



The Abdus Salam
International Centre for Theoretical Physics



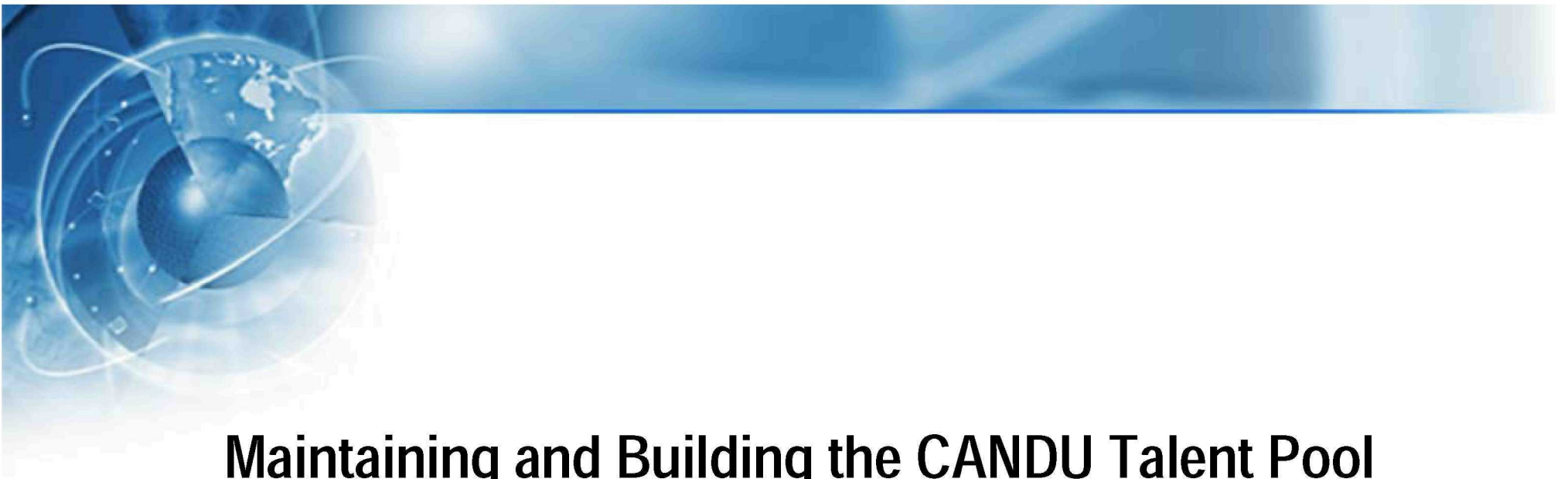
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SCHOOL OF NUCLEAR KNOWLEDGE MANAGEMENT

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Maintaining and building the CANDU Talent Pool

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Maintaining and Building the CANDU Talent Pool

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Outline

- Objectives of Approach
- Maintaining staff levels
- University Interaction
- Other Initiatives
 - UNENE
 - CANTEACH
 - COG
 - Science Academy
 - Youth Science Foundation
 - Partners in Research and in Business
 - Canadian Nuclear Society
 - Canadian Nuclear Association
 - Participation in standards bodies
- Summary



Objectives

- **Maintain core CANDU engineering and science capability within Canadian universities and industry**
- **Encourage and train next generation of nuclear science and engineering graduates**
- **Facilitate sharing of CANDU nuclear knowledge – underlying science and engineering, OPEX, new developments – amongst university and industry partners**



Maintain Required Staff Levels and Competency in Canadian Nuclear Utilities

- **Support a number of Industrial / University Research Chairs**
- **Development / Implementation of detailed staffing, recruitment and training plans (operations, maintenance and engineering)**
- **Utility Participation in UNENE Program**
- **Improvements in the areas of Documentation and Accessibility of Technical Plant Information**



AECL Hiring/Training Strategy

- 1. Undergrad Student program: university/college co-op and summer students**
- 2. Graduate students program: Proactive approach to identify good candidates, then assess for future hiring**
 - NSERC Fellows, Industrial Fellowships**
 - Centre d'Etudes Supérieures des Techniques Industrielles (CESTI) (equivalent to a M.Eng)**
- 3. Researcher Emeritus Program: transfer of knowledge and expertise, mentoring and continued work by internationally renowned scientists and engineers retired from AECL (currently 5)**



