15. Health and Safety

15.1 Introduction

This chapter provides general information on healthy and safety associated with the proposed 100MW OCGT power plant in addition to more detailed technical information relating to issues raised during the previous planning application submitted to Kilkenny County Council in 2010. This chapter is divided into the following sub sections:

15.2 Health and Safety in Design

15.2.1 General Information

All stakeholders (e.g. developers, engineers, architects, planners, construction site personnel etc) involved in the construction process have a legal obligation under the *Safety Health & Welfare Act* (2005) to prevent accidents and ill health from occurring on construction projects, through both the design and actual construction stage processes.

Under Regulation 6 of the *Safety, Health and Welfare at Work (Construction) Regulations* (2006) GIL is required to appoint in writing:

- A competent project supervisor for the design process (PSDP); and
- A competent project supervisor for the construction stage (PSCS).

Mott MacDonald Ireland has been appointed as the PSDP for the proposed power plant at Purcellsinch. It is Mott MacDonald Ireland's responsibility to organise co-operation between designers on the proposed power plant and, so far as is reasonably practicable, to ensure coordination of their activities in relation to design with a view to protecting the safety, health and welfare of persons involved in construction work as well as members of the public who may be impacted by construction works.

During the construction phase of development Mott MacDonald Ireland will liaise with the PSCS on the content of the Project Safety File and liaise with GIL, the design team and the PSCS as well as any specialist contractors to ensure that any amendments to design have proper regard to safety and health.

15.2.2 Health and Safety in Design

The term 'design' has a very broad definition. According to the Health and Safety Authority (HSA) publication *Guidelines on the Procurement, Design and Management Requirements* (2006), design work is defined as the "*preparation of drawings, particulars, specifications, calculations, preambles and preliminaries of bills of quantities in so far as they contain specifications or other expressions of purpose according to which a project, or any part or component of a project, is to be executed*".

The duty of care of designers applies to the preparation of any design that is intended for construction. Designers should, where practicable, consider the following in terms of their design:

- The avoidance of risks;
- The evaluation of unavoidable risks;
- The combat of risks at source;
- The adaptation of the place of work to technical progress;
- The replacement of dangerous articles, substances, or systems of work by non dangerous or less dangerous articles;
- The giving of priority to collective protective measures over individual protective measures;
- The development of an adequate prevention policy in relation to safety, health and welfare at work; and
- The giving of appropriate training and instruction to employees.

As well as their role as PSDP, Mott MacDonald Ireland is also the primary designer for this power plant. It is Mott MacDonald Ireland's responsibility when preparing or modifying a design to avoid risk to the safety and health of any person involved in phases of the project from construction to maintenance and operation and eventual demolition. In addition, Mott MacDonald Ireland has an obligation to identify hazards and, so far, as is reasonably practicable eliminate hazards which may give rise to risks and then to reduce risks from any remaining hazards.

15.3 Road Icing

Following on from a query raised during the previous planning application in 2010 (Kilkenny County Council Reference 10/627), Mott MacDonald Ireland consulted with a supplier (Irish Cooling Towers) to confirm if adverse weather conditions could potentially lead to formation of ice on adjacent roadways as a result of pluming from the cooling towers. It was confirmed that icing concerns associated with cooling infrastructure is typically associated with elevated equipment that is very cold, including open elevated man ways around industrial equipment and wiring and insulators above tower elevations. There is no risk of icing resulting from pluming from the cooling towers at adjacent roadways.

15.4 Risk of Legionellosis

In the previous planning applications in 2007 and 2010 (Kilkenny County Council References 07/2164 and 10/627) there were some concerns regarding the risk of Legionellosis associated with water treatment and cooling towers. Legionellosis is a disease comprising two distinct clinical entities: Pontiac fever, a mild self-

limiting influenza-like illness, and Legionnaires ' disease a more serious form of the illness, characterised by pneumonia. Legionellosis is caused by *Legionella* bacteria which are ubiquitous in nature and can be found naturally in the environment in locations such as rivers, lakes and reservoirs. From there the organism can pass into sites that constitute artificial reservoirs such as water distributions systems in towns and cities.

