Unofficial translation

Decision:

AMENDMENT OF THE NUCLEAR ENERGY ACT LICENCE GRANTED TO N.V. ELEKTRICITEITS-PRODUKTIEMAATSCHAPPIJ ZUID-NEDERLAND (NV EPZ) FOR THE EXTENSION OF THE DESIGN LIFETIME OF THE Borssele Nuclear Power Plant

(Long Term Operation)

Granted by:

THE MINISTER OF ECONOMIC AFFAIRS

OF

THE NETHERLANDS

CONTENTS

1 The Decision

1.1 Licence

Under Section 15 b. of the Nuclear Energy Act the applicant N.V. Elektriciteits-Produktiemaatschappij Zuid–Nederland (NV EPZ), Zeedijk 32, 4454 PM Borssele (postal address PO Box 130, 4380 AC Vlissingen) is hereby granted a licence for the changes requested by letter of 12 September 2012, reference KT/MCr/TKe/B1200055, for the extension of the design lifetime of the Borssele Nuclear Power Plant (KCB) at Borsele to 31 December 2033. The licence application relates in particular to amendments to the Safety Report, which are set out in the document Revision VR-KCB93 REV.7 attached to the application. The KCB design in the Safety Report currently in force was based on an operating life of 40 years (ending in 2013), whereas the operating period in accordance with the provisions of Section 15a (1) of the Nuclear Energy Act has now been set at 60 years (up to 31 December 2033 at the latest). The licence application sets out the safety argument in support of a lifetime of 60 years for the KCB.

The changes requested are set out in the accompanying application documents and discussed in Part 2 of this licence.

With the granting of the changes requested, the Nuclear Energy Act licence currently in force of 18 June 1973, reference No. 373/1132/EEK, as laid down by Royal Decision of 13 September 1979, No. 46, under Sections 15a and 15b, 29 and 34 of the Act, as last amended by Decision of 24 June 2011, reference ETM/ED/11081801, for the Borssele Nuclear Power Plant situated at Zeedijk 32, Borssele is hereby further amended. The licensed changes relate to amendments to paragraphs 3.3, 3.4, 3.7 and 5.1.3 of the Safety Report in accordance with Annex C to the application.

The documents referred to at 1.2 form part of the licence.

To ensure safety and radiation protection the conditions at 1.3 are attached to this licence.
At the same time a number of conditions at 1.3 are attached to the licence ex officio under Section 19 (1) of the Nuclear Energy Act. The ex officio revision of the conditions relates to:

- Inspection of the reactor wall in response to previously undetected laminar defects in the reactor pressure vessel walls at the Belgian NPPs Doel 3 and Tihange 2.
- The abolition of the conditions on decommissioning and security, which are now redundant as EPZ has a decommissioning plan and a security plan approved by the Minister of Economic Affairs.

Annex A contains a glossary of terms as used in this Decision. This glossary does not form part of the present Decision. This also applies to the list of abbreviations contained in Annex B.

The licence is valid for an indefinite period.

1.2 Application documents forming part of the licence

The changes and additions to the 1993 Borssele Nuclear Power Plant Safety Report indicated in the annex to the application of 12 September 2012, reference EPZ/KT/MCr/TKe/B1200055, under the application and VR-KC93 REV.7 shall be adopted mutatis mutandis, superseding previous versions, and are included in the documents forming part of the licence.

The following annexes to the application form part of the licence:

1. Application for Amendment of the Nuclear Energy Act Licence: Revision of Safety Report regarding Operating Life of Borssele Nuclear Power Plant (Long Term Operation).
2. Annex C to the document referred to at 1, entitled Amendments to Safety Report.

The purpose of the document at 2 is to indicate the differences between Revision 6 and Revision 7 of the 1993 Borssele Nuclear Power Plant Safety Report. These differences are shown as changes in Revision 7 of the Safety Report.

1.3 Conditions attached to the licence

The conditions attached to the licence as granted by Decision of 18 June 1973, reference No. 373/1132/EEK, last amended by Decision of 24 June 2011, reference ETM/ED/11081801, shall be amended and supplemented as follows.

The following conditions at I. relate to the change requested by NV EPZ (as granted at 1.1). The conditions at II. have been included by the competent authority ex officio.

I. Conditions relating to the change requested, as granted at 1.1.

1.
Condition I.1, 'General', is amended and now reads as follows:
Insofar as not otherwise stated in this licence, following completion of the changes the Borssele Nuclear Power Plant must be equipped and operated in accordance with the provisions of paragraph 1.1 and Chapters 3-21 of Safety Report VR-KCB93, as amended and supplemented by the revisions with the references VR-KCB93 REV.1, VR-KCB93 REV.2, VR-KCB93 REV.3, VR-KCB93 REV.4, VR-KCB93 REV.5, VR-KC93 REV.6 and VR-KCB93 REV.7.

2.
After Condition II.Ba, 'Radioactive materials and sources', a new Condition II.Bb, 'Extended design lifetime to a period of 60 years', including Conditions 1-11 is inserted:

<u>II.Bb. Extended design lifetime to a period of 60 years</u>

Ageing management and additional inspections

1.
Based on an extended lifetime of 60 years, supplementary to condition II.B.20 NV EPZ shall submit an implementation plan for measures implementing the improvements to the ageing management system to the Director of the KFD (Department of Nuclear Safety, Security and Safeguards of the Inspectorate of Environment and Transport (ILT/KFD)) by 1 July 2013. The plan should relate to modifications for a sixty-year lifetime to:
a) organization, procedures and administration, and the skills, knowledge and behaviour of staff in relation to ageing management, and
b) the plant programmes (instandhoudingsprogramma's) of the Borssele NPP and how these programmes relate to one another.

The implementation plan shall include at least the ageing management objectives and the method for ascertaining whether they have been met. The implementation plan shall also provide at least an overview of the measures proposed by NV EPZ for improvements based on the results of:
a) the review of ageing management in the light of the extended lifetime (the Ageing Management Review),
b) the safety evaluation of the Safety Factors "Organization, Management System & Safety Culture" and "Human Factor",
c) the 2012 IAEA SALTO peer review, and

d) the assessment by the competent authority of the evidence produced for the licence application.

The measures in the implementation plan must be implemented by NV EPZ by 1 January 2014. NV EPZ shall submit a report on the progress of the plan and the interim results to the Director of the KFD by 1 October 2013.

2.
As part of the implementation plan referred to in Condition II.Bb.1 NV EPZ shall draw up a supplement to the in-service inspection (ISI) programme.
The purpose of this supplement to the programme is to assure the integrity of the systems, structures and components (SSCs) of the primary system (MCPB, Main Coolant Pressure Boundary) so that they can continue to perform their safety functions for 60 years of operation. This supplement must take at least the following activities into consideration:

1. Reinvestigation (ultrasonic) of the documented underclad cracking (UCC) in the reactor pressure vessel. An analysis demonstrating that the UCCs in the steam generators are covered by those in the reactor pressure vessel.
2. Ultrasonic testing of the ligaments on the reactor pressure vessel head.
3. Ultrasonic testing of the transition welds in the control rod nozzles on the reactor pressure vessel head.
4. Visual examination (VT-3) of the reactor pressure vessel support blocks including connecting welds at the first inspection opportunity.
5. Visual examination of the core barrel guide blocks including the connecting welds with the stainless steel cladding of the reactor pressure vessel.
6. Examination of the components of the main coolant pressure boundary that were not examined in the last inspection interval because of limitations in the number of welds to be examined (25% or the presence of an identical component).
7. External surface examination of the most highly stressed part of a representative bend in each primary cooling circuit.
8. Visual examination of the interior surface of the primary circuits.
9. Visual examination (VT-3) of the attachment welds of the pressurizer supports.
10. Visual examination of both steam generator channel heads and the Alloy 600 tube plugs.
11. Eddy testing (ET) of the rolled tube plugs (Alloy 690TT).
12. Extending the examination of the steam generator supports to the base material.
13. Supplement to the System Leakage Testing Walkdown procedure, listing rooms, components and parts for leakage inspection and checks on the clearance of support guides and whip restraints.
14. Additional ISI (surface and volumetric examination) of spray lines and spray valves on the pressurizer.
15. Internal examination (VT-1 and VT-2) of the pressurizer.
16. Supplement to the ISI programme adding areas that depart from the specifications and repairs to the primary pressure boundary.
17. Monitoring and trending of deposits on the steam generator tube sheets using the ET data.
18. Visual examination (VT-3) of the supports including the attachment welds of the steam generators and the main coolant pumps.
19. Visual examination (VT-1) of the steam generator channel heads.
20. Inspection of the welds, including transition welds, in the CRDM pressure housing for degradation of special materials.
21. Development of VT-1 internal inspections of selected surfaces in main coolant lines.
22. Inspection of austenitic pipework for TGSCC at critical locations in the primary system.
23. Inspection of the high-pressure cooling system of the main coolant pumps.
24. Checking prestressing in anchor bolts of primary components.
25. Checking the fasteners of high-strength materials (Class 8.8 bolts/studs and Class 8 nuts) for hydrogen-induced SCC.

26. Assessment of the integrated containment leak test frequency based on the result of the next test and the trend.
27. Non-destructive testing of containment welds.
28. Inclusion of the inspection of reactor pressure vessel internals in the ISI programme.
29. Checking for the presence of austenitic steel (A2 and A3 quality) fasteners in an environment where chlorides cannot be ruled out, and replacement with A4 and A5 quality material.

If equivalent information can be obtained in a way other than by means of the activities described above with which it can be demonstrated that the relevant SSCs can continue to perform their safety functions for the remaining operating life, that equivalent information may be used.
NV EPZ shall submit the supplement to the ISI programme to the Director of the KFD by 1 July 2013 and a report on the progress of the plan and the interim results to the Director of the KFD by 1 October 2013.
NV EPZ shall implement the measures identified based on the supplement to the ISI programme as soon as is reasonably possible and no later than 1 January 2018.

RPV embrittlement

3.
NV EPZ shall verify the safety margin for the ductile-brittle transition temperature at sixty years lifetime with the aid of two additional sets of test specimen (SOP3 and SOP4) placed in the reactor in 2007. Once the test specimen have been sufficiently irradiated by neutrons (i.e. equivalent to 55 full-load years), SOP3 and SOP4 shall be removed from the reactor. The safety margin for embrittlement shall be verified once the irradiated test specimen have been experimentally tested.
NV EPZ shall submit an action plan for the verification of the safety margin for the ductile-brittle transition temperature to the Director of the KFD at least six months prior to the removal of test specimen SOP3 and SOP4.
Once the results of the experimental tests of the test specimen and the verification of the safety margin for embrittlement are known NV EPZ shall submit these results to the Director of the KFD as soon as is reasonably possible and no later than 1 January 2020.

Fatigue

4.
NV EPZ shall ensure that during the entire operating life of the Borssele Nuclear Power Plant no safety-related damage occurs to materials of structures and components important to safety at its facility as a result of fluctuating loads (‘fatigue’).
NV EPZ shall replace the following five components/locations in the facility before 1 January 2020 unless state-of-the-art analyses show that the cumulative usage factor for fatigue of these components/locations is less than 1 for a lifetime of 60 years.
NV EPZ shall submit the results of the state-of-the-art analyses together with any action plan for additional measures for these five components/locations to the Director of the KFD by 1 October 2013. The action plan must also take into consideration the possibility of the reference levels for environmental fatigue being exceeded. The five components/locations are as follows:
a. Steam generator: Main steam nozzle
b. Main coolant line: nozzle of safety injection system/main coolant system (TJ/YA)
c. Surge line: surge line - main coolant line nozzle
d. Surge line: surge line - pressurizer nozzle
e. Pressurizer spray lines: spray nozzles of the volume control system (TA-hot)

5.
NV EPZ shall submit an action plan for additional measures for three components/locations that exceed the reference levels for environmental fatigue to the Director of the KFD by 1 October 2013. The three components/locations are as follows:

a. Main coolant line: TA/YA nozzle (volume control system/main coolant line)
b. Surge line: surge line piping
c. Main feedwater lines: nozzles of double T-piece RL/RS (main feedwater/backup emergency feedwater system)

The additional measures must be implemented by 1 January 2014.

6.
Until the end of the operating life of the Borssele Nuclear Power Plant NV EPZ shall use the FAMOS fatigue monitoring system installed in 2010 to monitor actual load fluctuations. NV EPZ shall use the FAMOS results to monitor the criteria for, and hence the validity of, the fatigue analyses and at the same time to optimize normal operation. NV EPZ shall submit an overview of the load fluctuations that occurred in the preceding year based on the FAMOS results to the Director of the KFD annually. This overview shall be based on the classification of forecast stress fluctuations for a 60-year period in the Load Catalogue, i.e. Lastfallkatalog.

7.
NV EPZ shall use the results of the measurements carried out using FAMOS obtained during five cycles, from the installation of FAMOS in 2010 until the refuelling outage in 2015, to update the original load catalogue in 2015 so as to provide a new load catalogue for a sixty-year design lifetime.
NV EPZ shall submit the aforementioned results of the FAMOS measurements, and the criteria for the fatigue analyses, together with the revised load catalogue for a sixty-year design lifetime, to the Director of the KFD as soon as is reasonably possible and no later than 1 January 2016.

8.
Based on the results when adopting the new stress catalogue for a sixty-year lifetime NV EPZ shall submit an action plan containing the measures to be taken for those parts of the facility for which the 'reference limit' is exceeded in the cumulative usage factor for a 60-year lifetime to the Director of the KFD by 1 July 2016.

'Leak before break'

9.
To gain a better understanding of leak-before-break behaviour, NV EPZ shall carry out specific verification of the assumptions regarding thermal stratification based on the measurement results obtained from the FAMOS fatigue monitoring system, once a sufficient amount of representative data is available for this purpose. NV EPZ shall submit the results of this verification to the Director of the KFD as soon as is reasonably possible and no later than 1 January 2016.

Qualification of accident-resistant electrical equipment

10.
NV EPZ shall implement a method for calculating the qualified residual life of accident-resistant electronic equipment based on the state of the art before 1 January 2014. This method must

ensure the availability and functionality of accident-resistant equipment during and after an accident.

NV EPZ shall calculate the residual life of all accident-resistant electrical components after each fuel cycle. If a residual life of less than five years is calculated for an accident-resistant electrical component, the component in question must be requalified or replaced.

Active components

11.

NV EPZ shall ensure that all active components within the scope of LTO are properly included in the plant programmes before 1 January 2014. To this end NV EPZ shall submit the results of the verification of the management of active components in the plant programmes, including any measures to be taken based on this verification, to the Director of the KFD by 1 July 2013. The measures for the management of active components must be implemented by NV EPZ by 1 January 2014.

II. Condition attached to the licence ex officio

1.
A new condition is inserted after Condition II.B.30, to read as follows:

II.B.31.
NV EPZ shall submit the results of the inspection of the reactor wall in response to previously undetected laminar defects in the reactor pressure vessel walls at the Belgian NPPs Doel 3 and Tihange 2 to the Director of the KFD by 1 June 2013.
NV EPZ must submit the action plan for this inspection to the Director of the KFD three months prior to the planned date of the inspection.

2.
Conditions II.B.29, II.E and II.H (2) are deleted.

1.4 Entry into force of the Decision

This Decision shall enter into force in accordance with the provisions of Section 20.3 of the Environmental Management Act (Wm).

2 The Application

2.1 The application documents

NV EPZ's application, dated 12 September 2012, reference KT/MCr/TKe/B1200055, was received on 19 September 2012. The following documents were enclosed with the covering letter:

1. Aanvraag tot wijziging van de Kernenergiewetvergunning Aanpassing Veiligheidsrapport inzake bedrijfsduur Kerncentrale Borssele (Long Term Operation);
2. m.e.r.-beoordelingsplicht Long Term Operation KCB, Ministerie van Economische Zaken, Landbouw en Innovatie, ETM/ED/11132793, 13 september 2011
3. Conceptual Document LTO Bewijsvoering KCB, NRG, NRG-22701/10.103460, 9 september 2011
4. Basisdocument 10EVA13 (Toetsingskader en PvA van de 3e tienjaarlijkse evaluatie), EPZ, KT/MCr/HtL/R10617, 6 december 2011
5. KCB RPV safety assessment assuming 60 years of operation, AREVA, NTCM-G/2009/en/0549, 12 July 2010
6. LTO Demonstration of Fatigue TLAAs, NRG, NRG-22488/11.106369 Revision 1, 30 May 2012
7. Review Time Dependency Break Preclusion for Borssele NPP to 2034, NRG, NRG-912192/09.97298, 26 November 2009
8. Ageing Management Review – Methodology Report, AREVA, PESS-G/2010/en/0041, 11 August 2011
9. Definition of the Scope of KCB Systems, Structures and Components to be Taken into Consideration for the Long-term Operation Process, AREVA, NEPS-G/2008/en/0056, 27 July 2011
10. Screening of relevant Structures and Components in the frame of the KCB Long-Term Operation Process, AREVA, NTCM-G/2009/en/0144, 6 October 2011
11. Summary report Ageing Management Review, NRG, NRG-22503/11.109273, June 2012
12. Methodology, approach and results of the 'Long Term Operation Bewijsvoering sub-project: Qualification of Design Base Accident-resistant electrical Equipment', EPZ, KTE/AdJ/SAL/R106299, Revision A, 7 September 2012

Annex 1 describes the actual application and the amendments to the 1993 Borssele Nuclear Power Plant Safety Report resulting from extending the lifetime. These amendments need to be incorporated in Revision 7 of the Safety Report as changes.
Annexes 5-12 contain the main supporting documents for extending the lifetime from 40 to 60 years.

In its application NV EPZ indicated its wish for Annex 2 to the report referred to above at 9, Definition of the Scope of KCB Systems, Structures and Components to be Taken into Consideration for the Long-term Operation Process, AREVA, NEPS-G/2008/en/0056, 27 July 2011, and Annex 2 to the report referred to above at 10, Screening of relevant Structures and Components in the frame of the KCB Long-Term Operation Process, AREVA, NTCM-G/2009/en/0144, 6 October 2011, to be treated confidentially. These two reports were appended to the application as annexes.

Given the need to protect trade secrets and security data, supplementary to the request in the licence application of 12 September 2012, NV EPZ asked in a letter of 18 October 2012, reference KT/MCr/TKe/B1200055, to deposit for inspection a second text of two other documents forming part of the application. These are the report referred to above at 5, KCB RPV safety assessment assuming 60 years of operation, AREVA, NTCM-G/2009/en/0549, 12 July 2010, and the report referred to above at 8, Ageing Management Review – Methodology Report, AREVA, PESS-G/2009/en/0041, 11 August 2011. In addition EPZ asked for the confidential handling of the documents referred to in the licence application of 12 September 2012 to be extended from Annex 2 to all the annexes.

The differences between the documents submitted with the application referred to at 5, 8, 9 and 10 and the second text deposited for inspection are as follows:
- The category S1-S3 scoping criteria have been deleted from the second text, as has the description of and reference to the barrier concept.
- All annexes have been deleted from the second text.
- All references to/explanations of underlying AREVA reports/annexes, i.e. references including the respective text passages, have been deleted from the second text.
- Virtually all AREVA references have been deleted from the second text.

2.2 Content of the application as indicated by NV EPZ

NV EPZ and its shareholders entered into an agreement with the State in 2006 (the Borssele Nuclear Power Plant Covenant, Government Gazette 2006, 136) stipulating 31 December 2033 as the closure date for the Borssele NPP (KCB). This closure date has now been enshrined in the Nuclear Energy Act.

The licence in force for the putting into operation and maintaining in operation of the KCB is valid for an indefinite period and therefore permits it to have an unlimited operating lifetime. The Nuclear Energy Act (Section 15a (1)) limits its operating life to 60 years.
Condition I.1 attached to the Nuclear Energy Act licence lays down that 'following completion of the changes the nuclear power plant must be equipped and operated in accordance with the provisions of paragraph 1.3 and Chapters 3-21 of Safety Report VR-KCB93, as amended and supplemented by the revisions with the references VRKCB93 REV.1, VR-KCB93 REV.2, VR-KCB93 REV.3, VR-KCB93 REV.4, VR-KCB93 REV.5 and VR-KCB93 REV.6'.

The Safety Report assumes an operating life of years 40 (lifetime) for various design analyses. The Borssele Nuclear Power Plant Covenant and Section 15a (1) of the Nuclear Energy Act permit operation up to and including 31 December 2033, corresponding to an operating life of 60 years. The effect of the longer operating life on the design analyses and other aspects of continuing to operate safely after 2013 is considered in Safety Report VR-KCB93 REV.7.
The application includes an overview of the amendments to the Borssele Nuclear Power Plant Safety Report (VR-KCB93) resulting from a 60-year lifetime. These amendments were incorporated in the Safety Report (VR-KCB93 REV.7) as changes.

Owing to the fact that parts of the Safety Report form part of the licence in force and the fact that amendments to the Report are needed in connection with the maximum operating life, which is set to end on 31 December 2033, NV EPZ requests that VR-KCB93 REV.7 be added to Condition I.1 attached to the licence.

