



Energy for  
generations

# Poolbeg Industrial Emissions Licence Review

Electricity Supply Board

## Attachment-4-8-1-Operational Report

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## 1 Introduction

This document is the Operational Report to support the Poolbeg Generating Station Industrial Emissions (IE) Licence Review.

The Poolbeg Generating Station site is located along the eastern end of the Poolbeg peninsula in East Dublin, County Dublin, to the south of the River Liffey estuary at Dublin Bay, see Location Plans as follows:

- QP-000038-03-D460-002-001-000 – Poolbeg Generating Station Site Location Map (1 of 2) (rev 1).
- QP-000038-03-D460-002-002-000 – Poolbeg Generating Station Site Location Map (2 of 2) (rev 1).

The station covers approximately 18.6 hectares (ha). The existing Poolbeg Generating Station site comprises a variety of brownfield areas. A significant portion of the western part of the site is occupied by buildings associated with 1970s conventional thermal units which have been decommissioned.

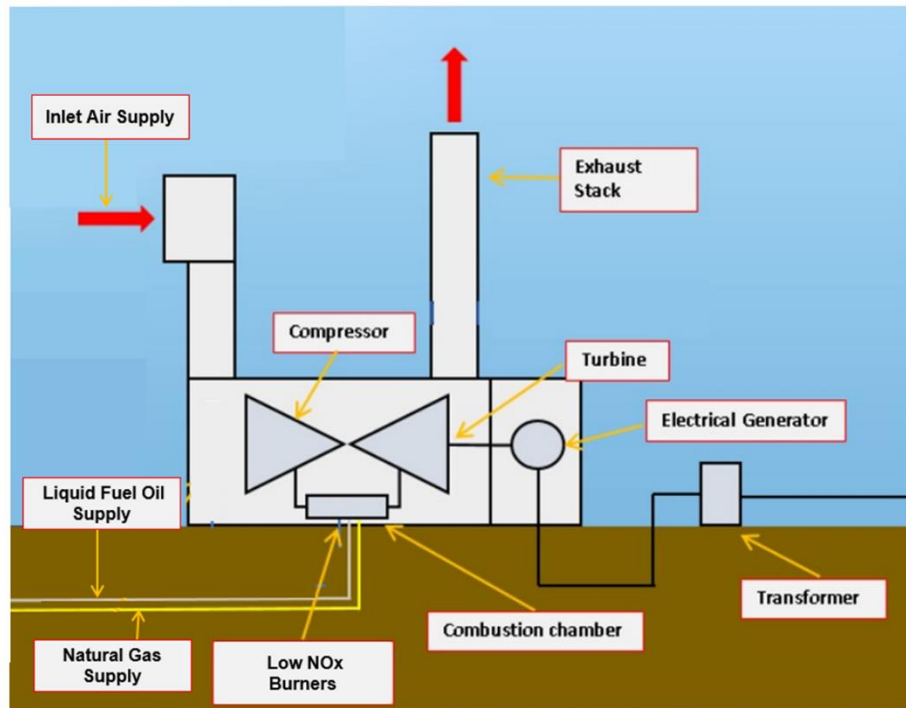
Poolbeg Combined Cycle Gas Turbine (CCGT) was granted planning permission in 1992, the station has operated as a combined cycled since 1999. The two gas turbines, CT14 and CT15 were commissioned in 1998 and 1994 respectively.

Permission is currently being sought by ESB who hold the Industrial Emissions (IE) licence (EPA Reg. No. P0577-04), for Poolbeg Generating Station for an additional 299 MWe (electrical output) Open Cycle Gas Turbine (OCGT) for the generation of electricity to be referenced as '**Poolbeg OCGT**'.

## 2 Proposed OCGT

### 2.1 Description of OCGT

The proposed OCGT consists of a gas turbine enclosure and generator enclosure being installed within a building. A simple schematic of the main process at the site is provided below (figure 1). Note, the schematic drawing is not to scale and is for illustrative purposes only.



**Figure 1: Schematic of Open Cycle Gas Turbine Unit**

The OCGT provides fast, efficient and reliable power, either operating on natural gas as the primary fuel or gas oil as a back-up fuel. The OCGT provide additional generation to the grid in periods when the demand for electricity is high, such as adverse weather conditions, or when another base load generation plant is not available or insufficient, or there is grid instability. The plant will help to ensure stability and security to the Irish electricity supply and will provide response capabilities in a timely fashion to support sudden fluctuations in electricity demand. These fluctuations are anticipated to be more frequent due to the increased amount of renewable generation on the network.

The electricity generated will be fed to the site transformer where the voltage is stepped up for transmission into the national grid. This transmission will be via connection to an existing 220kV Substation within the Poolbeg Generating Station complex.

The OCGT will be available to operate 24-hours per day, seven days per week. However, the operational period for the plant will be non-continuous. It is expected the plant will operate during peak demand periods during the hours of the day when electrical demand is at its highest.

Poolbeg OCGT will normally be unmanned and will be remotely operated. Regular site visits and inspections will take place to ensure the plant is appropriately managed and maintained. It will contain a protection system and control system for operating the units along with a switchgear enclosure.

The plant will be primarily fuelled with natural gas. Gas oil will be available as an emergency back-up fuel, in accordance with the Commission for Regulation of Utilities (CRU) secondary fuel requirement for 72 hours of fuel availability.

The 299 MWe OCGT development is proposed to be located immediately west of the existing CCGT, within the existing 18.6 hectare (ha) Poolbeg Generating Station site. The OCGT development site will generally comprise the following key elements:

- The compound (c. 2.5 hectare (ha) secure compound).
- One (1) F-Class OCGT generator in a packaged enclosure.
- Gas turbine generator auxiliaries, including a Continuous Emissions Monitoring System (CEMS) hut, water wash cart, lube oil skid, fin fan coolers, liquid fuel forwarding skid, and fire suppression cabinet.
- One (1) exhaust stack complete with access ladders/stairways and platforms.
- Associated electrical infrastructure and modules including transformers and other plant.
- Control, electrical and building services modules.
- Electrical connection at 220 kV to an existing Substation within the ESB Poolbeg Generating Station complex.
- Connection to the existing Gas Networks Ireland (GNI) Above Ground Installation (AGI) located to the south of the Poolbeg Generating Station (outside the IEL boundary).
- Associated gas supply equipment.
- Water supply.
- Fire-fighting systems.
- Gas oil (diesel) treatment facility.
- Welfare and car parking facilities.
- All necessary ancillary works.

The key elements are the gas turbine package and the associated exhaust stack.

## 2.2 Process Overview – OCGT

The process at the proposed OCGT will be the combustion of natural gas (primary fuel) in an F-Class OCGT that drives a generator to produce electricity. The OCGT utilises the Brayton Cycle, using the following simple steps:

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1. Air at atmospheric pressure enters a gas turbine compressor and is compressed to increase its pressure and temperature.
2. Natural gas (or gas oil) is added to the combustor and the combination of high-pressure air and gas is ignited.
3. The resulting gases produced are expanded across the gas turbine, in-turn, driving it.
4. The gas turbine drives an electrical generator to produce electricity. The electricity generated will be stepped up by a transformer for transmission into the national grid.
5. The products of the combustion process are discharged to atmosphere via the exhaust stack.

The OCGT can also operate on gas oil (back up fuel) in the case of loss of natural gas. It is predicted that the back-up fuel will only be used in emergency situations, wherein there is a disruption to the supply of natural gas. It should be noted that periodic testing will be required to ensure that the system remains functional.

The main components of the OCGT unit are:

- A single gas turbine and generator
- Air intake filter house
- Gas turbine inlet air compressor
- Gas turbine combustor
- Gas turbine blades and housing
- Generator
- Gas Turbine enclosure
- Vent air outlet
- Bleed valve plenum
- Exhaust stack
- Auxiliaries comprising the following:
  - Lube Oil skid
  - Fin fan coolers
  - Liquid Fuel forwarding skid
  - Fire suppression cabinet
  - Water wash cart
  - Gas reducing building
  - Gas compressor and associated cooling fans
  - Continuous Emissions Monitoring System (CEMS)
  - Liquid fuel treatment area
  - Firefighting pump house
  - Gas supply
  - Emergency diesel/gas oil generator
  - Electrical equipment module
  - Plant control module
  - Plant C&I and communications module
  - Main step-up, unit and house transformers
  - Demineralised water tank
  - Raw/fire water tank

- Welfare facilities building
- Storage container

## 2.3 Description of Associated Systems – OCGT

### 2.3.1 Gas Turbine Oil Systems

Closed loop oil systems will be used for lubricating and cooling the gas turbine and associated turbine plant equipment. These systems are currently subject to detailed design.