Increased University Interaction

- **AECL Supports Industrial Research Chairs**
 - Ecole Polytechnique (Pettigrew)
 - Queen's University (Holt)
 - University of New Brunswick (Lister)
- **AECL Adjunct Professors - AECL staff teach at:**
 - Carleton, Laurentian, McGill, McMaster, Manitoba, Ottawa, Royal Military College, Saskatchewan, Sherbrooke, Waterloo, Trent, Western Ontario
- **Development of nuclear-related R&D programs with graduate student opportunities**
- **Participation in the University Network of Excellence in Nuclear Engineering (UNENE) Program**



Other Initiatives



University Network of Excellence in Nuclear Engineering (UNENE)

- **An alliance of universities, nuclear power utilities, research and regulatory agencies for the support of nuclear education and R&D capability in Canadian universities**
- **Assure a sustainable supply of qualified nuclear engineers and scientists to meet industry needs...**
- **Industry funds matched by NSERC for creating Industrial Research Chairs (IRCs)**
- **Full-time undergraduate and graduate degrees**
- **Part-time programs for industry employees, on-site**
- **Instructions by university professors and experts from the industry**



University Network of Excellence in Nuclear Engineering (UNENE)

Membership:

- Atomic Energy of Canada Ltd
- 8 Universities in 3 provinces
- 2 utilities (12 reactors)
- Canadian Nuclear Safety Commission
- CANDU Owners Group
- other industrial partners

Academia:

- 6 Industrial & Research Chairs
- 36 research students
- 10 Adjunct professors





UNENE Industrial and Research Chairs

- **Nuclear Materials**
- **Control, Instrumentation & Electrical Systems of Nuclear Power Plants**
- **Nano-Engineering of Alloys for Nuclear Power Systems**
- **Risk-Based Life Cycle Management of Engineering Systems**
- **Nuclear Safety Analysis**
- **Health Physics & Environmental Safety**

