



TECHNICAL DOCUMENT

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**GKN Dodewaard
Decommissioning Cost Estimate 2016**

**Task: Deferred Scenario
Starting date of decommissioning: 2045
Clearance levels: KEW**



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Executive Summary

The objective of the present study is to provide a new cost estimate for the complete dismantling of the “Kernenergiecentrale Dodewaard” (KCD) after Safe Enclosure (SE) called “KCD new Decommissioning Cost Estimate”.

The KCD new Decommissioning Cost Estimate is evaluated in the frame of a “**Deferred Decommissioning Scenario**”. Under this scenario, it is assumed that the actual KCD dismantling works start in **2045**. Licensing and preparation start about 4 years earlier.

One task is evaluated using best estimate assumptions, including clearance levels as defined in the Dutch “Kernenergiwet” /3/.

The new cost estimate is performed in a frame of a Preliminary Decommissioning Plan (PDP). The sections of the present study represent a table of content for this PDP as given in Appendix 1 of the Technical Requisition File (TRF) /6/. The level of detail provides a full understanding how the decommissioning costs are obtained and shows that they are in compliance with Dutch Laws and context specifications taking into account all KCD conditions.

The present study is prepared by Siempelkamp NIS Ingenieurgesellschaft mbH (NIS). For almost 35 years now NIS has been involved in nuclear decommissioning projects and has analysed them from a technical and an economical point of view. These experiences have steadily been included in the NIS calculation programme CORA & CALCOM to assure an up-to-date cost calculation with regard to modern techniques /7/.

The main assumptions made in the present study are:

- Non-radioactive concrete rubble is to be reused or sent to landfill.
- Only dismantling costs (incl. licensing and preparation) are estimated. Operational costs for Safe Enclosure (SE) are not included. Based on present expenses the yearly costs for SE period are 1,3 M€ per year.
- Costs related to Authorities are included with 45.000 € per year. Additionally 450.000 € are considered for the license. This includes a fee for the license (200.000 €) and for the technical support to the regulator (250.000 €).
- The staff wages are based on relevant wages of Dutch companies.
- The goal of the decontamination and dismantling activities is to reach “Green field”. The dismantling includes the removal of the buildings, of all the various underground structures, including among others the foundation piles, the cooling water inlet structures, and bringing the soil of the site at the same level as the surroundings.
- An updated status of KCD (using the most recent physical and radiological data inventories stored in Dodewaard Information System - DIS) has been taken into account.
- All materials in the controlled area are supposed as being radioactive, unless measurements indicate that the contamination is below the clearance levels.
- The radiation exposure is kept ALARA. In any case, the radiation exposure per person is limited to 20 mSv per year. This is the current Dutch dose limit for workers occupationally exposed to radiation.

- The COVRA waste management costs given in the Appendix 6 of the TRF /6/ apply. The costs for “Transport, Interim Storage at COVRA, and Disposal” for KONRAD Type II containers are based on an E-Mail from COVRA dated 31. Aug. 2015 /9/.
- Both absolute and net present value costs are estimated; the discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk) is 4 % above inflation. This figure serves as a standard indexing number, as it was chosen in the past. Therefore, it is used in the present study as well, in order to make a comparison between studies possible.
- The reference date for the price level of the cost estimate is taken as 01.01.2015. VAT is not included in the costs.

The results of the new Decommissioning Cost Estimate KCD are as follows. The first table gives an overview of the produced amount of radioactive waste, the necessary packages, the waste storage volume as well as the costs for transport, interim storage at COVRA and final disposal.

Free Release Levels taken from	Packed Mass [Mg]	Number of Disposal Containers [-]	Disposal Containers Costs [M€]	Storage Volume [m³]	Costs for Transport, Interim Storage, Disposal [M€]
KEW NL	1.166,4	2.422	4,4	1.193,8	28,8

The second table shows as the results of the cost estimate the absolute value and the net present value taken into account an interest rate of 4% above inflation.

Free Release Levels taken from	Costs	
	Absolute Value [M€]	Net Present Value (4% above inflation) [M€]
KEW NL	160,5	42,4

It should be noted that it is rather difficult to anticipate and evaluate the uncertainties on the decommissioning costs resulting from some forty years' time-scale period (between now and the end of the decommissioning).

The overall duration of the project (starting with planning and ending with “Green field” conditions) takes about 14 years.

More detailed results can be found in the following sections of the study or on the CD (delivered in the frame of the present study).