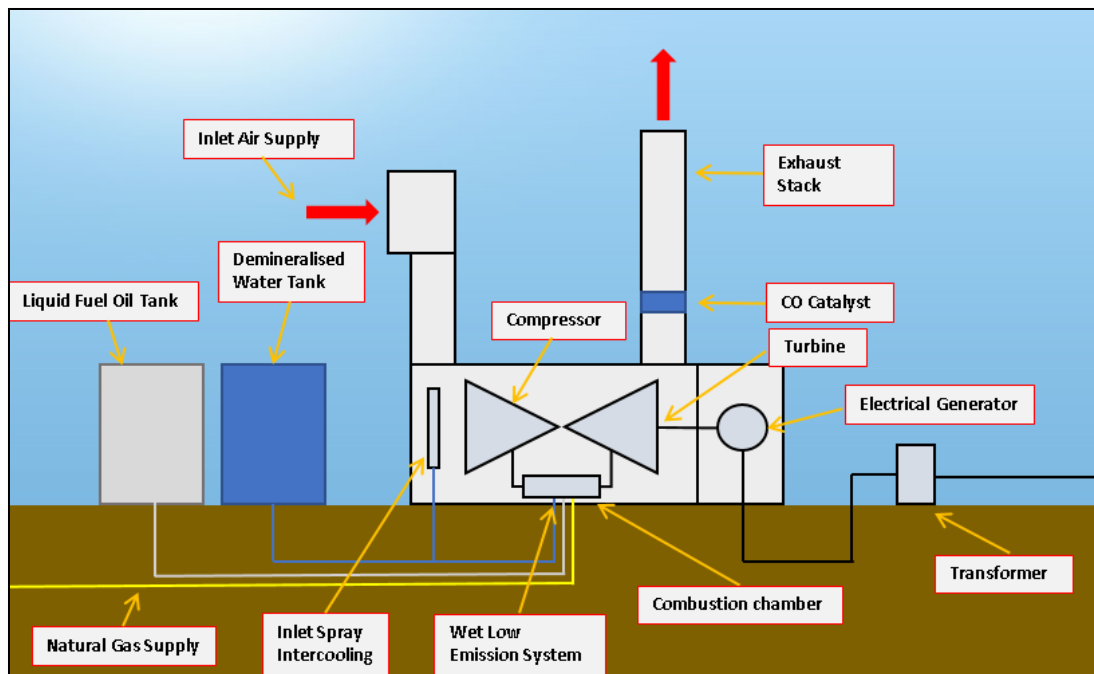
### 2.3.2 Water Treatment Plant

A dedicated water treatment plant is not being provided for the proposed OCGT. Demineralised water will be provided by the existing WTP serving the CCGT.

## 3 Licensed FlexGen

### 3.1 Description of FlexGen

The licensed OCGT consists of a gas turbine enclosure and generator enclosure being installed within a building. A simple schematic of the main process at the site is provided below (figure 2). Note, the schematic drawing is not to scale and is for illustrative purposes only.



**Figure 2: Schematic of FlexGen gas turbine**

The 65 MWe FlexGen development is located in a secure FlexGen development site within the existing 18.6 hectare (ha) Poolbeg Generating Station site. The FlexGen development comprises the following key elements:

- The compound (c. 1.5 hectare (ha) secure compound).
- One (1) modular aero derivative gas turbine generator in a packaged enclosure.
- Gas turbine generator auxiliaries, including a Continuous Emissions Monitoring System (CEMS) hut, water wash cart, lube oil skid, fin fan coolers, liquid fuel forwarding skid, water injection skid enclosure, and fire suppression cabinet.
- One (1) exhaust stack complete with integrated CO catalyst for emissions control and access ladders/stairways and platforms.
- Associated electrical infrastructure and modules including transformers and other plant.
- Electrical connection to an existing 220 kV Substation within the Poolbeg Generating Station site.
- Control, electrical and building services modules.
- Associated gas supply equipment including a gas receiving and metering station, pressure regulation and compression equipment.
- Water supply, storage and treatment.
- Fire-fighting systems.
- 1 day gas oil storage tank and pump building.
- Welfare and car parking facilities.
- All necessary ancillary works.

The key elements are the gas turbine package and the associated exhaust stack. Connections to external services and networks including gas, electricity and water.

The plant will be primarily fuelled with natural gas. Gas oil will be available as an emergency back-up fuel, in accordance with the Commission for Regulation of Utilities (CRU) secondary fuel requirement for 72 hours of fuel storage.

The FlexGen aviation-derived engine can start-up quickly, typically needing to be online in less than 5 minutes. FlexGen, along with the proposed OCGT, will help to ensure stability and security to the Irish electricity supply and will provide response capabilities in a timely fashion to support sudden fluctuations in electricity demand.

### 3.2 Process Overview – FlexGen

The process at the Poolbeg FlexGen plant will be the combustion of natural gas (primary fuel) in a modular aero derivative turbine that drives a generator to produce electricity. The aero derivative gas turbine also utilises the Brayton Cycle, described under Section 2.2 above.

The Flexgen aeroderivative gas turbine is fitted with Inlet Spray Intercooling (ISI) technology which increases the performance of the gas turbine, particularly when ambient temperatures are high.

Additionally, FlexGen is fitted with Wet Low Emissions (WLE) technology which helps to control and lower the NO<sub>x</sub> emissions emitted by the plant. The WLE technology

works by injecting demineralised water into the combustor, which lowers the flame temperature, ultimately reducing NO<sub>x</sub> emissions.

In the event of a loss of the fuel gas supply and a system electrical emergency, the aero derivative gas turbine can operate on gas oil if the system requires it, due to shortage of supply.

### 3.3 Description of Associated Systems – FlexGen

#### 3.3.1 Gas Turbine Oil Systems

Systems are required for cooling and lubricating the gas turbine and associated turbine plant equipment. The gas turbine lube oil system provides synthetic turbine oil to cool and lubricate the gas turbine's gearboxes and bearings through an on-engine driven pump.

Other systems present include the hydraulic oil system, which delivers synthetic hydraulic oil to operate valves and actuators. Additionally, an Electric Start Motor (ESM) cooling system is present which supplies synthetic oil to the ESM for lubrication of bearings and cooling of the rotor and armature during the engine start cycle.

The three systems described above are closed loop and share one common synthetic oil reservoir. A water-cooled plate heat exchange is installed which cools oil scavenged from the engine bearings and the ESM. To ensure no oil vapour is released to atmosphere, a separator is mounted to the top of the oil reservoir. Oil recovered from the separator will be returned to the reservoir, while clean air is vented to atmosphere.

Additionally, a mineral lube oil system is present for the lubrication and cooling of the generator. This system is supplied from a separate dedicated mineral oil tank. It is fitted with its own dedicated water-cooled heat exchanger to cool the mineral oil, an oil heater for low ambient temperatures and an oil extractor to ensure no vapour is vented to atmosphere. An emergency pump is included, which will supply oil to the bearings in the event of a complete loss of power.

#### 3.3.2 Water Treatment Plant

As outlined above in Section 3.2, demineralised water is required for the ISI and the WLE systems. The demineralised water will be stored in a single tank of 12 m in height with a capacity of 1,500 m<sup>3</sup> which will facilitate 72 hours of demineralised consumption.

The demineralised water treatment plant is a typical Reverse Osmosis (RO) and Electro-deionisation (EDI) demineralisation system consisting of the following process stages:

- Biocide Dosing System - To reduce biological activity and fouling.
- Pre-filters - To remove particulates to a level of 150 µm.
- Ultrafiltration (UF) System - To remove fine particulates from the raw water.
- Anti-Scalant Dosing System - To reduce scale formation on the RO membranes.

- Reverse Osmosis System - Removes dissolved solids from the treated river water.
- Electro-deionisation System - To remove any remaining dissolved solids not already removed.
- Effluent Neutralisation System - Collects and neutralises all wastes that are not of a pH suitable for disposal to surface water network (sulphuric acid and caustic soda).
- Membrane Cleaning Systems – to clean the membranes.
- Typical Associated Chemicals - Ferric chloride, sodium hypochlorite, sodium bisulphate, citric acid.

