Comprehensive risk and safety assessments of nuclear power plants (EU Stress Tests) as a follow-up to the Fukushima accident

Peer Review

Practical arrangements

Host Country

1. INTRODUCTION

In the wake of the Fukushima accident in 2011, Europe has taken the lead in carrying out comprehensive risk and safety assessments ("Stress Tests") of Nuclear Power Plants (NPPs) to assess how they can withstand extreme external events.

The final results of the EU Stress Tests have provided important technical insights for safety improvements. Work is underway to implement the changes in all 17 participating countries (15 EU countries and 2 non EU countries, namely Switzerland and Ukraine) over the next years in order to achieve a higher standard of nuclear safety. One other EU neighbouring country (Armenia) joined the same process at a later stage and is currently starting to implement the safety improvements identified during its Stress Test review.

The EU Stress Tests have been carried out in a transparent manner and the results were actively shared[1], in the interests of our citizens and a stronger global safety culture.

Since the beginning, the stress tests have been carried out on a voluntary basis. The main spirit of the stress tests and the peer review exercise is based on proportionality, equal treatment of the participants and mutual interest in learning from each other to contribute to a more robust and solid nuclear safety framework worldwide.

Regarding non EU countries, in the European Council's conclusions of 24-25 March 2011[2], it is noted:

"[…] the safety of all EU nuclear plants should be reviewed, on the basis of a comprehensive and transparent risk and safety assessment ("stress tests"); the European Nuclear Safety Regulatory Group (ENSREG) and the Commission are invited to develop as soon as possible the scope and modalities of these tests […]

- the priority of ensuring the safety of nuclear plants obviously cannot stop at our borders;

the EU will request that similar "stress tests" be carried out in the neighbouring countries and worldwide, regarding both existing and planned plants; in this regard full use should be made of relevant international organisations;

- the highest standards for nuclear safety should be implemented and continuously improved in the EU and promoted internationally;

- […] The Commission is invited to reflect on how to promote nuclear safety in neighbouring countries; […]".

In addition, according to the Joint Declaration/Press Statement published in June 2011[3] "*As an outcome of the meeting of 23 June 2011 with Commissioner Oettinger, Deputy Ministers of Energy and senior representatives of the Ministries of Energy and national authorities responsible for nuclear energy of the Republic of Armenia, Republic of*

[1] http://www.ensreg.eu/EU-Stress-Tests/Country-Specific-Reports
[2] https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/120296.pdf
[3] https://ec.europa.eu/energy/sites/ener/files/documents/20110623_stress_test_joint_declaration_eu_neighbouring_countries.pdf

Belarus, Republic of Croatia, Russian Federation, Swiss Confederation, Republic of Turkey, Ukraine, in cooperation with the EU:

- *Confirm their willingness to undertake (if this has not yet been done) on a voluntary basis comprehensive risk and safety assessments ('stress tests'), taking into account the specifications agreed by the European Commission and the European Nuclear Safety Regulators Group (ENSREG) on 24 May 2011. The need for a consistent approach towards nuclear safety by all countries making use of nuclear energy is reinforced by today's shared vision that highlights the potential cross-border nature of nuclear accidents;*
- *Agree to commit nuclear operators to self-assessments of their nuclear power plants, as well as to invite national regulatory bodies to present national reports, and to make use of a transparent peer-review system enhancing credibility and accountability of the comprehensive risk and safety assessments;[…]".*

The European Commission ('the COM') has always indicated its willingness to support the peer review process in collaboration with ENSREG when a country is ready to conduct such a process. Following this approach, Stress Test peer review exercises were organised in Taiwan in 2013 and in Armenia in 2016.

However, even if the technical specifications which define the scope of the process were, and will in the future, be the same for all countries which are participating to a peer review process[4], the practical organisation of a single exercise for one country is by nature different from the simultaneous organisation of a peer review in 17 countries in 2012. The practical organisation could require also some adaptations to take into account whether a country subjected to the peer review is an embarking country or not and whether it is an EU country or not.

