

Harmonisation of Licensing Processes

&

European Utility Requirements



Bart Henstra (NRG)
9 June 2022

Keywords: Harmonisation, Standard Design, Licensing, EUR, SMR



Nuclear. For life.

Bio



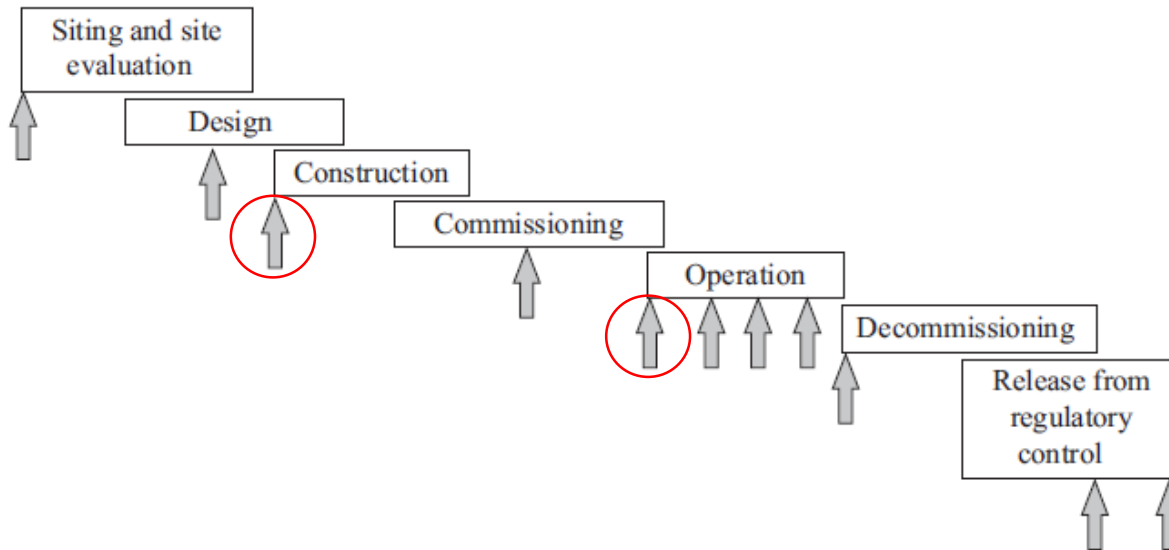
Bart Henstra graduated as a Chemical Engineer at the Delft University of Technology and started his working career in the field of industrial crystallization technology. Since 2006 he is working at NRG Arnhem as a Consultant Nuclear Safety & Licensing and is participating in/managing several nuclear (power plant) projects. Besides working in nuclear projects, he trains operators in heat transfer phenomena.

Since 2008 Bart represents NRG, along with Joost van den Broek, within the European Utility Requirements Organisation.

At the Nuclear Innovation Conference, Bart will act as a speaker. He looks forward to the findings of the conference and possible formulations/consensus how to continue with nuclear activities.

Licensing of Nuclear Projects

- Licensing is: **complex, time consuming, expensive**
- Due to production of **many documents** and the **interpretation** and **acceptance** of it
- 7 Main stages can be distinguished (incl. possible regulatory 'hold points')



Example of Documents to be submitted...

1. A descriptive construction report
2. References to and benchmarks against other relevant nuclear installations
3. A draft plan for the project
- 4. A site evaluation report**
5. Environmental impact assessment
6. Public inquiry strategy plans
7. Management and organization of the design and construction project
8. Acquisition program
9. The strategic plan for the licensing process
- 10. Preliminary safety analysis report**
11. Plans relating to the operating organization and its management system for all licensing steps
12. Technical design documents
13. Physical protection plans
14. Fire protection plans
15. Plans for accounting for and control of nuclear material
16. Training and qualification plans for operations personnel
17. Proof of trustworthiness
18. Commissioning program
- 19. Final safety analysis report**
20. Ageing management plans
21. General operating rules
22. Technical specifications
23. A plan for collecting and applying feedback on operating experience
24. Plans for evaluating and improving safety performance
25. Operating procedures for accident management
26. Emergency preparedness and response plans
27. Reports and manuals on the radiation protection program
28. Reports on radioactive waste and spent fuel management
29. Modification rules
30. Details of the maintenance and the periodic testing program
31. Reports of periodic safety reviews or other safety reviews
32. Decommissioning plans and reports

