Scope and Detail Recommendation Environmental Impact Statement

New PALLAS research reactor

Date 17 September 2015

Contents

The Dutch version is leading in case of possible different interpretations between this translation and the original Dutch document.

1 Introduction

The Stichting Voorbereiding PALLAS-reactor (Foundation for the preparation of the PALLAS reactor, subsequently referred to as 'PALLAS') proposes to build and operate a new reactor with a maximum thermal capacity of 55 MW in Petten. This will eventually replace the current reactor in Petten, the High Flux Reactor (HFR). The construction and use of the new reactor will require applications to be submitted for a Nuclear Energy Act licence and a Water Act licence, among other things. The Minister of Infrastructure and the Environment is the competent authority for both licences.

An environmental impact assessment (EIA) procedure[1] is being carried out in support of the applications. The Nuclear Safety and Radiation Protection Authority is responsible for coordinating the EIA procedure. This Scope and Detail Recommendation sets out how the environmental impact statement (EIS) should be organized.

Background

In its notification of intent PALLAS states that the PALLAS reactor is designed to replace the current reactor, the HFR. The HFR performs a pivotal role in the activities of the licensee, the Nuclear Research and consultancy Group (NRG), and has been in use since 1961. It is used to produce isotopes for nuclear medicine and for fundamental and applied nuclear research. It makes a substantial contribution to the production of medical isotopes worldwide. It has now been operational for over fifty years and is coming to the end of its economic lifespan. The loss of the HFR's production capacity will reduce the availability of medical isotopes. With the constuction and operation of the new reactor PALLAS aims to guarantee the production of medical isotopes and the research activities for the future.

Government policy

The Government sent a letter[2] to the House of Representatives on 16 October 2009, in which it stated that it was in favour of the costruction of a new reactor provided certain conditions are met. The Government's view is that a new reactor is needed to secure the reliable production of medical isotopes in the long term. It also considers that siting it in the Netherlands makes sense, given the existing knowledge in this area, the existing logistical facilities and infrastructure and in order to preserve employment.

The Government further states that certain conditions as regards waste, safety, the environment, planning and funding need to be met. Nuclear waste must be transported, treated and stored safely. Decommissioning is also important. On top of this, the health and safety of workers and people in the vicinity of the reactor need to be safeguarded. To what extent the new reactor could also be used for research into nuclear technology needs to be examined.
One of the criteria laid down is that the costs of building, operating and decommissioning the reactor must be met from revenue from the reactor activities. The final business case must also show whether the revenue from the

1 The EIA procedure identifies the environmental effects of an activity before the decision is taken. An Environmental Impact Statement (EIS) sets out the results of the EIA.
2 House of Representatives, 2009-2010 Session, 25422, No. 74.

new reactor's activities is sufficient to enable it to be operated without public funding.

History
The original initiator of the new PALLAS reactor was the NRG, which launched an EIA procedure for the project in 2009. In response to this the then competent authority drew up guidelines for the organization of the environmental impact statement in summer 2010.

Around 2012, however, it emerged that the NRG was unable to assemble sufficient funds to continue the project. Given the importance of the continued production of medical radioisotopes and the need to preserve nuclear expertise and employment, in February 2012 the Government decided to provide a loan of 40 million euros for the first phase of the PALLAS project.[3] This first phase covers designing the reactor, obtaining all the necessary licences and bringing in sufficient private investors. One condition was that the preparatory work for the new reactor should be carried out by a separate foundation, and the Stichting Voorbereiding PALLAS-reactor was therefore set up on 16 December 2013.

On condition that the reactor would be built in Petten (at the time there was also the possibility that it might be built in Borssele) the Province of North Holland also provided a loan of 40 million euros for this first phase.