During operation, the RO and EDI equipment will continuously produce concentrated reject wastewater containing dissolved solids removed from the Irish water supply. The treatment plant equipment must be backwashed and/or cleaned in place periodically. This washing/cleaning and flushing of the UF, RO and EDI results in additional wastewater streams from the demineralized water treatment plant. The clean in place and backwashing of the UF, RO and EDI typically take place every 3-6 months depending on the quality of the water taken in by the system.

The continuous reject stream and the washing/cleaning wastewater streams will be directed to the FlexGen surface water drainage system. During operation, RO reject stream flow to the surface water system will be approx. 6.5 m<sup>3</sup>/hr. While the maximum periodic discharge will occur during UF backwash and is estimated to be 30 m<sup>3</sup>/hr.

## 4 Existing CCGT

### 4.1 Description of CCGT

The existing Combined Cycle Gas Turbine (CCGT) plant is made up of two gas turbines of 155 MWe each, and a steam turbine of 170 MWe, a total capacity of 480 MWe. The CCGT plant utilises the following main process:

1. Fuel, either natural gas or gas oil (in emergencies), is fired in the gas turbines.
2. The products of combustion are used to heat compressed air.
3. The heated compressed air and products of combustion are used to drive the gas turbines, each of which, in turn, drives an electrical generator.
4. The exhaust gas is passed to a heat recovery steam generator (HRSG) to generate steam and is then discharged to atmosphere.
5. The steam produced in the HRSG drives a steam turbine which in turn, drives an electricity generator.
6. Steam from the turbine is condensed using estuarine cooling water and recirculated to the HRSG.

The main components of the CCGT are:

- Two gas turbines with generators.

- Two heat recovery steam generators.
- Steam turbine and generator.
- Condenser.
- Water treatment plant.
- Gas oil storage (now managed by NORA – outside IEL boundary) and gas supply.
- Cooling water system with chlorination.
- Auxiliary boiler.

CCGT efficiency is approximately 51%, this is the percentage of chemical energy of the fuel which is converted to electricity energy. The remaining energy is dissipated to the environment, largely to cooling water from the Liffey estuary and in small amounts through heat loss in combustion gases and from plant surfaces.

The contents of the operational report are based on CCGT, but it should be noted that in the future ESB could potentially run this plant on an OCGT basis.

## 4.2 Process Description –CCGT

### 1. Fuel Combustion

Combustion takes place in a gas turbine, which constitutes the first part of the combined cycle. Combustion is the process by which the chemical energy stored in the fuel is converted to heat energy.

### 2. Combustion Air Supply and Compression

In a gas turbine, air is used in a mixture with the products of combustion, also as the working fluid to be expanded in the turbine. As a working fluid to be expanded, it must first be raised to a high level of pressure. This is done in an air compressor. Air is taken from the outside atmosphere where it is coldest and most dense. Since the air is to be used also as a working fluid, a great deal more air is supplied to the turbine than is needed for combustion alone.

The air is passed through banks of filters to remove dust particles in the air, which would damage the surfaces of the compressor and turbine blades. It is compressed to a very high pressure by a multi-stage compressor driven by the shaft of the gas turbine.

The compressed air is delivered to two sets of eight burners; each set placed above one of a pair of combustion chambers, one on each side of the gas turbine.

### 3. Fuel Conditioning, Supply, and Ignition

Natural gas fuel is injected under its own controlled delivery pressure from the high-pressure gas pipeline.

Gas oil which is available as a back-up emergency fuel is imported from storage tanks in the adjacent tank farm which is managed by the National Oil Reserve Agency (NORA). Gas oil is only fired in emergency circumstances or for testing purposes.

At full load, each gas turbine consumes about 45,000 m<sup>3</sup>/hour of natural gas and 39 tonnes/hour of gas oil. Both fuels can be burned simultaneously but, as with all gas oil burning, this would be exceptional.

Fuel is injected to the burners, mixed with the air and ignited in the combustion chambers. The addition of heat energy released in the combustion of the fuel, raises the temperature of the air and products of combustion to approximately 1,060°C.

#### **4. Air/Flue Gas Expansion**

After combustion, the heated compressed air and flue gas enters the turbine directly from the combustion chambers. The work done on the turbine by the expansion of the gases drives the compressor, delivering the air and the generator to produce electricity. The expanded air/flue gas mixture leaves the turbine at a high temperature of about 530°C.

The gas is fully expanded at this stage and can do no more work on the gas turbine. It could be expelled to atmosphere at this point, allowing the fairly high-grade heat be dissipated in the atmosphere. A separate stack/chimney on each gas turbine, known as a bypass chimney, is provided for this purpose at emission points, A1-7 and A1-8, for the two gas turbines. The gas turbine is then said to be operating in open cycle mode.

The heat contained in the gases can be used in a boiler to produce steam, which can then be used to drive a steam turbine. The steam turbine constitutes the second part of the combined cycle.

#### **5. Steam Generation**

The high-temperature exhaust flue gas and air mixture of each gas turbine is sent to a heat recovery steam generator (HRSG). Essentially, this is a boiler of the drum variety, but without fans, air heaters or burners (as in a conventional boiler) as the hot products of combustion have already been produced by combustion in the gas turbine, where they have already carried out considerable work of electricity generation. Steam is generated, separated from the water and superheated.

In order to best utilise the limited heat available post gas turbine, there are two separate water/steam circuits in each HRSG. Each circuit has its own economiser, evaporator, drum and superheater stages. One circuit is known as the high-pressure (HP), the other as the low-pressure (LP) circuit. By separating the boiler water in two circuits at different pressures, and so with different boiling points, the moderately hot flue gas is enabled to produce a reasonable amount of superheated steam for expansion in the steam turbine.

The flue gases are then discharged to atmosphere at a temperature of about 100°C at emission points, A1-5 and A1-6 for the two gas turbines.

#### **6. Steam Expansion**

The steam from both HRSGs is sent to a single steam turbine. The steam turbine is made of just two cylinders, the High Pressure (HP) and the Low Pressure (LP). The high-pressure steam expands through the HP cylinder and then on through the LP cylinder. The low-pressure steam expands only through the LP cylinder, by joining with the partially expanded HP steam after it leaves the HP cylinder.

### **7. Steam Reheating**

No provision is made for reheating, as this is not justified given the limited energy supply.

### **8. Steam Condensation**

The total steam flow exhausts to the condenser where it is condensed by cooling water from the estuary. The cooling water is discharged to the estuary from emission point, SW1. Condensate is pumped from the condenser using a pair of extraction pumps.

### **9. Feedwater Preheating**

No feedheaters are provided other than a contact-type heater used for deaeration, which is only used if needed, as cycle conditions do not justify it.

For gas oil operation, a condensate preheater is provided. In this preheater, hot water is taken from the HP economiser and passed over tubes containing the condensate. The cooled water from the preheater is added to the main condensate flow under its own pressure. This is done to ensure the condensate to the economiser is hot enough to avoid cooling flue gas to the acid dew point when burning distillate. It has no efficiency benefits as a feedheater.

### **10. Feedwater Conditioning**

The condensate is, deoxygenated, and deaerated only if necessary. To prevent corrosion in the HRSGs, pH > 9.5 must be maintained. This is achieved by injecting dilute ammonia (< 1%) into the condensate, ammonia is stored in a bunded chemical tank and diluted to the required concentration in a bunded boiler dosage room.

### **11. Working Fluid Pressurisation**

Condensate is pumped by the extraction pumps both to the LP circuit of both HRSGs, and to the feedwater tank, via the deaerator if oxygen levels have not been sufficiently reduced in the condenser, or otherwise, directly to the feedwater tank. From the feedwater tank a pair of boiler feed pumps, pumps the water to the HP circuit of both HRSGs. In this way, the water in the LP and HP circuits of both HRSGs is pressurised to allow the steam generated from it to be available again as a working fluid for expansion in the turbine.

### **12. Boiler Drum Blowdown and Further Alkalisiation**

This takes place in both drums of both HRSGs. The feedwater contains traces of impurities which are normally at low concentration in the feedwater. These impurities become more concentrated in the drum since most of the soluble impurities will not be carried over in the evaporated steam. These impurities will build up to a level at which they could be carried over in steam. The impurity levels are quantified by

conductivity measurement on the drums. When the conductivity measurements reach a certain level a drain on either a HP or LP drum is opened to release water carrying the concentrated impurities, this is known as blowdown. The blowdown frequency depends on the water treatment quality or if a cooling water leak occurred. The water is blown down to emission points, SW7 and SW8, and is then discharged to the cooling water outfall.