2.3 Ex officio revision of conditions

Inspection of the reactor pressure vessel wall
Laminar indications were found in the reactor pressure vessel wall at the Belgian NPP Doel 3, and subsequently at Tihange 2. Although these indications do not appear to present a threat to the structural integrity of the reactor pressure vessel, investigation is warranted by their number and the fact that they were not reported during construction. Based on current knowledge of the problem at Doel 3 NV EPZ has investigated whether it could be transferable to the KCB and concludes that this is not the case. I would refer here to my letter of 2 October 2012 to the House of Representatives,[1] which also stated that NV EPZ intends to carry out ultrasound inspection of the reactor pressure vessel welds and a number of areas distributed over the vessel during the next refuelling outage so as to be able to reach a definitive conclusion. Condition II.B.31 deals with this.

[1] House of Representatives, 2012-2013 Session, No. 25 422 – 95.

Decommissioning and security
The conditions attached to NV EPZ's licence on security and decommissioning are being brought into line with the legislation in force on the subject, namely the Nuclear Facilities and Nuclear Materials (Protection) Regulation (Government Gazette 2010, 19950) and the Nuclear Facilities (Shutdown and Decommissioning) Regulation (Government Gazette 2010, 4386). These regulations require NV EPZ to have a security plan and a decommissioning plan approved by the Minister of Economic Affairs. I approved NV EPZ's security plan on 15 February 2012 and its decommissioning plan on 27 October 2011. As a result of the approval of these plans the licence conditions on security and decommissioning have been superseded by these plans as of those dates and are now redundant. Those conditions have therefore been deleted from NV EPZ's licence.

3 Legislation and procedures

3.1 Applicable laws and regulations

The legislation
Under Section 15b of the Nuclear Energy Act an amendment to the licence in force is required for the change requested. The changes requested to the conditions are made under Section 19 (3) of the Act. The ex officio amendment to the condition is made under Section 19 (1) of the Act. Having regard to Section 15 of the Act the Minister of Economic Affairs is competent to decide on this application.
In accordance with Section 17 (1) and Section 20 (1) of the Act the uniform public preparatory procedure as referred to in Division 3.4 of the General Administrative Law Act applies, as does Division 13.2 of the Environmental Management Act.

EIA requirement
Whether an Environmental Impact Assessment (EIA) is required for the licence amendment requested by NV EPZ has been considered, and it was concluded that, given the amendment requested, whereby the Safety Report for the KCB is revised as regards the effects of the longer design lifetime on the design analyses and on other aspects of continuing to operate safely after 2013, an EIA is not required for the proposed activity. NV EPZ was notified of this conclusion by letter of 13 September 2011, reference ETM/ED/11132793.

In the first place, NV EPZ's Nuclear Energy Act licence in force for the KCB is valid for an indefinite period, not solely for 40 years. The validity period of this Nuclear Energy Act licence for the KCB was therefore expressly not extended when granting this licence to extend the KCB's lifetime.

The change requested primarily involves formalizing amendments to the Safety Report attached to the licence in force. In the last resort one-on-one replacement of non-environmentally-critical components would be required, which can take place under the licence in force. The amendment requested, then, does not involve any expansion of or modification to the KCB facility. Also, extending the validity period of the Safety Report cannot be regarded as extending the validity period of the licence itself, as this was issued for an indefinite period.

Nor do any of the cases referred to in Category D 22.3 in Annex D to the Environmental Impact Assessment Decree apply. Furthermore, under Article 2 (5) b. of the Decree it is not necessary to consider whether there is an EIA requirement, as there is no activity in the meaning of Column 1 of the Decree.
Lastly, the activities undertaken in connection with the extended lifetime will not have any adverse environmental effects, as all that is involved is the updating of the Safety Report, with no modification to the Borssele NPP. There will therefore be no change in the existing environmental effects – nuclear or conventional – as already authorized.

Documents not made public
Under Section 19.3 (1) and (2) of the Environmental Management Act a second text of a number of reports attached to the application was submitted from which information was omitted, citing the Government Information (Public Access) Act (Wob). This information relates to trade secrets and security data. It could also harm the security of the state. Personal data was also deleted, citing Section 10 (1) d. of the Wob.

Administrative bodies involved
In accordance with Article 15, opening and paragraph a., of the Besluit kerninstallaties, splijtstoffen en ertsen[2] (Bkse) the following provincial, municipal and water board authorities have been involved in the drafting of this draft Decision:

In the Netherlands:
- Zeeland Provincial Executive

[2] Nuclear Facilities, Fissile Materials and Ores Decree

- Borsele Municipal Executive
- Middelburg Municipal Executive
- Noord-Beveland Municipal Executive
- Sluis Municipal Executive
- Terneuzen Municipal Executive
- Veere Municipal Executive
- Vlissingen Municipal Executive
- Goes Municipal Executive
- Zeeuwse Eilanden Water Board, Middelburg
- Zeeuws-Vlaanderen Water Board, Terneuzen
- Zeeland Security Region, Middelburg

In Belgium:
- Ministry of Environment, Nature and Energy, Environmental Permits Department, Brussels
- Ministry of Environment, Nature and Energy, East Flanders Environmental Permits, Ghent
- The Governor of the Province of Antwerp
- East Flanders Provincial Authority, Ghent
- City of Antwerp
- City of Ghent
- Municipality of Wachtebeke
- Municipality of Moerbeke
- Municipality of Stekene
- Municipality of Sint-Gilles-Waas
- Municipality of Beveren

Legislation
The main legislation here is as follows:
- Nuclear Energy Act (Kew), in particular Sections 15-19, 29 and 34
- Nuclear Facilities, Fissile Materials and Ores Decree (Bkse)
- Radiation Protection Decree (Bs)
- Environmental Management Act (Wm), in particular Parts 7, 13 and 20
- Environmental Impact Assessment Decree 1994
- General Administrative Law Act (Awb), in particular Part 3
- Nuclear Power Plants (Quality Assurance) Regulation
- Borssele Nuclear Power Plant Covenant (2006)
- Effects of Ionizing Radiation (Analysis) Regulation (MR-AGIS)
- Justification of Uses of Ionizing Radiation (Publication) Regulation (MR Rechtvaardiging)
- Security of Nuclear Facilities and Fissile Materials Regulation
- Decommissioning of Nuclear Facilities Regulation

3.2 The procedure

Receipt of application and admissibility check
The application (as described above at 2.1) was received from NV EPZ on 19 September 2012. NV EPZ supplemented it by letter of 18 October 2012. To decide whether the application could be considered it was checked against the requirements pursuant to the General Administrative Law Act and the Nuclear Facilities, Fissile Materials and Ores Decree (in particular Articles 3 and 11). The application meets these requirements and was therefore taken into consideration.

The draft Decision
Notification was given of the draft Decision on 24 October 2012, stating the opportunities for inspection and public consultation. The draft Decision and the notification were also sent to the administrative bodies involved listed above.
The public were able to express their views relating to the draft Decision in line with Sections 3.15 and 3.16 of the General Administrative Law Act up to and including 5 December 2012. An information evening was organized in Heinkenszand on 7 November 2012, providing the opportunity to ask questions and express views. Up to and including 5 December 2012, 638 views were received (of which 635 written and three verbal). The written views were accompanied by two

petitions with 3088 signatures. Of the 638 views, 284 were from the Netherlands and 354 from Germany. Many of the 638 expressed views were identical. Selecting for unique views, a total of 54 were identified that had been received within the time limit for public consultation. A further 13 views were received outside the time limit; these will be disregarded, as they were submitted too late.

Annex C to this Decision shows who expressed their views. Part 6 of the Decision summarizes the views, groups them under five headings and discusses them.

4 Assessment Framework for Amendment of the Licence

4.1 Extended design lifetime: the background

4.1.1 What does extended design lifetime entail?

An important point when considering the licence application to extend the design lifetime is that NV EPZ's Nuclear Energy Act licence for the KCB is not time-limited; it was granted for an indefinite period. The original design and construction of the KCB, however, were based on an operating life of 40 years. This design lifetime was taken as the basis for the design and as such included in the Safety Report that forms part of the Nuclear Energy Act licence.

In the first place, NV EPZ has not applied for a change in the period of the operating licence as part of this licensing procedure. The licence application to extend the design lifetime of the KCB relates to formalizing amendments to the Safety Report. In effect this application relates to continuing the current operations, for which the Report needs to be updated for a design lifetime of 60 years. The previous Report was based on an operating life of 40 years for the design of the KCB (ending in 2013), whereas Section 15a (1) of the Nuclear Energy Act lays down that the KCB is permitted to remain in operation until 31 December 2033 at the latest, i.e. having an operating life of 60 years.

Nor does the application involve any modification or expansion to the KCB facility. The change requested primarily involves formalizing amendments to the Safety Report attached to the licence in force. One-on-one replacement of components may be needed in order to operate up to 2034, but this does not require an amendment to the licence.

As the application does not relate to a modification or expansion to the KCB facility, there is no change in aspects such as waste generation, security and non-proliferation, the consequences of discharges of radioactive materials, the consequences of accidents or other consequences for the environment. This means that these aspects remain outside the assessment framework for this application.

The argument in support of this licence amendment relates to the physical ageing of the KCB plant. Ageing of the design – conceptual ageing – is not part of this and is therefore not included in the assessment framework for this licence to extend the KCB's design lifetime. Ageing of the design – conceptual ageing – is included in the Periodic Safety Review. See also the section on *Periodic Safety Review (PSR) in 4.1.3.*

4.1.2 Extended design lifetime: the international context

The amendment to the licence to keep the NPP in operation until the end of 2033 has been examined in the light of an assessment framework, the main criteria for which can be found in the conditions on extending the design lifetime of nuclear power plants (Long Term Operation, LTO) published by the International Atomic Energy Agency (IAEA).

The original design of NPPs assumes a finite operating life. In recent years increasing consideration has been given internationally to operating power plants beyond the lifespan provided for in the original design analyses.

The IAEA defines LTO as follows:[3]

'Long term operation (LTO) is operation beyond an established timeframe set forth by, for example licence term, design, standards, licence and/or regulations, which has been justified by safety

[3] Safe Long Term Operation of NPPs, IAEA Safety Report Series (SRS) 57, 2008

assessments with consideration given to life limiting processes and features of systems, structures and components (SSCs)'

In the past the design of nuclear power plants was often based on a design lifetime of 30 or 40 years. This design lifetime was used particularly in the design of a few components whose replacement did not seem particularly economically viable at the time, such as reactor pressure vessels and reactor buildings. These SSCs were designed so as to be certain to last for the design lifetime based on a particular operational load.

Given overdesign and conservative analyses it is likely that large, less easily replaceable SSCs will substantially outlast those 40 years, but this still has to be demonstrated.

Operators of NPPs have what is referred to as an 'ageing management programme' to monitor and deal with physical ageing phenomena in materials of SSCs that are important to safety. This programme thus ensures that SSCs that are important to safety are in satisfactory condition at all times. SSCs are given timely maintenance, or measures taken to replace them, based on findings.

The possibility of LTO is determined not solely by technical factors but also by organizational, administrative and human factors.[4]

How feasible it is to extend operating life in terms of technology is partly an economic issue: the more the operator is willing to invest, the more SSCs can be replaced and/or repaired and the longer operating life can be extended.

4.1.3 Different types of safety reviews

This section discusses some other safety reviews that were carried out recently, are currently in progress or will be carried out in the near future at the KCB. This is done mainly to indicate what the investigation with regard to extended design lifetime does not include, and to clarify the relationship between these safety reviews and extension of the KCB's design lifetime. These investigations therefore have no connection with the assessment framework for this licence amendment insofar as it relates to extending the lifetime.

These are the 'European stress test analysis', the PSR, the investigation that is to be carried out in response to the findings in the reactor pressure vessels of the Belgian NPPs Doel 3 and Tihange 2, and lastly the investigation by the Benchmark Commission under the Borssele Nuclear Power Plant Covenant.

The purpose of the investigation into extending design lifetime and the inspection of the reactor pressure vessel in response to the findings at the Belgian NPPs is to demonstrate that the plant is in satisfactory physical condition at all times. This is an essential precondition for safe operation.

The main aim of the investigations as part of the European Stress Test and the Periodic Safety Review is to evaluate the design and operation of the KCB in the light of the state of the art and current understanding of nuclear safety.

The investigation by the Benchmark Commission relates to both aspects: both the current physical condition of the plant and the current state of the design of the NPP are included in the criteria on which it will base its conclusion.

European 'stress test analysis'

In response to the nuclear accident in Fukushima all European NPPs have undergone a 'stress test analysis'. The stress test looked specifically at the robustness of the NPPs against extreme external hazards, not at physical ageing. The results of the stress test have not led to conclusions that have consequences for the licence to extend the KCB's design lifetime.

[4] 'Human factors' includes staff qualification, proper training and human-machine interfaces.

The stress test has produced a better understanding of the KCB's safety margins. Improvement measures have been identified to increase these, based on the analysis carried out as part of the stress test. The improvement measures are to be implemented over the next few years and will be completed by the end of 2017.

Periodic Safety Review (PSR)

The purpose of the Periodic Safety Review (PSR) is to assess the current physical condition of the plant, and additionally to evaluate the design and operation of the KCB in the light of the state of the art and current understanding. The PSR is a specific implementation of the concept of continuous improvement. The results of the PSR lead to modifications and improvements to the plant and to some extent will result in revision of the licence. The Periodic Safety Review of the KCB is a requirement under the current licence.

The current PSR covers the 2004-2013 period and is the third official PSR of the KCB since its commissioning in 1973; the evaluation must be completed by the end of 2013 (10-EVA13). Following the first and second PSRs the design of the KCB was improved as a result of the measures taken at the time based on current understanding.

The PSR includes investigation into ageing, including not just the physical ageing of SSCs and materials, as carried out for this licence application, but also the ageing of the design. This conceptual ageing is not included in the decision-making on this licence to extend the KCB's design lifetime.

The modifications proposed based on the third Periodic Safety Review will be carried out after 2013. Implementation of the measures will be completed by the end of 2017.

Doel 3 and Tihange 2

Following the discovery of defects in the reactor pressure vessel walls at the Belgian NPPs Doel 3 and Tihange 2 a condition was added to the licence ex officio requiring NV EPZ to carry out additional measurements to ascertain whether there are defects at the KCB similar to those found in the reactor pressure vessels at Doel 3 and Tihange 2. This requirement has been included in this licence for the sake of continuous improvement and international uniformity. From a safety point of view it is not necessary to carry out this investigation immediately. It will be carried out during the next regular maintenance shutdown in spring 2013 [see also Parliamentary Papers II, 2012/13, Appendix 642].

As regards the defects discovered in the reactor pressure vessels at Doel 3 and Tihange, the Federal Nuclear Inspection Agency (FANC) concludes that these are most likely to be 'hydrogen flakes' (inclusions of hydrogen in the metal) that occurred during the manufacture of the Belgian reactor pressure vessels. These defects are therefore not ageing phenomena.

Benchmark Commission

Article 4 of the Borssele Nuclear Power Plant Covenant lays down that the parties to the covenant shall set up an international expert commission to assess whether the NPP meets the agreed requirement, which is that the KCB should remain among the twenty-five percent safest water-cooled and water-moderated power reactors in the European Union, the USA and Canada.

The Borssele Benchmark Commission (BBC) was set up at the end of 2008. As far as possible it assesses safety based on quantified performance indicators. Where a quantitative comparison of design, operation, maintenance, ageing and safety management is not possible the comparison is based on a qualitative appraisal by the experts on the commission.

The BBC investigation does not form part of the framework for assessing the application to extend the KCB's lifespan. The BBC will however include in its assessment the results of the investigation into ageing in connection with extending the design lifetime.

It has meanwhile developed its assessment method and will publish its first report during 2013.

4.2 Assessment framework

4.2.1 Justification and radiation protection

The statutory framework for radiation protection as laid down in the Nuclear Energy Act and underlying decrees is based inter alia on the three principles of radiation protection policy: justification, ALARA and dose limits.

Justification means that a procedure that entails exposure to ionizing radiation is only permitted if the economic, social and other benefits of that procedure outweigh the damage to health that it could cause. This principle in laid down in the legislation in Article 19 of the Nuclear Facilities, Fissile Materials and Ores Decree in conjunction with Article 4 (1) of the Radiation Protection Decree. It has been developed under Article 19 (2) of the Radiation Protection Decree in Annex 1 to the Justification of Uses of Ionizing Radiation (Publication) Regulation.

Applying the ALARA (As Low As Reasonably Achievable) principle entails optimization of the probability and magnitude of potential exposures. The ALARA principle is laid down in the legislation in Section 15c (3) of the Nuclear Energy Act and Article 19 of the Nuclear Facilities, Fissile Materials and Ores Decree in conjunction with Article 5 of the Radiation Protection Decree. Optimization takes place at the design stage, before the activity commences, and in the operational phase by NV EPZ, once the activity has been authorized.

ALARA results in a process aiming at a likelihood of damage that is as small as can reasonably be achieved in the given circumstances, taking social and economic factors into account and covering both environmental and health and safety aspects.

Dose limits provide a safety net, i.e. where the application of justification and ALARA is not sufficient to achieve a particular level of protection. The limits are laid down in legislation in Article 19 of the Nuclear Facilities, Fissile Materials and Ores Decree in conjunction with Articles 48, 49, 76 and 77 of the Radiation Protection Decree.

This application does not involve any modification to the facility, so the principles of justification, ALARA and dose limits are of limited significance when assessing it.

4.2.2 Safety and IAEA guidelines

The safety argument, hence the argument in support of this amendment to the Safety Report, is based on the guidelines laid down by the International Atomic Energy Agency (IAEA) in Safety Report No. 57, 'Safe Long Term Operation of Nuclear Power Plants' (SR-57), where the IAEA lays down a specific methodology for dealing with ageing management aspects for LTO.

In order to comply with the requirements in SR-57 NV EPZ has carried out an LTO Assessment evaluation project to provide the arguments and documentation required for the licence application for extended design lifetime. Fig. 1 provides a representative overview of SR-57, which was used as the basis for the LTO Assessment project.

SR-57 includes:

- A more broad-based consideration of the whole LTO process, including re-evaluation and revalidation of previous analyses based on time-dependent assumptions (such as presumed operating life), referred to as 'Time-Limited Ageing Analyses' (TLAAs).
- A systematic method for identifying SSCs that fall within the scope of LTO.
- Evaluation of SSCs within the scope of LTO.

SR-57 does not deal with organizational or administrative matters or human factors: these are covered by Safety Factors 10 and 12 in the IAEA Safety Guide NS-G-2.10.

SR-57 lays down an evaluation process in three stages:

- Stage prior to LTO Assessment;
- Stage of LTO Assessment;
- LTO approval and implementation stage.

This is illustrated in Fig. 1 in SR-57 as shown on the next page.

As part of the 'Verification of preconditions' the efficacy of the KCB's 'plant programmes' was checked. These plant programmes are designed to ensure the functionality of passive and active components based on surveillance testing, inspections, maintenance, etc. The efficacy check falls in the stage prior to the LTO assessment. In addition, NV EPZ verifies whether the active components that are important to safety are included in the plant programmes. The verification of active components is based on a recommendation by a team of international experts from the IAEA as part of the 2009 SALTO peer review.

