Environment Agency

Permitting decisions

Bespoke permit

We have decided to grant the "Installations" permit for Capenhurst Tails Management Facility operated by Urenco ChemPlants Limited. Note that Urenco ChemPlants Limited holds separate permits for "Radioactive Substances Activities"; this document relates only to the "Installations" permit.

The permit number is ZP3835TX.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements, including the desirability of promoting economic growth, and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account

Unless the decision document specifies otherwise, we have accepted the applicant's proposals in the documentation supporting the permit application. The permitting decisions document should be read in conjunction with the environmental permit and the introductory note summarising what the permit covers.

Key issues of the decision

Urenco Chemplants Ltd are the operators of the Tails Management Facility, a new plant currently undergoing commissioning. The plant is being commissioned to enable the deconversion of uranium hexafluoride tails to stable uranium oxide (U_3O_8). The tails are a by-product of the uranium enrichment process and the resulting deconverted uranium oxide can be reused in the enrichment process. This process is considered to be the Best Available Technique (BAT) option for the management of the tails as it is established technology, which has been used in France for over 25 years, enabling the reuse of the uranium oxide.

The operator has provided a technical description of the operating techniques associated with the plant and the various facilities supporting the deconversion plant. The operator has demonstrated where BAT has been used and we have considered this against relevant sector guidance in our decision making process:

- Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals - Ammonia, Acids and Fertilisers, August 2007; and
- How to comply with your environmental permit: Additional guidance for The Inorganic Chemicals Sector (EPR 4.03).

The operating techniques, for each part of the TMF operations, will be discussed below in relation to BAT for the prevention, re-use and minimisation of liquid, gases and solid wastes which can be discharged to the environment and raw material usage. Emissions and monitoring will be discussed in more detail in separate sections.

Operations:

Tails Deconversion Plant:

The first stage of this process is vapourisation to enable uranium hexafluoride to be continuously fed into the kilns in a gaseous form. The cylinders are heated in autoclaves which are steam fed. The system has been designed so the water is transferred to the residue recovery facility where it will be treated and reused back in the process optimising the use of water within the plant. The autoclaves have been designed to contain any leaks from the cylinders, therefore, minimising any fugitive emissions. Instrumentation is installed to detect any rises in temperature or pressure to ensure the autoclave is isolated and stops the heating.

Uranium hexafluoride (UF_6) residues, known as heels, remain in the cylinder at the end of the vapourisation process. The plant has been designed to enable the remaining heels to be removed from the nominally empty cylinder and transferred to the full cylinder waiting to go through the deconversion process. This has a number of advantages; it prevents the production of reduced quality hydrofluoric (HF) acid which cannot be reused; enables more UF_6 to be converted to U_3O_8; reduces the number of times the cylinder needs to be rewashed, therefore, minimising water use and reducing liquid discharges.

The deconversion process will produce stable U_3O_8 and hydrofluoric (HF) acid which is a saleable product. This is a dry process which occurs in a kiln in two stages. Gaseous UF_6 is reacted with steam to produce uranyl fluoride (UO_2F_2), a powder, and hydrogen fluoride gas. Pyrohydrolysis converts the UO_2F_2 to U_3O_8 and produces hydrogen fluoride and excess steam. The hydrogen fluoride gas is diluted with nitrogen and passed through coolers and a condenser to form HF acid. The HF acid and uncondensed gases are separated, liquids passing to the HF recovery tanks and gases are scrubbed with a weak HF solution and water. The scrubbing liquors are combined with the HF condensate to produce HF acid at the required concentration.

Radiological gaseous releases occur from maintenance activities and the area has a ventilation system installed which is connected to one of the extract systems where the emissions are filtered and discharged to atmosphere.

U_3O_8 Processing:

U_3O_8 is transferred to the powder packing unit where it is compacted to increase its bulk density and maximise the amount of product to be stored in the DV70 containers. Fugitive emissions from the powder filling system (the powder receipt hopper, the powder compacting feed hopper, the compactor, and the filling heads) are minimized by connections to the ventilation system.

HF Processing:

This process has two functions, transfer of HF acid to the HF storage area and abatement of HF discharges.

This process does not produce any liquid effluent. The gaseous effluent is treated by the HF area ventilation system (HFAVS).

Aqueous and gaseous HF is separated in HF processing. Hydro ejectors are used to extract the HF from the deconversion kilns whilst also providing process ventilation for the kilns. They also provide a scrubbing function by absorbing about 80% of the HF from the condenser. An abatement system treats the HF and any insoluble gases prior to discharge.

The processing washing column is fed with demineralised water to produce overflow HF acid which is transferred to the HF recovery tanks. This reduces the HF concentration to the required specification and reducing HF vapours going into the final product.

