PROFILE PARK POWER STATION

WASTE HEAT RECOVERY FURTHER NOTE ON FUTURE PROOFING

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Rev.	**Kind of Revision**	**Prepared By:**	**Checked By:**	**Approved By:**	**Date:**	
Greener Ideas		**Document No.:**	PP-GIL-SW-ZZ-XX-Z-0002		**Rev.:**	01
		Project: **GIL Profile Park**				
		Title: **Profile Park Power Station Waste Heat Recovery Further Note on Future Proofing**				

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1.0 GLOSSARY OF TERMS AND ABREVIATIONS

BGE	-	Bord Gáis Energy
GIL	-	Greener Ideas Limited
HT	-	High Temperature
LFO	-	Light Fuel Oil
LT	-	Low Temperature
MW	-	Mega Wattg
P&ID	-	Piping and Instrumentation Diagram
SDCC	-	South Dublin County Council

2.0 INTRODUCTION & DOCUMENT PURPOSE

This document should be read in conjunction with document "PP-GIL-SW-ZZ-XX-Z-0002 - Profile Park Power Station Waste Heat Recovery Statement". In the original document the scope of the Profile Park Power Station was described in detail and information was provided on the potential waste heat recovery strategy to be employed at the plant should a future district heating system be installed that the plant could be connected to. The original document concluded that a waste heat recovery system at the Profile Park Power Station was not currently feasible as no such district heating system existed, however, the document did indicate that certain measures had been taken within the design of the plant to ensure that such a waste heat recovery system could be installed at a later date. This document serves to outline the future proofing measures that have been taken to ensure that such a waste heat recovery system can be installed with relative ease should circumstances change in the future.

3.0 OVERVIEW OF PLANT COOLING SYSTEM AND FUTURE TIE-IN PROVISION FOR WASTE HEAT RECOVERY SYSTEM

As indicated in document "PP-GIL-SW-ZZ-XX-Z-0002 - Profile Park Power Station Waste Heat Recovery Statement", the Profile Park Power Station is comprised of five 20 MW dual fuel engines, capable of running on gas or Light Fuel Oil (LFO).

Each of the dual fuel engines is cooled by two primary cooling water circuits during operation to maintain safe operating parameters. The High Temperature, HT, cooling water circuit circulates water around the engine jacket which cools the main body of each engine, this is the primary source of waste heat from this type of engine. The HT cooling circuit also supplies an amount of cooling water to the Low Temperature, LT, cooling circuit via an expansion tank. The LT cooling water circuit is a secondary system and serves to circulate around the engine pistons and nozzles to appropriately cool these components within safe operating limits.

Only the HT cooling circuit is suitable for consideration in a waste heat recovery system as only this circuit has a tangible delta between inlet and outlet temperature thus making waste heat recovery feasible. The LT cooling circuit is supplied directly from the HT circuit and thus is a sub-system of the HT system, so therefore, waste heat can be recovered from this circuit by connecting only to the HT circuit rather than needing to provide separate connections to both the HT and LT cooling circuits.

In the current configuration the HT and LT cooling line outlets are diverted through a bank of radiators which dissipate the heat to atmosphere before the cooled water is re-directed around the engine cooling circuits once again. To recover the waste heat a plate pack heat exchanger unit could be installed in the space immediately underneath the radiators with the HT cooling water flow being diverted through the heat exchanger system instead of passing through the radiators; this is indicated in the below P&ID excerpts.