Environmental impact assessment
PALLAS published its notification of intent to carry out an environmental impact assessment on 26 May 2015, in which it stated that it was launching a new procedure because some important circumstances had changed since 2009, such as the setting-up of the foundation and that fact that the choice of site was now definite. There were also technical changes: the lessons from Fukushima had been incorporated in the requirements laid down for the reactor, for example, and the reactor power had been substantially reduced.
The purpose of the EIA is to assist the competent authority in its consideration of the licence applications relating to the project, in particular the applications for a Nuclear Energy Act licence and a Water Act licence. An EIA is required for these licences under the Environmental Management Act. The EIS should describe the environmental effects of the proposed activity and various alternatives.

Scope and Detail Recommendation
This Recommendation relates to the Project EIS that is required. As PALLAS stated in its notification of intent, implementing the proposed activity will also require the zoning plan for the Petten Research Facility to be revised, for which a separate procedure will be carried out. A Plan EIS will be drawn up for this revision.

In the Scope and Detail Recommendation the competent authority sets out what environmental information the EIS should contain so that the interests of the environment can be taken into account in the decisions on the applications for a Nuclear Energy Act licence and a Water Act licence in particular.

When drawing up the Recommendation the competent authority took into account the public consultation responses to the notification of intent (subsequently referred to as 'objections') and recommendations such as those of the Netherlands Commission for Environmental Assessment and various municipalities, insofar as they relate to the project.

3 See also House of Representatives, 2012-2013 Session, 33 626, A/No. 1 and 2014-2015 Session, 33 636, No. 4.

The content of the Recommendation is also based on the statutory requirements for an EIS, the EIA notification of intent and some elements in the aforementioned 2010 guidelines.

The procedure to date

The competent authority received the notification of intent for the EIA from PALLAS on 26 May 2015.

On 3 June 2015 the competent authority publicly announced the notification of intent by placing an advertisement in the Government Gazette and various newspapers and weeklies in the Netherlands. In compliance with the Espoo Convention all the Espoo member countries were also informed of the proposed project. The Netherlands Commission for Environmental Assessment was also asked to make recommendations on the notification of intent.

The notification was available for the public from 4 June 2015 to 15 July 2015 and was also accessible on the websites of the Nuclear Safety and Radiation Protection Authority (ANVS) and the Dutch government. During this period anyone could make verbal or written comments on the notification and the content of the Scope and Detail Recommendation. The competent authority also organized an information meeting in Petten on the subject on 11 June 2015.

The Netherlands Commission for Environmental Assessment made recommendations on the scope and detail of the EIS on 13 August 2015, having taken notice of the opinions and recommendations it received up to and including 6 August 2015.

Organization of this document

Chapter 2 sets out the scope of the EIS and the essential main points that must at least be included in the EIS.

Chapter 3 then describes the aim of the project, the policy framework and the decisions that need to be taken.

Chapter 4 discusses the proposed activity, e.g. the choice of the type of reactor and isotope production, and sets out the alternatives that need to be developed.

Chapter 5 sets out how the baseline situation should be described, based on the existing environmental situation and the expected organic development, and defines the plan area and area under consideration. This chapter also discusses the description to be included in the EIS of the environmental effects of the proposed activity and the alternatives on the various environmental media.

Chapter 6 discusses socio-economic aspects, gaps in the environmental information, how the environmental effects should be monitored and an evaluation programme implemented. It also provides instructions on the form, presentation and summary of the EIS.

Chapter 7, lastly, contains the signatures to this Recommendation.

2 Main points for the EIS

As already stated, this Recommendation sets out the scope and detail required for the Project EIS for the licence applications. It does not therefore apply to the Plan EIS which also needs to be drawn up.

Scope of the EIS

We recommend not confining the EIS to a detailed description of the effects of construction and operating the reactor; the effects of the steps that take place beforehand (e.g. the production of fuel) and afterwards (e.g. the distribution of isotopes and the processing of fission waste) should also be identified in general terms. We recommend considering the whole production chain, even though this is a reactor for the production of isotopes, which differs in nature and especially size from a nuclear power plant. This recommendation is made in view of the ongoing public debate on the use of nuclear fission in general and the pros and cons of various ways of producing medical isotopes in particular.[4]

The effects of the proposed activity for which PALLAS is submitting a licence application must be identified and described in detail and site-specifically, as regards both the construction phase and the operating phase. The phase in which the new reactor is in use, possibly along with the HFR, should be examined separately. The parts of the production chain that could be carried out by other organizations have their own licensing procedures: as regards the environmental effects of these parts of the production chain a description based on available (quantitative) data will suffice.