Ammonia injected into the condensate for the purpose of alkalising condensate pH to minimise corrosion is carried over in the steam separated in the drums of the HRSGs. The water in the drums and evaporator circuit may need further alkalisation depending on the level and type of impurities in the drums. Alkalisation of the drum/evaporator circuit is achieved by occasional injection of small amounts of caustic soda (sodium hydroxide, NaOH) to the drum as indicated by online pH measurement.

### **13. Electricity Generation**

The steam turbine, driven by expansion of the steam from both HRSGs, generated by the exhaust gas heat from both gas turbines, in turn drives an air-cooled generator to produce electricity.

## **4.3 Description of Associated Systems – CCGT**

### **4.3.1 Water Treatment Plant**

Make up water to the water/steam cycle is taken from the mains water supply via an on-site water treatment plant, where it is filtered and de-ionised before storage in Reserve Feedwater Tanks for use in the boilers and auxiliary cooling systems.

The water treatment plant includes the following:

- 2 organic scavengers, including one brine tank for regeneration.
- 2 ion exchange streams, each consisting of one cation unit followed by an anion unit.
- A mixed bed unit which operates on one stream only.
- Regeneration equipment.
- Storage tanks for mains (raw) water and treated (deionised) water.
- Effluent neutralisation tank and pumps.

Organic scavengers are regenerated using alkaline brine. Cation and anion exchange resins are regenerated using sulphuric acid and sodium hydroxide solutions respectively. Mixed beds are regenerated using both sulphuric acid and sodium hydroxide. Effluent from the regeneration process is neutralised in a holding tank to a pH of between 6 and 9 before discharge at Emission Point, SW3.

A control and instrumentation system provides for the complete automatic control of the water treatment system. Regeneration is carried out under the control of station employees. Instrumentation includes rate-of-flow meters, pressure and differential pressure gauges, pH meters, analysers (including silica analyser) and conductivity meters.

Ion exchange resins are replaced after several years when their efficiency is reduced.

### 4.3.2 Cooling Water (CW) System

Cooling water, taken for the River Liffey, is required continuously when the CCGT plant is running, primarily for the removal to the environment of the low-grade, unavailable heat. It is also used for the much more minor cooling of auxiliary cooling water (ACW) systems, which, in turn, cool various secondary plant items.

The CCGT has a cooling water pumphouse, cooling water flows through fixed, coarse inlet screens. Rotatable fine screens are then used to prevent smaller flotsam entering the cooling water system. The collected material is washed periodically from the screens and collected in a basket. The wash water is returned to the estuary.

The cooling water is pumped via culverts to the condensers. The main cooling water flows pass through the condenser tubes, cooling the steam exhausting from the steam turbines. Parallel flows cool the closed auxiliary cooling water circuits. The total water flows, having been raised in temperature by up to 14°C, then flows to the discharge channel where it returns to the Liffey (Emission Point SW1). The discharge channel runs northwards for 200 m before turning eastwards and discharging to the estuary.

The CW tubes of the condensers and ACW coolers are maintained free of silt and slime which would seriously reduce the efficiency of the heat exchange process, by the use of recirculating sponge balls. These are pumped into the CW flow and pass, under the pressure of the CW through the tubes, scouring them clean. They are separated from the CW at the outlet side of the condenser, by screens and reused.

### 4.3.3 Cooling Water Chlorination

The cooling water, drawn from the estuary, is chlorinated to control biological fouling and damage to the condensers, principally by mussels, which thrive in the conditions encountered in cooling water systems. Sodium hypochlorite solution is produced by electrochlorination and injected into the cooling water intake. The systems produce a dosage of up to 1 ppm active chlorine in the cooling water. It is used continuously while the cooling water systems are in operation. The plants consist of transformers, rectifiers, electrochlorinator cells, filters, pumps, acid cleaning systems, cooling systems and injection control systems. In addition, all associated vessels, pipes, valves, fittings, signals and alarms are provided.

Sodium Hypochlorite solution is injected into the cooling water pump chambers after the cooling water intake gates. During normal operation sodium hypochlorite dosage is modulated to achieve a residual chlorine content of not more than 0.1 mg/L at the outlet of the cooling water system. The system is designed for completely automatic operation during normal operation of the plant.

After a few weeks, deposits of hydroxides and carbonates from seawater hardness form on the electrolyser cathodes. These are removed by dilute hydrochloric acid in a manually controlled operation. The acid is reused for several cleaning cycles until the concentration is down to approximately 2.5 –3% by weight.

Exhausted acid solution is neutralised in a bunded storage tank with sodium hydroxide solution until the pH is in the range 6 to 9. The neutralised waste in the tank is collected and disposed via an approved waste contractor.

#### 4.3.4 Auxiliary Cooling Water Circuits

Auxiliary cooling water (ACW) systems are used to cool auxiliary plant items. The systems are topped up against small losses with de-ionised water. The ACW of each unit circulates in a closed system, through heat exchangers on items to be cooled.

On the CCGT plant, the steam turbine and HRSGs' ACW circuit is cooled using estuarine cooling water from the main CW system. The gas turbines ACW circuit is cooled by circulating the water through finned tubes and ambient air is drawn over them using fans. Ethylene glycol is added as an anti-freezing agent for the gas turbine ACW circuits. Ammonia is added to maintain a high pH in the steam turbine and HRSG ACW systems to prevent corrosion.

#### 4.3.5 Turbine Lubricating Oil System

The oil for turbine, generator and exciter bearing lubrication and cooling is circulated by electrically driven pumps. It is cooled using ACW to avoid the possibility of oil getting into the main cooling water discharge in the event of a heat exchanger leak.

The oil tanks are vented using fans, which expel moisture and some oil vapour to the atmosphere. The oil is purified of contaminants such as water and grits, by filters and centrifugation.

#### 4.3.6 Generator Cooling

The three generators of the CCGT plant are air-cooled.

#### 4.3.7 Electrical Transformers and Transmission

The voltage at which electricity is generated is unsuitable for long distance transmission. On CCGT generators the voltage is 10.5 kV on the gas turbines and 15.75 kV on the steam turbine. In both cases it is raised to 220 kV. This is achieved by a generator transformer located outside the turbine building, which raises the voltage to 220 kV. As with all energy conversion, this results in some loss of energy. The lost energy degrades to heat, that lowest grade form, to which all energy forms decay. The heat is dissipated to atmosphere in oil-filled radiators fitted with cooling fans for use in warmer weather. The oil circulates by natural convection caused by heating and cooling, through the body of the transformer and out to the vertically mounted radiators. On the gas turbine transformers there are also oil pumps to assist this circulation, which only start in the event of high temperature.

The electrical output of the main generator transformers is switched to underground, pressurised, oil-filled transmission cables in high-voltage switchgear, insulated by SF6 gas.

Unit and house transformers are used to step the voltage down to 6.6 kV and 380 V respectively for use within the power plant.

All transformers are banded according to best practice against the highly unlikely event of oil leakage. Transformer bands are inspected and tested as per EPA Guidelines and IE licence requirements.

#### 4.3.8 Control and Instrumentation

A complete control and instrumentation system is provided to achieve effective control and monitoring of the plant and of its individual components. Operations are centralised in a single control room. This system is referred to as the Distributed Control System (DCS).

On the CCGT, the gas turbines and the steam turbines along with the HRSG are controlled by individual Turbine Control Systems (TCS) and are capable of controlling the units independently or as a combined cycle unit under the DCS.

The DCS provides the operator with all necessary information on plant status. Plant operations, alarms and events are recorded and stored in specialised storage solutions. Alarms advise the operator of impending faults so that appropriate action can be taken quickly. Any condition that may cause injury or risk to life or damage to plant, trips the relevant plant to a safe condition.

#### 4.3.9 Fire Protection System

Fixed firefighting systems are provided to protect against the main fire risks (lubricating oil, natural gas, transformers, etc.). A hydrant and landing valve system, covering both indoor and outdoor locations, is provided together with an automatic deluge system. These are supplied by electrical and diesel fire pumps, housed in a dedicated fire pumphouse. Mains water is stored in tanks to supply the pumps. A fire-detection, alarm and control system covering all fire risk areas is provided. Portable fire extinguishers are widely distributed for use around the plant.