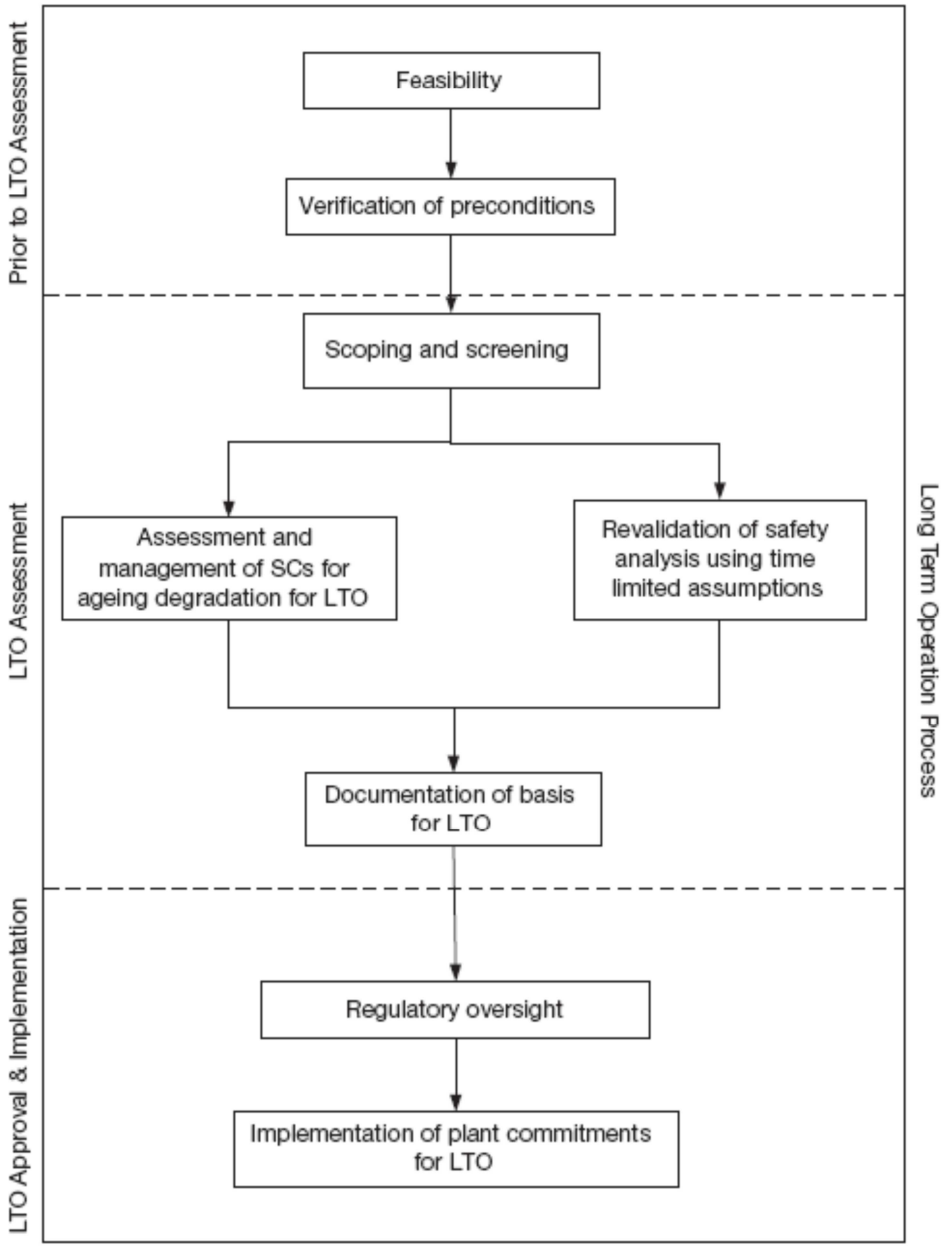

Fig. 1 Overview of activities for an LTO evaluation in line with SR-57

4.2.3 Management & Organization (Safety Factors 10 and 12)

The KCB carries out periodic safety evaluations: it is required, for instance, to carry out a comprehensive safety evaluation every ten years, the 'PSR'. The current PSR evaluation of the KCB must be completed by the end of 2013 (10-EVA13).

The policy framework for PSR is an IAEA guide, NS-G-2.10 *Periodic Safety Review of Nuclear Power Plants* of 2003. Meanwhile there is a draft DS 426 of the successor to the IAEA Safety Guide with the same title.

NS-G-2.10 and DS 426 provide recommendations on how to carry out a periodic safety evaluation of an existing NPP based on a number of Safety Factors.

A PSR considers not only technical aspects but also organizational and personnel matters. Safety Factor 10 in NS-G-2.10 and DS 426 is concerned with Organization, Management System and Safety Culture, and Safety Factor 12 with Human Factors.

The aim of evaluating SF10 is to determine whether the organization, the management system and the safety culture are adequate and effective to guarantee the safe operation of the NPP.

The aim of SF12 is to evaluate the various human factors that can affect the safe operation of the NPP and to attempt to identify improvements that are reasonable and practicable.

SF10 and SF12 have been included in the LTO assessment framework with a view to the continued operation of the KCB. NV EPZ therefore used the evaluation reports drawn up as part of the PSR for SF10 and SF12, so that it can be assessed before 1 January 2014 whether these factors require measures relating to the organization of the KCB's operation.

5 The Assessment of the Application

5.1 Justification

As regards justification I find that NV EPZ has been licensed to maintain the KCB in operation for an indefinite period. I would also refer to the Borssele Nuclear Power Plant Covenant signed in 2006, under which the House of Representatives agreed to limit this period to 31 December 2033 inclusive at the latest. This date is also laid down in Section 15a (1) of the Nuclear Energy Act. I would also refer to Annex 1 to the Justification of Uses of Ionizing Radiation (Publication) Regulation (Government Gazette 2002, 248), where the KCB is listed in Category I.B.2, Power Generation, thus justifying the operation of the KCB in general.
In this category electricity generation is mentioned as an argument, in addition to the general arguments of employment and economic benefits to society.

In this case the principle of justification applies to the requested amendment to the Safety Report as regards the effects of the longer design lifetime on the design analyses and on other aspects of continued safe operation after 2013.
Justification generally involves looking at an activity that in itself could entail exposure to radiation and that the applicant wishes to commence and to carry out on a long-term basis. The disadvantage of the proposed activity in terms of damage to health is weighed against its benefits. In this case there is no modification or expansion of the KCB's activities, hence there is no change in the damage to the health of local residents outside the facility versus the situation prior to the continued operation. The change requested primarily involves formalizing amendments to the Safety Report attached to the licence in force by amending the licence.

The competent authority lays down additional inspections with the aim of demonstrating the integrity of the structures and components of the primary system so that they can continue to perform their safety functions for 60 years of operation. Additional inspections entail an additional dose of radiation exposure for staff involved in carrying them out, and they have financial consequences. The radiation exposure of staff employed by NV EPZ or brought in by NV EPZ must comply with the statutory provisions. In spite of the disadvantages, laying down a condition on additional inspections is nevertheless regarded as justified, given the benefit to nuclear safety.

The conclusion is that the activities requested are justified in this context.

5.2 Safety and radiation protection

Framework

NV EPZ has applied to extend the KCB's lifespan. Before submitting the application, NV EPZ provided the Ministry of Economic Affairs with a large number of documents in support of it. The Ministry has assessed the application and the supporting documents in the light of the policy framework agreed on the basis of IAEA documents.

For the technical aspects IAEA Safety Report No. 57, Safe Long Term Operation of Nuclear Power Plants (SR-57), was used, and for the organizational aspects Safety Factor 10, Organization, Management System and Safety Culture, and Safety Factor 12, Human Factors, were used as the policy framework (see 4.4).

When assessing the supporting documents in the LTO Assessment the Ministry was assisted by expert advisers from the German Gesellschaft für Anlagen- und Reaktorsicherheit (GRS).

In addition, at the request of the competent authority the International Atomic Energy Agency (IAEA) reviewed the analyses carried out by NV EPZ in two Safe Long Term Operation (SALTO) peer reviews. A SALTO peer review examines how the management deals with the ageing of materials and components and advises on the setting-up and implementation of a systematic ageing management programme (AMP) to ensure safe operation beyond the original design

lifetime. The IAEA SALTO peer reviews to the KCB took place in 2009 and 2012. Each mission was carried out by a group of international experts on the technical and organizational aspects of extending the design lifetime of NPPs.

The results of the assessment of Safety Factors 10 and 12 were based mainly on the findings of the 2012 SALTO peer review.

Assessment

As regards the information supplied by NV EPZ on extending the KCB's design lifetime, the following conclusions can be drawn:

- The relevant aspects are adequately described in the application and the annexes.
- The documents supplied by NV EPZ in support of the application also contain sufficient information and sufficiently detailed information to enable a decision to be taken on extending the KCB's design lifetime.
- The approach adopted by NV EPZ is in accordance with the assessment framework.

The documents appended to the application by NV EPZ comply with the international criteria for extended design lifetime. In particular, NV EPZ has supported and demonstrated that:

- The large, difficult-to-replace components such as the reactor pressure vessel can remain in service for another twenty years.
- All systems, structures and components that perform safety functions are in satisfactory physical condition and are covered by an adequate ageing management programme.

Based on the foregoing I conclude that NV EPZ's application to extend the design lifetime is adequately supported and complies with the international rules, provided the conditions attached to this licence are implemented.

Conditions

Conditions have been attached to the licence based on the findings and recommendations of GRS and the IAEA SALTO peer reviews and the Ministry's assessment of the application. In addition to the general requirement to comply with the recommendations resulting from the assessment of the application, as laid down in Condition II.Bb.1, certain specific conditions have been laid down based on the findings and recommendations.

A general requirement when drawing up the conditions attached to this licence is that the measures must be implemented before 1 January 2014, i.e. before the period of continued operation commences. In the case of a number of conditions this requirement has been waived for various reasons, which are stated.

The precondition for safety is that the KCB must be able to be operated safely at all times. This means that the safety criteria laid down must be complied with at all times, both during current operation and during its continued or extending operating life. To ensure that this is the case, as regards the safety argument in support of extending the KCB's design lifetime it was examined whether the integrity of difficult-to-replace components that are important to safety, such as the main coolant lines and the reactor pressure vessel, can be guaranteed up to and including 2033.

An important point here is that in a few cases the integrity of certain plant components may not be demonstrated for entirely up to the end of 2033 while it is demonstrated for up to an earlier date. If this is the case it must be clear that the integrity of these plant components must be demonstrated for the remaining operating life before this earlier date is reached.

The safety argument submitted by NV EPZ for the design lifetime extension demonstrates this for up to the end of 2033 with the exception of a few components/locations in terms of fatigue. Condition II.Bb.4 deals with this.

The current load catalogue for calculating cumulative usage factors is based on extrapolation from the load fluctuations in the plant up to 2007. This current load catalogue adequately supports the extension of the KCB's design lifetime up to the end of 2033 as regards fatigue, with the exception

of the components/locations listed in Condition II.Bb.4. For these locations NV EPZ must submit an action plan before 1 October 2013 to ensure that the conditions laid down for fatigue are met or that adequate measures are taken, e.g. replacement.

If necessary the components/locations listed in Condition II.Bb.4 must be replaced before 2023 based on the current cumulative usage factors for fatigue. Condition II.Bb.4 requires the components/locations listed to be replaced before 1 January 2020, unless state-of-the-art analyses before that date show that the cumulative usage factor for fatigue of these components/locations is less than 1 for a design lifetime of 60 years.

The method described above means that the actual loads during the entire design lifetime – also with a design lifetime of 60 years – are guaranteed not to exceed the load criteria laid down for safe operation at any time.

There are other conditions of which the measures have a later implementation date:

Condition II.Bb.7, for instance, requires NV EPZ to submit a revised load catalogue for the plant based on FAMOS (the Fatigue MOnitoring System) to the Director of the KFD before 1 January 2016. The data on which this new load catalogue is based will not be known until after five cycles, i.e. after the 2015 refuelling outage. The new load catalogue can then be drawn up, in which cumulative usage factors up to the end of the extended design lifetime (the end of 2033) are recalculated based on the actual loads measured using FAMOS. This will supersede the current load catalogue in support of the application for LTO. Condition II.Bb.8 requires NV EPZ to submit a new action plan for those parts of the facility if it then emerges that reference levels for the new cumulative usage factors for an operating life of 60 years are being exceeded.

Condition II.Bb.3 also lays down a later implementation date, as it relates to a verification as an additional check. The irradiation programme referred to in this condition serves to verify the safety margin for reactor pressure vessel embrittlement, supplementing the argument given in the application to extend the design lifetime. The calculations in the argument show that this safety margin is adequate. The results of empirical testing must be submitted to the Director of the KFD by 1 January 2020. The irradiation sets SOP3 and SOP4 are a continuation of the previously removed sets SOP1 and SOP2. The power plant previously began operating with SOP1 and SOP2, which were removed from the reactor pressure vessel and tested after a certain irradiation time.

Condition II.Bb.9 also relates to a verification as an additional check, namely verification of the thermal stratification criteria using the readings obtained from the FAMOS fatigue monitoring system. This verification will improve understanding of leak-before-break behaviour. It can take place as soon as a sufficient quantity of representative data is available (not before 2014). NV EPZ must therefore submit the results of this verification to the Director of the KFD as soon as is reasonably possible and no later than 1 January 2016.

Like the verifications under Conditions II.Bb.3 and II.Bb.9, not all the additional inspections under Condition II.Bb.2 will take place before 1 January 2014. NV EPZ is required to implement the measures identified as a result of the additions to the in-service inspection (ISI) programme as soon as is reasonably possible and no later than 1 January 2018. The purpose of the additional inspections is to obtain more information on the condition of the main plant components and to verify the assumptions regarding the long-term use of those components. These additional inspections are to be incorporated in the existing inspection programme and are subject to inspection intervals (e.g. once every ten years) to ensure adequate ageing management of those components. The additions to the ISI programme must be incorporated in the existing programme before 1 January 2014. Also, a good deal is already known about the condition of the components concerned and there is time to carry out the additional inspections of the locations listed in the licence condition. On top of this, a number of specific inspections related to the design lifetime extension and arising from ageing investigations are to be carried out prior to 2014.

Based on the amendments to the Safety Report requested by NV EPZ and the analyses and evaluations carried out for a design lifetime of 60 years, conditions have been attached to this licence on six aspects. These conditions are discussed below.

1. Ageing management and additional inspections

The change entails adding to the Safety Report that the ageing management of all safety systems, structures and components, and those that are important to safety, was checked for completeness (coverage of relevant parts and ageing mechanisms) and suitability in 2011.

The 2012 IAEA SALTO peer review concluded that the ageing management system at NV EPZ is adequate to detect degradation of components that are important to safety in good time and that the evidence submitted for this application is in accordance with the international IAEA rules and guides on extending design lifetime. A subsequent (third) SALTO peer review in 2014 will check that NV EPZ is observing the recommendations of the previous SALTO peer reviews.

Based on the recommendations of the GRS and the IAEA SALTO peer review, the competent authority in the first instance imposes a general condition on NV EPZ designed to supplement the KCB plant's existing ageing management system. This involves drawing up an implementation plan (a) to strengthen ageing management in the organization, e.g. by integrating the LTO documentation in the KCB's management system documentation and ensuring that the organization has the correct duties and responsibilities, and (b) to add to the KCB's plant programmes and ensure that they are coherent. This implementation plan must contain measures to address all the recommendations of GRS and the IAEA SALTO peer review and the findings of the assessment of the application to extend the design lifetime.

In a second condition the competent authority also imposes an addition to the ISI programme as part of NV EPZ's implementation plan, in particular to address GRS's recommendations on this point.

The implementation plan to be drawn up by NV EPZ must identify further actions. Once the licence to extend the design lifetime is granted, as part of its supervision and enforcement remit the KFD (Department of Nuclear Safety, Security and Safeguards) will oversee the implementation plan and take enforcement action if necessary.

2. Reactor pressure vessel embrittlement

The change entails adding to the Safety Report that analysis of changes in material properties due to neutron irradiation, based on the state of the art, has been carried out for a design lifetime of 60 years. The analysis takes into account the effects of changing the core loading strategy, the possible use of MOX fuel elements and improved understanding of brittle fracture behaviour and methods of calculating it. The new assessment shows that there are generous safety margins as regards the reactor pressure vessel's brittle fracture behaviour for a 60-year design lifetime as well.

Based on the calculations, NV EPZ concludes that RPV embrittlement due to neutron irradiation under the influence of temperature and pressure is not a safety problem for an operating life of 60 years. The competent authority supports the assumptions and the conclusion on this subject. NV EPZ must however verify the calculations of the RPV embrittlement safety margin empirically using test specimen (SOP3 and SOP4) irradiated in the KCB reactor. The length of time for which the test specimen are irradiated in the reactor is an important aspect of this verification. In the case of SOP4 this should be equivalent to 55 full-load years. A condition is to be attached to the licence on verifying the safety margin for RPV embrittlement as an additional check. There is no reason from the safety point of view to wait for this before granting the licence.

3. Material fatigue in the KCB reactor system

The change entails adding the following to the Safety Report:

- Load conditions during surveillance testing. Surveillance testing means pressure tests of components and systems taken into service for the first time and periodic pressure and leak-tightness tests.

- On reviewing the fatigue analyses for a design lifetime of 60 years the original design numbers were revised based on extrapolation from the actual load fluctuations up to 2007. The review showed that the existing fatigue design basis includes an adequate margin to prevent damage to the reactor system due to fatigue.
- The fatigue factors comply with the draft KTA (Nuclear Safety Standards Committee) limits for environmental fatigue.
- Projected values for 60 years' operating life based on the actual load fluctuations up to 2007 have been added to Table 3.3/1.

As regards fatigue of the components concerned, in a conservative analysis NV EPZ calculated for five components/locations that the cumulative usage factor for extended operating life up to 2034 (CUF2034) is greater than 1. The fatigue effects could be too high for these components/locations from 2023. The competent authority imposes the requirement of a three-year margin, which means that these components/locations must be replaced before 2020 at the latest, unless NV EPZ is able to demonstrate with state-of-the-art analyses that damage due to fatigue in the period up to 2034 can be ruled out, or that additional measures can be taken in time.

Meanwhile NV EPZ has installed FAMOS (FAtigue MOnitoring System) to monitor the loads and load fluctuations in the KCB plant. NV EPZ uses this information to keep track of the actual loads on the plant and to monitor the criteria and hence the validity of the fatigue analyses, and to optimize normal operation with a view to reducing the loads on the plant.

The FAMOS data will also be used in 2015, after five cycles, to draw up a new load catalogue that is valid for a sixty-year design lifetime. Based on this new load catalogue NV EPZ will examine whether the cumulative usage factor remains less than 1 for the components/locations concerned and whether the 'reference values' for the usage factors for 60 years' operating life are not exceeded. If so, NV EPZ shall submit an action plan setting out the measures to be taken by it.

4. Leak before break

The change entails adding to the Safety Report that the leak-before-break principle has been demonstrated for high-energy lines for a design lifetime of 60 years.

The design principle applied internationally is that if five principles are applied during the design, construction and operation of components, major fractures in these components as a result of a circumferential crack can be ruled out. It must be demonstrated that leakage will occur before the components will fail (the leak-before-break principle) so that precautions can be taken in time to prevent a major fracture once a leak is detected.

NV EPZ concludes that the leak-before-break safety concept as it is applied to the high-energy (main coolant, main steam and main feedwater) lines remains valid if the KCB's design lifetime is extended from forty to sixty years. In every case the crack growth rate based on a presumed initial crack is slow and will not result in a through-wall crack or leak in the respective line within the design lifetime of sixty years. If a leak develops there are large safety margins for it to be detected and measures can be taken in time to prevent the failure (fracture) of the line.

The competent authority considers the application of the leak-before-break concept to be justified. This has not led to a specific condition on leak-before-break being laid down. NV EPZ will however verify the thermal stratification criteria using the readings obtained using the FAMOS fatigue monitoring system. This verification will improve understanding of leak-before-break behaviour.

It can take place as soon as a sufficient quantity of representative data is available (around 2014). A condition has been formulated on this subject.

5. Qualification of accident-resistant electrical equipment

The KCB has electrical equipment to control and regulate the electricity generation process. In order to deal with accidents, part of this equipment is accident-resistant, i.e. capable of withstanding the environmental conditions that could result from an accident, such as increased temperature, pressure, relative humidity and radiation level.

In the context of extending the KCB's design lifetime the qualification of the accident-resistant electrical and instrumentation and control systems, i.e. their availability and functionality in accident situations, has been assessed. Based on this assessment, at the time of each refuelling NV EPZ will check the qualification of accident-resistant electrical equipment by ascertaining that the residual life for which it will demonstrably continue to operate correctly under the accident conditions laid down is five years or more. If the residual life is found to be five years or less the component concerned must be requalified or replaced.

6. Active components

In support of LTO the KCB carried out a project to demonstrate the safe long-term operation of all relevant components. This was conducted in accordance with SR-57,

which is based largely on American NRC rules, which presuppose that all NPPs apply the Maintenance Rule (10 CFR 50.65) when implementing LTO. This rule requires that the utility monitors the performance or condition of relevant SSCs, or applies a preventative maintenance programme and ensures the correct ageing management of active components. This aspect is therefore not dealt with in SR-57. As the Maintenance Rule does not apply to EPZ, NV EPZ carries out an evaluation of active components in line with that Maintenance Rule. For the same reason the 2009 SALTO peer review recommended evaluating active components in the context of LTO.

As part of checking the preconditions for LTO NV EPZ examined the efficacy of the existing plant programmes. These plant programmes are designed to ensure the functionality of passive and active components based on surveillance testing, inspections, maintenance, etc. NV EPZ will also demonstrate before 1 January 2014 by means of verification that the active components are adequately included in the plant programmes so as to guarantee their correct operation.

Safety and radiation protection: conclusion

The conclusion that can be drawn from the safety analyses that have been carried out is that (a) the arguments submitted by NV EPZ are of adequate quality and (b) they demonstrate that also with a design lifetime of sixty years the statutory framework and the policy framework adopted to supplement it and the standards and design principles laid down therein are complied with, provided that the improvement measures identified based on the analyses and evaluations are implemented. Additional conditions are attached to the licence to ensure the timely and effective implementation of the measures.

The conclusion is that there are no reasons to refuse the change requested, also from the point of view of safety and radiation protection.

6 Views expressed to the Draft Decision

6.1 Views expressed

Following the depositing of the draft Decision for inspection, as stated at 3.2 above, 638 views were received, of which 54 were unique. These unique views will be discussed at 6.4.

The submitters of views are listed in Annex 3 to this Decision. To avoid excessive references it has been decided to list the views not by submitter of a view but by subject.

To ensure that all the submitters of views are able to identify themselves in the responses each unique view is numbered in the list in Annex C. This number corresponds to the numbers given to the respective topics in 6.4.1-6.4.5.

6.2 General response to views expressed

Before discussing the individual views in 6.4, for the sake of clarity we shall consider extensively once more what the application to extend the KCB's design lifetime entails and again discuss the background to the licence application and the assessment framework within which it has been examined.

