

Harmonization of licensing requirements

WENRA experience, and
potential application to new
nuclear systems

- Western European Nuclear Regulators' Association
- Association of *Heads of Nuclear Regulatory Authorities* of 16 EU countries + Switzerland that operate NPPs
- 17 Members: Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Hungary, Italy, Lithuania, Netherlands, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom
- 5 Observers (non-nuclear countries): Austria, Ireland, Luxemburg, Norway and Poland

WENRA policy and objectives

- *WENRA commits itself to a continuous improvement of nuclear safety in the respective countries...*
(Original Terms of Reference signed 4 February 1999)
- Common approach to nuclear safety and radiation protection
 - Countries recognize IAEA Safety Standards, the Convention on Nuclear Safety, etc.,
 - But, different organizations & different regulatory regimes

WENRA: expanding organization

- 1999 – 10 Members
- 2003 – 17 Members
- 2009 – 17 Members and 5 Observers
- 2009 – 3 More Observers invited
(Armenia, Russian Federation, & Ukraine)
- New Challenges:
 - Defining position & relation to European Nuclear Safety Regulators' Group & other relevant organisations
 - Considering new tasks:
 - Research reactors
 - Cooperation (**Armenia, Russian Federation & Ukraine**)

WENRA harmonization commitment

- There should be *no substantial differences between countries from the safety point of view in generic, formally issued, national safety requirements, and in their resulting implementation on NPPs*
- Safety requirements should be *independent on regulatory regime & NPP design*
- Basis: workers & public in Europe expect equivalent levels of safety in operation of NPPs
- Goal: establish harmonization basis by 2006, and achieve harmonization by 2010

WENRA harmonization working groups

- Harmonize safety approaches and continuously improve nuclear safety for:
 - Nuclear Power Plants (excluding research reactors)
 - *Reactor Harmonisation Working Group (RHWG)*
 - Radioactive waste, spent fuel storage, & decommissioning
 - *Working Group on Waste and Decommissioning (WGWD)*

- Focus on RHWG in this presentation

Boundary conditions for harmonization work

- Safety of **existing** (and shut down) NPPs only
 - No new nuclear reactor technologies
 - No physical protection aspects (security)
- Cover deterministic, probabilistic, management, & safety culture aspects
 - No legal aspects
- Level: overall **safety** requirements
 - No technical details, no specific NPP design
- Focus on regulators' published requirements from plant operators
 - No regulatory practices

Harmonization “stepwise” methodology

1. Formulation of **Reference Levels** – related back to IAEA safety standards & national best practices
2. **Self-assessment** = individual national assessments of compliance with each Reference Level
Evidence of legal requirement & practical implementation at all relevant sites
3. **Benchmarking** = peer review & communal validation of national self-assessments
4. **Review** benchmarking experience & comments **by stakeholders** : revision of Reference Levels where necessary
5. **National Action Plans** to modify national legal systems & practices according to benchmarking results

Reference Levels: approach

- Reference: IAEA safety standards
- Any 'deltas' of best practices in countries
 - Best practice – nationally or IAEA
 - Upper quartile – top 25% of good national practice
Not what everybody already does
 - Number of Levels per Issue is not significant
 - Not formal safety requirements or standards
 - To enable harmonization assessment
- Plus RHWG members' high level of experience

Reference Levels: approach (cont'd)

- ALARP concept – As Low As Reasonably Practicable
- Outcome is important, not means of achieving it
 - Design neutral
- “Periodic Safety Review” concept – 10 year frequency
- Must be able to be benchmarked at two levels:
 - Is there a national legal requirement?
 - Is it implemented on all sites?and if this is not the case:
 - Can it be justified?
 - Should it be harmonized?

