BELGIAN STRESS TESTS

FANC

federal agency for nuclear control

National action plan for nuclear power plants

20 December 2012

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1. Introduction

Belgium has always been a pioneering country in the development of nuclear sciences and technologies for peaceful purposes. As such, the country is endowed with seven pressurized water reactors currently in operation on two distinct sites:

- The Doel site, located on the Scheldt river close to Antwerp (Flanders), home of four reactors:
  - Doel 1/2: twin units of 433 MWe each, commissioned in 1975,
  - Doel 3: single unit of 1 006 MWe, commissioned in 1982,
  - Doel 4: single unit of 1 039 MWe, commissioned in 1985.

- The Tihange site, located on the Meuse river close to Liège (Wallonia), home of three reactors:
  - Tihange 1: single unit of 962 MWe, commissioned in 1975,
  - Tihange 2: single unit of 1 008 MWe, commissioned in 1983,
  - Tihange 3: single unit of 1 054 MWe, commissioned in 1985.

Both sites are operated by the same licensee, namely Electrabel, a company of the GDF-SUEZ energy and services Group.

For all nuclear safety related matters, the licensee's activities are under the control of the Belgian regulatory body[1], which is composed of:

- the Federal Agency for Nuclear Control (FANC),
- and Bel V, its technical subsidiary.

As a consequence of the accident that occurred on 11 March 2011 at the Japanese Fukushima-Daiichi nuclear power plant, a wide-scale targeted safety reassessment program was set up among the member states of the European Union operating nuclear power plants.

This "stress tests" program is designed to re-evaluate the safety margins of the European nuclear power plants when faced with extreme natural events (earthquake, flooding and extreme weather conditions) and their potential consequences (loss of electrical power and loss of ultimate heat sink), and to take relevant action wherever needed. The approach is meant to be essentially deterministic, focusing not only on the preventive measures but also on the mitigative measures (severe accident management).

The scope of the Belgian stress tests covers all seven reactor units including the associated spent fuel pools, and the dedicated spent fuel storage facilities at both sites, namely:

- "SCG" building at Doel (dry cask spent fuel storage facility),
- "DE" building at Tihange (wet spent fuel storage facility).

In accordance with the European methodology, the stress tests of the nuclear power plants are performed in three phases:

1. The licensee carries out the stress tests in its facilities and communicates a final report to the Belgian regulatory body (in the present case, one final report per site). In these reports, the licensee describes the reaction of the facilities when facing the different extreme scenarios, and indicates, where appropriate, the improvements that could be implemented to reinforce safety. This phase was achieved by the licensee on 31 October 2011.

2. The regulatory body reviews the licensee's final reports and evaluates the approach and the results. Based on these data, the regulatory body writes its own national report and communicates it to the European Commission. This phase was achieved by the regulatory body on 30 December 2011.

[1] Additional information about the Belgian regulatory body and nuclear facilities is available on the FANC website (http://www.fanc.fgov.be), specifically in the 2010 report for the Convention on Nuclear Safety

3. The report of all national regulatory bodies participating in the stress tests program is subject to an international peer review. The national reports are reviewed by other regulatory bodies representing 27 European independent national Authorities responsible for the nuclear safety in their country. This phase was achieved by ENSREG on 26 April 2012.

The resulting national action plan presented in appendix synthetizes all of the actions undertaken as a result of the stress tests program, and gives the associated timeframe. Until full implementation, this action plan will be updated regularly. The current version presented herein was last updated on 14 December 2012.

Some of these actions may be amended or cancelled if their relevance is questioned by the remaining operating lifetime of the units. This is especially the case for the actions intended for the Doel 1&2 units which will cease operation in 2015 as a result of a decision of the Belgian Federal Government in July 2012.

Likewise, the target dates mentioned in the action plan must be considered as “indicative”, given that some actions might face time constraints due to interaction with other projects, and depend on internal or external resources for supply and implementation on the sites.

Upon demand of the Belgian Federal Government, terrorist attacks (aircraft crash) and other man-made events (cyber-attack, toxic and explosive gases, blast waves) were also included as possible triggering events in the stress tests program for the nuclear power plants. The assessment of these man-made events were however not in the scope of the European stress tests programs, and therefore the actions related to man-made events are not included in the present national action plan.

As part of the Authorities’ transparency policy, this national action plan is made available to the public and media on the Belgian regulatory body’s website (http://www.fanc.fgov.be).

2. References

[1] Centrale nucléaire de Tihange – Rapport des tests de résistance
Electrabel
31 October 2011

[2] Kerncentrale Doel – Rapport weerstandstesten
Electrabel
31 October 2011

[3] Belgian stress tests – National report for nuclear power plants
Federal Agency for Nuclear Control
23 December 2011

[4] Peer review report – Stress tests performed on European nuclear power plants
ENSREG
26 April 2012

[5] Peer review country report – Stress tests performed on European nuclear power plants
ENSREG
26 April 2012

[6] Compilation of recommendations and suggestions – Peer review of stress tests performed on European nuclear power plants
ENSREG
26 July 2012

[7] Final summary report
2nd extraordinary meeting of the contracting parties to the Convention of Nuclear Safety
27-31 August 2012

3. Stress tests national action plan

3.1. National action plan construction process

The national action plan presented in appendix was set up and updated progressively all along the stress tests program, and is still liable to modifications in the next months or years depending on the current situation and perspectives.

Indeed, the licensee's action plan was amended several times to take account of the subsequent requirements and recommendations derived from the on-going stress tests process and implying several interested parties at the national and international levels. Other considerations such as the remaining operation life-time of the units are other inputs that might have a significant influence for the relevance of the planned actions and thus can motivate important changes in the final action plan.

a) Licensee's initial action plan

The needs for safety improvement were first identified by the licensee as a result of the stress tests self-assessment, which led to a series of proposals presented in the licensee's final reports [1][2] released in October 2011. The proposed actions were pursuing the following main objectives:

- Topic 1 (extreme natural events):
    - enhanced protection against external hazards (earthquake, flooding, extreme weather conditions).
- Topic 2 (loss of electrical power and loss of ultimate heat sink):
    - enhanced power supply,
    - enhanced water supply,
    - enhanced operation management (procedures),
    - enhanced emergency management (on-site),
    - non-conventional means (NCM).
- Topic 3 (severe accident management):
    - enhanced protection against severe accidents (SAM).

Overall, the indicative deadlines proposed by the licensee for the implementation of the corresponding actions were in line with the sensitivity of the issues. They also took account of the constraints related to the complexity of the actions, the dependence on internal or external resources for supply and implementation on the sites, and the potential interactions with other projects (especially the "LTO" project aimed at the earliest units).
A number of short-term actions were already implemented by the end of year 2011, and the majority of the remaining actions are to be implemented by the end of year 2013.

b) Regulatory body review

The regulatory body reviewed the licensee's final reports and acknowledged the set of propositions formulated by the licensee. However, the regulatory body identified additional improvement opportunities that were detailed in the national report [3] released in December 2011, and for which relevant actions were expected.
Furthermore, the regulatory body asked the licensee to anticipate the completion of a few specific actions due to their importance for the improvement process.

The licensee's action plan was updated accordingly.
On 15 March 2012, the licensee submitted a detailed consolidated stress tests action plan, including the additional requirements of the regulatory body mentioned in the national stress tests report. In

total, 350 individual actions were identified. The action plan was structured with the following headings:

- family (7 in total, e.g. “External hazards”),
- sub-family (≈ 30 in total, e.g. “Extreme weather conditions”),
- sub-sub-family (≈ 60 in total, e.g. “Heavy rain”),
- pilot,
- deliverable type: “study”, “procedure”, “organization”, “realization”, “training”,
- target deadline.

c) International peer review

The subsequent international peer review of the national stress tests reports, supervised by ENSREG, allowed to draw further learnings not only at the national level but also at the European scale. The aim of the peer review was, among others, to share relevant findings and to benefit from the best practices and insights in order to further improve safety on the field. In this respect, a number of propositions were successively issued by ENSREG in a peer review report [4] and a peer review country report [5] released in April 2012, followed by a compilation of recommendations and suggestions [6] released in July 2012.

The analysis of these documents led to the inclusion of additional entries in the licensee’s action plan wherever applicable. Some of the recommendations derived from other countries were already in force in the Belgian units or scheduled in the action plan and thus did not imply further amendments.

After taking into account the additional actions as a result of the ENSREG peer review, the FANC formally approved on 25 June 2012 the consolidated version of the licensee’s action plan.

d) Current national action plan

The content of the current national action plan results from the successive input sources described above.

Its shape and structure is in compliance with the common template that was released by ENSREG to all participating countries in order to facilitate subsequent peer review and follow-up at the European level. It is made of the three following datasheets:

- “Topics 1 to 3”: This datasheet recalls the recommendations aimed more specifically at the licensee, resulting mainly from the ENSREG peer reviews. For each recommendation, the datasheet shows the order number of the associated actions undertaken by the licensee to fulfil these needs. The field of the actions in question is also specified, referring to “Family”, “Sub-family” and “Sub-sub-family”.

- “Additional topics”: This datasheet recalls the recommendations resulting from the ENSREG peer reviews and the requirements resulting from the stress tests national report, aimed more specifically at the licensee. For each entry, the datasheet shows the order number of the associated actions undertaken by the licensee to fulfil these needs. The field of the actions in question is also specified, referring to “Family”, “Sub-family” and “Sub-sub-family”.

- “Implementation of activities”: This datasheet is directly derived from the licensee’s action plan. All of the actions planned by the licensee are listed and numbered. The actions are sorted by topic (e.g. “External hazards”, “Power supply”, “Emergency management”…) and plant/unit (e.g. “CNT”, “KCD3”…). The number of the related recommendations or requirements on European level or national level is also mentioned for each action in order to ease cross-references with the previous datasheets. Finally, the current status (e.g. “In progress”, “Closed”) and the target date for implementation are mentioned for each action.

The national action plan presented in appendix is dated 14 December 2012, and is subject to subsequent updates until final implementation.

In this regard, one should notice that the licensee intends to achieve about 20 % of its planned actions by the end of year 2012 (i.e. after the release of the current national action plan). Once these actions are completed, a significant part of the licensee's commitment towards safety improvement will become effective. However, this status is not yet reflected in the current version of the national action plan attached in appendix.

3.2. Periodic review process

The national action plan is updated regularly to perform a close follow-up of the status of the different on-going actions.

As most items of the national action plan are derived from the licensee's action plan, the licensee is directly involved in the process to provide the relevant data.

Within the regulatory body, Bel V plays a key role in the monitoring of the licensee's action plan status and progress. The FANC is obviously involved but on a higher level.

The review process consists of three types of periodic meetings:

- the technical meetings,
- the progress meetings,
- the contact committee meetings.

The technical meetings are convened on a monthly basis. These meetings deal specifically with technical matters. The licensee and Bel V are the regular attendees to these meetings. The FANC may also participate from time to time, depending on the importance of the issues that will be discussed.

The progress meetings are convened every three or four months. These meetings deal with the status of the licensee's action plan and general topics with cross-cutting issues. In addition to the licensee and Bel V, the FANC also attends these meetings systematically.

The contact committee meetings are convened twice a year. These meetings deal with high-level strategies and issues, such as internal resources, major postponements, etc. The senior management of the licensee, Bel V and the FANC, attend these meetings.

These different types of meetings allow a close follow-up of the licensee's action plan by the regulatory body, with appropriate periodicities according to the level of detail and technicality.

The main decisions involving both parties are recorded in periodic follow-up meeting reports for future reference.

3.3. Implementation and compliance monitoring

The licensee is responsible for the full and proper implementation of its own actions.

Bel V is in charge of the supervision of the licensee's action plan progress, on behalf of the regulatory body. This responsibility implies close monitoring of the implementation process of the licensee's action plan, and checks on the field to confirm the compliance of the actions implemented in the facilities. These data are used to validate the licensee's action plan status.

The items to be closed in the licensee's action plan are proposed by the licensee, with reference to any related document or piece of evidence showing that the action has effectively been implemented. Once prior checks and confirmations have been performed, Bel V can ratify that these actions are indeed considered to be closed and the licensee's action plan is then updated.

3.4. Transparency and public interaction approach

Transparency is a key value of the regulatory body. As such, the national action plan is released in full to the public and media through the FANC website (http://www.fanc.fgov.be).

In addition, a full information file on the stress tests program is available on the FANC website to remind the context and perspectives on a higher level.

Flash messages are also published on the website homepage if important information needs to be released to the public and media.

The public is encouraged to interact with the FANC about the stress tests national action plan, and more generally for all nuclear safety related matters. A single point of contact is available at the FANC to collect and evaluate all demands and provide answers to all relevant requests. Questions can be asked via postal mail, e-mail, telephone, fax, or through the FANC website (http://www.fanc.fgov.be/fr/page/point-de-contact/1056.aspx) by filling an electronic query form.
All relevant questions get an answer within 14 calendar days.

4. Convention on Nuclear Safety

On 27-31 August 2012, the IAEA convened an extraordinary meeting of the Convention on Nuclear Safety intended to review and discuss the lessons learned to date from the Fukushima-Daiichi accident. The debates were held within 6 working groups in charge of delivering their conclusions in topical reports as follows:

- topic 1: external events (earthquake, flooding, extreme weather conditions),
- topic 2: design issues,
- topic 3: severe accident management and recovery (on site),
- topic 4: national organizations,
- topic 5: emergency preparedness and response and post-accident management (off site),
- topic 6: international cooperation.

The debates led to a number of high level safety recommendations [7] aimed for the most part, firstly at the licensee (topics 1 to 3), and secondly at the relevant national authorities (topics 4 to 6).

For the topics 1 to 3, most recommendations were already covered by the planned activities derived from the stress tests program.

The majority of the key issues identified for the topics 4 to 6 are already addressed in Belgium. However, complementary actions were identified through self-assessments conducted as part of the continuous improvement process.

4.1. National organisations

a) Revision of regulations

All the reference levels of the WENRA reactor harmonization group (RHWG) have been incorporated in the Belgian regulations. A Royal decree signed in November 2011 is dedicated to the safety requirements applicable to the nuclear installations. Relevant sections of this regulation concern in particular the design extension of existing reactors, as well as emergency operating procedures and severe accident management guidelines. Furthermore, the FANC is currently drafting regulation proposals about decommissioning and waste and spent fuel storage in order to include the related WENRA reference levels in the national regulations.

b) IRRS mission in Belgium

The FANC has requested an IRRS mission to identify possible improvement opportunities in the organization and activities of the regulatory body. The IRRS mission is expected to be a full scope mission covering all activities of the FANC. In particular, the new “Fukushima” module has been explicitly requested, in order to benchmark the FANC regulatory framework with the latest Fukushima insights in view to identify future improvements if needed.
A “preliminary” self-assessment of the regulatory body was carried out from September 2011 till September 2012. The IRRS mission is scheduled for the end of 2013.

c) Issuance of safety guidance

In close collaboration with Bel V and the Royal Observatory of Belgium, the FANC intends to elaborate a specific guidance for the assessment of the seismic hazard, using deterministic and probabilistic methods and the input data that are available. The international practices will also be considered in the process.
This guidance will then be applied for the seismic design of the new nuclear facilities in Belgium.

d) Research and development

Following the Fukushima accident, Bel V has been involved in several R&D programs related to severe accident (core modelling and melting scenario calculations), and fission products and hydrogen behaviour and management.
The findings of these programs will help improving severe accident management guidelines where applicable.

e) Extensive valorisation of experience feedback

The regulatory body is developing an internal process intended to better benefit from, and contribute to, the national and international experience feedback.
This joint process involving the FANC and Bel V will improve the procedures currently in force and will help the regulatory body to seek, capture and value the relevant data regarding operating experience, research and development findings, evolution of standards and regulations, and other safety related matter.
Wherever relevant, the nuclear operators settled in Belgium will be informed of the learnings resulting from the process, in addition to their own in-house experience feedback system.

4.2. Emergency preparedness and response (off-site)

Following the European stress tests program, ENSREG identified that emergency preparedness should be improved at the European level, and included this subject in its activities. The European Commission ordered specific studies on this issue that will be useful for further orientation. The FANC will actively participate in these activities.

a) Reinforcement of the regulatory body's preparedness

The self-assessment conducted by the regulatory body as part of the preparation of the IRRS mission resulted in the following improvement actions:

- establishment of individual profiles for critical functions within the FANC and Bel V in an emergency situation,
- training and refresher training programs for the involved staff of the regulatory body,
- introduction of procedures for recording and monitoring of the training and the participation to emergency drills, in order to maintain knowledge and skills of the FANC / Bel V staff,
- optimization of the collaboration between the FANC, Bel V and the national coordination and crisis centre.

b) Enhancement of the national crisis organization and structure

Several actions involving the national coordination and crisis centre (CGCCR) were decided to further improve the emergency preparedness with respect to Fukushima-like accidents:

- review and update (where needed) of the procedures and instructions related to CELEVAL (evaluation cell of the CGCCR), to CELMES (measurement cell of the CGCCR), and to the FANC / Bel V internal crisis centre,
- installation of a videoconferencing system at the FANC / Bel V internal crisis centre that will be compatible with those installed in the CGCCR and on nuclear sites,
- introduction of arrangements and mechanisms to provide officials and local authorities with advice and expertise in radiation protection,
- introduction of an information brochure for the intervention staff explaining the concepts and provisions related to radiological emergency, radiation exposure and dose levels.

c) Prior upgrade of the TELERAD national network

The early warning and radiation monitoring network (TELERAD) benefited from a large-scale modernization program in 2010-2011. No specific new action is envisaged with respect to this monitoring network as a result of the Fukushima accident.

