



# Towards Design Standardization and Safety Harmonisation : European Nuclear Utility Initiatives

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## Introduction (1/2)

From a utility perspective, standardisation of reactor designs provides:

- Economic benefits by reduction of construction and operational costs
- More certainty in licensing process and therefore reduction of financial risks
- But also safety benefits with allowing larger and more efficient feedback in construction and operation of fleets of similar designs

## Introduction (2/2)

- In the early nineties several european utilities got together to prepare specifications for the next generation of NPPs to be built in Europe:  
**European Utilities Requirements (EUR)**
- In 2005, as a counterpart of WENRA initiative to define safety Reference Levels for existing nuclear facilities, European nuclear utilities established **ENISS inside FORATOM:**  
**European Nuclear Installation Safety Standards**



## The EUR project initial objectives (1991)

- Light water reactor plants only
- Reduced licensing risks
  - Quite **high safety objectives**: common rules valid for a long enough time and in a wide enough area
  - **Improved acceptance** by the public and the administrations
  - **Safety harmonisation** : within Europe and, as far as possible, with USA
- Increased LWR plant competitiveness
  - allowing the development of **standard designs** usable throughout a wide area
  - promoting **cost-effective design features**
  - establishing conditions for a fair **competition** between the vendors
- Open electricity market
  - **Harmonised design requirements**

# EUR today: a mature cooperative organisation of European utilities

- working together since 1992
- committed to keep the nuclear option open
- sharing specification and development works for Gen 3 LWR plants
- involving most of the major European electricity producers.
- operating a very large nuclear fleet: more than 130 LWRs + others
- in competition with each other



# EUR: a hub to harmonise European utilities views & requirements and to make Gen 3 a reality in Europe

- a utility network to share experience in plant specification (including conventional part and grid interface), design evaluation, licensing ...
- a common bridge with external stakeholders
  - the vendors
  - the regulators: safety (WENRA), HV grid, ...
  - the EUR counterparts outside Europe: EPRI, Asian utilities, ...
  - the international organisations: IAEA, OECD, EU, WNA...
  - the education and training organizations and networks: ENEN, WNU,...

# The EUR document

**volume 1**



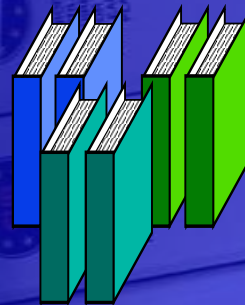
main policies  
& objectives

**volume 2**



generic  
nuclear island  
requirements

**volume 3**



Applications of  
EUR to specific  
projects

**volume 4**



generic  
conventional island  
requirements

revision A: 03/1994  
revision B: 11/1995  
revision C: 04/2001

revision A: 11/1996  
revision B: 03/2000  
revision C: 10/2007

# EUR volume 3: analyses of compliance of the selected LWR projects vs. the EUR generic requirements

- analyses at detail level
  - each of the 4000 requirements (shall, should, may) of the EUR volumes 1 & 2 is analysed by EUR utilities' engineers from information supplied by the vendors.
  - standard scale of compliance for all the projects
  - rationales & references
  - cross-checking between the different assessments
  - several man•years for each project
- the detailed analyses are not published
- only the main deviations are highlighted in the published part as well as the main "compliance with objectives".



# EUR volume 3

<p><b>BWR</b> 1400 MWe evolutionary PWR Westinghouse June 1999</p> 	<p><b>EPR</b> 1600 MWe 4-SG evolutionary PWR Areva Dec 1999</p> 	<p><b>EP 1000</b> 1000 MWe 3-SG PWR with safety features Westinghouse Dec 1999</p> 	<p><b>SWR 1</b> 1000 MWe BWR with safety features Areva Feb 2002</p> 	<p><b>ABWR</b> 1400 MWe evolutionary PWR General Electric Dec 2001</p> 	<p><b>AP 1000</b> 1000 MWe 2-SG PWR with safety features Westinghouse May 2007</p> 	<p><b>VVER AES</b> 1000 MWe 4-SG PWR with safety features AEP Moscow Dec 2007</p> 	<p><b>EPR</b> 1600 MWe 4-SG evolutionary PWR Areva July 2009</p> 
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# The TRENDS

