



12 March 2021

AGL WHOLESALE GAS LIMITED
WORKS APPROVAL APPLICATION 1003907
RESPONSE TO SECTION 22(1) NOTICE TO SUPPLY FURTHER INFORMATION –
QUESTIONS 8 AND 12

OPTIMISING FSRU OPERATIONS - CLOSED LOOP

Question 7: Please provide information on the feasibility of reusing the waste heat from the engines to vaporise the LNG and so avoid discharge of wastewater and reduce emissions to air.

The waste heat from the engines as well as other machinery is recovered and used onboard in several ways:

- (a) The FSRU engines are fitted with economizers (waste heat recovery units). These units supply heat to the cofferdam heating system and heating to the living quarters. Cofferdams are located between the LNG storage tanks and are heated to prevent the ship steel in the bulkheads from reaching cryogenic temperatures. As this heat recovery is already used it cannot be used to aid in vaporisation of the LNG (see Section 10.4.1 of the Works Approval Application); and
- (b) In open loop regasification mode, water used for cooling the engines and auxiliary machinery systems is redirected to the open loop regasification cycle. This waste heat is therefore used to assist in vaporising the LNG and reduces the total amount of wastewater being discharged (see section 4.3.1 of Chapter 4 – Project Description of the EES).

In open loop mode, the percentage of heat that can be recovered from the engine/auxiliary cooling is between 5 – 10 percent of the heat used during the regasification process. This would be dependent on the gas export rate and number of trains in operation.

It is not possible in closed loop regasification mode, in its current configuration, to recover the heat from the regasification cooling water. This is because the water used for heating the LNG operates in a closed loop, meaning it continuously circulates without water entering or leaving the system.

To recover waste heat in closed loop mode, heat exchangers would need to be installed on the engine and auxiliary equipment cooling water discharge streams and incorporated into the closed loop system. Using heat exchangers for heat recovery would recover a lower amount of heat than the amount of heat recovered in open loop mode. In order to install the extent of piping and exchangers required for heat recovery into the already congested space of the FSRU, significant modification to the vessel would be required. Due to the limited benefit anticipated from installing a heat exchanger, as well as the significant cost and modifications to the FSRU that would be associated, it is not considered a practical or feasible option. AGL is unaware of any other FSRU incorporating heat exchangers of this type.

As outlined above, the feasibility of reusing waste heat from the engines and auxiliary machinery systems differs between open and closed loop regasification modes. Waste heat can be recovered in open loop mode but cannot be recovered from closed loop mode without significant intervention

and very substantial cost. With the aim of reducing emissions to air, the preferred and best practice option would be to operate the FSRU in open loop regasification mode. Predicted greenhouse gas emissions would be approximately four times higher under closed loop compared to open loop (a difference of approximately 180,570 tCO₂-e/year).