HF Storage:

HF acid is stored in tanks prior to being transferred to customers. The tanks are used for storage or blending. Blending is carried out to produce the correct HF product specification and therefore reduce the generation of HF waste.

The tanks are bunded to contain any leaks or spills and are designed to hold 25% of the total tank storage capacity. There are 9 tanks each with a capacity of 20 m^3. We asked the operator for further information to seek further clarification on the capacity of the bunds housing the HF storage tanks. The operator confirmed the bunds are sized as a minimum for 110% of the largest tank volume, 25% total tank volume, or largest credible overflow scenario volume, whichever is largest. Where bunds provide a safety function to contain liquor (e.g. HF bunds), the sizes will be justified in the engineering substantiation reports.

We were satisfied with the operator's response as it meets BAT for the storage and bunding of tanks.

The operations produce gaseous and aqueous effluents. Liquid effluents are produced from tank washing and the wash down of personal protective equipment (PPE). The effluent is collected in the effluent collection system tank and is transferred to one of two tanks for processing; either the HF contaminated buffer storage tank or the waste HF acid tank. Gaseous effluents from the HF acid tanks are transferred via the vent header to the HF processing scrubbers. The vent header is also used to prevent fugitive emissions from the road tankers during filling and the sampling cabinets.

HF detectors are also installed to detect releases of HF to atmosphere. In the event of a large HF release in the area the detectors will activate the dosing of the emergency scrubber with potassium hydroxide.

HF neutralisation is used to treat the liquid effluent contaminated with HF to either enable the water to be recycled within the process or as a minimum to comply with the discharge limits to Rivacre Brook. The water will be analysed prior to discharge to ensure it meets the relevant discharge limits. If the waste has the potential to contain radioactive contamination it is tested prior to being transferred into this process. The neutralisation process produces solid calcium fluoride which is disposed of to landfill.

Cylinder Wash Facility:

The UF_6 cylinders are washed to enable their reuse. There is the potential for fugitive emissions to be released from the cylinders so they are connected to the gaseous effluent ventilation system (GEVS). The process has been designed to minimise the generation of liquid effluents. The wash water is transferred to the residue recovery facility to recover any uranium in the wash waters. After being washed out the cylinders are leak tested and transferred to the cylinder handling facility for reuse.

Decontamination and maintenance facility:

Items of plant are decontaminated and maintained in this facility to enable them to be reused or disposed of appropriately following appropriate checks. Various decontamination techniques are used and all have been considered to ensure the amount of waste generated is minimised.

The Uranic decontamination maintenance facility uses both wet and dry processes. The majority of items enter the DMF via the dry dismantling area where up to 80% of the uranic contamination will be removed using a powder vacuum system thus minimising the need for wet and chemical decontamination. This approach minimises both raw material usage and waste generation.

Wet decontamination uses either water or chemicals to remove any radioactivity from the plant or equipment. High Pressure (HP) water jetting has been chosen for mechanical decontamination as it is an effective method and is used within the nuclear industry. Water jetting will also be compatible with uranium recovery in the RRF and will not give rise to secondary wastes that may be difficult to manage. Gases are extracted to the venturi scrubber. The scrubbed gases and liquids pass through a cyclone separator where the liquids and solids are separated from the gases and returned to the scrubber feed tank.

The industrial washer package is used to wash small equipment items. It is an automated system to minimise the volume of water used. The package uses water from the process water system for the washing and rinsing phases. The process water is filtered as well as the discharge water. The discharge water is sent to the Water Decontamination Sump Tank, to be recycled by the water jetting system.

Nitric Acid has been chosen for chemical decontamination which is widely used in the nuclear industry. Nitric acid will be used in the chemical decontamination baths and the rinse water bath will feed back into the acid baths. Recycling the water and reducing water use in this process. Nitric Acid used in the decontamination process can be reused downstream in the RRF, thus, helping to conserve raw materials used and minimise discharges. Phosphoric Acid is identified as an alternative to Nitric Acid, for carbon steel items which would be aggressively attacked by Nitric Acid.

The gases from all areas are extracted to the Con 3 ventilation system which is discussed further in the abatement section of this document.

Items contaminated with HF are decontaminated in the HF decontamination area. Effluents which are produced are returned to the HF neutralisation process. The gases are extracted by the HFAVS.

Residue Recovery Facility:

Aqueous effluents are treated in this facility to enable them to be reused or to minimise the radioactivity of the effluent prior to discharge. Uranium contaminated wastes are immobilised.

