Poolbeg Generating Station

Industrial Emissions
Licence Register Number: P0577-03

Decommissioning Management Plan

Electricity Supply Board

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Summary

Activity Details

- Name: Electricity Supply Board
- Address: Poolbeg Generating Station, Pigeon House Road, Ringsend, Dublin 4, Ireland.
- Licence/Permit Number: P0577-03

Report Preparation

The report was prepared on behalf of the operator by ESB International, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin.

Licensed Activities

As per a Section 82A(11) Amendment to Licence Reg. No. P0577-03 dated December 2013, the following activities are licensed:

- Combustion of fuels in installations with a total rated thermal input of 50 MW or more.

Scope & Review

The Decommissioning Management Plan (DMP) addresses the key issues that would occur in the shut-down of power station activities at Poolbeg Generating Station.

The DMP will be reviewed annually.

Costs & Financial Provision

Costs arising at the Power Plant including aftercare over a 3 year period amount to €1,577,154.

The aftercare element of the costs has been adjusted to provide for an annual inflation rate of 2.5%.

ESB makes specific financial provision for closure of its power stations and the provision at 31 December 2013 for closure of generating stations including Poolbeg Generating Station was €139.0 million and actual provision for demolition was €36 million. The company has successfully decommissioned a number of power stations, many of which have included ash landfilling activities.

1 Introduction

1.1 IE Licence Reg. No. P0577-03

Environmental management at ESB's Poolbeg Generating Station is regulated by the conditions of Industrial Emissions (IE) Licence Reg. No. P0577-03, issued in March 2013.

An IPPC Licence for Poolbeg Generating Station was initially granted in April 2002 (P0577-01). It was subsequently reviewed and replaced by Licence 718 (P0577-02) in December 2004. A further review was carried out in 2012/13 and Licence P0577 – 03 was issued in March 2013

A Section 82A(11) Amendment to Licence Reg. No. P0577-03 issued in December 2013 and a Section 96(1) Amendment to Licence Reg. No. P0577-03 issued in December 2015. The amendment document is entitled "Technical Amendment B to Industrial Emissions Licence"

The following activities are licensed:

Combustion of fuels in installations with a total rated thermal input of 50 MW or more.

1.2 Licence Requirements for DMP

The requirements regarding decommissioning and residuals management are outlined in Condition 10 of IE Licence Reg. No. P0577-03 as follows:

10.1 Following termination, or planned cessation for a period greater than six months; of use or involvement of all or part of the site in the licensed activity, the licensee shall, to the satisfaction of the Agency, decommission, render safe or remove for disposal/recovery any soil, subsoil, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

10.2 Decommissioning Management Plan (DMP)

10.2.1 The licensee shall maintain a fully detailed and costed plan for the decommissioning or closure of the site or part thereof.

10.2.2 The plan shall be reviewed annually and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the agreement of the Agency.

10.2.3 The licensee shall have regard to the Environmental Protection Agency Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision when implementing Condition 10.2.1 above.

10.3 The Decommissioning Management Plan shall include, as a minimum, the following:

(i) a scope statement for the plan;

(ii) the criteria that define the successful decommissioning of the activity or part thereof, which ensures minimum impact on the environment;

(iii) a programme to achieve the stated criteria;

(iv) where relevant, a test programme to demonstrate the successful implementation of the decommissioning plan;

(v) details of the costings for the plan and the financial provisions to underwrite those costs

10.4 A final validation report to include a certificate of completion for the Decommissioning Management Plan, for all or part of the site as necessary, shall be submitted to the Agency within three months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.

1.3 Site Description

The station comprises two elements, namely the decommissioned conventional thermal units (two 120 MW capacity and one 270 MW capacity boiler/turbine units) and a combined cycle gas turbine (CCGT) plant (two 155 MW capacity gas turbines, two heat recovery steam generators (HRSGs) and a single 170 MW capacity steam turbine).

The conventional thermal units have been decommissioned and all hazardous materials and wastes removed. The CCGT has been electrically separated from the conventional thermal station(control of a few circuit breakers to be transferred to the CCGT by Q2 2017)

The heavy fuel oil (HFO) and diesel tank farm, and jetty has been leased to NORA (National Oil Reserve Agency) since February 2016.

The CCGT plant is fired on natural gas with gasoil being available as secondary fuel supply. The CCGT is only likely to run on gas oil in the following circumstances:

- under test on an annual basis as per the Secondary Fuel Grid Code.
- or in the event of a national electrical system emergency

1.4 Scope of DMP

The DMP is presented in Section 3 herein and refers to the operating plant (CCGT) within the site. Its scope addresses the key issues that would occur in the shut-down of current power station activities at Poolbeg Generating Station. There are no current plans to decommission the plant.

The older, conventional oil-fired thermal plant was decommissioned in March 2010 and all hazardous materials and wastes removed. The decommissioned generation station is not considered further in this report.

1.5 Application of DMP

Condition 10.1 of the Licence refers to planned cessation of operations for a period of greater than six months. The role that Poolbeg Generating Station will play in the Irish electricity industry at the time of its decommissioning will be determined by a complex array of issues and cannot be foreseen at this point in time. While the plant may be unused, or not, in operation for a period of six months, circumstances could dictate that it be maintained until such time as production resumes, as has occurred historically at other power stations. In such an event the DMP will not be implemented.

