


CAPEX Cost Estimate

CO₂ Capture Facility

Kårstø, Norway

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Attachments

- 1) Capital Cost Estimate Summary Sheets
 - 2) Summary of Contingency and Risk Analysis
-

1.0 General

The estimate was prepared in accordance with the requirements of the following Contract Documents:

- Exhibit E1.1: Requirements for Cost Estimates and Capture Cost Calculation
- Exhibit E1.2: Cost Breakdown Structure

The Capital Cost Estimates (CAPEX) has been prepared to an accuracy of +/- 20% as required in the Contract documents. The Cost Breakdown Structure (CBS) described in document E1.2 was used.

A cost risk analysis was performed and details are provided in this documents.

The following sections provide additional information on the CAPEX and risk analysis

2.0 CAPEX Estimate

2.1 General

The Capital cost estimate (CAPEX) is provided in attachment number 1.

2.2 Pricing basis

The estimate costs are based on 4th Quarter 2008 prices. Escalation through commercial operation is not included.

2.3 Exchange rate

The currency exchange rate used for the estimate is 1 USD = 5.3 NOK, which is in accordance with the requirements of Exhibits E1.1 and E1.2

2.4 Contingency

Contingency is not included in the Contractors Cost in attachment number 1. The Contingency analysis was undertaken as part of the risk analysis (see section 3.0).

2.5 Qualifications and Assumptions

The following qualifications and assumptions apply to the CAPEX estimate:

- The site is clean, free of hazardous materials, level, and free of any obstructions above or below grade.
- The estimate is only for material within the plant B/L shown on the general arrangement drawing, except for the flue gas duct, electrical power tie-ins, seawater cooling pumps, and cooling water pipe.

- Since the site is an existing operating plant with a wharf, it is possible to receive shop-fabricated, large-diameter tanks and vessels. Access to the project site is possible without any modifications to the route.
- The existing stack can accept the modifications to support the CCC Plant flue duct and stack damper.
- The seawater pump structure accommodates the selected pumps, and the cooling water pipe connection design and routing can be accommodated.
- Construction power and water are to be provided by the Owner.
- Soils conditions allow for spread footing design.
- Adequate construction access is available on all sides of the proposed site except the west side.
- CCC Plant lighting and small power distribution are limited to the B/L.
- All pre-existing hazardous materials are to Owner's account.

2.6 Exclusions

The following items are excluded from this cost estimate:

- Contingency (see section 3.0)
- Escalation
- Liquidated damages (LD) insurance
- Builders risk and marine cargo insurance
- Required payment securities
- Environmental wetland and endangered species protection is excluded.
- All construction and environmental permits (to be obtained by Owner)
- Camp costs
- Value-added taxes (VATs) and import duties, where applicable, which are a pass through
- Licensing or royalty fees associated with proprietary processes/equipment/chemicals (none identified for base case)
- Capital spare parts
- Work associated with demolition at the site
- Furniture or laboratory equipment
- Duties, permits, and taxes
- Modifications to existing utilities, equipment, and facilities
- Onsite accommodations for craft housing are excluded

3.0 CAPEX Cost Contingency and Risk Analysis

3.1 General

The Bechtel Risk Analysis Contingency (BecRAC) software was used for the contingency and risk analysis. The summary sheet of the results from the analysis IS provided in attachment 2.

The Contingency derived from the analysis was not included in the overall CAPEX estimate for the project.

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Estimate Summary Sheet



GASSNOVA

		TOTAL NOK
0 - A	Complete Project Cost	
1	Owner's Costs	by Gassnova
0 - B	Contractor's Costs	2,235,711,000
2	General (Indirect) Costs	438,227,000
2.1	Project Engineering (including Project Management, Documentation, other)	62,526,000
2.2	Construction Preliminaries	307,792,000
2.3	Mechanical Completion; Commissioning and Testing	62,609,000
2.4	Training	5,300,000
2.5	Guarantee tests	Included in 2.3
2.6	Spare Parts	Included in 2.3
3	Stack connection / modification incl. Engineering , Procurement, Construction and all ducting within the Naturkraft property	81,965,000
3.1	Flue gas plenum including support structure and foundation, reinforcement where necessary	13,716,000
3.2	Stack modifications including silencers, damper, measurement devices	3,395,000
3.3	Flue gas transfer duct including insulation, measurement devices and support structure and foundation works	49,790,000
3.4	Other	10,836,000
3.5	400 V power interface for new flue gas dampers including LV power cabling with cable trays from outgoing terminal of existing 400 V CCPP switchgear and all required electrical systems to feed the required consumers	4,228,000
4	Flue gas conditioning incl. Engineering, Procurement, Construction from Naturkraft fence to Absorber inlet flange	135,061,000
4.1	Flue gas cooler including all utilities	2,905,000
4.2	Flue gas fan including drives, all utilities	34,849,000
4.3	Piping and Vessels comprising: all process piping incl. valves and fittings all process vessels incl. the expansion joints	7,070,000
4.4	Pumps comprising: associated drives and utilities (e.g. lubrication system)	Included in 4.1
4.5	Heat and sound insulation	5,989,000
4.6	Other (Ductwork)	84,248,000
5	CO2 Absorption incl. Engineering, Procurement, Construction from flange in flue gas conditioning & utility systems to flange towards Solvent Regeneration system	352,461,000
5.1	Absorber Tower	
5.1.1	Absorber tower	89,962,000
5.1.2	Internal packing incl. distributon, collectors and associated equipment	60,866,000
5.1.3	Piping, fittings	83,731,000
5.1.4	Other	10,154,000
5.2	All Utilities i.e heat exchanger , pumps incl. drives	106,975,000
5.3	Insulation and cladding	773,000
5.4	Other (License Fee)	0
6	Solvent Regeneration incl. Engineering, Procurement, Construction	177,280,000
6.1	Tanks and storage vessels comprising all utilities	4,169,000
6.2	Stripper, comprising all utilities	33,813,000
6.3	Reboiler, comprising all utilities	14,052,000
6.4	Overhead condenser, comprising all utilities	13,481,000

