

# ALARA Program Highlights in CANADA

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# Current Canadian Nuclear Context

- Canada's CANDU reactors are ageing
- Increased service outage required to maintain and upgrade operating units
- Canadian regulatory body requires a formal ALARA program

- Canadian Nuclear Safety Commission (CNSC) staff conducts ALARA inspections of the Canadian nuclear plants.
- Canadian plants have focused on several dose reduction measures to achieve the proper balance between plant maintenance needs and site dose goals.

# Ontario Power Generation

- Ontario Power Generation operates eight (8) CANDU reactors
- Pickering 5-8, and Darlington 1-4, plus 4 laid up reactors (Pickering 1-4).  
Considerable effort has been devoted to maintenance on Pickering 1-4 to permit a return to service for these units in the future.

# OPG ALARA initiatives

- Hot Spot Reduction
- Heat Transport System Filtration Pore Size Reduction (0.1 micron)
- Temporary Shielding
- Teledosimetry and Remote Cameras
- Low Dose Waiting Area

# OPG ALARA initiatives

- Tritium Reduction Program
  - Moderator Detritiation
  - Optimising HT Vapor Recovery System
  - Temporary Power Supply to Dryers During Bus Outage
  - Temporary or Permanent Tritium Off-gassing Facility

# OPG ALARA initiatives

- Aggressive Follow-up by Line Management for Excessive Individual Tritium Exposure
- Use of HEPA and Temporary Containment
- Contaminated Control Area reduction by ~ 80,000-sq. ft. per unit (Pickering 1-4)
- Quick Disconnect Scaffolding
- Fuel Handling Area Particle Detection and Control

# OPG ALARA initiatives

- Non-rad Workers Trained for RP Technical Job Covered During Service Outage
- Improved D2O Leak Search and Tracking Process