Main points

The following points are regarded as essential information in the EIS. In other words, the EIS must include at least the following information to enable the interests of the environment to be taken into account in the decisions:

- The rationale for the intended aims of the proposed activity, e.g. the demand for medical isotopes and the contribution that the reactor could make to this, taking into account the development of alternative production methods, and the demand for experimental research into radiation.
- A description of the environmental effects of the whole chain (both the fuel chain and the medical and industrial isotopes production chain). Make this detailed and site-specific for the alternatives to the subject of the licence application[5] and based on available data on the other parts of the chain.
- A description of the safety situation and measures to guarantee safety.
- The effects on the North Sea Coast and Zwanenwater & Pettemer Dunes Natura 2000 sites.

4 Most of the objections argue that a general justification of the use of nuclear fission to produce medical (and other) isotopes is needed and ask for the waste problem and its effects to be discussed in the EIS.

5 Such as the building height/depth and design of the cooling system.

3 Rationale, policy framework and decisions

3.1 The rationale for demand and reactor power

The aim is set out clearly in section 2.1 of the notification of intent. The notification states that the HFR provides about 30% of the worldwide production of medical isotopes, that the demand for these isotopes will continue to rise because of the rapidly ageing population, increasing life expectancy and growing prosperity, and that the supply of isotopes due to the maintenance of the existing reactors is being squeezed. The new reactor is designed to contribute to the continuous availability of medical isotopes. It will also be used for nuclear research programmes, as is currently the case with the HFR.

Copy the aim and argumentation to the EIS and provide further substantiation for siting the reactor in the Netherlands and building one of this size (power). Substantiate the extent to which the reactor will be used to produce medical (and other) isotopes and for research. Most of the objections question the value of the proposed activity, pointing to a particle accelerator as a possible alternative for the production of medical isotopes. Based on the data available, outline in the EIS the pros and cons of both production methods, stating the reasons for opting for a reactor, differentiating between foreseeable and uncertain spatial planning, technological and economic trends and how they affect the feasibility of the proposed activity.[6] A start has already been made on this in section 2.2.3 of the notification of intent.

3.2 Policy framework and decisions required

The notification of intent states that the most important public-law decision required for the research reactor is a Nuclear Energy Act licence. State in the EIS what decisions and regulations are related to the Nuclear Energy Act and what the resulting constraints are.[7]

State in the EIS what other decisions still need to be taken to enable the proposed activity to be implemented, both follow-up decisions and spatial planning decisions. Discuss the decisions that need to be taken on the processing and disposal of spent fuel and other radioactive waste that is released. Discuss for example the storage facilities available at COVRA and the procedures required to use them. Also discuss the shutdown and decommissioning licences for which applications need to be submitted for the existing reactor and in due course for the new reactor.

Implementing the proposed activity will require the revision of the zoning plan, with an accompanying Plan EIS. In such situations it is not unusual to draw up a single EIS for both the planning and the licensing procedure. PALLAS has decided to separate the two procedures, however, and aims to initiate the planning procedure later than the licensing procedure but to complete it sooner.[8] The

6 Examples include the following: changes in the other companies at the Petten Research Facility with which PALLAS has relations (see e.g. the objection by Petten Village Council), changes in the demand for particular types of isotopes and the uncertainty surrounding the HFR's operating life (see e.g. the objection by the LAKA foundation). Consider not only the period when the reactor is being built but also the period when it will be operational.

7 For example the limits that the Nuclear Facilities, Fissile Materials and Ores Decree places on the risk of accidents in which the effective dose or the number of victims exceeds a certain limit.