Reference Levels in 18 safety issues areas

Main safety areas	Issue
Safety Management	A: Safety Policy
	B: Operating Organisation
	C: Management System
	D: Training and Authorization of NPP staff
Design	E: Design Basis Envelope for Existing Reactors
	F: Design Extension of Existing Reactors
	G: Safety Classification of Structures, Systems and Components
Operation	H: Operational Limits and Conditions
	I: Ageing Management
	J: System for Investigation of Events and Operational Experience Feedback
	K: Maintenance, In-service inspection and Functional Testing
	LM: Emergency Operating Procedures and Severe Accident Management Guidelines
Safety Verification	N: Contents and updating of Safety Analysis Report
	O: Probabilistic Safety Analysis
	P: Periodic Safety Review
	Q: Plant Modifications
Emergency Preparedness	R: On-site Emergency Preparedness
	S: Protection against Internal Fires

Example:
 SAR

Issue N	Issue: Contents and updating of Safety Analysis Report (SAR)
Document status: Final	Safety area: Safety Verification

Reference levels: (in part)

1. Objective

- 1.The Licensee shall provide a SAR^[1] and use it as a basis for continuous support of safe operation.
- 2.The Licensee shall use the SAR as a basis for assessing the safety implications of changes to the plant or to operating practices.

2. Content of the SAR

- 1.The SAR shall describe the site, the plant layout and normal operation; and demonstrate how safety is achieved.
- 2.The SAR shall contain detailed descriptions of the safety functions; all safety systems and safety-related structures, systems and components; their design basis and functioning in all operational states, including shut down and accident conditions.
- 3.The SAR shall identify applicable regulations codes and standards.
- 4.The SAR shall describe the relevant aspects of the plant organization and the management of safety.
- 5.The SAR shall contain the evaluation of the safety aspects related to the site.
- 6.The SAR shall outline the general design concept and the approach adopted to meet the fundamental safety objectives.
- 7.The SAR shall describe the safety analyses performed to assess the safety of the plant in response to postulated initiating events against safety criteria and radiological release limits.
- 8.The SAR shall describe the emergency operation procedures and accident management guidelines, the inspection and testing provisions, the qualification and training of personnel, the operational experience feedback programme, and the management of ageing.
- 9.The SAR shall contain the technical bases for the operational limits and conditions.
- 10.The SAR shall describe the policy, strategy, methods and provisions for radiation protection.

[1] A consistent safety document or integrated set of documents constituting the licensing basis of the plant and updated under control of the regulatory body

Ref. Level working document example: SAR (cont'd)

Related IAEA safety standards:

1.1 NS-R-2 “Safety of NPPs: Operation” contains several requirements referring to the need to maintain consistency with the plant safety analysis report (e.g. §§4.1, 5.1, 7.4). This SAR is expected to be available and approved before plant commissioning.

The regulatory body shall issue guidance on the format and content of documents to be submitted by the operator in support of applications for authorization. The operator shall be required to submit or make available to the regulatory body, in accordance with agreed timescales, all information that is specified or requested. This information should be presented in the form of a report, hereinafter referred to as a safety analysis report (SAR). (GS-G-4.1 §1.1)

SARs represent an important communication between the operating organization and the regulatory body, and they form an important part of the basis for licensing an NPP and of the basis for the safe operation of the plant. (GS-G-4.1 §2.1)

1.2 The SAR is prepared by the operating organization for submission to the regulatory body to enable it to assess the suitability of the plant for licensing. The SAR should also serve as a basis for the operating organization to assess the safety implications of changes to the plant or to operating practices. (GS-G-4.1, Para 2.7)

2. The SAR should contain accurate and sufficiently precise information on the plant and its operating conditions and should typically include information on, for example, safety requirements, the design basis, site and plant characteristics, operational limits and conditions and safety analyses, in such a way that the regulatory body will be able to evaluate independently the safety of the plant. (GS-G-4.1 §2.1)

Reference Levels: national self-assessment

- Two assessment criteria for each Reference Level:
 - ❖ Legal requirement?
 - Law, ordinance, or regulation
 - Formal, generic, public recommendation
 - ❖ Implemented for all NPPs?
- Two-letter coded answer (both criteria):
 - A = Yes
 - B = No, but justified (or will be 'yes' by end 2005)
 - C = No, and cannot be justified
- Examples:
 - code (A,A) → fully harmonized
 - code (A,C) → action necessary to implement

Reference Levels: benchmarking

- Peer reviews by RHWG Members carried out
 - highly experienced practitioners
- Self-assessments scrutinized → revisions by countries made where necessary
- Reference Levels revised/finalised to:
 - Give common understanding
 - Avoid duplication & complexity
 - Improve usefulness for harmonization
- Countries re-assessed themselves against revised Reference Levels