There are no direct references within the DMP to partial closure. In the unlikely event that one of the operating units of the combined cycle gas turbine (CCGT) plant was scheduled to be decommissioned well in advance of the other operating units, then the relevant sections of the DMP would be implemented.

1.6 Exclusions

The DMP applies to the site, except as follows:

- Successful decommissioning is determined as being completed when all buildings, equipment, wastes or any other materials that could result in environmental pollution are removed from the site and recycled, recovered or disposed of in accordance with all regulations in force at that time. The DMP will result in a decommissioned and decontaminated site suitable for future industrial use. All buildings and some site services, whilst emptied and cleaned as part of the DMP, may remain in place following decommissioning.
- The structural form of station buildings is conventional structural steel supported on reinforced concrete foundations. Gantries and walkways for access to plant and equipment are constructed of stainless/galvanised steel open grating type flooring. These are supported on steel beams and columns. External walls comprise profiled metal cladding and roofs are constructed of profiled metal decking on purlins spanning between rafters. The materials used do not pose any environmental threat in the event of station closure, whether they are demolished or remain in place.
- Certain areas at the power station will continue to operate or remain operational. These include facilities such as the diesel supply to the back-up engine of the fire protection system.

- Routine services that are performed by contractors on an ongoing basis include the following: hygiene services, general building work, rodent control, laundry, lagging, tool hire and specialist welding. These activities have no implication for the DMP.

- All equipment and plant is the property of Poolbeg Generating Station, other than the following:
    - Cylinders in which bottled gas is delivered are the property of the supplier, who will be responsible for their removal. ESB will be responsible for ensuring the suppliers remove gas cylinders off-site.
    - The Bord Gáis Energy (BGE) Above Ground Installation (AGI). While this is currently used solely for the purpose of feeding the Poolbeg Power Station, this will either be decommissioned by BGE or will be retained by them under a new lease. The AGI is outside the licence boundary and therefore BGEs responsibility for future use or decommissioning.
    - Electrical network transformers and cables and other facilities including GIS relay equipment are the property of ESB Networks.
    - The ESB Networks section of site is operated and maintained by ESB Networks. This section of the site is planned to be removed from Poolbegs IE licence in 2017 following agreement with the Agency. ESB will still have control over this section of site but it will not be under Poolbegs licence at the time of decommissioning.

1.7 Implementation

Since the commissioning of the conventional thermal plant, a number of incidents of environmental significance have occurred at the Poolbeg site, as follows:

- In 1985 a test tank overflowed causing a spillage of several tonnes of HFO within the oil farm.
- In 1989 a valve failed and approximately 50 t of HFO was spilled within the oil farm.
- In 1997 a coupling failed on a HFO pipeline within the oil farm, resulting in the spillage of 20 t of HFO.

All of the above incidents were followed by appropriate clean-up work and there is no ongoing impact on station lands. Since the decommissioning of the old thermal station, including the removal of HFO from the tanks, no further HFO incidents can occur.

Issues that are likely to arise upon closure at Poolbeg Generating Station have all been dealt with successfully in the past at other ESB power stations and similar care will be taken when decommissioning at this site. Furthermore, the conventional thermal plant on the site has already

been successfully decommissioned and any issues that could potentially arise during the decommissioning of the CCGT plant have been dealt with successfully on site.

ESB has successfully decommissioned a number of its former power stations. These were at Miltown Malbay, Screeb, Gweedore, Allenwood, Portarlington, Ringsend, Cahirciveen, Rhode, Ferbane, Arigna, Bellacorick, Lanesboro and Shannonbridge.

2 Site Evaluation

2.1 Description

The station is located on Pigeon House Road in Ringsend in Dublin's industrial area on the south of the River Liffey. It occupies an area of approximately 29 hectares.

2.2 Site History

Table 2-1 - History of Station Development

Year	Description
1971-2	Two 120MWe heavy fuel oil-fired units, (Units 1 and 2) were commissioned. Two 14MWe combustion turbine units were added which were for black start capacity.
1978	Construction and commissioning of the 270MWe Unit 3
1983-4	Conversion of all three units to firing natural gas or heavy fuel oil
1980	It operated as a traditional oil fired thermal power station until 1980. The site was then taken out of service for refurbishment.
1987	The two 14 MWe combustion turbines were decommissioned and removed from site
1994	Commissioning of a 150MWe gas turbine generator CG15
1998	Commissioning of a second 150MWe gas turbine generator CG14
1999	Installation of the combined cycle generation unit (Steam Turbine 16 and HRSGs 14 and 15)
2010	Decommissioning of the conventional thermal station

The plant is fired on natural gas supplied from the national gas network. It can also burn gasoil as a standby fuel and this is supplied from gasoil storage tanks on the site connected via a dedicated pipeline.

The plant's generation capacity is used to meet electricity demands made by Eirgrid. Units CG14 and CG15 ran for 3,256 and 2,585 hours, respectively, on natural gas in 2016.