8 On 29 June 2015, during a visit to the Petten Research Facility by the Netherlands Commission for Environmental Assessment, PALLAS stated that it had the following arguments for adopting this approach: the

present Recommendation is in line with the approach adopted and complies with the framework for the EIA procedures for the Nuclear Energy Act licence and the Water Act licence.

planning procedure is less complex, detailed and labour-intensive than applying for a Nuclear Energy Act licence, and less information and less detail is required than for deciding between variants.

4 Proposed activity and alternatives

4.1 General aspects

The proposed activity comprises the building and operation of a new research reactor to replace the HFR. Recommendations on the description of the proposed activity are set out in section 4.3 of this Recommendation, and on that of the alternatives (subsequently referred to here as 'variants') in section 4.4.

The proposed activity and the variants should be described insofar as they have effects on the environment. Give reasons for selecting particular variants. To enable the variants to be compared, their environmental effects should be described using the same method and at the same level of detail. Differentiate in the description between the activities that take place in the construction phase, the phase in which both reactors could possibly be operational at the same time, and the phase in which only the new reactor is still operating. For each alternative state what if any preventive, mitigating and compensatory measures are to be taken: for example, measures to prevent fish or other organisms being drawn in with the cooling water, or measures that can be taken now to reduce the amount of waste produced on decommissioning.

4.2 Siting

We note that two sites were still under consideration in 2009, namely Borssele and Petten. Since then the Borssele site has been dropped. State clearly in the EIS the considerations on the basis of which the site was chosen and to what extent environmental effects played a role. The notification of intent also indicates that the siting of the reactor within the Petten Research Facility has been decided in general terms. Substantiate this decision.[9]

4.3 Description of the proposed activity

Does the proposed activity include transporting irradiated targets to purchasers? And what is the situation regarding the storage, processing and transport of the various radioactive waste streams? And if the proposed activity does not include activities of this kind, who will be responsible, what are the environmental risks, and how is their control regulated? The EIS should describe clearly what the activity to be authorized does and does not include. This information is required to ascertain properly to what activities the detailed environmental effects relate and compare them for the various variants. Risks that need to be controlled of activities that are not included in the proposed activity but are inextricably bound up with it should merely be outlined: sections 4.3.2 and 4.3.4 in particular discuss this delineation of the proposed activity.

4.3.1 Choice of the type of reactor and safety principles

The notification of intent is based on a tank-in-pool reactor and explains the principles on which this operates: copy this to the EIS. State what advantages this type of reactor has for the proposed activities. Describe in the EIS any other possible types of research reactors and fuels that could be used to carry out the proposed activities. State the considerations on the basis of which it was decided to use a tank-in-pool reactor and a particular type of fuel, and to what extent environmental effects played a role.

9 Insofar as the information requested in this section has already been provided in the EIS being drawn up to substantiate the revision of the zoning plan, it will suffice to refer to that EIS, given that the planning procedure will be completed sooner.

The notification of intent states that the reactor should have a maximum power of 55 MW, but that it could be substantially lower. The EIS should describe the possibilities of building lower-power reactors and their risks and environmental effects. State the considerations on the basis of which the power will ultimately be decided.

The notification of intent briefly discusses the safety principles to be applied and states that they will be developed in the EIS. Outline the principles by which safety is guaranteed in normal operation and in the event of accidents so that they can be understood by the general public, including both the technical systems elements and the organizational elements. For details refer to the Safety Report where necessary. If reference is made to confidential documents to substantiate the safety principles, state what documents these are and who can access them.

4.3.2 Radionuclide production chains

Fuel cycle
The proposed activity does not include fuel enrichment and geological disposal of waste. These activities will be carried out by other organizations, and separate applications for licences for them have been or are being submitted. These activities are inextricably bound up with the proposed activity, however, so the EIS should make it clear how and where these activities are to take place and where the detailed environmental effects have been or will be described. Also discuss the options for the geological disposal of radioactive waste and the possibility of upgrading and recycling spent fuel and targets at a later stage. What options are currently envisaged, how feasible are they, and what steps are being taken by whom in this connection?

Discuss the transport flows required and the nature of the materials transported, the means of transport, frequencies, amounts and risks. State what safety measures are to be taken. Identify the routes, insofar as they are known and in the public domain. Discuss the organizations responsible and the responsibilities during transport.