There are two processing areas:

1. Non irradiated uranium - uranium is solubilised from the waste streams and recovered. Residual liquors are treated to neutralise the waste, recover the water and reduce the volume of the waste prior to immobilisation for off-site disposal. The uranium is chemically treated to produce sodium diuranate (NaDu) to ensure the maximum amount of uranium is recovered.
2. Non radiologically contaminated residue recovery facility - Aqueous wastes that are not radiologically contaminated are treated in this facility. They are collected in the combined effluent receipt tank and fed to the reverse osmosis (RO) feed tank to be pH adjusted prior to transfer to the RO plant. The RO will separate the effluent into recyclable water and concentrated waste. The effluent is first passed through filters to remove any solids and carbon filters to remove traces of chlorine and organic compounds. It then passes through semi-permeable membranes to produce water (permeate) for reuse within the process. The operator has provided a process data sheet for the design specification of the RO plant which shows that the expected quality of the permeate should be approximately that of potable water. This will be transferred to the process water break tank for reuse in the process. If this tank is unavailable it will go to the treated water tanks. The water in the tank is monitored for conductivity. If the level is high the water will be analysed and if not acceptable for use in the process will be treated in the RRF. If the water stored in the treated water tanks cannot be reused in the process, because the process water break tank is full, it can be discharged to Rivacre Brook via Urenco Chemplants effluent treatment plant, if analysis shows this to be acceptable and within limits. The concentrated waste that is produced from the RO plant is an ion rich solution which will require analysis, prior to disposal off site, to ensure it meets the relevant acceptance criteria of the receiving site.

Abatement:

As discussed above there are various ventilation and abatement systems which minimise gaseous effluent discharges to the environment. These will be considered in more detail below:

The TMF has 8 discharge points which have been included in the permit as emission points. These serve the following facilities:

- Tails Deconversion Plant.
- Decontamination and Maintenance Facility.

- Residue Recovery Facility.
- Cylinder Wash Facility.
- Utilities.

The following abatement techniques proposed for each discharge point, in the application, have been reviewed in terms of BAT and in consideration with the relevant sector guidance. It must be noted that the ventilation systems are designed to minimise discharges to the environment for both radiological and non-radiological emissions. The discharges from the Con 3-4 extract systems are mainly associated with the radiological hazards but will be discussed for completeness.

Con 2 Extract System:

Provides the ventilation to areas considered to have a low radiological impact and therefore discharges are straight to atmosphere through louvres. It is worth noting that there are not expected to be any non-radiological hazards in the areas served by this system.

Con 3 Extract System:

Provides ventilation for processes and general ventilation in process areas. The area this serves is considered to have a medium radiological hazard. As there is more potential for airborne contaminants the air is passed through high efficiency particulate air (HEPA) filters, an established technique for removing particulates from the air prior to discharge. Instrumentation is installed to enable samples and flows to be measured. The air is discharged via a dedicated stack.

Con 4 extract System:

This serves areas with the greatest radiological hazard. Due to the high airborne contamination potential in this area double stage HEPA filtration is used. Pre-filtration is also used prior to air reaching the filters to prolong the life of the HEPA filters and reduce the amount of waste produced.

Provision is in place to ensure failure of the Con 4 ventilation system will prevent the Con 3 system below it from operating to ensure all potential contaminants are retained within the building and minimising discharges to atmosphere.

U_3O_8 Powder Packaging Vent System

The powder filling system has connections to a vent system at various locations i.e. the powder receipt hopper, the compactor feed hopper, the compactor, and the filling heads. The exhaust fans are vented via a stack to atmosphere.

BAT for the abatement of particulates will be achieved with the use of candle filters to minimise particulate contamination on both the Powder Receipt Hopper and the Compactor Feed Hopper. The candle filters will be automatically back-blown with service air in order to minimise the accumulation of particles on the filter surfaces and therefore prolonging their operational life. Primary and secondary HEPA filtration (duty/standby arrangement) serve the vent system followed by potassium-hydroxide impregnated carbon filters, for the removal of trace quantities of HF. The carbon filters are configured in a lead/lag arrangement, whereby the lead filter carries the main process load, and the lag filter provides a polishing function. This arrangement maximises the load that the lead filter carries, thereby minimising the amount of contaminated carbon that is produced.

Duty/standby fans maximise the reliability of the vent system. The vent is discharged to atmosphere via the dedicated Powder Packing Stack which terminates at 3m above the building height. The stack includes instrumentation for the online monitoring, post event sampling and accurate flow rate recording of aerial discharges from the system.

Gaseous Effluent Vent System

The Gaseous Effluent Vent System (GEVS) is to protect operators from the potentially harmful effects of exposure to UF_6 and HF vapours, and to minimise discharges of HF and Uranium compounds to the atmosphere. Uranium Hexafluoride (UF_6) reacts with moisture in the air to produce Uranyl Fluoride (UO_2F_2) and HF vapours, and the GEVS is used in areas where there is the potential for residual UF_6 to remain during normal, abnormal, or maintenance activities.

