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## **Brief on UNENE**

(Focussing on the Master's of Engineering aspect)

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### **What is UNENE?**

- The University Network of Excellence in Nuclear Engineering (UNENE) is an alliance of universities, nuclear power utilities, research 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 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.
- In short UNENE:
  - Upgrades the education of staff working in the nuclear industry
  - Develops and supplies highly-qualified graduates
  - Supports nuclear research
  - Creates respected university-based experts

### **Main Activities**

- Funds Industrial Research Chairs (IRC) in nuclear-related subjects at 7 universities
  - McMaster, Queen's, Toronto, Waterloo, Western Ontario, University of Ontario Institute of Technology, Royal Military College
- Funds collaborative nuclear R&D (CRD) projects at universities
  - Currently Queen's, Guelph, McMaster, Toronto, Western
  - The IRCs and the CRDs are a source of both highly qualified graduate students and independent and unbiased experts (the professors)
- Runs a course-based Master's of Engineering programme aimed at people already working in the nuclear industry. This last item is the main subject of this brief.

## Members

Industry	Universities
Atomic Energy of Canada Limited	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

## Funding

- UNENE receives about M\$1.5 per year, largely from OPG, AECL, and BP, with lesser amounts from CNSC and NSS
- Almost all of the money goes toward the Research Chairs and the collaborative R&D projects; NSERC provides matching funds
- The Master's of Engineering programme is more or less break-even as far as UNENE is concerned (student fees cover the costs). However the employer typically reimburses the student's fees

## UNENE Master's of Engineering

- The UNENE M.Eng. is a joint programme, course-based, consisting of 10 courses, or 8 courses plus a project. 3 of the 10 courses can be Business Courses from Advanced Design and Manufacturing Institute (ADMI).
- It is accredited by the Ontario Council of Graduate Studies. The courses are graduate level in content & expectations. The courses are offered by McMaster, Waterloo, Western and Queen's. UOIT has also applied to OCGS.
- **The whole programme is geared to the working professional.** Each course is given on four alternate weekends, and requires a time commitment of about 40 hours contact time plus 100 hours homework. Students are formally evaluated via assignments, tests and exams and their marks become part of their university academic record. The M.Eng. is *not* like industry training – it is university education at the graduate level
- The courses span most of the *specific* science and engineering used in nuclear power:
  - **UN0802: Nuclear reactor analysis**
  - **UN0801: Nuclear plant systems and operations**

- **UN0804: Nuclear reactor heat transport system design**
  - **UN0803: Nuclear reactor safety design**
  - UN0603: Project management for nuclear engineering
  - UN0901: Nuclear materials
  - UN0805: Radiation health risks and benefits
  - UN0702: Power plant thermodynamics
  - UN0701: Engineering risk and reliability
  - UN0601: Control, instrumentation and electrical systems in CANDU
  - UN1001: Reactor chemistry and corrosion
  - UN0902: Fuel management
  - UN0602: Nuclear fuel waste management
  - UN0xxx: Nuclear Fuel Engineering (proposed for 2011)
- The courses in **bold** are compulsory for all students.

- Most of the UNENE course material is available via the UNENE web site.
- Students need a B average in their undergraduate programme to get in, and a B- in each course to pass. Typically students finish the M.Eng. in 3 or 4 years.
- Courses are delivered “live” in Whitby, due to the proximity to the OPG plants, and simultaneously using synchronous distance education technology. This makes it much easier for remote students to participate in the M.Eng.

### **Benefits to Students**

- Almost all graduates have told us how much their horizons have been broadened, and that they now better understand the context of the job they are doing.
- Many students view a UNENE M.Eng. as preparation for their *next* job with their company – i.e., it makes them better candidates for internal postings.
- OPG explicitly recognizes the benefit of the UNENE M.Eng. in its job postings, especially for Shift Supervisors.

### **Benefits to Employers**

- The UNENE graduates become natural mentors for more junior employees.
- Their work will be higher quality because they know disciplines outside their own area, and can understand how their work is used.
- The employer has greater flexibility in placing UNENE graduates because of their broader knowledge. In the longer term they become good candidates for promotion.
- The graduates have already demonstrated capability for hard work, self-discipline, learning and self-motivation.

### **Cost**

- Each UNENE course costs \$2,500, so the total investment for an M.Eng. is \$25,000 plus incidental university fees. Typically the employer will pay the cost on a per-course basis (over 3 to 4 years), as long as the student passes all his/her courses.

## **Usage**

- As of October 2010 there was an “active” enrolment (existing + accepted – inactive – graduated) of 68 students, almost all working in the industry; and there have been 44 graduates

## **Participation by Companies outside Canada**

The use of distance education technology makes it possible for countries outside of Canada to participate in the UNENE M.Eng., both in terms of enrolling students in the courses or delivering qualified courses to all UNENE students.

## **Conclusion**

- UNENE is well-placed to supply Highly-Qualified Personnel to the industry and has the capability for expansion of the current programme to meet industry needs.
- The use of distance education technology opens the door to participation by companies outside of Canada.

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