Legionella bacteria can be found in water systems containing a cooling tower as well as in water systems incorporating an evaporative condenser, hot and cold water systems, spa pools, respiratory and other therapy equipment, humidifiers, fountains/sprinklers, vehicle washes and many other systems containing water which is likely to exceed 20°C, or have an electrical component that can transfer heat and cause localised heating, and which may release a spray or aerosol (i.e. a spray of droplets) during operation.

In Ireland, the principal legislative provisions of relevance to the prevention of Legionellosis in the workplace include:

- The Safety, Health and Welfare at Work Act 2005;
- The Safety, Health and Welfare at Work (General Application) Regulations 2007;
- The Safety, Health and Welfare at Work (Biological Agents) Regulations, 1994 as amended in 1998;
- The Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001;
- National Guidelines for the Control of Legionellosis in Ireland, Health and Safety Executive (HSE), 2009; and
- Legionnaires' disease, The control of legionella bacteria in water systems. Approved Code of Practice and guidance, HSE UK, 2000.

In Ireland, under the above legislation there is a legal obligation on employers to carry out a risk assessment prior to the commencement of operations in relation to *Legionella* prevention and control in the workplace and where a risk is identified the appropriate control measures should be put in place and a risk management plan adopted.

The purpose of a risk assessment is to:

- Identify and assess the risk of exposure to *Legionella* bacteria from work activities and water systems on a premises i.e. a workplace, healthcare facility or leisure facility;
- Establish any necessary preventive and control measures; and
- Provide direction on prioritising the risks.

Risk assessments consider:

- The potential for *Legionella* seeding and growth;
- The potential for aerosol generation and exposure;
- The presence of susceptible persons;
- The adequacy of existing site management arrangements and records; and
- The efficacy of existing preventive and control measures.

The risk from exposure will be controlled by measures which do not allow the proliferation of *Legionella* bacteria in the system and reduce exposure to water droplets and aerosol. These include:

- Engineering controls, cleaning protocols and other control strategies such as:
- Controlling the release of water sprays;
- Avoidance of water temperatures and conditions which favour the proliferation of *Legionella* bacteria and other micro-organisms i.e. avoiding water temperatures between 20℃ and 50℃. Water temperature is a particularly important factor in controlling the risks and should be either below 20℃ or above 50℃;
- Avoidance of water stagnation that encourage the growth of biofilm (slimes that form on surfaces in contact with water) which can harbour *Legionella* bacteria and provide local conditions that encourage growth;
- Avoidance of the use of materials which harbour bacteria and other micro-organisms or provide nutrients for microbial growth e.g. natural rubber washers and hoses;
- Maintenance of the cleanliness of the system and the water in it in order to avoid the build up of sediments which may harbour bacteria (and also provide a nutrient source for them);
- Use of water treatment regimes/techniques where it is appropriate and safe to do so; and
- Action to ensure the correct and safe operation and maintenance of the water system.

All of the above measures and controls have been considered by the specialist suppliers and designers of the proposed power plant. The risk and management of *Legionella* has been considered in all stages of the design philosophy for this power plant and will be embedded, as required through legislation, in the management of this facility once operational.

More detailed technical guidance on the water treatment systems proposed to combat the risk of *Legionella* is included in Appendix G.3 *Specification for Make Up Water for the Cooling Towers* and Appendix G.4 *Additional Raw Water Treatment Details*.

15.5 Use of Treated Wastewater from Purcellsinch Wastewater Treatment Plant

15.5.1 Background

A submission made by the Health and Safety Executive (HSE) on the 2010 planning application (Kilkenny County Council ref: 10/627) made the following comments/observations:

- Water supply for drinking purposes should be from the public water mains only and not from either water abstracted from the River Nore or treated wastewater from the Purcellsinch Wastewater Treatment Plant;
- No supporting information regarding the wastewater treatment process has been supplied. In addition there is no reference to the biocides to be used in the treatment process and whether these will have an impact on air quality;
- The use of sewage wastewater for firefighting purposes is undesirable on public health grounds; and

- The EIS does not adequately address concerns regarding potential odours associated with the use of wastewater.