4.3. International cooperation

Belgium is actively represented in numerous organizations and cooperation programs, most of them implying activities related to the Fukushima accident.

a) Cooperation at international level

Belgium is a contracting party to the following main international conventions:

- the Convention on Nuclear Safety,
- the Joint convention on the safety of spent fuel management and on the safety of radioactive waste management,
- the Convention on assistance in the case of a nuclear accident or radiological emergency,
- the Paris convention on nuclear third party liability and the Brussels supplementary convention, and subsequent amendments,
- the Convention on early notification of a nuclear accident,
- the European ECURIE system,
- the Convention on physical protection of nuclear material.

The FANC and Bel V are also actively involved in other international activities.
At the IAEA, the FANC is an active member of the CSS, RASSC, WASSC, TRANSSC, NUSSC and the INES advisory committee. The FANC also participates in the steering committee of the OECD NEA and to the activities of the following OECD NEA committees: RWMC, CRPPH, CNRA and CSNI.
Bel V participates to the activities of the following OECD NEA committees and working groups: CNRA, CSNI, NSC, WGIP, WGOE, WGFCS, WGRISK, WGAMA, WGHOF, WGIAGE, WGFSM and various OECD projects.

Bel V is the national coordinator for the incident reporting system (IRS) of the OECD/IAEA, the incident reporting system for research reactors (IRSRR) of the IAEA, and the fuel incident notification and analysis system (FINAS) of the IAEA.
The FANC has a national coordinator for the International nuclear and radiological event scale (INES), allowing the exchange of information on significant events about nuclear safety and radiation protection occurring in all types of industrial facilities.

b) Cooperation at European level

At the European level, the FANC is an active member of the ENSREG regulators' group.

The FANC and Bel V are also members of the WENRA association, and participate to WENRA activities and task forces.

Furthermore, as a recent initiative, the regulatory body (FANC and Bel V) participates to the European clearinghouse on nuclear power plants experience feedback, set up for sharing and analysing international experience feedback at European level.

c) Cooperation at bilateral level

At the bilateral level, the FANC has several agreements in force and extended collaboration with foreign regulatory bodies, in particular with his neighbouring countries (France, the Netherlands and Luxembourg). Among others, this cooperation includes sharing of information, technical meetings, attendance at inspections on the field, and exchange of experts.

Bel V cooperates with other technical safety organizations in the framework of EUROSAFE, ETSON, and has a cooperation agreement with IRSN.

With respect to emergency planning and response, the Belgian provincial authorities are also regularly involved in foreign emergency exercises for the nuclear power plants that are close to the Belgian border.

d) Other initiatives

Belgium participates in the promotion of the stress-tests in the non-European countries.

Belgium also supports the commitment of member states to promote the IAEA action plan.

5. Conclusion

The European stress tests program applied to the Belgian nuclear power plants has pointed out a number of improvement opportunities that could reinforce the robustness of the facilities and increase the licensee's and national authorities' emergency preparedness.

The adequate provisions have been arranged by the licensee in order to fulfil its own commitments towards safety improvement, as well as the additional requirements from the regulatory body, and the complementary recommendations from the European peer review teams.

In the meantime, the national authorities have undertaken additional actions to improve their organization, enhance their response an emergency situation, and continue their cooperation with their counterparts at the international level.

Important decisions related to the national action plan are discussed at senior management level of all interested parties.

The status of the national action plan is updated periodically, and the implementation and compliance of the actions are thoroughly monitored on the field by the regulatory body.

These provisions will ensure an effective and sustained improvement of the safety in the Belgian nuclear power plants with respect to the Fukushima-Daiichi accident.

6. Acronyms

AC	Alternating current
AFW	Auxiliary feedwater system (Doel units)
BAE	Electrical building (Tihange units)
BAN	Nuclear auxiliary building (Tihange units)
BAR	Reactor auxiliary services building (Doel units)
BDBA	Beyond design basis accident
BEST	Belgian stress tests project
BK	Bunker (Doel units)
CAV	Cumulative absolute velocity
CEC	Recirculation system (Tihange units)
CEI	Fire water system (Tihange units)
CGCCR	Centre gouvernemental de coordination et de crise
CMU	Ultimate means circuit (Tihange site)
CNRA	Committee on Nuclear Regulatory Activities (OECD)
CNS	Convention on Nuclear Safety
CNT	Tihange nuclear power plant
CNT1	Tihange nuclear unit #1
CNT2	Tihange nuclear unit #2
CNT3	Tihange nuclear unit #3
CP	Contracting parties (to the Convention on Nuclear Safety)
CRP	Primary cooling circuit (Tihange units)
CRPPH	Committee on radiation protection and public health (OECD)
CSNI	Committee on the safety of nuclear installations (OECD)
CSS	Commission on safety standards (IAEA)
CTP	Spent fuel pool loop system (Tihange units)
CVA	Auxiliary steam system (Tihange units)
CW	Cooling water pipes (Doel units)
DC	Direct current
DE	Building for wet storage of spent fuel (Tihange site)
DEC	Design extension conditions
DUR	Emergency diesel generator (Tihange 1)
EAA	Auxiliary feedwater system (Tihange 2 and 3)
EAS	Safety feedwater system (Tihange 1)
ECR	Emergency control room
EDG	Emergency diesel groups
EDMG	Extensive damage mitigation guidelines
ELIA	High-voltage transmission system operator
ENSREG	European nuclear safety regulators group
EPZ	Emergency planning zone
EP&R	Emergency planning and response
ETSON	European technical support organization network
EU	European Union
FANC	Federal agency for nuclear control
FINAS	Fuel incident notification and analysis system (OECD-IAEA)
FCV	Filtered containment vent
FE	Fire water system (Doel units)
FRG	Function restoration guidelines
GDS	Safety diesel group (Tihange units)
GDU	Emergency diesel group (Tihange 2 and 3)
GNS	Emergency systems building (Doel units)
HOF	Human and organizational factors
IAEA	International atomic energy agency
IAK	Emergency compressed air (Doel units)
INES	International nuclear and radiological event scale (IAEA)
IRRS	Integrated regulatory review service
IRS	Incident reporting system
IRSN	Institut de radioprotection et de sûreté nucléaire

IRSRR	Incident reporting system for research reactors (IAEA)
I&C	Instrumentation and control
KCD	Doel nuclear power plant
KCD1/2	Doel nuclear units #1/2
KCD3	Doel nuclear unit #3
KCD4	Doel nuclear unit #4
LOOP	Loss of off-site power
LTO	Long term operation project
LU	Emergency cooling ponds (Doel site)
LUHS	Loss of ultimate heat sink
MCR	Main control room
MORV	Motor operated relief valve
MWe	Megawatt (electrical power)
MW	Non-degassed demineralized water (Doel units)
NAcP	National action plan
NCM	Non-conventional means
NEA	Nuclear energy agency
NPP	Nuclear power plant
NSC	Nuclear science committee (OECD)
NUSSC	Nuclear safety standards committee (IAEA)
OECD	Organisation for economic co-operation and development
OSART	Operational safety review team
PORV	Pressure operated relief valve
PSA	Probabilistic safety assessment
PSHA	Probabilistic seismic hazard analysis
PWR	Pressurized water reactor
RASSC	Radioprotection safety standard committee (IAEA)
RB	Reactor building
REX	Experience feedback
RG	Regulatory guide
RGB	Reactor building (Doel units)
RHWG	Reactor harmonisation working group (WENRA)
RLE	Review level earthquake
ROB	Royal Observatory of Belgium
RPV	Reactor pressure vessel
RRA	Shutdown cooling system (Tihange units)
RWMC	Radioactive waste management committee
RWST	Refueling water storage tank (Doel units)
R&D	Research and development
SA	Severe accident
SAEG	Severe accident exit guidelines
SAMG	Severe accident management guidelines
SBO	Station black-out
SC	Shutdown cooling system (Doel units)
SCG	Spent fuel container building (Doel site)
SEBIM	Type of pressurizer relief valve
SETHY	Water studies department in the Walloon region
SFP	Spent fuel pool
SG	Steam generators
SHARE	Seismic hazard harmonization in Europe
SP	Spray system of reactor building (Doel units)
SSC	Structures, systems and components
SUR	Emergency system (Tihange 1)
TEPCO	Tokyo electric power company
TPA	Feedwater turbo pump (Tihange 2 and 3)
TPS	Emergency feedwater turbo pump (Tihange 1)
TRANSSC	Transport safety standard committee (IAEA)
TSO	Technical support organization
TUR	Annulus space containment building (Doel units)

UHS	Ultimate heat sink
US NRC	United States nuclear regulatory commission
WANO	Western association of nuclear operators
WASSC	Waste safety standards committee (IAEA)
WENRA	Western European nuclear regulators' group
WENRA RL	WENRA reference levels
WENRA SO	WENRA safety objectives
WGAMA	Working group on analysis and management of accidents (OECD)
WGFCS	Working group on fuel cycle safety (OECD)
WGFSM	Working group on fuel safety margins (OECD)
WGHOF	Working group on human and organisational factors (OECD)
WGIP	Working group on inspection practices (OECD)
WGOE	Working group on operating experience (OECD)
WGRISK	Working group on risk assessment (OECD)
WGIAGE	Working group on integrity of components and structures (OECD)
WOG	Westinghouse owners group

Appendix: stress tests national action plan

Datasheet “Topics 1 to 3”

This datasheet recalls the recommendations aimed more specifically at the licensee, resulting mainly from the ENSREG peer reviews. For each recommendation, the datasheet shows the order number of the associated actions undertaken by the licensee to fulfil these needs. The field of the actions in question is also specified, referring to “Family”, “Sub-family” and “Sub-sub-family”.

N°	ENSREG Topic	Source	ENSREG Peer Review Recommendations and Suggestions	Action description : Family - subfamily - sub-subfamily	Action to be implemented	Comment
1	General	ENSREG compilation of recommendations, xCNS	The peer review Board recommends that WENRA, involving the best available expertise from Europe, develop guidance on natural hazards assessments, including earthquake, flooding and extreme weather conditions, as well as corresponding guidance on the assessment of margins beyond the design basis and cliff-edge effects. Thereby the harmonization of licensing basis methods, the use of deterministic and probabilistic methods, the definition of probabilistic thresholds and clarification of the BDBA/DEC scenarios considered in the safety assessment should be integrated. Further studies should use state-of-the-art data and methods and address trends in hazard data. It should be stated, that safety assessments should benefit from timely operational experience feedback and include organizational and human aspects, and that regulations and regulatory guidance should be regulary updated. In order to avoid blind spots, a peer review of assessments should be considered.	Not applicable (aimed at WENRA)	/	Not applicable (aimed at WENRA)
2	General	ENSREG compilation of recommendations, xCNS	The peer review Board recommends that ENSREG underline the importance of periodic safety review. In particular, ENSREG should highlight the necessity to reevaluate natural hazards and relevant plant provisions as often as appropriate but at least every 10 years. External hazards and their influence on the licensing basis should be reassessed periodically using state-of-the-art data and methods. PSR was identified as one good tool.	Not applicable (aimed at ENSREG)	/	Periodic Safety Reviews have been performed on all Belgian reactor units since the start of operation.
3	General	ENSREG compilation of recommendations, xCNS	Urgent implementation of the recognised measures to protect containment integrity is a finding of the peer review that national regulators should consider.	Operation management - Reactor building - Reactor building overpressure management Power supply - Total Station Black-out - Reactor building confinement Severe accident management - H2 risk - H2 concentration follow-up in reactor building Severe accident management - RB protection - Filtered containment vent	94, 95, 96, 192, 193, 194, 195, 196, 197, 498, 510, 551, 563, 564, 565, 566, 567, 568, 590, 591	Various activities deal with this issue: installment of filtered containment vents on all units, reactor building overpressure management strategies, H2 management,...
4	General	ENSREG compilation of recommendations	Necessary implementation of measures allowing prevention of accidents and limitation of their consequences in case of extreme natural hazards is a finding of the peer review that national regulators should consider.		/	All activities belonging to the topic "external hazards" are related to this recommendation
5	Natural hazards	xCNS	Deterministic methods should form the basis for hazard assessment. Probabilistic methods, including probabilistic safety assessment (PSA), are useful to supplement the deterministic methods.		/	
6	Natural hazards	ENSREG compilation of recommendations, xCNS	Hazard Frequency The use a return frequency of 10E-4 per annum (0.1g minimum peak ground acceleration for earthquakes) for plant reviews/back-fitting with respect to external hazards safety cases.	External hazards - Earthquake - Reevaluation of the seismic hazard regarding Design Basis Earthquake External hazards - Extreme weather conditions - Sewage capacity evaluation External hazards - Flooding - Protection against site flooding	1, 34, 429, 443, 546	

N°	ENSREG Topic	Source	ENSREG Peer Review Recommendations and Suggestions	Action description : Family - subfamily - sub-subfamily	Action to be implemented	Comment
7	Natural hazards	ENSREG compilation of recommendations	Secondary Effects of Earthquakes The possible secondary effects of seismic events, such as flood or fire arising as a result of the event, in future assessments.	External hazards - Earthquake - Impact earthquake on a fuel tank of Tihange 1. External hazards - Earthquake - Risk mitigation of internal flooding from circulation water circuit External hazards - Flooding - Additional means against extreme flooding (pumps, diesel generators,…)	2, 3, 4, 5, 442, 545, 614	
8	Natural hazards	ENSREG compilation of recommendations	Protected Volume Approach The use of a protected volume approach to demonstrate flood protection for identified rooms or spaces.	External hazards - Flooding - Protection against buildings flooding	37, 38, 39, 430, 431, 432	
9	Natural hazards	ENSREG compilation of recommendations	Early Warning Notifications The implementation of advanced warning systems for deteriorating wheather, as well as the provision of appropriate procedures to be followed by operators when warnings are made.	External hazards - Flooding - Internal emergency plan procedures External hazards - Flooding - Procedures in case of flooding	75, 76, 77, 540, 543	
10	Natural hazards	ENSREG compilation of recommendations	Seismic Monitoring The installation of seismic monitoring systems with related procedures and training.	External hazards - Earthquake - Regulatory watch	616	
11	Natural hazards	ENSREG compilation of recommendations	Qualified Walkdowns The development of standards to address qualified plant walkdowns with regard to earthquake, flooding and extreme weather – to provide a more systematic search for non-conformities and correct them (e.g. appropriate storage of equipment, particularly for temporary and mobile plant and tools used to mitigate beyond design basis (BDB) external events).	External hazards - Earthquake - Reinforcement of equipment anchorages	426, 582, 583, 618	
12	Natural hazards	ENSREG compilation of recommendations	Flooding Margin Assessments The analysis of incrementally increased flood levels beyond the design basis and identification of potential improvements, as required by the initial ENSREG specification for the stress tests.			Already implemented
13	Natural hazards	ENSREG compilation of recommendations, xCNS	External Hazard Margins In conjunction with recommendation 1 and 17, the formal assessment of margins for all external hazards including, seismic, flooding and severe weather, and identification of potential improvements. Licensing basis protection against external hazards (e.g. flood seals and seismic supports) should be verified to be effective. Margin assessments should be based on periodic reevaluation of licensing basis for external events considering possible cliff-edge effects and grace periods.			Already implemented
14	Design issues	ENSREG compilation of recommendations, xCNS	Alternate Cooling and Heat Sink The provision of alternative means of cooling including alternate heat sinks.	Water supply - Loss of Main Heat Sink - Backup heat sink Water supply - Total loss of heat sink - Backup heat sink Water supply - Total Station Black-out - Inadvertent let down of the pools	226, 227, 452, 453, 454, 455, 552, 554	Alternate heat sinks exist are available at the Doel and Tihange site (see National report)