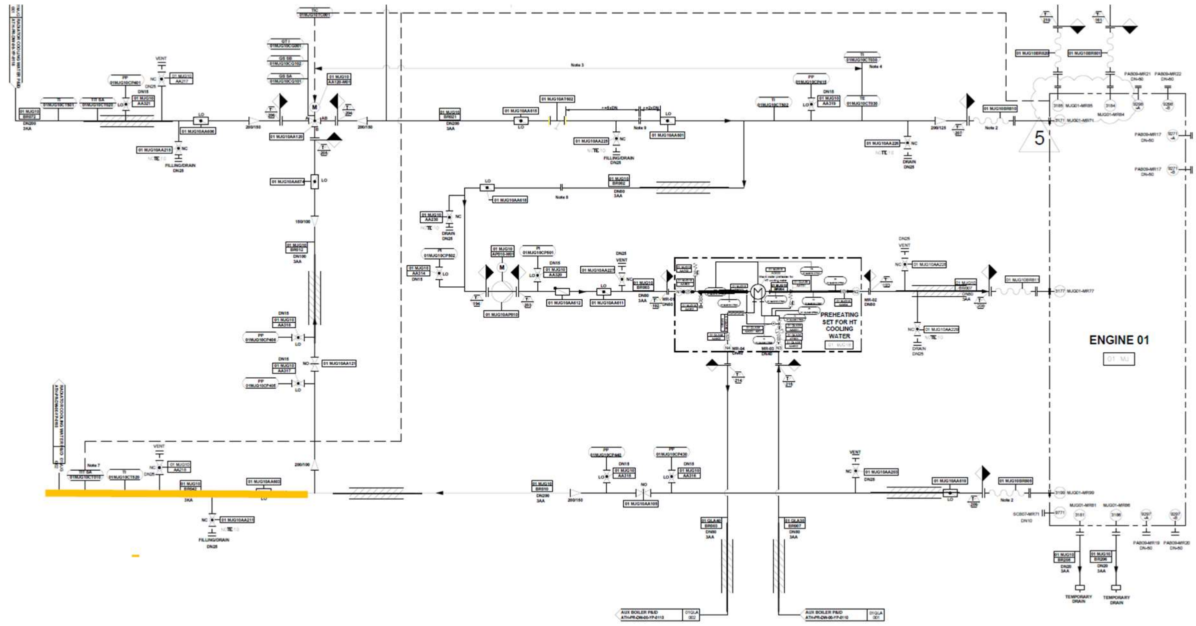

Fig. 3.1: P&ID for an engines cooling system. The piping marked in yellow indicates where the cooling stream could be diverted from the radiators into a heat exchanger for waste heat recovery.

