5.0 CONSIDERATION OF ALTERNATIVES

5.1 INTRODUCTION

This chapter provides an analysis of alternatives which have been considered as part of this development in terms of the following;

- Do Nothing' Scenario';
- Alternative Technologies;
- Alternative Locations;
- Alternative Process;
- Alternative Layouts; and
- Alternative Mitigations.

5.2 DO NOTHING SCENARIO

In the Do Nothing scenario, Greener Ideas Limited would not develop a power plant in Profile Park. In the absence of this power plant then there would be:

- Less integration of renewable technologies onto the Irish Grid which is one of the key strategic European and national objectives for the transition to a low carbon economy as set out in Chapter 4.0.
- Increased risk that older, less efficient and more polluting power plants would continue to operate and that proposals to decarbonise Ireland's power generation portfolio would be negatively impacted;
- The portfolio of dispatchable gas fired power plants available to manage fluctuating electricity demands and compensate for shortages occurring from wind or solar power would be reduced and this would result in increased grid instability.
- With respect to EirGrid's Data Centre Connection Policy, the absence of a power plant in Profile Park would mean no fixed electrical connection for data centre customers. There is a possibility that data centres will not develop on Profile Park , or they will seek to build their own power generating plant. The ability to centralise power generation services within Profile Park brings opportunities to better manage noise and emissions locally and provide a potential diversity effect of the data centre sites potentially enabling lower built capacity, and less operating hours.
- The site on which the power plant is proposed would more than likely be developed by another developer with a development consistent with the 'Enterprise and employment' zoning of the South Dublin County Development Plan 2016-2022.

5.3 ALTERNATIVE TECHNOLOGIES

5.3.1 TECHNOLOGY TYPES

Greener Ideas Limited considered a wide range of power generation technologies as part of a screening exercise undertaken to identify the most suitable technology to develop. These technologies included:

- Combined Cycle Gas Turbine (CCGT) plant;
- Open Cycle Gas Turbine (OCGT) plant; and
- Dual-fuel engine plants.

5.3.2 PREFERRED TECHNOLOGY PARAMETERS AND METRICS

Each of the above technologies were considered in the context of Greener Ideas Limited preferred operating parameters including:

- Primarily gas fuel, but must also be capable of running on diesel oil;
- Electric power grid frequency at 50Hz;
- Emissions compliant to EU regulations;
- ISO climatic conditions (15°C, 60% RH, sea level);
- Proximity to the ESB / EirGrid electrical distribution and transmission networks;
- Proximity to the Gas Network Ireland (GNI) gas transmission network;
- Capital cost and operating cost.

In addition, performance metrics were considered which included:

- Engineering, Procurement, Construction (EPC) Capital Expenditure;
- Operating Expenditure (fixed and variable);
- Plot area including diesel oil storage for 5 days continuous operation;
- Heat rate;
- Start-up / loading times;
- Minimum operating level;
- Water usage;
- DS3 services;
- Development, construction, commissioning times; and
- Other key advantages/disadvantages.

The above analysis identified several power plant technologies which would meet Greener Idea Limited's key operating parameters and technical performance metrics. These technologies were then considered as described in the following section.

5.3.3 ALTERNATIVE TECHNOLOGY ENVIRONMENTAL IMPACTS

Each of the technology options was considered initially in terms of its key environmental impacts under the following main operational parameters. These parameters were selected on the basis that any significant risk issue identified could present a significant design, consenting or operational constraint.

- Spatial requirements;
- Atmospheric emissions;
- Noise emissions;
- Water supply;
- Wastewater emissions.

Other environmental impacts, i.e. relating to land, landscape, traffic, biodiversity etc were considered to be comparative to each technology type at this location in Profile Park and, as such, were not considered further.