What does the application to extend the design lifetime entail?

An important point when considering the licence application to extend the design lifetime is that NV EPZ's Nuclear Energy Act licence is not time-limited, but was granted for an indefinite period. The original design and construction of the KCB, however, were based on an operating life of 40 years. This design lifetime was taken as the basis for the design and as such included in the Safety Report that forms part of the Nuclear Energy Act licence.

In the first place, NV EPZ has not applied for a change in the period of the operating licence as part of this licensing procedure. The licence application to extend the design lifetime of the KCB relates to formalizing amendments to the Safety Report. In effect this application relates to continuing the current operations, for which the Report needs to be updated for a design lifetime of 60 years. The previous Report was based on an operating life of 40 years for the design of the KCB (ending in 2013), whereas Section 15a (1) of the Nuclear Energy Act lays down that the KCB is permitted to remain in operation until 31 December 2033 at the latest, i.e. have an operating life of 60 years.

Nor does the application involve any modification or expansion to the KCB facility. The change requested primarily involves formalizing amendments to the Safety Report attached to the licence in force. One-on-one replacement of components may be needed in order to operate up to 2034, but this does not require an amendment to the licence.

As the application does not relate to a modification or expansion to the KCB facility, there is no change in aspects such as waste generation, security and non-proliferation, the consequences of discharges of radioactive materials, the consequences of accidents or other consequences for the environment. This means that these aspects remain outside the assessment framework for this application.

Extended design lifetime: the international context

The original design of NPPs assumes a finite operating life. As more and more NPPs worldwide are approaching the end of their original design lives, more and more research is being done into the possibilities of keeping NPPs in operation beyond the life provided for in the original design analyses. Extensive research has been carried out, in particular in the United States, on the basis of which the majority of the 104 NPPs in the USA are now licensed for an operating life of 60 years.

Long Term Operation (LTO) is an international term referring to the period of continued operation, i.e. the continuation of operation beyond the period on which the original design was based. Extended design lifetime must be justified by carrying out a safety review looking directly at time-limiting processes and characteristic systems, structures and components (SSCs). The term LTO means the same as extended design lifetime or continued operation.

In the past the design of nuclear power plants was generally based on a design lifetime of 30 or 40 years. This design lifetime was used particularly in the design of certain SSCs whose replacement did not seem particularly economically viable at the time, such as reactor pressure vessels. These SSCs were designed so as to be certain to last for the design lifetime based on a particular operational load.

As a result of conservative assumptions in the design analyses it is likely that large, less easily replaceable SSCs will substantially outlast their original design lifetime, but this still has to be demonstrated.

Operators of NPPs have what is referred to as an 'ageing management programme' to monitor and deal with the physical ageing (materials degradation due to time and/or usage) of SSCs that are important to safety. This programme thus ensures that SSCs that are important to safety are in satisfactory condition at all times. SSCs are given timely maintenance, or measures to replace them are taken, based on findings. In addition to physical ageing the term 'conceptual ageing' is used when considering the ageing of the safety design. This involves comparing the safety design with the latest developments in nuclear safety and radiation protection. 'Conceptual ageing' does not therefore form part of the framework for assessing the application to extend the KCB's operating life.

For the NPP operator, how feasible it is to extend operating life is an economic rather than a technical issue. Virtually all components can be replaced, so the technical lifespan can in theory be unlimited. The more the operator is willing to invest, the more SSCs can be replaced and/or repaired and the longer operating life can be extended.

Borssele Nuclear Power Plant Covenant

In June 2006 NV EPZ, the operator and licensee of the KCB, the shareholders in NV EPZ, Delta and Essent, and the State of the Netherlands agreed on the conditions under which the KCB can remain in operation until 31 December 2033 at the latest instead of the original forty years foreseen, by signing the KCB Covenant (Government Gazette 2006, 136). The most important provisions on nuclear safety in the Covenant are as follows:

- The KCB can remain open until 31 December 2033 at the latest.
- The KCB should remain among the twenty-five percent safest water-cooled and water-moderated power reactors in the European Union, the United States of America and Canada.

The latest closure date for the KCB is also laid down in Section 15a (1) of the Nuclear Energy Act.

With the passing of the KCB Covenant by the House of Representatives in 2006 a political decision was in effect taken to keep the KCB open until the end of 2033 at the latest (Parliamentary Papers II, 2005/06, 30000 No. 31).

The Covenant is the basis for continuing to operate the KCB until the end of 2033, but it does not form part of the framework for assessing the application to extend the design lifetime.

Extending the KCB's design lifetime: the argument

Any amendment to the Safety Report to extend the original design lifetime from forty to sixty years must be properly supported. The crucial question is whether the plant can be kept in operation safely for another 20 years. The criterion is that the argument must demonstrate the following:

- The large, difficult-to-replace components such as the reactor pressure vessel can remain in service for another twenty years.

- All systems, structures and components that perform safety functions are in satisfactory physical condition and are covered by an adequate ageing management programme.

The licence application sets out this safety argument in support of a design lifetime of 60 years for the KCB. Extended design lifetime can therefore be granted, provided that the conditions laid down are complied with.

Assessment framework

The competent authority has drawn up an assessment framework for the way in which this amendment to the Safety Report is supported technically, based on the guidelines laid down by the International Atomic Energy Agency (IAEA) in Safety Report No. 57, 'Safe Long Term Operation of Nuclear Power Plants' (SR-57).

SR-57 supplements the IAEA safety requirements and guidelines on the operation of NPPs with regard to extended operation and provides detailed, systematic information on how assessment should be carried out. It sets out:

a. The conditions for extended operation.

b. How to determine the SSCs and relevant functions that need to be assessed specifically for extended operation.

c. Criteria and guidelines for demonstrating that the effects of ageing will be dealt with during the extended design lifetime and assessing the physical condition of the plant components concerned.

d. The identification of safety analyses containing lifespan-related assumptions that need to be revalidated for extended design lifetime.

The assessment framework has also been extended to cover aspects relating to organization and administration and human action. NV EPZ needs to demonstrate that it is ready for continued operation from 1 January 2014 in these areas too.

For further discussion of the assessment framework see Part 4 of this Decision.

The assessment of the application

When assessing the application to extend the design lifetime to sixty years the competent authority was assisted by the German Gesellschaft für Anlagen- und Reaktorsicherheit (GRS).

In addition, the Borssele NPP was visited in May 2012 by a SALTO Peer Review Mission on the invitation of the competent authority. These missions are carried out under the auspices of the IAEA. SALTO stands for 'Safe Long Term Operation'. This type of international peer review involves an international expert team assessing NV EPZ's activities for extended design lifetime.

Another SALTO peer review was previously carried out in 2009 to assess NV EPZ's previous and proposed activities in relation to continued operation prior to the evaluation process on this subject.

The competent authority included the findings of the two SALTO peer reviews in 2009 and 2012 in its final assessment of the application to extend the KCB's design lifetime up to 2034.

6.3 Different types of safety reviews

In addition to the investigation into extended design lifetime a number of other safety reviews at the KCB were carried out recently, are currently in progress or will be carried out in the near future. These are the 'European stress test analysis', the Periodic Safety Review , the investigation that is to be carried out in response to the findings in the reactor pressure vessels of the Belgian

NPPs Doel 3 and Tihange 2, and lastly the investigation by the Benchmark Commission under the Borssele Nuclear Power Plant Covenant.

These investigations are discussed below to clarify the differences in their nature and findings and how they relate to extending the KCB's design lifetime.

The purpose of the investigation into extending design lifetime and the inspection of the reactor pressure vessel in response to the findings at the Belgian NPPs is to demonstrate that the plant is in satisfactory physical condition at all times. This is an essential precondition for safe operation.

The main aim of the investigations as part of the European Stress Test and the Periodic Safety Review is to evaluate the design and operation of the KCB in the light of the state of the art and current understanding of nuclear safety.

The investigation by the Benchmark Commission relates to both aspects: both the current physical condition of the plant and the current state of the design of the NPP are included in the criteria on which it will base its conclusion.

European 'stress test analysis'

In response to the nuclear accident in Fukushima all European NPPs have undergone a 'stress test analysis'. The stress test looked specifically at the robustness of the NPPs against extreme external hazards, not at physical ageing. The results of the stress test have not led to conclusions that have consequences for the licence to extend the KCB's design lifetime.

The stress test has produced a better understanding of the KCB's safety margins. Improvement measures have been identified to increase these, based on the analysis carried out as part of the stress test. The improvement measures are to be implemented over the next few years and will be completed by the end of 2017.

Periodic Safety Review (PSR)

The purpose of the Periodic Safety Review (PSR) is to assess the current physical condition of the plant, and additionally to evaluate the design and operation of the KCB in the light of the state of the art and current understanding. The PSR is a specific implementation of the concept of continuous improvement. The results of the PSR lead to modifications and improvements to the plant and to some extent will result in revision of the licence. The Periodic Safety Review of the KCB is a requirement under the current licence.

The current PSR covers the 2004-2013 period and is the third official PSR of the KCB since its commissioning in 1973, and the evaluation stage must be completed by the end of 2013. Following the first and second PSRs the design of the KCB was improved as a result of the measures taken at the time based on current understanding.

The PSR includes investigation into ageing, including not just the physical ageing of SSCs and materials, as carried out for this licence application, but also the ageing of the design. This conceptual ageing is not included in the decision-making on this licence to extend the KCB's design lifetime.

The modifications proposed based on the evaluation will be carried out after 2013. Implementation of the measures will be completed by the end of 2017.

Doel 3 and Tihange 2

Following the discovery of defects in the reactor pressure vessel walls at the Belgian NPPs Doel 3 and Tihange 2 a condition was added to the licence ex officio requiring NV EPZ to carry out additional measurements to ascertain whether there are defects at the KCB similar to those found in the reactor pressure vessels at Doel 3 and Tihange 2. This requirement has been included in this licence for the sake of continuous improvement and international uniformity. From a safety point of view it is not necessary to carry out this investigation immediately. It will be carried out during the

next regular maintenance shutdown in spring 2013 [see also Parliamentary Papers II, 2012/13, Appendix 642].

As regards the defects discovered in the reactor pressure vessels at Doel 3 and Tihange, the FANC concludes that these are most likely to be 'hydrogen flakes' (inclusions of hydrogen in the metal) that occurred during the manufacture of the Belgian reactor pressure vessels. These defects are therefore not ageing phenomena.

Benchmark Commission

Article 4 of the Borssele Nuclear Power Plant Covenant lays down that the parties to the covenant shall set up an international expert commission to assess whether the NPP meets the agreed requirement, which is that the KCB should remain among the twenty-five percent safest water-cooled and water-moderated power reactors in the European Union, the United States of America and Canada.

The Borssele Benchmark Commission (BBC) was set up at the end of 2008. As far as possible it assesses safety based on quantified performance indicators. Where a quantitative comparison of design, operation, maintenance, ageing and safety management is not possible the comparison is based on a qualitative appraisal by the experts on the commission.

The BBC investigation does not form part of the framework for assessing the application to extend the KCB's lifespan. The BBC will however include in its assessment the results of the investigation into ageing in connection with extending the design lifetime.

It has meanwhile developed its assessment method and will publish its first report during 2013.

6.4 Response to views expressed

6.4.1 Topic 1: Procedure

Submitters of views on this topic:
1, 2, 4, 5, 7, 8, 12, 15, 16, 18, 19, 20, 21, 22, 39, 42, 43, 44, 45, 49.

The following points were raised on the topic of **Procedure**:

EIA requirement

a. A number of submitters of views note that the licensee wrongly failed to draw up an EIA, including an assessment of transboundary effects, in spite of conventions such as OSPAR.

Response
Before granting the licence to extend the design lifetime, I assessed whether an EIA needed to be drawn up for the amendments to the Safety Report for the KCB proposed by NV EPZ with a view to operating up to and including 2033. I notified NV EPZ of the result of this assessment by letter of 13 September 2011, reference ETM/ED/11132793.

I concluded that for the activity proposed by NV EPZ and the licence amendment required for extended design lifetime not only does an environmental impact assessment not need to be drawn up, an EIA is not required for the activity. I gave reasons for this conclusion in paragraph 3.1 of the licence. A passage on this subject was also included in the announcement published with reference to the draft Decision on extended design lifetime. Let me explain once more how I reached this conclusion. In the first place, NV EPZ's Nuclear Energy Act licence in force for the KCB is valid for an indefinite period, not just for 40 years, as many submitters of views implicitly assume. The validity period of this Nuclear Energy Act licence for the KCB was therefore expressly not extended when granting this licence to extend the KCB's lifetime. The reason that NV EPZ has requested an amendment to the Nuclear Energy Act licence for the KCB for the post-2013 period relates to the fact that the original Safety Report for the KCB was based on an operating life of 40 years, i.e. up to 2014. In order to be able to continue to use the Nuclear Energy Act licence for the post-2013 period NV EPZ needs to demonstrate that it is possible to continue to operate the KCB after 2013 within the technical constraints that apply. As it was agreed in the 2006 KCB Covenant and laid down in Section 15a (1) of the Nuclear Energy Act that the KCB can remain in operation until the end of 2033 at the latest, NV EPZ needs to demonstrate that the large, difficult-to-replace components such as the reactor pressure vessel can remain in service for another 20 years, and that all systems, structures and components that perform safety functions are in adequate physical condition and are subject to an adequate ageing management programme. The foregoing has been demonstrated by NV EPZ with the aid of detailed technical safety assessments. In certain cases it was found that one-on-one replacement of non-environmentally-critical components would be required, which can take place without a licence amendment. This, however, was not sufficient to enable the Nuclear Energy Act licence in force to be used after 2013: the Safety Report attached to the Nuclear Energy Act licence for the KCB also needed to be revised as regards the effects of the longer design lifetime on the design analyses and on other aspects of continuing to operate safely after 2013. The revised parts of the Safety Report form part of the licence provisions and a licence amendment is required for them to form part of the licence. In effect, the purpose of this licence amendment is to formalize amendments to the Safety Report with a view to extending the design lifetime to 60 years; it does not involve any expansion or modification to the KCB facility. Also, extending the validity period of the Safety Report cannot be regarded as extending the validity period of the licence itself, as this was issued for an indefinite period, as already pointed out.

In my opinion an environmental impact assessment (EIA) is not required for the licence amendment for extended design lifetime, as explained above. Annex D to the Environmental Impact Assessment Decree under Category 22.3 lays down an EIA requirement for 'Modification to or expansion of a facility in which nuclear energy can be released, including the shutdown or decommissioning of such power plants or reactors' if certain situations listed in Column 2 occur in the course of this activity.

I found first of all that the amendment to the Safety Report proposed by NV EPZ does not involve any 'expansion' or 'modification' to the facility in the meaning of Column 1 in Annex D to the Decree, as the amendment to the Report is not related to a modification to the NPP itself. I also found that the licence amendment for extended design lifetime does not relate to any of the situations listed in Column 2 in Annex D to the Decree, as extending the design lifetime does not involve any change in the type or quantity of fuel or any change in the initial degree of enrichment (Situation 1). Nor is any increase in the authorized discharges into water or air (Situation 2) or any increase in storage capacity for spent fuel (Situation 3). Also, extending the design lifetime does not involve installing any systems to prevent or deal with serious accidents (Situation 4). Lastly, a change in the date of shutdown or decommissioning by more than five years (Situation 5) can also be disregarded, as the licence amendment for extended design lifetime does not relate to revision of a licence previously issued for the shutdown or decommissioning of the KCB. The KCB has not yet reached the end of its operating life and a shutdown and decommissioning licence has not been issued. The fact is that NV EPZ has a licence to maintain the KCB in operation for an indefinite period and that under the KCB Covenant and Section 15a of the Nuclear Energy Act the date of shutdown has already been decided. The change requested by NV EPZ merely relates to the amendment of the Safety Report, hence it does not relate to shutdown or decommissioning. Situation 5 does therefore not apply.

Given that the licence amendment for extended design lifetime does not involve any of the situations listed in Category 22.3 in Annex D to the Environmental Impact Assessment Decree there cannot be any EIA requirement, let alone a requirement to produce an EIA.

Furthermore, I found that under Article 2 (5) b. of the Environmental Impact Assessment Decree it is not necessary to consider whether there is an EIA requirement, as there is no activity in the meaning of Column 1 of the Decree.

In spite of this finding, and in spite of the fact that the situations in Column 2 do not apply, for the sake of completeness I finally examined whether the activity could actually have any substantial environmental effects. I found that the activities undertaken in connection with the extended design lifetime will not have any adverse environmental effects, as all that is involved is the updating of the Safety Report, with no modification to the Borssele NPP. There will therefore be no change in the existing environmental effects – nuclear or conventional – as already authorized. Lastly, the additional measures as a result of the stress test are not included in this licensing procedure to extend the design lifetime and cannot therefore constitute a ground to require an EIA. These measures will be included in a separate or existing licensing procedure, e.g. for the Periodic Safety Review.

Some submitters of views further refer to Decision 2000/1 of the OSPAR Commission, in which the OSPAR signatories decided in 2000 that the reprocessing facilities' discharge permits should be revised by the competent national authorities as a matter of priority. This decision is addressed solely to the signatories with reprocessing facilities, i.e. the United Kingdom and France and therefore has consequences only for the competent authorities of those countries. At the time, however, these two signatories abstained from voting on this decision, which means that they are not bound by OSPAR Decision 2000/1. There are no such reprocessing facilities in the Netherlands, so this decision does not apply to the Netherlands. Consequently it has no bearing on the application to extend the KCB's design lifetime.

Documents wrongly not deposited for inspection

b. A number of submitters of views note that NV EPZ's application refers to calculations and investigations that have not been deposited for inspection. Submitters of views further argue that a second version of documents was deposited for inspection at NV EPZ's request without further explanation in which relevant environmental information was deleted from the original documents, citing Part 19 of the Environmental Management Act. This information is therefore not available to interested parties. The submitters of views request that they be sent the original documents.

Response
Contrary to what the view suggests, I have indeed deposited for inspection all the documents forming part of the licence application. The documents referred to by NV EPZ in the licence application, to which the view refers, merely provide further support for the documents forming part of the licence application; they do not form part of the application documents and are not needed in order to assess the application. For this reason these documents have not actively been made public. This is not to say, however, that interested parties cannot come and inspect these documents on request. As regards a number of the documents forming part of the application that have been made public by me I have indeed, citing Section 19.3 (1) and (2) of the Environmental Management Act, submitted a second text from which information was omitted, citing the Government Information (Public Access) Act. I gave reasons for using this power in the announcement published with reference to the draft licence. This was also indicated in the overview of documents forming part of the application that was also deposited for inspection. As stated, this is information relating to trade secrets and security data that have not been made public. The interests of state security were also a reason for not publishing this information. Personal data have also been deleted. I remain of the opinion that I reached the correct decision based on the above reasons and that I cannot comply with the submitters' request for the documents to be made public. I am also of the opinion that the licence application and the draft Decision can be properly assessed without the omitted information. Any remaining views to keeping this information confidential can be raised under Section 19.5 of the Environmental Management Act as part of an appeal against the final licence.

Agreements under the 2006 Borssele Nuclear Power Plant Covenant not fulfilled

c. A number of submitters of views note that it was agreed in 2006 in the KCB Covenant that the KCB would only remain open as long as it is demonstrated to be among the 25 percent safest water-cooled and water-moderated power reactors in the European Union, the United States of America and Canada, and that this agreement has not so far been fulfilled. Also, there is no benchmark for safe reactors, according to these submitters of views. Nor is there according to them any method for laying down a benchmark.

Response
This view relates to the 2006 KCB Covenant and the agreements therein. The KCB Covenant does not form part of the framework for assessing the application to extend the KCB's design lifetime, hence the Covenant and the agreements therein fall outside the scope of this procedure and are not under consideration here. A copy of this licence will however be sent to the Expert Commission on Nuclear Safety Benchmarking for the KCB (BBC, Borssele Benchmark Commission).
While not strictly necessary, I shall briefly consider this view so as to provide a better understanding of the matter. The Covenant lays down that NV EPZ shall ensure that the KCB remains among the twenty-five percent safest water-cooled and water-moderated power reactors in the European Union, the United States of America and Canada. Safety is assessed, as far as possible, based on quantified performance indicators. Where a quantitative comparison of design, operation, maintenance, ageing and safety management is not possible the comparison is to be based on a qualitative appraisal by the BBC. The members of the

Commission were appointed at the end of 2008, since when they have been developing a methodology and reaching their conclusion. The report setting out the Commission's first five-yearly conclusion on the safety of the KCB is to be published in 2013.

d. A number of submitters of views note that the KCB's operating life is incompatible with the 25% criterion in the Covenant and that a similar NPP in Biblis is being closed for safety reasons.

Response
See also the response to the view at c. above. Nuclear power is a national responsibility within the EU regulatory framework. This applies to Germany and also to the Netherlands. The Netherlands has its own assessment framework, in which safety is always paramount.

e. The submitters of this view is dismayed that the KCB is allowed to remain open until 2034 under the KCB Covenant and the Nuclear Energy Act on condition that the safety requirements are met and wonders what these requirements are.