2.3 Facilities & Operations

The main operational features of the station include the following:

- Two gas turbines
- Oil and gas firing systems
- Steam turbine
- Electro-chlorination system
- Extraction, BF and circulating pumps
- Two heat recovery steam generators
- Flue gas main and bypass chimneys
- Chemical dosing system
- Condenser and cooling water system comprising pumphouse, chlorination plant, culverts and outfall
- Auxiliary cooling system
- Three air-cooled generators
- Gasoil storage facilities comprising bulk tanks
- Water treatment plant and water storage facilities comprising bulk tanks
- Transformers and high voltage electrical switchgear
- Fire protection system
- Administration/control building
- Supporting facilities including the following:
    - Fuel oil pumphouse
    - Fire protection pumphouse
    - Auxiliary cooling water system
    - Diesel generator
    - Chemicals storage tanks
    - Chemical laboratory
    - Workshop and stores

Decommissioned features of the station that remain in place include the following:

- Decommissioned thermal station main building housing three boiler and turbo-alternator units and associated plant.
- Jetty for unloading marine oil tankers having a capacity to accept vessels up to 35,000 dwt has been leased to NORA with the oil farms.
- Two decommissioned 210 m high reinforced concrete chimneys, one serving the two 120 MW units and the second serving the 270 MW unit.
- Five decommissioned tanks within two bunds for storing heavy fuel oil (HFO) with a total capacity to 140,000 t. These have been leased to NORA.
- Administration Building and Offices

2.4 Details on storage of fuel and other materials

Table 2-2- Transformers

Reference	Oil Content	Hazard/Persistence
TF1	14.7 tonnes	Not classified as an Environmental hazard according to CLP regulations.
T2003	92700 litres	
UT3	2114 gallons	
TF3	73.1 tonnes	
TF4	71 tonnes	
T2014	48315 litres	
UT14	4555 litres	
T2015	48315 litres	
UT15	2700 litres	
T2016	69 tonnes	
HOT 16 A	0.84 tonnes	
HOT 16 B	0.84 tonnes	

Reference	Oil Content	Hazard/Persistence
HOT 16 C	0.72 tonnes	
HOT 1 6 D	0.72 tonnes	
16MKC01 (Excitation transformer)	1.42 tonnes	
ST13	2600 litres	
HOT 17	650 kgs	

Table 2-3 - Oil Storage

Description	Capacity	Hazard/Persistence
Distillate D1	7000 m3	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product has a potential to bioaccumulate
Distillate D1	7000 m3	
GT14 lube oil	13.5 m3	Not classified as dangerous. This product is not expected to bioaccumulate.
GT15 lube oil	13.5 m3	
ST16 lube oil	15 m3	
Diesel Day Tank	10 m3	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product has a potential to bioaccumulate

Table 2-4 - Chemicals

Description		Capacity	Hazard/Persistence
Caustic Soda Liquor (NaOH) 47%	Outside WTP	1 x 30 k litres	Harmful effects may occur in aquatic environment, if pH 9 is exceeded. Not expected to bio accumulate significantly
Sulphuric Acid (H2SO4) 96-98%	Outside WTP	1 x 25 k litres	Sulfuric acid (98% solution) is slightly to moderately toxic to aquatic life. Large discharges into the environment may contribute to lowering of water pH and be fatal to aquatic life and soil micro-organisms.
Brine/Caustic Solution 24%NaCl/5%NaOH	Outside WTP	1 x 32 k litres	Toxic to aquatic life through an immediate raise in pH to toxic levels.

Description		Capacity	Hazard/Persistence
Ammonia(NH3) 35%	Outside – adjacent dosing room	1 x 1.6 m3	The substance is biodegradable. Unlikely to persist. May cause pH changes in aqueous ecological systems.
Sodium Hypochlorite Solution 1 ppm free chlorine can be produced from plant.	Outside Electrochlorination house.	38 m3	Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.
Hyspin AWS 46 (Phenol,dimethyl-, phosphate 3:1 > 99%)	GT14 Control Oil	1 m3	Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired. This product is not expected to bioaccumulate through food chains in the environment
Anvol PE46 HR > 99%	G16 Control oil (16MAX)	1 m3	

2.5 Key Considerations

In addition to the general requirements for decommissioning, the principal issues to be considered for Poolbeg Generating Station are identified as:

- Liquid fuel (gasoil) removal / cleaning from pipelines and tankage.
- Chemical removal / cleaning from pipelines and tanks
- Tanks and sumps
- Drainage line cleaning
- Decommissioning / transfer of operational control of oil filled transformers
- Decommissioning of oil-filled underground cables and the associated header tank

Other issues are as follows:

2.5.1 Waste Disposal

Site operations generate hazardous and other wastes. The types of waste generated are outlined in the Poolbeg Generating Station's Annual Environmental Reports (AERs). Types of waste and quantities vary from year to year.

The amount of wastes generated will increase during implementation of the DMP with the following being of particular note:

- Batteries
- Fluorescent tubes
- WTP Chemicals
- WTP Resins
- Smoke detectors
- Waste lubricating oils
- Waste transformer oils
- Antifreeze/ Coolants (spent machine)
- Chemical agents - paint and adhesives etc.
- HVAC gases – 2 units in UCA Building and other minor units
- SF6 in circuit breakers

Wastes arising during decommissioning will be managed in accordance with Condition 8 of IE Licence Reg. No. P0577-03.