Medical isotopes
The notification of intent already discusses the production of medical isotopes: develop this in the EIS. State for what type of companies they are to be produced, what targets will be used, what waste will be generated and what arrangements there are for processing and storing it.

Discuss the destination(s)/use(s) of the medical isotopes and state what subsequent operations are needed for them to reach their final destinations and where these subsequent operations, if any, will take place. Make it clear in the EIS how and where these activities are regulated Discuss transport in this production chain, both within and outside the site of the Petten Research Facility. State what safety measures are to be taken. Discuss the means of transport and frequencies, the organizations responsible and the responsibilities during transport, and any other operations required.

Industrial isotopes and nuclear technology research
The notification of intent only briefly discusses the other purposes for which the reactor is to be used, i.e. the production of industrial isotopes and nuclear technology research. Develop this in the EIS. State for what type of companies the nuclear technology research will be carried out and what type of research is

involved. State for what type of companies industrial isotopes are to be produced, what they are, what waste will be generated and what arrangements there are for processing and storing it.

Discuss the destination(s)/use(s) of these isotopes. State what if any subsequent operations are needed for them to reach their final destinations and where these subsequent operations will take place. Make it clear in the EIS how and where these activities are regulated. Discuss transport in this production chain (means of transport and frequency), both within and outside the site of the Petten Research Facility. State what safety measures are to be taken. Discuss the organizations responsible and the responsibilities during transport, and any other operations required.

4.3.3 Construction

Describe the construction work and the phasing and duration of the construction phase, including any pile-driving, excavation and drainage work.

4.3.4 Decommissioning

Although the decommissioning of the reactor is not directly part of the proposed activity it is bound up with it, so discuss decommissioning and the expected effects. The description may be an outline, as application will be made for a separate decommissioning licence in due course. Discuss the composition and amount of waste that will be released and measures that can be taken now to reduce the amount of waste produced on decommissioning, for example the use of low-activation materials. State how the waste will be dealt with. Discuss the shutdown and decommissioning timetable as currently foreseen.

4.4 Alternatives/variants

4.4.1 Variants: cooling

The 2009 notification of intent still referred to cooling systems based on air cooling, with or without surface water cooling. Outline the environmental (and other) considerations on the basis of which it was decided to use water cooling.

Identify the possible cooling water intake and outlet locations for both a 'freshwater-saltwater' and a 'saltwater-saltwater' cooling system. Give reasons for the location finally selected and show it precisely on a map. Describe:

- how the system is to be constructed
- the inlet construction, the inflow rate (m^3/s), the inflow speed and the inlet depth (insofar as is relevant at extreme high and low tides)
- the outlet construction (width, height and depth), the flow rate, the outflow speed and the hot-water plume
- the intersection in the primary flood defence for the discharge of cooling water and, if sea water cooling is adopted, the cooling water supply
- the chemical and/or thermal cleaning systems and other measures to prevent the inlet and the cooling system becoming blocked, silted up or clogged with growth and corrosion of the system (important if sea water is used)
- the measures to be taken to prevent fish and other organisms being drawn in (a sieve configuration with a fish return system, light-based and acoustic fish deflection)
- how the design of the cooling water capacity/facilities takes into account the effects of climate change (lower freshwater levels and higher cooling water temperature and the associated security of supply of fresh cooling water).

4.4.2 Variants: building height/depth

The notification of intent rightly points out that the height of the reactor will affect visibility from the surrounding dune and polder landscape, but the positioning of the reactor building in relation to ground level would appear to have been decided already.[10] It is important that various ways of lowering the position of the reactor should be compared in the EIS as fully-fledged variants, given the major effect that building depth can have on e.g. noise nuisance, soil, groundwater flows, primary flood defences and flora and fauna in the construction phase and the risks of leaks in the operational phase. The building height will also determine the effects of the reactor building on the landscape.[11]