Response
The safety requirements were included in the assessment framework used to assess the application to extend the KCB's design lifetime. The framework is described in detail in Part 4 of the licence. The main criteria for the framework are the rules published by the International Atomic Energy Agency (IAEA) on extending the design lifetime of NPPs (LTO, Long Term Operation). These criteria can be found in particular in IAEA Safety Report No. 57 'Safe Long Term Operation of Nuclear Power Plants', which lays down a specific methodology for dealing with ageing management aspects for LTO. The more organizational or administrative and human factors are covered by IAEA Safety Factors 10 and 12 in NS-G-2.10.

Some application documents not in Dutch

f. The submitter of this view notes that some of the licence application documents are not in Dutch but in English, which in his opinion is highly unacceptable, as not everyone is therefore able to assess the documents.

Response
It is not necessary to translate these documents. Submitters of views can be assumed to have a command of English. Furthermore, technically complex nuclear projects such as extending the KCB's lifespan take place in an international context. This explains why a substantial number of documents forming part of the application are in English, namely those supporting the application to extend the KCB's lifespan. The application itself, of course, is in Dutch. The assessment document drawn up by the competent authority is also in Dutch, and in combination with the supporting documents it provides a sufficiently clear picture of the whole matter. Translating the individual supporting documents would add little. International assistance was sought when assessing the supporting documents by bringing in GRS and carrying out SALTO Peer Review missions. This was in line with what is required internationally when extending design lifetime, so as to use the latest international understanding and knowledge. Also, translating these predominantly complex and technical documents into Dutch could result in subtleties being lost and proper understanding of the documents being made more difficult.

g. A number of submitters of views note that parts of the application/draft licence ought to have been published in German.

Response
The principle is that Dutch should be used for communication between administrative bodies and interested parties. It is appropriate to disregard this principle if it would be more efficient to use a different language and third-party interests would not be disproportionately harmed as a result. Given that the activities undertaken in relation to the extended design lifetime have

been found not to have any significant adverse environmental effects, also not in our neighbouring country Germany, I took the view that the interests of German residents would not be disproportionately harmed by not translating the documents concerned. From the fact that German residents lodged a substantive number of views to the draft Decision I also draw the conclusion that no translation was necessary, since these submitters of views availed themselves of the legal remedies available to them. It is therefore not necessary to translate the application documents into German. Furthermore, submitters of views can be assumed to have a command of English.

Seveso II Directive on safety evaluation not observed

h. A number of submitters of views note that the assessment report is based on a ten-yearly safety assessment and evaluation of the KCB, whereas under the SEVESO legislation the maximum period is five years.

Response
The ten-yearly safety assessment on which the assessment report is based relates to the safety regime under the Nuclear Energy Act, which solely covers the dangers of radioactive materials, including fuels. The safety regime to which the view refers in his view is the one based on the Seveso II Directive, which was implemented in the Netherlands by the Major Accidents (Risks) Decree 1999 (Brzo), which was declared applicable mutatis mutandis to nuclear facilities in the Nuclear Facilities, Fissile Materials and Ores Decree. The Brzo safety regime covers the dangers of hazardous substances other than radioactive materials. It does not apply to substances that can be both hazardous and radioactive at the same time. Radioactive materials are subject solely to the Nuclear Energy Act safety regime, with its own safety analysis report and all the requirements that apply. The five-yearly assessment under the Brzo to which the view refers does therefore not apply here. Aside from this it should be pointed out that the KCB is not a Brzo facility, as hazardous substances are not present at the KCB in the quantities to which Brzo 1999 applies.

Wait for other safety reviews and procedures first

i. A number of submitters of views note that before a decision can be taken on extending design lifetime the safety requirements first need to have been implemented, verification completed, the results of benchmarking known, the measures in response to the stress tests implemented, the problems of the hairline cracks in the Belgian reactors clarified, and the Periodic Safety Review and the licence revision completed.

Response
For a response to this view see the general part of the response to the views expressed under Different types of safety reviews. The application included all the relevant information in the light of the framework for assessing extended design lifetime used with regard to the application to amend the licence.

Financial position of licensee/shareholder inadequate for safety and decommissioning

j. A number of submitters of views note that Directive 2009/71/Euratom requires the member states to ensure that licensees are obliged to provide adequate personnel and financial resources to meet the requirements concerning the nuclear safety of a nuclear facility. No financial check was carried out in the context of the licence application to extend the KCB's design lifetime.

Response
The point of contact for the competent authority is the licensee. To guarantee that licensees do actually have adequate financial and personnel resources to meet the requirements concerning the nuclear safety of the nuclear facility there are general rules (Nuclear Safety Temporary Regulation), and the KCB licence includes specific conditions on material and personnel resources (requirements as to the expertise of personnel, operating procedures, etc.). The KFD monitors these requirements constantly and takes enforcement action if necessary.

k. A number of submitters of views note that the draft licence does not sufficiently guarantee safety, as it does not lay down any requirements as to the operator's financial position. They also wonder whether Delta will have the financial resources in time to meet all the safety requirements associated with extending the design lifetime.

Response
In the first place, the licensee is not Delta but NV EPZ. Delta is a shareholder in NV EPZ. The point of contact for the competent authority is the licensee. To guarantee that licensees do actually have adequate financial and personnel resources to meet the requirements concerning the nuclear safety of the nuclear facility there are general rules (Nuclear Safety Temporary Regulation), and the KCB licence includes specific conditions on material and personnel resources (requirements as to the expertise of personnel, operating procedures, etc.). The KFD monitors these requirements constantly and takes enforcement action if necessary.

l. A number of submitters of views note that Section 15f of the Nuclear Energy Act lays down that a financial guarantee must be furnished for the decommissioning of an NPP. The draft licence does not include any provisions on this subject.

Response
The most recent version of the Nuclear Energy Act (Bulletin of Acts and Decrees 2010, 18) and the underlying rules and regulations introduced a number of new obligations for licensees of nuclear facilities, inter alia in the area of decommissioning. Every licensee, for instance, must have a decommissioning plan approved by me, setting out among other things when and how the facility is to be shut down and decommissioned. All the licensees now have decommissioning plans approved by me. The legislation also obliges licensees of nuclear reactors to furnish a financial guarantee for the costs of decommissioning in a manner approved by me and the Minister of Finance. The application for approval of the way in which the licensee of the KCB (NV EPZ) was to furnish a financial guarantee for the costs of decommissioning was granted on 27 March 2012. NV EPZ is to deposit money annually in a foundation set up specifically for this purpose, which will invest it in line with the investment policy set out in the application. The investments are further subject to a lien for the benefit of the State. In this way NV EPZ provides the State with the guarantee required under the Nuclear Energy Act that adequate financial resources will be available to pay for the costs of decommissioning at such time as decommissioning is necessary.

Fragmented assessment

m. A number of submitters of views note that, as a result of not depositing for inspection the amendment regarding security and decommissioning at the same time as the amendment concerning design lifetime, the assessment of the extension of the KCB's design lifetime has wrongly been fragmented, as the extension of design lifetime cannot be considered separately from the point at which the KCB will be decommissioned.

Response
While the ex officio revision of the licence conditions on decommissioning and security is combined with the licence to extend the design lifetime, it is otherwise entirely separate from this licence. The ex officio revision could just as well have been carried out separately, but it was combined with another licensing procedure for reasons of efficiency. The licence to extend the design lifetime was the first opportunity that presented itself. Unlike the design lifetime

extension, the deletion of the conditions on decommissioning and security concerned is based on the Nuclear Facilities (Shutdown and Decommissioning) Regulation and the Nuclear Facilities and Nuclear Materials (Protection) Regulation, which entered into force in 2011. These Regulations require NV EPZ to have a decommissioning plan and a security plan for the KCB approved by the Minister of Economic Affairs. I approved the decommissioning plan on 27 October 2011 and the security plan on 15 February 2012. As a result of the approval of these plans the licence conditions on both decommissioning and security have been superseded by these plans as of those dates and are now redundant and therefore of no significance. Those conditions have therefore been deleted from the licence.

n. One submitter of a view notes that the licence cannot be issued if it does not permit compensation for existing planned damage.

Response
Planned damage is not in question here as this is an existing, licensed plant.

o. A number of submitters of views note that inadequate reasons have been given to justify the risks of using MOX fuel as part of extending the design lifetime, and that this point was also not dealt with at the information evening on 7 November 2012. This is incompatible with the obligation to state reasons.

Response
There is no incompatibility with the obligation to state reasons. The application to extend the design lifetime and the assessment thereof explicitly took the use of MOX fuel into account. The use of MOX was also discussed at the information evening on 7 November 2012.

Faits accomplis

p. A number of submitters of views note that NV EPZ entered into a reprocessing contract on 20 December 2011 and that a procedure was initiated for the enlargement of the HABOG storage building at COVRA, based on the argument of extending the KCB's design lifetime, and they wonder whether the decision to issue the licence to extend the design lifetime is being taken independently and objectively.

Response
I have based the present draft Decision solely on the detailed documentation provided with NV EPZ's licence application, the LTO assessment framework, its examination by GRS, the 2009 and 2012 SALTO peer reviews and my own final conclusion on the subject. The reprocessing contract entered into by NV EPZ on 20 December 2011 and the procedure initiated by COVRA for the EIA for the enlargement of HABOG did not play any part in this whatsoever. Both these initiatives, which are a logical consequence of the agreement under the 2006 KCB Covenant to keep the KCB open longer, are private initiatives at the expense and risk of NV EPZ and COVRA respectively. As regards the EIA procedure initiated by COVRA in connection with the enlargement of HABOG, I would add that this is not a fait accompli but merely preparation for the subsequent licensing procedure.

Implementation requirement after 1 January 2014

q. A number of submitters of views note that the Ministry states in the Assessment Report on Extending the lifetime of the Borssele Nuclear Power Plant that when laying down the conditions the general requirement is that the measures must be implemented before 1 January 2014, i.e. before the period of extended operating life begins. The submitters of views note that the competent authority has not gone on to enforce this condition, given the large number of exceptions that it permits, and that it is not correct to state in this connection that a 'proved safe condition' exists merely by complying with a number of reports, as information is not available yet.

Response
As the submitters of views argue, a general requirement when drawing up the conditions attached to this licence is that the measures must be implemented before 1 January 2014, i.e. before the commencement of the period of continued operation. In the case of a number of conditions this requirement has been waived for various reasons, which are stated.

The precondition for safety is that the KCB must be able to be operated safely at all times. This means that the safety criteria laid down must be complied with at all times, both during current operation and during its continued or extending operating life. To ensure that this is the case, as regards the safety argument in support of extending the KCB's design lifetime it was examined whether the integrity of the difficult-to-replace components that are important to safety, such as the reactor pressure vessel, can be guaranteed up to and including 2033.

An important point here is that in a few cases the integrity of certain plant components may not be demonstrated for entirely up to the end of 2033 while it is demonstrated for up to an earlier date. If this is the case it must be clear that the integrity of these plant components must be demonstrated for the remaining operating life before this earlier date is reached.

The safety argument submitted by NV EPZ for the design lifetime extension demonstrates this for up to the end of 2033 with the exception of a few components/locations in terms of fatigue. Condition II.Bb.4 deals with this.

The current load catalogue for calculating cumulative usage factors is based on extrapolation from the load fluctuations in the plant up to 2007. This current load catalogue adequately supports the extension of the KCB's design lifetime up to the end of 2033 as regards fatigue, with the exception of the components/locations listed in Condition II.Bb.4. For these locations NV EPZ must submit an action plan before 1 October 2013 to ensure that the conditions laid down for fatigue are met or that adequate measures are taken, e.g. replacement.

If necessary the components/locations listed in Condition II.Bb.4 must be replaced before 2023 based on the current cumulative usage factors for fatigue. Condition II.Bb.4 requires the components/locations listed to be replaced before 1 January 2020, unless state-of-the-art analyses before that date show that the cumulative usage factor for fatigue of these components/locations is less than 1 for a design lifetime of 60 years.

The method described above means that the actual loads during the entire design lifetime – also with a design lifetime of 60 years – are guaranteed not to exceed the load criteria laid down for safe operation at any time.

There are other conditions of which the measures have a later implementation date:

Condition II.Bb.7, for instance, requires NV EPZ to submit a revised load catalogue for the plant based on FAMOS (the Fatigue MOnitoring System) to the Director of the KFD before 1 January 2016. The data on which this new load catalogue is based will not be known until after five cycles, i.e. after the 2015 refuelling outage. The new load catalogue can then be drawn up, in which cumulative usage factors up to the end of the extended design lifetime (the end of 2033) are recalculated based on the actual loads measured using FAMOS. This will supersede the current load catalogue in support of the application for LTO. Condition II.Bb.8 requires NV EPZ to submit a new action plan for those parts of the facility if it then emerges that reference levels for the new cumulative usage factors for an operating life of 60 years are being exceeded.

Condition II.Bb.3 also lays down a later implementation date, as it relates to a verification as an additional check. The irradiation programme referred to in this condition serves to verify the safety margin for reactor pressure vessel embrittlement, supplementing the argument given in the application to extend the design lifetime. The calculations in the argument show that this safety margin is adequate. The results of empirical testing must be submitted to the Director of the KFD by 1 January 2020. The irradiation sets SOP3 and SOP4 are a continuation of the previously removed sets SOP1 and SOP2. The power plant previously began operating with SOP1 and SOP2, which were removed from the reactor pressure vessel and tested after a certain irradiation time.

Condition II.Bb.9 also relates to a verification as an additional check, namely verification of the thermal stratification criteria using the readings obtained from the FAMOS fatigue monitoring system. This verification will improve understanding of leak-before-break behaviour. It can take place as soon as a sufficient quantity of representative data is available (not before 2014). NV EPZ must therefore submit the results of this verification to the Director of the KFD as soon as is reasonably possible and no later than 1 January 2016.

Like the verifications under conditions II.Bb.3 and II.Bb.9, not all the additional inspections under Condition II.Bb.2 will take place before 1 January 2014. NV EPZ is required to implement the measures identified as a result of the additions to the in-service inspection (ISI) programme as soon as is reasonably possible and no later than 1 January 2018. The purpose of the additional inspections is to obtain more information on the condition of the main plant components and to verify the assumptions regarding the long-term use of those components. These additional inspections are to be incorporated in the existing inspection programme and are subject to inspection intervals (e.g. once every ten years) to ensure adequate ageing management of those components. The additions to the ISI programme must be incorporated in the existing programme before 1 January 2014. Also, a good deal is already known about the condition of the components concerned and there is time to carry out the additional inspections of the locations listed in the licence condition. On top of this, a number of specific inspections related to the design lifetime extension and arising from ageing investigations are to be carried out prior to 2014.

The conclusion is therefore that the conditions laid down based on the application for extended design lifetime ensure among other things that the KCB complies with the safety criteria laid down at all times, both during current operation and during its continued or extended operating life. This also applies to the conditions with an implementation date for measures after 1 January 2014.

6.4.2 Topic 2: General Drawbacks of Nuclear Energy

Submitters of views on this topic:
1, 3, 4, 7, 8, 9, 10, 12, 14, 15, 16, 17, 18, 19, 20, 21, 23, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 40, 41, 42, 43, 44, 47, 48, 49, 50, 51, 52, 53.

The following points were raised on the topic of **General Drawbacks of Nuclear Energy**:

Risks

a. A number of submitters of views note that the continued operation of the KCB prolongs the risk of military uses of the nuclear fuel and the spread of nuclear weapons (proliferation).

   Response
   NV EPZ has a licence for the KCB for an indefinite period. As this licence application does not involve extending the period of the licence or any modification or expansion of the facility, there is no change in aspects such as the military use of nuclear fuel and non-proliferation, which for that reason alone fall outside the assessment framework for this licensing procedure. As is well known, combating the spread of certain nuclear fuels, knowledge and technology is referred to as 'non-proliferation'. The main international treaties in this area are the Non-Proliferation Treaty, with its Additional Protocol, and the Euratom Treaty. Under these treaties all nuclear power plants in the Netherlands are subject to supervision in the form of announced and unannounced IAEA and Euratom inspections.

b. A number of submitters of views note that continued operation prolongs the risk of transport accidents, aircraft crashes and attacks.

   Response
   NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I would point out that under the Nuclear Facilities and Nuclear Materials (Protection) Regulation, which entered into force on 1 January 2011, the KCB must have a security package approved by me. This package contains the measures that the licensee is taking or will take to protect the facilities against a Design Basis Threat defined by me and the Minister of Security and Justice. The KCB now has a security package approved by me. After the nuclear accident in Japan (in March 2011) the European Council decided to have security stress tests carried out in addition to safety stress tests. The Dutch implementation of the stress test specifically considers 'man-made events', in particular aircraft impacts and ICT attacks. This stress test of the KCB showed that the KCB is well protected against these two types of incident and capable of withstanding them. I would refer to the letter sent to the House of Representatives by my predecessor in September 2012 (Parliamentary Papers II, 2012/13, 32 645, No. 41).

c. A number of submitters of views point to a 2007 German study indicating a higher risk of leukaemia for children living near an NPP.

   Response
   NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I would point out that the German study does not provide any conclusion on the possible cause of the increased risks. The researchers concluded that, according to current understanding of radiation risks, the additional radiation doses near the NPPs do not explain the increased risks, as they are too low. The National Institute for Public Health and the Environment (RIVM) in fact does research into the effects of

low doses of ionizing radiation on the development of cancer and leukaemia, among other things. It works together with a large number of European research groups on this research, the aim of which is to improve understanding of the risks of low-dose radiation. Further specific research will be carried out in future if it is warranted, and measures may be taken if necessary.

d. A number of submitters of views note that Germany and other European countries have decided to stop producing nuclear energy and that the Netherlands ought to follow suit.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. As is well known, nuclear power is a national responsibility in Europe, and this therefore applies to Germany and the Netherlands as well. The Netherlands has its own assessment framework, in which safety is paramount.

Environmental effects

e. A number of submitters of views note that nuclear energy causes damage to health and the environment as a result of uranium mining.

Response
Uranium mining is not included in the scope of the licensing procedure under the Nuclear Energy Act. This, however, is not to say that I do not consider it important for an NPP operator to assure that the fuel used is produced in a responsible manner. I would refer to the letter setting out preconditions sent to the House of Representatives by my predecessor at the beginning of 2011 (Parliamentary Papers II, 2010/11, 32 645, No. 1).

f. A number of submitters of views note that extending the design lifetime is not justified because of the environmental impact of the radioactive waste produced in generating nuclear energy.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I would point out that nuclear waste is stored above ground for at least 100 years in the Netherlands. After this it can be stored underground (referred to as 'final storage'). Final storage of radioactive waste in the Netherlands is technically possible, according to a report published by the Radioactive Waste Storage Committee (CORA) in 2002. The Radioactive Waste Final Storage Research Programme (OPERA) has been doing research in the European context into the underground storage of radioactive waste since 2011. This programme is funded by NV EPZ (the licensee of the KCB) and the government. It has also been decided that stored radioactive waste must be recoverable. The Government is to come up with a national programme for the final storage of radioactive waste by 2014. Like all the other EU member states, the Netherlands is required to submit a programme of this kind to the European Commission by 2015.

g. A number of submitters of views note that the KCB contributes to the radiation exposure of residents in the Netherlands and Germany as a result of discharges into air and water.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. As already stated, with its application to extend the design lifetime NV EPZ does not propose any modification or expansion to the plant. The current radiation

exposure due to discharges of radioactive materials into air and water does not therefore change as a result of the extended design lifetime. The current radiation exposure due to the discharges from the KCB into water and air has previously been calculated and the values are far below those set in the licence conditions. The licence makes it compulsory to monitor discharges and radiation exposure. In effect the added radiation dose from the KCB as a result of normal operation is scarcely measurable, if at all, beyond the site boundary. This means that the radiation exposure at larger distances in the Netherlands and Germany is not measurable, disappearing as it does in the background radiation.

h. One submitter of a view is against extending operating life because the prevailing wind is from the south west and he is fond of his grandchildren.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. It goes without saying that the prevailing wind and wind strength have been taken into account in the accident analyses. The results of these analyses comply with the laws and regulations and the conditions attached to the licence. The consequences of accidents do not change as a result of the requested amendment to the licence.

i. One submitter of a view wonders how it is that the background radiation has increased in the Vrouwenpolder during the past two or three months, especially when there is a southerly wind.

Response
No evidence is given for the assertion made in this view, and it is unclear what it is based upon. I am not aware of any data that suggest this and therefore cannot discuss it.

Competitiveness with sustainable energy

j. A number of submitters of views note that the continued operation of the KCB will result in less attention being paid in the Netherlands to improving energy efficiency and energy saving and investing in renewable energy.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. The 2011 Energy Report states that nuclear energy contributes to the diversity of energy sources and does not cause emissions of CO2 and other greenhouse gases. The Government therefore considers nuclear energy to be important in the transition to a sustainable (low-CO2) energy supply.

k. The submitter of this view notes that the KCB has been written off economically and is able to produce electricity at rock-bottom prices, resulting in unfair competition with renewable-energy producers.

