

Decision document: Sellafield Ltd and Sellafield site

Environmental permitting: radioactive substances activities

February 2020

Executive summary

The Sellafield site occupies an area of approximately 4 square kilometres on the west coast of Cumbria. Activities that currently take place on the site include reprocessing spent Magnox nuclear fuel, storing spent nuclear fuel and nuclear materials, processing liquid waste, retrieving, processing and storing solid waste, decommissioning (including cleaning out nuclear reactors and redundant facilities after operations have ended), and research and development.

Sellafield Ltd has reprocessed spent nuclear fuel in its Thermal Oxide Reprocessing Plant (THORP) and its Magnox reprocessing plant for many years. Fuel reprocessing at THORP ended in November 2018 and Magnox reprocessing is expected to end in 2020. This will result in a significant reduction in radioactive waste discharges into the environment. Sellafield Ltd's future mission will focus on decommissioning and environmental clean-up (remediation) of the Sellafield site. This will include cleaning up high hazard legacy facilities through a programme of high hazard and risk reduction activities. The aim of this radioactive substances activity environmental permit change (variation) is to make sure that this work can continue while, at the same time, protecting people and the environment.

The existing permit for the Sellafield site contains limits on the total amount of radioactive waste that Sellafield Ltd is allowed to discharge into the environment to ensure that any radiation exposure of people that results is small and well below statutory limits. It also includes annual limits on discharges from individual plants and quarterly notification levels, both of which provide measures for controlling discharges. This structure of limits and notification levels was first implemented around 20 years ago and reflects the guidance, legislation and operations at the site at that time. The permit also requires Sellafield Ltd to use best available techniques (BAT) to minimise radioactive waste disposals (including discharges) and their impact on people and the environment.

In October 2018, Sellafield Ltd applied for a number of changes to the permit, mainly to reflect the change in its operations and the discharges following the application of BAT. The application included a 2-phase approach of reducing site permit limits for discharging radioactive waste and replacing annual plant limits with annual plant notification levels. Phase 1 of the site limit reductions was intended to be introduced after THORP had closed, but before Magnox reprocessing had ended. Phase 2 was to be implemented when Magnox reprocessing ended. The application proposed a 2-tier (upper and lower) limit structure in phase 2 and significant reductions in discharge limits. We advertised the application and consulted on it between 26 October and 21 December 2018. We considered the consultation responses when assessing Sellafield Ltd's application to change (vary) its permit.

Sellafield Ltd has amended the proposal for site limits in its application since our consultation on the application. This is mainly because we asked it to provide further information on how it had derived the proposed site limits. This related to consistency with other published information, changes in the sources of discharges, and the margin Sellafield Ltd requested between estimated discharges and limits (headroom). In response, Sellafield Ltd amended its application to a single change in site limits rather than a 2-phase change. This offered further significant reductions in discharge limits compared with the original application and would retain a 2-tier structure. Sellafield Ltd proposed that the new limits would come into effect from the date of the permit change and so before the end of Magnox reprocessing operations. These developments became possible due to

THORP closing in November 2018, the progress being made towards Magnox reprocessing ending, and by assessing predicted future discharges further.