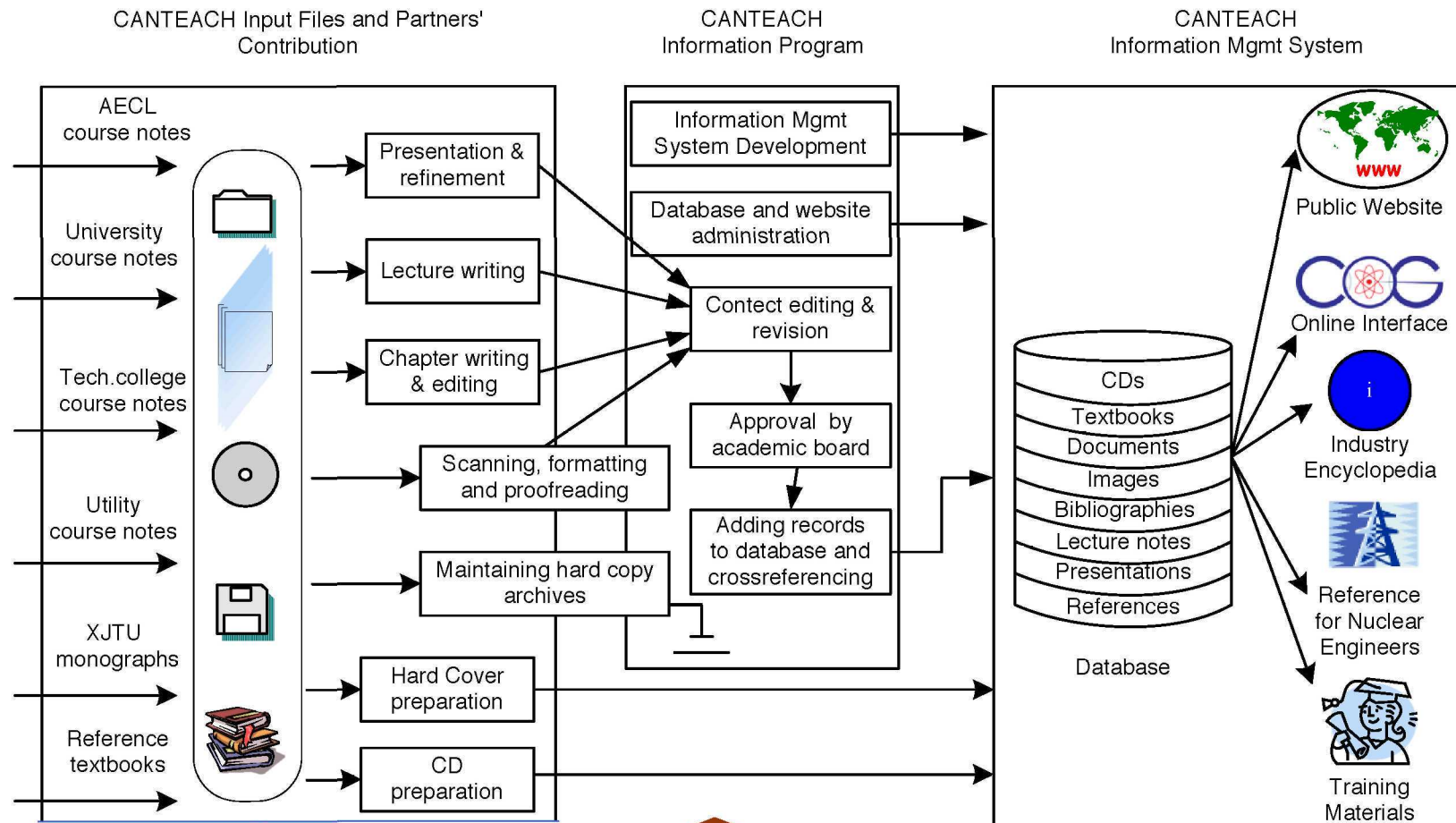


CANTEACH

- **Preservation and dissemination of CANDU[®] technical knowledge**
 - Web-based access to in-depth information about design and technology of CANDU[®] systems
 - Capture the 'why' as well as 'what' and 'how'
 - Capture and disseminate the design legacy
- **KM activities include:**
 - Capturing and Formatting
 - Validation, Filing and Archiving
 - Dissemination



CANTEACH -The process



Dan Meneley
Project Director



Bill Garland
Academic Director

Malcolm Lightfoot/Yulia Kosarenko
Project Administration



CANTEACH Web Site Tour

<http://canteach.candu.org/>

The screenshot displays the CANTEACH website interface. At the top left is the CANTEACH logo, which features a stylized atom symbol with a book inside, next to the text 'CANTEACH'. To the right of the logo is a search bar with the text 'Search' and a magnifying glass icon. Below the logo is a navigation menu with the following items: Home, What's New, CANTEACH Project, Library, and Help. Below the navigation menu is a tagline: 'The most comprehensive educational and reference library on CANDU technology'. In the center of the page is a large banner that reads 'Welcome to CANTEACH Project' and 'Find out what CANTEACH is'. Below the banner is a grid of content sections. The grid is divided into several columns and rows. The top row contains 'Concept Map Library', 'Site Map', 'Help Desk', and 'Teacher's Lounge'. The middle row contains 'CANDU Systems and Components', 'Documents Library', and 'Image Library'. The bottom row contains 'New Arrivals' and 'Index'. The 'Documents Library' section is the largest and features a stack of books icon. The 'Help Desk' section has a red question mark icon. The 'Image Library' section has a magnifying glass icon. The entire grid is enclosed in a light-colored border. At the bottom of the grid is a footer that reads 'CANTEACH Library'.

Concept Map Library
See the bigger picture of how technical information on CANDUs is organized

CANDU Systems and Components
Information organized by BSI, components, etc.