N°	ENSREG Topic	Source	ENSREG Peer Review Recommendations and Suggestions	Action description : Family - subfamily - sub-subfamily	Action to be implemented	Comment
15	Design issues	ENSREG compilation of recommendations, xCNS	AC Power Supplies The enhancement of the on-site and off-site power supplies.	Power supply - Total Station Black-out - Implementation of a 380 V emergency electrical grid Power supply - Total Station Black-out - Turbopomp power supply backup Power supply - Varia - Impact of the configuration and operation of High Voltage grid on the auxiliaries of NPP's	503, 550, 97, 98, 99, 100, 480, 481, 482, 483, 484, 485, 492, 493, 598, 599, 600, 609, 610, 611	Both on-site and off-site power supply will be enhanced.
16	Design issues	ENSREG compilation of recommendations, xCNS	DC Power Supplies The enhancement of the DC power supply.	Power supply - Batteries autonomy - Increasing battery autonomy	397, 398, 501, 502, 594, 595	
17	Design issues	ENSREG compilation of recommendations	Operational and Preparatory Actions Implementation of operational or preparatory actions with respect to the availability of operational consumables.	Power supply - EDG autonomy - On-site fuel transport Power supply - EDG autonomy - Procedures to manage the autonomy of electrical diesel generators Power supply - EDG autonomy - Procedures to manage the autonomy of electrical diesel generators in SUR	81, 82, 83, 84, 89, 489	
18	Design issues	ENSREG compilation of recommendations, xCNS	Instrumentation and Monitoring The enhancement of instrumentation and monitoring.	External hazards - Flooding - Additional means against extreme flooding (pumps, diesel generators,…) Power supply - Total Station Black-out - Autonomous generator to recharge the instrumentation Power supply - Total Station Black-out - Spent fuel pools : additional level measurements	64, 65, 104, 105, 106, 176, 177, 178	
19	Design issues	ENSREG compilation of recommendations	Shutdown Improvements The enhancement of safety in shutdown states and mid-loop operation.	Power supply - Total Station Black-out - Reactor building confinement Water supply - Total Station Black-out - Additional means to assure primary water supply	111, 112, 498, 551	Shutdown states and mid-loop operation were considered as initial states in the stress test. Appropriate actions were defined to further enhance safety in these states.
20	Design issues	ENSREG compilation of recommendations, xCNS	Reactor Coolant Pump Seals The use of temperature-resistant (leak-proof) primary pump seals. Study of RCP pump seal leakage following long term AC power failure.	Operation management - Total Station Black-out - Procedures in case of total station black-out	128, 129, 130	

N°	ENSREG Topic	Source	ENSREG Peer Review Recommendations and Suggestions	Action description : Family - subfamily - sub-subfamily	Action to be implemented	Comment
21	Design issues		Ventilation The enhancement of ventilation capacity during SBO to ensure equipment operability.	Power supply - Total Station Black-out - Verification of the feedwater pump in case of loss of ventilation (room temperature)	223, 224, 225, 496, 497	
22	Design issues	ENSREG compilation of recommendations, xCNS	Main and Emergency Control Rooms The enhancement of the main control room (MCR), the emergency control room (ECR) and emergency control centre (ECC) to ensure continued operability and adequate habitability conditions in the event of a station black-out (SBO) and in the event of the loss of DC (this also applies to Topic 3 recommendations). Habitability of control rooms/emergency centers under DEC conditions.			Additional actions are part of the man made events part of the action plan
23	Design issues	ENSREG compilation of recommendations, xCNS	Spent Fuel Pool The improvement of the robustness of the spent fuel pool (SFP).	Operation management - Spent fuel pools - SUR procedures in case of accident in spent fuel pools Power supply - Spent fuel pools - Electrical backup for the cooling pumps Power supply - Spent fuel pools - Procedures to manage spent fuel pools Water supply - Total Station Black-out - Inadvertent let down of the pools Water supply - Total Station Black-out - Water supply of spent fuel pools in case of aircraft crash	88, 91, 146, 147, 148, 456, 556, 596, 597	Additional actions are part of the man made events part of the action plan
24	Design issues	ENSREG compilation of recommendations	Separation and Independence The enhancement of the functional separation and independence of safety systems.			Separation and independence of safety systems is a general design criterion that is used in all design activities.
25	Design issues	ENSREG compilation of recommendations	Flow Path and Access Availability The verification of assured flow paths and access under SBO conditions. Ensure that the state in which isolation valves fail and remain, when motive and control power is lost, is carefully considered to maximise safety. Enhance and extend the availability of DC power and instrument air (e. g. by installing additional or larger accumulators on the valves). Ensure access to critical equipment in all circumstances, specifically when electrically operated turnstiles are interlocked.	Operation management - Total Station Black-out - Procedures in case of total station black-out	128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 490, 491, 592, 593	
26	Design issues	ENSREG compilation of recommendations, xCNS	Mobile Devices The provision of mobile pumps, power supplies and air compressors with prepared quick connections, procedures, and staff training with drills.	Emergency management - Requirements - Specifications of mobile means External hazards - Flooding - Additional means against extreme flooding (pumps, diesel generators,...) Power supply - Total Station Black-out - Implementation of a 380 V emergency electrical grid	60, 61, 62, 63, 97, 98, 99, 400, 436, 480, 481, 482, 515, 542	
27	Design issues	ENSREG compilation of recommendations	Bunkered/Hardened Systems The provision for a bunkered or “hardened” system to provide an additional level of protection with trained staff and procedures designed to cope with a wide variety of extreme events including those beyond the design basis (this also applies to Topic 3 recommendations).			Bunkered systems (containing 2nd level emergency systems) are a standard issue of all Belgian reactor units

N°	ENSREG Topic	Source	ENSREG Peer Review Recommendations and Suggestions	Action description : Family - subfamily - sub-subfamily	Action to be implemented	Comment
28	Design issues	ENSREG compilation of recommendations, xCNS	Multiple Accidents The enhancement of the capability for addressing accidents occurring simultaneously on all plants of the site and consideration of the site as a whole for a multi-units site in the safety assessment.	Emergency management - Multi-unit event and associated organization - Organization and logisitics of internal emergency plan in case of multi-unit event	213, 478, 504, 505, 581	
29	Design issues	ENSREG compilation of recommendations	Equipment Inspection and Training Programs The establishment of regular programs for inspections to ensure that a variety of additional equipment and mobile devices are properly installed and maintained, particularly for temporary and mobile equipment and tools used for mitigation of BDB external events. Development of relevant staff training programmes for deployment of such devices.	Emergency management - Requirements - Harmonization of sites training programs Emergency management - Requirements - Specifications of mobile means External hazards - Flooding - Availability of the additionnal means against extreme flooding	400, 515, 516, 541	
30	Design issues	ENSREG compilation of recommendations	Further Studies to Address Uncertainties The performance of further studies in areas were there are uncertainties. Uncertainties may exist in the following areas: · The integrity of the SFP and its liner in the event of boiling or external impact. · The functionality of control equipment (feedwater control valves and SG relief valves, main steam safety valves, isolation condenser flow path, containment isolation valves as well as depressurisation valves) during the SBO to ensure that cooling using natural circulation would not be interrupted in a SBO. · The performance of additional studies to assess operation in the event of widespread damage, for example, the need different equipment (e.g. bulldozers) to clear the route to the most critical locations or equipment. This includes the logistics of the external support and related arrangements (storage of equipment, use of national defence resources, etc.).	Severe accident management - RB protection - Research & Development for severe accidents	183, 394, 513, 518	
31	Severe accident management	ENSREG compilation of recommendations	WENRA Reference Levels The incorporation of the WENRA reference levels related to severe accident management (SAM) into their national legal frameworks, and ensure their implementation in the installations as soon as possible.			The WENRA reference levels on SAM have already been transposed into the Belgian regulatory framework (Royal Decree of November 30th 2011)
32	Severe accident management	ENSREG compilation of recommendations	SAM Hardware Provisions Adequate hardware provisions that will survive external hazards (e.g. by means of qualification against extreme external hazards, storage in a safe location) and the severe accident environment (e.g. engineering substantiation and/or qualification against high pressures, temperatures, radiation levels, etc), in place, to perform the selected strategies.	Emergency management - Infrastructure - On-site resistant storage for mobile means Emergency management - Requirements - Specifications of mobile means	400, 509, 515, 572, 573	
33	Severe accident management	ENSREG Compilation of Recommendations	Review of SAM Provisions Following Severe External Events The systematic review of SAM provisions focusing on the availability and appropriate operation of plant equipment in the relevant circumstances, taking account of accident initiating events, in particular extreme external hazards and the potential harsh working environment.	Severe accident management - Review SAMG procedures - Review Severe Accident Mitigation Guidelines procedures	189, 190, 191, 631, 632	

N°	ENSREG Topic	Source	ENSREG Peer Review Recommendations and Suggestions	Action description : Family - subfamily - sub-subfamily	Action to be implemented	Comment
34	Severe accident management	ENSREG compilation of recommendations, xCNS	Enhancement of Severe Accident Management Guidelines (SAMG) In conjunction with the recommendation 4, the enhancement of SAMGs taking into account additional scenarios, including, a significantly damaged infrastructure, including the disruption of plant level, corporate-level and national-level communication, long-duration accidents (several days) and accidents affecting multiple units and nearby industrial facilities at the same time.	Emergency management - Multi-unit event and associated organization - Organization and logisitics of internal emergency plan in case of multi-unit event Severe accident management - H2 risk - H2 concentration follow-up in reactor building Severe accident management - Review SAMG procedures - Review Severe Accidents Mitigation Guidelines procedures	189, 190, 191, 192, 193, 194, 213, 478, 504, 505, 581, 631, 632	
35	Severe accident management	xCNS	Analysis of human resources, communication, personnel training and guidance during severe long term accidents (esp. multi-unit) and validation of effectiveness through exercises.	Emergency management - Communications means - On & Off-site backup communications means Emergency management - Requirements - Harmonization of sites training programs	476, 507, 516	Additional actions are part of the man made events part of the action plan
36	Severe accident management	ENSREG compilation of recommendations	SAMG Validation The validation of the enhanced SAMGs.	Severe accident management - Review SAMG procedures - Coherence severe accidents procedures between Doel and Tihange Severe accident management - Review SAMG procedures - Review Severe Accidents Mitigation Guidelines procedures	189, 190, 191, 519, 520, 521, 522, 631, 632	SAMG are validated as part of the PSR process
37	Severe accident management	ENSREG compilation of recommendations	SAM Exercises Exercises aimed at checking the adequacy of SAM procedures and organisational measures, including extended aspects such as the need for corporate and nation level coordinated arrangements and long-duration events.	Severe accident management - Review SAMG procedures - Coherence severe accidents procedures between Doel and Tihange Severe accident management - Review SAMG procedures - Review Severe Accidents Mitigation Guidelines procedures	189, 190, 191, 519, 520, 521, 522, 631, 632	
38	Severe accident management	ENSREG compilation of recommendations	SAM Training Regular and realistic SAM training exercises aimed at training staff. Training exercises should include the use of equipment and the consideration of multi-unit accidents and long-duration events. The use of the existing NPP simulators is considered as being a useful tool but needs to be enhanced to cover all possible accident scenarios.	Severe accident management - Review SAMG procedures - Coherence severe accidents procedures between Doel and Tihange Severe accident management - Review SAMG procedures - Review Severe Accidents Mitigation Guidelines procedures	189, 190, 191, 519, 520, 521, 522, 631, 632	
39	Severe accident management	ENSREG compilation of recommendations	Extension of SAMGs to All Plant States The extension of existing SAMGs to all plant states (full and low-power, shutdown), including accidents initiated in SFPs.	Severe accident management - Review SAMG procedures - Review Severe Accidents Mitigation Guidelines procedures	189, 190, 191, 631, 632	
40	Severe accident management	ENSREG compilation of recommendations	Improved Communications The improvement of communication systems, both internal and external, including transfer of severe accident related plant parameters and radiological data to all emergency and technical support centre and regulatory premises.	Emergency management - Communications means - On & Off-site backup communications means External hazards - Flooding - Additional means against extreme flooding (pumps, diesel generators,…) External hazards - Flooding - Procedures in case of flooding	43, 50, 57, 476, 507, 543	

N°	ENSREG Topic	Source	ENSREG Peer Review Recommendations and Suggestions	Action description : Family - subfamily - sub-subfamily	Action to be implemented	Comment
41	Severe accident management	ENSREG compilation of recommendations, xCNS	Presence of Hydrogen in Unexpected Places The preparation for the potential for migration of hydrogen, with adequate countermeasures, into spaces beyond where it is produced in the primary containment, as well as hydrogen production in SFPs.	Severe accident management - H2 risk - H2 concentration follow-up in reactor building Severe accident management - H2 risk - H2 risk management in nuclear auxiliary building	192, 193, 194, 201, 202, 203, 512, 607	
42	Severe accident management	ENSREG compilation of recommendations	Large Volumes of Contaminated Water The conceptual preparations of solutions for post-accident contamination and the treatment of potentially large volumes of contaminated water.	Emergency Management - Multi-unit event and associted organization - Post accident fixing of contamination and the treatment of potentially large volumes of contaminated water	633,634	
43	Severe accident management	ENSREG compilation of recommendations	Radiation Protection The provision for radiation protection of operators and all other staff involved in the SAM and emergency arrangements.	Emergency management - Multi-unit event and associated organization - Complementary means for radiological surveillance Severe accident management - Radiological release - Leak path identification	172, 392, 477, 523, 524, 574, 575	
44	Severe accident management	ENSREG compilation of recommendations	On Site Emergency Center The provision of an on-site emergency center protected against severe natural hazards and radioactive releases, allowing operators to stay onsite to manage a severe accident.	Emergency management - Infrastructure - Site operation center in the new Access Control Building	171	Additional actions are part of the man made events part of the action plan
45	Severe accident management	ENSREG compilation of recommendations	Support to Local Operators Rescue teams and adequate equipment to be quickly brought on site in order to provide support to local operators in case of a severe situation.	Emergency management - Multi-unit event and associated organization - Optimization and storage of mobile means Emergency management - Multi-unit event and associated organization - Organization and logisitics of internal emergency plan in case of multi-unit event	213, 478, 504, 505, 581, 479, 560	
46	Severe accident management	ENSREG compilation of recommendations	Level 2 Probabilistic Safety Assessments (PSAs) A comprehensive Level 2 PSA as a tool for the identification of plant vulnerabilities, quantification of potential releases, determination of candidate high-level actions and their effects and prioritizing the order of proposed safety improvements. Although PSA is an essential tool for screening and prioritising improvements and for assessing the completeness of SAM implementation, low numerical risk estimates should not be used as the basis for excluding scenarios from consideration of SAM especially if the consequences are very high.			A level 2 PSA model is available for the Belgian units
47	Severe accident management	ENSREG compilation of recommendations	Severe Accident Studies The performance of further studies to improve SAMGs.	Severe accident management - RB protection - Research & Development for severe accidents	183, 394, 513, 518	
48	Severe accident management	xCNS	Containment venting for new NPPs	Not applicable	/	

Datasheet “Additional topics”

This datasheet recalls the recommendations resulting from the ENSREG peer reviews and the requirements resulting from the stress tests national report, aimed more specifically at the licensee. For each entry, the datasheet shows the order number of the associated actions undertaken by the licensee to fulfil these needs. The field of the actions in question is also specified, referring to “Family”, “Sub-family” and “Sub-sub-family”.

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
1	Natural hazards (earthquake)	ENSREG country peer review report	Probabilisitc seismic hazard analysis It is recommended that the national regulator monitors the completion of the updated PSHA related to the seismic hazard, the implementation of the consequential measures and the updated assessment of safety margins. These updates may benefit from a harmonization of the seismic hazard assessment on an international level. Experience exchange, namely among the neighbouring countries is recommended, in order to avoid discrepancies for sites with comparable seismic activity.	External hazards - Earthquake - Reevaluation of the seismic hazard regarding Design Basis Earthquake	1, 429	§ 2.1.3 of country peer review report.
2	Natural hazards (earthquake)	ENSREG country peer review report	Seismic instrumentation The seismic instrumentation which was observed during the plant visit appeared to offer an opportunity for improvement with respect to the number of accelerometers and to the evaluation procedure. An immediate evaluation of the recorded signals, allowing the comparison of response spectra with the design basis spectra and a direct access to this information is recommended in order to facilitate and to accelerate the measures to be initiated after a seismic event.	External hazards - Earthquake - Regulatory watch	616	§ 2.1.3 of country peer review report.
3	Natural hazards (flooding)	ENSREG country peer review report	Safety improvements Regarding the protection against external flood for the Tihange site, it is recommended that the national regulator should focus on the implementation of all safety improvements proposed by the licensee, as well as those prescribed by the regulator.	External hazards - Flooding - Internal emergency plan procedures External hazards - Flooding - Procedures in case of flooding External hazards - Flooding - Protection against buildings flooding External hazards - Flooding - Protection against site flooding	34, 37, 38, 39, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77,	§ 2.2.3 of country peer review report.
4	Natural hazards (flooding)	ENSREG country peer review report	Safety improvements Regarding the protection against external flood for the Doel site, it is recommended that the national regulator monitor the implementation of the measures proposed in the action plan.	External hazards - Flooding - Protection against buildings flooding External hazards - Flooding - Protection against site flooding	430, 431, 432, 433, 434, 435,	§ 2.2.3 of country peer review report.
5	Natural hazards (weather)	ENSREG country peer review report	Extreme weather conditions, With respect to extreme weather conditions, the derivation of design basis parameters with 10,000 years return periods is recommended to be considered.	External hazards - Extreme weather conditions - Confirmation of resistance to tornadoes External hazards - Extreme weather conditions - Sewage capacity evaluation	441, 443, 546, 547	§ 2.3.3 of country peer review report.
7	Design issues	ENSREG country peer review report	Autonomy of safety systems The peer review team recommends Belgian regulatory body to take into consideration the benefits of the increasing (up to at least 72 hours) of the autonomy of the emergency diesel generators of the 2nd level safety systems at Tihange 1 for events determined by design basis earthquake, possibly by enhancing the robustness of the CVA B01Hc fuel tank to design basis earthquake.	External hazards - Earthquake - Impact earthquake on a fuel tank of Tihange 1.	614	§ 4.3 of country peer review report.