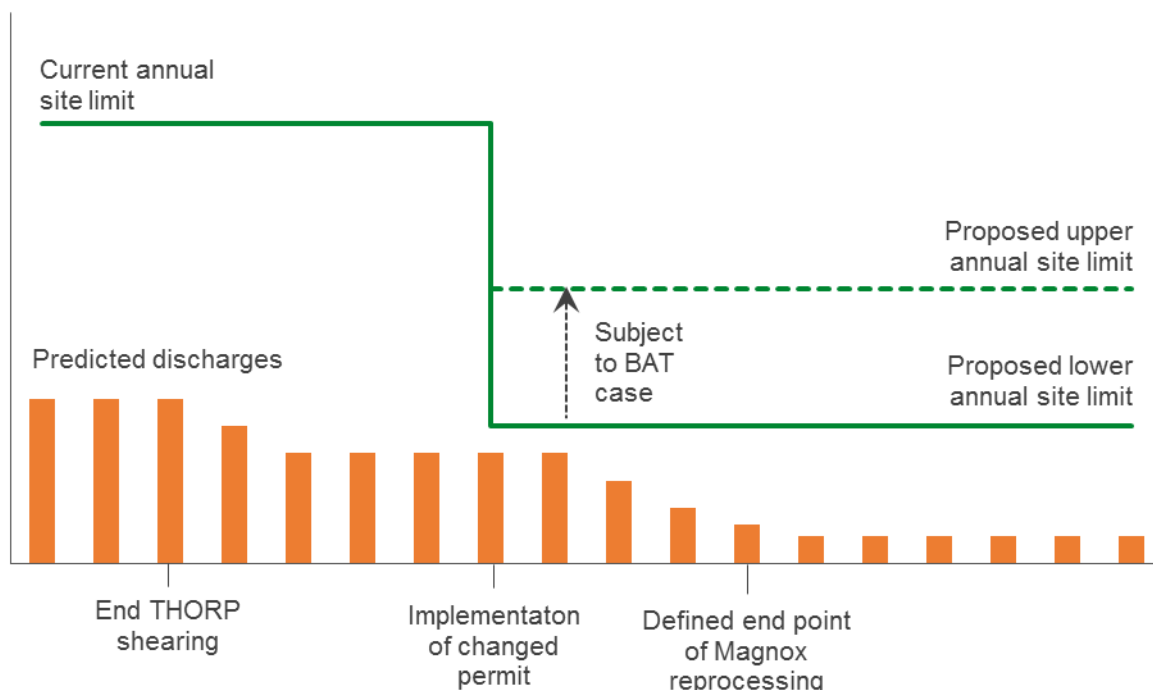
This decision document details how we assessed the application and the decisions we made on the following main changes:

- Significantly reducing site discharge limits and introducing a 2-tier (upper and lower) site discharge limit structure
- Removing some site discharge limits where discharges have fallen below significant levels and they do not meet our criteria for setting limits
- Replacing plant discharge limits with plant notification levels so that Sellafield Ltd can make most effective use of the available discharge routes and treatment plants
- Removing discharge limits related to the rate of fuel reprocessing (throughput) to reflect the end of reprocessing operations

The decision document also considers Sellafield Ltd's arrangements for using best available techniques to prevent or minimise discharges of radioactive waste, identifying improvements and requests for more information, as necessary.

In assessing the permit change request, we have taken into account relevant statutory requirements, and government guidance and policy. All of the relevant proposed aqueous limits (tritium, technetium-99, total alpha and total beta) are broadly consistent with the 2020 expected outcomes in the UK Strategy for radioactive discharges, taking into account that headroom is required between expected discharges and limits.

We have decided to change (vary) the permit to include the upper and lower site discharge limits at the values in Sellafield Ltd's revised proposal. We have also agreed to remove site discharge limits where discharges have fallen below significant levels and do not meet our criteria for setting a limit. All remaining site limits are significantly reduced, apart from 3 upper tier limits. Around half of the upper tier limits will come into effect when the permit change (variation) is issued and last until the relevant important milestone has been achieved. This will be either the end of Magnox reprocessing or the commissioning of the retrievals ventilation system incorporating high efficiency particulate air (HEPA) filtration in the Magnox Swarf Storage Silos (MSSS) ventilation stack. Once the lower site limit is in force, the upper site limit will only apply where we have agreed that Sellafield Ltd has submitted an acceptable BAT case to move to the upper limit for a certain time so that it can complete certain tasks. The upper and lower site limits and requirement for BAT cases is illustrated below:



The table below sets out the revised site limits at both upper and lower tier values and compares them with the existing limits. It also shows which limits we are removing and whether the upper or lower tier limit will be in force when the permit becomes effective.

We have decided that quarterly notification levels (QNLs) will be set at 25% of the site limit in force (upper or lower tier). These mean that Sellafield Ltd has to inform us if the trend in site discharges indicate it is likely that they could exceed an annual limit. We would then scrutinise operations more closely.

