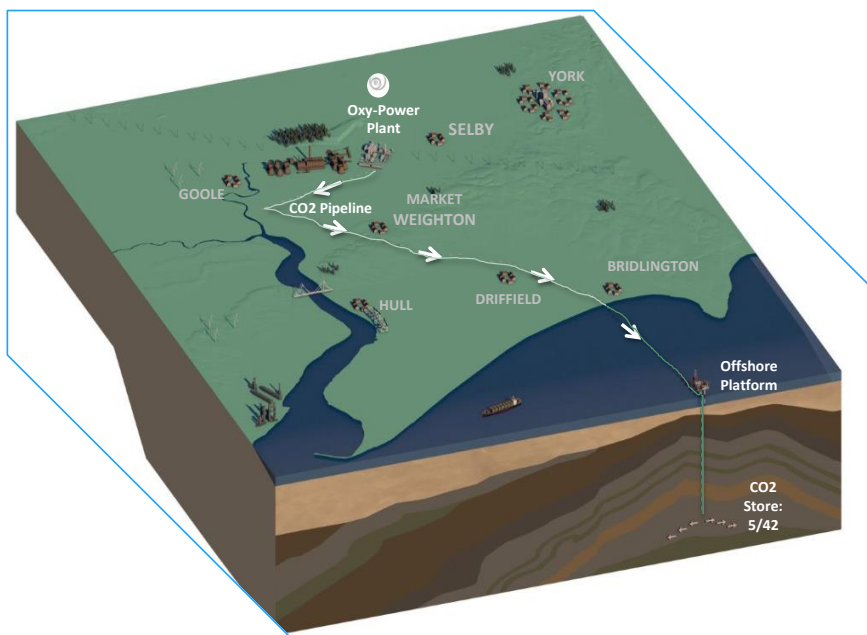




K24: Full Chain Equipment List

Technical: Full Chain



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Key Words

Key Work	Meaning or Explanation
Carbon Dioxide	A greenhouse gas produced during the combustion process
Carbon Capture and Storage	A technology which reduces carbon emissions from the combustion based power generation process and stores it in a suitable location
Coal	The fossil fuel used in the combustion process for White Rose
Dense Phase	Fluid state that has a viscosity close to a gas while having a density closer to a liquid Achieved by maintaining the temperature of a gas within a particular range and compressing it above a critical pressure
Full Chain	A complete CCS system from power generation through CO ₂ capture, compression, transport to injection and permanent storage
Heat and Mass Balance	Heat and mass balance/heat and materials balance is a document produced by process design engineers while designing a process plant. A heat and mass balance sheet represents every process stream on the corresponding process flow diagram in terms of the process conditions.
Key Knowledge	Information that may be useful if not vital to understanding how some enterprise may be successfully undertaken
Storage	Containment in suitable pervious rock formations located under impervious rock formations usually under the sea bed
Transport	Removing processed CO ₂ by pipeline from the capture and process unit to storage
Operation	Utilising plant/equipment to produce/provide the designed output commodity/service
Operating Mode	The method of operation of the OPP, which can operate in air or oxy-firing mode
Oxy Boiler	The boiler within the OPP capable of producing full load in either the air or oxy-fired mode of operation
Oxy-firing	The use of oxygen (instead of air) in the combustion process
Oxyfuel	The technology where combustion of fuel takes place with oxygen replacing air as the oxidant for the process, with resultant flue gas being high in CO ₂
Oxy Power Plant	A power plant using oxyfuel technology
Process Flow Diagram	Process Flow Diagram (PFD) is a drawing which describes the process flow for a processing plant. PFD is used to capture the main process equipment, main process streams, process/design conditions in these items of equipment and the basic process control scheme in a single drawing.
White Rose	The White Rose Carbon Capture and Storage project

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Executive Summary

The Full Chain Equipment List was generated as part of the Front End Engineering Design (FEED) contract with the Department of Energy and Climate Change (DECC) for White Rose, an integrated full-chain Carbon Capture and Storage (CCS) Project. This document is one of a series of Key Knowledge Deliverables (KKD) from White Rose to be issued by DECC for public information.

White Rose comprises a new coal-fired ultra-supercritical Oxy Power Plant (OPP) of up to 448 MWe (gross) and a Transport and Storage (T&S) network that will transfer the carbon dioxide from the OPP by pipeline for permanent storage under the southern North Sea. The OPP captures around 90% of the carbon dioxide emissions and has the option to co-fire biomass.

Delivery of the project is through Capture Power Limited (CPL), an industrial consortium formed by General Electric (GE), BOC and Drax, and National Grid Carbon Limited (NGC), a wholly owned subsidiary of National Grid.

This report provides a list of the main process equipment as shown on the Process Flow Diagrams covering the Full CCS Chain.

This document should be read in conjunction with the following documents:

- K.22 - Full Chain Process Flow Diagrams;
- K.23 - Full Chain Heat and Material Balances;
- K.27 - OPP - Process Description;
- K.29 - Transport - Process Description;
- K.30 - Storage - Process Description; and
- K.35 - Onshore Pipeline Route Plans Report.

1 Introduction

The White Rose Carbon Capture and Storage (CCS) Project (White Rose) is an integrated full-chain CCS project comprising a new coal-fired Oxy Power Plant (OPP) and a Transport and Storage (T&S) network that will transfer the carbon dioxide from the OPP by pipeline for permanent storage under the southern North Sea.

