Overview of Framatome ANP Activities at I&C and Electrical Systems

Dirk C. Hopp
Electrical Engineer Masters Degree
Framatome ANP – NGLE Ref. 2
Overview
AREVA-Group
and Department NGLE
Organization of AREVA

Front End Division
- Mining
- Chemistry
- Enrichment
- Fuel

Reactors & Services Division
- Reactors
- Equipment
- Nuclear Services
- Nuclear Measurement
- Consulting and Information Systems
- Mechanical Systems
- Technicatome

Back End Division
- Treatment
- Recycling
- Logistics
- Engineering
- Cleanup

Transmission & Distribution Division
- Products
- Projects & Systems
- Services

Connectors Division
- Communications Data Consumer
- Automotive
- Electrical Power Interconnect
- Microconnections

COGEMA
FRAMATOME ANP
FRAMATOME ANP
COGEMA
AREVA T&D
FCI
NGLE – Electrical Systems

NGL Kraft
Safety I&C, Electrical Systems

NGLE Dr. P. Weber
Electrical Systems

NGLEE Hauser
Electrical Systems, Erlangen

NGLEO Kunkel
Electrical Systems, Offenbach

NGLEA Metze
Cable routing / Software-Tools

NGLE Ref. 1 Stinshoff
Special Tasks (NPP Kozloduy 5/6)

NGLE Ref. 2 Warnken
Qualification of I&C and Electrical Components, Lifetime Management

OL3 Sobott
Electrical Systems
Activities
NGLE Ref. 2
Activities NGLE Ref. 2 Overview

> Ageing Management

> Life Time Management and Life Time Extension

> Basic Principles and Performance of LOCA Qualification

> Basic Principles and Performance of Seismic Qualification

> On-going Qualification of LOCA Qualified Equipment

> Basic Principles of Software Qualification for field devices

> Continuous Support of German NPP Customers in the Field of Spare Parts Obsolescence
Activities NGLE Ref. 2
Ageing

> Analyzing the qualification documents (if there are any), looking for “qualified life time” values (temperature and radiation) and

■ Activation energies (according to Arrhenius Law)

■ Dose rate effects

> Measurement of operational thermal and radiation loads for relevant locations (in parallel to cables)

> Deriving remaining qualified life time corresponding to the local operating condition
Activities NGLE Ref. 2
Lifetime Extension 1/3, Cables

> Determination of sensitivity against temperature and radiation primarily based on experimental results, determining
  ■ Activation energies (according to Arrhenius Law)
  ■ Dose rate effects

> Measurement of operational thermal and radiation loads for relevant locations

> Deriving life time prediction values by comparing / analyzing the results achieved
Activities NGLE Ref. 2
Lifetime Extension 2/3, Cables
Activities NGLE Ref. 2
Lifetime Extension 3/3, Cables

Materials tested
- SIR Silicon Rubber
- ETFE Ethylen Tetrafluor-ethylen
- XLPE Cross linked Polyethylen
- EVA Ethylen Vinyl Acetat
- EPR Ethylen Propylen Rubber

The graph shows the relationship between dose rate (Gy/h) and lifetime (years) at a 50% confidence level (e = 50%).
Activities NGLE Ref. 2
On-going Qualification

Check of LOCA parameters of a used 1.1 MW motor under laboratory conditions
Activities NGLE Ref. 2

Basic Principles and Performance of LOCA & Seismic Qualification

> Define test requirements derived from national and international standards by reading between the lines

> Specifying and performing tailored tests deriving test objectives from the basic safety function of the sample to be qualified

> Member of respective national and international standardization bodies
  - IAEA
  - IEC
  - KTA

> Support and performance of the conceptual design for NPP OL3 in Finland (formerly known as Finland 5)
Activities NGLE Ref. 2

Basic Principles of Software Qualification for field devices

- Development of basic requirements for Software Qualification of software-based field devices
- Similarly activities for the project OL3 in Finland together with the customer TVO and the finish authority STUK
- Currently we qualify the digital protection device 7SJ62 from Siemens PTD PA, Berlin. Scope:
  - Clarification of the used functions and safety importance
  - Hardware analysis
  - Extended process and product audit to check the development process of the used software (reviewed by German Assessors)
  - Inspection of the source code (together with German Assessors)
  - Integral test of the device for the used functions (with the insight of the source code)
On behalf of the German utilities we are responsible for maintaining product qualification of electrical components for German NPP’s. Therefore we consult the committee “Qualification of I&C and Electrical Components” of the German utilities (organized in the VGB). We perform process and product audits of manufacturers of safety important components to ensure the equality of current manufactured components to the formerly qualified components. Furthermore we are responsible for the availability of valid qualification certificates of safety important components for German NPP’s.