

TWO COMPLETE COMBINED CYCLE POWER PLANTS

(2 X LM2500+ and 2 x P&W FT8-3 Turbines)



Combined Cycle Natural Gas Power Plant project is based on four gas turbine generator sets incorporated with four heat recovery steam generators (HRSGs) of once through (OTSG) type, two steam turbine generator sets, two air cooled condensers (ACC) and auxiliary systems for base load operation with load cycling capability.

The Plant's cooling requirements are satisfied by utilizing an aircooled condenser for the steam turbine, and an equipment cooling water (ECW) system, utilizing an air-cooled heat exchanger for the auxiliary systems.

The water is produced in the water treatment plant, from raw water supplied from a dam, located at a distance of 7 km from the Plant site.

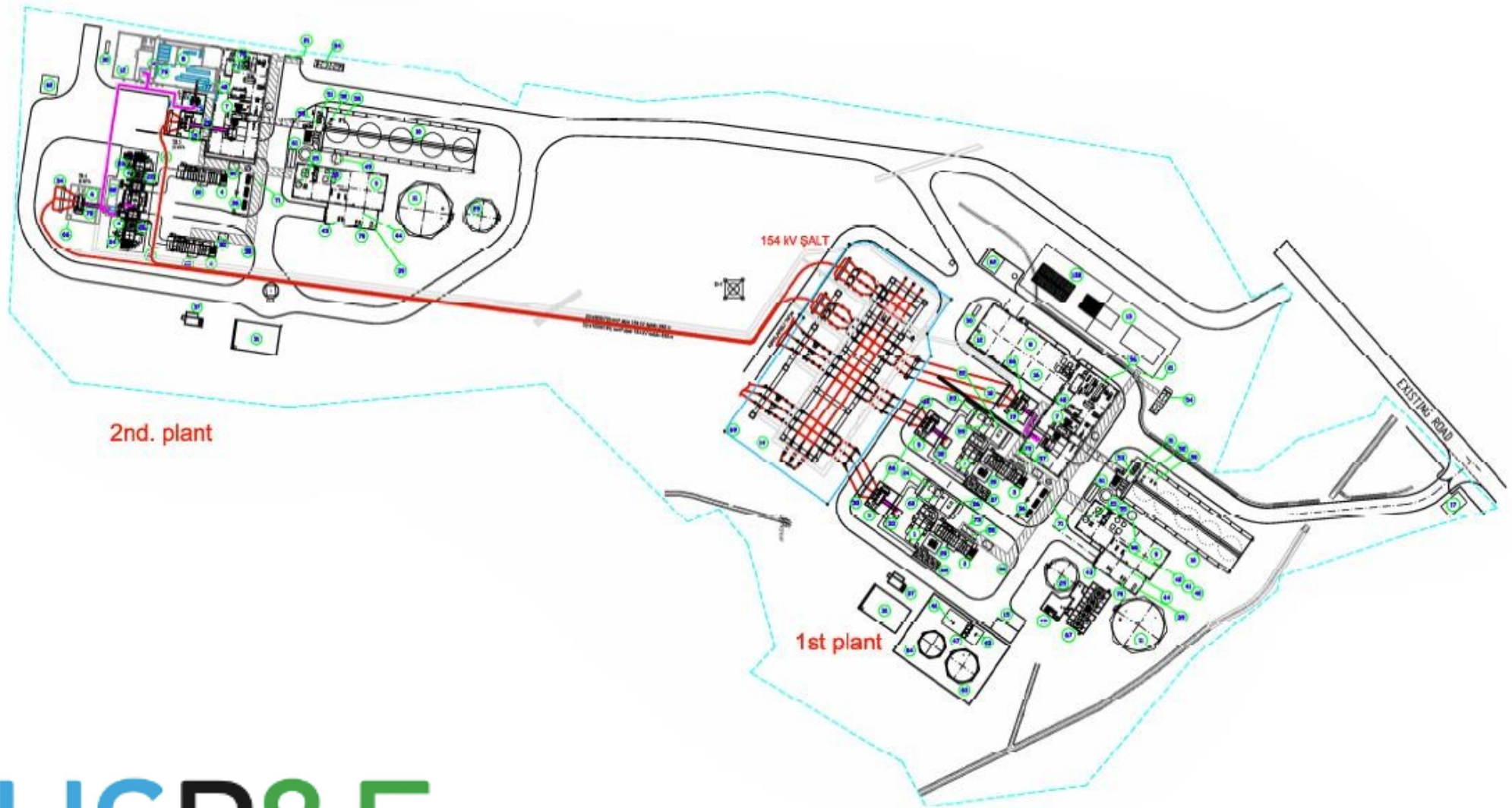
The generated energy is delivered to grid via existing 154 kV transmission line to local substation. The terminal point is at the 154 kV switchyard gantry including conductor and earth wire span to the first tower.

