Course 1: Introduction to European Utility Requirements

Guillaume JACQUART - EUR Chairman (EDF)

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OUTLINE

- EUR organisation
- EUR objectives
- EUR products:
  - EUR product#1: EUR Document
  - EUR product#2: EUR Standard Design Assessments
- EUR 2016-2018 Roadmap and challenges
THE EUR ORGANISATION

- 14 European Utilities
- Founded in 1991
- Technical specifications for GEN III LWR Nuclear Power Plant
- Assessments of designs against these specifications
- First EUR document: 1994

Public Website: www.europeanutilityrequirements.org

The EUR Fundamentals

- Nuclear energy combined with renewable energy sources is the optimal choice to ensure that sustainable development goals are met (i.e. to reduce greenhouse gas emissions, to provide affordable prices for electricity and to ensure security of supply)

- This has to be supported by an unambiguous demonstration to the citizens of Europe that the nuclear industry is safe, competitive and presents no harm to environment and neighbouring population under any foreseeable circumstance.

- EUR specifications are developed to assure those expectations are met for new LWR to be built in Europe
The EUR Objectives

Harmonised Specifications Document for new LWR in Europe allowing Standard Designs to be proposed over a wide area

- Benefits to the safety
  - High safety objectives: shared by utilities in line with European citizens' expectations
- Reduces licensing risks
  - Safety harmonization: within Europe (vs WENRA) and Worldwide (vs IAEA SSR 2/1)
  - Seek for an improved acceptance of European Regulators
- Increases plant competitiveness
  - Standard EU Designs: cost development can be spread over a larger number of plants
  - Promoting cost-effective design features (constructability, operation performance, ...)
  - Establishing conditions for a fair competition between the vendors

The EUR main Stakeholders

- Nuclear Industry
- Regulators/Gov.
- IAEA
- MDEP
- OECD/NEA/CSNI
- European Commission
- ENSREG
- WENRA
- VENDORS
- ENISS
- EPRI/URD
- WNA/CORDEL
- Gen 3 LWR’s

04/10/2017
The EUR Organisation

EUR Steering Committee:
- EUR Chairman: G. Jacquart
- + 1 representative per utility
- EUR SC secretary: G. Ferraro

EUR AG (Administration Group):
- EUR AG chairman: G. Ferraro
- + 1 representative per utility
- EUR AG secretary: M. Jannin

EUR revision E project
- 1 project manager
- 1 Technical Coordination Group
- 10 Topical Working Group*
  *Utilities experts

Design assessment projects
- (2 in progress)
  For each standard design assessment:
  - 1 assessment project manager
  - at least 2 sponsors and 2 supporters utilities
  - (15000h/assessment in 2 years)

EUR Secretariat:
- M. Jannin
- G. Ferraro

EUR Product #1: The EUR document

- A generic GEN 3 LWR specification written by investors & operators
  - Wide experience basis (14 operators in Europe)
  - Not a regulatory document
- Open
  - Design objectives and functional requirements
  - Fits all the designs of interest to the European utilities
  - Modular structure, versatile, easy to adapt
- Neutral
  - Does not favor any specific design
  - Seldom forbids, only if there is a bad operation experience or an unacceptable industrial risk
- Benchmarked
  - Other industrial specifications (EPRI-URD), regulatory documents, international design guides
  - Real Gen 3 designs assessed feedback (standard designs from 5 different vendors assessed against rev C and Rev D)
EUR Product #1: The EUR document added value

- Built on most up-to-date international standards
  - WENRA positions for new NPP designs (March 2013) and WENRA Safety Reference Levels for existing reactors (Sept 2014)
  - IAEA SSR 2/1, IAEA SSG-30, SSG-3 and SSG-4
  - New ENTSO-E Grid Code
  - IEC standards (61513, 60880, 62138, 61226) ...

- Structure appropriate for use in a call for bid

- Set precise requirements to fulfill the high level objectives of WENRA or IAEA
  - Levels of standard plant design and extreme hazards
  - Numerical values for CLI corresponding to general O2 and O3 WENRA objectives
  - ...

- Give clear guidance for a designer on what is expected

- Goes beyond safety requirements (performance, cost, environment, ...)

EUR Product #1: The EUR document

Applications of EUR to specific Gen3 LWRs designs

Volume 1
Main Objectives & Policies

Volume 2
Generic & Nuclear Island requirements

Volume 3
Specific Power Generation Plant requirements

Revision A: Mar. 1994
Revision B: Nov. 1995
Revision C: Apr. 2001

Revision A: Nov. 1996
Revision B: Mar. 2000
Revision C: Nov. 2007
EUR Product #1 : Structure of Volumes 1, 2 & 4

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<td>2.12</td>
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<td>Decommissioning</td>
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Volume 1: Main Policies and Objectives

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<td>App B</td>
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About 4500 requirements

EUR Product #2 : Assessment of standard designs

- **Assessment Project work produces a Volume 3 per standard design**
  - Analyses of compliance (AoC) of the selected LWR new design against the EUR generic requirements
  - Project lead by one of the EUR members utility and run by experts of several EUR members interested by the assessed standard design (at least 4 utilities).