Response
For the answer to this view see the response to j.

l. The submitter of this view notes that the State shoulders the commercial risk of a nuclear accident and that this measure creates unfair competition with other energy providers such as sustainable-energy providers.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. The government intervention referred to by the submitter is not intended to favour nuclear energy over renewable energy; it arises under international treaties. Under the Nuclear Accidents (Liability) Act (WAKO) the liability of the operator of an NPP is limited to a maximum of 700 million euros. Estimating the damage caused by nuclear accidents involves considerable uncertainties, owing particularly to the 'small risk/major consequences' nature of such accidents. If a nuclear accident occurs, the first part of the compensation, namely the amount of 700 million euros for which the operator is liable under the WAKO, must be paid by the operator of the NPP. This part of the compensation is covered by the insurance that the operator itself is required to take out. Insofar as the insurer has excluded certain types of damage, supplementary state insurance policies have been provided for the plant operators, for which the state is paid an annual premium. Insofar as the insurance payout is insufficient, part of the compensation will be borne by all the signatories of the 1963 Brussels Convention. The total amount (borne by all the signatories jointly) is 300 million euros. If these amounts also prove inadequate, under Section 18 of the WAKO the State is then required to provide approximately 2.27 billion euros (to be increased to 3.2 billion once the amendment to the WAKO enters into force) from public funds as compensation for damage up to that amount. The state charges the operator an annual sum for this guarantee. The Energy research Centre of the Netherlands (ECN) concluded in 2010 that there is no scientifically sound method of calculating and evaluating the external costs of serious nuclear accidents. It is not possible, therefore, to internalize all the costs of nuclear accidents.

Justification/social cost-benefit analysis

m. A number of submitters of views note that the government never carried out a cost-benefit analysis before signing the Borssele Covenant and that the benefits of keeping the NPP open for longer – securing energy supply and meeting the Kyoto targets – assumed at that time are now outdated. The submitters of views are of the opinion that there are adequate alternatives available to provide the Netherlands with energy in a truly sustainable, climate-friendly manner.

Response
As already stated, the KCB Covenant does not form part of the framework for assessing the application to extend the KCB's operating life, hence the Covenant and the agreements therein fall outside the scope of this procedure and are not under consideration here. Nor is it a case of keeping the KCB open longer, as NV EPZ has a licence for the KCB for an indefinite period. Insofar as these submitters of views refer to sustainable alternatives, I would point out that power generation at the KCB is justified in general under the Justification of Uses of Ionizing Radiation (Publication) Regulation (Category I.B.2) and is therefore not under consideration. Moreover, based on the 2011 Energy Report (Parliamentary Papers II, 2010/11, 31 510, No. 45) the Government considers nuclear energy to be important in the transition to a sustainable (low-CO2) energy supply, as it contributes to the diversity of energy sources and does not cause emissions of CO2 and other greenhouse gases.

n. One submitter of a view notes that the advocates of nuclear energy privatize the benefits and socialize the disadvantages. He also argues that nuclear energy is outdated, hierarchical and undemocratic and will also become increasingly expensive, and that sustainable energy is the future.

Response
This view is a very general one against nuclear energy and cannot therefore be considered in the context of this licensing procedure. See also the response to view m. above.

o. A number of submitters of views note that the social costs of a major nuclear accident would be substantial and that these costs cannot arise if it is decided not to extend the design lifetime.

Response
As pointed out in the general discussion of the views expressed, NV EPZ has a licence for an indefinite period. As this licence application does not involve extending the period of the licence or any modification or expansion of the facility, there is no change in aspects such the social costs of a nuclear accident, which for that reason alone fall outside the assessment framework for this licensing procedure.

p. The submitter of this view notes that perpetuating commercial nuclear technology is a breach of humanitarian rights, given the enormous risks being taken on behalf of many succeeding generations who will not 'benefit' but merely be saddled with the gigantic problems and health risks that this entails.

Response
This view is concerned with whether or not nuclear power is justified. The justification of nuclear energy is not under consideration here. For the argument see the response to view m.

q. One submitter of this view is worried about the safety of the Zeeland population, given the risks as shown by the required safety procedures, uninsurability and radioactive waste. The submitter notes that extending the design lifetime conflicts with sustainable food production in Zeeland. The submitter wonders, with a view to the health of our descendants, what we are leaving behind us.

Response
As pointed out in the general discussion of the views expressed, NV EPZ has a licence for an indefinite period. As this licence application does not involve extending the period of the licence or any modification or expansion of the facility, there is no change in the risks referred to by the submitter, which for that reason alone fall outside the assessment framework for this licensing procedure.

r. A number of submitters of views note that inadequate reasons have been given for utility and necessity, as the energy production argument has become less important because of the small contribution made by the KCB, and electricity production, including sustainably produced electricity, is sufficient, reinforced by the insolvency of the aluminium smelter Zalco and possibly of Thermphos.

Response
This view is concerned not so much with EPZ's proposal but rather with the justification of nuclear energy in general with a view to electricity production. The justification of nuclear energy is not under consideration here. For the argument see the response to view m.

s. A number of submitters of views note that the activity is not justified, as the strategic agreement is no longer applicable as a justification (Kyoto targets were met in 2011) and a comparison between the benefits of extending the design lifetime and the benefits of closing the KCB in 2013 ought to have been carried out. The submitters of views further argue that the benefits of immediate closure would be gaining knowledge of decommissioning that can subsequently be used elsewhere in the world, that there would be no unfair price competition between the KCB (which has been written off) and sustainable energy, that there would be more employment because the energy produced by the KCB would be replaced with local, smaller-scale generation of sustainable energy, and that fewer people would be exposed to ionizing radiation.

Response
This view is concerned not so much with EPZ's proposal but rather with the justification of nuclear energy in general with a view to electricity production. The justification of nuclear

energy is not under consideration here. For the argument see the response to view l. in Topic 2.

6.4.3 Topic 3: Outdated Design of the Nuclear Power Plant

Submitters of views on this topic:
0, 1, 5, 8, 11, 12, 19, 20, 21, 22, 23, 24, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 39, 41, 42, 43, 44, 46, 47, 48, 49, 53.

The following points were raised on the topic of **Outdated Design of the Nuclear Power Plant**:

Before discussing specific views in this Section, a general point needs to be made. The submitters of views assume that ageing of the design is included in the argument in support of the licence amendment under consideration, in addition to physical ageing. This, however, is not the case. Ageing of the design is included in the Periodic Safety Review. Ageing of the design – conceptual ageing – is not part of the decision-making on the licence to extend the KCB's design lifetime. See also *Periodic Safety Review (PSR) in section 4.1.3.*

The KCB does not have eternal life

a. A number of submitters of views note that, contrary to what NV EPZ asserts in its licence application, there are limitations on Borssele's technical lifespan. Although the original licence for the KCB does not state an end date, the NPP was designed and built for an operating life of forty years, and the risks and environmental effects were assessed from that point of view. The submitters of views further note that the European Nuclear Installations Safety Standards Initiative sets the technical design lifetime of Western pressure water reactors at forty years.

   Response
   NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. A closure date of 31 December 2033 was agreed in the Covenant with NV EPZ, Delta and Essent as part of the overall package. This date makes sense, given the extensions of design lifetime to 60 years that are permitted in other countries (in particular the USA). An important factor here is that safety evaluations showed that it was reasonable to assume that the most important large reactor components in the KCB can continue to function safely until that time. This is re-examined every ten years in safety evaluations by the Department of Nuclear Safety, Security and Safeguards (KFD). I do not have any document from the European Nuclear Installations Safety Standards Initiative at my disposal, nor have I been able to find one that supports the submitters' contention.

b. A number of submitters of views note that extending the design lifetime to over 40 years is exceptional and that 5% of reactors worldwide have been in operation for more than 40 years, hence there is little practical experience involving older power plants. Of the Borssele type of reactors, the KCB is the oldest. The submitters of views consider that extending the KCB's design lifetime would be even more risky, as the extension is being granted following substantially modified use, including the use of MOX.

   Response
   NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. Extending the design lifetime of NPPs to over 40 years is not as exceptional as the submitters of views argue. An increasing number of member states of the International Atomic Energy Agency (IAEA) are prioritizing extending the design lifetime of existing NPPs. In the 1990s the IAEA developed detailed general guidelines on how to manage the safety aspects of physical

ageing. It was recognized that internationally agreed, detailed guidelines were needed to help government bodies and operators deal with the unique challenges posed by Long Term Operation.

In response to this the IAEA carried out a research programme during the 2003-2006 period into the safety aspects of the Long Term Operation (LTO) of water-moderated reactors. The aims of the programme were to assist the member states to combine the related processes and practices, to lay down a general LTO framework and to provide a forum where the member states can exchange information and experience freely. Since 2007 the IAEA has been assisting the member states with peer reviews, safety standards, coordinated research, knowledge management and an advisory group on LTO and ageing management. The situation in the USA in August 2012 is that the NRC has extended the term of licences for 73 NPPs, over two-thirds of the American total. It also has applications to extend licences under consideration, and more applications are expected in 2013. Ultimately there are expected to be about 90 NPPs in the USA with licences for a 60-year operating life.

The Netherlands and most European countries modernize their NPPs every ten years, based on Periodic Safety Reviews. The original 40-year period was based more on the writing-off of capital than on the notion that these NPPs were designed for that lifespan. The submitters of views correctly argue that practical experience for the KCB and the Dutch competent authority is reduced by the phasing-out of the German NPPs. The KCB is a German design by the firm of Siemens-KWU. NV EPZ and the Dutch government rely on knowledge of and experience with similar NPPs in Germany. This involves exchanging technical data and operating experience, exchanging knowledge and expertise through bilateral contacts and bringing in German organizations to provide technical support to the authorities. As a result of the phasing-out in Germany this support will eventually cease. In response to this in particular I have included a condition in the licence requiring NV EPZ to submit a plan for the improvement and augmentation of the ageing management system to the Director of the KFD. This plan relates to modifications for a sixty-year design lifetime to the organization, procedures and administration, and the skills, knowledge and behaviour of staff in relation to ageing management, and the programmes for maintaining the KCB plant and how these programmes relate to one another. When deciding whether it is justified to extend the KCB's lifespan an important consideration is whether ageing is being managed correctly and adequately. Whether this is the case at the KCB was examined when evaluating the design lifetime extension. It was concluded that the arrangements are adequate, provided that the conditions attached to this licence are implemented.

c. The submitter of this view notes that experience in Germany shows that faults are developing in a relatively high and rising number of notifiable components in the second-generation Siemens/KWU pressurized water power plants, which have a basic design that is inadequate by present-day standards. Before a decision can be taken on extending the lifespan, the possibility that the increasing failure of components is a trend needs to be ruled out.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. It is unclear what the submitters' assertion is based upon. NV EPZ is a member of the ZEDB (Zentrale Zuverlässigkeits- und Ereignisdatenbank, Centralized Reliability and Events Database). This is a database managed by the VGB (Vereinigung der Großkessel-Besitzer e.V., federation of owners of large boilers) which keeps track of failure data and reliability data on components. Records on the reliability and failure probability of specific components are kept in it, and from them data is generated that is used in the current PSA (Probabilistic Safety Assessment) of the NPPs concerned. If a particular component that is important to safety has an increasing failure probability the current PSA for the NPP in question will indicate that the risk of core meltdown is increasing. This risk needs to remain below a certain value, and the NPP must take measures if this is not the case. In addition to the KCB all the German NPPs and

a Swiss NPP (with a German design) are represented in the ZEDB. This approach enables measures to be taken in good time (replacement) if there is an increasing failure trend.

d. The submitter of this view notes that another typical problem with the second-generation Siemens/KWU pressurized water power plants is the inadequate spatial separation of redundant systems, for example cabling of redundant systems running through the same conduit. Based on problems of this kind in Germany the submitter presumes that these problems also exist at the KCB.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. In addition to the ten-yearly evaluations referred to at c. NV EPZ has a faults working group that investigates reports of matters that could be relevant to the KCB and takes action if necessary to resolve them or make improvements. Acute matters detected elsewhere (e.g. in Germany) are tackled in this way. Specifically for ageing issues NV EPZ has an ageing management team that deals with reports of potential materials degradation.

e. The submitter of this view notes that it is unclear whether or not there is a 'containment sump problem' at the KCB. If not all the necessary measures have been taken to deal with LOCAs (loss-of-coolant accidents) with a release of insulating material, extending the lifespan is irresponsible and unacceptable from the safety point of view.

Response
NV EPZ has a licence for the KCB for an indefinite period. As this licence application does not involve extending the period of the licence or any modification or expansion of the facility, there is no change in aspects such as those referred to in the view, which for that reason alone fall outside the assessment framework for this licensing procedure. While not strictly necessary, I shall give a substantive response. The surface area of the containment sump filters at the KCB was increased substantially in the past. In addition, practically all the thermal insulation in the installation room, made up of blankets, has been replaced with metal cassette insulation. There is consequently no containment sump problem at the KCB.

f. The submitter of this view notes that it is unclear whether, and if so how, it has been ensured for the KCB that design accidents have been analysed based on the current state of the art, that the risks of such accidents occurring have been determined correctly and that the amounts of radioactivity released have been calculated correctly. Before a decision can be taken on lifespan, the safety standards in force in the Netherlands need to be brought up to date in the light of Fukushima.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. To keep up with the current state of the art the safety analyses are reviewed in a ten-yearly evaluation and revised if necessary.

g. One submitter of this view notes that after Fukushima the seven oldest reactors in Germany were closed down, and these seven reactors are younger than the KCB.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. In

safety terms the KCB cannot necessarily be compared with NPPs of the same age. It complies with Dutch laws and regulations and the provisions under the Nuclear Energy Act licence. Also, nuclear power is a national responsibility within the EU. The Netherlands has its own assessment framework, in which safety is always paramount.

Results of EU stress test of NPPs

h. A number of submitters of views note that the recently published results of the European stress test of the KCB show that measures need to be taken in and around the KCB to guarantee safety. The submitters of views also argue that it is not evident from the documents and NV EPZ's application that these measures were taken into account when assessing extended operation and that this needs to be done before a decision can be made regarding the application.

Response
In the first place, NV EPZ has a licence for the KCB for an indefinite period. As this view does not relate to the argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response to the view. The results of the stress test relate to the safety margins at the NPPs as a result of extreme external events and the failure of safety systems: in other words, how robust the NPPs are when confronted with an extreme external event such as a major earthquake or flood. The stress test did not take ageing aspects into account; this was done in analyses carried out specifically for this licence application. As a result of the stress test of the KCB a number of measures were identified to increase the existing safety margins. A package of measures and a timetable for them has meanwhile been agreed with NV EPZ. The Department of Nuclear Safety, Security and Safeguards is supervising their implementation. Some measures have already been implemented, while others will be complete in the near future. Further measures require detailed preparatory studies and analyses and will be implemented at a later date. All the measures are expected to have been implemented by the end of 2017. The stress test measures and their implementation are a separate issue from the licence to extend the design lifetime. As regards the general recommendations based on the European stress test, important measures have in fact already been taken in the Netherlands, some of them in the past: for instance, there has long been a statutory requirement in the Netherlands to carry out periodic safety evaluations, and measures were taken at Borssele back in the 1980s and 1990s to guarantee the integrity of containment (e.g. passive hydrogen recombiners), and emergency systems (e.g. diesel generators) were housed in a bunker. It goes without saying that the conclusions and recommendations of the European peer review report are being taken into account when developing and implementing measures to further increase the safety margins at the KCB. This is all part and parcel of the process of continuously improving safety.

i. The submitter of this view notes that the Safety Report needs to be re-examined if there is an external event that could cause any degradation of the plant.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. To supplement the answer to h., a few measures that NV EPZ is taking in response to the stress test will almost certainly result in modifications to the plant and therefore amendments to the Safety Report. The amendments to the Safety Report result in an application by NV EPZ to revise the licence. The safety analysis of the modifications to the plant to make it more capable of withstanding extreme external events is being carried out by NV EPZ as part of the Periodic Safety Review that is currently under way. NV EPZ is expected to submit the application to revise the licence based on the Periodic Safety Review in 2014, after which my Ministry will assess the amended Safety Report.

j. The submitter of this view notes that a core meltdown accident as a result of flooding cannot be ruled out, and in particular that the protective structures such as dykes and dams are not strong enough to protect Borssele with certainty in extreme weather conditions against a flood that could result in core meltdown. The submitter also claims to know that there are electrical components and power lines below water level that need to be taken into account in the event of flooding.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. The reactor during shutdown and the spent fuel pool can be kept in a safe, cold condition by the emergency cooling systems (Building 33), which is specially designed to handle extreme external hazards, including flooding. The reactor building is similarly capable of withstanding such extreme external conditions. A core meltdown accident due to extreme external conditions cannot be ruled out completely, but the likelihood is so small that the individual risk is below the statutory limit. It is correct that there are electrical components and power lines that would be submerged in the event of flooding, but they are not needed to keep the reactor and the spent fuel pool in a safe condition.

k. One submitter of a view considers that consent cannot be given to extend the design lifetime until research has shown that the flood defences (the dyke protecting the KCB site) will remain safe during the extended operating life.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. Management of the dyke is the responsibility of the Scheldestromen Water Board. Following a recent regular check the dyke was reinforced last year and brought up to a height great enough to provide sufficient strength until 2050, even assuming the most pessimistic models of rise in sea level.

l. The submitter of this view notes that alternative sites have not been assessed.

Response
The KCB is an existing, licensed NPP, so alternative sites are not in question.

m. The submitter of this view notes that the design principles on which Borssele was based are inadequate and do not comply with the international recommendations on design earthquakes. In particular it needs to be considered that combinations of external hazards could occur: for example, an earthquake could occur once the subsoil under Borssele has been softened by prolonged rainfall or flooding. The submitter considers that for Borssele there has not been an adequate examination of the consequences that such combinations of external hazards could have. Before a decision can be taken on extending the design lifetime, such combinations of external hazards resulting in core meltdown with a large-scale release of radioactivity must be ruled out.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. Contrary to the submitter's assertion, the consequences of external hazards and combinations of external hazards have been examined for the KCB. The KCB is kept in compliance with the

international recommendations on design earthquakes by means of Periodic Safety Reviews. The buildings of the NPP have pile foundations resting on a much deeper layer than the top layer which could possibly become saturated by rain or floods. The building foundations would not therefore be seriously weakened by saturation of the top layer. A combination of extreme meteorological and seismic conditions that are in themselves unlikely and unrelated is highly improbable. Combinations of rare external hazards must be considered, but only if they have a causal connection and it is therefore logical to assume that they will occur simultaneously. The likelihood of combinations of external hazards resulting in core meltdown with a large-scale release of radioactivity was analysed in the KCB's PSA. New knowledge of the external risks such as that contributed by Fukushima is being assessed in the Periodic Safety Review that is currently under way and incorporated in the PSA.

n. The submitter of this view notes that the protection against aircraft impacts corresponds to that of the German DWR-2 power plants that were shut down in 2011. The submitter argues that Borssele is therefore inadequately protected against aircraft impacts, especially from large passenger aircraft. Before a decision can be taken on extending the design lifetime, core meltdown with a large-scale release of radioactivity following impact by a large passenger aircraft, as a result of an accident or a deliberate attack, must be ruled out.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. An aircraft crash on the KCB would not necessarily result in core meltdown with a large-scale release of radioactivity. The buildings and systems have a certain level of resistance to the impact of an aircraft crash. In addition, the KCB has taken specific measures to mitigate the consequences of an aircraft crash and thus prevent core meltdown and a large-scale release of radioactive material. The actual level of resistance is determined as part of the Periodic Safety Review.

o. The submitter of this view notes that as Borssele is situated in the vicinity of a seaport there is an increased risk of pressure waves. The submitter argues that the design of Borssele is inadequate to cope with this. The submitter considers that before a decision can be taken on extending the design lifetime a major pressure wave resulting in core meltdown with a large-scale release of radioactivity at Borssele must be ruled out.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. The consequences of blast waves from industry or from ships on the busy Western Scheldt have been analysed. The buildings are capable of withstanding them. The probability of this external threat has been included in the KCB's PSA and does not result in an unacceptable risk of core meltdown or a large-scale release of radioactive material.

p. The submitter of this view notes that it is unclear whether, and if so how, measures have been laid down for reducing the consequences of severe accidents so that no adverse effects, or only minor ones, are expected outside the facility. The submitter notes that the NPP must have probabilistic analyses of the occurrence of core meltdown (PSA Level 1) and release of radioactive materials (PSA Level 2).

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. The

KCB has a package of emergency operating procedures and Severe Accident Management Guidelines (SAMGs) to prevent severe accidents or mitigate their effects on the environment. The KCB has a three-level PSA including these analyses.

q. The submitter of this view notes that there is inadequate historical and archaeological information available and that as a result of climate change the forecasts for the coastal site are not sufficiently precise for the proposed operating life.

Response
NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As this view does not relate to the safety argument in support of the licence application to extend the NPP's design lifetime, it does not lead me to revise the draft Decision. While not strictly necessary, I shall give a substantive response. The KCB keeps up with the current state of the art by means of the ten-yearly evaluation, also as regards natural events such as flooding and earthquakes. The most up-to-date information is used for this purpose.

6.4.4 Topic 4: Nuclear Safety and Ageing Management

Submitters of views on this topic:
1, 7, 8, 12, 13, 15, 16, 18, 19, 20, 21, 22, 24, 39, 49.

