Country Profile Template: Application of BAT in Nuclear Facilities

Contracting Party: United Kingdom

Section 1: Summary document detailing:

- Relevant national authorities and responsibilities;
- National legislation and basis for regulation;
- Application of BAT in domestic legislation;
- Environmental monitoring programmes;
- Dose limit, constraints and discharge limit setting rationale;
- Regulation, surveillance and monitoring;
- Radiation dose assessment methods;
- Environmental norms and standards;
- Quality assurance.

Relevant national authorities and responsibilities:

- **Department for Environment, Food and Rural Affairs (Defra)** – responsible for environmental protection, food production and standards, agriculture, fisheries, and rural communities in the UK. Defra has overall responsibility for the UK's relationship with OSPAR and coordinates across UK Government and the devolved administrations on the OSPAR programme of work.

- **Department for Business, Energy and Industrial Strategy (BEIS)** – responsible for business; industrial strategy; science, research and innovation; energy and clean growth; and climate change in the UK. BEIS, in close collaboration with devolved administrations and regulatory organisations, has responsibility for the OSPAR Radioactive Substances programme of work specifically.

- **The Scottish Government** – is the government for Scotland with a range of responsibilities including health, justice, rural affairs and the environment.

- **The Welsh Government -** is the government for Wales and responsible for, amongst other devolved matters, radioactive waste policy in Wales.

- **Northern Ireland Department for Agriculture, Environment and Rural Affairs -** responsible for, amongst other devolved matters, radioactive waste policy in Northern Ireland.

- **Environment Agency (EA)** – non-departmental arm of the UK government operating within England. EA are the regulator of radioactive waste disposals and in addition are responsible for regulating and advising on: major industry and waste; regulation of contaminated land; water quality; water resources; fisheries; inland navigation; conservation and ecology; managing the risk of flooding from main rivers, reservoirs, estuaries and the sea in England.

- **Scottish Environmental Protection Agency (SEPA) –** non-departmental arm of the Scottish Government, responsible for regulating and advising on environmental activities and protection (as listed above in the EA bullet) in Scotland.

- **Natural Resources Wales (NRW)** - non-departmental arm of the Welsh Government, responsible for regulating and advising on environmental activities and protection (as listed above in the EA bullet) in Wales**.**

- **Northern Ireland Environment Agency (NIEA)** - part of the Department for Agriculture, Environment and Rural Affairs, responsible for regulating and advising on environmental activities and protection (as listed above in the EA bullet) in Northern Ireland and also regulating the transport of radioactive material by road in Northern Ireland.

- **Office for Nuclear Regulation (ONR) –** independent nuclear regulator responsible for nuclear safety and security; transport of radioactive material, and nuclear safeguards throughout Great Britain.

- **Nuclear Decommissioning Authority (NDA) –** non-departmental public body reporting to BEIS and also responsible to Scottish ministers. The NDA is responsible for managing the decommissioning and clean-up of the civil public nuclear sector sites, including associated liabilities and assets.

- **Food Standards Agency (FSA) –** responsible for food safety in England, Wales and Northern Ireland.

- **Food Standards Scotland (FSS) –** responsible for food safety in Scotland.

National legislation and basis for regulation:

- **Environmental Authorisations (Scotland) Regulations 2018 (EASR18)** - These Regulations are made under sections 18 and 58 of the Regulatory Reform (Scotland) Act 2014 and repeal the Radioactive Substances Act 1993. They introduce the basis for an integrated framework for the authorisation of environmental activities. The purpose of this framework is to integrate the authorisation, procedural, and enforcement arrangements relating to the existing water, waste, radioactive substances and pollution prevention and control regimes (which are defined as regulated activities and currently include only radioactive substances activities) in Scotland. These Regulations transpose provisions of Council Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation.

- **Environmental Permitting Regulations (England and Wales) 2016 (EPR16) (as amended)** – These regulations consolidated and replaced the Environmental Permitting Regulations 2010 and set out an environmental permitting and compliance regime that applies to various activities and industries for England and

Wales. These regulations provide for ongoing supervision by regulators of activities which could harm the environment. The aim of the regime is to:

- protect the environment and ensure that statutory and government policy environmental targets and outcomes are achieved;
- deliver permitting, compliance with permits and certain environmental targets in a way that provides increased clarity and minimises the administrative burden on both the regulator and operators;
- encourage regulators to promote best practice in the operation of facilities; and
- continue to comply with international standards and fulfil international obligations.