Table 5-1: Alternative Environmental Impacts

<table>
<tr><th>Environmental Impacts</th><th>CCGT</th><th>OCGT</th><th>Dual Fuel Engine</th></tr>
<tr><td>Spatial requirements</td><td>The typical plot area for 1 no .CCGT units ranges from approximately 35,000m^2 to 80,000 m^2 which is the largest plot area for the technologies considered.</td><td>The typical plot area for 1-2 OCGT units ranges from approximately 15,000m^2 to 40,000 m^2 which is the second largest plot area for the technologies considered.</td><td>The typical plot area for 4-8 gas engine units ranges from approximately 12,000m^2 to 30,000 m^2 which is the smallest plot area for the technologies considered and considered most appropriate technology fit given both the spatial area of the site and the various system services which Greener Ideas Limited is looking to provid</td></tr>
<tr><td>Atmospheric emissions</td><td>The emission limit values for new CCGT plants operating on natural gas at various MWe based on the Industrial Emission Directive are as follows:
<table>
<tr><th>MWe</th><th colspan="2">Gas (mg/Nm^3)</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>NOx</td><td>CO</td></tr>
<tr><td>100</td><td>50</td><td>100</td></tr>
<tr><td>200</td><td>50</td><td>100</td></tr>
<tr><td>300</td><td>50</td><td>100</td></tr>
<tr><td>400</td><td>50</td><td>100</td></tr>
<tr><td>500</td><td>50</td><td>100</td></tr>
</table>
The yearly average emission limit values for new CCGT plants operating on natural gas based on the Best Available Techniques Reference Documents (BREF) are also indicated below.
<table>
<tr><th>MWe</th><th colspan="2">Gas (mg/Nm^3)</th></tr>
<tr><td></td><td>NOx</td><td>CO</td></tr>
<tr><td>100</td><td>10-30 (a)</td><td>5-30 (b)</td></tr>
<tr><td>200</td><td>10-30 (a)</td><td>5-30 (b)</td></tr>
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<table>
<tr><th>MWe</th><th colspan="2">Gas (mg/Nm^3)</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>NOx</td><td>CO</td></tr>
<tr><td>100</td><td>50</td><td>100</td></tr>
<tr><td>200</td><td>50</td><td>100</td></tr>
<tr><td>300</td><td>50</td><td>100</td></tr>
<tr><td>400</td><td>50</td><td>100</td></tr>
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</table>
The yearly average emission limit values for new OCGT plants operating on natural gas based on the Best Available Techniques Reference Documents (BREF) are also indicated below.
<table>
<tr><th>MWe</th><th colspan="2">Gas (mg/Nm^3)</th></tr>
<tr><td></td><td>NOx</td><td>CO</td></tr>
<tr><td>40</td><td>50 (a)</td><td>100</td></tr>
<tr><td>80</td><td>50 (a)</td><td>100</td></tr>
<tr><td>140</td><td>50 (a)</td><td>100</td></tr>
<tr><td>200</td><td>50 (a)</td><td>100</td></tr>
<tr><td>300</td><td>50 (a)</td><td>100</td></tr>
</table></td><td>The emission limit values for new dual fuel engines plants at various MWe operating on natural gas based on the Industrial Emission Directive are as follows:
<table>
<tr><th>MWe</th><th colspan="2">Gas (mg/Nm^3)</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>NOx</td><td>CO</td></tr>
<tr><td>35</td><td>75</td><td>100</td></tr>
<tr><td>87.5</td><td>75</td><td>100</td></tr>
<tr><td>140</td><td>75</td><td>100</td></tr>
<tr><td>210</td><td>75</td><td>100</td></tr>
<tr><td>262.5</td><td>75</td><td>100</td></tr>
</table>
The yearly average emission limit values for new dual fuel engines plants operating on natural gas based on the Best Available Techniques Reference Documents (BREF) are also indicated below.</td></tr>
</table>