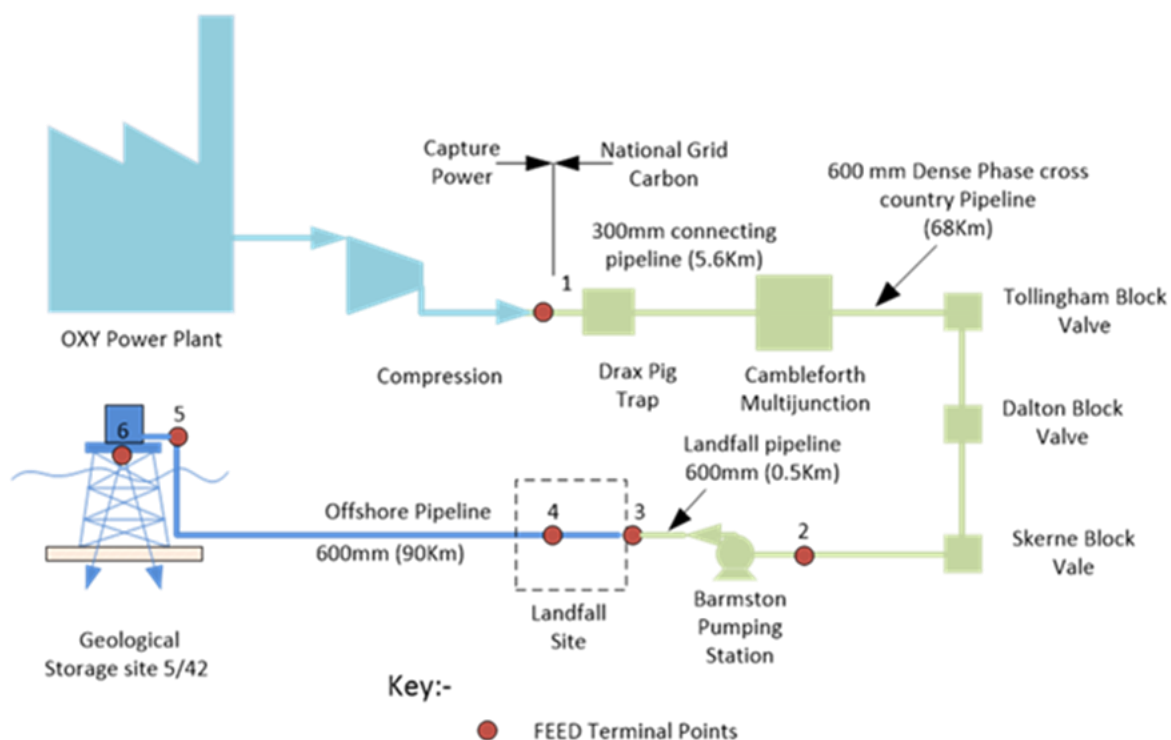
The OPP is a new ultra-supercritical power plant with oxyfuel technology of up to 448 MWe gross output that will capture around 90% of carbon dioxide emissions and also have the option to co-fire biomass.

One of the first large scale demonstration plants of its type in the world, White Rose aims to prove CCS technology at commercial scale as a competitive form of low-carbon power generation and as an important technology in tackling climate change. The OPP will generate enough low carbon electricity to supply the equivalent needs of over 630,000 homes.

White Rose is being developed by Capture Power Limited, a consortium of GE, BOC and Drax. The project will also establish a CO₂ transportation and storage network in the region through the Yorkshire and Humber CCS pipeline being developed by National Grid Carbon Ltd (NGC).

The Full Chain and its component parts (see Figure 1.1) are designed to be operated such that the target of two million tonnes of CO₂ per year can be safely stored.

Figure 1.1: Full Chain Schematic Diagram



2 Full Chain Equipment Lists

Table 2.1: Water Steam Cycle system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
E-1101 A/B	CONDENSER	1*100%	18*16*10 m		~vacuum	30°C	210 kg/s	0.4 barg	110°C	235 kg/s	Stainless steel
P-1102 A/B	CONDENSATE EXTRACTION PUMP stage 1	2*100%		16 t	10 barg	30°C	210 kg/s	19 barg	90°C	235 kg/s	Pump casing/diffusers : Carbon steel Shaft/impeller : Chromium steel
A-1103 A/B	POLISHING PLANT	2*50%			10 barg	30°C	2*105 kg/s	19 barg	90°C	2*125 kg/s	Per train, 2 polishing trains
P-1104 A/B	CONDENSATE EXTRACTION PUMP stage 2	2*100%		13	40 barg	30°C	210 kg/s	58 barg	110 °C	2*235 kg/s	Pump casing: Carbon steel Shaft/impeller : Chromium steel
E-1105 A/B	LP HEATERS 1	2*50%	l:10m diam1m	8 t	40 barg	30to 50°C	2* 68 kg/s	58 barg	110°C	2*80 kg/s	Tube stainless steel
E-1106 A/B	LP HEATERS 2	2*50%	l:10m diam1m	8 t	38 barg	50to 70°C	2.68 kg/s	58 barg	110°C	2*80 kg/s	Tube stainless steel
E-1107	LP HEATERS 3	1*100%	l:11m diam1m	12 t	36 barg	70 to 100°C	135 kg/s	58 barg	120°C	150 kg/s	Tube stainless steel
E-1108	LP HEATERS 4	1*100%	l:8.5m diam1.2m	10 t	34 barg	100 to 115°C	155 kg/s	58 barg	135°C	170 kg/s	Tube stainless steel
E-1109	LP HEATERS 5	1*100%	l:8.5m diam1.2m	10 t	32 barg	115 to 135°C	155 kg/s	58 barg	150°C	170 kg/s	Tube stainless steel
E-1110	LP HEATERS 6	1*100%	l:12m diam1.5m	16 t	30 barg	135 to 170°C	235 kg/s	58 barg	190°C	250 kg/s	Tube stainless steel
T-1111	FEEDWATER TANK (including deaerator)	1	L:20m diam 4m	300 t	22 barg	170 to 220°C	315 kg/s	26 barg	230°C	350kg/s	low alloyed steel
P-1112 A/B	BOILER FEEDWATER PUMPS	2*50%			310 barg	220°C	2*155 kg/s	500 barg	250°C	180 kg/s	
E-1113	HP HEATERS 1bis	1*100%	l:7m diam1.5 m	17 t	310 barg	300 to 315°C	100 kg/s	340 barg	350°C	120 Kg/s	Tube : low alloyed steel
E-1114	HP HEATERS 1	1*100%	l:10m diam 2m	57 t	310 barg	220 to 265°C	315 kg/s	340 barg	280°C	350 Kg/s	Tube : low alloyed steel
E-1115	HP HEATERS 2	1*100%	l:9m diam 2m	63 t	310 barg	265 to 300°C	315 kg/s	340 barg	315°C	350 Kg/s	Tube : low alloyed steel
V-1116	HP BY-PASS VALVE	1*70%			275 barg	600°C	225 kg/s	290 barg	610°C	270 kg/s	
V-1117	HP ADMISSION VALVE	1*100%			260 barg	600°C	300 kg/s	290 barg	610°C		
V-1118	IP ADMISSION VALVE				50 barg	620°C	260 kg/s	60 barg	630°C		
V-1119 A/B	IP/LP BY-PASS VALVES	2*35%			55 barg	620°C	250 kg/s	60 barg	630°C	260 kg/s	
E-1120	BOILER ECONOMIZER	RESERVED LIST									
E-1121	BOILER EVAPORATOR	RESERVED LIST									
E-1122	BOILER SUPERHEATER	RESERVED LIST									
P-1123	BOILER WATER CIRC PUMP	1*100%			N/A	N/A	0				USED DURING STARTUP ONLY
T-1124	FLASH TANK	1*100%			N/A	N/A	0				USED DURING STARTUP ONLY
E-1125	BOILER REHEATER	RESERVED LIST									
S-1126	HP STEAM TURBINE	1*100%			260 barg	600°C	300 kg/s				
S-1127	IP STEAM TURBINE	1*100%			50 barg	620°C	260 kg/s				
S-1128 A/B	LP STEAM TURBINE	2*50%			2 barg	230°C	220 kg/s				
P-1129 A/B	VACUUM PUMPS	2*100% (see note 1)			vacuum	30°C		vacuum	50°C		

Note 1: Two pumps installed: one in operation and one in standby for vacuum holding, two in operation for vacuum raising.