Station auxiliary supply for the Plant is from two (2) station auxiliary transformers; one (1) of which is connected to the 11 kV switchgear of Gas Turbine Generator No. 1 and the other one (1) to the 11 kV switchgear of Gas Turbine Generator No. 2. Electric supply for normal start-up, shut down and maintenance periods of the Plant is available from grid operator via back feed through the GTG step-up transformers.



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GENERAL PLANT LAYOUT



EQUIPMENT TECHNICAL DETAILS OF PLANT - 1

<i>BRAND NAME</i>	GENERAL ELECTRIC - NORWAY PACKED
<i>MODEL (LABEL)</i>	LM2500 Plus PK- MDWG03
<i>POWER</i>	30 MW
<i>START UP DATE</i>	Oct 14, 2005
<i>TURBINE PRODUCTION DATE</i>	2002
<i>FUEL TYPE</i>	NATURAL GAS & LIQUID FUEL (DUAL)
<i>GENERATOR BRAND NAME</i>	ABB
<i>GENERATOR COOLING</i>	WATER COOLED
<i>GENERATOR REVOLUTION</i>	1.500 rpm
<i>GENERATOR POWER</i>	37.800 KVA
<i>WEIGHT</i>	55.5 MT
<i>GEN. PRODUCTION DATE</i>	2002





<i>BRAND NAME</i>	IST (INNOVATIVE STEAM TURBINES) CANADA
<i>TYPE</i>	OTSG (ONCE THROUGH)
<i>PRODUCTION DATE</i>	2002
<i>HP STEAM PRESSURE</i>	54 barg
<i>HP STEAM TEMPERATURE</i>	475 °C
<i>HP FLOW</i>	9,89 kg/sec
<i>LP STEAM PRESSURE</i>	3,98 barg
<i>LP STEAM TEMPERATURE</i>	245 C
<i>LP FLOW</i>	3,98 kg/sec
<i>PREHEATER PRESSURE</i>	22,9 barg
<i>PREHEATER TEMP</i>	115 C
<i>PREHEATER WATER FLOW</i>	5,5 kg/sec



<i>BRAND NAME</i>	<i>GE NUOVO PIGNONE ITALY</i>
<i>MODEL</i>	<i>HNK 50/80</i>
<i>POWER</i>	<i>21,99 MW</i>
<i>REVOLUTION</i>	<i>5.050 rpm</i>
<i>CONDANSATE TEMP</i>	<i>49 °C</i>
<i>CONDANSATE PRESSURE</i>	<i>-0,8816 barg</i>
<i>TURBINE WEIGHT</i>	<i>72.000 kg</i>
<i>GENERATOR WEIGHT</i>	<i>45200 kg</i>
<i>GEAR BOX BRAND NAME</i>	<i>FLENDER</i>
<i>GEAR BOX REVOLUTION</i>	<i>5.050/1.500 rpm</i>
<i>GENERATOR BRAND NAME</i>	<i>ABB</i>
<i>POWER</i>	<i>30.630 KVA</i>
<i>WEIGHT</i>	<i>46.000 kg</i>
<i>PRODUCTION DATE</i>	<i>2002</i>



GAS TURBINE TRANSFORMER – Quantity = 2

<i>154/11 KV TRANSFORMER POWER</i>	40 MVA
<i>MANUFACTURER</i>	ABB
<i>START UP DATE</i>	09.06.2005



STEAM TURBINE TRANSFORMER – Quantity = 1

<i>154/11 KV TRANSFORMER POWER</i>	31 MVA
<i>MANUFACTURER</i>	ABB
<i>START UP DATE</i>	13.06.2005



<i>DRY TYPE</i>	
<i>11/0,4 KV TRANSFORMER POWER</i>	2500 KVA
<i>BRAND NAME</i>	ABB
<i>START UP DATE</i>	09.06.2005



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<i>MANUFACTURER</i>	<i>HAMON / USA</i>
<i>CELL</i>	<i>5 EA</i>
<i>TYPE</i>	<i>TEK SIRALI</i>
<i>FAN MOTOR POWER</i>	<i>75 kW</i>
<i>COOLING</i>	<i>AIR</i>
<i>STEAM FLOW</i>	<i>25,64 kg/s</i>
<i>STEAM TEMPERATURE</i>	<i>45 °C</i>
<i>STEAM PRESSURE</i>	<i>62,5 mbara</i>
<i>FAN GEAR BOX MANUFACTURER</i>	<i>HANSEN</i>
<i>GEAR BOX POWER</i>	<i>190 kW</i>
<i>FAN MOTOR REVOLUTION</i>	<i>1485-297 rpm</i>



