

U N E N E

University Network of
Excellence in Nuclear
Engineering

UNENE – Industry-University Collaboration

Dr. V.G. Snell

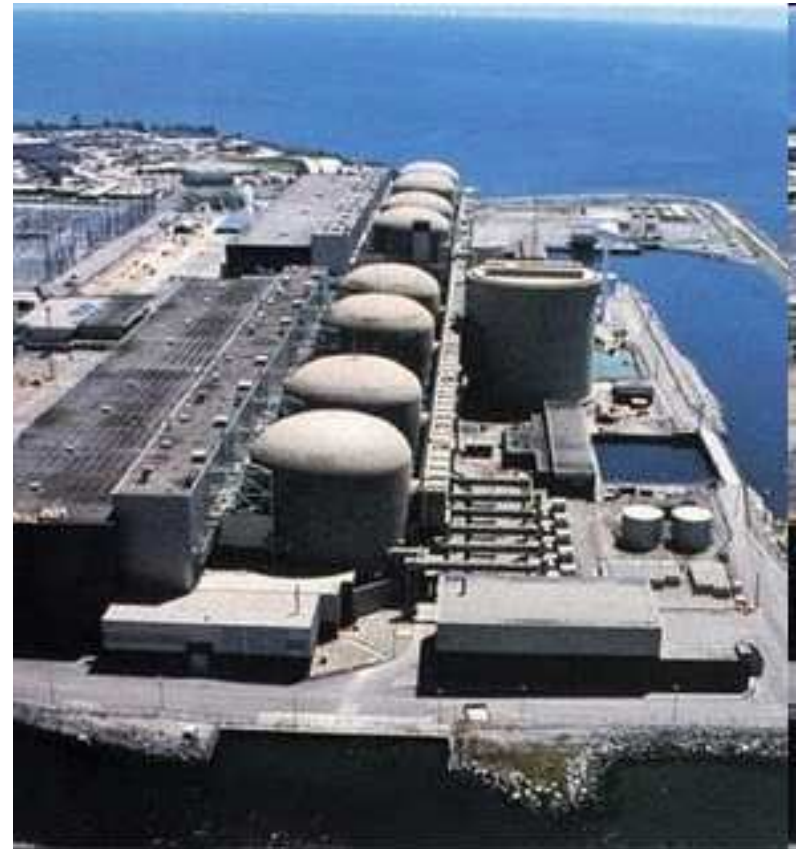
Program Director, UNENE

Presented on behalf of B.A. Shalaby, UNENE President



Nuclear Energy in Canada

- 19 operating nuclear power plants
- 62% of the electricity of province of Ontario
- 16% of Canada's electricity (21 NPPs)
- Refurbishment of 10 CANDU plants starting from 2016
- Retirement of experienced nuclear engineers
- Knowledge preservation of design and licensing basis of current plants





Nuclear Energy Research in Canada

- Fundamental research mostly funded by federal government
- Applied research mostly funded by industry
- Small independent research programme funded by nuclear regulator
- Performed by major laboratories (e.g. Chalk River) and Universities



What is UNENE?

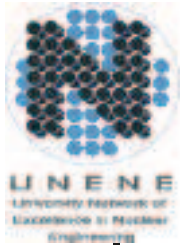
- University Network of Excellence in Nuclear Engineering
- Established 2002
- An industry-university partnership which:
 - Supplies highly-qualified graduates
 - Supports nuclear research
 - Creates respected university-based experts