Table 2.2: Air, Oxygen, CO₂ and Flue gas system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials	
					pressure	temperature	flow	pressure	temperature	flow		
A-1201	COAL MILL SYSTEM		RESERVED LIST									
A-1202	BIOMASS MILL SYSTEM (OPTION)		RESERVED LIST									
A-1203	BOILER (Boiler Firing system)		RESERVED LIST									
A-1204	BOILER (Pressure Parts)		RESERVED LIST									
E-1205	GAS TO GAS HEATER	1	RESERVED LIST									
F-1206	INDUCED DRAFT FAN	1*100%	RESERVED LIST									
F-1207	FORCED DRAFT FAN	1*100%	RESERVED LIST									
F-1208	PRIMARY “AIR” FAN	1*100%	RESERVED LIST									
A-1210	STEAM COIL AIR PREHEATER	1 x100%	7500 mm x 7500 mm	24000 kg	9 bar (g)	230°C	37200 kg/hr	14 bar (g)	300°C	37200 kg/hr	Carbon Steel, frame, tubes w/aluminium fins	
A-1211	MAIN STACK (Air & Oxy mode)	1	120m				atmospheric	65°C	22kg/s			Measurements are : H ₂ O, NO _x (NO+NO ₂), SO ₂ , CO ₂ , O ₂ , T° and Flow.
A-1212	CEMS (Air & Oxy mode)						atmospheric					
D-1220 to 25	FLUE GAS DUCTS DAMPERS	5					atmospheric					

Table 2.3: Auxiliary Steam system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
A-1301	Auxiliary Steam Header	1			12 to 22 barg	290°C	0 to 15 kg/s	26 barg	320°C	15 kg/s	
A-1302	Auxiliary Boiler (Start-up only)	1			15 barg	290°C	15 kg/s	20 barg	320°C	15 kg/s	
A-1303	Air pre-heater shoot blower	Steam sootblowing	3835mm x 915mm *	544 kg	Steam source: 1380 KPa above atm	150°C of superheat	77 kg/min	4480 kPa above atm	370°C	N/A	Beam – carbon steel Lance tube – alloy steel
A-1304	CEMS (Auxiliary boiler)	1			atmospheric						

Note* Dimension is projection outside of air preheater, assuming sootblower is mounted perpendicular to air preheater centreline

Table 2.4: Main Cooling Water system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
P-1401 A/B/C	Main Cooling Water Pumps	3*33%			2.5 barg	19°C	3*5250 kg/s	6 barg	30°C	3*5250 kg/s	
E-1402	Cooling Tower	28 CELLS			2 barg	29°C	16000 kg/s	6 barg	40°C	16000 kg/s	
E-1403 A/B	Closed Cooling Heat Exchanger	2*100%			2.5 barg	19°C	500kg/s	6 barg	30°C	500 kg/s	
A-1405 A/B	GPU cooling system Debris filter	2*100%			2.5 barg	19°C	5000 kg/s	6 barg	30°C	5000 kg/s	
A-1406 A/B	ASU cooling system Debris filter	2*100%			2.5 barg	19°C	600 kg/s	6 barg	30°C	900 kg/s	
A-1407 A/B	Closed Cooling system Debris filter	2*100%			2.5 barg	19°C	500kg/s	6 barg	30°C	500 kg/s	

Table 2.5: Raw and Demineralised Water system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
A-1501 A/B/C	Raw Water Pre-Treatment	3*150kg/s			2 barg	15°C	310 kg/s	4 barg	30°C	450kg/s	
T-1502	Raw Water Storage	1 tank	6400m3		atmospheric	15°C					
P-1503 A/B/C	Service water pump	3x 33 kg/s			6 barg	15°C	33 kg/s	10 barg	30°C	100 kg/s	
P-1504 A/B	Cooling Tower Make-up pump	2*100%			1 barg	15°C	300 kg/s	3 barg	30°C	420 kg/s	
P-1505 & P-1506	Fire water Pump / Diesel pump	1 + 1								200 kg/s	
A-1507	Demineralisation Plant	2*100%			3 barg	15°C	7 kg/s	5 barg	30°C	7 kg/s	
P-1508 A/B	Demineralisation feed pumps	2*100%			3 barg	15°C	7 kg/s	5 barg	30°C	7 kg/s	
T-1509	Demineralized Water Storage	1 Tank	1800 m3		atmospheric	15°C					
P-1510 A/B	WSC Make-up pump – normal	2*100%			8 barg	15°C	14 t/h	10 barg	30°C	14 t/h	
P-1511	WSC Make-up pump - quick	1*100%			8 barg	15°C	0 kg/s	10 barg	30°C	40 kg/s	

Table 2.6: Waste Water system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
A-1601	Neutralisation Pit	1	160 m3								
A-1602	Neutralisation Pit	1	200 m3								
A-1603	Primary Holding sump	1	2000 m3								
A-1604	Waste Water Monitoring	1									Measure : T (°C), Flow + sampling
A-1605 & A-1606	Oil/water separators	2			Gravity			1 barg	15°C	5.5 m3/h	
A-1607	Oil/water separator	1			Gravity			1 barg	15°C	11 m3/h	
A-1608	Storm water basin (North site)	1	5650m3		-	-	-	-	-	-	
P-1609 A/B	Discharge water pumps	2*100%	-					3 barg	30°C	450 m3/h	
A-1610	Storm water basin (South site)	1 basin	1150 m3		Gravity					130 m3/h	Discharged by gravity to the Carr Dyke
A-1611	OPP Sanitary effluents Pit	1	5m3								
P-1612 A/B	Sanitary effluents pumps	2*100%	-					2 barg	30°C	10 m3/h	
P-1613 A/B	Waste Water Pumps	2*100%			1 barg	20°C	70 m3/h	2 barg	50°C	100 m3/h	
T-1614	Neutralisation tank	1	30 m3								
T-1615	Precipitation tank	1	30 m3								
T-1616	Floculation tank	1	10 m3								
T-1617	Sedimentation tank	1	200 m3								
T-1618	Intermediate tank	1	30 m3								
T-1619	Nitrification	1	600 m3								
T-1620	Denitrification	1	1200 m3								
A-1621 A/B	Sludge tickener	1	2x50 m3/h							50 m3/h	
A-1622	Filter Press	2									
T-1623	Dissolved air flotation		40 m3								
T-1624	Clean water tank		10 m3								