The GEVS comprises an extract duct network with HEPA filtration for the removal of uranium compounds, and potassium-hydroxide impregnated carbon filters for the removal of HF. The discharge to atmosphere is monitored. A single GEVS covers all of the areas within the Tails Management Facility (TMF) that could potentially have UF_6 present. These areas are:

- Cylinder Wash Facility (CWF).
- Autoclaves and Heels Removal Systems (HRS).
- Tails Deconversion Plant (TDP) UF_6 systems.
- Decontamination and Maintenance Facility (DMF).

During normal operations, a fan maintains a depression in a header throughout the areas where UF_6 containment is broken. Some connections to the header are permanently open, such as the purge through the Injector Degassing Cubicle in DMF. Other uses of the GEVS will be intermittent, such as the discharge from the degassing pump in CWF when a cylinder is evacuated, or when an operator connects and disconnects cylinders as they enter and leave the autoclaves.

Particulates (including uranic species) are removed prior to discharge by primary HEPA filters. The primary filters are protected by pre-filters. Secondary HEPA filters provide protection against breakthrough of the primary filters, and offer additional filtration during normal operation. The air then passes through carbon filters impregnated with 10% potassium hydroxide that remove any traces of HF from the system. The potassium hydroxide reacts with both HF, and carbon dioxide (CO_2) from the air. The reaction with CO_2 produces potassium carbonate which reacts with HF to form potassium fluoride. The carbon filters are configured in a lead/lag arrangement, whereby the lead filter carries the main process load, and the lag filter provides a polishing function. The HF concentration downstream of the lead filter is routinely monitored, and indication of break-through identifies that the lead filter needs to be changed. This arrangement maximises the load that the lead filter carries, thereby minimising the amount of contaminated carbon that is produced.

The system includes duty and standby fans and filters, with the fans having variable speed drives in order to maintain a minimum velocity as usage throughout the system varies.

HF Area Ventilation System

The HF Area Ventilation System (HFAVS) provides a routine scrubbing and ventilation within the HF areas to ensure that any fugitive emissions are not released directly to atmosphere.

The scrubbing function is provided by means of a dilute potassium hydroxide (KOH) solution. In the event of an unplanned release of HF, either evaporating liquid or gas, the scrubber is dosed with a concentrated potassium hydroxide solution, in order to improve the performance of the scrubber for higher HF loads. The scrubber is sized to process the ventilation flow from all areas of plant handling HF. Dilute potassium hydroxide will be used as the scrubbing liquor, and it will continuously recirculate via duty and standby pumps. This ensures that the scrubber is adequately wetted, so that it will perform its function when required. The system is designed to provide protection from a leak (from catastrophic failure of a storage tank). The most likely arising of fugitive HF emission is from breaking connections once a tanker has been filled. Other sources of HF will be from sampling and during maintenance. Equipment is flushed through with water prior to breaking containment. Therefore only very small quantities of HF are expected to be released during maintenance.

If the HF detectors activate, the scrubber is dosed with a charge of 45% KOH solution. The air enters the bottom of the scrubber and rise through the scrubber packing, where it comes into contact with the KOH solution trickling down through the column. The KOH reacts with the HF, removing it from the air. All scrubber liquor drains into the recirculation tank, which is below the scrubber. The scrubber liquor recirculates permanently, to ensure that the scrubber is fully effective when it is required. The recirculation tank and scrubber are located in a bund, which provides secondary containment. The scrubber and fans are located inside a dedicated building, which is located in the heart of the area where HF is processed and handled. The main HF-containing aerial effluent is derived from the main deconversion process. This is scrubbed by the hydroejector and five scrubbers. Demineralised water is added to the final scrubber in order to provide final polishing of the effluent prior to discharge. This aerial effluent is discharged into the HF Area

Ventilation System, where it is further scrubbed as an ALARP measure. In the event of failure of the entire scrubbing train, the HF Area Ventilation System provides sufficient scrubbing capability.

Emissions to the environment

The discharges from TMF have been assessed using the Environment Agency's H1 screening tool which assesses the environmental impact of the emissions on the environment. We have reviewed the H1 assessment and we have included emission limit values in the permit in line with those in the relevant inorganic chemicals sector guidance.

Gaseous discharges

The TMF process will result in the discharge of nitrogen oxides (NOx) and hydrogen fluoride into the atmosphere. The operator is required to undertake an environmental risk assessment to show their releases will not have an adverse impact on the environment. The operator has used the Environment Agency's H1 risk assessment screening tool to assess the risks to the environment. The tool uses worst case estimates and therefore the figures it produces are likely be higher than if air dispersion modelling is used as the tool does not assess dispersion in the atmosphere.