4.5 Baseline situation

Describe the current state of the environment in the area under consideration[12] and its expected state as a result of 'organic development'. A description of both situations is needed to place the expected environmental effects of the proposed activity in perspective. 'Organic development' is defined as the state of the environment in 2025 if a new reactor is not built. Organic development provides the point of reference for comparing the environmental effects of the proposed activity and the variants. Base the description of organic development on the current activities in the area under consideration and new activities upon which decisions have already been made.[13]

No decision has yet been taken on the closure of the HFR, so this cannot officially form part of organic development. The notification of intent adopts this principle, stating that the HFR will remain in use as long as this is technically and economically justified. The new reactor is to be built because of the uncertain economic lifespan of the HFR, however, so we recommend assuming that the HFR will close at some point and regarding this as organic development. Also, both the HFR's closure date and the date on which the new reactor will be commissioned are uncertain, so we recommend developing scenarios:

- Scenario 1: the HFR remains operational for some time after the building of the new reactor is completed, or closes soon afterwards. In the construction and initial operating phases the cumulative effects of the two reactors must then be compared with a situation in which the HFR is no longer present. This relates particularly to the cumulative demand for and effects of cooling water, the effects on the landscape, the cumulative accident risks and the cumulative radiation doses due to normal emissions.
- Scenario 2: the HFR does not remain operational for long and has been shut down once building work starts on the new reactor.

10 See section 3.2 of the notification of intent.

11 The importance of this alternative is stressed in e.g. the objections by the Hollands Noorderkwartier Water Board, which express concerns about the water (in particular groundwater) situation and the positioning of the reactor between two flood defences, and various objections, e.g. by the Village Council and Natuurmonumenten (the Dutch nature conservation organisation), which directly link the reactor's visibility to the economic prospects for recreation in the region.

12 The area where effects of the proposed activity could also occur. The size of that area may differ for each environmental aspect.

13 The objection by Petten Village Council mentions various trends not mentioned in the notification of intent. The status of these trends needs to be indicated before it can be decided whether they form part of organic development.

5 Current environmental situation and environmental effects

5.1 General aspects

Observe the following general guidelines when describing the environmental effects:

- Describe the effects in the construction phase and the operating phase, also in the transition phase while the HFR is gradually being shut down.
- Describe the cumulative effects including those of other sources. In the phase in which both reactors are – at least partly – operational, allowance must be made e.g. for the HFR's contribution to the extraction and discharge of cooling water, radionuclides, and the radiation level at the site boundary.
- Make it clear how the environmental effects have been determined by including the base data in appendices or by referring explicitly to background material that has been consulted.
- Mention any uncertainties and inaccuracies in the forecasting methods and the data used and how these affect differentiation between the variants.
- Describe any effects on other countries, both in normal operation and in the event of accidents with and without core melt.

Chapter 5 of the notification of intent sets out the environmental aspects to be examined in general terms. We now discuss some aspects in more detail.

5.2 Safety

Describe in the EIS the risks and effects of:

- accidents involving the hazardous substances present;
- radiological emissions in normal and special operating conditions;[14, 15]
- external hazards such as aircraft impact or flooding,[16] and the effects on radiation safety and security of supply;
- other incidents involving radioactive material, for example waste being stored temporarily.

5.3 Waste

Give an overview of the various types of radioactive and hazardous waste produced, differentiating between waste generated in the production of medical isotopes, in the production of industrial isotopes and in technology research. For each type indicate the amount, the composition, the method of processing and storage, and the associated radiological risks. In line with section 5.4 of the notification of intent, discuss how certain it is that sufficient capacity for processing and storing radioactive waste will be available in time.

5.4 Soil and water

Section 5.7 of the notification of intent states how waste water and cooling water are to be dealt with. Develop these points in the EIS. Consider the requirements of, and verification of compliance with, the Water Framework Directive, as developed in the Water Quality Requirements and Monitoring Decree 2009. Make it clear that the waste water will be dealt with in accordance with the Water Act,

14 On this subject see also the objection by the North Holland North Security Region and Hollands Noorden Municipal Health Service.