Table 2.7: Light Fuel Oil system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
P-1701 A/B	LFO Unloading Pump	2 pumps			2 barg	15°C	40 m3/h	5 barg	30°C	80 m3/h	
T-1702	LFO Tank	1	660 m3			18°C					
P-1703 A/B	Main Boiler Transfer pumps	2*100%			25 barg	18°C	25 t/h	30 barg	30°C	30 t/h	
P-1704 A/B	Auxiliary Transfer pumps	2*100%			10 barg	18°C	10 t/h	15 barg	30°C	15 t/h	

Table 2.8: Electrostatic Precipitator system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
A-1801	ESP	1	-	-	-	-	-	-	-	-	steel

Table 2.9: Deashing system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
A-1901	Boiler Submerged Conveyor	RESERVED LIST									
A-1902	Boiler Bottom Ash Conveyor	RESERVED LIST									
A-1903	Bottom Ash Elevator	1			atmospheric	60°C	10 t/h	Atmospheric	15 t/h	80°C	
A-1904	Bottom Ash CONVEYERS	2			atmospheric	60°C	10 t/h	Atmospheric	15 t/h	80°C	
T-1905	Bottom Ash Silo	1 silo		980 m³							
A-1906	Fly Ash Hoppers				gravity	120°C	20 t/h	gravity	210°C	40 t/h	
A-1907	Air Compressor	1			1 barg	30°C					
A-1908	Air Blower	1			1 barg	30°C					
F-1909	Flushing Blowers	1 fan			5 barg	100°C	10 Nm³/h	7.5 barg	120°C	12 Nm³/h	
T-1910	Fly Ash Silo	1 silo		1760 m³							
A-1911	Fly ash handling system				5.5 barg		20t/h			40 t/h	

Table 2.10: Flue Gas Desulphurisation system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
A-2001	FGD	1	-	-	-	-	-	-	-	-	
A-2002	Reagent Storage & preparation	1									
A-2003	Gypsum dewatering & storage	1									
A-2004	Limestone unloading	45 ton/h			atmospheric	ambient		atmospheric	ambient		

Table 2.11: Gas Processing Unit system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
E-2101	Flue Gas Direct Contact Cooling	RESERVED LIST									
C-2102	Flue Gas Compression	RESERVED LIST									
A-2103	Flue Gas Purification	RESERVED LIST									
E-2104	GPU Cold Box	RESERVED LIST									
A-2105	CO ₂ Separation	RESERVED LIST									
C-2106	CO ₂ Compression	RESERVED LIST									
A-2107	CO ₂ Condensation	RESERVED LIST									
P-2108	CO ₂ Pump	RESERVED LIST									
A-2109	CO ₂ Cooling & metering	RESERVED LIST									
P-2110 A/B	DCC Circulation Pumps	RESERVED LIST									
E-2111	Quench Water Cooler	RESERVED LIST									
A-2112	Caustic dosing	RESERVED LIST									

Table 2.12: Selective Catalyst Reducer system

Equipment number	Designation	Duty	Main dimension	Weight	Operation conditions			Design conditions			Materials
					pressure	temperature	flow	pressure	temperature	flow	
A-2301	AMMONIA UNLOADING SKID	Intermittent	1500mm x 1200mm x 900mm H	225 KG	12 barg	38 C	Note 1	47 barg	93 C	20 L/min	Carbon Steel
T-2302 A/B	ANHYDROUS AMMONIA STORAGE TANK	Continuous	2845mm diameter x 12800mm L	2600 kg empty 70000 kg full	12 barg	38 C	Note 2	24 barg	52 C	13.5 L/min	Carbon Steel
P-2303 A/B	NH3 FORWARDING PUMP	Continuous	3500mm x 1850mm x 4300mm H	1000 kg	12 barg	38 C	Note 2	24 barg	52 C	20 L/min	Cast Iron and stainless steel
A-2304	NH3 VAPORIZER SKID	Continuous	2300mm x 6100mm x 4300mm H	2722 kg empty 4537 kg full	Water to fill 4 barg NH2 12 barg	Water 85 C NH3 38C	Note 2	24 barg	110 C	13.5 L/min NH3	Carbon steel and stainless steel
A-2305	SELECTIVE CATALYTIC REDUCTION	RESERVED LIST									
A-2306	NH3 DILUTION AIR & HEATER SKID	Continuous	6700mm x 2745mm x 2500mm H	12000 kg	Blower 1300 WC C	Heater 83 C	6500 kg/hr	Blower 1525 mm WC	93 C	9600 kg/hr	Cast steel w/aluminium stages Blower Incoloy
A-2307	NH3 INJECTION GRID	RESERVED LIST									
A-2308	SO3 MITIGATION DILUTION & PREPARATION	RESERVED LIST									
A-2309	SO3 MITIGATION INJECTION GRID	RESERVED LIST									

