Nuclear Engineering at UNB and UNB's Centre for Nuclear Energy Research (CNER)

William Cook
Professor & Chair, Chemical Engineering
Director, Centre for Nuclear Energy Research

Canada – Romanian Partnership in Nuclear Technologies
Canada – Romania Universities Cooperation
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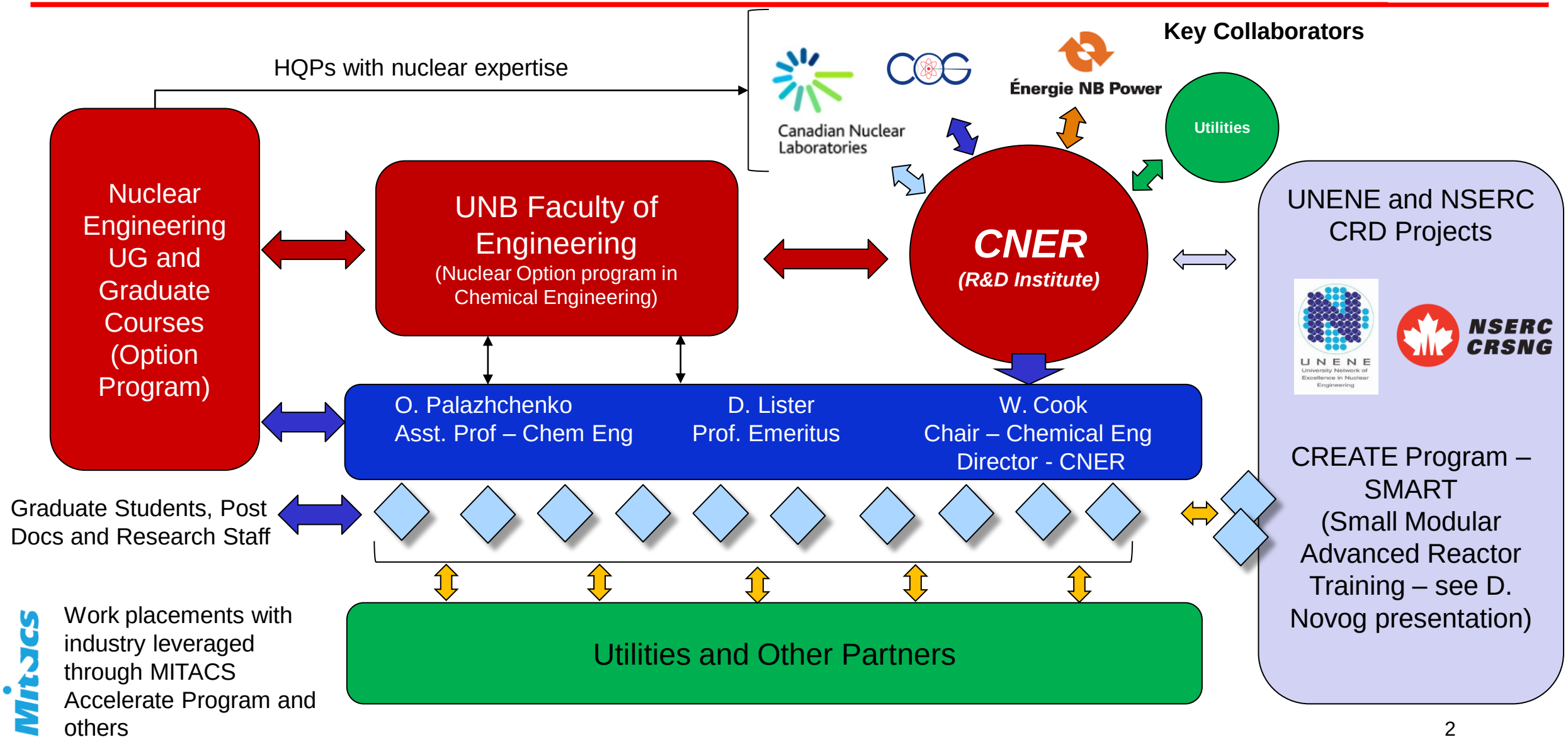
Nuclear Program Structure at UNB



Work placements with industry leveraged through MITACS Accelerate Program and others

About CNER

- CNER was established in 1991 as a technical and R&D support branch for AECL and NB Power, with support from NB Research and Productivity Council (RPC).