2.5.2 Surplus Materials

The power station's stores holds a variety of coded items that are used in operations and maintenance activities. The coding system provides for stock control. Most items are of no environmental significance.

With the scaling down of activities since conversion to CCGT operation, the actual quantities of materials held is much reduced on previous stocks. A further staged reduction in inventory will continue towards shut-down and stocks will likely be much less prior to closure.

Materials that are suitable will be removed for use at other ESB power stations. Otherwise they will be disposed of as waste.

2.5.3 Asbestos

Asbestos was not used in the construction or materials of Poolbeg CCGT plant and therefore removal/disposal should not be an issue during decommissioning. However asbestos has been found in a number of items in the CCGT over the last few years. The quantities are small any anything arising on decommissioning would be disposed of appropriately.

2.6 Environmental Incidents

The land on which the site is developed has a history of heavy industry and petroleum based operations. The principal accidents and incidents of environmental significance that have occurred at Poolbeg since being commissioned are as follows:

Table 2-5 - Incident History at Poolbeg

Year	Incident Description
Incident 1 1985	A test tank overflowed causing a spillage of several tonnes of HFO within the oil farm
Incident 2 1989	A valve failed and approximately 50 t of HFO was spilled within the oil farm
Incident 3 1997	A coupling failed on a HFO pipeline within the oil farm, resulting in the spillage of 20 t of HFO

All of the above incidents were followed by appropriate clean-up work and there is no ongoing impact on station lands. Such incidents will be prevented in the future as HFO is not used in the CCGT.

2.7 Compliance Record & Long-term Liabilities

Environmental incidents and complaints are reported in the Annual Environmental Reports (AERs) for Poolbeg Generating Station and via the stations environmental management system (EMS). Incidents are also reported though the online EPA Alder Web Portal system.

There has been no recorded uncontained spillage of chemicals at Poolbeg.

The environmental monitoring programme conducted at Poolbeg is in accordance with the requirements of Condition 6 of IE Licence Reg. No. 577-03. Monitoring is designed to identify any impacts associated with operation of the station so as to allow effective remedial action or minimise environmental pollution.

Given the current knowledge concerning the long-term environmental liability associated with the site and that full compliance with IE Licence Reg. No. 577-03 will ensure that additional liability

will be avoided, a significant soil and groundwater programme at station decommissioning is not anticipated. Groundwater monitoring and a groundwater data assessment by URS in December 2010 concluded that the "*overall potential risk to the identified receptor (Dublin Bay) is not considered significant*". Possible sources of fluctuation in BOD, COD, coliforms and PAH were identified as fill material underlying the site and up gradient off site sources such as the DCC waste water treatment plant (WWTP).

3 Decommissioning Management Plan

This section is focussed on the DMP aspects for the licensed activity.

3.1 Basis of DMP

The basis of the DMP is as follows:

- A review of the activities, including processes and services.
- Identification of existing and potential hazards, including evaluation of materials consumed and wastes generated.
- Consideration of historic environmental incidents and remediation works undertaken.
- Identification of items of plant and other materials that may be decommissioned, rendered safe or removed from the site for disposal or recovery in the event of closure.
- Identification of locations where cleaning, decontamination or remediation works may be required in the event of decommissioning to prevent environmental pollution.

The DMP includes the decommissioning and decontamination of all of the above and below ground structures and the management and safe removal of any residuals arising as a result of decommissioning.

3.2 Tasks and Programme

The purpose of the process is to ensure that the site no longer poses a risk of environmental pollution.

ESB intends to manage and execute the DMP using internal resources, supplemented as necessary and appropriate with external resources. All external resources used for cleaning, waste collection and disposal, etc. will be fully approved and licensed as appropriate.

A dedicated project team will manage and execute the entire project and key activities will be supervised by personnel with appropriate experience and expertise. Only suitably qualified personnel will carry out decontamination works.

Options that will be available with regard to various residuals are broadly as follows:

- Reuse: Removal for reuse at other ESB power station(s).
  Return to supplier
- Recovery / Recycling: Sale to third-party
- Disposal: Disposal as waste

Waste sent off-site for recovery / recycling or disposal will only be conveyed to a permitted waste contractor and only transported from the station to the site of recovery / disposal in a manner that will not adversely affect the environment.

3.2.1 Activities

The activities undertaken as part of the DMP will be as follows:

- Cessation of all production
- Cancellation of all incoming deliveries of materials
- Termination of all contracts other than those that are concerned with the DMP or related to safety of personnel or the environment
- Return of materials to suppliers where possible, for resale or reuse
- Isolation and purging of transfer lines from bulk storage to direct pipe contents back to bulk storage
- Shutting and blanking of supply lines from bulk storage for oils and chemicals to intermediate storage and/or dilution tanks
- Cleaning and blanking off of fuel lines
- Removal of all laboratory chemicals
- Cleaning and decontamination of laboratory analytical instruments
- Cleaning and decontamination of all plant and equipment
- Cleaning, decontamination and inspection of bunds, sumps and underground drains
- Removal of old and obsolete equipment and destocking of the workshops and stores
- Isolation and disconnection of all electrical supplies to pumps and motors
- Draining of oil from transformers that will not be reused elsewhere
- Draining and cleaning of lube oil systems
- Disposal of ion exchange resins
- Draining of water systems such as raw feedwater tanks, condensate storage tanks and supplementary cooling systems
- Maintenance of parts of the water supply system to provide wash-down and cleaning facilities during decommissioning and to meet the ongoing needs for fire protection and sanitary services
- Maintenance of site drainage system and oil interceptors during decommissioning activities

- Secure archiving of all relevant documentation including drawings, instrumentation diagrams, validation documentation, vendor manuals and data, project files, maintenance records, inspection records and other appropriate documentation
- Maintenance of a security presence on site on a 24-hour basis, as necessary, for ongoing monitoring of the site from a safety, fire protection and environmental perspective
- Maintenance of defined site access procedures.

