

# AECL

## REFURBISHMENT CAPABILITY

Refurbishment  
extends the  
life of existing  
CANDU plants  
by 25 to 30  
years.

### THE REFURBISHMENT PROCESS

- Retubing - replacement of reactor components at the end of service life
- Service-fitness confirmation of the entire plant
- Implementation of safety upgrades

Refurbishment extends the life of existing CANDU® plants by 25 to 30 years. Since retubing the Pickering A reactors in Partnership with Ontario Hydro in the 1980s, AECL has significantly improved its technology. It has also developed a comprehensive methodology for determining the scope and detailed planning of refurbishments.

### PERFORMANCE THROUGH PARTNERSHIP

AECL is committed to working with its utility partners to minimize cost and risk. The company offers unparalleled knowledge of CANDU design and core technology, together with all the tools and services required for implementing life-cycle management strategies.

### A NEW WAY OF DOING BUSINESS

- Flexible, innovative and responsive contractual arrangements, including firm price and fixed schedule
- Focus on performance and customer satisfaction
- Full General Contractor and Project Management responsibility for quality assurance, design, licensing support, procurement, construction, installation, testing and inspection
- AECL has already applied this new business model to the commitments for life extension of four plants

### PROVEN EXPERIENCE

- Currently working with five utilities in the planning and execution of refurbishment projects
- Systematic and thorough plant condition assessment proven indispensable in every case

- World leading track record in constructing and commissioning new nuclear power plants
- Completion of six new CANDU reactors in the last eight years, on or before schedule and on budget
- Successful project partnership with world class partners such as Hitachi and SNC-Lavalin
- Full life-cycle product and technology support through Chalk River research and development facility
- Refurbishment projects incorporate many elements from designs of more recent CANDU 6 plants, such as Wolsong 2, 3 and 4 and Qinshan 1 and 2

### RISK MITIGATION

Comprehensive pre-project plant condition assessment, costing and scheduling is carried out in full cooperation with the client.

- AECL works with the client and the CNSC to establish an agreed licensing process for key elements of the refurbishment work
- AECL accepts firm price and scheduling commitments
- AECL has established an outstanding reputation for delivering on time and on schedule
- AECL has extensive experience in the development of tools for reactor retubing

### PERFORMANCE THROUGH ENHANCED ASSET MANAGEMENT

Effective reactor refurbishment is the fastest, lowest cost and most sustainable power supply source for utilities, power system authorities and governments.

- Refurbished plants perform at increased capacity factors of at least 5%. Plant uprating can also provide an additional increase in power output of 3.5% to 5%
- AECL can further increase performance through implementation of automation technology that reduces resources required for operation and significantly enhances maintenance programs



## ECONOMIC COMPETITIVENESS

Nuclear reactors have consistently provided the least cost base-load generation for electric utilities.

- Unit energy costs for refurbished nuclear plants are competitive with imported gas and coal
- Risk of gas price increases and volatility can impact ratepayers
- Many jurisdictions are phasing out coal
- Nuclear fuel is inexpensive and not subject to price volatility
- Uranium is a Canadian resource with all the benefits of a stable supply chain

	Annual O&M Cost (local Economy)	Annual Fuel Cost (Imported)
Nuclear	93% of the Total	7% of the Total
Coal	36% of the Total	64% of the Total
Gas	10% of the Total	90% of the Total

Nuclear plants offer significant local economic benefit throughout their operating life, in the form of high-tech jobs.

## COMPLIANCE WITH KYOTO - THE ENVIRONMENTAL BENEFITS OF PLANT REFURBISHMENT

Refurbishment enables optimum use of the nuclear asset to meet Canada's Kyoto commitments. Nuclear plant refurbishment and life-extension projects provide viable, clean, safe solutions that are suitable to receive potential credits.

- CANDU plants, new and refurbished, produce no greenhouse gases and no health threatening emissions
- Refurbished CANDU reactors performance and safety is further enhanced by the new stronger and longer lasting zirconium-alloy pressure tubes used in all recent CANDU units
- Probabilistic Safety Assessments (PSAs) performed by AECL ensure that refurbishments are cost effective in improving overall plant safety
- Spent nuclear fuel can be safely stored on site for 100+ years, during which time disposal sites are expected to be operational

*CANDU® is a registered trademark of Atomic Energy of Canada Limited (AECL).*

- Nuclear waste is completely managed with no harmful releases to the environment

Each year a CANDU 6 reactor will avoid 4.8 million tons of carbon dioxide. For acid gases, the avoidance is approximately 80,000 tons annually.

## COMMUNITY SUPPORT FOR REFURBISHMENT

Recent polls indicate that public support for nuclear plant refurbishment runs very high – e.g., 67% in Ontario and 57% in New Brunswick, which rises to 72% in support of the Point Lepreau CANDU 6 unit.\*

- Support is seen to rise significantly when the link between local clean air and nuclear energy is understood
- Half of all Canadians support nuclear energy in general, with 64% of Ontarians also agreeing that existing plant licenses should be renewed and new builds should occur on existing sites
- AECL works very closely with the utility in determining the best refurbishment strategy for minimal environmental impact and maximized community benefit
- CANDU life extension continues production of the major source of Cobalt-60 for the worldwide health care industry - used for the sterilization of single use medical products such as gloves, gowns and I.V. kits.

## AECL CORE COMPETENCIES

- Reactor Retubing
- Project Management
- Control and Safety Computer Upgrades
- Other Designs and Safety Upgrades and Assessments

To assure the public and the regulator of the continuing safety of the station, AECL provides safety and licensing assessment based on the IAEA periodic safety review structure. This ensures that any contemplated life-extension/refurbishment project will maintain or improve plant safety. The assessment also includes an analysis of the station per current codes and standards, and selected improvements based on benefit/cost analysis.

*\*Source: 2003 Environics poll*