Assessment working document example: SAR

Ref	Legal requirement	Implementation	Summary
1.1	Atomic Law of Dec. 1959, Art. 7: "An application for a license for construction, for operation or for modification of an atomic facility must be accompanied by a comprehensive technical report". This fulfils the first part of the ref. level requirement.	A SAR is available at each Swiss NPP. Together with other documents, linked with the SAR, it constitutes the basis for plant operation.	C, A
1.2	None.	The SAR is used as the basis for safety assessments, generally, and for evaluating plant changes, in particular.	C, A
2.1	None.	The ref. level issues are included in the SAR. This is verified by the HSK, who reviews the SAR and its contents periodically. <u>Note</u> : the SAR is not formally approved by HSK.	C, A
2.2	None.	See under 2.1	C, A
2.3	None.	See under 2.1	C, A
2.4	None.	Plant organization / management aspects are contained in other (regulatory approved) documents.	C, B
2.5	None.	See under 2.1	C, A
2.6	None.	See under 2.1	C, A
2.7	None.	See under 2.1	C, A
2.8	None. The HSK Guideline R-17 contains requirements on qualification and training of personnel, and other organizational aspects.	EOP / SAMG documents are separate. These are regulatory approved documents. The other ref. level issues are addressed in plant documents, which are not linked to the SAR or regulatory approved.	C, C
2.9	None.	The SAR and several other documents (e.g. setpoint analysis), that are referenced in the SAR, contain the technical basis for OLCs.	C, A
2.10	None.	The policies etc. for radiation protection are summarized in the SAR; all details are contained in separate, legally binding, documents.	C, A
2.11	None.	Emergency preparedness arrangements are not contained in the SAR but in another document, which is reviewed and approved by HSK.	C, B

Results from RHWG

Figures / data taken from 2006 report

Figure 2(a):

Overview - All legal requirement results

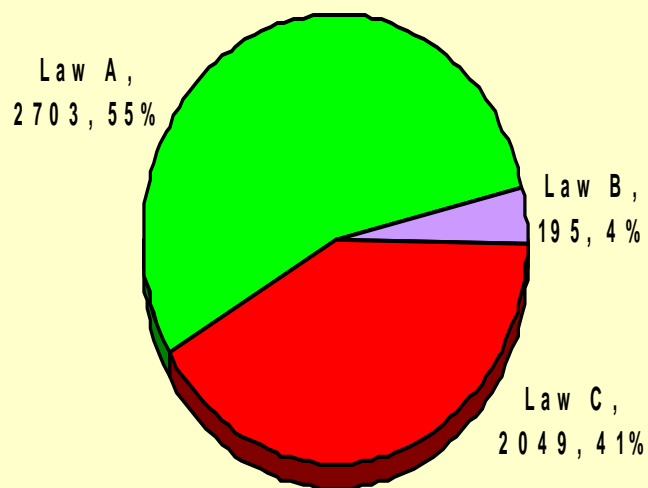
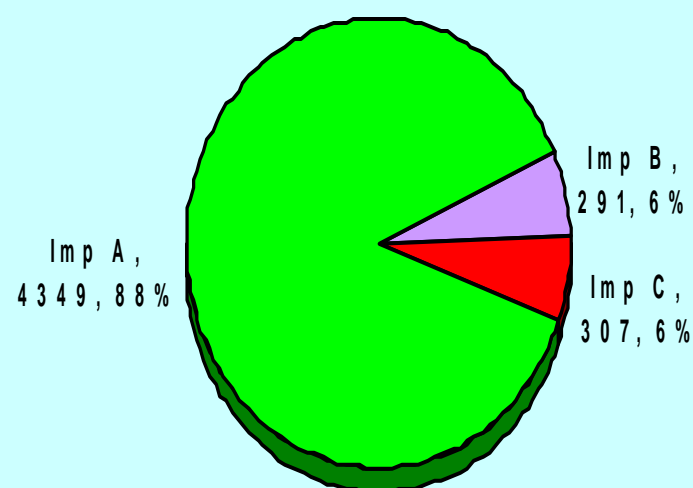




Figure 2(b):

