



Evaluating Cables Retrieved from Decommissioned Nuclear Power Plants



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Outline

- Who we are:
 - Canadian Nuclear Safety Commission (CNSC)
- Cable research projects
 - ✓ CNSC sponsored cable projects
 - ✓ other cable projects
 - ✓ status
 - ✓ cable research project results
- Concluding remarks

Canadian Nuclear Safety Commission: Canada's Nuclear Regulator for over 70 years



- The Canadian Nuclear Safety Commission (CNSC):
 - ✓ established in May 2000 under the *Nuclear Safety Control Act* (NSCA)
 - ✓ replaced the Atomic Energy Control Board, which was established in 1946 under the *Atomic Energy Control Act*
- The CNSC's mission is to:
 - ✓ regulate the use of nuclear energy and materials to protect **health, safety, security** and the **environment**
 - ✓ implement Canada's **international commitments** on the peaceful use of nuclear energy
 - ✓ disseminate **objective scientific, technical and regulatory information** to the public



Cable Research Projects

- CNSC sponsored cable projects:
 - ✓ Cable insulation degradation of the 20 MW nuclear power demonstration plant
 - ✓ Ageing management of cable in nuclear generating stations
 - ✓ Analysis of degradation mechanisms of cable insulation due to aging in a decommissioned nuclear power plant



Cable Research Projects (Cont'd)

- Other cable projects:
 - ✓ Aging of electrical cables - environmental stressors and condition assessment studies (by CNL/AECL);
 - ✓ With the possible closure of six nuclear reactors in 2024, there is high likelihood to initiate another cable project (to be sponsored by CNSC).

Status of Cable Research Projects

- Cable insulation degradation of the 20 MW nuclear power demonstration plant (NPD)
 - ✓ Objective: assess degradation of NPD cables and to determine the functional capability of naturally-aged and further accelerated-aged cable samples under LOCA and post-LOCA conditions
 - ✓ Status: completed in 1991
- Aging management of cable in nuclear generating stations
 - ✓ Objective: provide the background and technical basis supporting regulatory guidance, consistent with the requirements of CNSC regulatory document, REGDOC-2.6.3, “Aging Management”, pertaining to the recommended core elements of a cable ageing management program in Canadian NPPs
 - ✓ Status: completed in 2012

Status of Cable Research Projects (Cont'd)

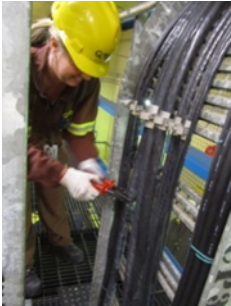
- Analysis of degradation mechanisms of cable insulation due to aging in a decommissioned nuclear power plant
 - ✓ Objective: assess the degradation of sample cable insulations retrieved from the permanently shut-down nuclear reactor, at Gentilly-2 NPP;
 - ✓ Status: Completed in June 2018
- Aging of electrical cables - environmental stressors and condition assessment studies
 - ✓ Objective: use retrieved cable samples from NPPs and nuclear facilities to assess the validity of the original environmental qualification of cables
 - ✓ Status: expected to be completed in March 2022.



Cable Research Project Results

➤ Recent results :

- ✓ The activation energy used for a majority of cable samples was appropriate. Thus, in agreement with EQ process, except one of these samples
- ✓ The insulation cable with formulation PVC 33A was found to be at or passed the end-of-life criterion, except cable samples with the formulations PVC100, 91, 11 & XXE
- ✓ The majority of XLPE cable samples have demonstrated to have a remaining service life of over 60 years, except for two XLPE cable samples



CNSC Regulatory Requirements

- REGDOC 2.5.2: Design of Reactor Facilities: Nuclear Power Plants
- REGDOC 2.6.2: Maintenance Program for Nuclear Power Plants
- REGDOC 2.6.3: Aging Management
- CSA N286-12: Management System Requirements for Nuclear Power Plants
- CSA N290.13-05: Environmental Qualification of Equipment for Nuclear Power Plants

Concluding Remarks

- Cables are of key importance to the safe and reliable operation of NPPs due to their widespread use as a connection medium with many systems important to safety
- The decommissioned NPPs provide an opportunity for the nuclear industry and the regulatory body to verify, validate and/or confirm the assumptions used as the basis of current qualification for cables
- This might later evolve into improvements of the current qualification approach for cables important to safety within NPPs





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