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
8	Design issues	ENSREG country peer review report	Venting system The preliminary study for the filtered venting system on each unit to be finished in 2012 should consider sub-atmospheric pressures in the containment.	Severe Accidents management - RB protection - Filtered containment vent	195, 196, 197, 510, 563, 564, 565, 566, 567, 568	§ 3.3 of country peer review report.
9	Design issues	ENSREG country peer review report	Hydrogen in SFP buildings Regardless of the outcome of the assessment of the residual risk of hydrogen generation and accumulation in the spent fuel pool buildings, the installation of PARs should be considered.	Severe Accidents management - H2 risk - H2 risk management in nuclear auxiliary building	201, 202, 203, 512, 607	§ 4.3 of country peer review report.
10	Emergency preparedness and response	ENSREG country peer review report	Severe accident management The additional measure by the regulatory body to increase the consistency between Tihange NPP and Doel NPP of the emergency training and refresher training programs should be broadened to the total concept for severe accident management (hardware provisions, procedures and guidelines) as much as possible.	Emergency management - Requirements - Harmonization of sites training programs	516	§ 4.3 of country peer review report.
11	Natural hazards (earthquake)	National regulatory inspection	Seismic margin assessment For all weaknesses identified during the walkdowns (SSC assessed as having a “low” probability of preserving their integrity and performing their function in an earthquake exceeding the RLE), the licensee shall provide a detailed action plan containing actions taken and actions planned. This also applies to the feasibility study on reinforcement of the electrical building (“BAE”) at Tihange 1.	External hazards - Earthquake - Reinforcement of equipments anchorages External hazards - Earthquake - Reinforcement of the electrical auxiliary building	7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 536, 622, 623, 624	§ 7.2.1 of national stress tests report
12	Natural hazards (earthquake)	National regulatory inspection	Probabilisitc seismic hazard analysis The licensee should carry out a more elaborated PSHA study with due consideration of (1) other elements such as the use of a more recent ground-motion prediction equation or such as a cumulative absolute velocity (“CAV”) filtering, (2) external reviews by international experts and (3) results arising from other studies such as the EC-project SHARE (seismic hazard harmonization in Europe).	External hazards - Earthquake - Reevaluation of the seismic hazard regarding Design Basis Earthquake	1, 429	§ 7.2.1 of national stress tests report
13	Natural hazards (earthquake)	National regulatory inspection	Seismic interactions The licensee must continue its efforts towards fostering awareness of potential seismic interaction inside the facilities. In particular, thorough attention must be paid to the strict application of the relevant procedures to avoid the interactions of scaffoldings with SSC that are seismically qualified.	External hazards - Earthquake - Sensibilization campagn to seismic alertness	428, 538	§ 7.2.1 of national stress tests report
14	Natural hazards (flooding)	National regulatory inspection	Safety margins The licensee shall include a safety margin for the first level of defense to adequately cover uncertainties associated with a 10,000-year flood (the wall of the peripheral protection should thus be designed higher than the flood level associated with a 10,000-year flood).	External hazards - Flooding - Protection against site flooding	539	Tihange NPP only § 7.2.2 of national stress tests report

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
15	Emergency preparedness and response	National regulatory inspection	Emergency preparedness For the flooding risk, further improvement of the emergency preparedness strategy and organization, including corresponding procedures, should be implemented by mid 2012.	External hazards - Flooding - Procedures in case of flooding	540	Tihange NPP only § 7.2.2 of national stress tests report
16	Design issues	National regulatory inspection	Non conventional means Since the non conventional means (CMU - Ultimate means circuit) is currently needed for floods exceeding the “reference flood” of 2615 m³/s (i.e., floods with return periods exceeding 100 to 400 years), the licensee should determine	Emergency management - Requirements - Specifications of mobile means External hazards - Flooding - Availability of the additionnal means against extreme flooding	400, 515, 541	Tihange NPP only § 7.2.2 of national stress tests report
17	Design issues	National regulatory inspection	Power supply The currently implemented alternate power sources for I&C systems and emergency lighting should be further improved, where needed, and the sufficiency of available or recovered I&C equipment to safely control the three units should be checked	External hazards - Flooding - Additional means against extreme flooding (pumps, diesel generators,…) Power supply - Total Station Black-out - Autonomous generator to recharge the instrumentation	176, 177, 178, 542	Tihange NPP only § 7.2.2 of national stress tests report
18	Design issues	National regulatory inspection	Non conventional means The technical characteristics of these non-conventional means (NCM) should account for the adverse (weather) conditions they may be subject to during the whole period of operation. If this is not covered by design, an appropriate protection or compensatory strategy should be developed.	Emergency management - Infrastructure - On-site resistant storage for mobile means Emergency management - Requirements - Specifications of mobile means	400, 509, 515, 572, 573	Tihange NPP only § 7.2.2 of national stress tests report
19	Emergency preparedness and response	National regulatory inspection	Flooding alert system The flooding alert system, which is based on a direct communication between the regional service competent for forecasting river flow rates in the Meuse basin (SETHY, making use of a dedicated forecasting system) and the NPP (with Tihange 2 being the single point of contact and responsible for warning Tihange 1 and Tihange 3), is a crucial factor. Therefore, its robustness and efficiency should be further improved. In particular:	External hazards - Flooding - Procedures in case of flooding	543	Tihange NPP only § 7.2.2 of national stress tests report
20	Emergency preparedness and response	National regulatory inspection	· the protocole between the NPP Tihange and SETHY should be formalized as soon as possible.	External hazards - Flooding - Procedures in case of flooding	543	Tihange NPP only § 7.2.2 of national stress tests report
21	Emergency preparedness and response	National regulatory inspection	· the licensee should pursue regular tests of the secured communication channels and transmitted data (i.e., on-line measurements and predictions of river flow rates).	External hazards - Flooding - Procedures in case of flooding	543	Tihange NPP only § 7.2.2 of national stress tests report
22	Emergency preparedness and response	National regulatory inspection	· the licensee should organize emergency preparedness exercises involving both the NPP and SETHY personnel.	External hazards - Flooding - Procedures in case of flooding	543	Tihange NPP only § 7.2.2 of national stress tests report
23	Emergency preparedness and response	National regulatory inspection	· criteria used to launch the internal emergency plan and to start the “alert phase” and associated actions should be unambiguously defined in the applicable emergency procedures.	External hazards - Flooding - Procedures in case of flooding	543	Tihange NPP only § 7.2.2 of national stress tests report

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
24	Emergency preparedness and response	National regulatory inspection	On-site transport Means for on-site transport of personnel and equipment towards the units, inside the units, or from one unit to another, while the site is flooded, should be further implemented and considered in the emergency preparedness strategy.	External hazards - Flooding - Procedures in case of flooding	544	Tihange NPP only § 7.2.2 of national stress tests report
25	Design issues	National regulatory inspection	Induced internal hazards Internal hazards potentially induced by the flooding (fire, explosion) should be examined and additional measures should be taken where needed (e.g., because the automatic fire extinction system is lost during a flood exceeding the “reference flood”). The potential deficiency of the Ultimate Means Circuit (CMU) in case of induced fire, in particular because of dependencies when the CMU is connected to the fire extinction system (CEI), should be examined and potential weaknesses should be resolved.	External hazards - Flooding - Procedures in case of flooding	545	Tihange NPP only § 7.2.2 of national stress tests report
26	Design issues	National regulatory inspection	Non conventional means The technical characteristics of the non-conventional means (NCM) that can be used in case of flooding of safety-related buildings (for all potential causes) should account for the adverse (weather) conditions they may be subject to during the whole period of operation. If this is not covered by design, an appropriate protection or compensatory strategy should be developed.	Emergency management - Infrastructure - On-site resistant storage for mobile means Emergency management - Requirements - Specifications of mobile means	400, 509, 515, 572, 573	Doel NPP only § 7.2.2 of national stress tests report
27	Emergency preparedness and response	National regulatory inspection	Emergency procedures Improvement of the procedures after earthquake (I-QM-01): after an earthquake, it shall be rapidly and visually verified if flooding due to cooling tower basin overflow (e.g. due to obstruction of its outlet channel) is ongoing or imminent. In that case, the CW pumps must be rapidly stopped.	External hazards - Earthquake - Risk mitigation of internal flooding from circulation water circuit	2, 3, 4, 5, 442	Doel NPP only § 7.2.2 of national stress tests report
28	Natural hazards (flooding)	National regulatory inspection	Periodic inspections As recent inspections evidenced locations with embankment heights approaching the minimal required height (Technical Specifications criterion), embankment height inspections should be done more regularly (e.g., two-yearly, and at least 5-yearly, instead of ten-yearly) in order to avoid a risk of excessive embankment overtopping by wind waves for floods within the design basis (embankment overtopping may occur for return periods larger than 300 years).	External hazards - Flooding - Protection against site flooding	434, 435	Doel NPP only § 7.2.2 of national stress tests report

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
29	Natural hazards (weather)	National regulatory inspection	Heavy rainfalls The reassessment of the capacity of the sewer system (five separate networks at Doel, separate networks per unit at Tihange), using a detailed hydrodynamic model must cover both short-duration heavy rains and long-lasting rains (95th percentile) for return periods up to 100 years. Moreover, to define such 100-yearly rains, observations of rain intensities over a sufficiently long period of time must be used, including the latest observations (e.g. the exceptional rain of 23rd August 2011). Depending on the results, potential improvements of the sewer system shall be envisaged and the licensee's action plan shall be updated accordingly where appropriate.	External hazards - Extreme weather conditions - Sewage capacity evaluation	439, 443, 546, 584	§ 7.2.3 of national stress tests report
30	Natural hazards (weather)	National regulatory inspection	Tornadoes Given the fact that tornadoes of high intensities were observed in the past years in the neighbouring countries (class EF4 on the enhanced Fujita scale), the robustness of the second level systems of Doel 1/2 and Tihange 1 should be confirmed in case of a beyond-design tornado with wind speed exceeding 70 m/s (250 km/h).	External hazards - Extreme weather conditions - Confirmation of resistance to tornadoes External hazards - Flooding - Availability of the additionnal means against extreme flooding	441, 547	§ 7.2.3 of national stress tests report
31	Design issues	National regulatory inspection	Non conventional means The operability of the non conventional means should be justified on the basis of technical data (design, operation, alignment and connections, periodic testing, preventive maintenance, etc.).	Emergency management - Requirements - Specifications of mobile means	400, 515, 541	§ 7.2.4 of national stress tests report
32	Design issues	National regulatory inspection	Non conventional means The technical characteristics of the non-conventional means (NCM) should account for the adverse (weather) conditions they may be subject to during the whole period of operation.	Emergency management - Infrastructure - On-site resistant storage for mobile means Emergency management - Requirements - Specifications of mobile means	400, 509, 515, 572, 573	§ 7.2.4 of national stress tests report
33	Design issues	National regulatory inspection	External power sources The licensee should, in collaboration with ELIA, manager of the high voltage network, make a feasibility study to ensure a better geographical separation of the high voltage lines (380 and 150 kV) to further improve the reliability of the external power supply to the NPPs. In addition, the licensee should, in agreement with ELIA, ensure that in case of LOOP the NPPs have the highest priority for reconstruction of the external power supply to the NPPs. The regulatory body shall take the necessary steps, in collaboration with other competent authorities, to ensure the fulfilment of this recommandation.	Power supply - Varia - Impact of the configuration and operation of High Voltage grid on the auxiliaries of NPP's	503, 550	§ 7.2.4 of national stress tests report
34	Design issues	National regulatory inspection	Station black-out In relation to the "total SBO" scenario, the potential overfilling or draining of the steam generators due to the loss of ultimate compressed air should be examined.	Water supply - Total Station Black-out - Steam generator protections Water supply - Total Station Black-out - Turbopomp power supply backup	219, 220, 221, 495	§ 7.2.4 of national stress tests report

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
35	Design issues	National regulatory inspection	Station black-out In relation to the “total SBO” scenario, the operability of the AFW turbine-driven pump due to the loss of ventilation in the turbine-driven pump room should be examined.	Power supply - Total Station Black-out - Verification of the feedwater pump in case of loss of ventilation (room temperature)	223, 224, 225, 496, 497	§ 7.2.4 of national stress tests report
36	Design issues	National regulatory inspection	Station black-out In case of (total) station black-out, the licensee should assess whether all containment penetrations can be closed in due time and whether the relevant containment isolation systems remain functional, in particular during outage situations. The feasibility of closing the personnel and material hatches should be assessed. These topics should be addressed in the “total station black-out” procedure.	Power supply - Total Station Black-out - Reactor building confinement	498, 551	§ 7.2.4 of national stress tests report
37	Design issues	National regulatory inspection	Loss of ultimate heat sink The licensee shall justify that the water capacity (quantity and flow of cooling water for the consumers) of the second level of protection is sufficient when all the units of the site are affected by the loss of primary UHS. If needed a strategy to optimize the water consumption should be developed.	Water supply - Loss of Main Heat Sink - Backup heat sink	454, 455, 552	§ 7.2.4 of national stress tests report
38	Emergency preparedness and response	National regulatory inspection	Emergency lighting For Tihange, the licensee should reinforce the emergency lighting in the different rooms and places where the operators should intervene during the different scenarios.	Power supply - Total Station Black-out - Additional emergency lighting	553, 508	§ 7.2.4 of national stress tests report
39	Emergency preparedness and response	National regulatory inspection	Loss of ultimate heat sink In relation to the “loss of primary UHS” scenario, the licensee shall carry out alignment and operating tests of the emergency deep water intakes from the Meuse river bed in 2012 (for Tihange 2 and 3).	Water supply - Loss of Main Heat Sink - Backup heat sink	554	§ 7.2.4 of national stress tests report
40	Emergency preparedness and response	National regulatory inspection	Loss of ultimate heat sink In relation to the “loss of primary UHS” scenario, the licensee should justify the availability (accessibility, operability and alignment) of the emergency water intakes of Tihange 2 and 3 in accordance with the requirements of US NRC RG 1.27.	Water supply - Loss of Main Heat Sink - Backup heat sink	226, 227	§ 7.2.4 of national stress tests report

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
41	Design issues	National regulatory inspection	Spent fuel pools Two configurations should be evaluated by the licensee for the spent fuel pools: · Configuration with a fuel assembly handled in the reactor pool during a "Total SBO". The fuel assembly should manually be handled in a safe position. The licensee should investigate the provisions (hardware installations, procedures, lighting, etc.) to be implemented for this configuration. · Configuration with the loss of water inventory in the spent fuel pools. The international experience feedback has already pointed out potential problems with the design of the siphon breakers in the spent fuel pools. In case of piping rupture, an insufficient capacity of the siphon breakers may lead to a fast uncovering of spent fuel assemblies. The licensee should examine this safety concern.	Power supply - Total Station Black-out - Safe Position Fuel Assembly Water supply - Total Station Black-out - Inadvertent let down of the pools	456, 500, 555, 556	§ 7.2.4 of national stress tests report
43	Emergency preparedness and response	National regulatory inspection	Severe accident management The adequacy of the procedural guidelines (BK procedures for Doel and severe accident management guidelines for Tihange) to cope with a severe accident has been assessed by the licensee, relying mainly on the fact that those procedures are inspired from the Westinghouse owners group severe accident management guidelines ("WOG SAMG"), are regularly updated, and are validated in the framework of the ten-yearly periodic safety reviews. Yet, those procedures still need to be improved with respect to the following aspects: · the Doel BK procedures should be supplemented with long term monitoring and exit guidelines, such as those already existing for Tihange (SAEG-1 and SAEG-2);	Severe Accidents management - Review SAMG procedures - Coherence severe accidents procedures between Doel and Tihange	519, 520	§ 7.2.5 of national stress tests report
44	Emergency preparedness and response	National regulatory inspection	· in some Doel BK procedures, reference is made to (the distinct) FRG procedures for the explanation of recommended methods. This constant switching between different procedures should be avoided, and therefore the BK procedures should be more selfsupporting and contain all information needed for their application;	Severe Accidents management - Review SAMG procedures - Coherence severe accidents procedures between Doel and Tihange	519, 520	§ 7.2.5 of national stress tests report
45	Emergency preparedness and response	National regulatory inspection	· an in-containment pH calculation tool should be added to the BK/SAMG procedures to determine the sump water acidity from the volumes and water quantities used during the management of the accident, taking into account all other physical and chemical pH influencing processes; this tool would also be used as a check and back-up for a dedicated sampling system;	Severe Accidents management - Radiological release pH reactor control	396, 527, 608, 620	§ 7.2.5 of national stress tests report
46	Emergency preparedness and response	National regulatory inspection	· a decision support tool (table/flow chart) should be added to the BK/SAMG procedures to quickly pinpoint the (most probable) location of a containment leak path based on the readings of certain detectors and to determine the most appropriate actions to limit the spread of fission products. This approach might involve the deployment of mobile detectors at specified locations;	Severe Accidents management - Radiological release Leak path identification	392, 523, 524	§ 7.2.5 of national stress tests report