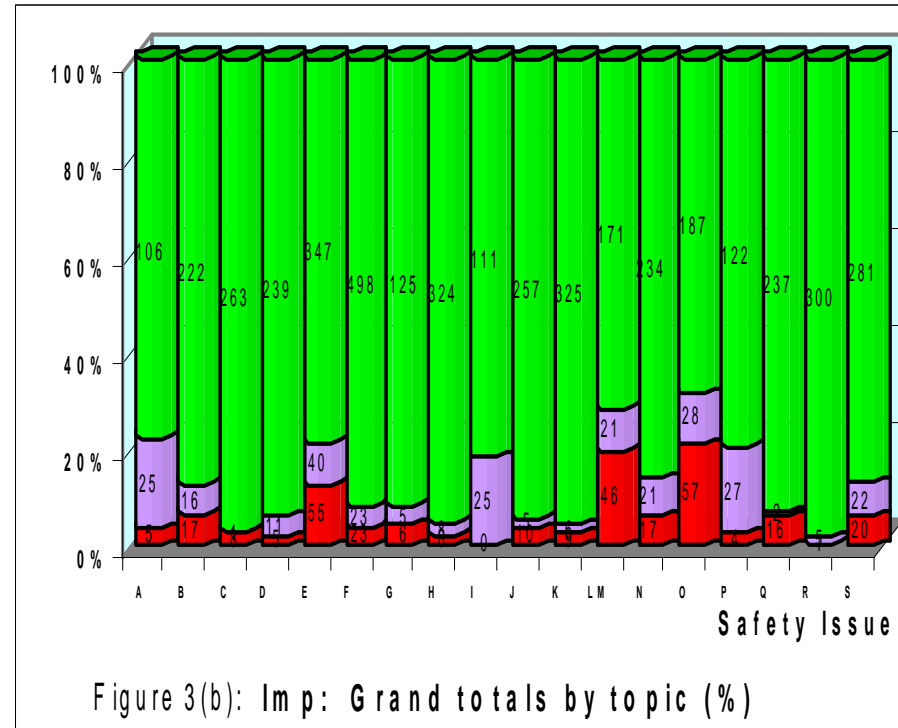
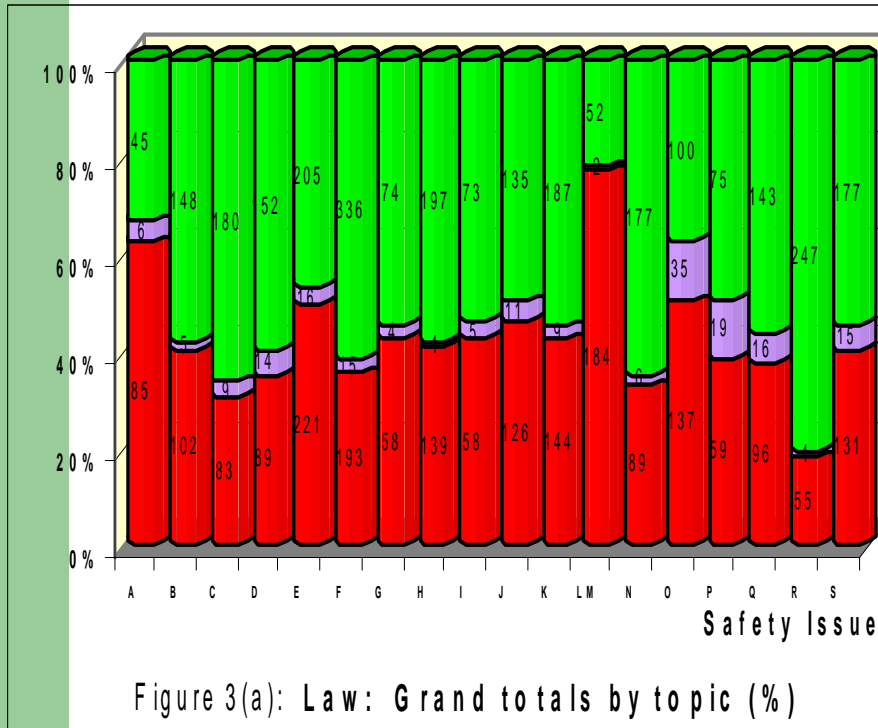
Overview - All implementation results



-  **Code A – Already harmonized**
-  **Code B – Justifiable difference**
-  **Code C – Needs harmonizing**