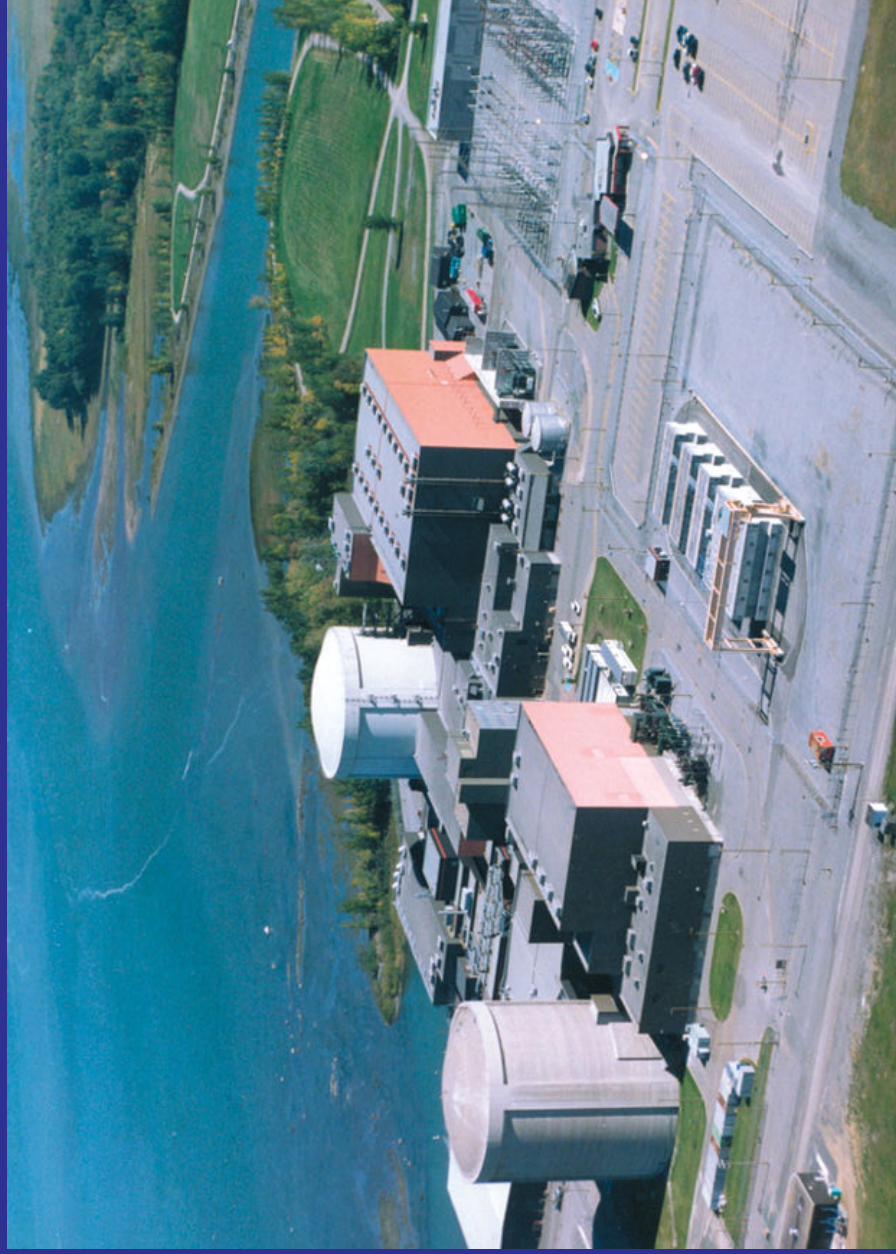
# Bruce Power

- Operated Units Bruce B (Units 5-8) in 2001 under management and 18 year lease of British Energy
- Two Service Outage per Year for Bruce B
- Bruce A, Units 3&4 Restart is a Near Goal Term of British Energy

# Bruce Power ALARA Initiatives

- Moderator Tritium Concentration Reduction by 30-35%
- Dedicated Group to Perform ALARA Reviews of Work Packages to better integrate ALARA in Work Planning Process