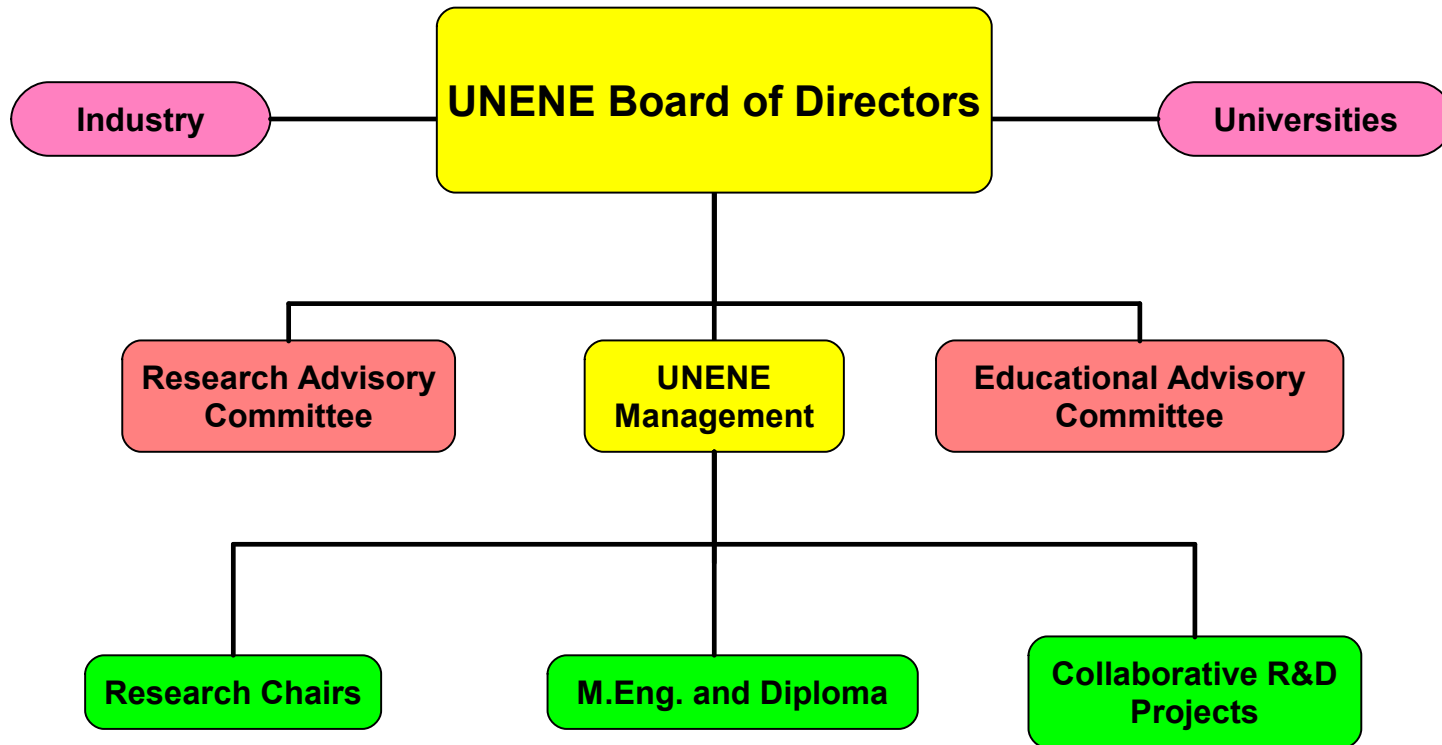
Members

- Canadian Nuclear Laboratories (Chalk River)
- Bruce Power
- Ontario Power Generation
- Canadian Nuclear Safety Commission
- CANDU Owners Group
- AMEC-NSS
- Nuclear Waste Management Organization
- SNC-Lavalin-Nuclear
- McMaster University
- Queen's University
- University of Ontario Institute of Technology
- University of Saskatchewan
- University of Toronto
- University of Waterloo
- Western University
- Ecole Polytechnique
- University of New Brunswick
- Royal Military College
- University of Guelph
- University of Windsor



Organization

UNENE Organization





Research Chairs

- Anchors for establishing strong research teams in key nuclear technology areas
- ~\$200,000 / year per chair
 - UNENE / Government of Canada cost share
- Current chairs:
 - McMaster – Safety / Thermohydraulics
 - Queen's – Nuclear Materials
 - Toronto – Corrosion of Alloys
 - Waterloo – Risk & Reliability
 - Western – I&C, Electrical
 - UOIT – Health Physics



Collaborative Research and Development Grants

- Small focussed projects
 - ~\$36,000 / year for 3 years
- Examples:
 - Waterloo – seismic risk analysis
 - McMaster – sub-channel mixing
 - Guelph – D₂O chemistry
 - Western – stress-corrosion cracking in Alloy 800
 - UOIT – non-destructive testing sensors (feeders)
 - Ottawa – thermohydraulics
 - Queen's – channel spacers - radiation ageing



Reactor Materials Testing Facility (Tandem Accelerator) – Queen's



04/06/2015

UNENE – Industry-University
Collaboration.ppt



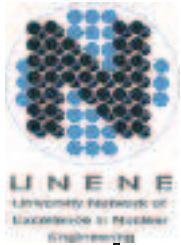
New Hot Cells (McMaster)



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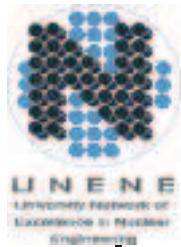
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Industry Staff Enhancement