NOx Emissions

We have reviewed the operator's H1 assessment which has shown that NOx emissions do not screen out as being insignificant. We required the operator to re-do their H1 assessment as they had not considered their NOx emissions in line with the H1 guidance; which states that NOx for short term releases should be 50% of the process contribution and emissions of oxides of nitrogen should be recorded as nitrogen dioxide, however, the operator had used the total process contribution for short term releases and recorded emissions as nitrogen monoxide rather than nitrogen dioxide. As a result of the re-assessment the emissions of NOx increased and therefore did not screen out as being insignificant. The operator will be required to undertake detailed air dispersion modelling to satisfy to us that they are not exceeding environmental standards. The environmental assessment levels (EALs) in the H1 tool are 40 ug/m^3 and 200 ug/m^3 for long and short term releases, respectively. If the process contribution (PC) is > 1% of the long term EAL and >10% of the short term EAL further assessment is required. In this case the PC is 72% of the long term EAL and 191% of the short term EAL.

We have decided to include an improvement condition in the permit to require the operator to conduct air dispersion modelling to assess, in more detail, the impact of the emissions on the environment to determine if the emissions are within environmental standards for NOx and can meet BAT associated emission levels (AELs), as set out in the Medium Combustion Plant Directive (MCPD). The current data used in the H1 assessment was from measured monitoring of NOx emissions during the commissioning of the boilers. We expect the operator to use the active commissioning phase of their operations to conduct NOx emissions monitoring while the boilers are running at a steady state at full load. This data should be used in the air dispersion modelling to provide a more realistic result to either demonstrate the impact is within the relevant EALs or show there is a potential environmental impact. If it is shown there is a potential environmental impact which the operator must then demonstrate and implement relevant mitigation measures.

The NOx emissions are from gas fired boilers which fall within the requirements of the MCPD:

The two gas fired boilers are considered to be medium combustion plant (MCP), as defined in the MCPD: all MCP with a rated thermal input of greater or equal to 1 MW - 50 MW. The TMF will operate with two gas fired boilers, with a combined thermal input of 9.3 MW. The MCPD defines whether plant is existing or new which is an important consideration as this defines the expected emission limit values (ELVs), unless BAT requires more stringent ELVs. The operator has provided evidence to show the boilers fall within the definition of existing: MCP put into operation before 18th December 2018. This means the plant must have been fired up to full load which can be during commissioning. The MCPD states the ELV for NOx for existing plant is 200 mg/m^3 and the compliance date for existing MCPs, > 5 MWth and < 50 MWth is 1st January 2025.

The operator does not have to comply with the ELV until 2025, however, the inclusion of the improvement condition will enable us to assess whether the relevant environmental standards can be met, and if further mitigation measures are required and whether more stringent BAT based ELVs will need to be imposed. The operator will be required to conduct NOx emissions monitoring and report these results annually from 01/01/2025.

Emissions of HF

We have reviewed the H1 assessment for hydrogen fluoride emissions. The operator has used the ELV of 5 mg/m^3 as their short term release as they do not have any operational data and the ELV is set out in the Inorganic Chemicals sector guidance note. The assessment has shown the short term contribution of HF has not screened out as insignificant with the short term release being >10% of the short term EAL. We have decided this does not require further assessment as the release is based on the failure of HF tanks. This is an extremely unlikely event and we expect any storage tanks to be of the relevant standard and be under a regular monitoring and maintenance regime to prevent such failures from occurring. This emission point is also served by a potassium hydroxide scrubber which has been designed to remove HF to levels below 5mg/m^3.

ELVs have been set in the permit for emission points A5-A7 to reflect the concentrations the operator has provided to us as part of their application. A5-A6 have an emission limit value of 1 mg/m^3 and A7 of 5 mg/m^3 as A7 serves the HF production plant which has the greatest potential for HF emissions.

The operator has assessed the short and long term emissions of HF and has concluded the concentration of HF will be 1 mg/m^3 for short term impacts from emission points A5 & A6 and 5 mg/m^3 from A7.

Sector guidance suggests an ELV of 5 mg/m^3 for fluorides and the Large Volume Inorganic chemicals BREF note between 1 to 5 mg/m^3 based on operational experience from HF production plants. The use of the alkaline scrubbing plant should ensure these ELVs are achievable. As this is an application for a new plant we feel it necessary to include those ELVs in the permit to ensure the necessary controls are in place and to ensure the environment is protected. We consider the operation of the plant and the scrubbing system are BAT and will enable the operator to be within the ELVs set. There is a permit requirement for the operator to submit monitoring data and therefore emissions from the site will be regularly assessed to ensure compliance with the permit conditions.