It should be noted that the HSE's preference in terms of process water supply (based on the information provided in the 2010 application) was for either a public water mains supply or alternatively water abstracted from the River Nore. However for this new planning application GIL have provided additional information in relation to the use of treated wastewater in order to address some of the concerns raised by the HSE. It should be noted, as indicated in *Section 3.11.1.3* that GIL are proposing to source the process water supply for the operational power plant from either river water abstracted from the River Nore, 'grey' water from the Purcellsinch Wastewater Treatment Plant or a combination of both. Grey water in the context of this development means wastewater which has passed through all the stages of treatment in the wastewater treatment plant and which is of a quality suitable for discharge directly to the River Nore.

Mott MacDonald Ireland has consulted with Kilkenny County Council Water Services Department regarding the potential to use treated 'grey' water and Water Services have agreed to this use in principle. The proposed abstraction point would be from a pumping chamber downstream of the final clarifiers in the wastewater treatment plant.

15.5.2 Water Supply for Drinking Purposes

As stated in *Section 3.11.1.3* consultations with Kilkenny County Council Water Services Section have indicated that a public water mains supply will be available for drinking water.

15.5.3 Supporting Information regarding Wastewater Treatment Process, the Use of Biocides and Impact on Air Quality

15.5.3.1 Analysis of Wastewater from Purcellsinch Wastewater Treatment Plant

In May 2010, Bord na Móna Technical Services was commissioned by GIL to undertake sampling and analysis of a wastewater sample from the Purcellsinch Wastewater Treatment Plant. Wastewater samples were collected and returned for laboratory analysis. A technical report was completed which included details of the monitoring, sampling and analytical methodologies carried out and the results obtained. A copy of this report is included in Appendix G.4 *Bord na Mona Water Quality Analysis.* The main findings of this report in respect of wastewater sampling are set out below:

- Low concentration of suspended solids (<6 mg/l);
- Low Ammonia concentration (<0.05 mg/l);
- Elevated levels of Ortho-phosphate (2.91 mg/l);
- Notable levels of Oils, Fats and Greases (16 mg/l); and
- Significant levels of microbiological forms (as would be expected) in the discharge from the wastewater treatment plant (>300 CFU/100ml).

15.5.3.2 Proposals for Water Treatment

The results were provided to water treatment specialists (Whitewater, Siemens and Ondeo) to assist in the development of water treatment proposals. All three specialists confirmed that the 'grey' water from the Purcellsinch Wastewater Treatment Plant could be treated on-site for use in the operational power plant. More detailed follow up discussions took place with Whitewater who provided technical specifications for water treatment systems for both demineralised water and make up water for the cooling towers, as summarised below:

- All water with the exception of the potable supply will pass through the 5500m^3/hr raw water storage tank with an hourly flow rate of 90m^3/hr. Source water entering this tank will be treated using membrane electrolysis technology to produce powerful disinfection agents which present no occupational risks. A disinfectant generator produces a liquid called NEUTHOX through the process of electrolysis of Brine (salt water). NEUTHOX is effective in breaking down biofilms and is an effective disinfection agent against most bacteria that can cause infections in humans including Legionella pneumophilla. NEUTHOX has no toxic by products and is used across a range of applications to ensure safe and healthy environments, including drinking water, horticulture, fruit and vegetable washing, food and dairy industry, hotels and public facilities etc. The only requirements to produce NEUTHOX are salt, water and electricity;

- For demineralised water a central purification method of Reverse Osmosis (RO) and electro-deionisation (EDI) is proposed. The RO unit proposed is a well tested, high rejection, single pass system with membranes which will give a 99% rejection of ions resulting in high quality purified water. Water quality will be monitored by way of an on line conductivity metre. The EDI module will comprise of an EDI cell, power pack, rectifiers and control unit. The EDI will use RO feed to produce low conductivity deionised water. It is proposed that 'Granular Activated Carbon' (GAC) media is used as a filter bed material to cater for the high levels of oils, fats and greases which were evident in the sample analysis. An ultraviolet (UV) water treatment unit is also proposed with an automatic wiping system, designed for high UV dose and poor inlet water. Carbon filters will assist in the reduction of organic fouling on the RO membranes. Pre-RO UV units have also been included to aid in minimising organic fouling on the RO membranes;