Complexity factor: Stakeholders

- Owner organisation
- Operating organisation
- Vendor (designer)
- Project owner
- Contractors
- Manufactures
- Grid Operator
- (local) Government
- Regulatory Body
- Users (organisations)
- Local Residents (including animals)
-



To conclude: high complexity will be reached when combining involved parties having all their own requirements

Improvement licensing process by

1. Harmonisation of requirements
2. Standardisation of Designs
3. Pre-licensing (*e.g. GDA in UK for site and standard designs*)

→ Regulators in Europe (safety):

WENRA founded for 1

→ Utilities in Europe (optimisation all NPP aspects):

EUR organisation founded for 1 and 2

THE EUR ORGANISATION

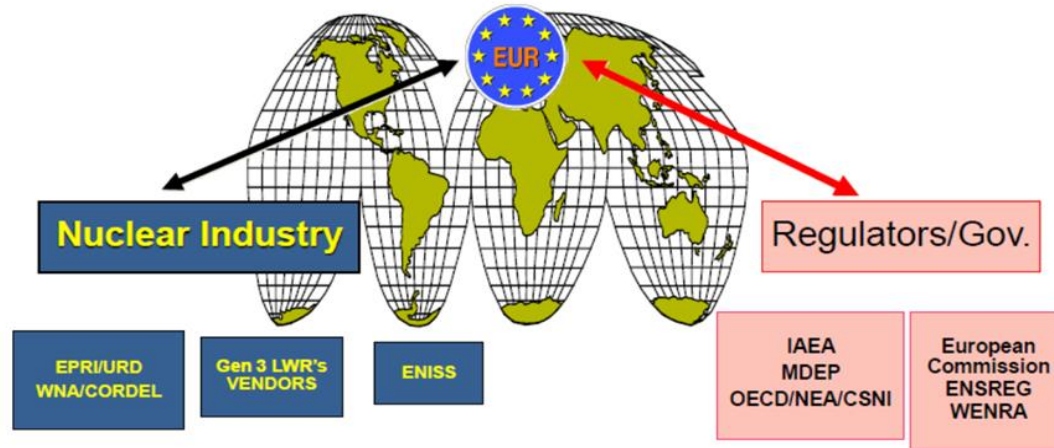


- ❑ Founded in 1991 by five European electricity producers

- ❑ The EUR Organisation (europeanutilityrequirements.eu) nowadays represents the following European electricity producers:
 - ❑ ČEZ (Czech Republic)
 - ❑ EDF (France)
 - ❑ EDF Energy (United Kingdom)
 - ❑ ENERGOATOM (Ukraine)
 - ❑ FORTUM (Finland)
 - ❑ EUAS Int. ICC (Turkey)
 - ❑ GEN energija (Slovenia)
 - ❑ IBERDROLA (Spain)
 - ❑ PAKS II (Hungary)
 - ❑ NRG (Netherlands)
 - ❑ ~~ROSENERGOATOM~~ (Russia) (*frozen status*)
 - ❑ TRACTEBEL (Belgium)
 - ❑ TVO (Finland)
 - ❑ PEJ (*Poland, membership in progress*)
 - ❑ TEPCO (*Japan, Observer i.e. limited membership*)

Mission

- Influencing design of future LWR NPPs in Europe and worldwide by :
 - *Harmonising requirements*
 - *Standard Reactor Designs*
 - *Strong Stakeholder interactions*
- Contributing to safety, licensability, competitiveness



Harmonization and Standardisation

- Set of Requirement has to cover regulatory requirements of every European Country !
- Concerns requirements for the Standard Design