2. SCOPE AND GENERAL PRINCIPLES

2.1. Scope of the stress test

As indicated in the Stress Tests final report published in 2012 *"ENSREG initially defined a "stress test" as a targeted reassessment of the safety margins of nuclear power plants in the light of the events which occurred at Fukushima: extreme natural events challenging the plant safety functions and leading to a severe accident..."*[5]

The technical scope of *the stress test* is defined in the "EU Stress Tests specifications" published by ENSREG on 31 May 2011 (http://www.ensreg.eu/node/289/)[6] and in particular in the section "Technical scope of the "stress test" (page 4 of the "EU Stress Tests specifications") and includes 3 main topics.

[4] http://www.ensreg.eu/node/352/
[5] http://www.ensreg.eu/sites/default/files/EU%20Stress%20Test%20Peer%20Review%20Final%20Report_0.pdf (page 7 of the document).
[6] Using the document prepared in 2011 for the EU Stress Tests peer review will ensure a full consistency of this peer review exercise with the one conducted in EU countries in 2012

- Topic 1: Initiating events: earthquakes, flooding and extreme weather conditions,
- Topic 2: Loss of safety systems: issues related to loss of power or ultimate heat sink; or a combination of both, as a consequence of any event, and
- Topic 3: Severe accident management (SAM)

2.2. Objective of the peer review

The main objective of the peer review is to ensure credibility and accountability of the comprehensive risk and safety assessments. Nuclear safety should be enhanced in a consistent way by providing the licensee and the national regulator with new insights on the need for improvements.

In addition, the peer review should:

- Provide an international, third line complementary assessment (in addition to the assessment conducted by the licensees and national regulators) to ensure that no important issues have been overlooked as concerns the "stress test" topics.
- Give information to the national regulator and the licensee for consideration of any further potential improvements or good practices that may have been identified from the reviews of the national reports in 2012 or later[7].
- Produce outputs that are reasonable, implementable within the scope of the Stress Test

2.3. General principles

2.3.1. Voluntary basis

The stress test in the Host Country "HC" is carried out on a voluntary basis.

2.3.2. Prime responsibility of the licensee

The licensee has the prime responsibility for safety. Hence, it is up to the licensee to perform the reassessments ('the stress test'), and to the regulatory bodies to independently review them.

2.3.3. Openness and transparency

The national regulatory authority of the HC shall be guided by the "principle for openness and transparency" as adopted by ENSREG in February 2011.

Details regarding transparency are described in the Working Paper "Transparency of "Stress Test" (http://www.ensreg.eu/node/349/).

[7] http://www.ensreg.eu/NODE/513

Namely, at the national level, the HC nuclear safety regulator should consider how to engage the public by organizing a structured and comprehensive information process.

The national report shall be made available to the public in accordance with national legislation and international obligations and commitments as well as contractual obligations assumed by the HC to third parties, provided that this does not jeopardise other interests, such as security, recognised in national legislation or international obligations.

The report from the utility should be made available to the public except where the disclosure of certain parts of the documents would adversely affect national security.

Other stakeholders (including those from non-nuclear fields, from non-nuclear organisations, etc.) should have the possibility to ask questions through the ENSREG Website during the peer review process. The national report and the questions/answers, should be made available on a dedicated sub site of the ENSREG website.

In any case the final results of the peer review (including the Peer Review Report) shall be made public on the ENSREG website.

2.3.4. Access to necessary information

In order to guarantee the rigor and the objectivity of the peer review, the national regulator under review gives the Peer Review Team ('PRT') access to all necessary information, staff and facilities to support the Peer Review exercise, subject to the required security clearance procedures, to enable the team to discharge its duties, within the limited time available.