- For make up water for the cooling towers, pre-treatment is proposed to eliminate dirt and pipe scale from the treated feed water from the Wastewater Treatment Plant. It is proposed that 20µ Bag Filters will be used for pre-treatment. In addition a UV unit with auto wiper upstream of a simplex GAC filter will protect softeners downstream. Triplex water softeners will give partial redundancy and maintain design based on standard units required for the make up water for the cooling towers. There will be a blend/bypass around the water softener to give a final hardness of 30-50mg/l, so as to provide a buffered supply to the cooling tower chemical treatment, and to maintain suitable pH value. In terms of chemical treatment the following systems are proposed:

  - General Electric (GE) Advanced Cooling System *TrueSence or equivalent will be used which optimises advanced technology to control addition of biocides on a continuous basis. This system combines monitoring and control capabilities with water treatment technology, wireless data monitoring and analysis along with filtration and membrane products for softening, filtering and wastewater reuse.

  - A chemical treatment program including both non oxidising and oxidising biocides for the minimisation of Legionella bacteria including *GenGard GN8108* Advanced Scale/Corrosion Inhibitor, *Biomate 5702* Oxidising Biocide with dispersants and *Spectrus NX1100* Non Oxidizing Biocide (or equivalent).

In terms of the above treatment processes and potential health and safety concerns regarding cooling towers and the risk of *Legionella* it should be noted that Mott MacDonald Ireland consulted with Irish Cooling Towers (ICT) who are a leading cooling tower supply sterilisation and maintenance contractor in Ireland. ICT advised that cooling towers are employed in many types of industries including food processing plants, pharmaceutical plants, agricultural and feed plants, manufacturing plants, breweries, public utilities, hospitals, office developments and power plants. In addition, ICT advised that similar cooling technology such as that proposed at Purcellsinch is in operation nationwide including at Smithwicks and Glanbia in Kilkenny, MSD (Mercks) in Carlow and Clonmel, Dundrum Shopping Centre, Cadbury, Allied Irish Banks, Bank of Ireland and Trinity College in Dublin. This type of technology is therefore well established across a range of industries in Ireland. Furthermore, and specifically in the case of the re-use of 'grey' water in cooling systems associated with power plants, this practice has been assessed by the United States Department of Energy in a report prepared by the Environmental Science Division of

Argonne National Laboratory (*United States Department of Energy-National Energy Technology Laboratory/ Argonne National Laboratory, September 2007).* This report identified that reclaimed water is being used in a range of applications at 54 power plants in the United States including for supply of cooling water, use in air scrubbers, boiler feedwater, etc. The report identifies that this water must be treated to at least secondary treatment standard (such as the wastewater in Purcellsinch Wastewater Treatment Plant is). For the proposed power plant development at Purcellsinch this water is subsequently treated on site with tertiary treatment techniques as specified previously, prior to use in the operation of the power plant.

In terms of wastewater emissions (and potential general public health issues associated with same), there are two ways in which treated wastewater can leave the site. One way is through evaporative airborne dispersion in the cooling towers and the other is via process wastewater discharge to the IDA sewer network before final discharge to the Purcellsinch Wastewater Treatment Plant. The use of biocides in the water treatment proposals for the cooling tower is at a scale which would not have a significant impact on air quality. As indicated previously this type of cooling technology and the chemical treatment process for same is well established. For the wastewater discharges, as discussed in *Section 11.4.3.2,* the characteristics of the wastewater will be monitored in an underground tank and if required, dosed or treated to acceptable limits before discharge to the public wastewater treatment system. It should also be noted that both air and wastewater emissions for this development will be regulated by the Environmental Protection Agency (EPA) under the Integrated Pollution Prevention and Control (IPPC) licensing regime.