It is anticipated that any necessary decontamination of plant and equipment will be carried out on site. It will primarily involve cleaning in place and power washing of internal and external surfaces.

ESB will seek approval from the Agency for any decontamination procedures and monitoring requirements to be employed.

3.2.2 Decommissioned Thermal Station

3.2.2.1 Plant Decommissioned

The conventional thermal generation plant at Poolbeg Station closed in March 2010 and significant decommissioning activities were undertaken since then. Completed plant decommissioned include the following:

- Unit 1: BBC steam turbine and sambre-fives boiler
- Unit 2: BBC steam turbine and sambre-fives boiler
- Unit 3: Alstom steam turbine and MAN boiler
- Laboratory:
    - The station laboratory is closed and chemicals are removed
    - All laboratory analytical instruments have been cleaned, decontaminated and not in use
- Common plant:
    - Water treatment plant
    - Cooling Water System, bandscreens
    - Natural gas piping system
    - Heavy fuel oil system
    - A and B chimneys
    - Administration building

- Maintenance workshops
- LPG tank and piping
- Unit 3 lift
- Diesel Generators

- Facilities
  - Offices, meeting rooms, locker rooms, showers and toilets
  - Main canteen
  - Cooling water pumphouse crane
  - Engine room cantilever cranes
  - Lifts
  - Electrical workshop
  - Instrumentation workshop

- HFO tanks (5 tanks, 140,000 t in total) have been leased to NORA.
- All oils and coolants associated with conventional thermal units have been removed from site. Some transformers still remain either operational or kept as spares
- Oil drained from some Thermal station transformers not in use and either disposed appropriately of or stored by ESB Networks for reuse

All waste created during the decommissioning of any of the plant was disposed of appropriately by approved waste contractors.

3.2.2.2 Materials and Plant transferred to Poolbeg CCGT

Items of plant and buildings remaining in service and transferred to Poolbeg's CCGT plant include:

- Fire pumps
- Townswater pumps
- Laboratory
- Lube oil store

3.2.3 Residual Liquid Fuel, Tankage and Pipelines

Drains in the areas where these facilities are located will be isolated before commencement of decommissioning activity.

Heavy Fuel Oil (HFO)

The station's storage capacity for heavy fuel oil stands at 140,000, comprising four tanks each of 25,000 t capacity and one of 40,000 t capacity. These have been decommissioned and emptied, although not cleaned. The HFO farm has been leased to NORA since February 2016.

Tanks are of fixed roof welded mild steel construction with man-made mineral fibre (MMMF) and aluminium cladding insulation. A programme of inspections of oil tanks, which includes out-of-service inspections and NDT, is undertaken in accordance with an ESB in-house standard that specifies requirements for intervals of 5, 10 and 15 years for all above ground fuel oil tanks. There have been no recorded losses of tank contents indicative of leakage through a tank base. Furthermore, where panels within tanks have been replaced their condition was not such as to indicate that leakage had occurred. The tanks are thus expected to be in good condition at the time of decommissioning.

All pipelines and tanks were drained using on-site pumps to 'loss of suction' to minimise the remaining HFO residues within tanks and pipework.

Tankage: The most effective method for cleaning of tanks will be to absorb residues by scrubbing / flushing. The dissolved liquid will then be pumped to a tanker for treatment and re-separation and the tank will be jet washed with water / detergent to remove remaining residues. The tanks would then be suitable for removal for clean scrapping. The tanks have not been cleaned as yet since the tank farm may continue to be leased to NORA.

***Pipelines*:** Where necessary, pipework will be cleaned by a variety of methods including an in-situ pneumatic pipe cleaner / scourer machine (a 'pig'), retro-jetting with water, flushing with water or kerosene, or high-pressure air flushing. At this stage of cleaning the pipework will be in an acceptable state for either retention on site or removal for clean scrapping.

All cleaning activities will be facilitated by maintaining the steam heating system for all pipes and tanks to supply steam to aid the flow and removal of oil.

Gasoil

The gasoil tanks have been leased to NORA, they will be upgraded to tertiary containment and supply the station with gasoil as a back up fuel.

Storage of gasoil comprises two 7,000 t capacity storage tanks within a concrete bund. There have been no recorded losses of tank contents indicative of leakage through the tank bases. These tanks will remain in use to support the secondary fuel requirements for the CCGT plant.

The maximum quantity of diesel will be used or removed prior to the cessation of power generation so that the minimum quantity of unused diesel remains on site.

Similar decommissioning methods to those used for HFO facilities will be used for tankage and pipelines containing gasoil.

Diesel

The station's storage of diesel consists of a number of small tanks.