Site Map

Help Desk

Teacher's Lounge
Introduction to CANDU
Bibliography
Who's Who
Links

Documents Library
Browse, search and download documents

Image Library
Browse, search and download images

New Arrivals

Index

CANTEACH Library



Potential Users

- High school teacher
- Technical staff trainer
- Nuclear industry professional
- University professor
- Senior management



CANDU Owners Group (COG)

- **an affiliation of CANDU Nuclear Power Plant Operators**
- **provides a framework for co-operation, mutual assistance and exchange of specialist expertise and information**
- **focus: the successful support, development, operation, maintenance and economics of CANDU technology**



COG Activities

- **Newsletter**
- **R&D Program - CANDU nuclear technology**
- **Information Exchange – OPEX**
- **Conferences**
- **Workshops**
- **State-of-the-Art Reports**
- **Participation in EPRI R&D Program**



Deep River Science Academy

- Non-profit organization with 2 campuses founded in 1985
- High school students work for 6 weeks in an R&D environment under the guidance of a university student tutor supervised by a research scientist/engineer
- Students are not observers; participate in experiments and contribute to research
- Introduces high school students to the benefits of nuclear R&D at a much earlier stage in their careers
- Become ambassadors for science and are better informed of options available to them

www.drsta.ca



Deep River Science Academy

- Encourages high school students to study nuclear science at university, and university students to seek careers in nuclear industry
- ~50 high school students, working in pairs to perform research under the supervision of a university student tutor, attend the Science Academy each year
- Sponsored by industry, power utilities, universities, AECL and National Research Council





Youth Science Foundation

- AECL sponsors the Canada-Wide Science Fair (CWSF)
- Annual scholarships and awards to promote science

See www.ysf.ca



Partners in Business - Team CANDU Partnership

- Consortium of leading private sector companies with expertise in nuclear power plant design, construction, and commissioning.
- Maintains advanced expertise and experience.
- Focus on turn-key fixed price new builds.
- Team members are:
 - Babcock and Wilcox Canada
 - General Electric Canada
 - Hitachi Canada
 - SNC-Lavalin Nuclear
 - AECL



Utility Collaborations – Example: CANDU Computer Systems Engineering Centre of Excellence

- **OPG, AECL, and Bruce Power cooperate in the area of real-time systems and software standards (a “community of practice” KM initiative)**
- **Development of standards and guidelines in I&C systems development**
- **Development and delivery of specialized industry training programs in I&C area**



Collaborations and Partnerships in Research - International

- GEN IV, & bilateral US cooperation (Idaho National Lab; INERI)
- EURATOM, JRDC (Korea), NPIC (China), EPRI (US)
- Other international bilateral – China, Korea, Argentina, Russia, Japan



Collaborations and Partnerships in Research - National

- **Federal & Provincial Government, NRCan, NRC**
- **Nuclear Utilities – OPG, Bruce Power, NBP, HQ**
- **R&D labs - Kinectrics, Stern, B&W, GE, RPC**
- **CANDU suppliers and manufacturers**
- **NSERC Industrial Research**



The Canadian Nuclear Society (CNS)

- **Non-profit organization:**
 - To exchange information in the field of applied nuclear science and technology
 - To promote/provide education applied nuclear science and technology
 - To enhance professional and technical capabilities
 - professional and educational institution memberships
 - Activities: CSA Bulletin (journal), conferences, technical training courses (see www.cns-snc.ca)



Canadian Nuclear Association (CNA)

- **Non-profit organization:**
 - Represents nuclear industry in Canada
 - To promote development and growth of nuclear technologies for peaceful purposes
 - To promote political and regulatory environment to advance nuclear industry in Canada
 - To encourage cooperation between utilities, government, private sector, educational institutions, and other industry players
 - Sponsors conferences, courses, seminars, and disseminates information



Participation with Standards Bodies

- **Canadian Standards Association**
 - N290 series nuclear standards
- **International Electrotechnical Commission (IEC)**
 - Nuclear series standards
- **International Standards Organization (ISO)**
- **IAEA (safety standards/guides)**
- **others**



Summary

- **Several important KM initiatives with broad support from AECL, power utilities, industry, universities and government to...**
 - **Encourage students to study nuclear science and engineering at university**
 - **Support ongoing R&D in nuclear science and engineering at university and other research laboratories**
 - **Establish strong networks within the nuclear community**
 - **Maintain core nuclear science and engineering capability within Canada**
 - **Facilitate preservation and exchange of knowledge**