3. PEER REVIEW'S ORGANISATION AND PROCESS, MAIN ACTORS AND OUTPUT

3.1. The stress test phases

The stress test peer review process for the **Host Country ('HC')** is organised in three phases:

- **Self-assessment by nuclear operator**. The nuclear operator in the HC is asked by the HC Nuclear Regulatory Authority to produce a "Stress Test" report containing the information and following the format described in the EU "Stress specifications" (pages 5-14).
- **Review of the self-assessment by HC Nuclear Regulatory Authority**. The national regulator reviews the information supplied by the operator ("Stress Test" report) and prepares a National Report for the nuclear power plant(s) concerned. The National Report contains the information and follows the format described in the document "Post Fukushima Stress Tests - Contents and Format of National Reports" published by ENSREG on 5 December 2011 (http://www.ensreg.eu/node/351/)

- **Peer review of the HC National Report by the Peer Review Team "PRT"**. The peer review includes a "desktop review" of the National Report (and of NPP's operator report except for the parts where the disclosure would adversely affect national security), involving an exchange of written Questions/Answers between the PRT and the HC national regulator, as well as a country visit.

  The country visit includes a site visit to the HC NPP(s) (subjects to the provisions of clause 2.3.4). The peer review is conducted by the PRT. This country visit (lasting one week) is foreseen to take place between the XXX and the XXX [exact dates will be fixed between the COM/ENSREG and the HC].

3.2. Peer review timeframe and main milestones

The main timeframe and milestones for the peer review exercise for a single country are the following[8]:

- **Letter from the HC to the COM and to ENSREG confirming its willingness to start the stress test peer review process, including the date of submission of the self assessment by the HC National Regulatory Authority (T0)**
- Call to ENSREG Members for candidates for the Peer Review Board and PRT: T0 – 3 months
- Deadline for ENSREG Members to submit candidates: T0 -2 months
- **Establishment of the Peer Review Board and the PRT: T0 - 1 month**
- **Transmission of the HC National Report to ENSREG: T0**
- **"Desktop review" of the HC National Report** on the stress test by the PRT (and potentially also by some additional ENSREG Members) - Pre-meeting between the PRT and representatives from HC **- Questions prepared by PRT and sent to the HC Regulatory Authority: T0 + 3 months**
- **Written replies from the HC Regulatory Authority to PRT: T0 + 4 months**
- The HC **Regulatory Authority** receives, not later than one week before the HC visit starts, the draft Peer Review Report along the topical areas.
- **Peer Review Mission to HC** (the country visit) (1 week, including 1-2 days visit of HC NPP): **T0 + 5 months**
- At the end of the country visit the PRT prepares a preliminary Peer Review Report and presents to the HC regulatory authority (supported if necessary by the nuclear operator and project designer) this preliminary Peer Review Report in the closure meeting. Discussions taking place during the closure meeting are taken into account for the preparation of the final Peer Review Report.
- The **final Peer Review Report**, in which the accuracy of facts is confirmed in discussions with the national regulator, is provided **within two months after the**

[8] The timeframe and milestones are indicative.

visit (T0 + 7 months). The responsibility for the final Peer Review Report remains with the PRT.

- The Peer Review Board presents the final Peer Review Report to the HC during an exit meeting which takes place at the latest 1 months after issuing the final version of the report (T0 + 8 months)
- After the final Peer Review Report has been published, the HC and the COM/ENSREG develop a joint Press Release on the findings of the peer review.

3.3. Main actors

3.3.1. Peer Review Board

The Peer Review Board provides appropriate leadership and supervises the peer review process. The board is composed of 5 members. The PRB elects its own Chair and Vice Chair. The board supervises the entire peer review process, ensuring that preparatory activities and the technical review are undertaken with appropriate rigour. The responsibilities, membership and composition of the board are defined in Annex I. A secretariat, supplied by the COM, provides administrative support to the board.

3.3.2. Peer Review Team

The PRT of experts consists of 1 Team Leader, 1 deputy Team Leader, 1 Rapporteur, 3-4 experts for Topic 1 (Extreme external initiating events), 3-4 experts for Topic 2 (safety functions and design issues) and 3-4 Experts for Topic 3 (Severe Accident Management).

The team is composed of 11-14 experts coming from nuclear and non-nuclear EU Member States , and EU Stress Tests participating neighbouring counties[9] as well as 2 officials from the COM (from DG ENER and DG JRC (1 expert and the rapporteur)).

The responsibilities, membership and composition of the PRT are defined in Annex I.

NB: The HC subjected to the review has to agree to the PRT composition.