Note 1: Flow of unloading skid is determined by pump/compressor

Note 2: Flow is 3.7 L/min 23 hours per day and 13.5 L/min 1 hour

Table 2.13: Air Separation Plant

EQUIPMENT LIST				Site of erection: Selby / UK							Issue: 2		Issue Date: 07.09.2015			Issuer: P.Barbeau		
Project-No.: 1520 B4NG				Dimensions and weights							Design Conditions			Operating Conditions				
Doc-No.: &AA A-LE 1001																		
Code	Description	No	unit	length [cm]	width [cm]	height [cm]	Volume per item [m³]	Weight per item [tons]	total Volume [m³]	total Weight [tons]	Design Pressure [bara]	Design Temp. [°C]	MoC	Pressure Inlet [bara]	Pressure Outlet [bara]	Temp. Inlet [°C]	Flow Rate [Nm³/h]	
C1161/1261	<u>Machineries and drivers</u>																	
	Air compressor (MAC+BAC Comb)	2	pcs	n/a	n/a	n/a	1.200,0	155,0	2.400,0	310,0	n/a	n/a	various	-	-	-	-	
1121	Aftercooler for air compressor 1	2	pcs	1.500	405	420	255,2	85,0	510,3	170,0	4,5 Shell / 64,0 Tube	190,0	SS	n/a	n/a	n/a	n/a	
1181	Electric driver for air compressor 1	2	pcs	600	300	350	63,0	50,0	126,0	100,0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
C1761	<u>N2-Product cold compressor</u>	2	pcs	n/a	n/a	n/a	n/a	25,0	n/a	50,0	n/a	n/a	various	3,28	4,76	89,0	77.699	
1781	Electric driver for N2-Product cold compressor	2	pcs	n/a	n/a	n/a	n/a	12,0	n/a	24,0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
X3471	Expansion turbine 1	2	pcs	500	350	500	87,5	5,2	175,0	10,4	n/a	n/a	various	n/a	n/a	n/a	n/a	
X3472	Hot expander	2	pcs	500	400	500	100,0	8,0	200,0	16,0	n/a	n/a	various	-	-	-	-	
<u>Pumps for non-cryogenic liquids</u>																		
P2466	Cooling water pump feed in E2416	4	pcs	150	150	220	5,0	2,5	19,8	10,0	n/a	n/a	various	tbc	tbc	tbc	tbc	
P2467	Chilled water pump from E2417 to E2416	4	pcs	150	150	200	4,5	1,9	18,0	7,6	n/a	n/a	various	tbc	tbc	tbc	tbc	
<u>Pumps for cryogenic liquids</u>																		
P7165	LOX - back up	2	pcs	120	150	200	3,6	2,5	10,8	7,5	n/a	n/a	various	tbc	tbc	tbc	tbc	
<u>CS & CN - vessels, containers & skids</u>																		
S1116	Container for Air filter	6	set	250	250	1.220	76,3	2,5	457,5	15,0	1,043	n/a	CS	n/a	n/a	n/a	556.400 eff	
2416	Direct contact air cooler II	2	pcs	270	270	1.650	120,3	25,0	240,6	50,0	6,0	-15 / +120	P265GH	n/a	n/a	n/a	n/a	
2417	Evaporation cooler vessel	2	pcs	505	505	2.250	573,8	50,2	1.147,6	100,4	atm	-15 / +60	P265GH	n/a	n/a	n/a	n/a	
2618	Electric heater for regeneration gas	2	pcs	160	170	350	9,5	6,5	19,0	13,0	4,0	300,0	CS	n/a	n/a	n/a	n/a	
2626	M S - adsorber I (radial)	4	pcs	520	520	1.060	286,6	59,5	1.146,5	238,0	n/a	n/a	CS	3,5	n/a	n/a	n/a	
7231	GOX pressure vessel	1	pcs	260	260	2.280	154,1	12,8	154,1	12,8	10,0	60,0	P355NL1	n/a	n/a	n/a	n/a	
7232	GOX pressure vessel	8	pcs	410	410	1.820	305,9	21,3	2.447,5	170,4	10,0	60,0	P355NL1	n/a	n/a	n/a	n/a	
<u>Other heat exchangers</u>																		
3415	Preheater (steam heated)	2	pcs	550	250	200	27,5	18,0	55,0	36,0	7,0 bundl & vess	200,0	CS	n/a	n/a	n/a	n/a	
<u>Evaporators / Ejector</u>																		
7116	LOX back up evaporator - waterbath - steam heated	1	pcs	360	360	640	82,9	17,0	82,9	17,0	10,0 bundle / 6,0 pipe	-196/+100 bund / 250 pipe	SS	n/a	n/a	n/a	99.000	

Table 2.14: Air Separation Plant (continued)

EQUIPMENT LIST Project-No.: 1520 B4NG Doc-No.: &AA A-LE 1001				Site of erection: Selby / UK							Issue: 2		Issue Date: 07.09.2015			Issuer: P.Barbeau		
				Dimensions and weights							Design Conditions			Operating Conditions				
Code	Description	No	unit	length [cm]	width [cm]	height [cm]	Volume per item [m³]	Weight per item [tons]	total Volume [m³]	total Weight [tons]	Design Pressure [bara]	Design Temp. [°C]	MoC	Pressure Inlet [bara]	Pressure Outlet [bara]	Temp. Inlet [°C]	Flow Rate [Nm³/h]	
	<u>Vacuuminsolated tanks</u>																	
7131	300 m³ LOX vacuum insulated storage vessel (P.U.-horiz)	1	pcs	2.650	485	485	623,3	105,0	623,3	105,0	6,0	-196 Inner / -10/+50 outer	SS / CS	3,0	n/a	n/a	n/a	
7132	300 m³ LOX vacuum insulated storage vessel (P.U.-vert)	4	pcs	485	485	2.700	635,1	120,0	2.540,4	480,0	12,0	-196 Inner / -10/+50 outer	SS / CS	8,0	n/a	n/a	n/a	
	<u>PU Coldboxes incl. Columns & PFHE</u>																	
3186	Coldbox shell (HEX)	2	pcs	2.480	880	1.230	2.684,4	496,8	5.368,7	993,7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
3286	Coldbox shell II (O2/N2)	2	pcs	820	760	4.300	2.679,8	323,0	5.359,5	646,1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
3288	Coldbox shell III (O2/N2)	2	pcs	820	700	4.900	2.812,6	354,5	5.625,2	709,0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
3686	LIQ Coldbox shell (Recycle part)	2	pcs	360	420	1.400	211,7	13,0	423,4	26,0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Table 2.15: Onshore Transport Equipment Lists