The maximum quantity of diesel will be used prior to the cessation of power generation so that the minimum quantity of unused diesel remains on site.

Similar methods to those used for HFO facilities will be used for tankage and pipelines containing diesel.

3.2.4 Residual Chemicals and Tankage

The main bulk chemicals used at the station and that will be addressed in decommissioning or closure are as follows:

- Hydrazine (N_2H_2): Hydrazine was used as an oxygen scavenger in boiler feed water, but this practice has been discontinued and the hydrazine tank emptied. The tank may be used in future as a second ammonia storage vessel.
- Ammonia (NH_3): Used to increase the pH of feedwater.
- Hydrochloric Acid (HCl): Used in electrochlorination plant.
- Sodium Hydroxide (NaOH): Used in water treatment plant.
- Sulphuric Acid (H_2SO_4): Used in water treatment plant.
- Brine Caustic (NaOH/NaCl): Used in water treatment plant.

Stocks of the chemicals consumed in operation of the power station will be run down to a minimum at the cessation of power generation. Remaining bulk quantities of chemicals will then be available for either transfer to other ESB power station(s), return to their supplier or disposal by contractors at licensed facilities.

Further to this, bulk storage tanks will be cleaned internally by contractors.

In addition to bulk storage, stocks of some chemicals are held in carboys or intermediate bulk containers (IBCs), which are delivered and replaced as required by the supplier. These include ammonia and hydrochloric acid.

All remaining carboys and IBCs will be removed. Decommissioning will include internal cleaning of delivery pipelines.

With wet chemistry carried out in the station laboratory being substantially eliminated by the use of modern instrumentation, remaining stocks of laboratory chemicals that require disposal will be low.

3.2.5 Boilers

A decision on station closure would likely be proceeded by a period where all or some of the station boilers are in storage. Dry storage is currently the preferred method and if this is in use no environmental emissions will result during decommissioning.

Cleaning of HRSGs in the CCGT element of the plant does not arise as they are not oil-fired boilers.

3.2.6 Drainage Line Cleaning

The discharges, whose designations below are those used in IE Licence Reg. No. 577-03, that are of concern are as follows:

- SW1 – Condenser cooling water to Lower Liffey Estuary via station drain
- SW3 - Water treatment plant neutralisation tank effluent to Lower Liffey Estuary via cooling water outfall
- SW7 - Boiler blowdown for CCGT (B14) to Lower Liffey Estuary via cooling water outfall
- SW8 - Boiler blowdown for CCGT (B15) to Lower Liffey Estuary via cooling water outfall
- SW9 – Storm water emissions
- SW11 – Screen wash water to Lower Liffey Estuary via cooling water pumphouse

Protection by oil interceptors is provided as appropriate and there is no potential for impact upon the Estuary if the drainage system is left in place after decommissioning. However, cleaning of station drains will be required to mitigate the potential for oil residues to be present within pipelines.

This will involve cleaning down the drainage system using water jetting, utilising the existing oil interceptor system and vacuum tankers. Thermal station oil interceptors have already been cleaned down and all waste and effluent removed for appropriate disposal. No areas of heavy or free product oil residues that would require steam cleaning are expected. On completion of decommissioning the site drainage will be in a suitable condition for removal or more likely to be left in place to continue to provide surface water drainage for the site.

The station will continue to properly operate and maintain the site drainage system prior to and during implementation of the DMP.

3.2.7 Tanks and Sumps

Notable tanks and sumps within the station are as follows:

- Turbine lubrication oil tanks – there is a separate lube oil tank associated with the steam turbine and with each combustion turbine.
- Boiler blowdown tanks – boiler blowdowns are discharged to tanks to reduce pressure prior to entering drains.
- Water treatment neutralisation sump - alternate acidic and basic waste streams, which arise in regeneration of ion exchange resins, are collected in the WTP neutralisation sump.

All waste will be removed from the above for appropriate disposal and tanks, sumps and associated pipework cleaned down and decommissioned.

3.3 Restoration and Aftercare Management

Site restoration and aftercare management plans are required in the case of landfill and mining facilities and where there is evidence of soil and groundwater contamination or there have been spills in the past. In such instances, facilities will be required to undertake some level of soil and groundwater investigation and risk assessment and when contamination is detected, there will be site remediation requirements. The purpose of remediation is to restore the soil and groundwater to a state that does not pose a risk to the environment. This process will include a suitable contaminated land risk assessment, which will provide recommendations and a programme of measures.

The general process for the development of a site restoration and/or remediation proposal typically involves the following steps:

- Audit of the site to identify potential sources of contamination and likelihood of occurrence.
- Soil and groundwater investigation.
- Qualitative contaminated land risk assessment and conceptual site model.
- Quantitative contaminated land risk assessment.
- Proposals for the restoration of the site through remediation.
- Agreement of the proposal with the EPA.

This scenario is not currently anticipated at Poolbeg Generating Station.

Current knowledge concerning the long-term environmental liability associated with the site and full compliance with IE Licence Reg. No. P0577-03 is expected to ensure that any additional

liabilities will be avoided. The limited scale and nature of ongoing operations is such that the possibility of significant environmental incidents occurring is very low.