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
47	Emergency preparedness and response	National regulatory inspection	· the BK procedures should provide quantitative criteria for selected key parameters to quickly arbitrate between the evacuation of the residual heat and the isolation of a leak in recirculation lines;	Severe Accidents management - Review SAMG procedures - Coherence severe accidents procedures between Doel and Tihange	521, 522	§ 7.2.5 of national stress tests report
48	Emergency preparedness and response	National regulatory inspection	· a decision support tool should be added to the BK procedures to arbitrate between injecting into the primary circuit and spraying inside the containment building.	Severe Accidents management - Review SAMG procedures - Coherence severe accidents procedures between Doel and Tihange	521, 522	§ 7.2.5 of national stress tests report
49	Emergency preparedness and response	National regulatory inspection	As much as possible, the licensee should consider to increase the consistency between the Tihange NPP and the Doel NPP with respect to the emergency training and refresher training programs (different in duration and frequency).	Emergency management - Requirements - Harmonization of sites training programs	516	§ 7.2.5 of national stress tests report
50	Emergency preparedness and response	National regulatory inspection	For the Doel NPP, the licensee states that the probability of a steam explosion when corium falls out of the reactor vessel into a flooded reactor pit is very low and can thus be neglected, based on various experiments carried out as part of international research programs that were unable to create this phenomenon. For the Tihange NPP (where the reactor pit is not flooded prior to the reactor vessel breach), the licensee states that a feasibility study of a system allowing water injection into the reactor pit will be launched. However, the licensee should follow-up the ongoing steam explosion experiments closely. If needed, the current strategies for flooding of the reactor pit before the rupture of the reactor vessel should be adapted.	Severe Accidents management - RB protection - Research &Development for severe accidents	183, 394, 513, 518	§ 7.2.5 of national stress tests report
51	Emergency preparedness and response	National regulatory inspection	The licensee should also assess the need of fitting new devices that would be useful for severe accident management (pH measurement in the sumps, temperature measurement at the bottom of the reactor vessel to monitor a potential core melt). The associated hardware modifications to improve those aspects should be sought where appropriate.	Severe Accidents management - RB protection - Reactor pit injection	166, 167, 168	§ 7.2.5 of national stress tests report
52	Emergency preparedness and response	National regulatory inspection	The licensee should identify the effective means to control the pH inside the containment building after a severe accident. This requirement applies in the early stages of the accident, and also during the long term phase. For the management of the long term phase of a severe accident, the licensee should take into consideration the impact of other severe accident management actions on the possibility of refilling the NaOH tank and the possibility for non-NaOH injection related measures to influence the sump water pH in the alkaline direction.	Severe Accidents management - Radiological release pH reactor control	620	§ 7.2.5 of national stress tests report

No	Topic	Source	Recommendations, Requirements from other national reviews	Action : Family - subfamily - sub-subfamily	Actions to be implemented	Comment
53	Emergency preparedness and response	National regulatory inspection	As a further diversification of the strategies available to manage a severe accident, an optimal battery load shedding strategy (in order to extend as long as possible the lifetime of the batteries and thus the period of availability of vital equipment for the management of the severe accident), should be developed and added to the ERG procedures (severe accident prevention) and to the BK/SAMG procedures (severe accident mitigation). A calculation and decision support tool should be studied in parallel to determine the loads that can be shed, the extra battery autonomy gained by shedding a specific load, the severe accident management functions that will be lost by shedding a specific load, and the alternatives that could be considered to (partly) compensate for the loss of each particular severe accident management function.	Power supply - Batteries autonomy - Increasing battery autonomy	397, 398, 501, 502, 594, 595	§ 7.2.5 of national stress tests report
54	Design issues	National regulatory inspection	The licensee should review the plants technical specifications in order to further improve the availability of the second level emergency equipment. In particular, the maximum allowed downtimes and the time limits for return to service should be re-evaluated and justified, given the risks involved.	Operation management - Varia - Maintaining installed but non-required equipments available as back-up	399, 528, 529	§ 7.2.5 of national stress tests report
55	Design issues	National regulatory inspection	The licensee should regard the additional means (including non conventional means) as safety related equipment as long as they play a key role in the prevention, the detection and/or the mitigation of a severe accident (defence in depth). In this context, the licensee shall determine the specific provisions applicable to this equipment where appropriate (introduction in the technical specifications, inspections and testing, preventive maintenance…).	Emergency management - Requirements - Specifications of mobile means External hazards - Flooding - Availability of the additionnal means against extreme flooding	400, 515, 541	§ 7.2.5 of national stress tests report

Datasheet “Implementation of activities”

This datasheet is directly derived from the licensee’s action plan. All of the actions planned by the licensee are listed and numbered. The actions are sorted by topic (e.g. “External hazards”, “Power supply”, “Emergency management”…) and plant/unit (e.g. “CNT”, “KCD3”…). The number of the related recommendations or requirements on European level or national level is also mentioned for each action in order to ease cross-references with the previous datasheets. Finally, the current status (e.g. “In progress”, “Closed”) and the target date for implementation are mentioned for each action.

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
1	CNT / PWR	External hazards	Earthquake	Reevaluation of the seismic hazard regarding Design Basis Earthquake	A detailed study of the seismic risk for the Tihange site will be conducted by the Royal Observatory of Belgium	6	1, 12	In progress	31/12/2014
2	CNT2 / PWR	External hazards	Earthquake	Risk mitigation of internal flooding from circulation water circuit	Modifying the seismic management procedures to send out an agent as quickly as possible to check if the cooling tower is overflowing. If so, the CEC pumps will be shut down rapidly.	7		In progress	31/12/2012
3	CNT3 / PWR	External hazards	Earthquake	Risk mitigation of internal flooding from circulation water circuit	Modifying the seismic management procedures to send out an agent as quickly as possible to check if the cooling tower is overflowing. If so, the CEC pumps will be shut down rapidly.	7		CLOSED	31/12/2012
4	CNT2 / PWR	External hazards	Earthquake	Risk mitigation of internal flooding from circulation water circuit	Studying the relevance of an automatic shutdown or of one of the 2 CEC pumps in case of a high level in a sump.	7		In progress	31/12/2013
5	CNT3 / PWR	External hazards	Earthquake	Risk mitigation of internal flooding from circulation water circuit	Studying the relevance of an automatic shutdown or of one of the 2 CEC pumps in case of a high level in a sump.	7		In progress	31/12/2013
7	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of a lateral support - Pneumatic valve BAN N202 (PCT1-CCV-V002PF)		11	In progress	31/12/2013
8	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of a lateral support - Pneumatic valve BAN N202 (PCT1-CCV-V005PV)		11	In progress	31/12/2013
9	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of a support at the discharge and intake of pump BAN N252 (PCT1-CAE-P01Ba1)		11	In progress	31/12/2013
10	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of fixation - Exchanger BAN N313 (PCT1-CRI-Q01DR1)		11	In progress	31/12/2013
11	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of anchoring - Exchanger BAN N452 (PCT1-CTP-Q01BD1)		11	In progress	31/12/2013
12	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of anchoring - Exchanger BAN N452 (PCT1-CTP-Q01BD1BIS)		11	In progress	31/12/2013
13	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Fixing the grating above the pump GPS P (PCT1-CEB -P01EB3)		11	In progress	31/12/2013
14	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of anchoring - Electrical panel BAE E504 (TAM1/S1)		11	In progress	31/12/2013
15	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of anchoring - Electrical panel BAE E504 (TAM8/S1)		11	In progress	31/12/2013
16	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of anchoring to take account of shear shift - Transformer 6kV-380V BAE E504 (TR2/S1)		11	In progress	31/12/2013
17	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of anchoring to take account of shear shift - Transformer 6kV-380V BAE E504 (TR3/S1)		11	In progress	31/12/2013
18	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Suppression of a link to the masonry wall - Transfer panel BAE E504 (PDT/UR1)		11	In progress	31/12/2013
19	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Suppression of a link to the masonry wall - Transfer panel BAE E506 (PDT/UR2)		11	In progress	31/12/2013
20	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of connecting anchoring between cabinet and electrical panel BAE E506 (TAM1/S2)		11	In progress	31/12/2013
21	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of connecting anchoring between cabinet and electrical panel BAE E506 BAE E506 (TAM8/S2)		11	In progress	31/12/2013
22	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Addition of anchoring to take account of shear shift - Transformer 6kV-380V BAE E506 (TR2/S2; TR3/S2)		11	In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
23	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Upgrade the anchors - Filter BAE E603 (PCT1-VLE-F06A01)		11	In progress	31/12/2013
24	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Upgrade the anchors - Filter BAE E603 (PCT1-VLE- F07A01)		11	In progress	31/12/2013
25	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Protect against interaction with the masonry wall - FIlter BAE E603 (PCT1-VLE-F13AV)		11	In progress	31/12/2013
26	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Upgrade the anchors - Exchangeur BAE E603 (PCT1-VLE-Q02AC1)		11	In progress	31/12/2013
27	CNT1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Upgrade the anchors - Exchanger BAE E603 (PCT1-VLE-Q04AC1)		11	In progress	31/12/2013
28	CNT2 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Interaction with masonry wall - Cooling unit BAE E165 (PCT2-CEG-Z01)		11	In progress	31/12/2013
29	CNT2 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Inspection of pipework running in the vicinity of the motor of the ventilator BAE E853 - Flr +5 (PCT2-CSC-A02B)		11	In progress	31/12/2013
30	CNT2 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Reassessment of anchoring using existing detail plans and calculation sheets - Reservoir BAN N320 (PCT2-CTP-B02R)		11	In progress	31/12/2013
34	CNT / PWR	External hazards	Flooding	Protection against site flooding	Construction of a peripheral wall on site + pumping equipment	6	3	In progress	31/12/2014
37	CNT1 / PWR	External hazards	Flooding	Protection against buildings flooding	Targeted protection of the buildings against flooding (elevate floors, water tightness, pumps…)	8	3	In progress	31/12/2013
38	CNT2 / PWR	External hazards	Flooding	Protection against buildings flooding	Targeted protection of the buildings against flooding (elevate floors, water tightness, pumps…)	8	3	In progress	31/12/2013
39	CNT3 / PWR	External hazards	Flooding	Protection against buildings flooding	Targeted protection of the buildings against flooding (elevate floors, water tightness, pumps…)	8	3	In progress	31/12/2013
40	CNT2 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Make-up to the reactor coolant circuit			In progress	31/12/2012
41	CNT2 / PWR	External hazards	Flooding	SG supply	Groundwater supply to the steam generators			In progress	31/12/2012
42	CNT2 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Facilitate access to premises			In progress	31/12/2012
43	CNT2 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Facilitate communication between actors	40		In progress	31/12/2012
45	CNT2 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Increase the capacity of the NCM diesel generators in order to expand energizable functions or extra functions			In progress	31/12/2012
47	CNT3 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Make-up to the reactor coolant circuit			In progress	31/12/2012
48	CNT3 / PWR	External hazards	Flooding	SG supply	Groundwater supply to the steam generators			In progress	31/12/2012
49	CNT3 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Facilitate access to premises			In progress	31/12/2012
50	CNT3 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Facilitate communication between actors	40		In progress	31/12/2012

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
52	CNT3 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Increase the capacity of the NCM diesel generators in order to expand energizable functions or extra functions			In progress	31/12/2012
54	CNT1 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Make-up to the reactor coolant circuit			In progress	31/12/2012
55	CNT1 / PWR	External hazards	Flooding	SG supply	Groundwater supply to the steam generators			In progress	31/12/2012
56	CNT1 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Facilitate access to premises			In progress	31/12/2012
57	CNT1 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Facilitate communication between actors	40		In progress	31/12/2012
59	CNT1 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Increase the capacity of the NCM diesel generators in order to expand energizable functions or extra functions	26		In progress	31/12/2012
61	CNT1 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Replace flexible connexions as much as possible by fixed and rigid pipes in order to reduce handling operations	26		In progress	31/12/2012
62	CNT2 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Replace flexible connexions as much as possible by fixed and rigid pipes in order to reduce handling operations	26		In progress	31/12/2012
63	CNT3 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Replace flexible connexions as much as possible by fixed and rigid pipes in order to reduce handling operations	26		In progress	31/12/2012
64	CNT1 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Increase the number of instrumentation measurements available during flooding period	18		In progress	31/12/2013
65	CNT3 / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,...)	Increase the number of instrumentation measurements available during flooding period	18		In progress	31/12/2012
66	CNT1 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the maintenance of layers 1 to 3		3	In progress	31/12/2014
67	CNT1 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the periodic testing of layers 1 to 3		3	In progress	31/12/2014
68	CNT1 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the use of layers 1 to 3		3	In progress	31/12/2014
69	CNT2 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the maintenance of layers 1 to 3		3	In progress	31/12/2014
70	CNT2 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the periodic testing of layers 1 to 3		3	In progress	31/12/2014
71	CNT2 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the use of layers 1 to 3		3	In progress	31/12/2014
72	CNT3 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the maintenance of layers 1 to 3		3	In progress	31/12/2014
73	CNT3 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the periodic testing of layers 1 to 3		3	In progress	31/12/2014
74	CNT3 / PWR	External hazards	Flooding	Procedures in case of flooding	Create procedures for the use of layers 1 to 3		3	In progress	31/12/2014
75	CNT1 / PWR	External hazards	Flooding	Internal emergency plan procedures	Integrate the implementation of the layers 1, 2 and 3 into the internal emergency plan	9	3	In progress	31/12/2014
76	CNT2 / PWR	External hazards	Flooding	Internal emergency plan procedures	Integrate the implementation of the layers 1, 2 and 3 into the internal emergency plan	9	3	In progress	31/12/2014
77	CNT3 / PWR	External hazards	Flooding	Internal emergency plan procedures	Integrate the implementation of the layers 1, 2 and 3 into the internal emergency plan	9	3	In progress	31/12/2014
78	CNT1 / PWR	External hazards	Extreme weather conditions	Clearing procedures in case of snow	Drafting of a procedure for the monitoring and removal of the snow beyond a thickness of 30 cm on the roofs of the non-bunkerized safety-related buildings			In progress	31/12/2012

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
79	CNT2 / PWR	External hazards	Extreme weather conditions	Clearing procedures in case of snow	Drafting of a procedure for the monitoring and removal of the snow beyond a thickness of 30 cm on the roofs of the non-bunkerized safety-related buildings			In progress	31/12/2012
80	CNT3 / PWR	External hazards	Extreme weather conditions	Clearing procedures in case of snow	Drafting of a procedure for the monitoring and removal of the snow beyond a thickness of 30 cm on the roofs of the non-bunkerized safety-related buildings			In progress	31/12/2012
81	CNT1 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Perform an analysis to envisage a minimum oil reserve in the oil make-up reservoir for the GDS safety diesel generators	17		In progress	31/12/2013
82	CNT1 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Amend the procedures to anticipate oil make-up to the various diesel generators	17		In progress	31/12/2013
83	CNT2 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Amend the procedures to anticipate oil make-up to the various diesel generators	17		In progress	31/12/2013
84	CNT3 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Amend the procedures to anticipate oil make-up to the various diesel generators	17		In progress	31/12/2013
85	CNT1 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Provide a procedure defining the electrical loads that are not essential in emergency situation, in order to minimize the consumption of the safety diesel generators in case of long-lasting loss of offsite power supply and impossibility of supplying diesel fuel and oil			In progress	31/12/2012
86	CNT2 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Provide a procedure defining the electrical loads that are not essential in emergency situation, in order to minimize the consumption of the safety diesel generators in case of long-lasting loss of offsite power supply and impossibility of supplying diesel fuel and oil			In progress	31/12/2012
87	CNT3 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Provide a procedure defining the electrical loads that are not essential in emergency situation, in order to minimize the consumption of the safety diesel generators in case of long-lasting loss of offsite power supply and impossibility of supplying diesel fuel and oil			In progress	31/12/2012
88	CNT1 / PWR	Operation management	Spent fuel pools	SUR procedures in case of accident in spent fuel pools	Amend the current management procedures of the SUR emergency system to ensure water supply and steam removal for the spent fuel pool	23		In progress	31/12/2013
89	CNT1 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators in SUR	Analyse the possibility to set up an automatic diesel fuel supply system for the DUR emergency diesel generator	17		In progress	31/12/2013
91	CNT1 / PWR	Power supply	Spent fuel pools	Electrical backup for the cooling pumps	Analyse the possibility of repowering the CTP and RRA pumps via the SUR emergency system	23		In progress	LTO
92	CNT2 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Provide a procedure defining the electrical loads that are not essential in emergency situation, in order to limit the fuel consumption of the GDU emergency diesel generators			In progress	31/12/2012
93	CNT3 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Provide a procedure defining the electrical loads that are not essential in emergency situation, in order to limit the fuel consumption of the GDU emergency diesel generators			In progress	31/12/2012