Equipment Tag Number	Name	No.	Material	Type/ Description	Duty / Main Process Parameters per Unit					Design Conditions			Dimension			Weight	
					Flow kg/h	Pressure barg	Max Temp oC	Process Duty kW	Absorbed/ Installed Power kW	Capacity MTPA	Pressure barg	Temp max/ min oC	W / D m	L / T/T m	Ht m	Dry Te	Op Te
03-VE-35001-D100	Drax PIG Launcher	1	LTCS+0mmCA	PIG launcher	305374	101 - 135.5	20	-	-	2.68	148.5	-46/50	0.3 (Minor barrel) 0.4 (Major barrel)	1.5 (minor barrel) 4.3 (major barrel)	-	**	**
03-VE-35002-D110	Camblesforth PIG Receiver	1	LTCS+0mmCA	PIG receiver	305374	101 - 135.5	20	-	-	2.68	148.5	-46/50	0.3 (Minor barrel) 0.4 (Major barrel)	4.3 (minor barrel) 4.3 (major barrel)	-	**	**
03-VE-35003-D110	Camblesforth PIG Launcher	1	LTCS+0mmCA	PIG launcher	1940639	100.9 - 135.5	15.4 – 19.9	-	-	17.00	148.5	-46/50	0.6 (Minor barrel) 0.7 (Major barrel)	1.5 (minor barrel) 5.7 (major barrel)	-	**	**
03-FIL32001-A/B-D150	Barmston CO ₂ Fine Filter	2	LTCS+0mmCA shell	cartridge filter	646880	90.1 - 102.0	4.3 – 16.8	-	-	5.70	148.5	-46/50	0.89	-	3.84	8.42	12.60
03-FIL32002-A/B-D150	Barmston Future CO ₂ Fine Filter	2	LTCS+0mmCA shell	cartridge filter	646880	90.1 - 102.0	4.3 – 16.8	-	-	5.70	148.5	-46/50	0.89	-	3.84	8.42	12.60
04-PU33001A/B/C-D150-	Barmston Booster Pump (skid mounted; "Dimensions" are for the skid)	3	LTCS	centrifugal pump driven by an electric motor	277234	100.6 – 178.2	4.3 – 27.9	-	1200	2.43	281.5	-46/50	2.00	9.50	2.50	20.00	21.00
04-PU33002-A to E-D150	Barmston Future Booster Pump	3	LTCS	centrifugal pump/ electric motor	277234	100.6 – 178.2	4.3 – 27.9	-	1200	2.43	281.5	-46/50	2.00	9.50	2.50	20.00	21.00
03-VE-35004-D150	Barmston PIG Receiver	1	LTCS+0mmCA	PIG Receiver	1940639	90.2 – 102.1	4.3 – 16.8	-	-	17.00	148.5	-46/50	0.6 (minor barrel) 7 (major barrel)	5.7 (minor barrel) 5.7 (major barrel)	-	**	**
10-AA31001-A/B-D150	Barmston Metering and Analysis Package	1	LTCS+0mmCA	flow meters	1940639	100.5 – 178.1	4.3 – 27.9	-	-	17.00	281.5	-46/50	16.50	18.50	5.00	**	**
03-EX33001-D150	Barmston CO ₂ Booster Pumps Recycle Cooler	1	LTCS	air cooler driven by an electric motor	277234	100.6 – 178.2	38	1810	190	2.43	281.5	-46/50	5.88	13.00	-	19.26	20.43
10-AA34001-A/B-D150	Barmston HIPPS Package	2		instrumentation													
03-VE-35005-D150	Barmston PIG Launcher	1	LTCS+0mmCA	PIG launcher	1940639	Tba	Tba		Tba	17.00	281.5	-46/50	0.6 (minor barrel) 7 (major barrel)	1.5 (minor barrel) 5.7 (major barrel)	-	**	**

Table 2.16: Endurance Offshore Storage Process Equipment List

Equipment Tag Number	Name	No.	Material	Type/ Description	Duty / Main Process Parameters					Design Conditions			Dimensions			Weight	
					Flow kg/h	Pressure barg	Temp Min/Max °C	Process Duty kW	Absorbed/ Installed Power kW	Capacity MTPA	Pressure barg	Temp max/ min °C	W / D m	L / T/T m	Ht m	Dry Te	Op Te
03-VE-35006-D200	Endurance PIG Receiver	1	LTCS+0mmCA	PIG receiver	194063 9	98 to 128	1/20	-	-	17	200	-46/50	0.6 (Minor barrel) 0.7 (Major barrel)	5.7 (minor barrel) / 5.7 (major barrel)	-	15.6	19.0
03-FIL32004-D200	Endurance Future CO ₂ Fine Filter	1	LTCS+0mmCA	filter	650685	98 to 128	1/20	-	-	5.7	200	-46/50	0.89	3.48	-	11.8	13
03-VE-35007-D200	Endurance Future PIG Launcher	1	LTCS+0mmCA	PIG launcher	194063 9	0 to 182	7/28	-	-	17.0	281.5	-46/50	0.6 (Minor barrel) 0.7 (Major barrel)	1.5 (minor barrel) 5.7 (major barrel)	-	15	18.5
03-FIL32003-D200	Endurance CO ₂ Fine Filter	3	LTCS+0mmCA	filter	650685	98 to 128	1/20	-	-	5.7	200	-46/50	0.89	3.48	-	11.8	13
10-AA33002-A/B-D200	Endurance Future HIPPS Package	2	LTCS+0mmCA	instrumentation							281.5	-46/50	1.10	2.00	3.1 0	9.6	10.6
03-EX330002-D200	Endurance Future Booster Pumps Recycle Cooler	1	hot side: LTCS #cold side: Ti	Plate and shell exchanger	970320 458175	122 to 130 #5 to 7	35 & 24 #19 & 26	3820	-	8.5MTPA #447m ³ /hr	281.5	-46/50	1.26	1.48	-	14.7	15.4
04-PU33003A/B/C-D200	Endurance Future CO ₂ Buster Pumps	3	LTCS	centrifugal pump/ electric motor	970320	144 to 182	1/27	-	4000	8.5	281.5	-46/50	2.0	10	2.8	27	29