These Regulations transpose provisions of 15 Directives which impose obligations required to be delivered through permits or capable of being delivered through permits.

Radioactive Substances Act 1993 (RSA93) and Radioactive Substances (Modification of Enactments) Regulations 2018 (RSR 2018) – Legislation applying in Northern Ireland to protect the environment from radioactive pollution by controlling the use of radioactive materials and in particular the disposal of radioactive waste. The Act requires those who keep or use radioactive substances, or accumulate or dispose of radioactive waste, to have a certificate of registration or authorisation issued under the Radioactive Substances Act 1993, as amended by the Radioactive Substances Act 1993 (Amendment) Regulations (Northern Ireland) 2011, or be covered by an exemption to that Act. These Regulations (and subsequent amendments made to them) transpose provisions of Council Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation.

Application of BAT/BEP in domestic legislation:

- In England and Wales, the application of Best Available Techniques (BAT) is the means to demonstrate compliance with the optimisation requirement. The use of BAT was one of the principles adopted in the 2009 UK Strategy on radioactive discharges. A 2018 review of the 2009 Strategy found that BAT had been comprehensively and effectively applied in England and Wales, and that the UK is contributing towards the objectives of the OSPAR Radioactive Substances Strategy.
- Following publication of the UK Strategy for Radioactive Discharges in 2009 (DECC, Department of the Environment Northern Ireland, the Scottish Government and Welsh Assembly Government, 2009), the application of BAT (replacing BPM and BPEO) was reiterated as the basis for the regulation of radioactive discharges in England and Wales. The UK Government's Statutory Guidance requires the Environment Agency and Natural Resources Wales (NRW) to ensure that nuclear site operators use BAT:
    - to prevent the unnecessary creation of wastes or discharges;
    - to minimise waste generation;
    - to minimise the radiological impact of discharges on people and the environment.

- In Scotland and Northern Ireland, the term Best Practicable Means (BPM) and Best Practicable Environmental Option (BPEO) continues to be used by the Scottish Environment Protection Agency (SEPA) and NIEA. The Environment Agency and SEPA consider that the requirements to use BPEO/BPM are equivalent to the requirements to use BAT and that the obligations on waste producers are the same.
- In its Statutory Guidance to the Environment Agency, the Department for Energy and Climate Change (DECC), placed specific requirements related to the application of BAT to the building of new nuclear plants, as follows:
    - "*In relation to any designs for new nuclear power stations, the Environment Agency should ensure that BAT is applied so that the design is capable of meeting high environmental standards. This requirement should be applied at an early stage so that the most modern or best available technology can be incorporated into the design of the stations, where this would ensure improved standards. The application of BAT should ensure that radioactive wastes and discharges from any new nuclear power stations in England and Wales are minimised and do not exceed those of comparable stations across the world"* (DECC and Welsh Assembly Government, 2009).
- In order to ensure that new nuclear power stations meet acceptable standards of safety, security and environmental protection, the regulators established a tiered Generic Design Assessment (GDA) process to consider the acceptability of new nuclear power reactors prior to commencement of the licensing process[1]. The GDA process includes an assessment of the application of BAT and the potential impact of liquid and gaseous discharges of radioactive wastes, (Environment Agency, 2007; 2016). The UK Government's objectives for new nuclear power are set out in the 2008 White Paper, "Meeting the energy challenge: a white paper on nuclear power".