- The EUR document is more and more used as a specification for Gen 3 reactor bids
- The EUR document is being maintained and improved
  - Revision B of the EPR just completed
  - Preliminary works on MHI's APWR evaluation
  - Other Gen 3 LWR projects?
- The EUR organisation keeps enlarging
  - EnergoAtom (Ukraine), CEZ (Czech Republic) have been welcomed into the EUR organisation
  - ENEL and Endesa have re-entered the organisation
  - MVM (Hungary) associate member

# ENISS :European Nuclear Installations Safety Standards Initiative

## Objectives

- To establish a common licensee view with respect to the “WENRA RLs”
- To present the industry position in discussions with WENRA
- To support an exchange of information about the interaction of license holders with their national regulators, in order to achieve a harmonised set of new regulations.
- To create an information platform for the European nuclear license holders with respect to new national and international regulatory activities
- To strengthen the influence in the revision work of the IAEA Safety Standards
- To cooperate with the European Institutions on regulatory issues in the area of nuclear safety, radiation protection, waste management and decommissioning
- To collaborate with international associations dealing with regulatory issues

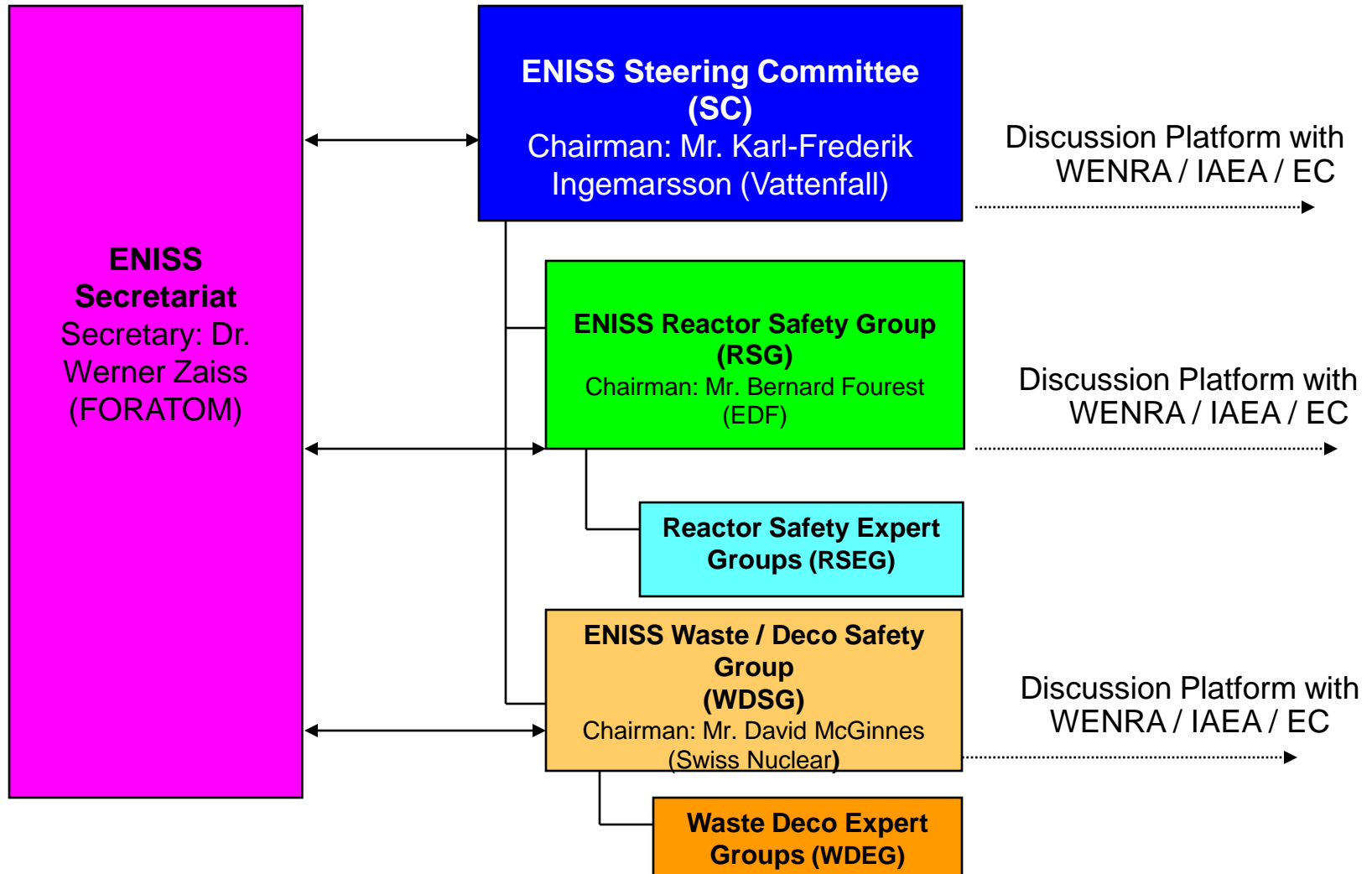
# ENISS – Membership

All ENISS Members are representing licensees

- Belgium (Tractebel, Electrabel)
- Finland (Fortum, TVO)
- Germany (EON, RWE)
- Italy (SOGIN/ENEL)
- Spain (UNESA)
- The Netherlands (EPZ)
- France (EdF, AREVA NC)
- Sweden (EON-Se, Vattenfall AB)
- Switzerland (Swiss Nuclear)
- Czech Republic (CEZ)
- Hungary ( Paks NPP)
- Slovakia (Slovenske Elektrarne, JAVYS\*)
- Romania (Nuclearelectra)
- Bulgaria (Kozloduy NPP)
- United Kingdom (BE)
- Slovenia (Krško NPP)
- Lithuania (Ignalina NPP\*)

\*involved only in waste & decommissioning activities

# ENISS - Organisation



# Interaction with WENRA

In January 2006, WENRA published three Harmonisation Reports:

- Harmonisation of Reactor Safety in WENRA Countries
- Waste and Spent Fuel Storage Safety Reference Levels Report for Nuclear Facilities
- Decommissioning Safety Reference Level Report for Nuclear Facilities

Comments and suggestions by stakeholders were asked for end of May 2006

# WENRA – ENISS Interaction – Reactor Safety

A constructive dialog between WENRA and ENISS on its comments

- Several meetings on 2006/2007
- Several sets of comments from ENISS
