could occur
- Working with the fishing industry:
  - § In NL, *One Ocean* was created as a communication & liaison organization between fishing and petroleum industries
  - § Fisheries advisory committee in NS advises regulator on minimizing impact on fishing industry
- Compensation programs in place for damage to fishing vessels or gear



More information  
available at:  
[www.capp.ca](http://www.capp.ca)  
[www.oneocean.ca](http://www.oneocean.ca)

Questions?