Liquid Discharges

Discharges from TMF will go via Urenco UK's (UUK) effluent treatment plant to Rivacre Brook. The H1 assessment has shown that copper has not been screened out as being insignificant in terms of the predicted environmental contribution in comparison with the EQS. It is 124% of the EQS. However, this does not consider the dilution effect of UUK's discharges.

The TMF liquid discharges are expected to be about 120 m^3 a year. This volume increase is less than 0.1% of the typical annual water flow from the site of 600,000 m^3 (a flow that is dominated by land run-off and land drainage). Most of the liquid effluent will be re-used back into the TMF process. However, during kiln outages the liquid effluent will be discharged via Urenco UK's (UUK) effluent treatment plant to the brook. UUK's discharges are considerably higher than those expected from the TMF process.

In 2015 we required the operator to assess the impact of TMF discharges on the receiving environment, Rivacre Brook:

"*to consult with UUK to provide a fresh assessment for liquid effluent discharges of copper, using realistic assumptions about flows in Rivacre Brook. This assessment should review how the combined outflow from all sources on the Capenhurst site can be managed to ensure Environmental Quality Standards are maintained or improved*".

This was not only to understand the impact of TMF's discharges but also the impact of the discharges from the Capenhurst site as a whole. UUK have a permitted discharge from their effluent treatment plant into Rivacre Brook and the TMF discharges will combine with these so it was important for us to understand the current water quality impacts together with those from TMF. The operator commissioned water quality modelling to be carried out to assess the liquid discharges from the TMF. The modelling considered the flow rate and chemical composition of the receiving water and the impact of UUK and TMF's discharges on Rivacre Brook. The results of the modelling have shown that the discharges from TMF will be insignificant and in combination with the combined discharge from UUK virtually undetectable due to the volume and nature of UUKs discharges compared with those from the TMF.

The water quality modelling has shown the proposed UCP discharges are several orders of magnitude below the permit limits for UUK (cadmium – 0.004%; copper – 0.178%; and, zinc – 0.341%) and their contribution to the annually averaged (AA) metal concentrations for comparison to the AA-EQS would be insignificant.

UUK annual emission limit for copper is 10 kg/annum compared to UCP which has an emission limit of 100g per year.

Copper discharges have also reduced from site due to various changes in operations at UUK:

- Closure of parts of E22 enrichment plant
- Coating of copper pipework in the chiller units
- Drain cleaning on site

We have not undertaken any additional modelling for the impact of copper on the brook based on the conclusions drawn for the water quality modelling, operations on site and changes to UUK site operations. Mass emissions for all determinands will be monitored and reported to us annually.

Noise

We have included an improvement condition in the permit to ensure the operator produces a noise management plan. During 2018/19 Urenco Chemplants received a number of complaints of noise coming from the site. Further investigation by the operator identified that three of the stacks had not been fitted with any noise abatement. Silencers have since been installed in the stacks and noise monitoring carried out by a consultant, commissioned by the operator, and has shown the noise levels have reduced and are within acceptable levels. Further noise monitoring will be undertaken when the site is fully operational. Various reports have been produced by the consultants which have been reviewed by an Environment Agency noise specialist. We consider it appropriate for the operator to produce a noise management plan to demonstrate how they will manage any noise issues going forward.

Decision checklist

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential.
Consultation	
Consultation	The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement. The application was advertised in the London Evening Standard. We consulted the following organisations: Cheshire West and Chester Council

	Food Standards Agency Health and Safety Executive Sellafield Limited North West Strategic Health Authority No responses were received.
Operator	
Control of the facility	We are satisfied that the applicant (now the operator) is the person who will have control over the operation of the facility after the grant of the permit. The decision was taken in accordance with our guidance on legal operator for environmental permits.
The facility	
The regulated facility	We considered the extent and nature of the facility at the site in accordance with guidance documents RGN2 "Understanding the meaning of regulated facility", Appendix 2 of RGN 2 "Defining the scope of the installation", and Appendix 1 of RGN 2 "Interpretation of Schedule 1". The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.
The site	
Extent of the site of the facility	The operator has provided a plan which we consider to be satisfactory, showing the extent of the site of the facility. The plan is included in the permit.
Site condition report	The operator has provided a description of the condition of the site, which we consider is satisfactory. The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive. The operator has identified sources of contamination based on the land use history of the site and site investigations providing baseline data to characterise the chemical and radioactive substances found on the site.
Biodiversity, heritage, landscape and nature conservation	The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat. We have assessed the application and its potential to affect all known sites of nature conservation, landscape and heritage and/or protected species or habitats identified in the nature conservation screening report as part of the permitting process. We consider that the application will not affect any sites of nature conservation, landscape and heritage, and / or protected species or habitats identified. Our decision is based on the results from the H1 risk assessment and the distance of the plant, which is greater than 5 km, from European sites. An improvement condition has been included in the permit for operational monitoring data for NOx to be used in detailed air dispersion modelling.