			MWe¤ | Gas·(mg/Nm³)¤ ¤ | NOx¤ | CO¤ 35¤ | 20-75¤ | -¤ 87.5¤ | 20-75¤ | -¤ 140¤ | 20-75¤ | -¤ 210¤ | 20-75¤ | -¤ 262.5¤ | 20-75¤ | -¤
	Overall, it was considered that atmospheric emissions are comparable between the three technologies considered. However, the operational profile for a dual fuel engine meets with Greener Ideas Limited's performance criteria more so than the CCGT or OCGT which are larger units versus the engines. All technologies are required to meet with its respect Industrial Emissions Directive emission limit values (ELVs).		
Noise emissions	Noise emission for this plant will be licended and enfored by the Environental Protection Agency and therefore limits for each type of power plant tehcncology ae the same. Further infromation on applicablenoise limited is provided in Chapter 11.0..		
Water supply	Water consumption for the range of CCGT technologies considered would typically range from 20m^3/hr to 75m^3/hr.	Water consumption for the range of CCGT technologies considered would typically range from 10m^3/hr to 70m^3/hr.	Either N/A or very low volumes. In the case of the plant design considered in this EIAR, there is only a potable water supply for a small operational workforce. there is no process water supply except for the closed loop cooling system. Dual fuel engine is therefore preferable to both the CCGT and OCGT.
Wastewater emissions	Typical wastewater emissions for the range of CCGT technologies ranged from 5m^3/hr to 20m^3/hr.	Typical wastewater emissions for the range of CCGT technologies ranged from 2m^3/hr to 20m^3/hr.	Either N/A or very low volumes. In the case of the plant design considered in this EIAR, there no process wastewaters. Dual fuel engine is therefore preferable to both the CCGT and OCGT.
In relation to the above environmental impacts considered across the technology range, it was clear that the best performing technology which met with GILs operational requirements was dual fuel gas engines.			

5.4 ALTERNATIVE LOCATIONS

EirGrid's Data Centre Connection Policy (2020) has identified the greater Dublin region as a capacity constrained area, especially with regard to satisfying the power needs of new data centres. EirGrid will provide firm capacity to a data centre where it provides new on-site dispatchable generation. This can also be facilitated through the installation of generation plant in the close proximity to the data centre, for example through projects such as the proposed power plant in Profile Park. Therefore the location and importance of the proposed power plant at Profile Park is one such that it helps enable additional development on the Profile Park industrial estate, especially with regards to new data centres, who otherwise may need to build this capacity on-site.

In addition to power supply to data centres, this type of power plant is necessary in order to achieve Ireland's binding 2030 emission targets. These power plants will enable the delivery of an efficient, safe and secure electricity system by helping to manage fluctuating electricity demands and compensate for shortages occurring from renewables such as wind or solar power.

Another critical location consideration is proximity to electricity grid and gas transmission networks.

The above were the technical and commercial drivers which Greener Ideas Limited considered when identifying a suitable site for the development of a power plant:

1. Location close to electrical and gas network systems;
    - *Profile Park is located immediately adjacent to the Castlebaggot 220 / 110 kV Substation and also within 1km of Gas Networks Ireland gas network near the Nangor Road.*
2. Location close to data centre developments on appropriately zoned lands.
    - *Profile Park, and its neighbouring lands, are also home to a number of existing data centre tenants including Google, Microsoft, Digital Realty Trust, Telecity and others. Much of the lands are zoned by South Dublin County Council to 'To provide for enterprise and employment related uses' which indicated that there is potential for future data centre development in the future.*

These factors influenced Greener Ideas Limited to contact Moffash Limited, the owners of Profile Park, to discuss the possibility of developing a power plant site on its lands. These discussions resulted in an agreement to locate the proposed power plant at the site which is considered in this EIA Report.

5.5 ALTERNATIVE GAS ENGINE PROCESSES

In gas engine process described in Section 3.2.2 is the standard for this type of power plant and as such no alternative gas engine processes were considered as part of this EIA Report.