Further details on water treatment for both demineralised water and make up water for the cooling towers are contained in the following appendices:

- Appendix G.1 *Specifications for Demineralisation Water Treatment*;
- Appendix G.2 *Specification for Make Up Water for the Cooling Towers*; and
- Appendix G.3 *Additional Raw Water Treatment Details*;

15.5.4 Use of Wastewater for Firefighting purposes on Public Health Grounds

It is understood that the HSE is concerned with the potential for aerosols to be created within the fire fighting system which could lead to pulmonary infections by pathogens such as legionella pneumophilla.

In the HSE's consultees response to the previous 2010 planning application it was stated that the use of wastewater for firefighting purposes was undesirable on public health grounds. As identified in the previous section, all water with the exception of the potable supply which will be sourced from the public mains, will pass through the 5500m^3/hr raw water storage tank and will be treated using membrane electrolysis technology to produce powerful disinfection agents which present no occupational risks. The fire fighting water distribution system itself will also be subject to a secondary dosing system. This dosing system will consist of a flow meter controlling a dosing pump that is capable of injecting one litre of disinfectant into each cubic metre of water passing through the fire fighting system. The dosing pump will be selected carefully to ensure it can handle the required pressure. A detailed specification for water treatment (dated 16th March 2012) which considers occupational exposure including fire-fighters is contained in Appendix G.3 *Additional Raw Water Treatment Details*.

15.5.5 Potential Odour Issues

In terms of odour nuisance as discussed in *Section 9.5.7* there are no activities from the operation of the power plant which could generate a malodour in the receiving environment, nor are there any substances proposed to be used in the development or released to the environment in such quantities as to generate an odour nuisance. The use of treated effluent in the cooling towers will not give rise to malodour generation as it will have been fully treated by both the Purcellsinch Wastewater Treatment Plant and the advanced pre-treatment processes proposed as part of the power plant development.

15.6 Major Accident Risk Assessment

The proposed power station does not store large quantities of hazardous materials and therefore is not required to produce a formal safety assessment (Major Accident Hazard report) for review by the Health and Safety Authority (HSA) under the Seveso Regulations. However, GIL is committed to developing a power plant that is safe to the general public and their employees. To better understand the risks, a risk assessment of the possible major accidents that could potentially occur at the site was undertaken. The risk assessment showed the risks to the general public outside the site to be very low and to be within the limits that the HSA would consider tolerable in the experience of Mott MacDonald Ireland.

The risks to the public from the proposed power station have been examined using the following approach:

- Compliance with the applicable design code; and
- An outline probabilistic risk assessment.

The design of gas pipelines and Above Ground Installations (AGIs) in Ireland is subject to standard *I.S. 328:2003, The Irish Standard Specification for Code of Practice for Gas Transmission Pipelines and Pipeline Installations*. This standard sets the allowable proximity distance from habited buildings according to the size and pressure of the gas pipeline. In this case the proximity distance is about 31 metres for 'normal' pipelines and about 12 metres for 'thick walled' pipelines. It is proposed case thick walled (~11mm wall thickness) pipelines will be used. The nearest habited building is more than 40 metres away. However the Sion Road is within the proximity distance. This is acceptable under the Code of Practice providing appropriate measures are taken to reduce the probability of pipeline failure. Such mitigations include the diameter of the pipe, the minimum yield strength of the pipe, the wall thickness of the pipe and the maximum operating pressure of gas. Given the extent of the Irish gas pipeline network, some 13,150km including offshore pipelines, gas facilities close to roads occur in many places and the location of the pipeline and AGI for the power station near to the Sion Road should not be grounds for concern. As detailed in Section 5 of *Appendix I* the risks to persons at all identified receptors are well within HSA guidance on acceptable risk for land use planning.

The assessment examined the potential consequences of accidents involving the release of natural gas and fires involving the gas oil used for supplementary firing. Consequence modelling was undertaken using the DNV PHAST modelling code, a well recognised code, which is also used by the HSA. The modelling is mainly deterministic showing the potential extent of the worse case accidents.