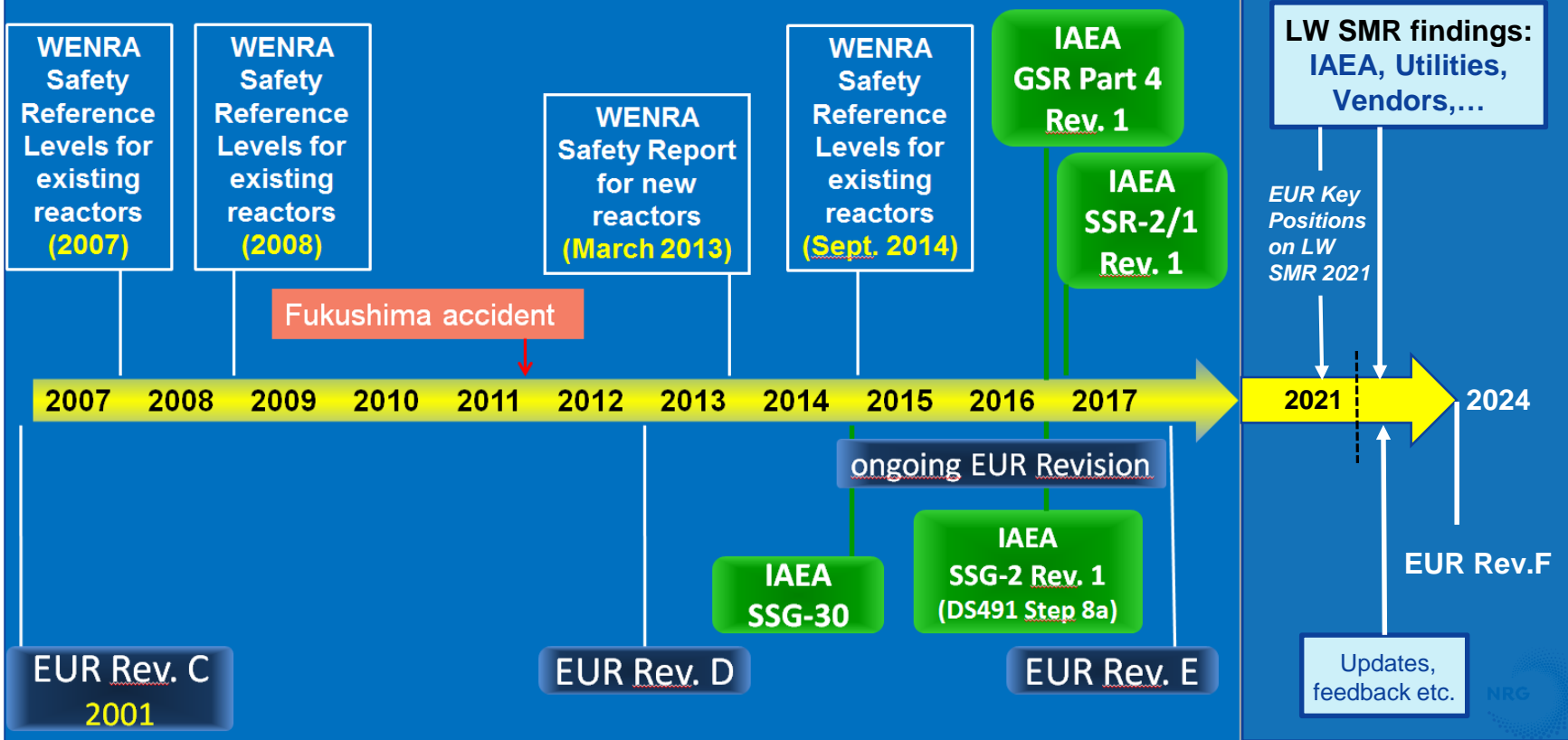
Harmonisation aspects

- ✓ Safety approaches, targets, criteria and assessment methods
 - ✓ Design conditions
 - ✓ Design objectives and criteria
 - ✓ Equipment specifications and standards
 - ✓
-
- Standard Design development
 - ✓ To be realized by Vendor for European market
 - ✓ Assessed by EUR by requirements evaluation

Nuclear (Safety) Developments and EUR revisions



Timeline



Example: EUR Document content revision E

Volume 2: Generic and NI requirements	
Chap.	item
2.1	Safety
2.2	Performance
2.3	Grid
2.4	Design Basis
2.5	Codes & Standards
2.6	Materials
2.7	Components
2.8	Systems & Processes
2.9	Containment
2.10	I&C & HMI
2.11	Layout
2.12	Design Processes & Documentation
2.13	Constructability & Commissioning
2.14	Operation, Maintenance & Procedures
2.15	Quality Assurance
2.16	Decommissioning
2.17	PSA Methodology
2.18	Performance Assessment Methodology
2.19	Cost Assessment Information
2.20	Environmental Impact
About 4500 requirements	