#### 4.3.10 Laboratory Activities

Laboratory activities involve analysis for operational and environmental monitoring. For operational control, samples from the steam/water circuit are analysed to ensure adequate purity to prevent corrosion. Environmental sampling and monitoring takes place on the aqueous streams as required and analysed for parameters such as residual chlorine. The quantity of chemicals stored and used in the lab is very small with the majority of environmental samples being submitted to certified 18025 external laboratories for analysis.

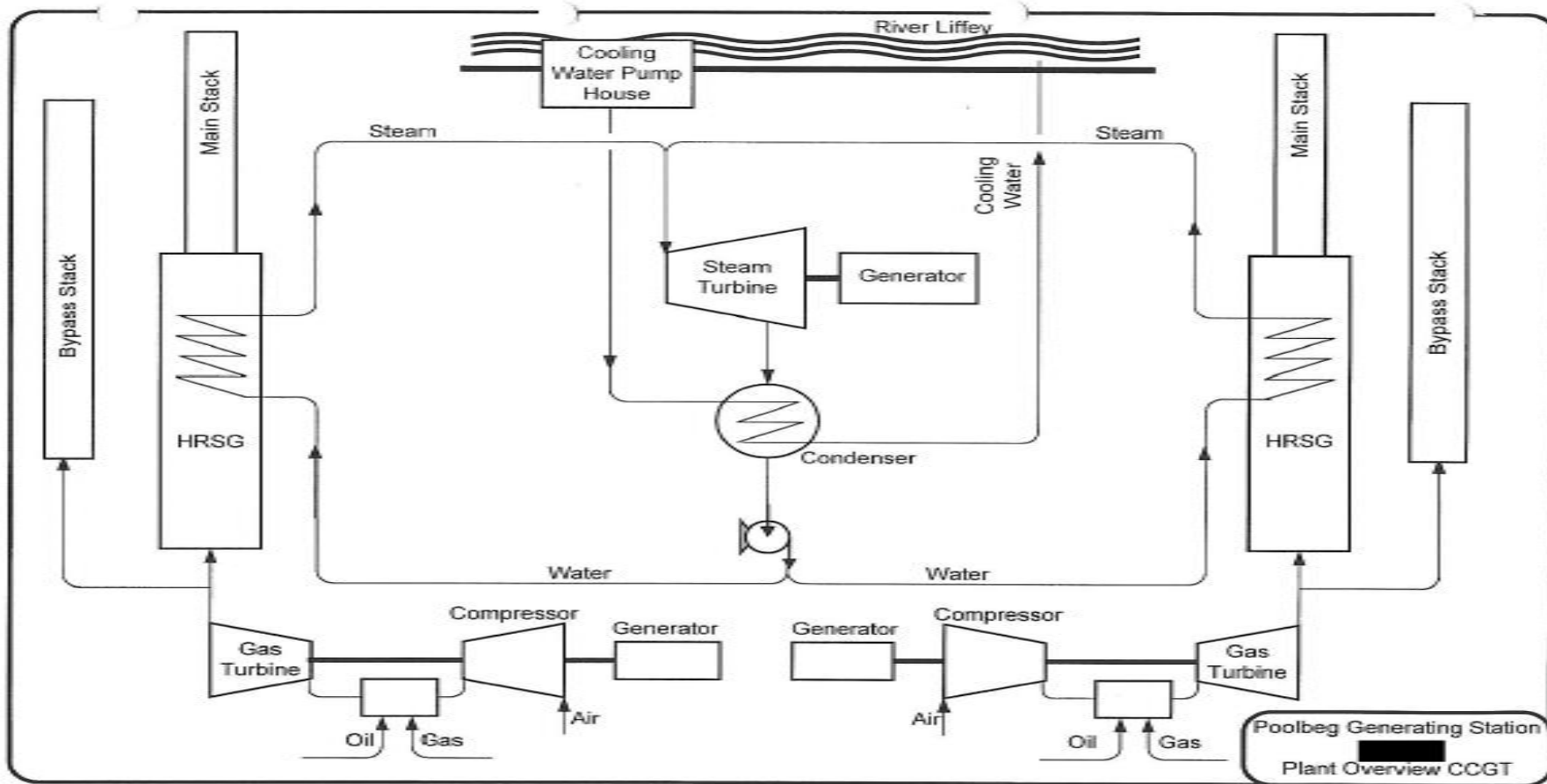


Figure 3 – CCGT Plant Overview

## 5 Battery Energy Storage System (BESS)

### 5.1 Description of BESS

The 75 MW BESS development is located in a secure compound within the installation boundary.

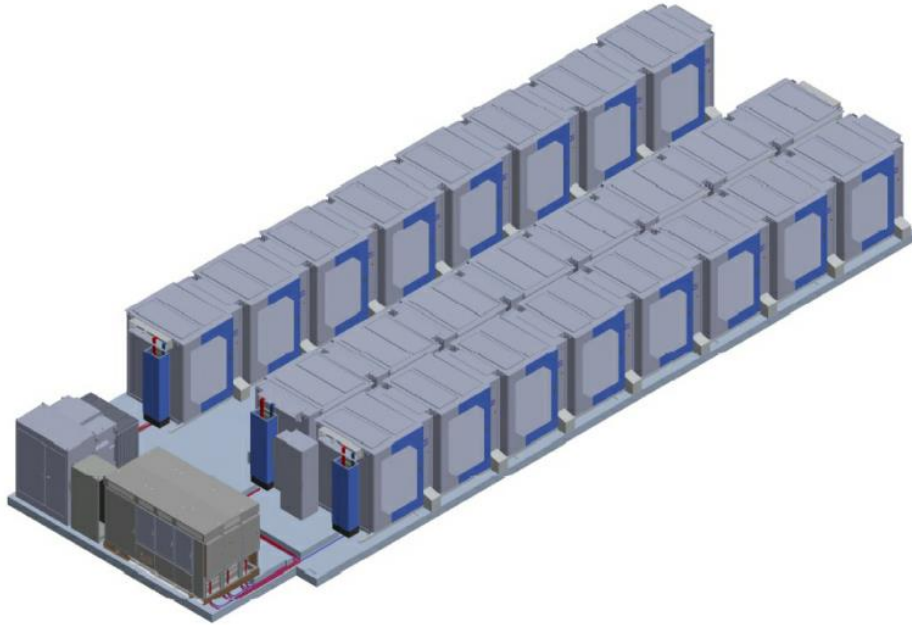
The BESS compound is approximately 5.3 Ha. To the north is the 'South Wall' of Dublin Bay and the Liffey estuary; to the south is an internal site road with an existing transformer building and an area of open landscaped ground; to the east is the decommissioned Poolbeg Power Station and to the west is the disused Pigeon House Power Station.

The BESS development site comprises the following key elements:

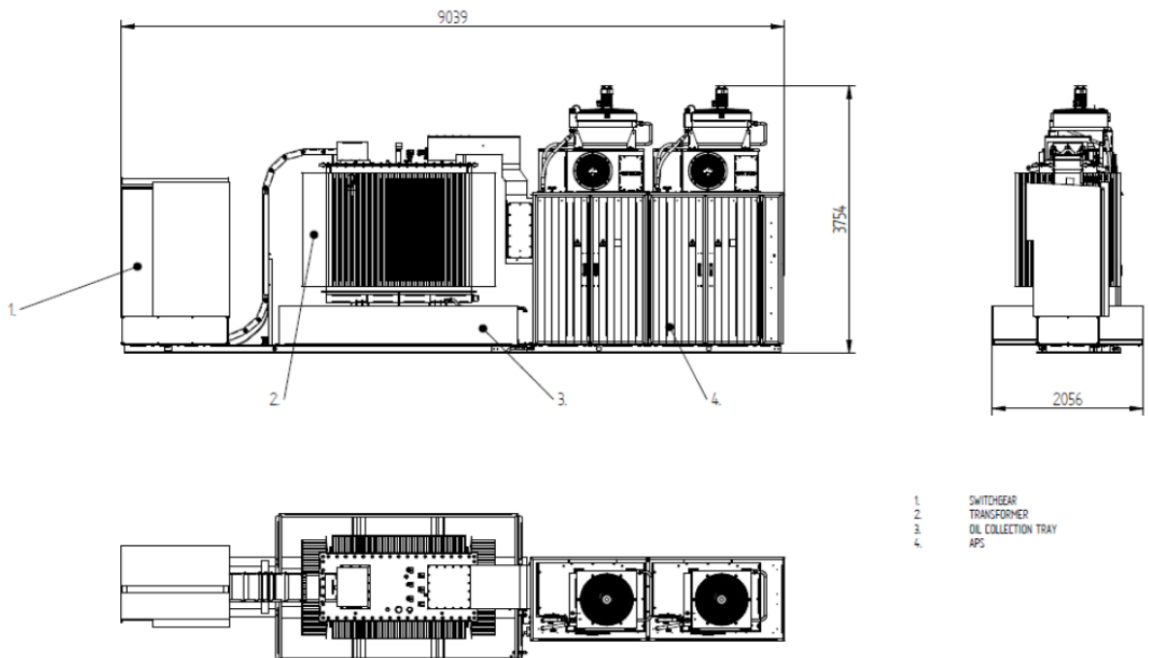
- Electrical cables and connections to existing substation infrastructure within the overall ESB Poolbeg Generating Station facility.
- BESS 'GEN6 – GRIDSTACK' cubes in 18 No. cores with associated battery inverters (up to 18No.).
- Supporting electrical infrastructure including house transformer, auxiliary supply transformer, VAR support and other electrical plant items.
- Control building.
- Lighting mast, security camera and SCADA pole.
- 33 kV export cable to the ganging transformer at the FlexGen site to the west.
- 220 kV grid connection cable (non-oil filled) from the ganging transformer arrangement at the Flexgen site to an onsite 220 kV Substation.
- All necessary ancillary works including drainage, attenuation and internal access roads.