3.3.3 Observers

The PRT may be extended to experts from third countries regulatory authorities (including vendor country) or international organisations (including the IAEA) who participate as observers. To maintain a manageable team the maximum number of observers is limited to 5.

The responsibilities of Observers are defined in Annex I.

3.3.4 Peer Review secretariat

The Peer Review secretariat is composed of a team of COM officials (DG ENER) and its task is to support the organisation of the peer review process.

The responsibilities of the secretariat are defined in Annex I.

[9] i.e. Switzerland, Ukraine and Armenia

3.4. Interface with the Host Country

The HC appoints a Single Point of Contact ('SPOC') for the Peer Review secretariat for the joint preparation of the peer review and other associated activities during and after the peer review itself.

A list of other contact points for the different chapters of the National Report will also be provided as per Annex III of this document.

The detailed roles of the HC SPOC and Peer Review secretariat are defined in Annex I.

3.5. Venue

The "desktop review" phase is performed by the PRT from their own offices. The main place of the peer review mission to HC is decided in coordination between the HC SPOC, the COM/ENSREG and the peer review Team Leader ('TL'). Typically, it is at the NPP site (if convenient and judged relevant) and at the premises of the national nuclear regulatory authority. The place of the review should allow easy access to the necessary documentation and experts during the review.

3.6. Language

The main working language is English during the "desktop review" and during the country visit (another language e.g. Russian can be used to facilitate exchanges during the peer review process). Documents will be translated orally to English by counterparts when necessary and, in case of important information, the translation shall be documented in a counter-signed written version.

3.7. Office support at the meeting place

3.7.1. Secretarial services

The HC provides one secretary who provides administrative support to the PRT during the mission, including for Word processing and copying assistance, when needed. The secretary should be fluent in English and be subject to the confidentiality agreement.

3.7.2. Office space, supplies, and equipment

The HC provides, at the meeting place, at least:

- Work spaces for the PRT (experts, rapporteur, TL) and secretaries. Distance between the different work spaces should be minimal.
- PRT meeting space with projector and PC/Laptop with access to wireless LAN and internet access.
- International phone and fax - at least for the TL and the rapporteur.
- Printers / copiers – team and TL.

- A wireless LAN and internet access for team, secretary and HC SPOC of sufficient capacity for internal and external communication.
- Local IT support availability.
- Normal office and stationary supplies, including supplies of printing paper.
- Paper shredder.

3.8. Plant/Country visits

3.8.1. Generalities

During NPP visit, the HC SPOC informs the team members if digital cameras can be used during plant tours. The photographs taken by team members should be made with the only purpose of supporting the peer review process by sharing some information (e.g. equipment exact layout) with other PRT members if the PRT team is split in different groups during the visit

The programme of the visit is finalized at least 4 weeks before the start of the mission.

3.8.2. Information needed for plant access

The HC informs the COM and the PRT about all the data and documents necessary to ensure access of the team members to the NPPs, including, if relevant, radiation exposure, examinations, health certificates, etc. All the necessary data and documents should be collected in advance as needed to ensure a smooth execution of the country visit.

3.9. Output of the peer review

The main output of the peer review exercise is a **Peer Review Report**. An executive summary of the main report is also prepared. This report is complemented by a joint Press Release prepared by the HC and the COM/ENSREG on the findings of the peer review.

The Peer Review Report shall be made public on the ENSREG website as soon as finalised.

The structure of the Peer Review Report should be similar to the structure of the other reports published for the countries which participated to the EU Stress Tests in 2012.[10]

This report includes four chapters and related sub-chapters. These chapters cover the following topics:

- General Quality of National Report and national assessment
- Topic 1: Plant(s) assessment relative to earthquake, flooding and other extreme weather conditions
- Topic 2: Plant(s) assessment relative to loss of electrical power and loss of ultimate heat sink

[10] As an example, the Ukraine's peer review report is available at: http://www.ensreg.eu/node/405

- Topic 3: Plant(s) assessment relative to Severe Accident Management

The Peer Review Report presents further potential improvements or good practices that may have been identified during the review exercise performed in the HC with a view to ensure continuous safety improvement.

The responsibility for the final Peer Review Report remains with the PRT.