1. UNENE Master's of Engineering
2. UNENE diploma
3. Advanced Professional Development



1. UNENE M.Eng.



- Course based:
 - 10 courses OR
 - 8 courses plus a project
- Accredited by Ontario Council of Graduate Studies
 - Courses are graduate level in content & expectations
- Offered by McMaster, Waterloo, UOIT, Western and Queen's
- Geared to the working professional
 - Topics are relevant to work
 - Weekend scheduling recognizes students have a day job
 - Distance Learning for remote students
 - In real time; also recorded for later review
 - **Free!** discipline refreshers before key topics
 - Typically students finish in 2 – 4 years while working full-time



Courses

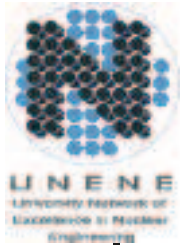
- UN0802: Nuclear Reactor Physics [McMaster]
- UN0803: Nuclear Reactor Safety Design [McMaster]
- UN0804: Nuclear Reactor Heat Transport System Design [McMaster]
- UN0502: Nuclear Plant Systems and Operations [UOIT]
- UN0501: Nuclear Fuel Management of the Reactor Core [UOIT]
- UN0601: Control, Instrumentation and Electrical Systems in CANDU based Power Plants [Western]
- UN0602: Nuclear Fuel Waste Management [Western]
- UN0603: Project Management for Nuclear Engineering [Western]
- UN0701: Engineering Risk and Reliability [Waterloo]
- UN0805: Introduction to Operational Health Physics [McMaster]
- UN0806: Nuclear Fuel Engineering [McMaster]
- UN0807: Power Plant Thermodynamics [McMaster]
- UN0808: Reactor Chemistry and Corrosion [McMaster]
- UN0901: Nuclear Materials [Queen's]



Four core courses

Coming soon:

UN0503 - Nuclear Energy in Society: Regulation and Our Energy Future



2. The UNENE Diploma

- Four courses instead of ten
- Identical to the M.Eng. courses
- Can finish the diploma in 1 to 2 years while working full-time



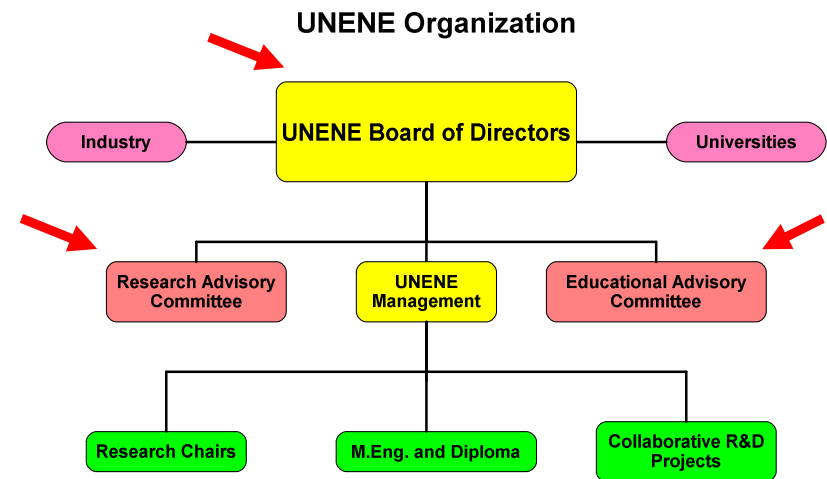
3. Advanced Professional Development

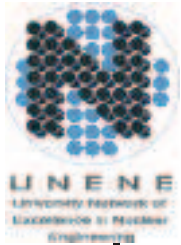
- UNENE offers in-house professional development courses
- Choice of any of the topics given in the University programmes
- Customized to meet Systematic Approach to Training



Means for Industry Input

- Industry funding for research matched by Government of Canada
- Industry representation on UNENE Board and Committees (→)
- Technical Advisory Committees
- Annual UNENE R&D workshop
- CANDU Owner's Group
- Changes at Chalk River
 - Transitioning to GoCo
 - National Laboratory role
 - Collaboration with Universities





Summary

- UNENE: Industry-University partnership
- Research – Industry funds University Chairs and small projects
- Leveraging – Federal government matches industry R&D funds
- Education – M.Eng. and diploma for full-time industry employees



For More Information

- UNENE web site: <https://unene.ca/>
- Questions?
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