



REPUBLIC OF SLOVENIA

MINISTRY OF THE ENVIRONMENT AND SPATIAL PLANNING

SLOVENIAN NUCLEAR SAFETY ADMINISTRATION

Peer review and implementation process of EU stress tests

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EN:REG
European Nuclear Safety Regulators Group



Nightmare of 11 March 2011

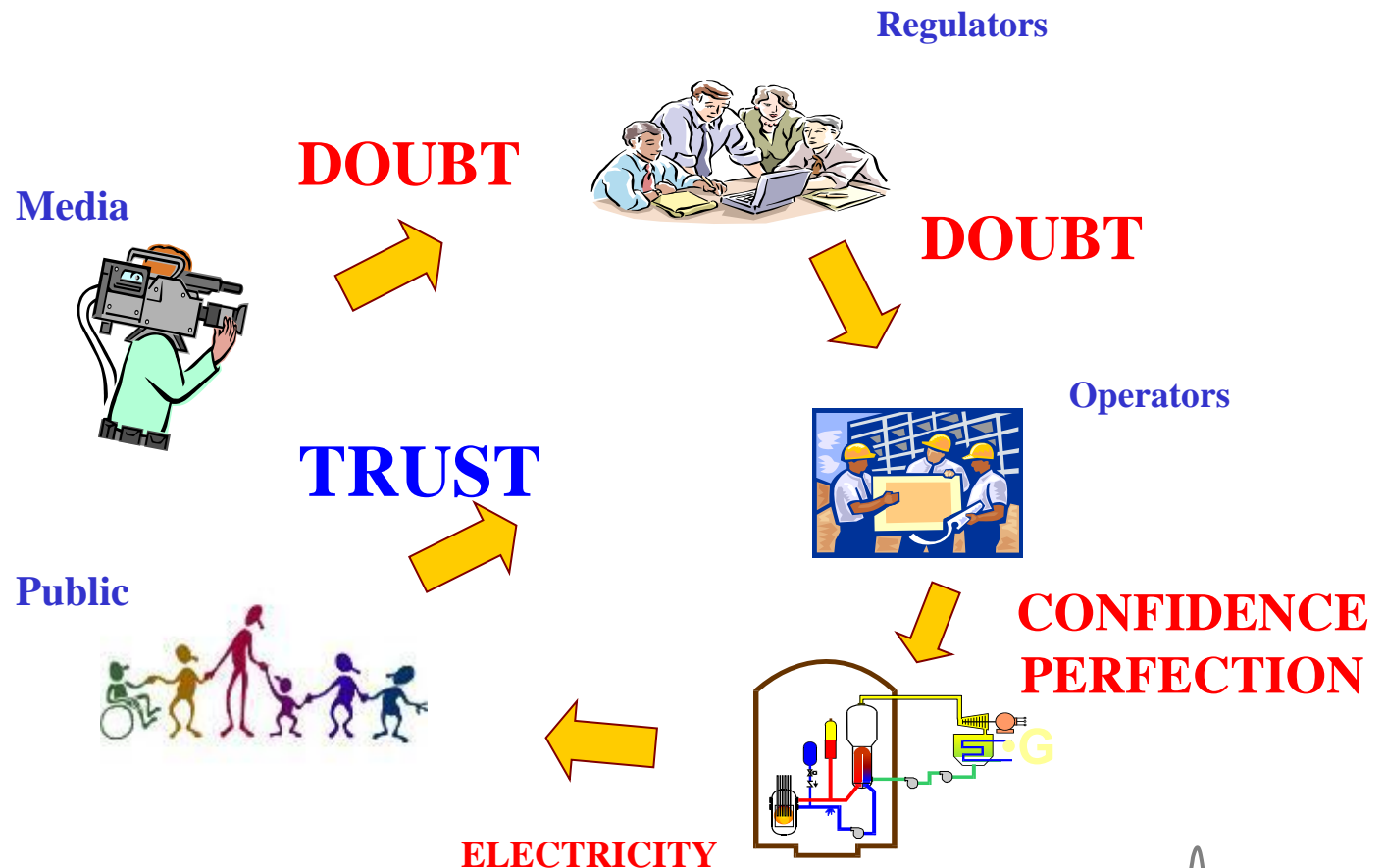


Nightmare of 11 March 2011

- Beneficial conversion of mass to energy turned into a disaster



- The feedback loop for assuring perfection has failed!
- **Trust of the society was lost!**



Stress Tests were about restoring confidence and regaining trust by further improving nuclear safety



Fukushima concerns

The main questions from Fukushima were the main objectives of our Stress Tests:

- Did we properly take into account uncertainties of all potential external hazards?
- Are our plants robust enough, are safety margins big enough?
- Are we able to cope even with extremely low probability events?