15 Postulated anticipated unusual operational occurances and postulated events involving single or multiple failure are set out in the ANVS Guide to the Safe Design and Safe Operation of Nuclear Reactors.

16 Describe in the EIS the risk of flooding, including the measures needed to prevent undesirable scenarios if flooding occurs. Include the effects of climate change (rise in sea level, more extreme weather).

including the possible presence of radioactivity in the waste water, as included in the notification of intent.

Describe the cooling water temperature around the discharge point and how quickly it will go down (as the cooling water disperses). Make it clear how much cooling water will be needed for the new reactor and the two reactors combined, and where this cooling water can be obtained.[17]

The presence of soil contamination, any cleanup required and the effects of excavation work on groundwater flows and on the stability of the flood defences and the soil must be set out in the EIS, as stated in the notification of intent.

5.5 Flora and fauna

The plan area is adjacent to the North Sea Coast and Zwanenwater & Pettemer Dunes Natura 2000 sites, which are protected under the Nature Conservation Act. Show the areas on a map. In the construction, transition and operating phases the proposed activity may have effects on natural assets in the surrounding area. Various things could occur during the construction phase, including desiccation when excavating the pit for the foundations, disturbance due to underwater noise when pile-driving[18] and clouding when constructing the cooling water inlet and outlet. In the operating phase effects are expected particularly from fish and larvae being drawn in with the cooling water and the discharge of hot cooling water.

If it cannot be ruled out that the proposed activity – on its own or in combination with other plans or projects – may have significant effects on one or more Natura 2000 sites, an Appropriate Assessment must be drawn up.[19] Under the legislation the project can only go ahead if it is established with certainty that the natural characteristics of nearby Natura 2000 sites will not be affected, or the 'ADC' test[20] is passed.

Construction phase

Describe the possible effects of the construction work, including at least:

- underwater noise, light and vibration.
- the effects of the construction of the cooling water inlet and outlet, including clouding. State the precise extent to which work is involved on the Natura 2000 sites.
- the effects on groundwater flows and seepage and their consequences for flora and fauna.
- NO_x deposition on the Natura 2000 sites. Use the AERIUS software for this purpose and check the results with the PAS (integrated approach to nitrogen) limits to determine whether adverse effects on natural characteristics can be ruled out.

Transition and operating phases

17 Adequate availability of cooling water is a point that is also mentioned in the objections, e.g. those by the Hollands Noorderkwartier Water Board. They point out that there could be conflict between the water needs of the various land uses in the area, particularly in periods of drought.

18 Pile driving in or near water (i.e. also on land) produces low-frequency impulses at high noise levels, which can cause serious physiological damage to fish and marine mammals.

19 We recommend including these in the EIS.

20 Under Sections 19g and 19h of the Nature Conservation Act 1998 these are: A: are there Alternative solutions to a project or activity (including alternative sites)? D: are there compelling (D=Dwingend) reasons in the public interest for the project to be implemented nevertheless? C: what Compensatory measures are to be taken to guarantee that the general coherence of Natura 2000 sites is preserved?

Describe the effects of the reactor when in operation on the surrounding vulnerable/protected flora and fauna, including at least:

- fish (including juvenile fish and larvae) and other organisms being drawn in with the cooling water, and any effects on the entire food chain
- chemical and/or thermal cleaning of the cooling water system and the effects on underwater life and, if relevant, the rest of the food chain (e.g. chloroform ingestion by fish if chlorination is used)
- the individual and cumulative effects of heat discharge on the aquatic environment.

Effects on protected sites and species

For the proposed activity describe the individual and cumulative effects on the conservation targets for the North Sea Coast and Zwanenwater & Pettemer Dunes Natura 2000 sites, particularly including indirect effects (on the food chain) and using worst case scenarios where there are knowledge gaps. Describe any effects on the essential characteristics and assets of the surrounding Ecological Main Structure sites[21] and expected changes in the populations of protected and/or red list species in the area under consideration as a result of the proposed activity.[22]

5.6 The environment

5.6.1 Ionising radiation

Identify the radiation level at the site boundary and the emissions of radiological substances into the air in normal operation and in the event of accidents with and without core melt, as stated in the notification of intent. Show immission contours if appropriate. State what mitigating measures are possible and what effects they would have on emissions of radiological substances.