	We have consulted Natural England and Natural Resources Wales on our Habitats Regulations assessments, and taken their comments into account in the permitting decision.
Environmental risk assessment	
Environmental impact assessment	In determining the application we have considered the Environmental Statement, the planning permission and the committee report approving it.
Environmental risk	We have reviewed the operator's assessment of the environmental risk from the facility. The operator has used the H1 screening tool to assess their risks which are based on a worst case scenarios and are therefore extremely conservative. The H1 tool uses the process contribution (PC) from the operation which are compared to environmental action levels (EALs) for short term and long term releases. If the PC's are greater than 1% & 10% of the long and short term EALs, respectively, further assessment is required. This involves assessing the predicted environmental concentration (PEC) if these exceed the EALs the emissions cannot be screened out as being insignificant. The operator's risk assessment shows that, applying the conservative criteria in our guidance on environmental risk assessment, all emissions may be categorised as environmentally insignificant with the exception of: NOx and, HF in emissions to air Copper in emissions to water These are discussed in more detail in the key issues section of this document.
Operating techniques	
General operating techniques	The most relevant guidance notes are: Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals - Ammonia, Acids and Fertilisers, August 2007; and How to comply with your environmental permit: Additional guidance for The Inorganic Chemicals Sector (EPR 4.03). We have reviewed the techniques to be used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit. We have discussed the techniques in detail in the key issues section of this document.
Operating techniques for emissions that do not screen out as insignificant	Gaseous emissions of nitrogen oxides and hydrogen fluoride cannot be screened out as insignificant. We have assessed whether the proposed techniques are BAT: **Oxides of nitrogen (NOx)** NOx emissions are from boiler plant, the total thermal input of which is within the designated range for "medium combustion plant" (MCP). There are two gas fired plants with a combined thermal input of 9.3 MW. The Medium Combustion Plant Directive applies to all combustion plant with a rated thermal input of equal to or greater than 1 MWth and less than 50MWth regardless of the type of fuel used (MCP). The directive sets out the emission limit values (ELV) for nitrogen

	oxides. For existing combustion plant the ELV is 200 mg/m^3. This is discussed in more detail in the key issues section of this document. **Hydrogen fluoride (HF)** HF emissions were re-assessed in 2015 to reflect design changes to the plant. The assessment shows the basis of their estimates for long and short term emissions. HF emissions from four of the seven emission points are not expected as HF is either not present in the areas served by the ventilation or the design of the plant is such that any leaks of HF are into the kilns and not into the rooms served by the ventilation plant. The stacks from which HF emissions are expected have ELVs set at 1 mg/m^3 for 2 of the stacks and 5mg/m^3 for the other. This figure is based on an emission benchmark set out in Sector Guidance for 'The inorganic Chemicals sector (EPR 4.03)'. The largest contribution derives from a pessimistic assumption of the loss of hydrofluoric acid containment, rather than from normal operation. Caustic impregnated carbon beds have been installed in the plant to provide the required abatement. There are also four water based scrubbing systems through which gases from the process are passed through. Additionally the HF area ventilation system has the capability to effectively become a chemical scrubber by deploying potassium hydroxide in the event of a major loss of HF containment. The proposed techniques/emission levels for emissions that do not screen out as insignificant are in line with the techniques and benchmark levels contained in the technical guidance and we consider them to represent appropriate techniques for the facility. The permit conditions ensure compliance with relevant BREFs and ELVs deliver compliance with BAT-AELs. This is discussed in more detail in the key issues section of this document. Aqueous emissions of copper cannot be screened out as insignificant. We have assessed whether the proposed techniques for minimising discharges are BAT: **Copper** The applicant's main technique for minimising discharges to water is to recycle water within the plant. The application uses estimates of volumetric arisings that are felt to be pessimistic, and contaminated waste water will be cleaned via a reverse osmosis plant, by precipitating out dissolved solids to enable re-use within the process. The effluent is initially pH adjusted prior to passing through sand beds and carbon filters, to remove particulates, chlorine and organic compounds before passing through a semi-permeable membrane. The process produces permeate, water that is virtually pure, and concentrate. The permeate can be re-used in the process and is stored in the Process Water Break Tank; the concentrate is sent off-site for disposal. If the Process Water Break Tank is full the permeate is transferred to the Treated Water Storage Tanks. From here the water will either be transferred back into the process, discharged to Rivacre Brook via Urenco UK's effluent discharge system, and it is through their environmental permit that final releases to the environment are regulated. The final option is to dispose off site via road tanker, this is only anticipated to occur if analysis shows the effluent cannot be discharged to the brook. The proposed techniques / emission levels for emissions that do not screen out as insignificant are in line with the techniques and benchmark levels contained in the technical guidance, we consider them to represent appropriate techniques