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
94	CNT1 / PWR	Operation management	Reactor building	Reactor building overpressure management	Primary circuit open: additional strategies for the management of overpressure in the containment building will be studied	3		In progress	30/06/2013
95	CNT2 / PWR	Operation management	Reactor building	Reactor building overpressure management	Primary circuit open: additional strategies for the management of overpressure in the containment building will be studied	3		In progress	30/06/2013
96	CNT3 / PWR	Operation management	Reactor building	Reactor building overpressure management	Primary circuit open: additional strategies for the management of overpressure in the containment building will be studied	3		In progress	30/06/2013
97	CNT1 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Install an alternative power supply (380V) for non-conventional and/or safety equipment (compressors, pumps, valves…)	15, 26		In progress	31/12/2013
98	CNT2 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Install an alternative power supply (380V) for non-conventional and/or safety equipment (compressors, pumps, valves…)	15, 26		In progress	31/12/2013
99	CNT3 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Install an alternative power supply (380V) for non-conventional and/or safety equipment (compressors, pumps, valves…)	15, 26		In progress	31/12/2013
100	CNT1 / PWR	Power supply	Total Station Black-out	Turbopomp power supply backup	Install an alternative power supply (380V) for the control panels of the TPS CNT1 safety turbo-pump	15		In progress	31/12/2013
104	CNT1 / PWR	Power supply	Total Station Black-out	Spent fuel pools : additional level measurements	Install additional water level measurements for the spent fuel pools complying with the following constraints: loss of all electric power supplies, readings accessible from outside the buildings	18		In progress	31/12/2012
105	CNT2 / PWR	Power supply	Total Station Black-out	Spent fuel pools : additional level measurements	Install additional water level measurements for the spent fuel pools complying with the following constraints: loss of all electric power supplies, readings accessible from outside the buildings	18		In progress	31/12/2012
106	CNT3 / PWR	Power supply	Total Station Black-out	Spent fuel pools : additional level measurements	Install additional water level measurements for the spent fuel pools complying with the following constraints: loss of all electric power supplies, readings accessible from outside the buildings	18		In progress	31/12/2012
107	CNT1 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Install devices to allow isolation of accumulators during depressurization of the CRP reactor coolant circuit			In progress	31/12/2013
108	CNT2 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Install devices to allow isolation of accumulators during depressurization of the CRP reactor coolant circuit			In progress	31/12/2013
109	CNT3 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Install devices to allow isolation of accumulators during depressurization of the CRP reactor coolant circuit			In progress	31/12/2013
111	CNT2 / PWR	Water supply	Total Station Black-out	Additional means to assure primary water supply	Perform a feasibility study for the installation of non-conventional means to provide make-up to the primary circuit in open CRP configuration	19		CLOSED	31/12/2012
112	CNT3 / PWR	Water supply	Total Station Black-out	Additional means to assure primary water supply	Perform a feasibility study for the installation of non-conventional means to provide make-up to the primary circuit in open CRP configuration	19		CLOSED	31/12/2012

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
119	CNT1 / PWR	Power supply	RB protection	Additional means to assure reactor building backup spray in case overpressure	Perform a feasibility study for the addition of a flanged connection to the outside of the nuclear auxiliary building to allow spraying into the reactor building using a mobile pump, so as to avoid overpressure in the containment			In progress	31/12/2013
120	CNT2 / PWR	Power supply	RB protection	Additional means to assure reactor building backup spray in case overpressure	Perform a feasibility study for the addition of a flanged connection to the outside of the nuclear auxiliary building to allow spraying into the reactor building using a mobile pump, so as to avoid overpressure in the containment			In progress	31/12/2013
121	CNT3 / PWR	Power supply	RB protection	Additional means to assure reactor building backup spray in case overpressure	Perform a feasibility study for the addition of a flanged connection to the outside of the nuclear auxiliary building to allow spraying into the reactor building using a mobile pump, so as to avoid overpressure in the containment			In progress	31/12/2013
122	CNT1 / PWR	Water supply	Backup feedwater tank	Enhanced feedwater tank capacity	Perform a feasibility study to increase the capacity of the EAS safety feedwater tank			In progress	LTO
123	CNT1 / PWR	Water supply	Total Station Black-out	Steam generator protections	Perform a feasibility study to enhance the reliability of manual operations on the steam generators discharge valves			In progress	31/12/2012
124	CNT3 / PWR	Water supply	Total Station Black-out	Steam generator protections	Perform a feasibility study to enhance the reliability of manual operations on the steam generators discharge valves (addition of manual valves)			In progress	30/06/2013
125	CNT1 / PWR	Water supply	Total Station Black-out	Steam generator protections	Perform a feasibility study for the addition of mobile compressors to be connected to the emergency compressed air circuit			In progress	31/12/2013
126	CNT2 / PWR	Water supply	Total Station Black-out	Steam generator protections	Perform a feasibility study for the addition of mobile compressors to be connected to the emergency compressed air circuit			In progress	31/12/2013
127	CNT3 / PWR	Water supply	Total Station Black-out	Steam generator protections	Perform a feasibility study for the addition of mobile compressors to be connected to the emergency compressed air circuit			In progress	31/12/2013
128	CNT1 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Provide procedures to cope with a complete SBO, including the necessary non-conventional means and the intervention strategies (for example: rapid depressurization to limit damage to the primary pumps seals, coordination with non-conventional means present on site, suppression of non-essential electrical loads, nitrogen in the accumulators, local command of TPA turbopumps, water top-up and discharge of steam from the pools and priority status of local actions in case of loss of normal cooling of the pools, etc.)	20, 25		In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
129	CNT2 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Provide procedures to cope with a complete SBO, including the necessary non-conventional means and the intervention strategies (for example: rapid depressurization to limit damage to the primary pumps seals, coordination with non-conventional means present on site, suppression of non-essential electrical loads, nitrogen in the accumulators, local command of TPA turbopumps, water top-up and discharge of steam from the pools and priority status of local actions in case of loss of normal cooling of the pools, etc.)	20, 25		In progress	31/12/2013
130	CNT3 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Provide procedures to cope with a complete SBO, including the necessary non-conventional means and the intervention strategies (for example: rapid depressurization to limit damage to the primary pumps seals, coordination with non-conventional means present on site, suppression of non-essential electrical loads, nitrogen in the accumulators, local command of TPA turbopumps, water top-up and discharge of steam from the pools and priority status of local actions in case of loss of normal cooling of the pools, etc.)	20, 25		In progress	31/12/2013
131	CNT1 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Modify the existing "Accident procedures" to take account of the complete SBO	25		In progress	31/12/2013
132	CNT2 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Modify the existing "Accident procedures" to take account of the complete SBO	25		In progress	31/12/2013
133	CNT3 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Modify the existing "Accident procedures" to take account of the complete SBO	25		In progress	31/12/2013
134	KCD12 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Modify the existing "Accident procedures" to take account of the complete SBO	25		In progress	31/12/2013
135	KCD34 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Modify the existing "Accident procedures" to take account of the complete SBO	25		In progress	31/12/2013
137	CNT1 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Implement the organization of the response to this type of non-conventional accident - complete SBO (management of equipment, documents, etc.)	25		In progress	31/12/2013
138	CNT2 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Implement the organization of the response to this type of non-conventional accident - complete SBO (management of equipment, documents, etc.)	25		In progress	31/12/2013
139	CNT3 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Implement the organization of the response to this type of non-conventional accident - complete SBO (management of equipment, documents, etc.)	25		In progress	31/12/2013
140	CNT1 / PWR	Water supply	Total loss of heat sink	Water supply procedures	Introduce or create in the procedures and/or strategies to manage "multi-unit" accidents, the methods for limiting groundwater consumption and determining the well(s) to be used preferentially			In progress	31/12/2013
141	CNT2 / PWR	Water supply	Total loss of heat sink	Water supply procedures	Introduce or create in the procedures and/or strategies to manage "multi-unit" accidents, the methods for limiting groundwater consumption and determining the well(s) to be used preferentially			In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
142	CNT3 / PWR	Water supply	Total loss of heat sink	Water supply procedures	Introduce or create in the procedures and/or strategies to manage "multi-unit" accidents, the methods for limiting groundwater consumption and determining the well(s) to be used preferentially			In progress	31/12/2013
146	CNT1 / PWR	Power supply	Spent fuel pools	Procedures to manage spent fuel pools	Procedures will be created for the management of the pools in case of loss of ultimate heat sink	23		In progress	31/12/2013
147	CNT2 / PWR	Power supply	Spent fuel pools	Procedures to manage spent fuel pools	Procedures will be created for the management of the pools in case of loss of ultimate heat sink	23		In progress	31/12/2013
148	CNT3 / PWR	Power supply	Spent fuel pools	Procedures to manage spent fuel pools	Procedures will be created for the management of the pools in case of loss of ultimate heat sink	23		In progress	31/12/2013
149	CNT1 / PWR	Water supply	Total loss of heat sink	Procedures in case of total loss of heat sink	Create or modify the procedures to: - define a global strategy for the case of loss of all ultimate heat sinks not taken into account in the design basis (management of containment building pressure in "feed and bleed" mode, optimal use of available equipment, etc.) - integrate these new scenarios in the current procedures - integrate the use of the new demineralised water installation for the resupply of the units using non-conventional or conventional means			In progress	31/12/2013
150	CNT2 / PWR	Water supply	Total loss of heat sink	Procedures in case of total loss of heat sink	Create or modify the procedures to: - define a global strategy for the case of loss of all ultimate heat sinks not taken into account in the design basis (management of containment building pressure in "feed and bleed" mode, optimal use of available equipment, etc.) - integrate these new scenarios in the current procedures - integrate the use of the new demineralised water installation for the resupply of the units using non-conventional or conventional means			In progress	31/12/2013
151	CNT3 / PWR	Water supply	Total loss of heat sink	Procedures in case of total loss of heat sink	Create or modify the procedures to: - define a global strategy for the case of loss of all ultimate heat sinks not taken into account in the design basis (management of containment building pressure in "feed and bleed" mode, optimal use of available equipment, etc.) - integrate these new scenarios in the current procedures - integrate the use of the new demineralised water installation for the resupply of the units using non-conventional or conventional means			In progress	31/12/2013
166	CNT1 / PWR	Severe Accidents management	RB protection	Reactor pit injection	Feasibility study for additional means to inject water into the reactor pit		51	In progress	31/12/2013
167	CNT2 / PWR	Severe Accidents management	RB protection	Reactor pit injection	Feasibility study for additional means to inject water into the reactor pit		51	In progress	31/12/2013
168	CNT3 / PWR	Severe Accidents management	RB protection	Reactor pit injection	Feasibility study for additional means to inject water into the reactor pit		51	In progress	31/12/2013
169	CNT2 / PWR	Power supply	Station black-out	On-site resistant storage for mobile means	Feasibility study for electric interconnections between the different electric panels			In progress	31/12/2013
170	CNT3 / PWR	Power supply	Station black-out	On-site resistant storage for mobile means	Feasibility study for electric interconnections between the different electric panels			In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
171	CNT / PWR	Emergency management	Infrastructure	Site operation center in the new Access Control Building	Installation of the COS on-site operation centre in the access control building	44		In progress	31/12/2013
172	CNT / PWR	Emergency management	Multi-unit event and associated organization	Complementary means for radiological surveillance	Analyse additional means for radiological monitoring in case of a severe accident affecting several units	43		In progress	30/06/2012
176	CNT1 / PWR	Power supply	Total Station Black-out	Autonomous generator to recharge the instrumentation	Study for the installation of autonomous electrical generators to repower instrumentation	18	17	In progress	31/12/2013
177	CNT2 / PWR	Power supply	Total Station Black-out	Autonomous generator to recharge the instrumentation	Study for the installation of autonomous electrical generators to repower instrumentation	18	17	In progress	31/12/2013
178	CNT3 / PWR	Power supply	Total Station Black-out	Autonomous generator to recharge the instrumentation	Study for the installation of autonomous electrical generators to repower instrumentation	18	17	In progress	31/12/2013
183	CNT / PWR	Severe Accidents management	RB protection	Research &Development for severe accidents	R&D follow-up status about ex-reactor vessel cooling and basemat melt-through	30, 47	50	In progress	31/12/2013
189	CNT1 / PWR	Severe Accidents management	Review SAMG procedures	Review Severe Accidents Mitigation Guidelines procedures	Consideration and implementation of the Fukushima accident experience feedback and of any revisions of WOG SAMG	33, 34, 36, 37, 38, 39		In progress	31/12/2014
190	CNT2 / PWR	Severe Accidents management	Review SAMG procedures	Review Severe Accidents Mitigation Guidelines procedures	Consideration and implementation of the Fukushima accident experience feedback and of any revisions of WOG SAMG	33, 34, 36, 37, 38, 39		In progress	31/12/2014
191	CNT3 / PWR	Severe Accidents management	Review SAMG procedures	Review Severe Accidents Mitigation Guidelines procedures	Consideration and implementation of the Fukushima accident experience feedback and of any revisions of WOG SAMG	33, 34, 36, 37, 38, 39		In progress	31/12/2014
192	CNT1 / PWR	Severe Accidents management	H2 risk	H2 concentration follow-up in reactor building	Implementation in the SAMG of the monitoring of H2 concentration in the containment building (monitoring to be included in the SAMG procedures)	3, 34, 41		In progress	31/12/2013
193	CNT2 / PWR	Severe Accidents management	H2 risk	H2 concentration follow-up in reactor building	Implementation in the SAMG of the monitoring of H2 concentration in the containment building (monitoring to be included in the SAMG procedures)	3, 34, 41		In progress	31/12/2013
194	CNT3 / PWR	Severe Accidents management	H2 risk	H2 concentration follow-up in reactor building	Implementation in the SAMG of the monitoring of H2 concentration in the containment building (monitoring to be included in the SAMG procedures)	3, 34, 41		In progress	31/12/2013
195	CNT1 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Study of a filtered vent for the reactor building	3	8	In progress	31/12/2012
196	CNT2 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Study of a filtered vent for the reactor building	3	8	In progress	31/12/2012
197	CNT3 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Study of a filtered vent for the reactor building	3	8	In progress	31/12/2012
201	CNT1 / PWR	Severe Accidents management	H2 risk	H2 risk management in nuclear auxiliary building	Additional risk assessment about H2 in the nuclear auxiliary building	41	9	In progress	31/12/2012
202	CNT2 / PWR	Severe Accidents management	H2 risk	H2 risk management in nuclear auxiliary building	Additional risk assessment about H2 in the nuclear auxiliary building	41	9	In progress	31/12/2012
203	CNT3 / PWR	Severe Accidents management	H2 risk	H2 risk management in nuclear auxiliary building	Additional risk assessment about H2 in the nuclear auxiliary building	41	9	In progress	31/12/2012
211	CNT / PWR	Emergency management	Multi-unit event and associated organization	Setting up of a fallback base	As part of the "High" mode of the internal emergency plan, alternative solutions for the off-site fall-back centre will be analyzed			CLOSED	30/06/2012
213	CNT / PWR	Emergency management	Multi-unit event and associated organization	Organization and logisitics of internal emergency plan in case of multi-unit event	Implementation of the organization of the emergency plan and the adapted logistics	28, 34, 45		In progress	31/12/2013
214	CNT1 / PWR	Power supply	SG protection	Backup feedwater pump	Feasibility studies for the addition of a safety feedwater pump as part of the long term operation project			In progress	LTO