While a need for aftercare management at Poolbeg is not currently foreseen, should the need arise as a result of some future contamination event, the DMP will be revised accordingly as part of its annual update for the AER. However, a contingency allowance is made for a three-year period following closure.

4 Costing

4.1 Implementation of DMP

The estimated costs associated with the implementation of the DMP are presented in Table 4.1.

Table 4-1 - Activities and Cost Estimates, Poolbeg CCGT Station DMP

Item	Description	Activity	Cost Estimate	Source
Plant Decommissioning 60 days				
Cleaning contractor – plant decontamination (1 supervisor)	€400 per day	Appropriate cleaning	€24,000	EPA Unit Rates
Cleaning contractor – building (3 general operatives)	€1,600 per day	Appropriate cleaning	€96,000	
Cleaning contractor – tank decontamination (jet vacuum road tanker, 2–3 general operatives)	€1,600 per day	Appropriate cleaning	€96,000	
Other Costs	Cleaning and removal of chemical and other residues	Appropriate cleaning	€50,000	
Demolition	Any demolition works required to be carried out in order to remove any risk of environmental pollution and/or return the site to a satisfactory state €20.00 per m3		€50,000	
Sub-total:			**€316,000**	
Oils Removal, Recovery, Decontamination, Decommissioning				
Distillate Storage	2 x 7,000 t Tanks	Appropriate cleaning	€140,000	EPA Unit Rates
GT15 / GT14 / ST16 lube oil lube oil	42 m3	Appropriate cleaning	€60,000	
Diesel Day Tank	10 m3	Appropriate cleaning	€60,000	
Sub-total:			**€260,000**	
Site Investigations				
Trial Pits	10		€1,000	EPA Unit Rates
Consultancy Fees	10 days		€8,000	
Monitoring well drilling & installation			€30,000	
Sub-total:			**€39,000**	
Environmental monitoring				

Consultancy Fees	10		€8,000	
Soil & solid (sampling & Analysis)		10 Samples	€1,500	
Surface water monitoring as per IE Licence		100 Samples	€15,000	
Groundwater monitoring as per IE Licence		100 Samples	€15,000	EPA unit Rates
Sub-total:			**€39,500**	
Site Clean-up				
Minor contaminated land with no long-term liabilities / Ground-staining	Cleaning of ground-staining near decommissioned stacks	Appropriate clean up	€60,000	EPA unit Rates
Waste disposal	Soils Non Hazardous	Haulage and Disposal	€10,000	EPA unit Rates
Waste disposal	Soils Hazardous	Haulage and Disposal	€30,000	EPA unit Rates
Sub-total:			**€100,000**	
Waste disposal (Not including Chemicals and Oils)				
Hazardous	WEEE, Other solid wastes, Solvents, filters, contaminated drums, lubricating oils, transformer oils and coolants etc	30 tonnes at €800	€24,000	EPA unit Rates
	Batteries, smoke detectors, chemical paints & additives,	10 tonnes at €800	€8,000	EPA unit Rates
Non Hazardous / Inert	Metal, Carboard, Food, Municipal Waste,	250 tonnes at €80	€20,000	EPA unit Rates
Sub-total:			**€52,000**	
Recycling of Chemicals				
Caustic Soda Liquor (NaOH)	30,000 l	Internal cleaning (€500)	€15,000	
Sulphuric Acid (H2SO4)	25,000 l	Internal cleaning (€500)	€12,500	
Brine/Caustic Solution 24%NaCl/5%NaOH	32,000 l	Internal cleaning (€500)	€16,000	
Ammonia(NH3)	1.6 m3	Internal cleaning (€500)	€1,000	
Sodium Hypochlorite Solution	38m3	Internal cleaning (€500)	€19,000	EPA unit Rates
Sub-Total:			**€63,500**	

Asbestos Survey and Removal if required				
Asbestos Survey			€3,000	
Asbestos Removal	100 tonnes at €300		€30,000	EPA unit Rates
Sub-Total:			**€33,000**	
Drainage Line and Oil Interceptor Cleaning				
All surface discharges - fully or partly comprise trade effluents	Underground pipework	Water jetting using oil interceptor system and vacuum tankers.	€50,000	EPA unit Rates
Disposal of cleaning waste	Underground pipework	Disposal of contaminated water from cleaning	€10,000	
Sub-Total:			**€60,000**	
Management/Administration/Security/Consultants/Insurance				
Management		Annual Management Cost	€280,706	
Administration		Annual Administration cost	€71,604	
Consultants		Annual Consultants Costs	€334,152	
Security		Annual Security Personnel Costs	€454,272	
Security Accommodation		Annual Security Accommodation Costs	€36,400	
Site Accommodation including running costs		Annual accommodation running costs, including water, electricity, fuel.	€315,380	
Insurance		Annual Insurance Costs	€104,000	EPA unit Rates
Sub-Total Annual Management, Admin, Security, Consultants / Insurance / Utilities (3 months)			**€399,129**	
Total Poolbeg CCGT Power Station Closure Cost			**€1,362,129**	
Contingency (10%)			**€136,213**	
Total including Contingency			**€1,498,341**	

4.2 Aftercare Costs

As stated, no aftercare requirement is currently foreseen. On a contingency basis an allowance of €25,000 is made.

The costs for closure and restoration / aftercare have been adjusted to provide for inflation at a rate of 2.5% per annum as shown in Table 4.2.