Despite the power plant being below the Seveso Regulations, GIL commissioned a comprehensive study of potential major accidents which have the potential to occur on site. These included the following:

- Pool fire – Only relevant for liquids, in this case the gas oil for supplementary firing;
- Jet fire – Gas releases with immediate ignition;
- Flash fire – Gas releases with delayed ignition in open areas; and
- Vapour cloud explosion – Gas releases with delayed ignition in confined spaces where an overpressure can be generated.

As part of a consequence modelling assessment, locations at which members of the public could be within the accident contours (for the applicable accident scenarios) were considered further as part of probabilistic risk assessment. The assessment found that risks to nearby receptors are very low and within the limits that the HSA consider tolerable for power plant developments. The risks are considered to be below the levels at which the HSA would consider advising against the proposal.

The HSA have provided guidance on the assessment of risks in their document 'Policy & Approach of the Health & Safety Authority to COMAH Risk-based Land-Use Planning, 1/9/2009', available on the HSA website. This document gives guidance on how they would formulate their advice if consulted on the acceptability of the power station location. The risks from this facility have been shown to be well below the levels at which the HSA would consider advising against the proposal. Further information on the Major Accident Risk Assessment is contained in *Appendix I*.

15.7 Additional Major Accident Information

As part of the previous planning application to Kilkenny County Council (ref: 10/627) a submission was received a Mr. John Brett which queried some of the technical information contained in the Major Accident Risk Assessment submitted as part of that planning application. The submission was based on consideration of the following technical details:

- Design standards for gas pipelines;
- Modelling process; and
- Fire and explosion not considered in the EIS.

15.7.1 Design Standards for Gas Pipelines

The code of practice for natural gas pipelines in Ireland is *I.S. 328:2003, The Irish Standard Specification for Code of Practice for Gas Transmission Pipelines and Pipeline Installations*. The power plant has been designed to ensure that it will meet or exceed the requirements of this code. *I.S. 328:2003* is comprehensive and covers all aspects of design construction, inspection and maintenance of the gas pipeline. The submission referenced extracts from a United States engineering guidance standard - *FM Global Property Loss Prevention Data Sheet 7-54*. The *FM Global Data Sheet* attempts to cover a wide range of gas installations. Its scope states:

"This data sheet covers natural gas piping systems and includes general piping and service devices, buried piping and building entrances, transmission and distribution pipelines, earthquake, exposures, corrosion protection, gas wells, gas holders, testing and emergency procedures for gas leaks or fires. This data sheet also covers systems using manufactured gas, coke oven gas, blast furnace gas and synthetic natural gas".

The *FM Global Data Sheet* refers to pipelines built to United States Standards - *ANSI Z223.1-1988, NFPA 54-1988, National Fuel Gas Code; ANSI/ASME B31.1-1989, Power Piping; and ANSI/ASME B31.8-1989, Gas Transmission and Distribution Piping Systems*. There are substantial differences between the Irish Standards and the most relevant United States Standard *ANSI/ASME B31.8-1989, Gas Transmission and Distribution Piping Systems*. In particular the United States standard allows much higher stressed and thinner walled pipework. Table 15.1 (part of a table in Evaluation of Pipeline Design Factors Task Report (August 1999 – January 2000) GRI 00/0076 Evangelos Michalopoulos and Sandy Babka of the Hartford Steam Boiler Inspection and Insurance Company) shows the differences in the allowable stresses in B31.8 (as referred to in the *FM Global Data Sheet*) and *I.S. 328:2003*.