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
216	CNT1 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Detail design study of an alternative electric power supply for the control of the SEBIM valves in order to increase their reliability			In progress	31/12/2013
217	CNT2 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Detail design study of an alternative electric power supply to further increase the reliability of the pressurizer discharge valves (PORV and MORV)			In progress	31/12/2013
218	CNT3 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Detail design study of an alternative electric power supply to further increase the reliability of the pressurizer discharge valves (PORV and MORV)			In progress	31/12/2013
219	CNT1 / PWR	Water supply	Total Station Black-out	Turbopomp power supply backup	In case of complete SBO, examine the risks of drying up or overfilling of the steam generators		34	In progress	31/12/2013
220	CNT2 / PWR	Water supply	Total Station Black-out	Turbopomp power supply backup	In case of complete SBO, examine the risks of drying up or overfilling of the steam generators		34	In progress	31/12/2013
221	CNT3 / PWR	Water supply	Total Station Black-out	Turbopomp power supply backup	In case of complete SBO, examine the risks of drying up or overfilling of the steam generators		34	In progress	31/12/2013
223	CNT1 / PWR	Power supply	Total Station Black-out	Verification of the feedwater pump in case of loss of ventilation (room temperature)	Check the functioning of the TPA EAA feedwater turbo pump without cooling ventilation in the room	21	35	In progress	31/12/2013
224	CNT2 / PWR	Power supply	Total Station Black-out	Verification of the feedwater pump in case of loss of ventilation (room temperature)	Check the functioning of the TPA EAA feedwater turbo pump without cooling ventilation in the room	21	35	In progress	31/12/2013
225	CNT3 / PWR	Power supply	Total Station Black-out	Verification of the feedwater pump in case of loss of ventilation (room temperature)	Check the functioning of the TPA EAA feedwater turbo pump without cooling ventilation in the room	21	35	In progress	31/12/2014
226	CNT2 / PWR	Water supply	Loss of Main Heat Sink	Backup heat sink	Justify according to US NRC RG 1,27 the availability of the deep water intakes from the Meuse (accessibility, operability and connection)	14	40	In progress	31/12/2012
227	CNT3 / PWR	Water supply	Loss of Main Heat Sink	Backup heat sink	Justify according to US NRC RG 1,27 the availability of the deep water intakes from the Meuse (accessibility, operability and connection)	14	40	In progress	31/12/2012
392	CNT / PWR	Severe Accidents management	Radiological release	Leak path identification	Addition of a decision support to determine the most likely leak paths through containment penetrations (including deployment of mobile detectors)	43	46	On-hold	On hold till results of discussion with Safety Authority
394	CNT / PWR	Severe Accidents management	RB protection	Research &Development for severe accidents	R&D follow-up status about steam explosion	30, 47	50	In progress	31/12/2013
396	CNT / PWR	Severe Accidents management	Radiological release	pH reactor control	Study of the necessity and feasibility (advantages/disadvantages) of the installation of tetraborate racks		45	In progress	31/12/2013
397	CNT / PWR	Power supply	Batteries autonomy	Increasing battery autonomy	A program for improving the autonomy of the batteries will be developed and integrated in the ERG/SAMG	16	53	In progress	31/12/2013
398	CNT / PWR	Power supply	Batteries autonomy	Increasing battery autonomy	A tool for decision-support and calculation of load shedding of the batteries, the lost SAMG functions and the alternatives for compensating the lost functions will be implemented	16	53	In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
399	CNT / PWR	Operation management	Varia	Maintaining installed but non-required equipments available as back-up	Improvement of the technical specifications to reduce allowed downtimes of the 2nd level systems		54	In progress	30/06/2013
400	CNT / PWR	Emergency management	Requirements	Specifications of mobile means	Determination of specific provisions for the additional equipment including the non conventional means (operation in adverse weather conditions, integration in the technical specifications, inspection and testing, maintenance…)	26, 29, 32	16, 18, 31, 32, 55	In progress	30/06/2012
422	KCD12 / PWR	External hazards	Earthquake	Reinforcement of the Refueling Water Storage Tank	Making RWSTs Doel 1 and Doel 2 seismic in order to further increase the robustness of the installations			In progress	15/12/2014
423	KCD12 / PWR	External hazards	Earthquake	Increasing steam generator reliability in case of earthquake	Increasing the reliability of the water supply to the steam generators in case of earthquake (automatic start of the EF pumps).			In progress	LTO
424	KCD12 / PWR	External hazards	Earthquake	Increasing steam generator reliability in case of earthquake	Extend seismic part of the FE circuit of Doel 1&2 to the BAR and provide connection points for FE on suction (directly or via WW-tank) from the WW-turbopomp.			In progress	LTO
425	KCD12 / PWR	External hazards	Earthquake	Procedure description	Issue an instruction for operators going from the main control room to the GNS.			CLOSED	01/06/2012
426	KCD34 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Walkdowns must be carried out with SG&H for inspection of the structures, systems and components in the reactor buildings of the 2 most recent units during the next outages in 2012	11		In progress	02/11/2012
428	KCD / PWR	External hazards	Earthquake	Sensibilization campagn to seismic alertness	Descriptive note: continue efforts to keep awareness of potential seismic interactions inside the premises. Ensure the strict application of procedures to avoid any interaction between scaffolding and seismic structures, systems and components		13	In progress	30/09/2012
429	KCD / PWR	External hazards	Earthquake	Reevaluation of the seismic hazard regarding Design Basis Earthquake	A detailed study of the seismic risk for the Doel site will be conducted by the Royal Observatory of Belgium	6	1, 12	In progress	31/12/2014
430	KCD12 / PWR	External hazards	Flooding	Protection against buildings flooding	Volumetric protection of the concerned safety-related buildings against flooding	8	4	In progress	01/04/2013
431	KCD3 / PWR	External hazards	Flooding	Protection against buildings flooding	Volumetric protection of the concerned safety-related buildings against flooding	8	4	In progress	01/08/2013
432	KCD4 / PWR	External hazards	Flooding	Protection against buildings flooding	Volumetric protection of the concerned safety-related buildings against flooding	8	4	In progress	15/12/2013
433	KCD / PWR	External hazards	Flooding	Protection against site flooding	Additional embankment reinforcements		4	CLOSED	01/07/2012
434	KCD / PWR	External hazards	Flooding	Protection against site flooding	Ensure that the "Waterwegen en Zeeschelde" Department arranges the annual inspection and maintenance of the complete exterior side of the embankment. KCD does this for the interior side of the embankment.		4, 28	CLOSED	01/07/2012
435	KCD / PWR	External hazards	Flooding	Protection against site flooding	Make arrangement for more frequent embankment height measurement than that laid down in Tech Specs.(10 per year)		4, 28	CLOSED	01/07/2012
436	KCD / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Use of mobile pumps during flooding	26		In progress	30/11/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
437	KCD / PWR	External hazards	Extreme weather conditions	Protection against lightning	Protection of all units against lightning in accordance with the new standard NBN EN 62305(2009)			In progress	31/12/2014
438	KCD / PWR	External hazards	Extreme weather conditions	Clearing procedures in case of snow	Drafting of a procedure for the monitoring and removal of the snow of a number of non-bunkered buildings (see BEST report)			In progress	30/06/2013
439	KCD / PWR	External hazards	Extreme weather conditions	Sewage capacity evaluation	Sufficient draining capacity in case of heavy rainfalls		29	In progress	01/11/2012
441	KCD12 / PWR	External hazards	Extreme weather conditions	Confirmation of resistance to tornadoes	The robustness of the 2nd-level emergency systems in Doel 1/2 should be confirmed should a beyond design tornado with wind speeds exceeding 70 m/s occur		5, 30	In progress	31/12/2013
442	KCD34 / PWR	External hazards	Earthquake	Risk mitigation of internal flooding from circulation water circuit	Modifying the seismic management procedures to send out an agent as quickly as possible to check if the cooling tower is overflowing. If so, the CW pumps will be shut down rapidly.	7	27	CLOSED	01/05/2012
443	KCD / PWR	External hazards	Extreme weather conditions	Sewage capacity evaluation	Re-evaluation of the capacity of the drainage system on the basis of observed rain intensities over long period (more than 1967-1993 (therefore earlier and later (also considering the exceptional rain of 23/8/2011))) and making use of the model that also supposes short, violent and not only protracted rainfall with a period of recurrence of 100 years.	6	5, 29	In progress	31/12/2013
444	KCD12 / PWR	Water supply	Total Station Black-out	Steam generator protections	Alternative make-up possibilities for safety-related water reservoirs, if necessary with additional connection points.			In progress	30/11/2013
445	KCD34 / PWR	Water supply	Total Station Black-out	Steam generator protections	Alternative make-up possibilities for safety-related water reservoirs, if necessary with additional connection points.			In progress	30/11/2013
446	KCD12 / PWR	Water supply	Total Station Black-out	Additional means to assure primary water supply	Fit shut-off valves on the SP spray lines to be able to continue injection with the SP pumps to the SC circuit if the RC pressure becomes high (D12)			In progress	30/11/2014
447	KCD34 / PWR	Power supply	RB protection	Additional means to assure reactor building backup spray in case of overpressure	Provide connection points on the containment spray pump intake and pitch and purchase of mobile pump to obtain alternative containment spray flow rate			In progress	30/11/2014
450	KCD12 / PWR	Water supply	Total loss of heat sink	Operationnal procedure to assure additionnal primary water supply	Updating procedures for alignment and start-up of alternative water supply			In progress	30/11/2013
451	KCD34 / PWR	Water supply	Total loss of heat sink	Operationnal procedure to assure additionnal primary water supply	Updating procedures for alignment and start-up of alternative water supply			In progress	30/11/2013
452	KCD12 / PWR	Water supply	Total loss of heat sink	Backup heat sink	Update procedures to optimize the use of the LU pools in case of a multi-unit accident	14		In progress	31/12/2012
453	KCD34 / PWR	Water supply	Total loss of heat sink	Backup heat sink	Update procedures to optimize the use of the LU pools in case of a multi-unit accident.	14		In progress	31/12/2012
454	KCD12 / PWR	Water supply	Loss of Main Heat Sink	Backup heat sink	Justify that the available water capacity (volume and flow rate) of the 2nd level is sufficient if all site units are affected by LUHS. If necessary create a strategy to optimize use.	14	37	In progress	01/07/2013
455	KCD34 / PWR	Water supply	Loss of Main Heat Sink	Backup heat sink	Justify that the available water capacity (volume and flow rate) of the 2nd level is sufficient if all site units are affected by LUHS. If necessary create a strategy to optimize use.	14	37	In progress	01/07/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
456	KCD / PWR	Water supply	Total Station Black-out	Inadvertent let down of the pools	Assess the configuration with loss of water inventory in the deactivation pools (potential design problems with the siphon breakers in deactivation pools). In case of pipe rupture, an insufficient capacity of the siphon breakers may result in rapid dewatering of the fuel assemblies. The operator should examine this safety issue.	14, 23	41	In progress	31/12/2013
476	CNT / PWR	Emergency management	Communications means	On & Off-site backup communications means	Re-evaluations of the performances of communications means will be launched to allow the site and Corporate level to execute their tasks more efficiently	35, 40		CLOSED	30/06/2012
477	CNT / PWR	Emergency management	Multi-unit event and associated organization	Complementary means for radiological surveillance	Re-evaluations of the performances of software calculating radiological consequences will be launched to allow Corporate level to execute their tasks more efficiently	43		In progress	30/06/2012
478	CNT / PWR	Emergency management	Multi-unit event and associated organization	Organization and logisitics of internal emergency plan in case of multi-unit event	Description of the organization of the emergency plan and the logistics adapted to take account of a multi-unit accident	28, 34, 45		CLOSED	30/06/2012
479	CNT / PWR	Emergency management	Multi-unit event and associated organization	Optimization and storage of mobile means	An optimization study for mobile equipment and their storage infrastructure (site or centralized) will be performed, also on the basis of the analysis of the EDMG	45		In progress	31/12/2013
480	KCD12 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Install an alternative power supply (380V) for non-conventional and/or safety equipment (compressors, pumps, valves…)	15, 26		In progress	30/11/2013
481	KCD3 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Install an alternative power supply (380V) for non-conventional and/or safety equipment (compressors, pumps, valves…)	15, 26		In progress	30/11/2013
482	KCD4 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Install an alternative power supply (380V) for non-conventional and/or safety equipment (compressors, pumps, valves…)	15, 26		In progress	30/11/2013
483	KCD12 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Installation of an alternative power supply (380 V) for the rectifiers	15		In progress	30/11/2013
484	KCD3 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Installation of an alternative power supply (380 V) for the rectifiers	15		In progress	30/11/2013
485	KCD4 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Installation of an alternative power supply (380 V) for the rectifiers	15		In progress	30/11/2013
486	KCD12 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Provide a procedure defining the electrical loads that are not essential in emergency situation, in order to limit the fuel consumption of the diesel generators			In progress	31/12/2012
487	KCD3 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Provide a procedure defining the electrical loads that are not essential in emergency situation, in order to limit the fuel consumption of the diesel generators			In progress	31/12/2012
488	KCD4 / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Provide a procedure defining the electrical loads that are not essential in emergency situation, in order to limit the fuel consumption of the diesel generators			In progress	31/12/2012
489	KCD / PWR	Power supply	EDG autonomy	On-site fuel transport	Purchase of tanker wagon to transport diesel fuel to the site, and evaluation of the necessary connection points	17		In progress	31/12/2012
490	KCD12 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Update an operating procedure in case of total SBO or LUHS (e.g., rapid cooling by means of steam generators)	25		In progress	30/11/2013
491	KCD34 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Update an operating procedure in case of total SBO or LUHS (e.g., rapid cooling by means of steam generators)	25		In progress	30/11/2013
492	KCD12 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Establishment of procedures for connection and start-up of alternative electric power supplies	15		In progress	30/11/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
493	KCD34 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Establishment of procedures for connection and start-up of alternative electric power supplies	15		In progress	30/11/2013
494	KCD / PWR	Power supply	EDG autonomy	Procedures to manage the autonomy of electrical diesel generators	Amend the procedures to anticipate oil make-up to the various diesel generators			In progress	31/12/2012
495	KCD12 / PWR	Water supply	Total Station Black-out	Steam generator protections	In case of complete SBO, examine the risks of drying up or overfilling of the steam generators		34	In progress	31/12/2013
496	KCD12 / PWR	Power supply	Total Station Black-out	Verification of the feedwater pump in case of loss of ventilation (room temperature)	Check the functioning of the AFW feedwater turbo pump without cooling ventilation in the room	21	35	In progress	31/12/2013
497	KCD34 / PWR	Power supply	Total Station Black-out	Verification of the feedwater pump in case of loss of ventilation (room temperature)	Check the functioning of the AFW feedwater turbo pump without cooling ventilation in the room	21	35	In progress	01/04/2014
498	KCD / PWR	Power supply	Total Station Black-out	Reactor building confinement	In case of total station black out, check whether all penetrations through the containment building can be closed in due time and whether the building isolating systems remain functional, in particular during shutdown states of the reactor. The feasibility of closing the access routes of the personnel and equipment must be examined. These topics must be considered in the "total SBO" procedure.	3, 19	36	In progress	31/12/2013
500	KCD / PWR	Power supply	Total Station Black-out	Safe Position Fuel Assembly	Assess the configuration with ongoing handling of a fuel assembly in the reactor pool when a "total SBO" occurs		41	In progress	31/12/2013
501	KCD12 / PWR	Power supply	Batteries autonomy	Increasing battery autonomy	Develop a load shedding programme for batteries to increase autonomy in SA circumstances (so that vital equipment for SAM remains available as long as possible).	16	53	In progress	31/12/2013
502	KCD34 / PWR	Power supply	Batteries autonomy	Increasing battery autonomy	Develop a load shedding programme for batteries to increase autonomy in SA circumstances (so that vital equipment for SAM remains available as long as possible).	16	53	In progress	31/12/2013
503	KCD / PWR	Power supply	Varia	Impact of the configuration and operation of High Voltage grid on the auxiliaries of NPP's	Perform a feasibility study to ensure a better geographic separation of high voltage lines. Also, in agreement with ELIA, the operator should make sure that in case of LOOP, the nuclear power stations are granted absolute priority for the restoration of their external power supplies.	15	33	In progress	31/12/2013
504	KCD / PWR	Emergency management	Multi-unit event and associated organization	Organization and logisitics of internal emergency plan in case of multi-unit event	Description of the organization of the emergency plan and the logistics adapted to take account of a multi-unit accident	28, 34, 45		CLOSED	30/06/2012
505	KCD / PWR	Emergency management	Multi-unit event and associated organization	Organization and logisitics of internal emergency plan in case of multi-unit event	Implementation of the organization of the adapted emergency plan and logistics	28, 34, 45		In progress	31/12/2013
507	KCD / PWR	Emergency management	Communications means	On & Off-site backup communications means	Re-evaluations of the performances of communications means will be launched to allow the site and Corporate level to execute their tasks more efficiently	35, 40		In progress	30/11/2012

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
508	KCD / PWR	Power supply	Total Station Black-out	Additional emergency lighting	Increase the emergency lighting in the various zones and rooms and places where the operators must be present in various scenarios.		38	In progress	31/12/2013
509	KCD / PWR	Emergency management	Infrastructure	On-site resistant storage for mobile means	Temporary storage place on the site, capable of withstanding external aggression, for non-conventional equipment in order to guarantee an autonomy of 72 hours.	32	26, 32	In progress	31/12/2013
510	KCD12 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Study of a filtered vent for the reactor building	3	8	In progress	31/12/2012
512	KCD12 / PWR	Severe Accidents management	H2 risk	H2 risk management in nuclear auxiliary building	Evaluation of the residual risk on H2 production and accumulation around the spent fuel pools	41	9	In progress	31/12/2012
513	KCD / PWR	Severe Accidents management	RB protection	Research &Development for severe accidents	R&D follow-up status about ex-reactor vessel cooling and basemat melt-through	30, 47	50	In progress	31/12/2013
515	KCD / PWR	Emergency management	Requirements	Specifications of mobile means	Determination of specific provisions for the additional equipment including the non conventional means (operation in adverse weather conditions, integration in the technical specifications, inspection and testing, maintenance…)	26, 29, 32	26, 31, 32, 55	In progress	30/06/2012
516	CNT / PWR KCD / PWR	Emergency management	Requirements	Harmonization of sites training programs	Consider increasing as far as possible the consistency between CNT and KCD as regards emergency plan training and refresher training (in terms of duration and frequency).	29, 35	10, 49	In progress	31/12/2013
518	KCD / PWR	Severe Accidents management	RB protection	Research &Development for severe accidents	R&D follow-up status about steam explosion	30, 47	50	In progress	31/12/2013
519	KCD12 / PWR	Severe Accidents management	Review SAMG procedures	Coherence severe accidents procedures between Doel and Tihange	Adapt BK-procedures according to SAMG (SAEG-1&2) and without reference to FRGs.	36, 37, 38	43, 44	In progress	31/12/2013
520	KCD34 / PWR	Severe Accidents management	Review SAMG procedures	Coherence severe accidents procedures between Doel and Tihange	Adapt BK-procedures according to SAMG (SAEG-1&2) and without reference to FRGs.	36, 37, 38	43, 44	In progress	31/12/2013
521	KCD12 / PWR	Severe Accidents management	Review SAMG procedures	Coherence severe accidents procedures between Doel and Tihange	Adapt BK-procedures according to SAMG CNT (aspects: evacuation of residual heat versus isolation of leak on the recirculation line - injection in primary versus spraying containment).	36, 37, 38	47,48	In progress	31/12/2013
522	KCD34 / PWR	Severe Accidents management	Review SAMG procedures	Coherence severe accidents procedures between Doel and Tihange	Adapt BK-procedures according to SAMG CNT (aspects: evacuation of residual heat versus isolation of leak on the recirculation line - injection in primary versus spraying containment).	36, 37, 38	47,48	In progress	31/12/2013
523	KCD12 / PWR	Severe Accidents management	Radiological release	Leak path identification	Complete BK-procedures with a decision-supporting tool (table, flow chart) to pinpoint rapidly the (most likely) place of a containment leak based on the reading of certain RM chains so as to determine the most appropriate action to limit the spread of radioactivity. This approach may involve deployment of mobile detectors at particular places.	43	46	In progress	On hold till results of discussion with Safety Authority