- Current focus areas:
  - Reactor chemistry and materials / corrosion
    - Collaborate with utilities, COG, CNL on station operational issues
    - Member of COG Chemistry and Steels WG
    - Developed online corrosion monitor for feeder pipes and feedwater systems (HEPro™)
  - SMR & advanced GenIV reactor systems
    - Molten Salt Reactors
    - Sodium Fast Reactors
    - Supercritical Water Reactors

HEPro installed at Darlington U2 for corrosion monitoring during hot-conditioning

CNER People & Projects

Academics

- **Dr. William Cook** (Director CNER & Chair Dept. of Chemical Engineering)
- **Dr. Olga Palazhchenko** (Assistant Prof.)
- **Dr. Derek Lister** (Prof. Emeritus)
- **Dr. Lihui Liu** (Senior Research Scientist)
- **Dr. Kyle Rogers** (Research Scientist)
- **Dr. Jane Ferguson** (PDF)

Visiting Researchers

- **Biyash Bhattacharya**
- **Jose Zuniga**

Technical Staff

- **Kody Belliveau** (Chemical Engineer – Engineering Projects Manager)
- **Brad McCann** (Chemical Engineer – Systems Specialist)
- **Chester Morris** (Mechanical Engineer – Safety / QA Lead)
- **Jordan Lyons** (Chemical Engineer – Special Projects)

PhD Students

- **Jirapinya Kongtuk** – Film forming substances effect on IX resins
- **Pongpat Santiwiparat** – Hydrogen diffusion in CNERs HEP system
- **John Flood** – Production and optimization of HT9 for fast reactors
- **Monishola Aransiola** – Physical property measurements of molten salts for reactor coolants and fuel

Masters Students

- **Paige Wilson** – Oxygen measurement in molten salt systems
- **Devon Stagg** – Electroreduction and pyro-processing of used CANDU fuel
- **Ben Loder** – Contaminant limits for boiler water purity
- **Eric Saulnier** – Verification of CNER's HEP corrosion monitor for feedwater systems
- **Jessica Gauthier** – Purification system impacts on FAC of CANDU outlet feeder pipes
- **Morgan MacGregor** – Diffusion coating evaluation for use in supercritical water systems

Current CNER Collaborators & Partners

Government & Funding Agencies

- NRCan - CanmetMATERIALS
- Gov. of New Brunswick
- Atlantic Canada Opportunities Agency (ACOA)
- New Brunswick Innovation Foundation (NBIF)
- Natural Sciences and Engineering Research Council (NSERC)
- University Network of Excellence in Nuclear Engineering (UNENE)
- New Brunswick Research & Productivity Council (RPC)

Industry Partners

- ARC Clean Energy Canada Inc.
- Moltex Clean Energy Canada
- NB Power
- Ontario Power Generation
- Bruce Power
- Framatome
- IAPWS
- CANDU Owners Group (COG)
- Electric Power Research Institute (EPRI)
- Canadian Nuclear Laboratories (CNL)
- Thermal Chemistry Inc. (New Zealand)
- Swan Analytical Instruments Inc. (Switzerland)

CNER & UNB Capabilities and Facilities

- 8 high temperature / pressure water loops:
  - Simulates water-reactor systems
- Molten salt lab
  - Glovebox facilities for salt preparation and quantification
  - Thermal and physical property measurements
  - Corrosion assessment
- Sodium lab and flow loop
  - in planning stages
- Chemical Engineering Machine and Fabrication Shops

- Full suite of surface analysis and analytical chemistry capabilities available at UNB:
  - SEM, EDS, FIB, TEM, Raman
  - ICP-OES and MS (w/ laser ablation), XRF
  - IC, GC, HPLC
  - TGA / DSC
  - Etc …