Table 15.1: Allowable Stresses

	CODE	CONDITION	FACTOR[1] ON YIELD STRENGTH	FACTOR[1] ON TENSILE STRENGTH	COMMENTS
ipeline Codes	B31.4 Pipeline Transportation Systems for Liquids	Pressure hoop stress	0.72		
	B31.8 Gas Transmission and Distribution Systems	Pressure hoop stress Location Class 1, Div 1 Location Class 1, Div 2 Location Class 2 Location Class 3 Location Class 4	 0.80 0.72 0.60 0.50 0.40		Code includes numerous modifications for types of facilities, crossings, encroachment, etc.
	British BS 8010 Section 2.8 Pipelines on Land: Steel for Oil and Gas	Pressure hoop stress Category B substances Category C & D Class 1 Category C & D Class 2 Category C & D Class 3	 0.72 0.72 0.30 0.30		Categories are related to hazard potential of substances and location class to population densities.

The section of pipeline within the power plant site is considered to fall under B31.8 Location Class 2; defined as '*A location in any 1 mile section that has more than 10 but fewer than 46 buildings intended for human occupancy. It is intended for fringe areas around cities and towns, industrial areas, ranch or country estates, etc'.* The allowable factor in yield stress would be 0.60 under B31.8. The proposed pipework has been designed in accordance with *I.S. 328:2003* with a yield stress less than 0.30 (actual pipework yield stress factor calculated as 0.22). The proposed pipework is therefore much stronger than that being considered in the *FM Global Data Sheet*.

It should also be noted that the *FM Global Data Sheet* allows for the use of cast iron pipework. This is no longer installed for pipelines in Ireland as it has a higher failure rate in service than steel pipework.

The *FM Global Data Sheet* considers only pipelines sizing from 8" (200mm) to 36" (0.91 metres). The proposed pipework on the GIL Kilkenny site is only 150mm (6"). This is below the range of pipeline sizes considered in the *FM Global Data Sheet*. There is a significant difference in considering the accident envelope from 6" pipework to 36" pipework and the 'one size fits all' approach to distances is not appropriate (as recognised by *I.S. 328:2003*).

The FM Global Data Sheet also suggests sleeving the pipework. This is advised against in I.S. 328:2003 which states 'the use of sleeves should be minimised as they can cause adverse effects on cathodic protection systems'. It is proposed on this site to apply appropriate protection systems and externally inspect pipework. This approach is considered to be of greater safety benefit. The objection also provides descriptive text taken from the FM Global Data Sheet which describes the various hazards associated with natural gas and gas pipelines. These hazards are identified in Table 15.2 which also explains how these hazards are considered in the Major Accident Risk Assessment contained in Appendix I.

Table 15.2: Natural Gas Hazards

Hazard	How this hazard in considered in the Major Accident Risk Assessment
Explosions from leaks in buried pipes	The buried pipelines will not be covered by an impermeable barrier so gas leakages will follow the path of least resistance to the surface.
Corrosion	*I.S. 328:2003* gives information on the protection systems to be used against corrosion. It should be noted that the use of thicker walled pipework gives a greater safety margin than that envisaged by the *FM Global Data Sheet.*
Causes of pipeline ruptures	The submission identifies general causes of pipeline failure which are reasonable. However it should be noted that all of these are also addressed in *I.S. 328:2003*. In addition there is pipeline failure data available that is more relevant to Ireland and up to date (e.g. Hazardous Installations Directorate Gas & Pipelines Unit Major Hazard Safety Performance Indicators in Great Britain's Onshore Gas and Pipelines Industry Annual Reports). The UK pipeline product loss frequency over the 5 years 2002-2006 was 0.028 incidents per 1000 km per year compared to 0.248 incidents per 1000 km per year during the period 1962-2006. This reduction is partially attributed to the phasing out of cast iron pipelines. There will be automatic systems to shut of gas in the event of a pipe failure on site.
Outdoor Vapur Cloud Explosions	The FM Global Data Sheet states that 'Outdoor vapour cloud explosions have not occurred with natural gas.' Though this is consistent with other references, GIL's assessment has used the more conservative approach (following discussion with the HSA relating to larger power station projects assuming VCEs can occur anywhere within the site boundary).

It should be noted that the assessment found that risks to nearby receptors are very low and within the limits that the HSA consider tolerable for power plant developments. The risks are considered to be below the levels at which the HSA would consider advising against the proposal.