Table 4-2 - Cost Adjustment for Inflation (Rate 2.5%)

Activity	Cost Estimate
Cost Year 0	€1,498,341
Aftercare Year 1	€25,625
Aftercare Year 2	€26,266
Aftercare Year 3	€26,922
TOTAL	**€1,577,154**

4.3 Financial Provision

ESB has a very significant working capital and any decommissioning or closure of Poolbeg Generating Station would evidently be a well-resourced activity. The company has adequate resources of finance and manpower to implement the DMP through to completion.

More significantly, ESB makes specific financial provision for closure of its power stations and this is outlined in the company's annual accounts. The provision for actual demolition costs amount to €36M for station closures. ESB makes specific financial provision for closure of its power stations and the provision at 31 December 2016 for closure of generating stations including Marina Generating Station was €180.0 million and actual provision for demolition was €36 million. The company has successfully decommissioned a number of power stations, many of which have included ash landfilling activities.

This provision represents the present value of the current estimate of the costs of closure of the stations, including Poolbeg Generating Station, at the end of their useful lives.

The estimated costs of closing stations are recognised in full at the outset of the asset life, but discounted to present values using a risk free rate. The costs are capitalised in property, plant and equipment and are depreciated over the useful economic lives of the stations to which they relate. The costs are reviewed each year and amended as appropriate.

Since the costs are capitalised and initially provided on a discounted basis, the provision is increased each year by a financing change. This is calculated based on the provision balance and is included in ESB's profit and loss account. In this way the provision equals the estimated closure costs.

Further to the above, the site of Poolbeg Generating Station has considerable potential for redevelopment following closure.

5 Plan Implementation

5.1 Criteria for Successful Closure

The following criteria have been established to set the benchmark for the successful closure of the site.

- Plant safely decontaminated using standard procedures and authorised contractors;
- Wastes handled, packaged, stored and disposed or recovered in a manner which complies with regulatory requirements;
- Relevant records relating to waste and materials management retained throughout the closure process;
- No soil or groundwater contamination at the site verified using monitoring data and a soil and groundwater assessment at the time of closure (if required);
- Hazard and/or risk of environmental pollution addressed and the EPA is satisfied that the site is returned to a satisfactory state;
- Sufficient funds available to cover the full cost of closure; and
- Environmental management system in place and actively implemented during the closure period.

5.2 Nuisance Mitigation

Works that are carried out in connection with or associated with the DMP have the potential to lead to elevated noise levels and to creation of dust. Additional traffic movements will also arise. The following mitigation measures are proposed:

Noise

All works will be carried out during daylight hours and noise levels will be monitored to ensure compliance with the requirements set out in IE Licence No. P0577-03. Noise minimisation measures will be employed. These will include such measures as using saw-cutting machinery instead of rock breaking equipment.

Dust

Surfaces that have the potential to generate dust during their decommissioning will be wetted prior to the work commencing. Activities that have the potential to create dust will be avoided on windy days to the extent possible.

Traffic

While traffic will arise in the removal from site of residuals, this will coincide with the elimination of current sources of traffic associated with station operations. It is considered that the demolition related traffic will not pose undue difficulties.

5.3 Closure Plan Validation

5.3.1 Monitoring

The monitoring and reporting requirements set out in IE Licence N° P0577-03 will be complied with in full until the licence is surrendered to the Agency. The monitoring will identify if any contamination of air, surface water, groundwater or soils has occurred during the lifetime of the IE Licence.

In the event that a future environmental incident causes contamination of these media, which has not been quantified at the time of the closure of the facility, a test programme will be established as part of the DMP to identify the nature and scale of any associated environmental pollution.

Tests will be carried out on wash waters generated during the decontamination works to confirm that they are suitable for discharge.

5.3.2 Validation Report

Following implementation of the DMP, a validation audit will be carried out and a validation report will be produced to demonstrate its successful implementation. It will confirm that there is no continuing risk of pollution to the environment from the site.

The Report will address:

- Disposal of materials.
- Decontamination of items of plant and equipment.
- Decommissioning of plant and equipment.
- Results of monitoring and testing.
- The need for ongoing monitoring and investigations.

The qualification and experience of the auditor will be provided and agreed with the EPA prior to the validation commencing. The scope of the validation audit will be agreed in advance with the EPA. The completed validation audit report will be submitted to the EPA for approval.

5.4 Environmental Summary Report

In addition to the above validation, in line with ESB's policy in relation to closure of its power stations, a full environmental summary report will be prepared. This will outline the following:

- The full history of Poolbeg Generating Station site from its initial development through to closure.
- The various investigations undertaken and reports prepared during the operation of the plant

- The actions taken in the course of the DMP.

The Environmental Summary Report will be made available to future users of the site, whether this is ESB or a third party.

5.5 Update & Review

Condition 10.2.2 of Licence Reg. No. P0577-03 requires as follows:

> *The plan shall be reviewed annually and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the agreement of the Agency.*

The operator commits to reviewing the closure plan on an annual basis and updating to reflect any significant alterations on site.

The DMP will be updated as necessary, particularly taking into account any environmental incidents at Poolbeg Generating Station that could lead to long-term liabilities at the station site.

Appendix A – 3D Site Map