The following points were raised on the topic of **Nuclear Safety and Ageing Management**:

Safety inadequate and not demonstrated in time

a. A number of submitters of views note that EPZ states in the licence application that the KCB is demonstrably safe until 2034. A number of submitters of views further argue that a safe condition for 60 years in the context of extended design lifetime is proven merely on paper, based partly on reports produced for the European stress test and not supported by evidence from practice. The submitters of views consider that this assessment is premature, as there is insufficient data available at present to support it. The submitters of views further note that in its assessment the Gesellschaft fur Anlagen- and Reaktorsicherheit points more than once to shortcomings in the current inspections, e.g. in the recurring inspection programme for pressure-retaining components.

   Response
   See first and foremost Part 4 of the Decision, which explains the framework used to assess extending the KCB's design lifetime. As regards the examination of the application in the light of the assessment framework see Part 5 of the Decision. See also the general part of the response to views, which provides more information on the assessment framework. As regards the safety analyses that have been carried out, the conclusion is that the supporting documents submitted by NV EPZ are of adequate quality. It is also concluded that the assessment framework used and the standards and design principles for extended design lifetime set out in it have therefore been complied with, provided that the improvement measures identified in the analyses and evaluations are implemented. Additional conditions are attached to the licence to ensure the timely and effective implementation of the measures. This is a standard process when granting licences for nuclear facilities. The argument in support of the application demonstrates that the assessment framework has been complied with, and additional conditions will be laid down if necessary. The inspectorate, i.e. the Department of Nuclear Safety, Security and Safeguards (KFD), ensures that not only the additional conditions but also all the other statutory provisions and licence provisions that the licensee is required to comply with are implemented correctly and in good time.
   As regards the proof being merely on paper, it can be pointed out in response, among other things, that the methods and techniques used for the analyses in support of the application to extend the design lifetime are based on international codes. These codes have been validated by experiments and worldwide practical experience.
   Lastly, it should be noted that the competent authority has included the GRS recommendations to which the submitters of views refer in the conditions attached to the licence granted in response to the application. The inspections referred to in Condition II.Bb.2 are required to be included in a supplement to the in-service inspection programme that must be submitted to the Director of the KFD before 1 July 2013. Finally, the inspections themselves must have been carried out by 1 January 2018.

Reactor pressure vessel embrittlement

b. The submitter of this view notes that the core loading pattern and the nuclear fuel have been changed during the course of operating the KCB and wonders what effect this has on calculations and assumptions based on 'full-load years' and 'reactor lifespan'.

   Response

The neutron spectrum on the reactor wall has indeed changed over the years as a result of changes in the core loading. The calculations of neutron fluence for the purpose of this licence amendment involved calculating the first 33 reactor cycles (approx. one year) to compute the current loading pattern on each occasion. The figures from the last three cycles were then extrapolated to 55 full-load years. In reality the number of full-load years after 60 years of operation will be lower. What this amounts to is that all core configurations were computed in the fluence calculations. In the early years there was a core with fresh elements on the outside, hence relatively large quantities of neutrons on the vessel wall. Later on the fresh elements were placed on the inside. Because of the change in the loading pattern the quantity of neutrons on the vessel wall is lower than originally assumed, resulting in less embrittlement of the vessel wall than originally assumed.

c. The submitter of this view notes that, according to the report by Areva NP GmbH, SOP3 and SOP4 will be removed from the reactor between 2013 and 2017, whereupon the transition temperature of the samples will be measured. The Areva report indicates that neutron fluence is the only factor that is important when determining the residence time of the samples in the reactor. This means that if SOP4 has been subjected to more than 3.5 E19 n/cm² neutron fluence – which is considered to be representative of 60 years' operating life – the samples will be further examined. At the same time NV EPZ has changed the core loading pattern and the core composition several times during the past 40 years, from out-in via partial leakage to full low leakage. Meanwhile NV EPZ has also been licensed to start using MOX fuel. It is not unlikely that these changes in core loading and fuel will affect the characteristics – the energy level – of the actual neutron fluence. The nature of the neutron fluence to which SOP3 and SOP4 are exposed, then, is not the same as that to which the reactor pressure vessel itself has been exposed over the years. The submitter considers that SOP3 and SOP4 cannot therefore provide a reliable simulation of the actual reactor pressure vessel wall embrittlement.

Response
Not only has the neutron fluence been computed for the various core configurations, so has the neutron flux and the energy spectrum. Embrittlement of the material is caused by neutrons with sufficiently high energy. All this has been taken into account in the fluence calculations. The calculations determined how many neutrons SOP3 and SOP4 encounter over time, enabling the length of time required for a particular fluence on these SOPs to be computed. The aim is to allow SOP4 to be subjected to at least the design fluence (3,5 E19 n/cm²) before removing it from the vessel and testing it for toughness and other parameters. In addition to the fluence to which they are subjected, SOP3 and SOP4 are also representative in that they are irradiation sets containing precisely the same material as the vessel wall around the reactor core. The irradiation sets are also subjected to virtually the same temperatures as the vessel wall.

d. The submitter of this view wonders why SOP3 and SOP4 must necessarily be irradiated in the KCB reactor. If neutron fluence is the sole factor in exposure of the samples, not the nature of the radiation, the submitter considers that there are other methods – e.g. a particle accelerator or the HFR – for exposing the samples to 3.5 E19 n/cm² more rapidly. In this way the Director of the KFD would not have to wait until 2020 for the final outcome of the embrittlement study.

Response
SOP3 and SOP4 indeed do not necessarily have to be irradiated in the KCB reactor. The advantage of using the KCB reactor is that the irradiation sets are subjected to virtually the same neutron spectrum as the vessel wall, and the irradiation temperature is also the same. Carrying out an irradiation programme in the KCB's own reactor is highly preferable to rule out influence parameters as far as possible and avoid arguments, and it complies with the international codes. It is not necessary to wait until 2020 for certainty. First of all, the SOPs are not designed to provide proof but to verify conservative assumptions in the calculations. To verify the original brittle fracture analysis material was also irradiated in the KCB reactor and then tested (SOP1 and SOP2); the new SOPs, SOP3 and SOP4, supplement this.

e. The submitter of this view argues that relatively low radiation exposure over 60 years cannot yield the same degree and nature of embrittlement as relatively high radiation exposure over about 6 or 10 years (the exposure to which the test specimen are subjected).

Response
The irradiation sets are irradiated more rapidly than the vessel wall. Because of the smaller distance from the reactor core there is a 'lead factor'. As a result, in the case of Borssele the irradiation sets are subjected to approximately the same fluence in one year as the vessel wall in eight years (lead factor ≈ 8). Extensive research has been done worldwide into the influence of this 'dose effect'. It has been established that lead factors up to approx. 12 have no influence on the degree of embrittlement. Even with higher lead factors the influence is not substantial, although it does play a role. This is another reason why e.g. brief intense irradiation in the HFR, as suggested at d., is less desirable.

f. The submitter of this view wonders whether it is known from experiments what embrittlement behaviour the material of the reactor pressure vessel displays under locally varying radiation exposure.

Response
Variations in radiation exposure cause variations in toughness in the vessel wall. The neutron fluence is highest on the inside of the vessel wall at the level of the core. The radiation over the circumference fluctuates mainly owing to the shape of the core. It also fluctuates over the height as a result of the core power spectrum. The strength calculations assume faults at locations where the highest radiation has been measured, i.e. those with the lowest toughness.

g. The submitter of this view wonders whether the average neutron fluence after 60 years is 3.40 E19 n/cm² and whether it should be assumed that certain parts of the reactor have been irradiated more intensely, or whether the 3.40 E19 n/cm² is the radiation exposure of the most intensely irradiated part. If so, the submitter goes on to ask which part that is.

Response
See also the previous answer. Based on the calculations, 3.4 E19 n/cm² has been determined to be the highest fluence. This, however, is based on the use of MOX fuel from 2012, and this has not yet been used. As a result the fluence will be somewhere between 3.22 and 3.4 E19 n/cm². Annex 22 to Reference 7 in the application shows the position where this maximum occurs (0° in circumference and 17 cm below the vertical centre of the vessel).

h. The submitter of this view notes that the reactor wall is about 19 centimetres thick and wonders what the consequences of partial embrittlement due to neutron fluence on steel of this thickness are. The submitter assumes that the inside of the reactor pressure vessel wall is irradiated more than the outside and that there are therefore gradations in embrittlement, and wonders how these gradations affect the brittle fracture behaviour of the reactor pressure vessel wall.

Response
See previous answers. The screening effect of the 19 cm-thick reactor wall causes a gradual decrease in fluence over the vessel wall with a factor of 10 in the outermost layer. See Fig. 10 in Reference 7 in the application. The toughness at the tip of any crack is important in the case of brittle fracture: this is what determines whether the crack will spread. The evidence is always based on worst-case scenarios.

i. The submitter of this view asks whether the relationship between embrittlement and fatigue has been investigated and whether steel that has been exposed to neutron radiation for 60 years has a different fatigue curve from 'new' steel. The submitter asks whether embrittled steel fatigues differently.

Response
Embrittlement due to neutron radiation requires neutrons of sufficient energy. Only the vessel wall at the level of the reactor core is subjected to irradiation by neutrons of sufficient energy, and radiation embrittlement therefore occurs only in the vessel wall at that level. It is in this area that the fatigue loads are negligible, hence a combination of fatigue and radiation embrittlement can be ruled out.

j. The submitter of this view notes that the transition temperature of the SOP samples was measured in the past by means of a notched-bar impact test. Nowadays NV EPZ uses a three-point bending test for this purpose. These experiments involve exposing a relatively small piece of material to a force. The brittleness of the test specimen is determined from the fracture behaviour it displays. The submitter wonders whether these tests can be regarded as representative of the reactor wall as a whole. When in use, and during emergencies, the whole reactor is exposed to large pressure and temperature fluctuations. Because of the vessel dimensions it can be assumed that there will be variations in the quality of the steel and the welds. A brittle fracture in the reactor wall is most likely to occur where it is weakest. The SOP experiments, however, provide a mean value for the brittle fracture behaviour of the reactor pressure vessel material. But just as a chain is as strong as its weakest link, the reactor wall is as strong as its weakest part. The submitter does not see how the SOP experiments can be regarded as representative, especially of the weakest parts of the reactor pressure vessel.

Response
It is not the case that the notched-bar impact test used in the past has now been superseded by the three-point bending test. In the case of SOP3 and SOP4 irradiation sets will again be notch tested to ascertain the impact value, but three-point bending tests will also be carried out using a more recent method. The results of the two methods will be compared. The use of these methods, which enable conclusions to be reached with regard to the reactor pressure vessel wall as a whole based on technological tests on small test specimen, has been examined in detail internationally and set out in international codes. Empirical research has also been done to test these various concepts, comparing the actual integrity of vessels with the rejection criteria in those codes. The concept of these codes, whereby conclusions are reached with regard to the vessel based on small test specimen, has been found to be very conservative. The actual safety margins have been found to be much larger, among other things because of the many conservatisms applied in the concept. The homogeneity of the reactor steel is an important aspect in the manufacture and testing of the product. The position and orientation of the test material for the SOP test is determined precisely, applying international codes such as KTA 3203, with the result that the test provides representative values for the material. Also, the sample survey that SOP3 and SOP4 undergo is fairly comprehensive: for each material tested twelve notched-bar impact test specimen, ten three-point bending test specimen and three tensile test specimen are irradiated and then tested.

k. The submitter of this view notes that the ductile-brittle transition temperature has been estimated very conservatively but not the expected neutron fluence. In the design this was estimated at 3.50 E19 n/cm², and after 40 years' planned operating life the radiation exposure was approximately 2.5 E19 n/cm². The actual radiation exposure in 2012 was therefore 71% of the design exposure. After 60 years' operation and with the use of MOX fuel NV EPZ assumes that the radiation exposure will be 3.40 E19 n/cm². The radiation exposure will therefore be 97% of the design exposure. The submitter considers that this cannot be called 'conservative'.

Response
It is clear from the licence application that NV EPZ originally assumed 3.5 E19 n/cm² for 32 full-load years. Based on the fluence calculations for this licence amendment it has been ascertained that this value will not be reached even after 60 years' operating life. On this basis it is fair to say that the estimate at that time was a conservative one. Based on the use of MOX from 2012 and 55 full-load years, the radiation exposure would be 97% of the original design exposure calculated for 32 full-load years. Given the large brittle fracture margin, safety could also be demonstrated for a much higher radiation exposure. As the original design exposure will not be reached even after 60 years, it was decided to base the brittle fracture margin on

this design exposure. In other words, the reduction in the margin versus the design value with the use of MOX and after 55 full-load years is not a problem, as the respective brittle fracture safety margin turns out to be much larger than was previously assumed.

l. The submitter of this view notes that after 40 years' operation, according to NV EPZ, in the event of a pressurized thermal shock (loss-of-coolant accident) the safety margin between the permitted and the measured transition temperature is 22°C. According to KTA 3203 of the German GRS the transition temperature rises by 10°C for each additional E19 n/cm² neutron fluence. As NV EPZ assumes that a further 1.5 E19 n/cm² radiation exposure can be expected on the reactor wall during the next 20 years, the submitter deduces that this margin is reduced by 15°C and the safety margin in the event of a pressurized thermal shock (loss-of-coolant accident) would be a mere 7°C. The submitter considers that this is not conservative enough to grant the licence.

Response
This is a misinterpretation of the licence application. The 22°C safety margin stated for the current licence situation is also based on 3.5 E19 n/cm² (see also the answer to j.). The LTO assessment shows with the aid of detailed (state-of-the-art) analyses that the safety margin is much larger than was calculated for this fluence at the time. 104°C has been calculated as the margin for the vessel wall at the reactor core, based on 60 years' operation.

m. The submitter of this view notes that a number of nuclear reactors elsewhere have already been decommissioned. The submitter wonders whether SOP-type experiments have been conducted on these other reactors and whether the steel of these reactors has been tested for brittle fracture behaviour following decommissioning. The submitter further asks whether the results of SOP experiments elsewhere have turned out to be good predictors of the actual brittle fracture behaviour of reactor pressure vessel material. The submitter considers that it is irresponsible to grant this licence application until a clear idea of this has been gained.

Response
A vast amount of research has been done worldwide on irradiated reactor pressure vessel steel. Various experiments have shown that the requirements in the codes are very stringent, and it is fair to say that, provided that the codes in force are observed, there are very large safety margins as regards brittle fracture of reactor pressure vessels.

n. The submitter of this view notes that no material tests have been done on vessels of reactors that have been shut down which actually show material fatigue effects, in particular due to neutron irradiation, as a result of four decades of operation. The submitter further argues that, for a major extension of design lifetime such as that proposed for Borssele, tests need to be carried out on vessels of reactors that have been shut down, as this is the only way of showing that the actual material ageing corresponds to the calculated ageing. The submitter argues that otherwise it cannot be ruled out that the actual material fatigue of the Borssele reactor pressure vessel is worse than assumed and that the reactor pressure vessel constitutes a major safety risk if the design lifetime is extended.

Response
A vast amount of destructive testing has been done internationally on irradiated reactor pressure vessel material. The results have been used to arrive at conservative international codes for radiation embrittlement. These codes were used in the argument in support of NV EPZ's LTO licence application. To verify the analyses, irradiation sets have been and are being irradiated in the KCB reactor pressure vessel. These irradiation sets have been and are being destructively tested.

Inadequate information on technical condition of reactor pressure vessel/underclad cracks

o. The submitter of this view considers that keeping the KCB open longer is incompatible with observing the conservative design principles on which the plant was based, given the laminar cracks in reactor pressure vessels at Belgian NPPs. The submitter notes that conservative margins were used in the design of the KCB and that in many cases modern techniques enable the exposure of components to be estimated more precisely. In some cases NV EPZ concludes that the exposure of certain components during the past 40 years was less than assumed at the design stage and that the design assumptions have indeed turned out to be conservative. At the same time there is new understanding which shows that conservative margins need to be observed strictly. The submitter notes that 8,000 and 2,500 laminar cracks were found in the reactor pressure vessels of the NPPs at Doel and Tihange in Belgium respectively.

   Response
   Faults were found at Doel 3 and Tihange 2 in Belgium which developed during the manufacturing process, according to the Belgian analyses and investigations. According to Electrabel this is not a case of an ageing process. NV EPZ has demonstrated, based on a safety evaluation carried out for the KFD, that the reactor pressure vessel problem found in Belgium is not transferable to the vessel of the KCB. The KFD has adopted this position. The Belgian inspectorate, FANC, reached preliminary conclusions in January 2013 on the investigation into the defects in Belgium, and additional information has been requested from the licensee before the two NPPs can be recommissioned.

p. A number of submitters of views note that it was proved last summer that the current methods of testing are inadequate, when a new non-destructive test happened to reveal thousands of hairline cracks in the reactor pressure vessels of Doel 3 and Tihange 2. The FANC's investigation into the cause of the hairline cracks and the consequences for the safety of the reactor is not yet complete. A similar investigation of the reactor pressure vessel at Borssele has not yet been carried out. This is necessary, however, for a proper safety analysis to be carried out and thus a decision to be made on the proposed design lifetime extension, given that the results of the investigation using test specimen SOP3 and SOP4 will not be available until the 2014-2018 period, i.e. after the period of continued operation has started. The submitters of views argue that it is necessary to wait for these results before deciding on extended operation, or that a worst-case scenario should be assumed for these results, so that the prescribed assessment of all the relevant aspects can be carried out even without these results yet being available.

   Response
   Based on the information available on (a) the differences between the reactor pressure vessels at Borssele and Doel 3 and (b) the intrinsic condition of the reactor pressure vessel at Borssele, the KFD concludes that Borssele still meets all the reactor pressure vessel safety requirements. The KFD does however consider new tests on the base material of the vessel wall at Borssele to be necessary with a view to continuous improvement and international uniformity. From a safety point of view, on the other hand, it is not necessary to carry these out immediately, and in the KFD's opinion, in line with the views and approach of the other international inspectorates involved, these can be deferred until the regular maintenance shutdown in April 2013. Safety is not at stake here. For that matter, NPPs are not being shut down prematurely to carry out tests in any country, including Belgium. Indeed, countries such as the United Kingdom, the United States, France and Germany do not even have any plans to carry out tests.

q. The submitter of this view, who claims to be an ex-RDM worker, wonders whether the KCB reactor pressure vessel will actually be safe after 60 years, given that he knows from his own experience in the 1969-1971 period that there are underclad cracks in it.

Response
At the time, when fitting the cladding at RDM, shallow cracks (underclad cracks) developed in the base material of a few parts of the KCB reactor pressure vessel. The cause was excessive application of heat to the base material during welding. Measures were taken when this was discovered. For the as yet unclad RPV shell sections it was decided to outsource the fitting of the cladding to a German firm that had a thorough command of this process and was able to fit the cladding without cracking. Inspections showed that there are no underclad cracks. In other locations, such as the bottom spherical head and the vessel flange on the top head, the layer of cladding that had been fitted was removed and the base material repaired. At a few locations in the top part of the vessel (where no embrittlement due to neutron radiation occurs) it was decided, based on consideration of the fracture mechanics, to leave the underclad cracks in place and not repair them, as they do not threaten the integrity of the vessel. 'Inspection windows' were cut at these locations to enable the underclad cracks to be monitored ultrasonically. After four in-service inspections it was found that they are not growing, and it was decided, with the inspectorate's approval, to discontinue these inspections. To rule out any doubt on this subject in the context of LTO a condition has been attached to the draft licence requiring a further inspection of the underclad cracks to be carried out.

r. The submitter of this view understands that the initial welded cladding layer has been entirely removed from the bottom spherical head of the vessel and welded in again with changed welding parameters such as a narrower weld band and less heat input. The submitter wonders why the bottom spherical head was fitted with a new cladding layer but not the shells.

Response
See also the answer to q. RPV shell sections 3 and 4 were forged as the last parts of the vessel. As these were only to be clad after they had been welded to form a 'twin' (a cylinder comprising the two shell sections welded together), the underclad cracks had already been discovered before work on cladding these sections could begin. Siemens has decided to have this twin cladded in Germany, using an improved process. A welding process to prevent underclad cracks had been developed in Germany and qualified. As a result of different welding parameters and a multi-layer cladding process it can therefore be asserted that the bottom four forged parts of the KCB reactor pressure vessel are free from underclad cracks.

s. The submitter of this view notes that the fracture mechanics methodology uses theoretical assumptions in its calculations. The submitter further wonders whether notions have changed, or whether past assumptions were correct and have been confirmed in practice.

Response
There have been substantial developments in fracture mechanics. Using current methods and computational tools conclusions can be reached on crack initiation and growth that approximate reality very closely, as has been established by comparing computations and experiments. The Assessment on reactor pressure vessels, however, is conservatively based on 'traditional' fracture mechanics analyses and safe margins. Various research projects have shown that the assumptions are conservative. I would refer e.g. to the final report of the NESC-1 project, NESC-1 Project Overview, EUR 19051EN (NESC: Network for Evaluating Structural Components).

t. The submitter of this view understands that the 'windows' have been inspected visually and on the surface using a video camera for the past 30 years or so. The submitter wonders whether this says anything about the cracks beneath the surface. The submitter further argues that the stainless steel cladding layer is tougher than the more brittle carbon steel and that if the cracks were to deepen they would be more likely to extend into the carbon steel than into the cladding layer.