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
524	KCD34 / PWR	Severe Accidents management	Radiological release	Leak path identification	Complete BK-procedures with a decision-supporting tool (table, flow chart) to pinpoint rapidly the (most likely) place of a containment leak.	43	46	In progress	On hold till results of discussion with Safety Authority
527	KCD12 / PWR	Severe Accidents management	Radiological release	pH reactor control	Study of the necessity and feasibility (advantages/disadvantages) of the installation of tetraborate racks		45	In progress	31/12/2013
528	KCD12 / PWR	Operation management	Varia	Maintaining installed but non-required equipments available as back-up	Improvement of the technical specifications to reduce allowed downtimes of the 2nd level systems		54	In progress	30/06/2013
529	KCD34 / PWR	Operation management	Varia	Maintaining installed but non-required equipments available as back-up	Improvement of the technical specifications to reduce allowed downtimes of the 2nd level systems		54	In progress	30/06/2013
536	CNT1 / PWR	External hazards	Earthquake	Reinforcement of the electrical auxiliary building	Feasibility study for the reinforcement of the BAE electrical building		11	In progress	31/12/2012
538	CNT / PWR	External hazards	Earthquake	Sensibilization campagn to seismic alertness	Descriptive note: continue efforts to keep awareness of potential seismic interactions inside the premises. Ensure the strict application of procedures to avoid any interaction between scaffolding and seismic structures, systems and components		13	In progress	30/09/2012
539	CNT / PWR	External hazards	Flooding	Protection against site flooding	Provide a safety margin for the first level systems to take account of the uncertainties related to the decamillenial flood level		14	In progress	31/12/2012
540	CNT / PWR	External hazards	Flooding	Procedures in case of flooding	Additional improvements of the emergency intervention strategy and the crisis management should be implemented, including corresponding procedures	9	15	In progress	01/10/2012
541	CNT / PWR	External hazards	Flooding	Availability of the additionnal means against extreme flooding	Robustness of the CMU ultimate means circuit: determine the specific provisions applicable to safety related equipment (testing, maintenance, inspections…)	29	16, 30, 55	In progress	31/12/2012
542	CNT / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Robustness of the CMU ultimate means circuit: the alternative electric sources currently used to power the instrumentation and control systems and the emergency lighting should be improved where necessary	26	17	In progress	31/12/2012
543	CNT / PWR	External hazards	Flooding	Procedures in case of flooding	The robustness of the early warning system based on direct communication between the regional service competent for forecasting flow rates in the Meuse Basin ("SETHY", using a dedicated forecast system) and Tihange power station should be improved	9, 40	19, 20, 21, 22, 23, 24, 25	In progress	31/12/2012
544	CNT / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	Means of transport on site of personnel and equipment to the units, within the units or from one unit to another while the site is flooded must be organized and taken into account in the emergency plan			In progress	31/12/2012
545	CNT / PWR	External hazards	Flooding	Additional means against extreme flooding (pumps, diesel generators,…)	The internal risks potentially induced by flooding (fire, explosion) should be examined and additional measures should be taken where necessary	7		In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
546	CNT / PWR	External hazards	Extreme weather conditions	Sewage capacity evaluation	The re-evaluation of the capacity of the sewer system using a detailed hydrodynamic model must cover short-lasting heavy rainfalls and long-lasting rainfalls for return periods of up to 100 years	6	5, 29	In progress	31/12/2013
547	CNT1 / PWR	External hazards	Extreme weather conditions	Confirmation of resistance to tornadoes	The robustness of the 2nd-level emergency systems in Tihange 1 should be confirmed should a beyond design tornado with wind speeds exceeding 70 m/s occur		5, 30	In progress	31/12/2013
550	CNT / PWR	Power supply	Varia	Impact of the configuration and operation of High Voltage grid on the auxiliaries of NPP's	Perform a feasibility study to ensure a better geographic separation of high voltage lines (380 kV and 150 kV). Also, in agreement with ELIA, the operator should make sure that in case of LOOP, the nuclear power stations are granted absolute priority for the restoration of their external power supplies.		33	In progress	31/12/2012
551	CNT / PWR	Power supply	Total Station Black-out	Reactor building confinement	In case of total station black out, check whether all penetrations through the containment building can be closed in due time and whether the building isolating systems remain functional, in particular during shutdown states of the reactor. The feasibility of closing the access routes of the personnel and equipment must be examined. These topics must be considered in the "total SBO" procedure.	3, 19	36	In progress	31/12/2013
552	CNT / PWR	Water supply	Loss of Main Heat Sink	Backup heat sink	Justify that the 2nd level water capacity is sufficient when all site units are affected by the loss of the main ultimate heat sink. If necessary, a trategy for the optimization of water consumption will be developed.	14	37	In progress	31/12/2013
553	CNT / PWR	Power supply	Total Station Black-out	Additional emergency lighting	Reinforce the emergency lighting in the various rooms and places where the operators may work during the different scenarios		38	In progress	31/12/2013
554	CNT / PWR	Water supply	Loss of Main Heat Sink	Backup heat sink	Perform connection and operation tests in 2012 on the safety deep water intakes in the Meuse bed	14	39	In progress	31/12/2012
555	CNT / PWR	Power supply	Total Station Black-out	Safe Position Fuel Assembly	Assess the configuration with ongoing handling of a fuel assembly in the reactor pool when a "total SBO" occurs		41	In progress	31/12/2013
556	CNT / PWR	Water supply	Total Station Black-out	Inadvertent let down of the pools	Assess the configuration with loss of water inventory in the deactivation pools (potential design problems with the siphon breakers in deactivation pools). In case of pipe rupture, an insufficient capacity of the siphon breakers may result in rapid dewatering of the fuel assemblies. The operator should examine this safety issue.	23	41	In progress	31/12/2013
557	KCD / PWR	Emergency management	Multi-unit event and associated organization	Setting up of a fallback base	As part of the "High" mode of the internal emergency plan, alternative solutions for the off-site fall-back centre will be analyzed			CLOSED	30/06/2012
558	CNT / PWR	Emergency management	Multi-unit event and associated organization	Setting up of a fallback base	As part of the "High" mode of the internal emergency plan, alternative solutions for the off-site fall-back centre will be analyzed			In progress	31/12/2013
559	KCD / PWR	Emergency management	Multi-unit event and associated organization	Setting up of a fallback base	As part of the "High" mode of the internal emergency plan, alternative solutions for the off-site fall-back centre will be analyzed			In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
560	KCD / PWR	Emergency management	Multi-unit event and associated organization	Optimization and storage of mobile means	An optimization study for mobile equipment and their storage infrastructure (site or centralized) will be performed, also on the basis of the analysis of the EDMG	45		In progress	31/12/2013
563	CNT1 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Implementation of a filtered vent for the reactor building	3	8		LTO
564	CNT2 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Implementation of a filtered vent for the reactor building	3	8	In progress	31/12/2017 ?
565	CNT3 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Implementation of a filtered vent for the reactor building	3	8	In progress	31/12/2017 ?
566	KCD12 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Implementation of a filtered vent for the reactor building	3	8	In progress	LTO
567	KCD34 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Study of a filtered vent for the reactor building	"	8	In progress	31/12/2012
568	KCD34 / PWR	Severe Accidents management	RB protection	Filtered containment vent	Implementation of a filtered vent for the reactor building	3	8	In progress	31/12/2017 ?
572	CNT / PWR	Emergency management	Infrastructure	On-site resistant storage for mobile means	Fixed storehouse on site withstanding external aggression, for the permanent storage of the mobile non-conventional means necessary for covering the first 72 hours	32	18, 32	In progress	31/12/2013
573	KCD / PWR	Emergency management	Infrastructure	On-site resistant storage for mobile means	Fixed storehouse on site withstanding external aggression, for the permanent storage of the mobile non-conventional means necessary for covering the first 72 hours	32	18, 32	In progress	31/12/2013
574	KCD / PWR	Emergency management	Multi-unit event and associated organization	Complementary means for radiological surveillance	Analyse additional means for radiological monitoring in case of a severe accident affecting several units	43		In progress	30/06/2012
575	KCD / PWR	Emergency management	Multi-unit event and associated organization	Complementary means for radiological surveillance	Re-evaluations of the performances of software calculating radiological consequences will be launched to allow Corporate level to execute their tasks more efficiently	43		In progress	30/06/2012
581	Corporate CNT / PWR	Emergency management	Multi-unit event and associated organization	Organization and logisitics of internal emergency plan in case of multi-unit event	Implementation of the organization of the adapted emergency plan and logistics	28, 34, 45		In progress	31/12/2013
582	CNT2 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Seismic walkdowns with SG&H	11		In progress	31/12/2013
583	CNT3 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Seismic walkdowns with SG&H	11		In progress	31/12/2013
584	CNT / PWR	External hazards	Extreme weather conditions	Sewage capacity evaluation	Sufficient draining capacity in case of heavy rainfalls		29	In progress	31/12/2013
590	KCD12 / PWR	Operation management	Reactor building	Reactor building overpressure management	Primary circuit open: additional strategies for the management of overpressure in the containment building will be studied	3		In progress	30/06/2013
591	KCD34 / PWR	Operation management	Reactor building	Reactor building overpressure management	Primary circuit open: additional strategies for the management of overpressure in the containment building will be studied	3		In progress	30/06/2013
592	KCD12 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Implement the organization of the response to this type of non-conventional accident - complete SBO (management of equipment, documents, etc.)	25		In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
593	KCD34 / PWR	Operation management	Total Station Black-out	Procedures in case of total station black-out	Implement the organization of the response to this type of non-conventional accident - complete SBO (management of equipment, documents, etc.)	25		In progress	31/12/2013
594	KCD12 / PWR	Power supply	Batteries autonomy	Increasing battery autonomy	A tool for decision-support and calculation of load shedding of the batteries, the lost SAMG functions and the alternatives for compensating the lost functions will be implemented	16	53	In progress	31/12/2013
595	KCD34 / PWR	Power supply	Batteries autonomy	Increasing battery autonomy	A tool for decision-support and calculation of load shedding of the batteries, the lost SAMG functions and the alternatives for compensating the lost functions will be implemented	16	53	In progress	31/12/2013
596	KCD12 / PWR	Power supply	Spent fuel pools	Procedures to manage spent fuel pools	Procedures will be created for the management of the pools in case of loss of ultimate heat sink	23		In progress	31/12/2013
597	KCD34 / PWR	Power supply	Spent fuel pools	Procedures to manage spent fuel pools	Procedures will be created for the management of the pools in case of loss of ultimate heat sink	23		In progress	31/12/2013
598	CNT1 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Establishment of procedures for connection and start-up of alternative electric power supplies	15		In progress	31/12/2013
599	CNT2 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Establishment of procedures for connection and start-up of alternative electric power supplies	15		In progress	31/12/2013
600	CNT3 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Establishment of procedures for connection and start-up of alternative electric power supplies	15		In progress	31/12/2013
601	KCD12 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Detail design study of an alternative electric power supply to further increase the reliability of the pressurizer discharge valves (SEBIM)			In progress	31/12/2013
602	KCD3 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Detail design study of an alternative electric power supply to further increase the reliability of the pressurizer discharge valves (PORV)			In progress	31/12/2013
603	KCD4 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Detail design study of an alternative electric power supply to further increase the reliability of the pressurizer discharge valves (PORV)			In progress	31/12/2013
604	KCD12 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Install devices to allow isolation of accumulators during depressurization of the CRP reactor coolant circuit			In progress	31/12/2013
605	KCD3 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Install devices to allow isolation of accumulators during depressurization of the CRP reactor coolant circuit			In progress	31/12/2013
606	KCD4 / PWR	Power supply	Total Station Black-out	Reliability of depressurization means	Install devices to allow isolation of accumulators during depressurization of the CRP reactor coolant circuit			In progress	31/12/2013
607	KCD34 / PWR	Severe Accidents management	H2 risk	H2 risk management in nuclear auxiliary building	Evaluation of residual risk on H2 production and accumulation around the spent fuel pools	41	9	In progress	31/12/2012
608	KCD34 / PWR	Severe Accidents management	Radiological release	pH reactor control	Study of the necessity and feasibility (advantages/disadvantages) of the installation of tetraborate racks		45	In progress	31/12/2013
609	CNT1 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Installation of an alternative power supply (380 V) for the rectifiers	15		In progress	31/12/2013
610	CNT2 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Installation of an alternative power supply (380 V) for the rectifiers	15		In progress	31/12/2013
611	CNT3 / PWR	Power supply	Total Station Black-out	Implementation of a 380 V emergency electrical grid	Installation of an alternative power supply (380 V) for the rectifiers	15		In progress	31/12/2013

No.	Plant / Type	Topic	Sub-family	Sub-sub family	Action / Activity	Related recommendation on European level ("Topics 1 to 3")	Related recommendation on national level ("Additional topics")	Status	Target Date
614	CNT1 / PWR	External hazards	Earthquake	Impact earthquake on a fuel tank of Tihange 1.	Verify (via a visit) and analyze the consequences of the impact of a failure of the fuel tank CVAB01C at Tihange 1 (containing 500 m3 of fuel and not seismically qualified) (e.g., fires, flood) induced by an earthquake	7	7	In progress	31/12/2012
616	CNT / PWR KCD / PWR	External hazards	Earthquake	Regulatory watch	Follow the regulatory requirements on accelerometers	10	2	In progress	31/12/2013
618	CNT23 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Walkdowns must be carried out with SG&H for inspection of the structures, systems and components in the reactor buildings of the 2 most recent units during the next outages in 2012	11		In progress	31/12/2013
619	KCD / PWR	Power supply	Station black-out	Spent fuel pools : additional level measurements	Demonstrate good working of level gauges in case of boiling in the spent fuel pools			In progress	31/12/2013
620	CNT / PWR KCD / PWR	Severe Accidents management	Radiological release	pH reactor control	Check that it is effectively possible to take representative measurement of pH in severe accident conditions		45, 52	In progress	31/12/2013
622	KCD12 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Doel 12 (outside RGB and TUR): 1CV172: possible interaction between manual wheel and wall RGB. This adaptation has already been made: a smaller manual wheel has been fitted.			CLOSED	DONE
623	KCD4 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Doel4 (outside RGB and TUR): VAS-EX0003, VAS-EX0013 and VAS-EX0023: add lateral support(s) for anchoring ventilation conduits.		11	In progress	15/12/2012
624	KCD1 / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	RGB Doel1: the pneumatically controlled valves 1CV75, 1CV76, 1CV160 and 1RC20 must be better supported.		11	In progress	15/12/2013
625	KCD / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Perform Inspections in the reactor buildings and TURs of Doel2, Doel3 and Doel4		11	In progress	31/10/2012
626	KCD / PWR	External hazards	Earthquake	Reinforcement of equipments anchorages	Perform Inspections for a number of external water tanks (MW,…) that could be used as an alternative source of water (e.g. for WW).			In progress	31/07/2012
631	KCD12 / PWR	Severe Accidents management	Review SAMG procedures	Review Severe Accidents Mitigation Guidelines procedures	Consideration and implementation of the Fukushima accident experience feedback and of any revisions of WOG SAMG	33, 34, 36, 37, 38, 39		In progress	31/12/2014
632	KCD34 / PWR	Severe Accidents management	Review SAMG procedures	Review Severe Accidents Mitigation Guidelines procedures	Consideration and implementation of the Fukushima accident experience feedback and of any revisions of WOG SAMG	33, 34, 36, 37, 38, 39		In progress	31/12/2014
633	KCD / PWR	Emergency management	Multi-unit event and associated organization	Post-accident fixing of contamination and the treatment of potentially large volumes of contaminated water	Long term logistics and contingencies	42		In progress	31/12/2013
634	CNT / PWR	Emergency management	Multi-unit event and associated organization	Post-accident fixing of contamination and the treatment of potentially large volumes of contaminated water	Long term logistics and contingencies	42		In progress	31/12/2013