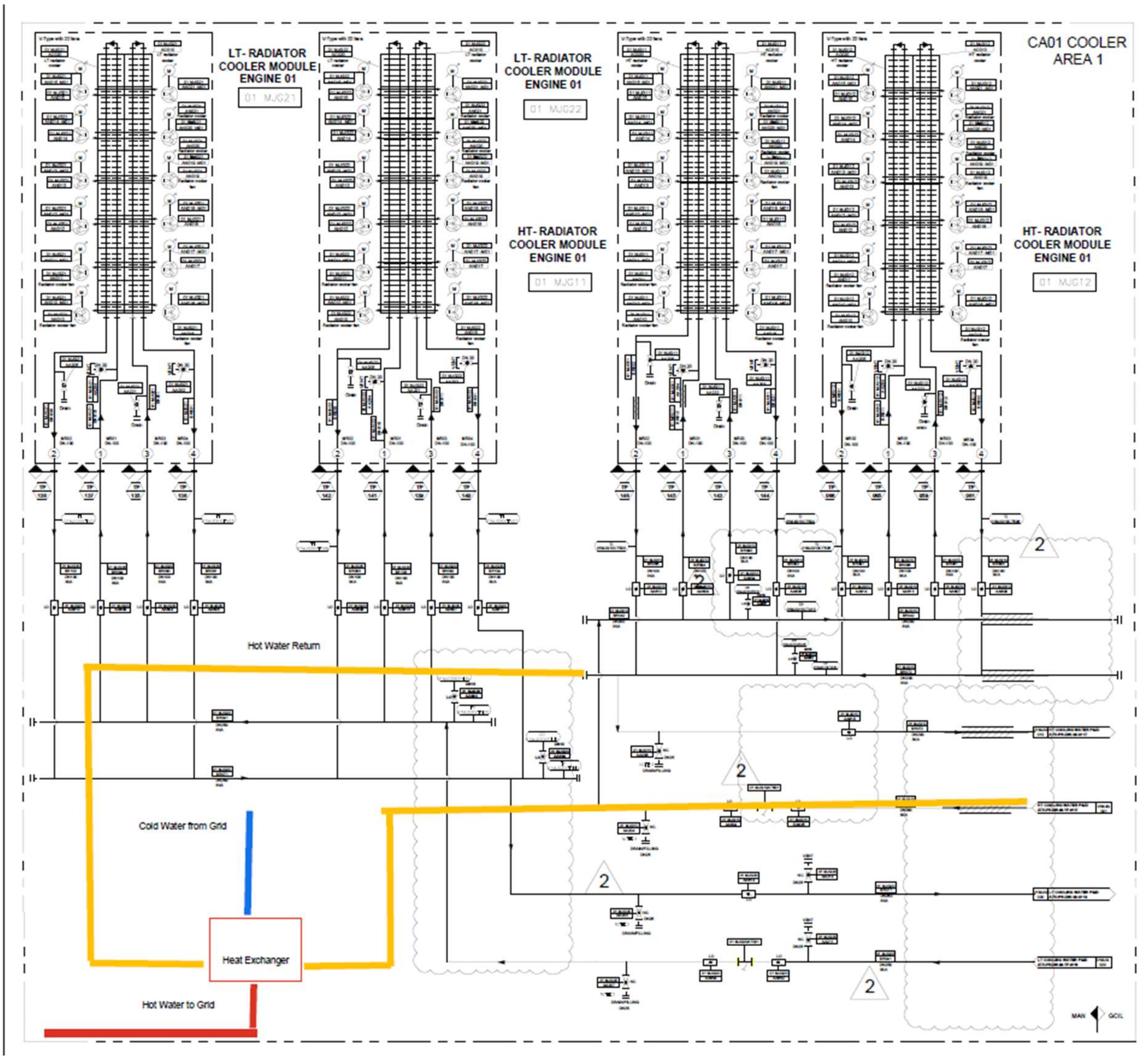

Fig. 3.2: P&ID for cooling radiator system. The piping marked in yellow indicates the HT cooling water being diverted through a heat exchanger system; the red and yellow piping indicates the hypothetical inlet and outlet from a future district heating system.

To divert the HT cooling water flow through a heat exchanger a 3-way valve would be installed in each HT cooling water circuit adjacent to the collectors as shown in Fig. 3.3 below. The purpose of this 3-way valve is to ensure that the flow of HT cooling water from the outlet of the engine cooling circuit can be diverted away from the radiators towards the heat exchanger so that there will be no flow through the radiators and thus all flow will be through the heat exchangers and the heat recovered for use in the hypothetical district heating network.

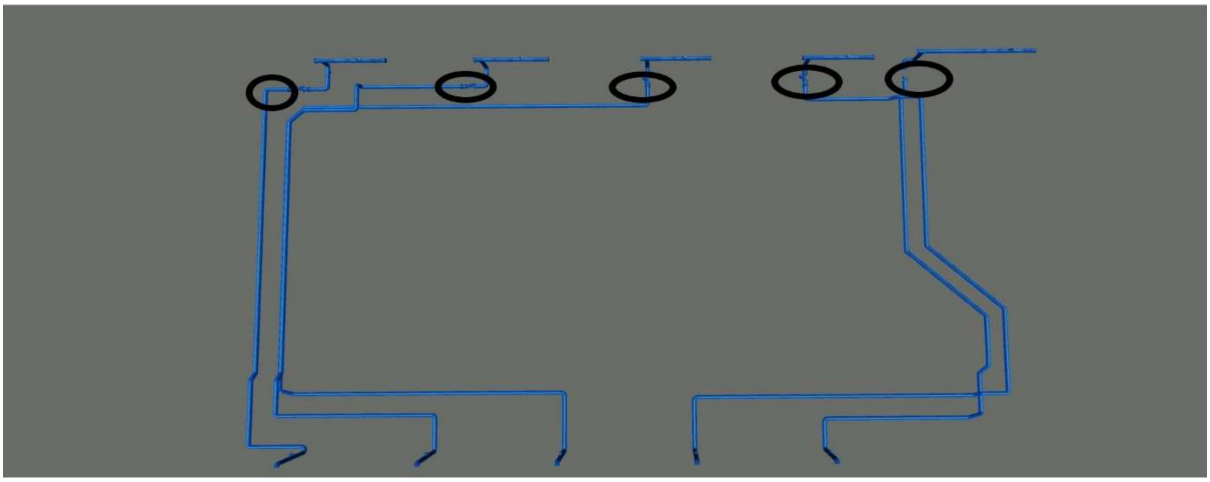

Fig. 3.3: Tie in points to each engines HT cooling water circuit to install the 3-way diverter valves to allow cooling water flow from the engine cooling water outlets to the radiator inlets to be diverted through a heat exchanger system.

After heat has been extracted from the HT cooling water it will be pumped back to the collector where it will be re-circulated around the respective engine cooling water circuits. The tie in to the collector would be either by a piping spool or by another 3-way valve installed to prevent backflow through the radiators, this would be determined during detailed engineering. The tie-in points are indicated in Figs. 3.4-3.6 below.