- Explanatory notes prepared by WENRA (on PSA) and by ENISS (on fire protection)
- Proposed Interpretations of some RLs by ENISS agreed by WENRA

WENRA published a new set of RLs on January 2008

Futur interactions expected on Safety Objectives for GEN 3 being prepared by WENRA on 2010

# **WENRA-ENISS Interactions: Waste/Spent Fuel Storage and Decommissioning:**

- First Drafts issued in January 2006, but without benchmarks
  - ENISS provided comprehensive comments
  - Consultation and discussion between ENISS and WENRA WDWG
  - Version 2.0 both to be issued end of 2009
- Stakeholders are invited to provide comments



# **ENISS Participation in the Revision of the IAEA Safety Standards**

- WENRA's Policy Statement: Influence the Revision of the IAEA Safety Standards as appropriate
- Strengthening the influence of European nuclear licensees on IAEA Regulatory Work with regard to nuclear facilities
- FORATOM/ENISS acting as a non-governmental organisation representing the European nuclear power plant licensees
- IAEA/ENISS Meeting to launch a cooperation agreement (8 February 2007)
- ENISS assistance in IAEA Drafting Groups, observer status in IAEA Safety Standard Committees (NUSSC, WASSC...)

# **ENISS involvement in IAEA Standard activities**

## **Areas to be covered**

(Priority on Requirements)

- NPP Design
- NPP Operation
- Management Systems
- Waste Management / Treatment
- Decommissioning
- Radiation Protection (with respect to nuclear safety)

# EU Nuclear Safety Directive

- In the framework of the European Nuclear Energy Forum, ENISS suggested contents elements of this Directive: should be based on IAEA safety fundamentals, but no technical content
- Interactions with European Parliament
- Interactions with ENSREG

EU Nuclear Safety Directive approved by the Counsel on  
June 2009

# Conclusions

- With the EUR initiative, European nuclear utilities were the first to work towards standardisation of reactor designs at the international level.
- EUR requirements are being used by utilities in Europe and elsewhere as a basis for specifying new reactors.
- Some level of safety harmonisation is one of the precondition to standardisation.
- European nuclear utilities welcome WENRA initiative to establish Reference Levels for existing plants. It creates ENISS to interact with it, and this already provided concrete and positive results.
- ENISS and EUR will join their efforts to interact with WENRA on new reactor safety objectives.
- MDEP is an other steps towards standardisation and the nuclear industry is eager to support this effort.