Table 2.17: Offshore Utility Equipment List

NAME	No.	MATERIAL	TYPE	MAIN PROCESS PARAMETERS PER UNIT				DESIGN CONDITIONS			DIMENSIONS			DRY	OP	NOTES
				FLOW m³/h	PRESSURE bar(g)	TEMPERATURE C (Min/Max)	ABSORBED/ INSTALLED POWER (kW)	CAPACITY	PRESSURE bar(g)	TEMPERATURE Min/Max C	W / D (m)	L / T/T (m)	H (m)	WEIGHT (Te)	WEIGHT (Te)	
SEAWATER SYSTEM																
Seawater Lift Pumps (Electric Motor)	2	Super Duplex 25%Cr (Casing) / Super Duplex 25%Cr (Imp.)	Pump (Centrifugal)	46	0/10	4/19	20	46 m³/h	15	-10/50	0.2	-	2.38	0.2	0.25	
Seawater Lift Pump Caissons	2	CS with Glass Flake Vinyl Ester Coating	Caisson	-	Atmospheric	4/19	-	-	3		0.7	37	-	17.0	17.0	
Seawater Lift Pumps Filters	2	Super Duplex (25%Cr)	Filters	46	0/10	4/19	-	46 m³/h	15	-10/50	0.4	-	0.7	0.1	0.15	
Biofouling Control Package	1	-	Package	to suit pumps	-	-	1	see note	-	-	1.0	2.0	1.0	0.1	0.1	Comprising one control panel, three anode cradles and associated items. See text
TEMPORARY WASH WATER SYSTEM																
Temporary Wash Water Package	1	-	Package	42	0/80	4/19	-	42 m³/h	-	-	11	10	5	59	64.9	
Wash Water Cartridge Filter	2	Super Duplex (25%Cr)	Filter	42	0/10	4/19	-	42 m³/h	15	-10/50	-	-	-	-	-	
Wash Water Cartridge Fine Filter	2	Super Duplex (25%Cr)	Filter	42	0/10	4/19	-	42 m³/h	15	-10/50	-	-	-	-	-	
Wash Water Chemical Injection Package	1	Super Duplex (25%Cr) for 2" and above / 6Mo Tubing	Package	42	0/10	-3/20		42 m³/h	15	-10/50	-	-	-	-	-	Package includes pumps and tote tanks for oxygen scavenger; biocide; scale inhibitor; corrosion inhibitor
Wash Water Injection Pump (Electric Motor)	2	Super Duplex 25%Cr (Casing) / Super Duplex 25%Cr (Imp.)	Pump (Centrifugal)	42	0/83	4/19	147	42 m³/h	200	-10/50	-	-	-	-	-	Pumps have stand alone engine skid
Injection Pump Diesel Engine	2	-	Engine	-	-	-	1	-	-	-	-	-	-	-	-	
Diesel Storage Tank	1	CS	Tank	-	Atmospheric	-3/20	-	10 m³	0.07 + static head (full of Water)	-10/50	-	-	-	-	-	Diesel tank sized to allow operation of temporary wash water skid for the 7-day duration of wash water activity.
Wash Water Service Tank	1	Super Duplex (25%Cr)	Tank	-	Atmospheric	4/19	-	16 m³	0.07 + static head (full of Water)	-10/50	-	-	-	-	-	
MEG INJECTION SYSTEM																
MEG Storage Tank	1	316 SS	Tank	-	Atmospheric	-7/28	-	48 m³	0.07 + static head (full of MEG)	-10/50	2.5	6.0	3.2	5.5	54.2	33 m3 working volume.
MEG Filter	1	CS	Filter	21	Atmospheric / 5	-3/20	-	21 m³/h	10	-10/50	0.4	-	0.6	0.05	0.07	
MEG Injection Pumps (Electric Motor)	2	CS	Pump (Reciprocating)	4.0	0/83	-3/20	11	4.4 m³/h	200	-10/50	0.6	1.2	0.6	1.1	1.3	
CHEMICAL INJECTION SYSTEM																
Chemical Injection Package	1	Super Duplex (25%Cr) for 2" and above / 6Mo Tubing	Package	-	98/128	-3/20	1	see note	200	-10/50	2.5	4.5	2.0	4.0	4.3	Package for injection in 3 wells. Package Includes 2 x 100% pumps for Corrosion Inhibitor and IRCDs. Space for future expansion to inject into all 6 platform wells would be allocated and an additional injection pump installed.
Future Subsea Wells Chemical Injection Package	1	Super Duplex (25%Cr) for 2" and above / 6Mo Tubing	Package	-	98/128	-3/20	1	see note	200	-10/50	2.0	3.0	2.0	2.0	2.2	Package for injection in 2 subsea wells. Package Includes pumps for Corrosion Inhibitor.
FRESHWATER / SEWAGE SYSTEM																
Macerator	1	CS	Macerator	0.15	-	>0/20	-									

Table 2.18: Offshore Utility Equipment List (continued)

NAME	No.	MATERIAL	TYPE	MAIN PROCESS PARAMETERS PER UNIT				DESIGN CONDITIONS			DIMENSIONS			DRY	OP	NOTES
				FLOW m³/h	PRESSURE bar(g)	TEMPERATURE C (Min/Max)	ABSORBED/ INSTALLED POWER (kW)	CAPACITY	PRESSURE bar(g)	TEMPERATURE Min/Max C	W / D (m)	L / T/T (m)	H (m)	WEIGHT (Te)	WEIGHT (Te)	
MATERIAL HANDLING																
Diesel Operated Pedestal Crane	1	-	Crane	0.2	-	-	5.3 (Lighting & Heating), 500 (Diesel Engine)/	22 Te	-	-10/50	7.0	7.5	7.5	100 (Crane)	101 (Crane)	Dimensions shown are for crane cab, height is given from top of pedestal to top of crane cab.
Material Handling Equipment	1	-	Package	-	-	-	-	-	-	-	-	-	-	10.0	10.0	
Future Pumps Runway Beams	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Material Handling Trolleys	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Umbilical Winch	1	-	-	-	-	-	-	-	-	-	2.45	2.96	2.46			
Hose Loading station	1	-	Utility Station	-	-	-	-	-	-	-	0.6	5.2	1.06			
EOA AND HELIDECK																
Helideck	1	-	Misc.	-	-	-	0.5 /	-	-	-	17	17	-	35.0	35.0	
Navais Package (Control Panel)	1	-	Marine Obstruction	-	-	-	5.3 /	-	-	-	1.6	0.7	2.1	3.3	3.3	
Navais Package (Battery)	1	-	Marine Obstruction	-	-	-	-	-	-	-	0.8	0.7	1.8	0.5	0.5	96 Hrs
Telecoms Package	1	-	Instrumentation	-	-	-	3.7 /	-	-	-				3.5	3.5	
H&V System (EOA / TR / LER)	1	-	Package	-	-	-	12.1 /	-	-	-	1.1	3.0	2.17	0.7	0.7	
EOA / Temporary Refuge	1	-	Building	-	-	-	7.9 /	-	-	-	6.5	14.3	5.0			
LER	1	-	Building	-	-	-	4.7 /	-	-	-	6.5	14.3	5.0			
Battery Room	1	-	Building	-	-	-	-	-	-	-	6.5	10.25	5.0			
SAFETY SYSTEMS																
Helideck Foam and DIFFS Package	1	-	Package	-	-	-	-	-	-	-	5.5	2.25	2.7	6.3	14.5	
Liferaft	2	-	Liferaft	-	-	-	-	-	-	-	0.56	1.16	0.513	0.07	0.07	
TEMPSC with Davit (19 people) (Diesel Motor)	1	-	Boat	-	-	-	12 /	-	-	-	6.0	6.0	3.5	8.2	10	Davit winch motor
Safety Showers and Eyewash Station	3	-	Package	-	-	-	-	-	-	-	1.04	0.72	3.6			
WIRELINE EQUIPMENT (TEMPORARY)																
Mast Container	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.8	3.6		5.0	5.0	
Wireline Winch	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.8	3.0		7.0	7.0	
Wireline Mast	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.0	-	24	9.0	9.0	
Air Compressor	2	-	Wireline Equipme	-	-	-	-	-	-	-	1.4	2.8		2.9	2.9	
Glycol Tank	2	-	Wireline Equipme	-	-	-	-	-	-	-	1.9	2.2		4.0	4.0	
Generator	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.0	2.5		3.6	3.6	Assumes all temporary equipment is independent of platform power supply.
Workshop Container	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.9	4.5		7.7	7.7	
Mast Rig-Up Box	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.3	1.0		2.5	2.5	
Multi-line PCE Basket	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.4	4.5		5.5	5.5	
Multi-line BOP Frame	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.3	2.1		4.0	4.0	
Well Control Panel	1	-	Wireline Equipme	-	-	-	-	-	-	-	1.1	1.4		1.5	1.5	

Table 2.19: Offshore Utility Equipment List (continued)