EQUIPMENT TECHNICAL DETAILS OF PLANT II

GAS TURBINES – Quantity = 2

<i>BRAND NAME</i>	PRATT & WITNEY USA
<i>MODEL (LABEL)</i>	FT8-3 SWIFT PACK SINGLE SHAFT
<i>POWER</i>	29 MW
<i>START UP DATE</i>	10.07.2010
<i>TURBINE PRODUCTION DATE</i>	2009
<i>FUEL TYPE</i>	NATURAL GAS
<i>GENERATOR BRAND NAME</i>	BRUSH
<i>GENERATOR COOLING</i>	AIR COOLED
<i>GENERATOR REVOLUTION</i>	3.000 rpm
<i>GENERATOR POWER</i>	79,875 KVA
<i>TYPE</i>	BDAX72-340ER
<i>GEN. PRODUCTION DATE</i>	2009



HEAT RECOVERY STEAM GENERATORS – Quantity = 2

<i>BRAND NAME</i>	<i>IST (INNOVATIVE STEAM TURBINES) CANADA</i>
<i>TYPE</i>	<i>OTSG (ONCE THROUGH)</i>
<i>PRODUCTION DATE</i>	<i>2010</i>
<i>HP STEAM PRESSURE</i>	<i>54 barg</i>
<i>HP STEAM TEMPERATURE</i>	<i>475 °C</i>
<i>HP FLOW</i>	<i>9,89 kg/sec</i>
<i>LP STEAM PRESSURE</i>	<i>3,89 barg</i>
<i>LP STEAM TEMPERATURE</i>	<i>245 °C</i>
<i>LP FLOW</i>	<i>2,491 kg/sec</i>

GAS TURBINE TRANSFORMER – Quantity = 1

<i>TRANSFORMER</i>	<i>POWER</i>	
<i>154/11 KV</i>		<i>80 MVA</i>
<i>MANUFACTURER</i>		<i>BEST / TURKEY</i>
<i>START UP DATE</i>		<i>2010</i>



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STEAM TURBINE – Quantity = 1

<i>BRAND NAME</i>	HTC CHINA
<i>MODEL</i>	NKS 50/80
<i>POWER</i>	18.518 MW
<i>REVOLUTION</i>	3.000 rpm
<i>CONDANSATE TEMP</i>	45 °C
<i>CONDANSATE PRESSURE</i>	0,9124 bara
<i>TURBINE WEIGHT</i>	79.000 kg
<i>GENERATOR WEIGHT</i>	68.000 kg
<i>GENERATOR BRAND NAME</i>	NANYANG CHINA
<i>POWER</i>	23.500 KVA
<i>WEIGHT</i>	2010
<i>PRODUCTION DATE</i>	18.12.2010



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STEAM TURBINE TRANSFORMER – Quantity = 1

<i>TRANSFORMER POWER</i> <i>154/11 KV</i>	<i>MVA</i>
<i>MANUFACTURER</i>	<i>BEST</i>
<i>START UP DATE</i>	<i>2010</i>



<i>TRANSFORMER POWER</i> <i>11/0,4 KV</i>	<i>KVA</i>
<i>MANUFACTURER</i>	<i>BEST</i>
<i>START UP DATE</i>	<i>2010</i>



AUXILIARY TRANSFORMER – Quantity = 1

<i>MODEL</i>	<i>HPS 80710</i>
<i>TYPE</i>	<i>Wet Back - 3 Pass</i>
<i>OUTPUT (NOMINAL)</i>	<i>Kg/hr</i>



<i>MANUFACTURER</i>	<i>ECOSTAR</i>
<i>TYPE</i>	<i>ECO8 O(L) C3A</i>
<i>FUEL</i>	<i>Light oil</i>
<i>OUTPUT</i>	<i>kW</i>
<i>OPERATING PRINCIPLE</i>	<i>Electronic control of fuel/air ratio</i>
<i>LIGHT OIL DELIVERY</i>	<i>m3/hr</i>
<i>PRESSURE PROBE</i>	<i>-18 bar</i>
<i>PRODUCTION DATE</i>	<i>2009</i>

AIR COOLED CONDENSER (ACC) – Quantity = 1

<i>MANUFACTURER</i>	<i>HAMON / USA</i>
<i>CELL</i>	<i>5 EA</i>
<i>TYPE</i>	<i>TEK SIRALI</i>
<i>FAN MOTOR POWER</i>	<i>75 kW</i>
<i>COOLING</i>	<i>AIR</i>
<i>STEAM FLOW</i>	<i>25,64 kg/s</i>
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<i>GEAR BOX POWER</i>	<i>190 kW</i>
<i>FAN MOTOR REVOLUTION</i>	<i>1485-297 rpm</i>
<i>PRODUCTION DATE</i>	<i>2009</i>