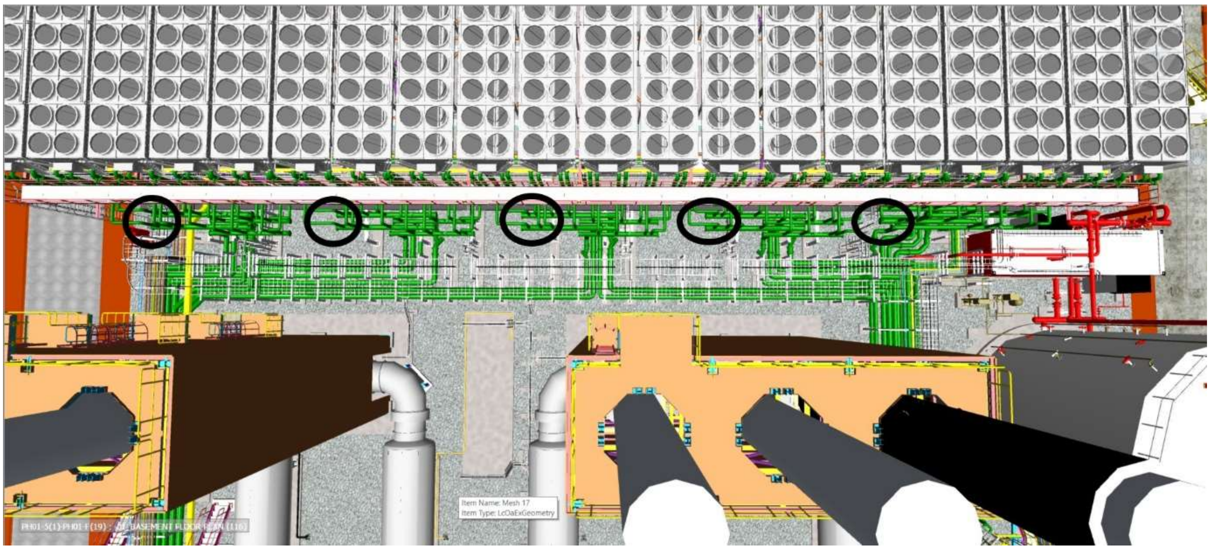

Fig. 3.4: Tie-in points of the return flow line from the heat exchanger to the main HT cooling line.

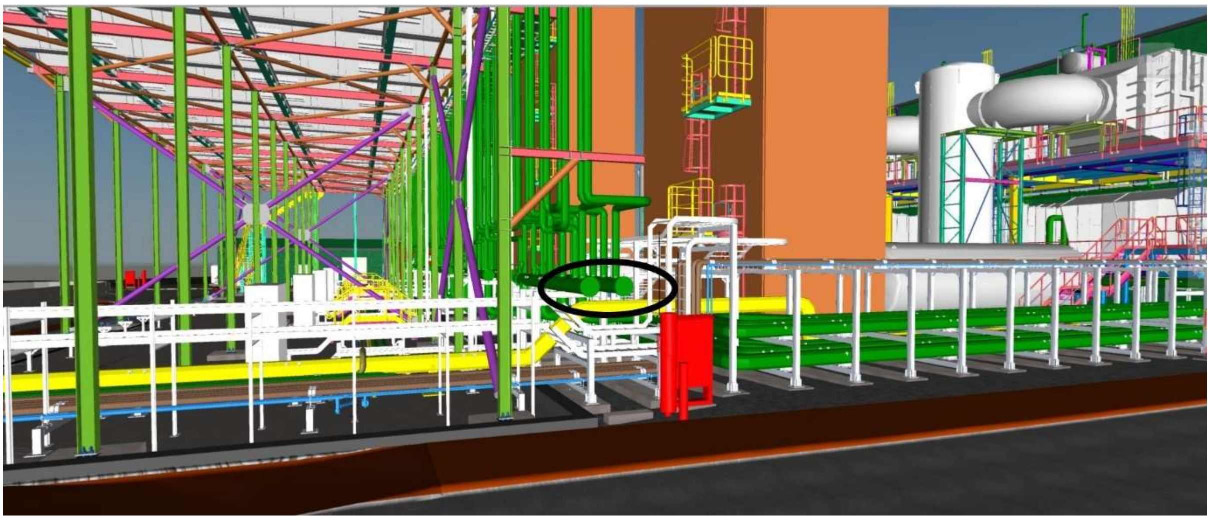

Fig. 3.5: Tie-in points of the return flow line from the heat exchanger to the main HT cooling line.