NAME	No.	MATERIAL	TYPE	MAIN PROCESS PARAMETERS PER UNIT				DESIGN CONDITIONS			DIMENSIONS			DRY	OP	NOTES
				FLOW m³/h	PRESSURE bar(g)	TEMPERATURE C (Min/Max)	ABSORBED/ INSTALLED POWER (kW)	CAPACITY	PRESSURE bar(g)	TEMPERATURE Min/Max C	W / D (m)	L / T/T (m)	H (m)	WEIGHT (Te)	WEIGHT (Te)	
DIESEL SYSTEM																
Crane Pedestal Diesel Storage Tank	1	CS	Tank	-	Atmospheric	-3/20	-	51.4 m³	0.07 plus Static Head (Full of Water)	-10/50	2.6	-	12.0	11.0	66.9	Working volume capacity of 51.4 m3 allows for diesel supply for 155 days in unmanned mode.
Diesel Transfer Pumps (Electric Motor)	2	CS	Pump (Reciprocating)	1.0	0/2	-3/20	0.06	1 m³/h	6.0	-10/50	0.7	1.0	1.1	0.3	0.73	
Diesel Service Tank	1	CS	Tank	-	Atmospheric	-7/28	-	16.25 m³	0.07 plus Static Head (Full of Water)	-10/50	2.5	2.5	2.6	2.5	14.4	
NITROGEN SYSTEM		CS														
Nitrogen Package (cylinders)	1	-	Package	-	300	AMB	-	1728 l	330	-46/50	1.2	1.0	2.1	1.7	2.3	Design capacity: 16 XL (4BA240) cylinders
POWER GENERATION																
Diesel Generator Package	3	-	Package	0.0012 (0.0020 Manned)	-	-	-	100 kW	-	-	2.0	4.2	3.5	6.5	6.9	Each Diesel Generator within package includes a diesel day tank, to supply diesel for 8 hours in unmanned mode. During manned operation diesel generators will operate as 2 duty/1 standby.
POWER DISTRIBUTION																
13.8 kV Switchboard / MCC	1	-	Power Dist.	-	-	-	-	-	-	-	1.4	7.2	2.4	7.0	7.0	
LV Switchboard / MCC	1	-	Power Dist.	-	-	-	-	-	-	-	1.0	7.4	2.4	4.0	4.0	
LV Switchboard Transformer	2	-	Transformer	-	-	-	-	-	-	-	1.0	1.5	1.9	2.0	2.0	
AC UPS system Rectifier/Inverter Cubicle	1	-	Power Dist.	-	-	-	-	-	-	-	0.8	1.6	1.7	1.0	1.0	
AC UPS system Battery Stands	4	-	Power Dist.	-	-	-	-	-	-	-	8.9	0.9	1.7	9.6	9.6	72 Hrs
DC UPS system Rectifier/Inverter Cubicle	1	-	Power Dist.	-	-	-	-	-	-	-	0.8	1.6	2.0	1.0	1.0	
DC UPS system Battery Stands	1	-	Power Dist.	-	-	-	-	-	-	-	0.8	4.0	2.0	3.5	3.5	
Power Transformers 10MVA	2	-	Transformer	-	-	-	-	-	-	-	3.0	5.2	4.0	22.5	22.5	
CONTROL AND INSTRUMENTATION																
Wellhead Hydraulic Power Unit	1	-	Instrumentation	-	-	-	5	-	-	-	2.0	4.0	2.5	5.9	6.0	Includes wellhead control panel.
ICSS	1	-	Instrumentation	-	-	-	-	-	-	-	-	-	-	-	0.6	
Fire and CO2 Detection System	1	-	Instrumentation	-	-	-	-	-	-	-	-	-	-	-	-	
Future Subsea Wellhead Control Package	2	-	Instrumentation	-	-	-	2.5	-	-	-	1.0	2.0	1.25	0.7	0.6	
Future Wellhead Hydraulic Power Unit	1	-	Instrumentation	-	-	-	5	-	-	-	2.0	4.0	2.5	5.9	6.0	
Topside Umbilical Termination Unit	5	-	Instrumentation	-	-	-	-	-	-	-	0.5	2.0	2.3	0.3	0.3	
Junction Box	2	-	Electrical	-	-	-	-	-	-	-	0.5	2.0	2.3	0.3	0.3	

3 Glossary

Abbreviations	Meaning or Explanation
AG	above ground
AGI	Above Ground Installations
Ar	Argon
ASU	Air Separation Unit
BAC	Boosted Air Compressor
bara	Bar absolute
barg	Bar gauge
BFD	Block Flow Diagram
CCS	Carbon Capture and Storage
CCW	Closed Circuit Cooling Water
CO ₂	Carbon Dioxide
CS	Carbon Steel
Cr	Chromium
CPL	Capture Power Limited
DECC	The UK Government's Department of Energy and Climate Change
Dense Phase	Fluid state that has a viscosity close to a gas while having a density closer to a liquid. Achieved by maintaining the temperature of a gas within a particular range and compressing it above its critical pressure.
ESDV	Emergency Shutdown Valve
ESP	Electrostatic Precipitator
FEED	Front End Engineering Design
FGD	Flue Gas Desulphurisation
GAN	Gaseous Nitrogen
GAP	Gaseous Air (Pressurised)
GE	General Electric
GOX	Gaseous Oxygen
GPU	Gas Processing Unit – processes the flue gases to provide the dense phase carbon dioxide
HP	High Pressure
H ₂ O	Water
ID	Induced Draft
IP	Intermediate Pressure
kg/h	Kilogrammes per hour
kg/m ³	Kilogrammes per cubic meter
kg/s	Kilogrammes per second
KKD	Key Knowledge Deliverable
LFO	Light Fuel Oil
LIN	Liquid Nitrogen
LOX	Liquid Oxygen
LP	Low Pressure

Abbreviations	Meaning or Explanation
m	Meter
m³	Cubic meter
MAC	Main Air Compressor
MCW	Main Cooling Water
MEG	Monoethylene Glycol
MP	Medium Pressure
NaOH	Sodium Hydroxide
NC	Normally Closed
NGC	National Grid Carbon Limited
NH₃	Ammonia
N₂	Nitrogen
OPP	Oxy Power Plant
O₂	Oxygen
PFD	Process Flow Diagram
PIG	Pipeline Inspection Gauge: a unit, which is inserted into the pipeline, to clean and/or monitor the inner bore surface of the pipe.
SO₃	Sulphur Trioxide
SO_x	Sulphur Oxides
SS	Stainless Steel
t/h	Tonnes per hour
T&S	Transportation and Storage
UG	Underground
VSD	Variable Speed Drive
WR	White Rose