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EU response to Fukushima



Stress Tests

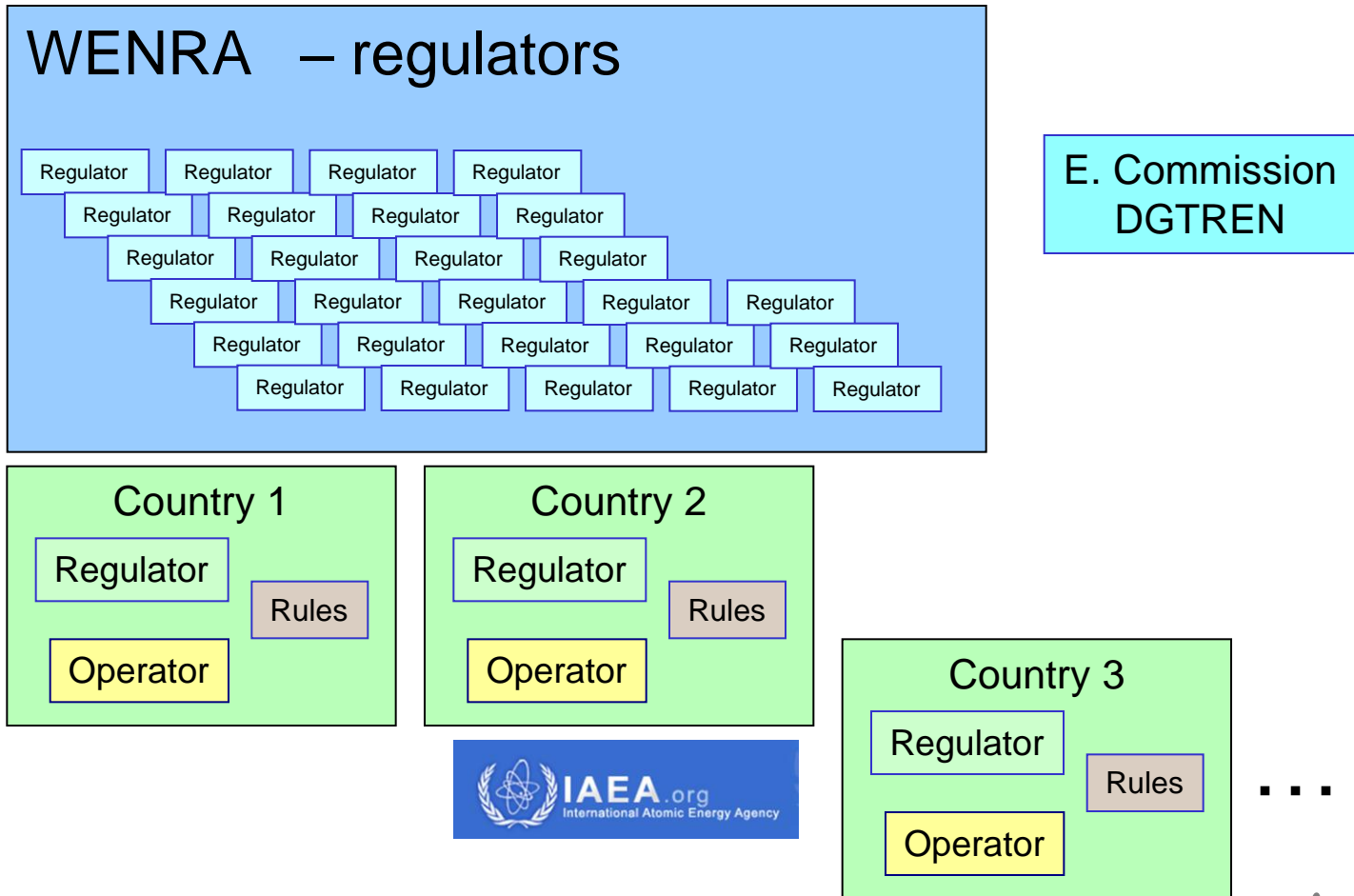
- 11 March: Fukushima accident occurs
- 24 – 25 March: European Council Requests:
 - **Stress tests** to be developed by European Nuclear Safety Regulators Group (ENSREG), the Commission and WENRA
 - Safety of all EU plants to be reviewed
 - Scope of review to be in light of lessons learned from Japan
 - Assessments conducted by national Authorities
 - Assessments completed by a peer review