Volume 1: Main Policies and Objectives	
Chap.	item
1.1	Introduction
1.2	Policies
1.3	Synopsis
1.4	EUR Key Issues
1.5	EUR Key Positions on SMLWR
App A	Abbreviations and Acronyms
App B	Definitions

Volume 4: Specific PGP requirements	
Chap.	item
4.1	Introduction to the Volume 4
4.2	Main turbine generator systems
4.3	Steam, condensate and feed-water system
4.4	Electric Power systems
4.5	Circulating water systems
4.6	Auxiliary systems
About 1000 requirements	

Assessments of Standard Designs

- ❑ Before 2001: BWR90, EPP, EPR, ABWR, SWR1000
- ❑ AP1000 (Westinghouse, 2007)
- ❑ VVER AES92 (AEP, 2007)
- ❑ STD EPR (AREVA, 2009)
- ❑ EU APWR (MHI, 2014)
- ❑ EU APR1400 (KHNP, 2017)
- ❑ VVER TOI (AEP, 2019)
- ❑ HPR1000 (CGN, 2020)
- ❑ APR1000 (KHNP, ~end 2022)

Results

- ❖ Detailed assessment reports and summarizing report (main findings, EUR Vol.3)
- ❖ EUR certificate when 'passed' (no formal status)
- ❖ Assessment can be used by Vendor for Technical Bid Evaluation (TBE).
- ❖ EUR uses assessment for feedback and development (of requirements and assessment of other designs)



Differences in final design per country/project

Due to

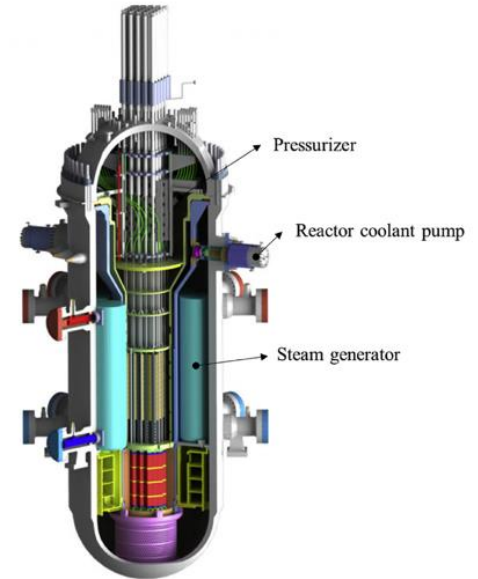
- Country specific conditions:
 - Industrial Conditions (codes, standard practices)
 - Site Conditions
 - Nuclear Regulator
- Time (obsolete technologies, supplier change)
- Customer preferences



For EPR designs in Europe (Finland, France, UK) many differences exist (e.g. seismic, core, LBB/BP, SA equipment, Containment Vent, etc)

EUR Developments: requirements for Light Water SMR

- Large impact on EUR document
 - 1: High level requirements → introduced in 2021 in Vol1.5
 - 2: Detailed level requirements → incorporation in revision F, 2024
- Specifics LW SMR:
 - Multi reactor modules (with shared systems)
 - Integrated systems (RPV, SG, PRZ)
 - Smaller/specific SSCs
- Consequences (changes)
 - Accident scenario's (mutual/combined impacts)
 - Emergency Response
 - Applicability safety evaluation (one or multi module)
 - Operator activities (one or multi module)
 - Control room (lay-out)
 -



Example of High Level requirement LW SMR

EUR Vol 1.5, Key Parameter: KP7, part A

Topic: Safety

Technical Item: Safety of multi-module units

“For multi-module Units, it shall be **demonstrated** that connections, shared features, or interactions between several reactor modules, including Common-Cause Failures, are not detrimental to the safety of each reactor module and of the Unit.”

To be incorporated/addressed within EUR rev. F

- PSA methodology for multi-module units risk assessment.
- Design constraints/conditions (in principle technology independent)

Conclusion

- Licensing of Nuclear Projects: complex, time consuming, expensive
- Licensing process improved by: harmonisation of requirements, standardisation of designs and pre-licensing activities
- Influential Organisations: EUR (European Utilities) and WENRA (European Regulators)

For speed up of Nuclear New Build: more/improved international cooperation and agreements are necessary among Nuclear Stakeholders

Contact: henstra@nrg.eu