The BESS units are modular and are arranged across the site with associated transformers and inverters. An example of typical BESS units are shown in the figures on the following page.

BESS operates in either a charging mode or a discharging mode. During discharging mode power from the batteries is converted from direct current to alternating current by an inverter. Power from all the batteries is stepped up through a transformer to a 33 kV busbar which then connects to a main transformer and from there an underground cable connects the facility to the grid. During charging mode, the process is reversed and electricity from the grid is fed into the batteries and the energy is stored.



**Figure 4: Rendered isometric view showing a typical core of the proposed BESS 'GEN 6 – GRIDSTACK' cube technology.**



**Figure 5: Plan, section and elevations showing the proposed battery inverters, transformers and ring main units. Note that these transformers contain oil and are fitted with an oil collection tray. This tray will drain into the remote containment tank which is equipped with pumped oil detection and interception.**

## 6 Operational Philosophy

It is envisioned that the operation of the proposed Poolbeg OCGT, FlexGen and BESS will be controlled remotely from a central location, which will be manned 24 hours a day, seven days a week. This remote location is planned to be ESB's Renewables Operations Control Centre. The local team will attend site on a scheduled basis to check the status of the equipment and site, and to perform routine maintenance activities. In addition, personnel will be available to attend site as the need arises. Remote operation of flexible generation plants such as that to be installed at Poolbeg is commonplace and is considered normal operating practise in the industry. Modern telecommunications systems are capable of allowing this type of plant to be monitored and dispatched efficiently and safely.

Each area will have advanced sensors, process monitoring and CCTV systems which will provide the remote operations teams with real-time plant data and site status. This connectivity will be enabled through secure telecommunications systems. These systems allow operators to plan and assess any maintenance requirements to ensure that the plants are available when required, as well as providing analysis of any deviations from normal operation. The remote operations teams will have the capability of mobilising personnel to site if the need arises.

Data from the systems monitoring the emissions and environmental aspects of the plants operation will be available to the remote operations team. This will include data from the Continuous Emissions Monitoring System (CEMS) and bund status. In the event of a fault on a gas turbine or other major plant items, the plant will be shut down automatically in a controlled manner. In addition, the remote team can manually shut-down the plant if the need arises.

The existing CCGT will continue to be operated locally from the stations control room.

The installation will be managed under an accredited Environmental and Safety Management Systems, which will be audited regularly by external auditors. Incident response, emergency and reporting procedures will be coordinated between the CCGT, FlexGen, BESS and proposed OCGT. A consolidated environmental report for all activities at the installation will be submitted to the Agency in the Annual Environmental Report.

## 7 Emissions

### 7.1 Emissions to Air

#### 7.1.1 Proposed OCGT

There is one new main emission to air associated with the proposed OCGT:

**A2-2: Exhaust Stack Emissions** – This emission point relates to the main stack, which is used for the combustion of either natural gas or gas oil.

The main OCGT air emission will be via the main stack (A2-2), which is approximately 40 m high.

The following controls/abatement system will be in place in relation to air emissions:

- Dry Low NO<sub>x</sub> burners.
- Periodic inspection and fault corrections.
- Continuous Emissions Monitoring Systems (CEMS) for online monitoring of the IE Licence.

### 7.1.2 Licensed FlexGen

There is one licenced point source discharges to air as follows:

**A2-1: Exhaust Stack Emissions** – This emission point relates to the main stack, which is used for the combustion of either natural gas or gas oil.

The main station air emissions will be via the main stack (A2-1), which is approximately 30 m high.

The following controls/abatement system will be in place in relation to air emissions:

- NO<sub>x</sub> emissions will be controlled through utilisation of a Wet Low Emissions (WLE) Combustor.
- A Catalyst to control CO emissions.
- Periodic inspection and fault corrections.
- CEMS for online monitoring of the IE Licence.

Details of Best Available Techniques (BAT) for the installation are included in Section 4.7 (BAT) of this IE Licence review application.

### 7.1.3 Existing CCGT

There are currently five licenced point source discharges to air are as follows:

- **A1-5: Exhaust from CT14 Heat Recovery Steam Generator (HRSG) Chimney Stack**
- **A1-6: Exhaust from CT15 HRSG Chimney Stack**
- **A1-7: CT14 Bypass Chimney Stack**
- **A1-8: CT15 Bypass Chimney Stack**
- **A4-1: Auxiliary Boiler**

The following controls/abatement system are in place in relation to CCGT air emissions:

- Low NO<sub>x</sub> (premix) combustion burners.
- Periodic tuning of plant during overhauls to maintain lowest practicable emissions during operation.
- Monitoring in line with IE Licence.
- Low sulphur gasoil, gasoil only used in grid system emergencies.
- CEMS for online monitoring of the IE Licence.

## 7.1.4 BESS

There are no air emissions associated with the operation of BESS.

## 7.1.5 Further Details on Emissions to Air

Details of Best Available Techniques (BAT) for the Poolbeg Station (proposed OCGT, licensed FlexGen and existing CCGT) are included in Attachments 4.7 (BAT) of this IE Licence review application.

The proposed ELVs for the main emission points are in accordance with the LCP CID<sup>1</sup>. Details are included in the following attachment:

See Attachment 7.4.1 Emissions to Atmosphere – Main and Fugitive Emissions.

The emissions to air points (main) are shown on the Map “Poolbeg Generating Station Site Plan 3 - Atmospheric Emissions (Main), QP-000038-03-D460-002-005-000 (rev 1)”.

Minor air emissions for the installation are included in the following attachment:

See Attachment 7.4.2 Emissions to Atmosphere – Minor and Potential.

It is also noted that the Poolbeg Generating Station operates in accordance with its Greenhouse Gas (GHG) Emission Permit No. IE-GHG160-10425-2 as issued by the EPA. A review of the GHG permit to include the FlexGen plant is currently being processed by the EPA. A further revision, or a separate new permit, will be required for the proposed OCGT.

## 7.2 Surface Water Emission

### 7.2.1 Proposed OCGT

There are no surface water emissions associated with the proposed OCGT.

### 7.2.2 Licensed FlexGen

There is one licensed surface water emissions associated with the FlexGen plant:

**SW14: Water Treatment Plant effluent** - The FlexGen plant uses demineralised water in the combustion chamber to reduce nitrogen oxide emissions. Demineralised

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<sup>1</sup> COMMISSION IMPLEMENTING DECISION (EU) 2021/2326 of 30 November 2021 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants

water required for the turbine operation will be produced in its dedicated onsite water treatment plant. This water is consumed at a rate of 26,000 litres per hour of operation. To produce 26,000 litres of demineralised water the plant will generate 9,000 litres of effluent. This will be discharged via SW14 in accordance with EPA Licence requirements.

There are no changes to the surface water ELVs proposed as part of this Licence review for SW14. The ELVs for this emission point remain as per Schedule B.2 Emissions to Water of the existing Licence and are as outlined in Attachment-7-2-Emissions-to-Surface-Water.