Development of Stress Test Methodology

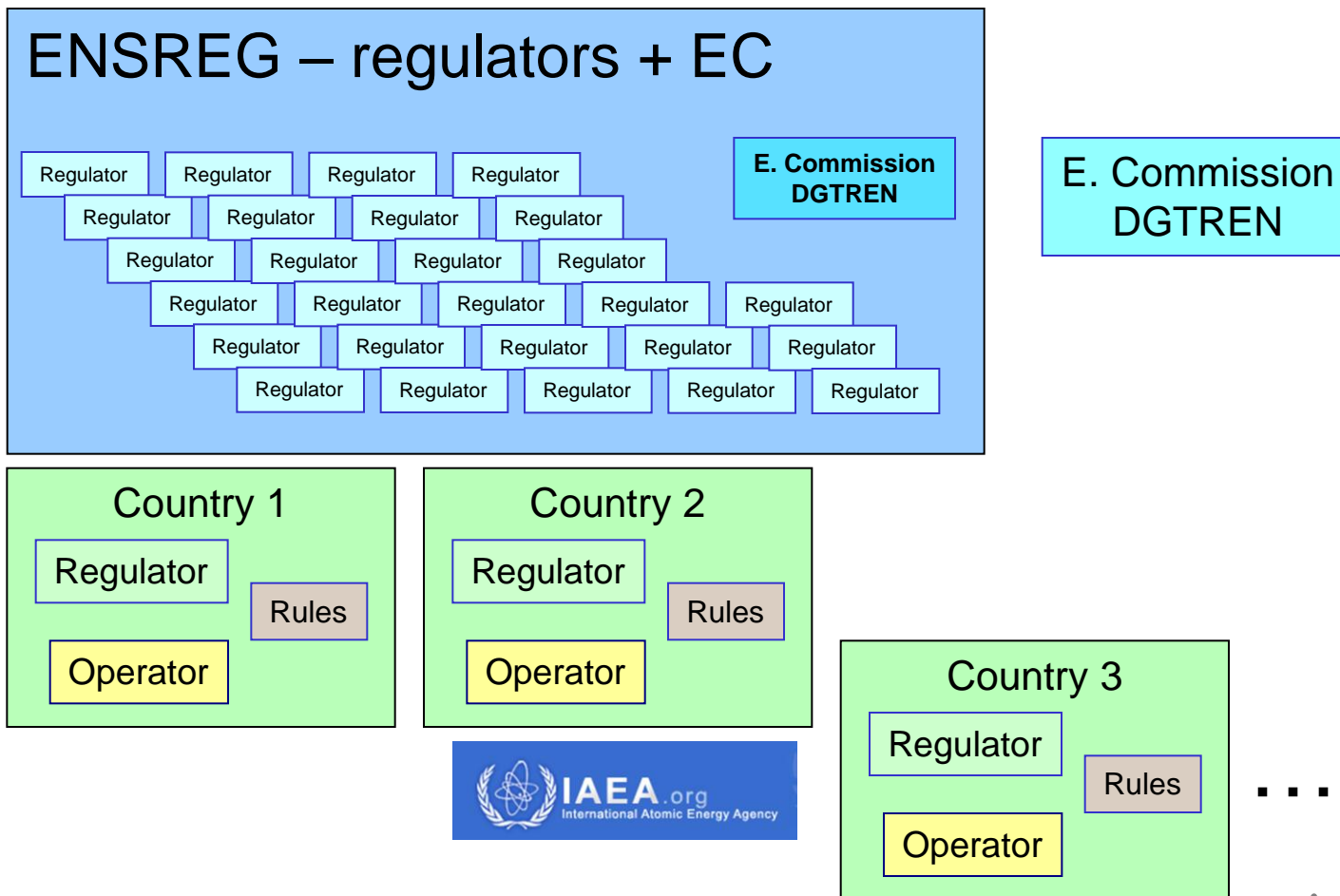
- Methodology drafted by [WENRA](#) in April
- Agreed to by [ENSREG](#) in May

- On 25 May 2011 ENSREG including the European Commission published the ENSREG declaration that described EU Stress Tests methodology

WENRA



ENSREG



Stress Test Implementation

1. 6. 2011	Start
15. 8. 2011	Operators submitted progress reports
15. 9. 2011	National progress reports submitted
31. 10. 2011	Operators submitted final reports
8. 12. 2011	EU Council informed about progress
31. 12. 2011	Final National reports submitted

7 months!