Results from RHWG (cont'd)

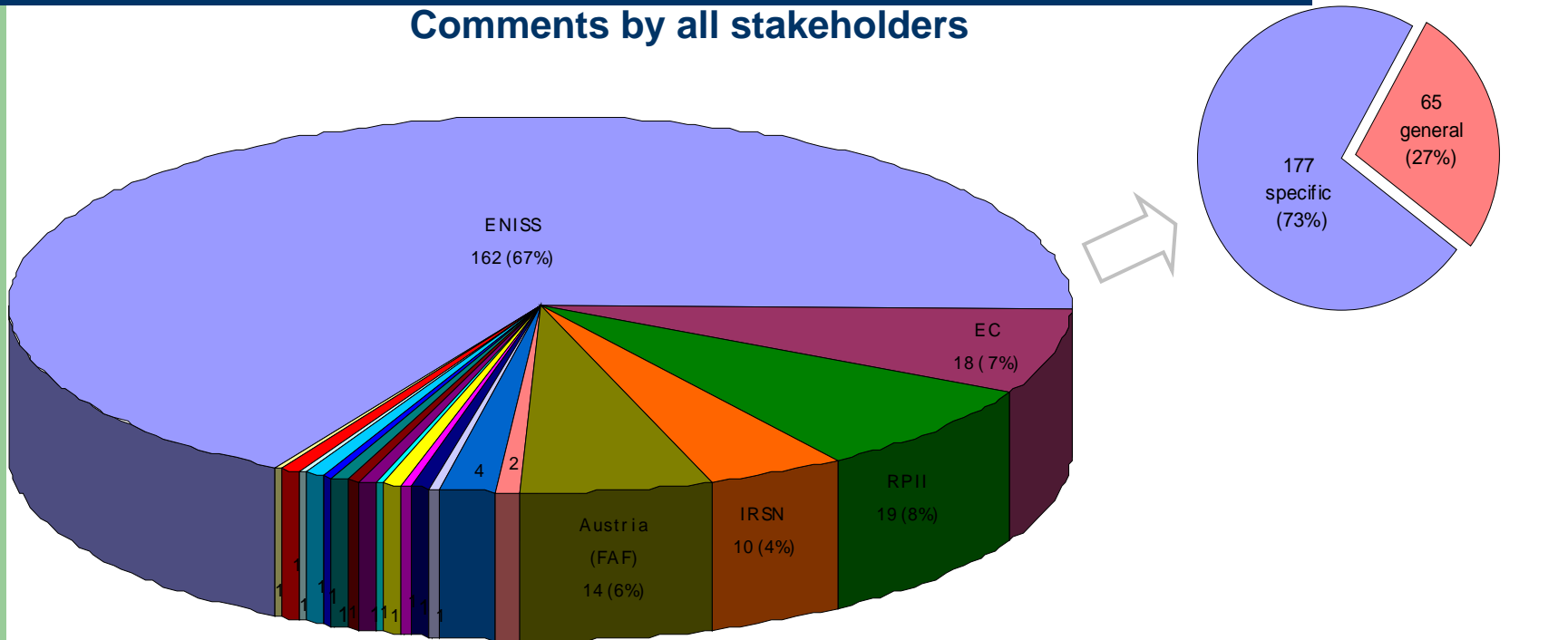
Figures / data taken from 2006 report



- Code A – Already harmonized
- Code B – Justifiable difference
- Code C – Needs harmonizing

Stakeholder comments to RHWG results

Comments by all stakeholders



- ENISS
- IRSN
- GPR (Groupe Permanent Reacteur)
- EDF
- E.ON Ker nkr af t GmbH
- Slovenske Elektrarne
- Teollisuuden Voima Oy
- EC (European Commission)
- Austria (FAF - For um fur Atomf ragen)
- RA (Risque Attitude)
- Electabel
- Fortum Nuclear Services
- Swisnuclear
- Vattenfall European Nuclear GmbH
- RPII (Radiological Protection Institute of Ireland)
- SKI
- AREVA
- EnBW Kraftwerke AG
- RWE Power AG
- Tractebel