- **Analyses are done at detail level and reviewed by the EUR Organisation :**
  - Each of the 4500 requirements (shall, should) of the EUR volume 2 analysed by EUR utilities' engineers from information supplied by the vendors
  - Standard scale of compliance for all the projects, rationales & references
  - Reviews at 3 different levels: CG (project Coordination Group) ; AG (EUR Administration Group); SC (EUR Steering Committee) for final approval
  - Cross-checking between the different assessments
  - Several man. years for each design assessment

- **Detailed analyses are not published :**
  - Work is done under Non Disclosure Agreements and stays proprietary
  - Only the main deviations are highlighted in the published part as well as the main "compliance with objectives"
EUR Product #2: Assessment of standard designs

- **Standard Scale of Compliance**

<table>
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<tr>
<th>Compliance assessment labels</th>
<th>Meanings</th>
<th>Acronyms</th>
</tr>
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<tr>
<td>compliance</td>
<td>the design meets the requirement or goes beyond it</td>
<td>COM</td>
</tr>
<tr>
<td>compliance with objectives only</td>
<td>the design is supposed to achieve the objective of the requirement, but: A) a different approach from the EUR one is used to achieve the same objectives, or B) the approach is not yet sufficiently defined for a COM, but there is a fair expectation based on provided information and experiences that the Vendor will fulfil the requirement in the later phase of the design</td>
<td>CWO</td>
</tr>
<tr>
<td>non compliance</td>
<td>the design does not meet the requirement</td>
<td>NOC</td>
</tr>
<tr>
<td>not applicable</td>
<td>the requirement is not applicable to the technology.</td>
<td>NAP</td>
</tr>
<tr>
<td>not assessable now</td>
<td>the assessment cannot be made because of the stage of the design</td>
<td>NAN</td>
</tr>
<tr>
<td>Project, Owner or Site specific</td>
<td>the assessment cannot be made because the requirement is project, owner or site specific</td>
<td>POS</td>
</tr>
<tr>
<td>not applicable</td>
<td>the requirement is not applicable to the technology.</td>
<td>NAP</td>
</tr>
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**EUR Product #2: Assessment of standard designs**

- **Assessment process planning:**
  - 4 phases with 5 milestones needing EUR organisation decision (Steering Committee)
  - 2 years duration process after T0 = decision to start the assessment

- **Main pre-requisites to launch an assessment:**
  - Design must be frozen and well documented in English (at least PSAR)
  - Pre-assessment against “53 key issues” (~ 190 major EUR requirements)
  - Vendor and Utilities resources must be available: about 10 man. years for one design assessment; at least 4 utilities must participate (2 “sponsors” and 2 “supporters”)

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**Assessment process planning diagram:**

- Application received
- Decision to start the project
- T0: Decision to start Assessment Phase
- T0 + 18 months: Assessment completed
- T0 + 26 months: Vol 3 issued

**Preparation phase:**
- Vendor ability verified
- EUR utilities ability verified
- Key issues requirements self-assessment report and Technical Plan Description issued by the Vendor
- Design meets Key issues requirements (verified by EUR organisation)

**Assessment phase:**
- Full Vol 2 requirements self-assessment sheets & Detailed Design Description issued by the vendor
- Project Manual approved
- Start-up seminar organized
- Final Study approved
- Analysis of Compliance (AoC) and Synthesis reports for each Vol 2 chapter issued by involved EUR utilities experts
- AoC and Synthesis reports reviewed and approved by EUR organisation (CC, AU & SCI)

**Finalisation phase:**
- Vol 3 preparation (preliminary Chap. 5. Plant description) written by the Vendor
- Chap. 2 “Highlights of the Compliance Analysis” written by EUR
- Vol 3 distilling and distribution
### EUR Product #2: Assessment of standard designs

- **5 designs assessed before 2001 against rev B**
- **3 designs assessed against rev C (AP 1000, VVER AES 92, EPR rev B)**
- **1 design assessed against rev D (EU APWR) – October 2014**

#### AP 1000
- 1000 MWe
- 2-SG PWR with passive safety features
- Westinghouse & Ansaldo
- May 2007

#### VVER AES 92
- 1000 MWe
- 4-SG PWR with passive safety features
- AES Moscow, GP, KI
- Dec 2007

#### EPR rev B
- 1800 MWe
- 4-SG evolutionary PWR
- Avara
- July 2009

#### EU-APWR
- 1700 MWe
- 4-SG evolutionary PWR
- EU
- Oct 2014

### On going Assessments on Rev D

- **Two standard design assessments are under progress**
EUR Organisation challenges for the next years
Roadmap 2016 – 2018

Main challenges for the period 2016-2018:

- Keep a strong interaction with other important stakeholders in Europe and worldwide (ENISS, CORDEL, IAEA, WENRA, OECD...)
- Promote the use of EUR Rev E widely (communication, training courses,...) (2017-2018)
- Complete the 2 current design assessments against Rev D (EU-APR: Nov. 2017 ; VVER TOI: mid 2018)
- Plan and lead the next design assessments against Rev E
- Initiate position papers for the next Revision (with opportunity study of including SMR requirements)

Thank You for your attention!