The following controls/abatement system are in place:

- Operation of the FlexGen plant will be according to BAT (Best Available Technology) principles and in compliance with the IE Licence for the site to ensure that releases to, and subsequent contamination of, soil and water environments does not occur during normal and/or emergency conditions (material spillage or fire event situations).
- The system will be configured so that no discharges outside the emission limits for pH can be discharged.
- Monitoring in line with IE Licence.

### 7.2.3 Existing CCGT

There are five licensed surface water emissions points associated with the CCGT (SW1, SW3, SW7, SW8 & SW11):

**SW1: Condenser Cooling Water** - This discharge is the return of heated cooling water. Cooling water is abstracted from the Liffey Estuary at the cooling water pump house. The cooling water is pumped via culverts to the condenser and is used to condense steam exhausting from the steam turbine. The cooling water then flows to a discharge channel where it returns to the Liffey. The discharge channel runs northwards for 200 m before turning eastwards and discharging to the Liffey Estuary. Sodium hypochlorite is used to treat the cooling water to prevent biological fouling of the condenser by mussels and other species.

**SW3: Water Treatment neutralisation tank** – Mains water supplied by Irish Water is treated to achieve high water purity by passing through ion exchange resins. These resins are regenerated with sulphuric acid, sodium hydroxide or caustic brine which results in alternate acidic and alkaline streams which must be treated for pH correction prior to discharge. The neutralisation tank is a large sump for collection of the acidic and basic wastes, the sump is used for mixing and storing the regeneration wastes where sulphuric acid and/or sodium hydroxide are added as required to neutralise the waste before controlled discharge to the cooling water system.

**SW7 and SW8: Boiler Blowdowns from HRSG 14 and HRSG 15** - Boiler blowdowns comprise discharges of high purity boiler water in which an accumulation of impurities has arisen. The blowdown is discharged to a tank to reduce pressure prior to entering drains, which in turn are discharged to the cooling water.

**SW11 - Screen Wash Water** - Screens are in place at the cooling water intake to prevent marine debris being taken into the cooling systems. The screens are automatically rotated occasionally to allow removal of debris that has accumulated on them. The frequency and duration of screen rotation depends on the extent of build-up of debris. Typical manual operation is once every eight hours for a period of 8 minutes. When the screens are in operation, they are washed with cooling water to remove the debris. The cooling water used in screen washing is not heated.

There are no changes to the surface water ELVs proposed as part of the licence review for SW1, SW3, SW7, SW8 & SW11. The ELVs for these emission points remain as per Schedule B.2 Emissions to Water of the existing Licence and are as outlined in Attachment-7-2-Emissions-to-Surface-Water.

The following controls/abatement systems are in place:

- WTP discharge controlled to pH 6 - 9.
- Boiler pH monitored and controlled to pH 6 -10. The boiler blowdowns (SW7 and SW8) are discharged to tanks to reduce pressure and temperature prior to discharge through the surface water system.
- Monitoring in line with IE Licence.

#### 7.2.4 Further details on Emissions to Surface Water

All emission points discharge to the River Liffey (Lower Liffey Estuary) as shown on Site Plan 2 Surface Water Emissions QP000038-03-D460-002-004-004 (rev2).

### 7.3 Storm Water Discharges

There are four existing storm water monitoring points at the installation. SW9 and SW12 are associated with the existing CCGT and SW13 and SW15 are associated with the licensed FlexGen and BESS assets.

Three additional storm water monitoring points are being proposed under this licence review associated with the OCGT (SW16) and the existing site (SW17 & SW18).

All storm water generated on site (with the exception of roofed and non-process areas) will discharge via a Class 1 Full Retention Oil Interceptor to the Liffey Estuary Lower waterbody.

### 7.4 Noise Emissions

A noise impact assessment has been carried out in line with guidance provided in Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) as published by the Environmental Protection Agency's Office of Environmental Enforcement.

Details of this assessment is contained in the EIAR submitted with this application

Attachment-6-3-1-2-EIAR December 2022\_Main, as follows: Chapter 11 Noise and Vibration.

Potential noise impacts from the installation are considered separately and in combination with the other nearby industrial sites. These include Dublin Bay Power,

Ringsend FlexGen, the Covanta Dublin Waste to Energy facility, Ringsend Wastewater Treatment Plant and the proposed Ringsend OCGT (subject to planning).

The operational noise impacts due to the installation when considered individually, demonstrate that the predicted noise levels at representative noise receptors in Dublin Bay area will be below the lowest criterion given in the NG4 guidance of 45 dB(A) Leq for the night-time. The noise levels are also below the criteria for daytime and evening of 55 dB(A) Leq and 50 dB(A) Leq respectively. Therefore, there is no potential significant adverse effect due to operational noise from the installation.

Cumulative impacts of predicted operational noise from the installation and the other licensed sites in the area were considered and the predicted noise levels at the representative noise receptors show that the combined level does not exceed the night-time criterion of 45 dB(A).

The modelling assessment indicates that the noise contribution from the proposed installation will meet the limits set out in NG4, and no mitigation will be required.

#### 7.4.1 Proposed OCGT

The following are the noise sources associated with the operation of the OCGT plant:

- Gas Turbine Generator
- Compressors
- Cooling Fans
- Transformers

For details in relation to noise emissions refer to licence application: Attachment 7.5 Noise Emissions.

#### **Noise Control:**

Noise emissions from the OCGT will be controlled as follows:

- The plant has been designed to ensure the impacts of noise have been minimised.
- Equipment will be inspected and maintained as per manufacturers requirements.
- The plant will be managed through the stations work management system.
- Nonessential activities will be avoided during night-time. Plant doors will be kept shut where possible to limit the noise impact on nearby dwellings.
- The gas turbine enclosure will provide noise attenuation for the gas turbine.
- Air intake silencer will be included in the combustion air inlet system of the gas turbine.
- Sound attenuation will be applied in other areas where required.
- Appropriate location of equipment and buildings – equipment where possible is stored internally to prevent noise emissions during operation.
- An EMS Procedure in relation to noise will be developed to include the proposed OCGT.

Abatement measures in relation to BAT are discussed in further detail in Attachment-4-7-1-LCP-CID.

### 7.4.2 Licensed FlexGen

The following are the noise sources associated with the operation of the Flexgen plant:

- Gas Turbine Generator
- Compressors
- Cooling Fans
- Transformers

For details in relation to noise emissions refer to licence application: Attachment 7.5 Noise Emissions.

#### **Noise Control:**

Noise emissions from the FlexGen will be controlled as follows:

- The plant has been designed to ensure the impacts of noise have been minimised.
- Equipment is inspected and maintained as per manufacturers requirements and is managed through the stations work management system.
- Nonessential activities are avoided during night-time. Plant doors are kept shut where possible to limit the noise impact on nearby dwellings.
- The gas turbine enclosure will provide noise attenuation for the gas turbine.
- Air intake silencer will be included in the combustion air inlet system of the gas turbine.
- Exhaust silencer and ductwork will be included in the exhaust stack.
- Sound attenuation will be applied in other areas where required.
- Appropriate location of equipment and buildings – equipment where possible is stored internally to prevent noise emissions during operation.
- An EMS Procedure in relation to Noise will be developed for the licensed FlexGen plant.

### 7.4.3 Existing CCGT

The CCGT plant is of modern design and specifically tailored to deliver a low level of noise emissions. As normal with gas turbine units the air inlet and the flue gas outlet are potentially significant noise sources. The air inlet is fed via a filter house and inlet silencer, which provides adequate attenuation of compressor noise, usually blade-passing frequency noise. The exhaust gas from the gas turbine passes through a mixed reactive-absorptive silencer designed to attenuate combustion-generated noise. Additional substantial attenuation is provided by the Heat Recovery Steam Generator from which the flue gas passes to the stack. The gas turbines and steam turbine are fully enclosed in noise attenuating packages designed to minimise noise breakout.

Transformer noise is minimised by design and by screening afforded by the mounding on site as well as blast walls provided for fire/safety protection on these units.

#### **Noise Control:**

Noise radiated from the various components of the plant are controlled as follows:

- Noise from the gas turbine inlets is controlled by inlet silencer/filter assemblies.
- Noise from the gas turbine outlets is controlled by in-line silencers and by the additional attenuation of the heat recovery boiler in the case of the CCGT plant.
- Both gas turbines are contained in noise attenuating enclosures.
- The heat recovery boilers are fully enclosed.
- Steam discharge noise in all plant is controlled by use of in-line silencers. This includes quick-start ejectors used for raising vacuum on start-up.
- Steam drains are fed to a boiler blowdown tank, which is equipped with a silencer.
- Boiler steam safety valve discharges are via silencers.