4. ENTRY INTO FORCE

These practical arrangements enter into force upon an exchange of letters between the HC and the COM. The letter from the COM should include the final date of the country visit, the list of PRT members and the necessary information to be provided beforehand by the HC.

<u>Annex I:</u> – The role and appointment of the Peer Review Board, Rapporteur, Experts, Secretariat, Observers and HC SPOC

1. Roles:

1.1. Peer Review Board:

The Peer Review Board:

- Provides leadership during the peer review process.
- Provides guidance to officers and participants of the peer review.
- Supervises delivery of the peer review on the NPP's site visit.
- Advises ENSREG on the progress of preparations for the Peer Review with reference to its aims, objectives and plans.
- Presents the results (including the Peer Review Report) to ENSREG.
- Ensures good governance during the peer review process.
- Present final version of the Peer Review Report to the HC

The Chair and Vice Chair supervise the process through Board meetings and by monitoring the work of the PRT (when the Chair considers appropriate). The Chair performs the role of spokesperson to the media and ensures that the results of the peer review are effectively communicated to stakeholders.

1.2. Team Leader

The Team Leader (TL) will plan and manage the delivery of the assigned Peer Review Team's objectives. The Team Leader's responsibilities include:

- Coordination of the "desktop review" of the National Report by the PRT.
- Monitoring and supporting participants to deliver a timely response to comments generated during the "desktop review".
- Development of a detailed programme for the country visit.
- Provision of guidance and leadership to participants of the PRT.
- Chairing the country visit.
- Providing questions to the national report (and if necessary to the nuclear operator report) and analysing the replies provided.
- Preparing the introduction, the conclusion and the executive summary of the Peer Review report.
- Presentation of the preliminary peer review findings to the HC and to the Peer Review Board.

1.3. Experts

The role of the experts appointed to the PRT is to provide authoritative scientific and engineering advice and leadership during the Peer Review process discussions. Responsibilities include:

- Undertaking a "desktop review" of the national report (and of NPP's operator report except for the parts where the disclosure would adversely

affect national security) and in particular of the sections relevant to their field of expertise.
- Providing questions to the National Report and analysing the replies provided.
- Leading discussions during the Peer Review meetings.
- Participation in the country visit.
- Preparation of a presentation summarising the principal findings for the topical area they are assigned to.
- Preparation of a report summarising the situation, good practices and the principal findings for the topical area they are assigned to.

1.4. Rapporteur

The role of the Rapporteur is to record the discussions and findings of the PRT. Responsibilities include:

- Providing support during the "desktop review" (collecting questions, answers, draft peer review report, etc.).
- Assembling a first draft peer review report based on the texts developed by the experts and by the Team Leader.
- Participating in the country visit.
- Recording presentations, discussions and findings of the peer review.
- Finalising the Peer Review Report with the PRT Leader and the experts.

1.5. Observers

The role of the observers is to follow and if necessary, based on their expertise, to contribute the discussions during the country visit.

1.6. Secretariat

The COM (DG Energy) provides a peer review Secretariat. The Secretariat shall assist the Peer Review Board generally and organises for the Peer Review process. Responsibilities include:

- To arrange meetings, circulate documents and make a record of meetings of the Peer Review board.
- To receive and compile the questions from the desktop reviews performed by EU Member State experts and transmit them to the HC SPOC.
- To arrange and manage a facility to receive stakeholder questions via the ENSREG website.
- Issue of invitations, instructions and documents to PR participants.
- Publication of documents/questions on the ENSREG website.
- Generally perform work related to the proper conduct of Peer Review.

1.7. HC Single Point of Contact ('HC SPOC'):

The HC SPOC:

- is the single point of contact for administrative and logistical matters and communicates with the COM on detailed mission arrangements.
- Supports the review team in administrative and logistic needs during the mission.
- Coordinates and supports the formalities needed to allow access of the review team to the NPP of the HC.
- Receives the questions from the desktop reviews and ensures their distribution to the responsible stakeholders.
- Coordinates the technical answers and presentations during the country review.
- Takes care of local transport from/to airport / hotel / place of work / NPP site visits.