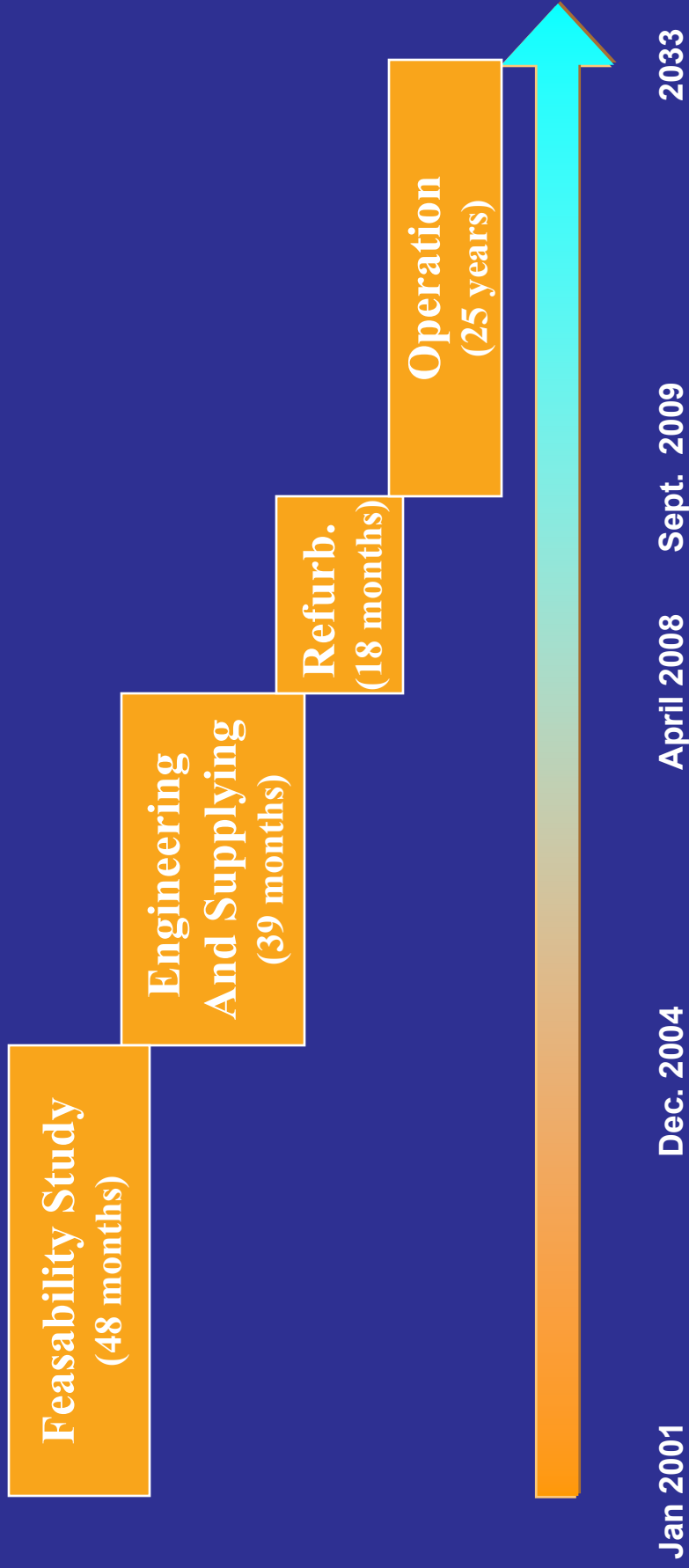
# Hydro-Québec Gentilly-2



# Hydro-Québec Gentilly-2

- Power Plant Life Extension Project
  - Major Benchmark Dates
    - August 2003 (Starting Second Phase of Feasibility Study)
    - End of 2004 (Final Decision for Life Extension or not)
  - Impact on Plant Outage Work Scope
    - Adding Systems/Components Inspection → Doses

# Schedule and Milestones



# Feasibility Study

- To make sure, using best assumptions, that power plant life extension will be technically and economically viable until 2033, taking into account refurbishing in 2008-2009
- Identify major work to be done during refurbishing phase
- Identify cost and schedule for the project
- Obtain license renewal with regulatory authority (CSNC)
- Prepare environmental impact study and obtain government authorisations