- Management of radioactive waste in the UK is regulated through enforcement of a range of national and international legislation. EU Directives and international treaty obligations are implemented through their transposition into UK law.
- Through EASR18 and EPR16 (as amended), the relevant environment agencies review each permit/authorisation for nuclear and non-nuclear sites periodically to ensure that it is still suitable and to drive improvements in environmental performance (there are no nuclear sites in Northern Ireland). A major review of permits/authorisations is carried out as and when required. This process involves widespread consultation with relevant Government Departments, other stakeholders and the general public, post-consultation review and final decision and permit/authorisation revision. The review process takes account of all relevant activities conducted or foreseen including any modifications, processing (including legacy wastes) and decommissioning. The environment agencies work in close contact with the ONR which regulates the safety of nuclear plants (including that for waste storage) and workers. Permits/authorisations are issued only after consultation.
- Radioactive substance activities to be carried out (by both nuclear and non-nuclear industries) are specified in the discharge permit/authorisation granted by the

[1] GDA currently applies to England and Wales only, as other devolved governments are not currently considering developing new nuclear power stations.

relevant environmental regulator. The permit/authorisation requires operators to use BAT/BPM in respect of the disposal of radioactive waste to: minimise the activity of gaseous and aqueous radioactive waste disposed of by discharge to the environment; minimise the volume of radioactive waste disposed of by transfer to other premises; and dispose of radioactive waste at times, in a form, and in a manner so as to minimise the radiological effects on the environment and members of the public.

- Radioactive waste disposals are only permitted/authorised by specified routes which do not exceed any specified limits on disposals. Disposals may occur by discharge to the environment. Discharge limits to the environment are established through an assessment process, initiated by either the operator or the relevant environment agency. Discharge limits on the disposal by discharges to the environment may be expressed as an annual or monthly discharge limit. The permit/authorisation may also include quarterly notification levels or weekly advisory levels. Where a quarterly notification level is exceeded, an investigation is triggered as to whether BAT or BPM have been applied in the control of the relevant discharge.
- Other relevant legislation includes: the Ionising Radiations Regulations 2017 (keeping exposure to ionising radiations as low as reasonably practicable); the Environmental Protection Act 1990 (basis for a regulatory regime for identifying and remediating contaminated land); and the Nuclear Installations Act 1965, (as amended) (regulation of nuclear safety including taking account of the international conventions on legal liability). Specific plants and operations may also be governed through the Pollution Prevention and Control Act 1999, the Control of Major Accident Hazards Regulations 2015 and the Water Industry Act 1991. Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR) establish a framework of preparedness measures to ensure that arrangements are in place to effectively respond to that emergency, both on the site of the emergency situation and off-site where members of the public might be affected. The Conservation of Habitats and Species Regulations 2017 also includes the requirement for radiological impact assessment of designated habitat sites.

Environmental monitoring programmes:

- Operators of nuclear licensed sites in the UK undertake environmental monitoring, both to comply with conditions in permits/authorisations and to provide the general public with information regarding the impact from the facility on the local environment. The operators' monitoring programmes include sampling of marine food chain and indicator species, local food produce, direct radiation from facilities, and external radiation from publicly accessible places (e.g. beaches). Operators are also required to take duplicate samples of discharges and to provide the duplicate sample to the regulators as required. These are analysed by the regulators' independent analysts in order to be assured that operators' measurements of discharges are accurate.
- Independent environmental monitoring is undertaken by the relevant UK regulatory authorities. These monitoring programmes are organised by the environment agencies (Environment Agency, SEPA, NRW and NIEA), FSA and FSS, and are independent of the industries discharging radioactive wastes. These programmes

include monitoring on behalf of the Scottish Government, Channel Island States, the Northern Ireland Department of Agriculture, Environment and Rural Affairs, the Department of Business, Energy and Industrial Strategy (BEIS), Department for Environment, Food and Rural Affairs (Defra), Natural Resources Wales (NRW) and the Welsh Government.