	for the facility. The permit conditions ensure compliance with relevant BREFs and ELVs deliver compliance with BAT-AELs. This is discussed in more detail in the key issues section of this document.
Operating techniques for emissions that screen out as insignificant	Emissions to water of aluminium, arsenic, fluoride, iron, lead and nickel have been screened out as insignificant, and we agree that the applicant's proposed techniques are BAT for the installation. We consider that the emission limits included in the installation permit reflect the BAT for the sector.
Noise management	We have reviewed the operator's initial noise assessments in accordance with our guidance on noise assessment and control. At the time of review we considered the noise assessment to be satisfactory as the applicant had confirmed they would carry out a noise survey during commissioning to confirm the effectiveness of the noise mitigation measures. Since the review noise issues were reported during the inactive commissioning phase of the project. Investigations carried out by the operator and their consultant highlighted three stacks were causing an issue as noise mitigation measures had not been installed. This has since been rectified, however, we have included an improvement condition in the permit to ensure a noise management plan is submitted.
Permit conditions	
Use of conditions other than those from the template	Based on the information in the application, we consider that we do not need to impose conditions other than those in our permit template.
Raw materials	We have specified limits and controls on the use of raw materials and fuels to satisfy the Sulphur Content of Liquid Fuels Regulations 2007. **Table S2.1 Raw materials and fuels** **Raw materials and fuel description** — **Specification** Fuel oil used in standby generators — Less than 0.1% sulphur content.
Pre-operational conditions	Based on the information in the application, we consider that we need to impose pre-operational conditions. The installation is a new plant, appreciably different from the most similar other plant in the UK, and the operator is also a new legal entity and operating on a nuclear licensed site. The pre-operational conditions we have imposed require the operator to submit additional information at least 2 weeks before starting to operate the installation. The information covers final preparations (such as training, commissioning and verification that environmental equipment is functional); substantiation of any late modifications contrary to information specified in the application; environmental risk assessment for accidents, odour, noise and fugitive emissions.
Improvement programme	Based on the information in the application, we consider that we need to impose an improvement programme. This reflects the installation being a new plant being managed by a new operator. We have imposed an improvement programme to ensure that the operator considers and reports on:

	• Fugitive emissions, odour including consideration of the need if any for associated management plans. A response is required 1 month after completion of active commissioning at each facility. • The wider outcomes of commissioning and any actions required to deliver the operating techniques described in the application and comply fully with permit conditions. A response is required 1 month after completion of active commissioning at each facility. • A specific noise condition requiring the production of a noise management plan. • Emissions monitoring of NOx during active commissioning to validate detailed air dispersion modelling. The operator must consider the outcomes of the modelling in terms of environmental impact and additional mitigation if required. A response is required 3 months after completion of active commissioning.
Emission limits	ELVs and/or equivalent parameters or technical measures [based on BAT] have been set, based on sector guidance, for the following substances: Total fluorides and oxides of nitrogen for releases to air. Aluminium, Arsenic, Cadmium, Chromium, Copper, Fluoride, Iron, Lead, Nickel, Zinc and, Volume for releases to water.
Monitoring	We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed by the operator. These are standard monitoring techniques and considered to be BAT. The monitoring requirements have been imposed in order to obtain assurance that the operator is using techniques that are able to deliver compliance with emission limits and BAT. Based on the information in the application we are satisfied that, where appropriate, the operator's monitoring techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate. The operator is required to write to us in advance of seeking to use any techniques that do not meet MCERTS standards.
Reporting	We have specified annual reporting for gaseous and aqueous emissions of: Gaseous: HF, NOx, CO Aqueous: Aluminium, Arsenic, Cadmium, Chromium, Copper, Fluoride, Iron, Lead, Nickel, Zinc, Volume The frequency of reporting has been set as annual, reflecting the low magnitude of releases to the environment compared to those from UUK. For example annual mass limits of emissions to water are in grams whereas UUK's emissions to water are in kilograms.
Operator competence	
Management system	The operator provided us with their proposed management arrangements as part of their application. As the project has developed we expected the arrangements to develop and we carried out a readiness inspection in 2018 to satisfy ourselves the operator had an appropriate management system in place. We were satisfied they have the necessary arrangements in place. We have also attended regular regulatory update meetings which provided further reassurance that the necessary management arrangements are in place.

	Through our routine regulatory engagement we will also ensure the management arrangements remain appropriate for the operations on site. The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.
Relevant convictions	The Case Management System has been checked to ensure that all relevant convictions have been declared. No relevant convictions were found. The operator satisfies the criteria in our guidance on operator competence.
Financial competence	There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. 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.