Response
In principle, underclad cracks cannot be observed visually. Following commissioning they were monitored in periodic ultrasonic inspections. After four inspections it was found that the cracks are not growing, and it was decided, with the inspectorate's approval, to discontinue these

inspections (see also the answer to q.). A condition has been attached to the draft licence requiring a further ultrasonic inspection of underclad cracks to be carried out. The main aim of the visual inspection referred to was to monitor the condition of the cladding.

u. The submitter of this view argues that the licence should stipulate that inspection of the windows in accordance with the draft licence must take place after ten years in line with the then state of the art and based on approval by the competent authorities.

Response
In general it is the case that NV EPZ must comply with the state of the art in relation to all compulsory inspections. All compulsory inspections must be approved by competent authorities. This also applies to new ultrasonic investigation of underclad cracks. Lloyd's is a competent authority, and the KFD, being the responsible inspectorate, has commissioned Lloyd's to supervise the inspection.

MOX fuel

v. A number of submitters of views note that there is little experience of extending design lifetime and that extending the design lifetime of an NPP using MOX fuel is unique.

Response
The argument in support of the application to extend the design lifetime takes into account the use of MOX fuel until the end of 2033. The relevant safety analyses show that, even with the introduction of MOX fuel, the criteria laid down for the relevant safety parameters are met. This is also being verified in practice with the aid of the results of the SOP3 and SOP4 irradiation experiments. NPPs in Germany already have 20 years' experience of using MOX fuel, also in relation to ageing. This experience was taken into account in the argument and the assessment of the application to extend the KCB's operating life.

Safety margins

w. A number of submitters of views note that the documents state in various places that the KCB's safety margins are diminishing and that this was also the case with the amendment to the KCB's licence to enable MOX fuel to be used. The submitters of views further note that a study by the Max Planck Institute entitled 'Global risk of radioactive fallout after major nuclear reactor accidents' shows that the likelihood of a serious nuclear accident is much greater than that on which the Nuclear Facilities Decree is based. This study shows that until the Fukushima accident it was assumed that a nuclear accident could occur once in a hundred thousand reactor years, but in reality the likelihood of an accident of this kind is far greater. The submitters of views argue that the safety margins on which the KCB was based are therefore reduced and that this new knowledge should result in their being recalculated.

Response
The submitters of views do not substantiate their claim that the documents state at various places that the KCB's safety margins are diminishing. Calculations and analyses in support of the application show that in the case of all the relevant safety parameters the distance from the respective acceptance criteria is large enough and the criteria are certainly not exceeded. I do not share the submitters' view that the KCB's safety margins need to be recalculated in the light of new knowledge based on a study by the Max Planck Institute for Chemistry about the likelihood of a serious nuclear accident. The Max Planck Institute's study is concerned not so much with probability calculations to gauge the safety of an NPP and assess the likelihood of nuclear accidents but rather with the dispersion of radioactive materials after a serious nuclear accident. This is a related but nevertheless different topic. Probability calculation is not central to the study and the model as such is a simplified one. In the calculation, for example, the Max Planck Institute divides the number of major nuclear accidents by the number of years that nuclear energy has been in use. The researchers themselves admit that this is a calculation

that is not proven to be correct. I consider the Probabilistic Safety Assessment (PSA) as used by EPZ to be suitable for determining the risk of a serious nuclear accident. The IAEA had EPZ's PSA checked in 2010 by an International Probabilistic Safety Assessment Review Team (IPSART). The PSA uses far more sophisticated parameters as input: even all the events that could occur once in ten thousand years are included in the KCB's PSA. It is fair to say, then, that this gives a realistic picture of the safety of the KCB. The European Commission also recently indicated in the report on the European stress test that the data on external hazards used in the KCB's PSA are correct. In this connection the Commission referred to the KCB's PSA and risk monitor as 'good practices'.

Fatigue

x. The submitters of this view notes that NV EPZ installed a fatigue monitoring system (FAMOS) in 2010 and that the FAMOS data are to be used to update the load catalogue. The view asks whether, based on FAMOS data, load values that were first conservatively estimated are now to be included in the load catalogue less conservatively. The submitter further asks what the consequences, if any, of unnoticed measurement errors in FAMOS would be and whether there is a second independent monitoring system.

Response
FAMOS enables the stresses due to thermal fatigue to be ascertained more accurately, making it possible to demonstrate for a number of locations that the loads originally assumed were over-conservative and the calculations can be based on less severe fatigue stresses. By taking FAMOS readings for several years the new load catalogue can be revised accordingly. Conservative assumptions will continue to be used in the fatigue calculations as regards both the severity of loads and other parameters. The calculations will be done in line with codes in force and will be submitted to the inspectorate for approval. FAMOS is a qualified system. The individual monitoring points (thermocouples around the circumference of lines) are monitored and any discrepancies investigated. The thermocouples are calibrated periodically. Also, FAMOS can be compared with the existing monitoring system.

y. The submitter of this view notes that NV EPZ states that normal operation will be optimized based on the load data from FAMOS. The submitter asks whether NV EPZ can indicate how they propose to achieve a balance between economic and load optimization.

Response
NV EPZ states that FAMOS will help to optimize normal operation. This optimization is expressly designed to reduce fatigue stresses on components (if possible and desirable) so as to reduce the likelihood of fatigue damage and avoid having to replace them. Safety remains paramount.

z. The submitter of this view notes that many parts of the KCB are overdesigned. The submitter asks whether the same fatigue curve applies to such parts as to more economically designed parts and whether it is known whether parts of this kind can become weakened in ways other than 'standard' fatigue.

Response
NPPs such as Borssele are subject to design codes such as those of the American Society of Mechanical Engineers, e.g. ASME III, Component Design and Construction. Among other things, these codes indicate how to deal with fatigue and describes the fatigue curves to be used. Different fatigue curves are given for different categories of material. The design of components is a separate issue.

aa. The submitter of this view asks what the state of the art is regarding fatigue in critical safety systems in nuclear reactors and whether the acceptable cumulative usage factor CUF for such systems is not less than 1.

Response
The current state of the art as regards designing for fatigue in NPPs still applies a concept based on demonstrating a cumulative usage factor of less than 1. It does however require allowance to be made for the possible negative influence of the medium (water) on the lifespan ('environmental fatigue'). In line with the regulations this effect can be taken into account by applying 'correction factors' when calculating the usage factor. The cumulative usage factor ultimately arrived at in this way should also be less than 1 in order to demonstrate that cracks will not be initiated by fatigue. Another option is to apply adequate fixed correction factors to start with. This concept (based on German codes) has been applied by NV EPZ (see p. 30 of the licence application), hence the CUF applied is not 1 but 0.2 (austenitic steel) and 0.4 (ferritic steel) respectively for locations where the medium can exert an influence.

bb. The submitter of this view asks whether the fatigue curve is still fully applicable to a period of 60 years and whether this has been ascertained empirically.

Response
Fatigue curves are independent of the age of a component as long as the microstructure of the material remains unchanged. Apart from neutron irradiation, the conditions in a nuclear reactor such as the KCB are such (low temperature) that there are no changes in the microstructure. A fatigue curve sets a limit based on the number of load cycles and the amount of the fluctuating loads. If an NPP is operated longer, components will be subjected to more load cycles. The fatigue curve itself does not change.

Ageing processes difficult to detect

cc. A number of submitters of views note that ageing phenomena in a reactor often remain hidden until it is too late. The submitters of views consider that this risk should not be taken with an NPP, as the consequences of failure are not foreseeable.

Response
These submitters of views make an assertion that is not substantiated. Ultimately the safety condition of the plant is the deciding factor. This condition is maintained by servicing the plant in line with a plant programme that complies with international recommendations and national rules and regulations. The plant programme pays particular attention to the gradual degradation of components due to ageing – this is known as 'ageing management'. At the KCB this ageing management is carried out in line with the IAEA guidelines. Ageing management means ensuring the integrity and functionality of systems, structures and components by means of a systematic management process. The management process involves minimizing the consequences of ageing by means of inspections, timely maintenance, replacement of parts or reduction of stresses.

dd. The submitter of this view notes that passive components fall under the scope of the Ageing Management Review in line with IAEA Safety Report No. 57. The submitter asks what method has been used to evaluate the ageing of active components and what the results were.

Response
For the active components NV EPZ carries out a verification in line with Condition II.Bb No. 11 (p. 10 of the draft Decision). For a brief description of this verification see Chapter 4 of the report 'Conceptual Document LTO 'Bewijsvoering' KCB' (see Reference 4 in the LTO licence application).

ee. The submitter of this view notes that cavitation is not dealt with by NV EPZ in the licence application, despite the fact that this is an acknowledged ageing phenomenon. The submitter notes that the extent to which parts of the KCB, in particular lines, have been weakened by cavitation is also unclear. The submitter further notes that it is not clear whether leak-before-break behaviour is influenced by cavitation-related ageing and whether ageing due to cavitation is recorded by FAMOS or in some other way. The submitter considers that before the

licence can be granted NV EPZ must provide a clear picture of the current situation so that this can be properly taken into account.

Response
The SALTO team suggested in 2012 that cavitation should be regarded as an ageing phenomenon and therefore added to the catalogue of degradation mechanisms for mechanical components. In the catalogue, NV EPZ has indeed not dealt with this phenomenon as an explicit ageing phenomenon. The Ageing Management Review did consider cavitation, but as a sub-phenomenon of the ageing phenomenon of flow-assisted corrosion. NV EPZ therefore certainly regards cavitation as a possible degradation mechanism, and measures have been or are being taken in the event of cavitation. In the case of lines classified as 'leak-before-break' it has been ascertained that the likelihood of cavitation damage is minimal, and inspections are carried out to verify this periodically. Temperature measurements are carried out at various locations using FAMOS. This system is not designed nor suitable for measuring cavitation.

6.4.5 Topic 5: Miscellaneous

Submitters of views on this topic:
1, 6, 12, 18, 28, 37, 38.

The following points were raised on the topic of **Miscellaneous**:

Inadequate knowledge during continued operation

a. A number of submitters of views note that a large part of the assessment of the application to extend the KCB's design lifetime was carried out by the German Gesellschaft für Anlagen- and Reaktorsicherheit (GRS) and that this institution was also involved in granting the licence to use MOX fuel at the KCB. Greenpeace and the Zeeuwse Milieufederatie (Zealand Environmental Federation) wonder whether the competent authority has sufficient knowledge to supervise the functioning of the KCB properly during its continued operation.

   Response
   As regards the submitters' doubts concerning the competent authority's knowledge I consider that the competent authority has sufficient knowledge to assess the argument in support of extending the KCB's design lifetime. On top of this GRS (Gesellschaft für Anlagen- und Reaktorsicherheit) was brought in where necessary. GRS has for many years been the Technical Support Organization (TSO) of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and has many years' experience of ageing in NPPs, in particular the German ones. Bringing in GRS provides access to German knowledge and experience of safety analyses in general and German experience of ageing in particular. This experience relates to Siemens-designed NPPs, and the KCB is also a Siemens design. The inspectorate, the KFD, also has access to all the information on the safety assessment for extending the KCB's design lifetime and is therefore sufficiently prepared to carry out supervision.

b. A number of submitters of views note that the licensee has not adequately demonstrated that it will be able to keep its knowledge up to scratch for the next 20 years – when there will be ageing and turnover of personnel and knowledge and infrastructure will be lost in the neighbouring countries – in the context of extending the design lifetime for both the operating and decommissioning phase.

   Response
   The licensee's organization is generally required to meet expertise requirements under statutory regulations and conditions attached to the licence. A condition has also been attached to the licence requiring the recommendations on competence, knowledge and behaviour of personnel as regards ageing management to be included in an adaptation plan in the context of extending the design lifetime. The KFD will supervise this during the period of continued operation and can take measures if necessary.

Various views expressed

c. A number of submitters of views say they are against nuclear energy without putting forward any arguments.

   Response
   In the first place, NV EPZ has a licence for the KCB for an indefinite period, limited by Section 15a (1) of the Nuclear Energy Act to the end of 2033. As no substantive arguments are put forward in this view, it does not lead me to revise the draft Decision.

d. The submitter of this view votes in favour of continued operation.

Response
This view supports the decision made and note is taken thereof.

e. The submitter of this view notes that the KCB will not have been in operation for 40 years on 1 January 2014, but earlier, on 12 October 2013, since it was already connected to the Dutch grid on that date.

Response
The original Safety Report was based on an operating life of 40 years. If this period is applied strictly, the KCB will indeed have been in operation for precisely 40 years on 12 October 2013, not on 1 January 2014. Granting the licence to extend the design lifetime involves amending the Safety Report from the original design lifetime of 40 years to a design lifetime of 60 years and the safety argument in support of this. This licence will come into force well before 12 October 2013.
The precondition for safety is that the KCB must be able to be operated safely at all times. This means that the safety criteria laid down must be complied with at all times, both during current operation and during its continued or extending operating life. With the granting of this licence the safety argument has been assessed and it has been concluded that it is possible to operate the KCB safely until 31 December 2033, provided that the additional conditions laid down are implemented in addition to the existing statutory requirements and licence provisions.

6.5 Conclusion in response to the views expressed

The above views expressed have not led me to refuse the amendment requested to the licence in force. The views expressed to the draft Decision have however resulted in revision of the final Decision versus the draft. The argument in support of the Decision has been clarified on a number of points and the terminology brought more into line with the application, without however revising the licence or the conditions attached to it. It has emerged from the views expressed that there is a need for more explanation of the assessment framework, especially the meaning of 'extended/continued design lifetime', the scope of the assessment framework for this application versus other safety reviews and the fact that an EIA is not required for the proposed activity. As a result paragraph 3.1 has been revised and Part 4 expanded and reorganized.

7 Final Conclusion

My final conclusion is as follows:

- The relevant aspects of the amendment are adequately described in the application and the annexes.
- The safety analyses that have been carried out show that the supporting documents submitted by NV EPZ are of adequate quality.
- The amendment requested to the licence in force satisfies the three principles underlying radiation protection policy: justification, ALARA and dose limits.
- The statutory framework, the assessment framework applied in addition to this, and the standards and design principles set out therein from the point of view of safety have been complied with, also for a design lifetime of sixty years.
- Additional conditions have been attached to the licence to guarantee the timely and effective implementation of the improvement measures identified.
- The conditions attached to the licence ex officio have brought the licence back into line with the rules and regulations in force and with current developments.

Given the foregoing considerations I conclude that there is no ground for refusal as referred to in Section 15b of the Nuclear Energy Act or any other ground for refusal pursuant to the Nuclear Energy Act. I am therefore able to grant the amendment to the Nuclear Energy Act licence requested by NV EPZ. I have also amended the licence ex officio.

Yours faithfully,

H.G.J. Kamp
Minister of Economic Affairs

Interested parties may appeal against this decision to the Administrative Jurisdiction Division of the Council of State, PO Box 20019, 2500 EA
The Hague. The time limit for submitting an appeal application is six weeks and commences on the day after that on which the decision is deposited for inspection. No appeal may be lodged by an interested party who can reasonably be charged with not having filed an view to the draft of this decision.

This decision shall enter into force on the day after that on which the time limit for lodging an appeal application expires. If during that period an application for provisional relief is made to the President of the Administrative Jurisdiction Division of the Council of State this decision shall not enter into force until a decision has been made on that application.

Annex A: Glossary

Load condition or load fluctuation
Change in mechanical or thermal load causing stresses in a material.

Break preclusion
Safety principle on the basis of which line fracture can be ruled out.

Brittle fracture
Fracture involving cracking with little or no plastic deformation.

Conservative/conservatism
Basing assessment, testing or monitoring on an unfavourable scenario.

Economic life
The period for which a production resource can be exploited economically (profitably).

Environmental fatigue
Fatigue under the influence of corrosive environmental conditions, i.e. the influence of the coolant (water) on resistance to cracking due to fatigue.

Cumulative usage factor, usage factor
Ratio between the number of actual (or expected) load fluctuations and the number of permitted load fluctuations in relation to fatigue. The cumulative usage factor is the sum of the usage factors for each type of load fluctuation.

Qualified residual life
The remaining period or length of time for which it has been demonstrated that the component in question will continue to function, taking into account the environmental conditions during normal operation and in accident situations.

International Atomic Energy Agency (IAEA)
This agency is an international autonomous organization of the United Nations, with 151 member countries, in which the member states work together in the field of nuclear energy and its peaceful use.

Leak before break
The principle by which a small, stable, detectable leak occurs first, giving enough time to take measures to prevent failure (fracture).

Long Term Operation
Continuing operation for a longer period than originally foreseen. The original period may be limited on the basis of e.g. rules and regulations, licences, standards and/or design.

Design lifetime
The operating life postulated when carrying out design analyses.

Ductile-brittle transition temperature
Characteristic temperature indicating the resistance of a material to brittle fracture.

Reactor pressure vessel embrittlement
The phenomenon whereby the reactor pressure vessel wall becomes more brittle under the influence of high-energy neutron irradiation when the ductile-brittle transition temperature increases.

SAfe Long Term Operation (SALTO)
A SALTO peer review is a peer review carried out by a team of international experts from the IAEA, focusing on the elements important to the safety of Long Term Operation (LTO).

Stratification
The presence or formation of clear separate layers with different temperatures in water.

Technical life
The period for which a production resource is technically capable of production.

Time-limited analysis
Safety analysis whose validity is limited to the assumed design lifetime.

Transient
A disturbance in the temperature control/energy balance of the plant.

Fatigue
The phenomenon whereby damage occurs to a material as a result of fluctuating mechanical loads (stresses).

Ageing
The process whereby the physical properties of a structure or component change under the influence of specific environmental conditions as a function of time.

Ageing management
The entirety of activities and measures aimed at dealing with ageing effects during use.

Full-load year
One full-load year is equivalent to one year (365 days) of production at the NPP at 100% power (full load).

Annex B: List of Abbreviations

PSR
Periodic Safety Review

10-EVA13
Periodic Safety Review planned for the year 2013

AM
Ageing Management

AMR
Ageing Management Review

AREVA
AREVA GmbH

Bkse
Besluit kerninstallaties, splijtstoffen en ertsen (Nuclear Facilities, Fissile Materials and Ores Decree)

BBC
Borssele Benchmark Commission

Brzo
Besluit Risico's Zware Ongevallen (Major Accidents (Risks) Decree)

COVRA
Centrale Opslag Voor Radioactief Afval (central waste storage facility)

CUF
Cumulative Usage Factor

DELTA
DELTA Energy B.V.

EQDBA
Qualification of Design Base Accident-resistant electrical Equipment

EZ
Ministry of Economic Affairs

FAMOS
FAtigue MOnitoring System

FANC
Federaal Agentschap voor Nucleaire Controle (Federal Nuclear Inspection Agency)

GRS
Gesellschaft für Anlagen- und Reaktorsicherheit

HABOG
Hoogradioactief Afval Behandelings- en Opslag Gebouw (waste treatment and storage building for high-level waste)

IAEA
International Atomic Energy Agency

ICT
Information and Communication Technology

ISI
In-Service Inspection

KCB
KernCentrale Borssele (Borssele Nuclear Power Plant)

Kew
Kernenergiewet (Nuclear Energy Act)

KFD
KernFysische Dienst (Department of Nuclear Safety, Security and Safeguards)

KTA
KernTechnischer Ausschuss (Nuclear Safety Standards Committee)

KWU
KraftWerkUnion

LBB
Leak Before Break

LOCA
Loss-of-Coolant Accident

LTO
Long Term Operation

m.e.r.
Milieueffectrapportage (environmental impact assessment, EIA)

MER
Milieueffectrapport (environmental impact assessment, EIA)

MeV
megaelectron volt

MOX
Mixed OXides

NRG
Nuclear Research & consultancy Group

NV EPZ
N.V. Elektriciteitsproduktiemaatschappij Zuid-Nederland

NVR
Nationale VeiligheidsRegel (national safety rule)

MW
megawatt

MWe
megawatt electrical

OSART
Operational SAfety Review Team

OSPAR
OSlo PARis Convention

PSA
Probabilistic Safety Assessment

RDM
Rotterdamse Droogdok Maatschappij

RIVM
Rijksinstituut voor Volksgezondheid en Milieu (National Institute for Public Health and the Environment)

RSK
Reaktor-SicherheitsKommission

RT
Reference Temperature (transition temperature from brittle to ductile fracture)

SALTO
SAfe Long Term Operation

SAMG
Severe Accident Management Guidelines

SF
Safety Factor

SOP
Staal Onderzoek Programma (steel testing programme)

SR
Safety Report

SSC
systems, structures and components

TK
Tweede Kamer (House of Representatives)

TLAA
Time-Limited Ageing Analysis

UF
Usage Factor

VGB
Verein Grosskessel Betreiber

VR-KCB
VeiligheidsRapport Kernenergie-eenheid Centrale Borssele (Borssele Nuclear Power Plant Safety Report)