2. Appointments:

As soon as a letter from the HC is received by the COM and by ENSREG confirming its willingness to start the nuclear stress test peer review process and indicating a timetable, a call is launched to ENSREG Members for candidates for the Peer Review Board and PRT.

The ENSREG Members have a right (but not the obligation) to propose nominations to serve as experts, PRT Leader, Deputy Team Leader, or board members of the Peer Review.

1. Peer Review Board

The Peer Review Board comprises:

- A Chairperson
- A Deputy Chairperson
- The PRT Leader
- A representative of non-nuclear EU Member States (to follow in particular transparency issues), and
- A representative of the COM.

The appointment of the members of the Peer Review Board has to be agreed by ENSREG and the COM.

The members of the board shall be from EU nuclear regulatory authorities.

The Peer Review Board is appointed 6 months before the date of the peer review country visit. This ensures that the Board is operational providing effective leadership during the preparation and implementation phases of the Peer Review.

2. Peer Review Team

2.1.Team Leader and Deputy Team Leader

The appointment of the PRT Leader has to be agreed by ENSREG and the COM. A Deputy Team Leader is also nominated following the same procedure.

The PRT Leader is appointed 6 months before the Peer review country visit. This ensures that the Team Leader of the Peer Review is operational, providing effective leadership during the preparation and implementation phases of the Peer Review.

The Team Leader and Deputy Team Leader should be from EU nuclear regulatory authorities.

2.2. Experts

3-4 experts would be necessary for each of the 3 topics covered.

Nominations from ENSREG Members, and from EU Stress Tests participating neighbouring counties are reviewed by the PR Board who assigns resources to facilitate a balanced composition of experience and national representation.

1 expert (from DG JRC or DG ENER) is nominated by the COM.

Appointments are confirmed by the Peer Review Board.

The experts are appointed 6 months before the Peer review country visit.

Experts are members of national regulatory authorities (or persons nominated by national regulatory authorities) from nuclear and non-nuclear EU Member States, and participating neighbouring counties with relevant technical qualifications and experience.

2.3.Observers

Observers are proposed by the HC and/or by the COM and/or ENSREG Members or observers. Their appointment will be confirmed by the Peer Review Board.

2.4. Rapporteur

The rapporteur is nominated by the COM.

Annex II: Example of an Agenda for a country visit

HC Stress Test Peer Review
Draft Agenda
1 week

Meetings to take place mainly in the HC Nuclear Regulatory Authority (RA) offices in XXXX and at the HC Nuclear Power Plant (NPP)

DAY	Time	Topic	Location
Monday	09:00 to 12:00	Pre-meeting of the Peer Review Team	Hotel or HC RA offices
	13:00 to 15:00	Meeting with HC RA: Introduction Meeting Presentation of HC National Report Regulatory treatment applied to the actions and conclusions presented in national report	HC RA offices
	15:00 to 18:00	Meeting with experts: Questions/Answers on National Report ;Topical discussions (3 groups)	
Tuesday	09:00 to 18:00	Meeting with experts: Questions/Answers on National Report Topical discussions (3 groups) Preparation of HC NPP visit	HC RA offices
Wednesday	09:00 to 18:00	Meeting with HC RA and utility: Visit of HC Nuclear Power Plant	HC Nuclear Power Plant
Thursday	09:00 to 12:00	Meeting with experts: working in 3 groups on the outcome of the visit of HC NPP	HC RA offices
	13:00 to 18:00	Drafting Peer Review Report	HC RA offices
Friday	09:00 to 12:00	Meeting with HC RA and utility: discussion on the Peer Review Report	HC RA offices
	13:00 to 18:00	Meeting with HC RA Continuation of morning discussions Closure meeting	HC RA offices

Annex III:

Chapter №	Title of chapter	Responsible persons		
		HC RA	HC TSO	HC NPP
Chapter 1	General data about the site and plant			
Chapter 2	Earthquakes			
Chapter 3	Flooding			
Chapter 4	Extreme weather conditions			
Chapter 5	Loss of electrical power and loss of ultimate heat sink			
Chapter 6	Severe accident management			
Chapter 7	Action plan			