

# UNENE and Nuclear Human Resource Development in Canada

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## Background

There are currently 17 operating nuclear power plants in Canada, which provide 16% of Canada's electricity, and more than 50% of the electricity of the province of Ontario. With the phase-out of coal plants in Ontario, electricity forecasts show a significant supply gap opening up around 2015<sup>1</sup>, and as a result Ontario has decided to include new nuclear power plants in its planning, as well as life-extension of 10 existing nuclear plants. As a result Ontario Power Generation (OPG) expects to hire hundreds of new nuclear engineers; over the next few years 40-50% of their experienced nuclear engineers will retire<sup>2</sup>. Timely supply of the new graduates and their mentors is clearly a significant challenge.

## UNENE

UNENE (University Network of Excellence in Nuclear Engineering) is uniquely placed to contribute to Human Resource Development (HRD) needs. UNENE is an alliance of universities, nuclear power utilities, design and research organizations and regulatory agencies for the support and development of nuclear education and R&D in Canadian universities. UNENE was established as a not-for-profit corporation by the Government of Canada on July 22, 2002. The main HRD purpose of UNENE is to assure a sustainable supply of qualified nuclear engineers and scientists to meet the current and future needs of the nuclear industry through university education. It does this through programmes that:

- Upgrade the education of staff working in the nuclear industry
- Develop and supply highly-qualified graduates
- Support nuclear research, and
- Create respected university-based experts for consultation by industry and the public.

UNENE members include Atomic Energy of Canada Limited (AECL<sup>3</sup> - the designer of CANDU); the two nuclear utilities in Ontario (Ontario Power Generation (OPG) and Bruce Power); three additional nuclear companies; the Canadian regulator (Canadian Nuclear Safety Commission); and 12 Canadian universities – the detail is shown below:

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<sup>1</sup> Atomic Energy of Canada Limited, "Maintaining Flexibility: Ontario's Electricity Supply Gap and Implications for the Supply Mix" report for Ontario Power Authority's Call for Submissions in Response to the Minister's Request for Advice on the Electricity Supply Mix; August 25, 2005.

<sup>2</sup> Talk by Pierre Charlebois, Chief Operating Officer, OPG Hosted Dinner for World Nuclear University Summer Institute, Toronto, Ontario; July 21, 2008.

<sup>3</sup> CANDU Energy is now responsible for the CANDU design

| Industry                                     | Universities                                  |
|--|---|
| Atomic Energy of Canada Limited <sup>4</sup> | McMaster University                           |
| Bruce Power                                  | Queen's University                            |
| Canadian Nuclear Safety Commission           | University of Ontario Institute of Technology |
| CANDU Owners Group                           | University of Saskatchewan                    |
| Ontario Power Generation                     | University of Toronto                         |
| CAMECO                                       | University of Waterloo                        |
| AMEC / Nuclear Safety Solutions              | University of Western Ontario                 |
|  | Ecole Polytechnique de Montréal               |
|  | University of New Brunswick                   |
|  | Royal Military College                        |
|  | University of Guelph                          |
|  | University of Windsor                         |

## UNENE Activities

In line with the four programme objectives, UNENE undertakes three major activities:

1. UNENE funds **Industrial Research Chairs (IRC)**<sup>5</sup> in nuclear-related subjects at 7 universities (McMaster, Queen's, Toronto, Waterloo, Western Ontario, University of Ontario Institute of Technology, Royal Military College). These chairs are held by world-class scientists who have considerable industrial experience and are well respected in the industry. The IRCs become anchors for establishing research programs and competent research teams within the respective universities. Industry funding of the IRC programs has also served to leverage additional funds from federal (Natural Resources Canada) and provincial research grants, thus widening the scope and size of these programmes – which have allocated \$50M (Canadian) to date. Over a hundred Highly Qualified Personnel (HQP) – Ph.D., Post-Doctoral Fellow, M.Sc. – have been produced, with most of them successfully recruited within the industry, research institutions, government and universities.

The IRCs and their disciplines to date are:

- McMaster University: Safety and Thermalhydraulics
- Queen's University: Material Sciences
- University of Toronto: Corrosion Control and Materials Performance
- University of Waterloo: Risk and Reliability
- University of Western Ontario (UWO): Instrumentation, Control, and Electrical
- Royal Military College (RMC): Fuel Technology
- University of Ontario Institute of Technology (UOIT): Health Physics and Environmental Safety

Most of these programs focus on R&D in areas of key interest to the industry, such as: safety analysis methodologies, phenomena and analytical codes; fuel channel material sciences; corrosion chemistry in nuclear materials; and probabilistic and risk modelling in support of Life Cycle Management in current plants.

<sup>4</sup> CANDU Energy is now responsible for the CANDU design

<sup>5</sup> B.A. Shalaby, V.G. Snell and B. Rouben, "UNENE: An Update on Nuclear Education and Research", CNS 31<sup>st</sup> Annual Conference; May 24-27, 2010; Montréal.