5.6 ALTERNATIVE LAYOUTS

Greener Ideas Limited considered an alternative layout configuration which is presented in Figure 5-1. This configuration also comprised of 6 no. gas engines and similar ancillary equipment however the overall layout differed substantially from the layout which has been subject to consideration as part of this EIA Report. For example, the engine hall building and

tanks are located closer to the southern site boundary and the alternative Gas AGI and electrical substation buildings and equipment are located in the northern part of the site. This layout would have resulted in a comparable environmental impact as the development was similar and emissions, i.e. air, water as well as environmental impacts such as landscape and visual, cultural heritage and traffic etc would be comparable given the same baseline environment and scale of development. However, the alternative design would have resulted in a need to install a bridge or culvert over the steam adjacent to the site. In addition, the sound power levels associated with the alternative layout would have resulted in a more significant noise impact. For these reasons this design was ultimately discounted in favour of the design which is subject to this EIA Report.

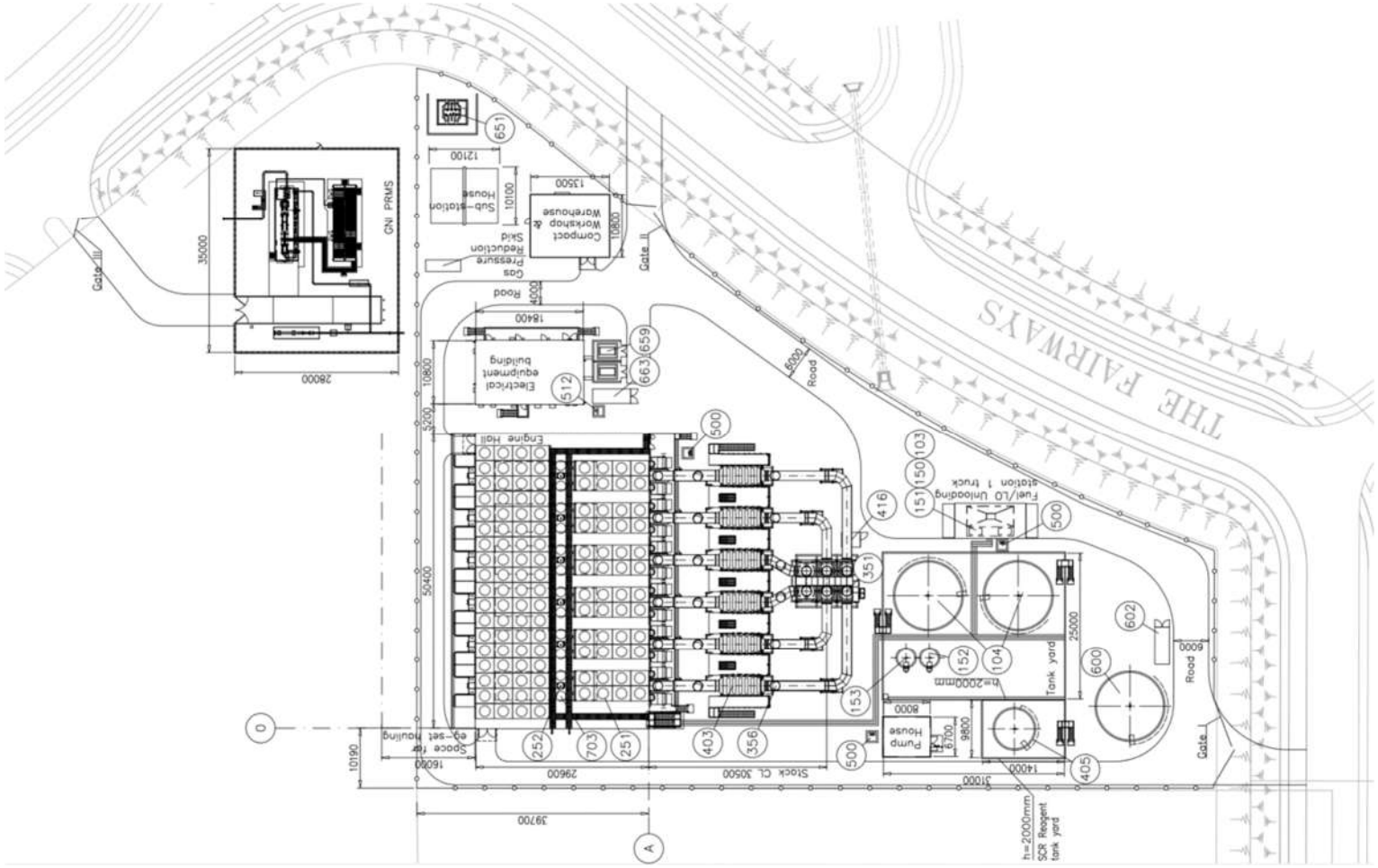

Figure 5-1:Alternative Gas Engine Layout

5.7 ALTERNATIVE MITIGATIONS

The proposed power plant will be regulated by the Environmental Protection Agency under the Industrial Emission (IE) Directive (2010/75/EU) and is required to demonstrate compliance also with the European Commission Implementing Decision on Best Available Techniques for the Large Combustion Plant (2017) (hereafter referred to as the LCP Bat Conclusions).

The BAT Conclusions apply primarily to combustion of fuels in installations with a total rated thermal input of 50 MW or more and set out emission limit values for various parameters as well as several other BAT.

BAT is defined in Section 5(1) of the EPA Act 1992, as amended as the "*the most effective and advanced stage in the development of an activity and its methods of operation, which indicate the practical suitability of particular techniques for providing, in principle, the basis for emission limit values, and in the case of an industrial emissions directive activity other additional licence conditions, designed to prevent or eliminate or, where that is not practicable, generally to reduce an emission and its impact on the environment as a whole*", where:

B	**'best',** in relation to techniques, means the most effective in achieving a high general level of protection of the environment as a whole;