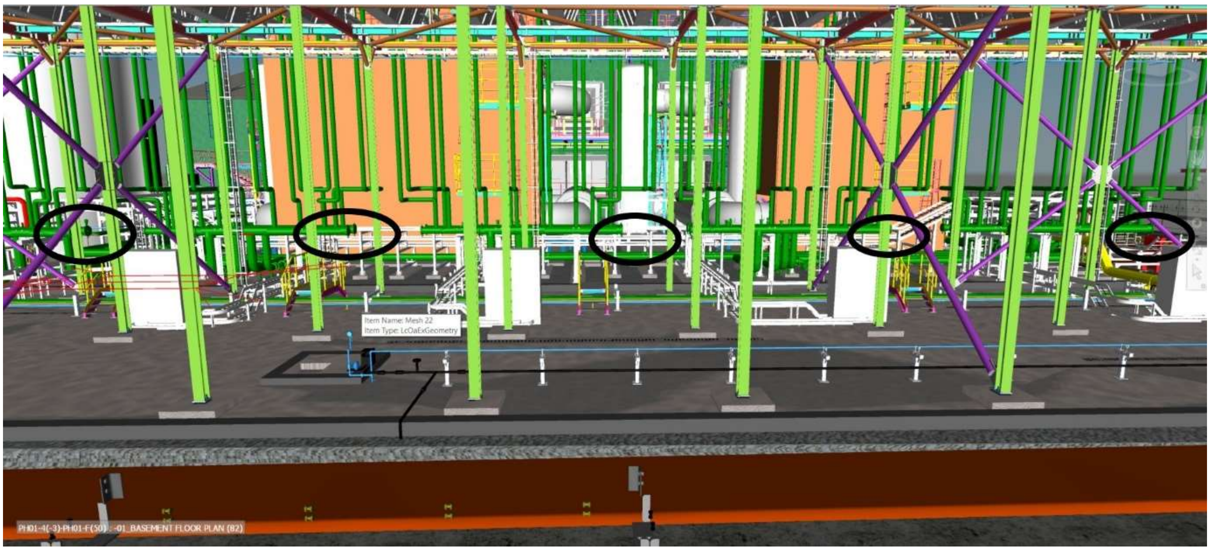

Fig. 3.6: Tie-in points of the return flow line from the heat exchanger to the main HT cooling line.

4.0 FUTURE PROOFING OF THE EXISTING PLANT DESIGN

For the provision of a future waste heat recovery heat exchanger system the following major items of equipment would need to be engineered, procured and installed: a plate pack heat exchanger unit, forwarding pumps, control panel and associated equipment, valves and piping, power supply equipment. The sizing and layout of this equipment cannot be carried out at this time as it would be determined by the heat duty calculations carried out once the details of the district heating network it would be connecting to are known.

Since any future district heating network remains a hypothetical concept at this stage, it's process parameters and its physical location relative to the Profile Park Power Station are unknown and, as such, no detailed engineering work on a heat recovery system for the plant can be carried out.

Therefore, in terms of future proofing to allow for the future installation of a heat recovery system the scope of this is limited to providing reservation for the siting of heat exchanger equipment and for piping tie-in to the cooling water circuits.

As such, reservation of real estate has been made in the area directly beneath the radiators for the heat exchanger equipment to be located in future.

For piping tie-ins, piping spools have been installed in the HT cooling lines connected to the collectors. These piping spools can easily be dropped out and replaced with either a 3-way diverter valve or a diverting spool piece to allow the tie-in to the heat exchanger equipment to be made. The use of piping spools allows for easy tie-in as these can simply be dropped out of the line and replaced, rather than needing to cut into existing piping as would be the case with continuous welded piping. As discussed above, diverter valves cannot be installed in place of the spool pieces now as these cannot be appropriately sized until the physical parameters of any district heating network to which the heat recovery system would be connected to are known.

No provision has been made for inlet and outlet piping to connect the downstream side of any future waste heat recovery system to a prospective district heating network. In a similar vein to the above, nothing is yet known about any future district heating network in terms of its physical parameters nor it's physical location relative to the Profile Park Power Station. That being the case such piping cannot be designed at this stage as it's size nor routing can be speculated upon until actualities of a district heating network are known. What should be noted however is that the Profile Park Power Station site contains a road around the entire perimeter of the site that runs immediately adjacent to the radiator area. This means that inlet and outlet pipe work could easily be routed underneath this roadway from the connection point to the future district heating network at the extremity of the site to the heat exchanger system located in the radiator area.