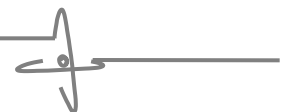


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The Peer Review Process



The Peer Review process

- WENRA prepared first draft in June 2011
- The Methodology endorsed on 12 October 2011
- The Peer Review Board, about 80 experts involved
- Three topical reviews in parallel, January and February 2012
 - **Initiating Events**
 - **Loss of Safety Functions**
 - **Severe Accident Management**
- 17 country visits in 6 parallel groups, March 2012
- ENSREG Report + 17 Country Reports in April 2012





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Main Results of the Peer Review



General conclusion over Europe

- Significant steps taken in all countries to improve safety of plants
- Varying degrees of practical implementation
- Global consistency over Europe in identification of:
 - Strong features
 - Weaknesses
 - Measures to increase robustness

Measures to increase robustness of plants

- Significant measures to increase robustness already decided or considered, such as:
 - Additional mobile equipment
 - Hardened fixed equipment
 - Improved severe accident management with appropriate staff training
- Details available in Country Reports and Main Report

Example: New equipment in Krško NPP



Pumps



Additional connection points



Portable fire system



Portable external diesel generators

Assessment of natural hazards and margins

Recommendation no. 1:

- WENRA, involving the best available expertise from Europe, should develop guidance
 - on natural hazards assessments, including earthquake, flooding and extreme weather conditions,
 - on the assessment of margins beyond the design basis and cliff-edge effects.



Report

Updating WENRA Reference Levels for existing reactors in the light of TEPCO Fukushima Dai-ichi accident lessons learned

September 2014

DONE!



Periodic safety review

Recommendation no. 2:

- ENSREG should underline the importance of periodic safety review.
- In particular, ENSREG should highlight the necessity to re-evaluate natural hazards and relevant plant provisions at least every 10 years.



COUNCIL DIRECTIVE 2014/87/EURATOM**of 8 July 2014****amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations**

- (b) the licence holder under the regulatory control of the competent regulatory authority, re-assesses systematically and regularly, **at least every 10 years**, the safety of the nuclear installation as laid down in Article 6(c). That safety reassessment aims at ensuring compliance with the current design basis and identifies further safety improvements by taking into account ageing issues, operational experience, most recent research results and developments in international standards, using as a reference the objective set in Article 8a.

**DONE!**

Containment integrity

- Fukushima disaster highlighted once again the importance of the containment function
- Last barrier to protect people and the environment against radioactive releases
- Issue already considered as follow-up of previous accidents and possible improvement already identified

Containment integrity

Recommendation no. 3:

- Recognized measures to protect containment integrity should be urgently implemented



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IN PROGRESS

Containment integrity

- Measures vary depending upon the design of the plants
- For water cooled reactor, they include equipment, procedure and accident management guidelines to:
 - Depressurize primary circuit to prevent high pressure core melt
 - Prevent hydrogen explosions
 - Prevent containment overpressure

Prevention of accidents resulting from natural hazards and limiting their consequences

Recommendation no. 4:

- Measures for prevention of accidents and limitation of their consequences in case of extreme natural hazards should be implemented



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IN PROGRESS

Prevention of accidents resulting from natural hazards and limiting their consequences

- Typical measures:
 - **Bunkered equipment** including instrumentation and communication means
 - **Mobile equipment** protected against extreme natural hazards
 - **Emergency response centers** protected against extreme natural hazards and radioactive releases
 - **Rescue teams** and equipment rapidly available to support local operators

Follow-up

- National regulators developed national Action Plans by the end of 2012
- ENSREG Workshop to discuss national action plans in March 2013
- WENRA has developed guidance
- Nuclear Safety Directive was amended
- Improvements of Offsite emergency arrangements
- Another workshop to be held in Spring 2015

WENRA Guidance

- Focuses on developing actions in the following:
 - natural hazards
 - containment and severe accident
 - accident management
 - mutual assistance amongst regulatory bodies in responding to nuclear accidents in one of its Member States
- Reviewed PSR related Reference Levels, particularly with respect to external hazards.