A	**'available techniques'** means those techniques developed on a scale which allows implementation in the relevant class of activity specified in the First Schedule to the EPA Act 1992, as amended, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced within the State, as long as they are reasonably accessible to the person carrying on the activity;
T	**'techniques'** includes both the technology used and the way in which the installation is designed, built, managed, maintained, operated and decommissioned.

Typical BAT associated with dual fuel engine such as those proposed in Profile Park include those relating to:

- Environmental management systems;
- Environmental Monitoring;
- Water usage and wastewater emissions to water;
- Waste management;
- Atmospheric emissions abatement;
- Noise abatement; and
- Energy efficiency.

It is not possible to deviate from BAT requirement unless a derogation to do so is consented as part of the IE licence application process. In the case of this power plant, no derogation is required or requested. The plant will comply fully with the LCP BAT Conclusions. No alternative abatement technologies or techniques outside of recommended BAT are proposed.

In relation to non IE licensable impacts which require mitigation these relate to general construction activities relating to the protection of land, water, archaeology, local amenity etc. In many cases the mitigations set out in the technical chapters comprising this EIA Report will overlap with BAT Conclusions. Mitigations as set out in the respective technical chapters of this EIA Report are considered either standard (for power generation development) or have been applied due to a request to consider same from the various stakeholders who responded to EIAR consultations. In all cases, no mitigations which would result in any significant change from what is set out in this EIAR were considered.

5.8 ALTERNATIVE CONSTRUCTION AND DECOMMISSIONING PRACTICES

Construction practices for gas fired power plant are well understood and there are several thousand such plants in operation across the globe. Standard construction practices will be employed in the construction of this plant. Similarly, decommissioning practices will follow standard practices and will be carried out in accordance with EPA requirements as set out in the IE Licence. No alternative construction or decommissioning practices are considered in this EIAR as best practice or other regulatory requirements will be followed in all instances.