- In England and Wales, the FSA conducts food monitoring, whilst the Environment Agency and NRW carry out environmental and dose rate monitoring. In Scotland, SEPA carries out food, environmental and dose rate monitoring, working closely with FSS on its programme, and in Northern Ireland this is carried out by the NIEA. Programmes of monitoring of drinking water, air and rain are carried out on behalf of BEIS, NIEA and the Scottish Government. SEPA (as part of the joint SEPA/FSS monitoring programme) and the FSA also carry out UK monitoring of milk and canteen meals that are collected remotely from nuclear licensed sites. Annual surveys of seas around the UK (including locations away from nuclear licensed sites) are carried out by the environment agencies on behalf of the Scottish Government and BEIS.
- The Environment Agency has an agreement with NRW to undertake some specific activities on its behalf in Wales including some environmental monitoring (and aspects of radioactive substances regulation). In Scotland, as part of a co-ordinated programme SEPA undertakes environmental monitoring on behalf of FSS.
- The monitoring programmes have several purposes. Ongoing monitoring helps to establish the long-term trends in concentrations of radioactivity over time in the vicinity of, and at distance from, nuclear licensed sites. The results are also used to confirm the safety of the food chain. Monitoring the environment provides an indication of radionuclide dispersion around each nuclear site. Environmental and food results are used to assess dose to the public to confirm that the controls and conditions placed in the authorisations/permits provide the necessary protection and to ensure compliance with statutory dose limits. Monitoring of food and the environment remote from nuclear licensed sites is also carried out, giving information on background concentrations of radionuclides.;
- The Environment Agency and SEPA also undertake routine auditing of liquid effluent discharges to provide checks and an independent assessment on site operators' data. These checks encompass monitoring of liquid effluent samples and quality checking of solid waste disposals.
- Since 1995, the results of the environmental monitoring programmes, and the subsequent radiological assessments, have been published in the annual report series 'Radioactivity in Food and the Environment' (RIFE). The most recent RIFE report (RIFE 24, 2019) represents collaboration by the Environment Agency, FSA, FSS, NIEA, NRW and SEPA across the UK. The publication of RIFE reports is independent of the nuclear industry.. Specifically, it provides estimates of doses to members of the public from authorised practices and enables such results to be made available to stakeholders. In recent years, FSA, SEPA and EA have all completed reviews of their environmental radioactivity monitoring programmes. Further information of completed reviews is available in RIFE reports (e.g. Environment Agency, FSA, FSS, NIEA, NRW and SEPA, 2019).

Dose limit, constraints and discharge limit setting rationale:

- The relevant dose limits (adopted in the UK since 1993), for permitted and authorised discharges, to members of the public are 1 mSv per year for (effective) dose.
- The equivalent dose limits for skin and lens of the eye are 50 mSv per year (averaged over any area of 1 cm^2) and 15 mSv, respectively.
- These dose limits are derived from the Basic Safety Standards Directive 2013/59/EURATOM (more information below).
- Limits are set on radioactive discharges to the environment to ensure that:
    - the radiation exposure of members of the public is less than the statutory dose limits and constraints and is as low as reasonably achievable;
    - ensure the environment is protected; and
    - provide a reference for the indication of operational discharge performance and the application of the best available techniques to minimise discharges.

Regulation, surveillance and monitoring:

- The UK regulatory framework requires BAT (BPM in Scotland and Northern Ireland) to be used to minimise activity in radioactive discharges to air and to water from nuclear and non-nuclear facilities. The UK regulators ensure that these requirements are met via conditions in the site permits/authorisations/certificates. Requirements are also met by programmes of inspection and audit of the operator's facilities. Assessments are undertaken by operators to inform the application of BAT or BPM to limit the activity of waste discharged. Furthermore, the way in which discharge permits/authorisations/certificates are applied and reviewed, along with the supporting arrangements (e.g. management arrangements and engineering controls) places a continuing requirement to demonstrate BAT. Thus, BAT, or BPM, as defined in the UK, together with the way in which these concepts are applied, delivers a level of discharge control that is at least consistent with BAT as defined by OSPAR.
- The permits/authorisations/certificates to dispose of radioactive waste continue to be periodically reviewed in a transparent, consultative and integrated approach. The decision and explanatory documents associated with permits/authorisations/certificates are generally available on the relevant regulatorwebsites and demonstrate the level of detail underlying the consideration of different abatement technologies and the corresponding discussions between the operator and regulator.

Radiation dose assessment methods:

- Dose assessments consider those people in the population most exposed to radiation, due to radioactive discharges, because of their age, diet, location or habits. These results are for comparison with legal limits in EU and UK law.
- In the UK, two main types of retrospective doses are assessed. The first type of assessment is more complete in considering the combined effects of direct radiation exposure, gaseous and liquid radioactive discharges from nuclear licensed sites (*total dose*). The second type of assessment estimates dose from specific sources and associated exposure pathways. These dose assessments check on the adequacy of the *total dose* method and offer additional information for key exposure pathways. Further information describing the assessment of doses is available in RIFE reports (e.g. Environment Agency, FSA, FSS, NIEA, NRW and SEPA, 2018).