Off-site emergency preparedness

- Development of improved guidance on mutual assistance between regulators
 - Harmonization of off-site responses (HERCA+WENRA)

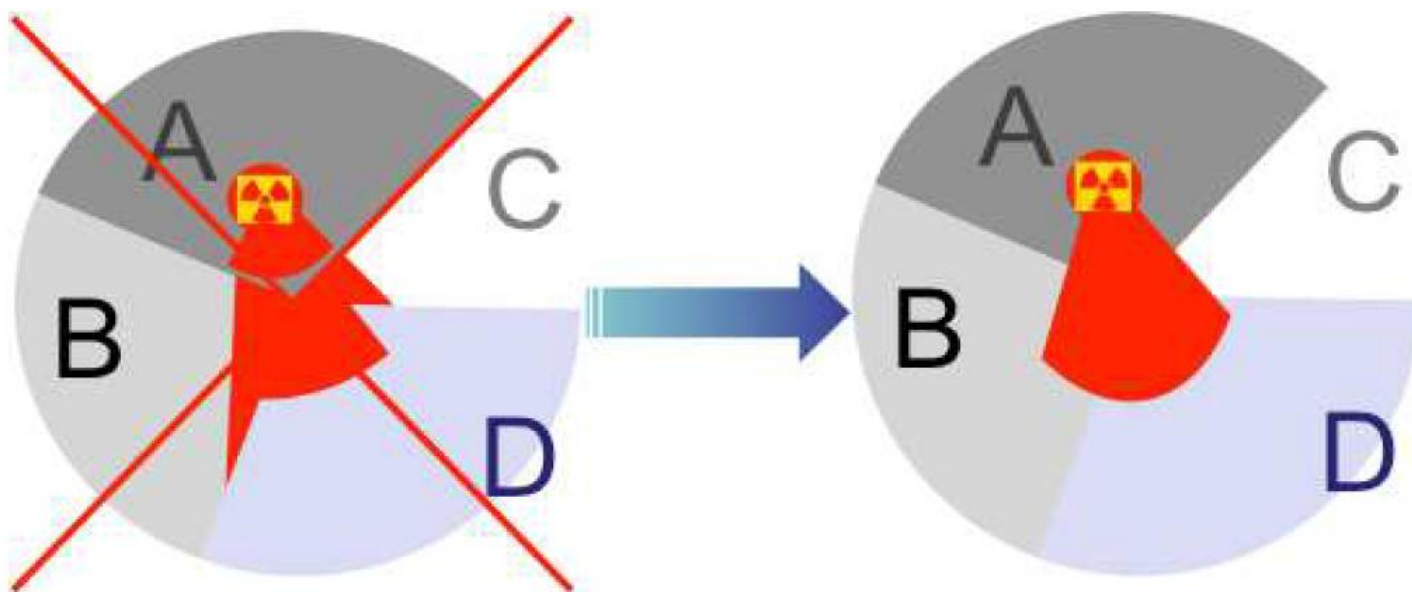



Figure from

HERCA
Heads of the European Radiological
protection Competent Authorities

 **Figure 1:** Country A has a nuclear emergency close to the borders of three other countries. All four countries are affected. Each country decides on a particular protective action individually. The protective action applies to the areas marked in red, for each country. The aim is to align protective actions.



For the end:

Maintaining proper focus

Stress Tests were about the

- **design of plants and**
- **mitigation of accidents.**

Equally or more important is

- **operational safety.**

**The focus of operators and regulators
must be properly balanced between
these three cornerstones of nuclear
safety!**



Japanese Lesson

“What must be admitted – very painfully – is that this was a disaster “Made in Japan.” Its fundamental causes are to be found in the ingrained conventions of Japanese culture:

- our **reflexive obedience**;
- our **reluctance to question authority**;
- our **devotion to ‘sticking with the program’**;
- our **groupism**; and
- our **insularity”**

Kiyoshi Kurokawa, Chairman

Fukushima Nuclear Accident Independent Investigation Commission

June 2012



- Each of us must keep looking for:
 - Weak “ingrained conventions of **our own cultures**”,
 - Weaknesses in our behavior or
 - Any other potential root cause of severe accidents

- Non-complacency and **continuous improvement** are prerequisites for the **good Safety Culture**