5.6.2 Noise

Show the noise contours during the construction work and the use phase on a map. Also show the underwater noise produced during the construction phase. State what effect mitigating measures would have.

5.7 Landscape and cultural history

Additionally to section 5.13 of the notification of intent we recommend identifying the effects on the landscape assets of the Zwanenwater site.

21 Under the Ecological Main Structure rules it is only necessary to check for things that interfere with that structure, but environmental effects on it through external mechanisms should be identified in the EIS.

22 This analysis can be confined to protected species (Table 2, Table 3 and birds in line with the 'exemption order' (administrative order under Section 75 of the Flora and Fauna Act) and any other relevant species, e.g. red list species. We recommend including the information needed to apply for an exemption if necessary. Give reasons why you assume that an exemption will be granted. Allow for the fact that an exemption cannot in principle be granted for disturbance to nesting birds.

6 Other aspects

6.1 Socio-economic effects

The building of the reactor could have substantial effects on social and economic conditions in the region around it. Give an overview in the EIS of the socio-economic effects of the proposed activity at local, regional and provincial level that can be expected, including at least:

- population distribution and density.
- the expected numbers of temporary construction personnel and reactor workers and the associated temporary or permanent (or in any event long-term) housing and general amenities.
- the local economy and labour market: effects on local economic activity and employment. Also consider the effects on culture, tourism and recreation.
- utilization of the local infrastructure.

In the description differentiate between the current situation, the construction phase, the transition phase and the operating phase. Describe the expected direct environmental effects such as possible nuisance due to increased noise, air pollution, waste etc. and the possible effects on health. This relates particularly to the expected environmental effects due to the socio-economic aspects set out above: these are additional to the environmental effects due to the construction, transition and operating phases (as set out in Chapter 5 of this Recommendation).

Also describe the possible measures to minimize the expected negative effects and nuisance.

6.2 Gaps in the environmental information

When describing the baseline situation and assessing the environmental effects, indicate explicitly on which environmental aspects no information, or only inadequate information, can be included because of lack of data. Describe the extent of the uncertainties which remain as a result, the reason, and to what extent this affects impact assessment. Indicate in the EIS what relevance and possible consequences the knowledge gaps and uncertainties have for the decision. Indicate to what extent the information could be available in the short term and what this would require.

6.3 Monitoring and evaluation programme

Discuss the monitoring of the cooling systems, of transports of materials (ingoing and outgoing) and of persons. Describe the monitoring programme to safeguard environmental quality. Set out how the control of safety is guaranteed to remain optimal in the future ('continuous improvement of nuclear safety'): e.g. such things as staff education and training, internal and external audits, regular safety evaluations, the evaluation of incidents (at the facility and elsewhere) and the international partnerships in this area.

In the EIS also make a start on monitoring programme for the underwater noise produced during the construction phase. Describe the measuring methodology that is expected to be used.

The competent authority will state with its decision how and when an evaluation is to be carried out to compare the forecast effects with the actual effects and to take additional measures if necessary. We recommend that the EIS should make a

start on this, relating it to the information gaps and uncertainties that have been found.

6.4 Form, presentation and summary of the EIS

We recommend formulating the EIS in such a way as to be comprehensible and accessible to the general public. It may therefore be necessary to confine the main text of the EIS to outlines and to provide more detailed information in appendices.

Classified information

It may be that some parts of the EIS can only be substantiated by classified documents, e.g. because they contain sensitive information on terrorism. Section 19.3 of the Environmental Management Act and Section 10 of the Government Information (Public Access) Act permit the non-disclosure of such information at the request of the initiator, subject to the decision of the competent authority. The Netherlands Commission for Environmental Assessment will be informed of the decision.

Summary

Decision-makers and objectors will read the summary of the EIS first, so this part requires careful consideration. The summary must be readable as a self-contained document and accurately reflect the content of the EIS.

7 Signatures

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