We have decided to replace annual plant limits with annual plant notification levels (APNL), and to remove fuel throughput limits as these related to rates of reprocessing activities that are no longer possible. The vast majority of APNL are set at much lower levels than the previous plant limits apart from in a few cases where they are set at the same level as the existing limit. The levels are generally based on the current monthly trigger levels that Sellafield Ltd uses to monitor plant discharge performance and so reflect its use of best available techniques to minimise discharges of radioactive waste. Sellafield Ltd must notify us if an APNL is exceeded. This will prompt us to examine closely if it is applying BAT at individual plants. Sellafield Ltd would not be in breach of its permit if it exceeded either a QNL or APNL, but it would have to notify us about the circumstances leading to the levels being exceeded, and why it believes that it has continued to use BAT.

We have also decided to ask Sellafield Ltd to submit a quarterly report that shows any internal monthly triggers that have been exceeded. Again, this can lead us to question whether BAT is being applied at individual plants before the APNL is exceeded.

Overall, we believe that this new structure of limits and controls (site upper and lower limits, QNLs and APNLs, and monthly triggers) provides a high level control of discharges by the operator and regulator while also allowing the flexibility to achieve the Sellafield mission. The revised structure of limits and controls also meets with our limit setting guidance and so reflects the current approach to regulating radioactive waste disposals.

In its application, Sellafield Ltd proposed a specific limit 12,000 Bq/g for tritium contaminated waste disposals to the CLESA landfill. This limit would allow greater flexibility in the disposal of waste containing tritium at CLESA and would allow decommissioning to progress more quickly. We have determined that we could include this limit in Sellafield Ltd's permit whilst ensuring that people and the environment are protected. We plan to implement the changes by way of a separate variation to the permit following confirmation from Department for Business Energy and Industrial Strategy (BEIS) that there are no implications from this proposal under Article 37 of the Euratom treaty, which concerns the assessment of trans-boundary impacts to other EU Member States from disposals of radioactive waste to the environment. The UK left the EU on 31 January 2020 but there is a transition period until 31 December 2020. Throughout the transition period, the UK will continue to comply with all the requirements of EU law, include Euratom Article 37. No confirmation has been received from BEIS either way yet; so this change has not been implemented in this variation.

Overall, we are satisfied that, subject to a number of improvements and providing additional information, Sellafield Ltd has demonstrated that it has adequate arrangements in place to use BAT and to effectively manage radioactive waste with regard to meeting relevant statutory requirements and government guidance and policy. The requirements for improvements and information can be found in the permit and its associated Compilation of Environment Agency Requirements, Approvals and Specifications (CEAR) document. The conditions of the permit are legally binding on Sellafield Ltd. The CEAR is used to specify the detailed requirements of the permit conditions so that they are fully complied with. We are not consulting on the CEAR because it contains matters of detail.. We refer to the CEAR in the decision document where we think this is helpful and have highlighted key proposed changes to it in appendix 5. We will work closely with Sellafield Ltd to ensure that the CEAR is fully implemented. A copy of the revised CEAR will be placed on the Public Register. Key improvements in the permit and the CEAR include:

- developing and maintaining a waste management plan (WMP) and a site wide environmental safety case (SWESC)
- progress reports relating to improvements in Sellafield Ltd's asset management arrangements generally and, in particular, managing ventilation ducting

- an assessment of future aqueous discharges of cobalt-60 from legacy waste
- maintaining and reviewing the CLESA closure and aftercare management plan
- progress reports on higher activity waste (HAW) records restoration work
- some changes to, remove and consolidate existing requirements relating to approved gaseous waste discharge outlets, discharge and waste reporting, discharge check monitoring and providing other information.

We have also updated the permit to reflect wider developments in our regulation of nuclear sites along with some changes to implement the Basic Safety Standards Directive 2013/59/Euratom and other minor updates.