15.7.2 Modelling process

The submission also queried the modelling processes undertaken as part of the Major Accident Risk Assessment included in *Appendix I*. These queries are identified in Table 15.3 which also includes a technical description of measures included in the Major Accident Risk Assessment to address same.

Table 15.3: Modelling Queries

Query/Concern	GIL Response
Duration of Failures	There will be an automatic system of detection of pipework failures. Automatic shut-valves will enable the gas supply to be isolated in the event of a pipework failure; the actual valve closure time is about 2 seconds. The UK HSE gives the failure rate on demand of automatic shut-off valves as 1 x10-2. In the design of this power plant, multiple means of isolating the gas supply have been considered, so a single failure would not mean the gas supply could not be isolated. It should be noted that fast acting automatic shut down systems are also essential for gas turbine protection.
Fire Wall	The fire wall is intended to ensure that any release of gas will not result in a horizontal jet fire in southerly direction. The wall would withstand an impinged jet of gas for the short time before the gas supply is isolated. In the case of large release of gas the gas would not be within the flammable limits as it impinges the wall so the actual fire withstand required is quite limited.
Pool Fire Impact at Nearest Residential Property	A pool fire of distillate is a very unlikely event given that distillate is not categorised as flammable. The nearest residential property is well outside the thermal radiation contours so there is no risk from thermal radiation. In the unlikely event that such a fire did occur there may be a considerable amount of smoke produced and the emergency services may take procedural precautions to evacuate nearby buildings.
Flash Fire and Vapour Cloud Explosions at Nearest Residential Property	The probability of such events effecting the nearest residential property are very low. Flash Fire - Natural gas is much lighter than air and any gas cloud would be above ground level. The nearest residential property would not be directly engulfed by the flash fire and the risks to the house and its inhabitants would be low. It should also be noted that, above ground level, there are few sources of ignition.

Query/Concern	GIL Response
	VCE - FM Global Property Loss Prevention Data Sheet 7-54 states that 'Outdoor vapour cloud explosions have not occurred with natural gas.' The modelling undertaken in the Major Risk Accident Assessment is therefore very pessimistic (i.e. considers an accident scenario not envisaged in the Data Sheet). Though it is possible that damage to the nearest residential property could occur it is unlikely to be severe.

It should be noted that the assessment found that risks to nearby receptors are very low and within the limits that the HSA consider tolerable for power plant developments. The risks are considered to be below the levels at which the HSA would consider advising against the proposal.

15.7.3 Fire and Explosion Scenarios not considered in the EIS

The submission also queried the fire and explosion scenarios not undertaken as part of the Major Accident Risk Assessment. These queries are identified in Table 15.4 which also includes a technical response.

Table 15.4: Fire and Explosion Scenarios Identified in Submission

Accident Scenario	Comment
Fire in Gas Turbine Building	The Major Accident Hazard Report does not consider fires in the gas turbine enclosure as they would not pose a credible hazard to persons outside the site boundary. It should be noted that the oil inventory required for the power plant is not large. GIL have, for completeness, examined explosions within the turbine enclosure (see figure 4.5 of *Appendix 4*). The on-site raw water storage tank (5500m³) has been sized to allow for fire water storage (550m³) in accordance with the relevant codes and standards as advised by Kilkenny County Council Fire and Rescue Services.
Gas Compressor Fire and Explosion	The compressor required to support the gas turbine is a comparatively small reciprocating unit such as the Atlas Copco BBR 4242S Compressor Package. Though fires and explosions are possible they will be comparatively small events and would not pose a significant risk outside the site boundary. It should be noted that the nearest house is much more than 20m away from the compressor building (actual distance more than 40m) and the berm is between the compressor building and the house.

It should be noted that the assessment found that risks to nearby receptors are very low and within the limits that the HSA consider tolerable for power plant developments. The risks are considered to be below the levels at which the HSA would consider advising against the proposal.

15.8 Residual Impacts

Health and safety has been considered at all stages in the design of the proposed power plant. It is considered that the controls and processes outlined in this chapter address any residual concerns in respect of health and safety issues associated with developing a power plant at this location.