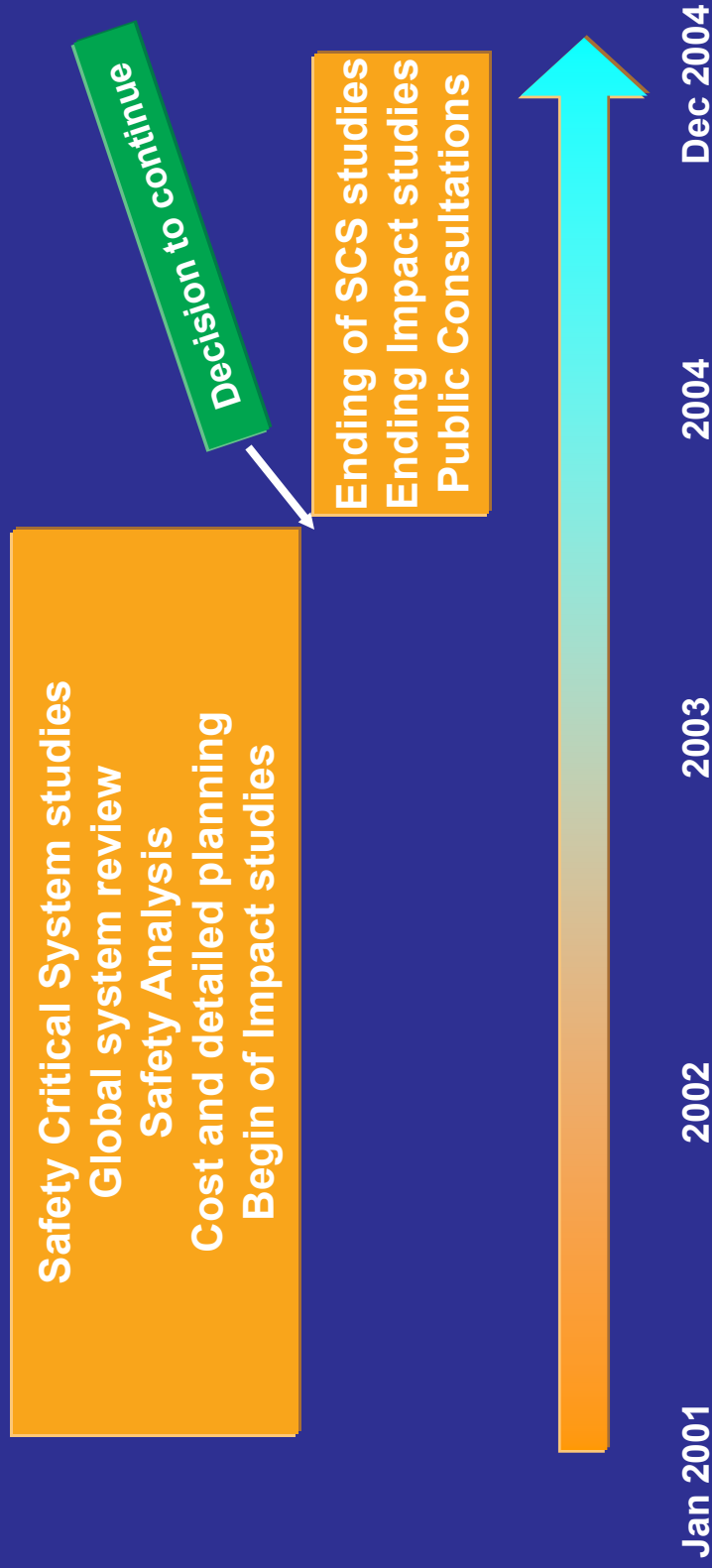
# Main tasks

- Complete ageing studies on safety critical components
- Complete inspections on safety critical components
- Finalize main systems « good health » status review
- Evaluate Fuel Channel Replacement
- Evaluate costs and schedule milestones for the project

# Main tasks

- Evaluate and start safety studies request by CNSC and obtain good assurance of License renewal
- Update economical studies
- Realize environmental impact studies
- Write feasibility study report
- Prepare public consultation
- Obtain internal approval and government authorization for the project

# Feasibility Study Milestones



# Gentilly-2 ALARA Initiatives

- Hot Spot Survey and Reduction Program
- Use of Teledosimetry for Rad Work Control and Reactor Face Dose Rate Mapping
- ALARA Review of Work Package
- Project Underway to Optimize and Enhance Rad Control Area Access Control Points and Rad Control Area Optimization.

# Gentilly-2 ALARA Initiatives

- Aggressive Rad Waste Reduction Program
- Enhancement of Radiation Protection Software including:
  - Rad Work Permit (Including Access Control using DRD)
  - Contaminated Workers Detection and Control
  - Waste Control
  - Hazards (Radiological and Industrial)

# Point Lepreau

- No Planned Maintenance Outage in 2001
- 1 Major Force Outage (03/15 to 04/15) Due to One Feeder Leak.
  - 3 feeders replaced (540 pers.-mSv)
- 2 Minor Outages in December for 4 and 9 days (20 pers.-mSv, one of it involving a stalled fueling machine containing used fuel).

# Point Lepreau ALARA Initiatives

- Feeder Leak Detection System
  - Tritium-in-air monitor at reactor face
- ALARA Review meeting (Part of Newly--implemented ALARA Program)