- In support of the assessment process, prospective assessments of doses to the public are made assuming discharges at the specified limits. Discharge limits are set so that doses to the public will be below the source and site dose constraints of 0.3 and 0.5 mSv per year, respectively if discharges occurred at the limits.[2]

Environmental norms and standards:

- The UK continues to apply the principles of radiological protection, recommended by the International Commission on Radiological Protection (ICRP), to reduce levels of radioactive discharges and doses of ionising radiation to humans, and the protection of wildlife and the environment.
- Current UK practice relevant to the public is based on the recommendations, as set out in ICRP Publication 103 (2007). The dose standards are embodied in national policy on radioactive waste and in guidance from IAEA in their Basic Safety Standards (BSS) for Radiation Protection (IAEA, 1996). Legislative dose standards are contained in the BSS Directive 96/29/Euratom (CEC, 1996) and subsequently incorporated into UK law in the Ionising Radiations Regulations 1999 (as amended, IRR17).
- In order to implement the BSS Directive, the standards in England and Wales concerning radiation doses to the public and their methods of estimation and regulation for all pathways are set down in EPR16. Similarly, in Scotland, the standards are set down in EASR18. In Northern Ireland, regulations were made to implement the requirements of the BSS Directive in the Radioactive Substances (Basic Safety Standards) Regulations (Northern Ireland) 2003.
- The revised Basic Safety Standards Directive (BSSD) (2013/59/EURATOM) in 2013 consolidated and updated existing Euratom provisions for protection against the harmful effects of ionising radiation by replacing five existing Directives and a Commission Recommendation. The revised Directive takes account of developments in the recommendations and standards issued by the ICRP and the International Atomic Energy Agency (IAEA). It covers standards for public exposure as well as those for occupational and medical exposures. The BSSD has been implemented into UK law via several pieces of legislation.

Quality assurance:

- UK operators of nuclear licensed sites in the UK, and laboratories undertaking independent environmental monitoring, utilise Quality Assurance (QA) and International Standards Organisation (ISO) accreditation to demonstrate quality management and sustainable development.
- Most notable standards include the ISO 9000 and ISO 14000 series, primarily concerned with quality management systems and environmental management (to minimise the harmful effects on the environment caused by human activities and to achieve continual improvement of environmental performance), respectively.
- Quality assurance of discharge sample measurements and environmental analysis, and the assessment of the impact of discharges and exposure on members of the general public, is based on the work of operators, a national system of independent regulators (e.g. Environment Agency and SEPA), laboratories undertaking

[2] Please see the Principles for the Assessment of Prospective Public Doses arising from Authorised Discharges of Radioactive Waste to the Environment (2012, EA, SEPA, NIEA, FSA, HPA) for more information.

independent environmental monitoring, advisory bodies (e.g. Public Health England (PHE)) and other Government bodies. Each rely on accreditation to an appropriate ISO or other standard.

- Nuclear sites have their own laboratories which adhere to the requirements of ISO/IEC 17025 and ensure the European standard for the operation of calibration and testing laboratories are met.
- Laboratories undertaking independent environmental monitoring are also required to comply with technical and quality assurance specifications as defined by the relevant UK regulatory authorities. Each laboratory is accredited by the United Kingdom Accreditation Service (UKAS). Laboratories are also accredited for the appropriate ISO 9000 and ISO 14000 series of standards. Analytical quality control procedures (all covered under UKAS accreditation) include regular calibration of detectors using radiation standards (traceable to national standards), inter-comparison exercises with other laboratories (both national and international) and the use of standard operating procedures.
- The annual development of RIFE reports and associated dose assessments across the UK (mentioned above) is acts as a quality assurance of the regulatory process.
- International peer reviews invited by the UK, including IAEA Integrated Regulatory Review Service (IRRS) Missions, also help to ensure quality assurance through robust audit of the regulatory process.