We are satisfied that the radiation doses to the public and dose rates to non-human species (wildlife) associated with permitted discharges from the Sellafield site will be well below the UK national dose limit of 1,000 microsieverts per year ($\mu\text{Sv}/\text{y}$), the source ($300\mu\text{Sv}/\text{y}$) and site ($500\mu\text{Sv}/\text{y}$) dose constraints and below the guideline level for non-human species of 40microgray per hour. We have assessed the total doses to a representative (most exposed) person as 108 and $59\mu\text{Sv}/\text{y}$ for discharges of radioactive waste at the upper and lower site limits respectively. Both values are considerably lower than the total dose at the existing permit site limits of $203\mu\text{Sv}/\text{y}$.

We have previously advertised the application and consulted on it (26 October to 21 December 2018). We have also consulted on a draft decision and draft permit (7 October to 1 December 2019). We have assessed the application, considered the responses we received and have made a decision to grant the application subject to the conditions in the varied permit that accompanies this document.

We believe that our decision and permit conditions are consistent with the relevant legislation, guidance on the regulation of radioactive discharges into the environment, and relevant government policy. We have also considered relevant wider social-economic duties, including contributing to sustainable development. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Table: Existing and revised site limits - note the limit to be in force when the permit change (variation) becomes effective is shown in bold.

All quantities are given in scientific notation, for example 3.0E+06, which means 3000000.

Radionuclide or radionuclide group	Current (MBq)	New upper & lower (MBq)	% of current limit	Current (GBq)	New upper & lower (GBq)	% of current limit
	Gaseous discharges: Site limits			Aqueous discharges: Site limits		
H-3	1.1E+09	3.7E+08(1) 1.7E+08	34 15	1.8E+07	3.0E+06(1) 7.0E+05	17 4
C-14	3.3E+06	2.3E+06(1) 3.8E+05	70 12	2.1E+04	1.3E+04(1) 5.1E+03	62 24
Co-60	-	-	-	3.6E+03	3.6E+03 2.5E+03	100 69
Kr-85	4.4E+11	7.0E+10(2)	16	-	-	-
Sr-90	7.1E+02	5.0E+02(3) 7.4E+01	70 10	4.5E+04	3.2E+04 1.4E+04	71 31
Zr-95/Nb-95	-	-	-	2.8E+03	Removed	-
Tc-99	-	-	-	1.0E+04	7.5E+03(1) 4.5E+03	75 45
Ru-106	2.3E+04	1.8E+04 2.8E+03	78 12	5.1E+04	1.0E+04 3.1E+03	20 6
Sb-125	3.0E+04	3.0E+04(2)	100	-	-	-
I-129	7.0E+04	4.2E+04(1) 1.3E+04	60 19	2.0E+03	8.0E+02 3.2E+02	40 16
I-131	3.7E+04	Removed	-	-	-	-
Cs-134	-	-	-	1.6E+03	Removed	-
Cs-137	5.8E+03	4.8E+03(3) 4.1E+02	83 7	3.4E+04	2.4E+04 1.7E+04	71 50
Ce-144	-	-	-	4.0E+03	Removed	-
Np-237	-	-	-	7.3E+02	Removed	-
Pu-alpha	1.9E+02	1.3E+02(3) 7.2E+01	68 38	7.0E+02	5.0E+02 2.9E+02	71 41
Pu-241	3.0E+03	Removed	-	2.5E+04	1.8E+04 6.0E+03	72 24
Am-241	-	-	-	3.0E+02	2.2E+02 1.4E+02	73 47
Am-241 + Cm-242	1.2E+02	8.4E+01(3) 5.0E+01	70 42	-	-	-
Cm-243+Cm-244	-	-	-	5.0E+01	Removed	-
Alpha	8.8E+02	6.6E+02(3) 3.2E+02	75 36	9.0E+02	6.0E+02 3.4E+02	67 38
Beta	4.2E+04	3.2E+04(3) 5.1E+03	76 12	1.8E+05	1.2E+05 6.3E+04	67 35
Uranium	-	-	-	2000kg (70GBq)	7.0E+01 2.0E+01	100 29

(1) Will move to lower limit after the end of Magnox reprocessing, by written agreement in the CEAR

(2) Limit removed after the end of Magnox reprocessing, as notified by Sellafield Ltd

(3) Will move to lower limit when MSSS HEPA filters have been installed and commissioned, by written agreement in the CEAR