B.02.06.02 Techniques for improvement of energy efficiency

FSU and LNG regasification compound

The FSU and LNG receiving terminal and regasification compound have been designed so as to minimize heat ingress within the systems maximizing energy efficiency.

Measures to optimize the energy efficiency of the LNG and related process have been established in the design principles and include the following:

1. The FSU has been retrofitted with new LNG pumps for the ship-to-shore LNG transfer. These new pumps shall be considerably smaller than the existing ones which are sized to offload a full tanker in circa 24 hours. The new pumps are sized for the small continuous flows required during permanent operations. Thus they are considerably more efficient at following onshore gas demands that the original pumps.

2. LNG tanks and pipe connections have been designed with appropriate heat insulation so as to prevent heat ingress from the environment. This way BOG production will be managed and minimised; thereby reducing the potential for system pressurization which could otherwise lead to BOG flaring under emergency conditions. In addition minimising BOG production will reduce the usage of the BOG compressors which are relatively large consumers of auxiliary power

3. The water glycol system recovers valuable cooling power from the LNG regasification process which is then transferred to the GTs air intake coolers. The GT air intake temperature is reduced within these coolers enhancing the performance of the CCGT plant. Similarly the heat taken from the GT air inlets is transferred to the IFV equipment and used as heat to regasify the LNG. Thus eliminating additional cooling in the CCGT and reducing additional heating in the regasification plant and increasing the efficiency of both.

4. LNG cryogenic, propane and water glycol solution pumps are designed as per API 610. These pumps have been designed so as to operate in the region of the best efficient and so optimizing the polytropic efficiency.

CCGT Power plant

The SCC-800 type gas turbine combined cycle plant has been designed with a reliable and efficient technology which maximizes the energy efficiency of the plant. Some of these systems and design principles are outlined below:

1. The CCGT power generation technology itself is highly efficient as it recovers a considerable proportion of heat developed during the combustion process of the natural gas within the burners via a direct expansion of the flue gases in the GTGs and subsequently in the HRSG by raising steam at two levels of pressure which will be expanded in a steam turbine.

2. The gas turbine (GT) combustion system and transition ducts is lined with a proprietary thermal barrier coating to minimize heat losses to the environment. This way, most of the heat developed during the combustion process is converted into shaft work in the turbine gas expansion optimizing the efficiency.

3. The exhaust diffuser and the HRSG section are coated with thermal insulator material which will prevent from heat leakage into the environment. This way, exhaust gas energy content is recovered to the extent possible with current state of the art technology in the heat exchangers within the HRSG enhancing the efficiency.

4. The CCGT includes gas fuel performance heaters. These heaters will preheat the gas fuel intake before being injected in the combustion chambers. HRSG hot feed-water is used as the heating medium, thus increasing efficiency of the system.

5. The GTs are equipped with annular-type Dry Low Emission (DLE) burners. A fuel-lean, staged combustion process is developed within the DLE burners accomplishing low level of NOx and CO emissions. The combustion process will be complete so as to increase the heat released during the combustion process and increase the energy efficiency.

6. The new CCGT offers high operational flexibility which allows operating the plant at a wide range of loads so as to meet different power output demands. In combined cycle mode, the power plant can operate with one, two or three GTs in combined cycle mode so that the efficiency is optimized during part load operation.