## 8 Raw Materials

### 8.1 Fuel Supply and Storage

Natural gas is the primary fuel for all plant at the Poolbeg Generating Station.

Natural Gas will be supplied to the OCGT, FlexGen and CCGT from the existing Gas Networks Ireland Above Ground Installation (AGI), located to the south of the site, outside the IE Licence boundary. A new gas pipeline from the AGI will be routed to the proposed OCGT site.

Natural gas is supplied from the gas transmission system, under pressure. It is reduced in pressure to a fixed level from which admission control valves regulate the rate of supply to the gas turbines.

A nitrogen purging system is used to remove gas from the pipelines for maintenance purposes. The nitrogen displaces the natural gas, contained in the pipework to atmosphere, in an infrequent operation.

### 8.2 Gas Oil Storage

#### 8.2.1 Proposed OCGT

Gas oil will be provided by NORA as required, from the adjacent NORA managed banded oil storage facility, located outside the installation boundary. Poolbeg HFO and gas oil farms are now under the control of NORA, since being removed from Poolbeg's IE licence boundary in 2020 (Refer to IE licence P0577-03 Technical Amendment C).

Gas Oil is pumped to the gas turbine injection pump via oil filters and from the injection pump on to the oil burners. The excess oil re-circulates back to the tank in the oil farm.

A small banded diesel tank (4 m<sup>3</sup>) will be installed on-site to supply the emergency

backup diesel generator.

### 8.2.2 Licensed FlexGen

Gas oil will also be supplied by NORA to the licensed FlexGen plant. However, in order to ensure security of supply the backup fuel, gas oil will also be stored in a single dedicated fuel oil day tank on the Poolbeg Flexgen site. The single dedicated fuel oil day tank will be bunded for environmental protection in accordance with requirements of the EPA's guidance note "*Storage and Transfer of Materials for Scheduled Activities 2004*". In order to fulfil the requirement for three days in accordance with CRU requirements, the remaining gas oil will be stored in the NORA gas oil tank farm adjacent to the installation (outside the Licence boundary).

The dedicated gas oil day tank (185 m<sup>3</sup>) is to be installed within a concrete bunded area. The fuels stored will be contained, managed and integrity tested as bulk storage.

Storm water drainage from the fuel oil system area is discharged through a Class 1 oil interceptor, prior to storage in an attenuation tank for controlled release.

### 8.2.3 Existing CCGT

Gas oil will be provided by NORA as required, from the adjacent NORA managed bunded oil storage facility, located outside the installation boundary.

Gas Oil is pumped to the gas turbine injection pump via oil filters and from the injection pump on to the oil burners. The excess oil re-circulates back to the tank in the oil farm.

A small bunded diesel tank is maintained on-site for the supply of diesel to the auxiliary boiler and diesel generator.

## 8.3 Chemical Storage

All hazardous substances on site will be controlled in accordance with Code of Practice for Chemical Agents Regulations 2016 and as per IE Licence requirements and ESB standards.

All bulk chemical and fuel tanks will be bunded, tested and inspected as per EPA guidelines and IE Licence requirements.

The details of process related raw materials, intermediates, products, etc., used or generated on the site are provided in Attachment-4-6-2-Raw-Material-Interm-Products. This includes the following materials and raw products.

- Natural Gas
- Gas oil
- Lubricating Oil Various
- Gas Turbine Aerosol Fire Protection
- Water Wash Drain Tank
- Water

- Ethylene Glycol Water
- Compressor Water Wash Chemicals
- Nitrogen Gas
- SF6 Circuit Breakers
- Propane

## 9 Water Use

### 9.1 Proposed OCGT

The proposed OCGT will not require water injection when firing on natural gas or gas oil.

Low quantities of demineralised water will be required for other process activities such as gas turbine wash cycles and the high-pressure purging water system.

The demineralised water will be supplied to the OCGT from the existing CCGT water treatment plant in Poolbeg.

The demineralised water on the OCGT site will be stored in one (1) dedicated storage tank (6,000 m<sup>3</sup>).

The remaining water demand for the proposed OCGT will be low. Potable water will be required for domestic purposes (drinking water, toilets, etc.) in the welfare facility. This will be provided from the existing CCGT mains water supply from Irish Water.

Potable water will also be required to fill the fire water/raw water tank (2650 m<sup>3</sup>). It is assumed as a conservative estimate that the tank may be filled once a year. The estimated volume of water required to accommodate the welfare facilities is approximately 11,000 litres per year.

The connection will be metered and shut off valves will be provided on the connection. All connection works will be carried out in accordance with the requirements of Dublin City Council and / or Irish Water.

### 9.2 Licensed FlexGen

The FlexGen site water requirements are as follows:

Raw water will be supplied by Irish Water to the FlexGen site from a new mains water supply connection.

A standalone water treatment plant will treat the raw water to an appropriate quality (demineralised) for use in the process. Demineralised water is required for the purpose of NO<sub>x</sub> (Nitrogen Oxide) control, using Wet Low Emission (WLE) technology and to increase efficiency using Inlet Spray Intercooling (ISI) technology.

The demineralised water on the Poolbeg FlexGen site will be stored in one (1) dedicated storage tank to facilitate sufficient storage for up to three days' supply.

The remaining water demand for the proposed FlexGen will be low, potable water will be required for domestic purposes (drinking water, toilets, etc.) in the welfare facility. This will be provided from the mains water supply connection from Irish Water.

The water demand for FlexGen will be predominantly associated with the demineralised water for the turbine. It is expected that the turbine will require 25,781 litres per hour of demineralised water (worst case running on natural gas). This would amount to demand for the turbine of 128,905 litres/day of demineralised water based on 5 hours of operation per day.

The demineralised water will be produced from potable water using an on-site water treatment plant. The water treatment plant will operate for approximately 8.4 hours per day and consume 22,000 litres per hour of potable water to produce the required daily amount of demineralised water. This equates to 184,150 litres per day of potable water.

Potable water will also be required to fill the fire water tank (2,000 m<sup>3</sup>). It is assumed as a conservative estimate that the tank may be filled once a year. Volumes associated with use of welfare facilities will be insignificant by comparison. The estimated annual total potable water demand for the FlexGen site is estimated to be 11,000 litres per year.

The connection will be metered and shut off valves will be provided on the connection. All connection works will be carried out in accordance with the requirements of Dublin City Council and / or Irish Water.

### 9.3 Existing CCGT

Water to supply the makeup needs of the existing HRSGs and for cooling and other purposes is drawn from the Irish Water, mains water.

In 2021, 53,593 m<sup>3</sup> of potable water was consumed on-site for both plant and domestic purposes.

### 9.4 BESS

A water supply is required to provide welfare facilities during periods of maintenance. Water demand will be low and is estimated at approximately 6,000 litres per year.

## 10Waste

All wastes including recyclable, non-hazardous and hazardous, will be managed offsite by a licensed waste contractor in accordance with the relevant waste legislation. Full detail of which are and will be reported in the Annual Environmental Reports (AERs).

Waste procedures are in place under the certified EMS for the station, see Section 8 Waste of this IE licence review application. Similar EMS procedures will be put in place for the OCGT, Flexgen and BESS. Waste reporting for all operations on Poolbeg site will be submitted as per the requirements of the IE Licence.

## 11 Other Process Waste Waters

Small volumes of wastewater will also be generated during maintenance operations such as the gas turbines wash cycles (approximately 6 m<sup>3</sup>/year). Wastewater from these processes will be collected in suitably designed holding tanks. The content of the holding tanks will be collected by a suitably licenced waste contractor in accordance with the Waste Management Act 1996, and associated regulations for disposal.

## 12 Main Alternatives

An assessment of alternatives has been provided in Chapter 2 of the EIAR submitted with this licence review application (see Attachment-6-3-1-2-EIAR December 2022\_Main).

## 13 Hours of Operation

Poolbeg Generating Station operates 24-hours per day, seven days per week, subject to availability, with the main activity on site being from 08:00 to 16:30 Monday to Friday.

The proposed hours of operation for the proposed OCGT are: 24-hours per day, seven days per week, subject to availability. However, the operational period for the plant will be non-continuous and it is expected the plant will operate during peak periods such as mornings and winter evenings.