Timeline

- 1999 WENRA's harmonization ideas developed
- Pilot Project to devise a methodology
 - Reference Levels devised for six safety issues
 - 9 countries benchmarked
 - 2002 Results reported
- 2003 Main project started, using Pilot Project experience
 - Accession countries invited to join – 17 countries
 - Number of safety issues increased to 18
- 2006-2008 NPP Reference Levels finalized
- 2010 National Action Plans to be implemented

Status of WENRA harmonization

- Original mandate of RHWG (harmonization of safety requirements for existing reactors) fulfilled
- Follow-up ongoing:
 - Monitoring of national action plans
 - Ensuring no divergence of interpretations
 - Experience feedback on update of regulations
 - “Periodic Safety Review” – concept (10 yr review) for future
- WTHWG (waste and transportation harmonization working group): results also published

New mandate (2008)

- Support WENRA's vision of a comparable, high level of nuclear safety in Europe
 - Influence, from the European regulators' perspective, the safety standards for **new nuclear systems**
 - WENRA Reference Levels & likely relevance to new designs – ***recognising their high-level design neutrality***
 - Further improve the safety of existing plants

Scope of new mandate

- Use proven methodology from WENRA harmonization working groups
- Define safety objectives / safety principles / specific considerations relevant to new nuclear reactors
- Proposition: new reactors must have a higher safety level
- Review these against Reference Levels defined for current reactors
- Identify where Reference Levels need to be complemented / updated
- Note: development of new Reference Levels, self-assessment, benchmarking is not (yet) included in scope

First results from WG for new reactors

- Study published December 2009 (ref. www.wenra.org)
- Focus on reactors currently being built or planned in short-term (designs largely completed)
- Reference: most advanced IAEA standards (safety principles SF-1 of 2006 in particular)
- Study represents a first assessment:
 - categories: (A) Ref.Levels fully applicable, (B) Ref.Levels acceptable but greater safety expectations exist, (C) Ref.Levels must be extended, (D) missing issues
 - no quantitative formulation of extension to Ref.Levels formulated in many areas (Example: requirement to enhance effectiveness of independence between D-i-D levels (ref. SF-1) is formulated, update to D-i-D level scheme is proposed but no further details are given)
 - difficult to reach consensus between all countries

This table shows the preliminary results of the exercise issue by issue, not yet validated.

		A	B	C	D
Issue	Number of RLs	Fully applicable	Applicable but greater expectation	More stringent description is necessary	Identified Missing topics
A: Safety Policy	8	2	1	5	0
B: Operating Organisation	15	4	0	11	0
C: Management System	23	11	0	12	0
D: Training and Authorization of NPP staff	15	10	0	5	1
E: Design Basis Envelope for Existing Reactors	44	25	17	2	3
F: Design Extension of Existing Reactors	12	4	8	0	1
G: Safety Classification of Structures, Systems and Components	7	4	2	1	0
H: Operational Limits and Conditions	19	18	0	1	0
I: Ageing Management	8	3	4	1	1
J: System for Investigation of Events and Operational Experience Feedback	16	7	6	3	0
K: Maintenance, In-service inspection and Functional Testing	20	14	4	2	4
LM: Emergency Operating Procedures and Severe Accident Management Guidelines	14	14	0	0	0
N: Contents and updating of Safety Analysis Report	16	13	3	0	1
O: Probabilistic Safety Analysis	16	15	0	1	1
P: Periodic Safety Review	9	8	1	0	0
Q: Plant Modifications	15	11	4	0	0
R: On-site Emergency Preparedness	18	14	2	2	2
S: Protection against Internal Fires	20	16	4	0	1
	295	193	56	46	15

Conclusions

- WENRA internationally recognized effective methodology:
 - Contributes to improved national nuclear safety requirements through formulation of common Safety Reference Levels
 - Sound basis for developing safety requirements for new nuclear systems
 - Contributes to improvement of the IAEA safety standards
 - Created a new network and a platform for open information exchange among regulators

Conclusions (cont'd)

- Large undertaking for WENRA countries
 - Define Reference Levels in all safety related areas
 - Benchmark assessments from 17 countries against 18 safety issues
 - Implement National Action Plans for harmonization
 - Monitor implementation progress
- More work needed to define Reference Levels for new reactors (only Gen. III and III+ reactors included in study thus far)