North American Pipelines
- Advantages, Disadvantages, Risk Reduction

United Nations Economic Commission for Europe
Workshop on the Prevention of Water Pollution
due to Pipeline Accidents
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Introduction

- Overview of North American pipeline infrastructure
- National Energy Board (context)
- Benefits & disadvantages of pipelines
- Reducing the risk of pipeline accidents
National Energy Board of Canada

- Regulates about 45,000 km of transmission pipelines that cross inter-provincial or international borders (between Canada and U.S.A)
- 40% of these lines carry crude oil or refined products (gasoline, aviation fuel)
- National Energy Board’s role is to promote safety, environmental protection and economic efficiency in the regulation of pipelines, energy development and trade
Major Oil Pipelines in Canada
Oil Pipelines Crossing International Waterbodies

- Saginaw
- Sarnia
- Montreal
- Buffalo
- Enbridge
- TNPI
Benefits and Disadvantages of Pipelines

- **Benefits**
  - **Economic**
    - 8.0 €/m³ toll from Edmonton to Chicago
  - **Safety**
    - 87 times fewer deaths than truck transport
    - 35 times fewer fires/explosions than truck transport
  - **Security**
    - Largely invisible to the general public
  - **Environment**
Benefits and Disadvantages of Pipelines

- **Disadvantages**
  - **Capital cost**
    - ~500,000 €/km or 650 – 800 €/km•mm diameter
  - **Environmental impacts of construction**
    - Topsoil stripping
    - Deforestation (right of way clearing)
  - **Environmental impacts of operation**
    - Effects of pipeline releases
  - **Infringement on land rights (expropriation)**
Reducing the Risk of Pipeline Accidents

Comparison of Leak/Break/Rupture by Cause
Reducing the Risk of Pipeline Accidents

Risk = Probability x Consequences

- Canadian regulatory approach:
  - Reduce probability
    - Integrity Management Programs
    - Damage Prevention Programs
  - Mitigate consequences
    - Emergency Planning and Response Programs
  - Verify compliance
    - Management System Audits
Reducing the Risk of Pipeline Accidents

- **Integrity Management Program**
  - Reduce the probability of corrosion-related releases
  - Includes:
    - Management System
    - Working Records System
    - Condition Monitoring Program
    - Mitigation Program

- **Damage Prevention Program**
  - Reduce the probability of third-party damage
    - Permission to excavate on RoW; notify within 30 metres
    - Awareness obligations
Reducing the Risk of Pipeline Accidents

- **Emergency Planning & Response Program**
  - Mitigate consequences of an uncontrolled release to land or water
    - Management system approach
    - Liaison program for first responders
    - Continuing education program for public

- **Compliance verification**
  - NEB management system audits
Audit Findings

- Environment: 23%
- Safety: 12%
- Integrity: 22%
- Emergency Response: 43%
Reducing the Risk of Pipeline Accidents

- U.S.A. regulatory approach
    - Identification of High Consequence Areas
    - Baseline assessments
    - Continuous evaluation and assessment
    - Risk assessment
    - Repair criteria
    - Program effectiveness measures
  - Emergency response
USA Pipelines & High Consequence Areas
Working with Other Regulators

- Pipeline Technical Regulatory Authorities Committee of Canada (PTRACC)
- Memorandum of Understanding with U.S. Pipeline Hazardous Materials Safety Association
- Development of joint GIS-based pipeline mapping system
Summary

What have we learned?

- Regulatory intervention can positively influence safety and environmental protection
- Understanding release causes is a critical first step in developing a program to reduce the risk

Future regulatory directions

- Increased movement toward goal-oriented regulation
- Introduction of Health, Safety and Environment Case