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		TOTAL NOK
6.5	Heat exchanger incl. all utilities	25,954,000
6.6	Pumps and blowers incl. all utilities	31,994,000
6.7	All internal piping including valve and fittings	53,559,000
6.8	Heat and sound insulation where applicable	258,000
6.9	Other	0
7	CO2 Compressor and Conditioning incl. Engineering, Procurement, Construction from flange Solvent Regeneration system & utility system to flange of the CO2 pipeline to Transport Project	200,177,000
7.1	Multistage compression and conditioning package comprising all internal piping, valves and fittings	197,265,000
7.2	Metering package	1,696,000
7.3	All utility equipment	Included in 8.0
7.4	Heat and sound insulation	1,216,000
7.5	Other	0
8	General utility system incl. Engineering, Procurement, Construction	171,240,000
8.1	Cooling water system	51,789,000
8.2	Process steam system	38,147,000
8.3	Condensate system	6,264,000
8.4	Sewage and waste water system	28,340,000
8.5	Compressed air and instrument air system	6,351,000
8.6	Reclaimer	7,973,000
8.7	Hazardous waste system	2,621,000
8.8	Fire fighting system	6,767,000
8.9	Other	22,988,000
9	Automation incl. Engineering, Procurement, Documentation, Construction	98,005,000
9.1	Supply of Field Equipment in Flue Gas Conditioning Area	9,494,000
9.2	Supply of Field Equipment in CO2 Absorption Area	18,988,000
9.3	Supply of Field Equipment in Solvent Regeneration Area	9,494,000
9.4	Supply of Field Equipment in Compress. & Conditioning Area	9,494,000
9.5	Supply of Safety and Automation System (SAS)	9,284,000
9.6	Services for Field Equipment and SAS	26,643,000
9.7	Supply and Services of Plant Communication Systems	4,822,000
9.8	Supply and Services of Fire and Gas Monitoring and Alarm System	9,786,000
10	Civil structural work incl. Engineering, Procurement, Construction	222,804,000
10.1	Site preparation comprising: Levelling works, roads, parking areas, pavements, preparational works for cranes and tools, all installations for prefabrication and erection, utilities supply and installation, fencing and gates.	12,500,000
10.2	Foundations comprising Formworks, concrete works, piling if applicable and all internals	119,983,000
10.3	Supporting Steel Construction comprising all hangers and suspensions, all platforms and gratings	26,840,000
10.4	Trenches for cables and piping	7,170,000
10.5	Buildings (except control room building) comprising HVAC, sanitary installation and cladding	36,998,000
10.5.1	Control room building	19,313,000
10.5.2	Social rooms and offices	Included in 10.5

CO₂ KARSTO**Estimate Summary Sheet**

- 10.5.3 Workshops and storage rooms
 10.5.4 Laboratory building
 10.6 Other

TOTAL NOK
Included in 10.5
Included in 10.5
0

11	Main power supply, all distribution system and auxiliary system incl. Engineering, Procurement, Construction	358,492,000
11.01	Power Transformers including tap changer, secondary cabling, protection, control, etc.	44,820,000
11.02	Medium Voltage Switchgears: including the complete secondary cabling, electrical protection and control, etc.	10,672,000
11.03	Low Voltage Switchgears: including the complete cabling, for protection, control, etc	4,109,000
11.04	DC equipment	6,023,000
11.05	Safe AC Equipment	0
11.06	Emergency Diesel Generator Set: including prime mover and all necessary auxiliary equipment like e.g. AVR, generator protection, etc	2,209,000
11.07	Cabling: including cable connecting, cable terminations, cable joints, etc	132,726,000
11.08	Earthing and Lightning Protection, EMC Requirements: Includes the earthing of the complete electrical equipment, all non electric metal structures, etc.; also includes the inner and outer lightning protection of the whole CCC Plant and all EMC requirements. Note: Earthing laid in concrete shall be included in the civil construction costs of the CCC Plant.	8,600,000
11.09	Lighting and small power installations: the prices for lights, power sockets and domestic sockets shall include the respective portion of the lighting distributions and all necessary cabling, cable ducts, junction boxes, fixing materials, etc. necessary for their installation and connection to the related lighting distributions	26,712,000
11.10	Power factor compensation system: includes MV and / or LV compensation equipment, e. g. reactors, capacitors, electronic control, secondary cabling, electrical protection, etc. (refer to Exhibit E5.1, Section 1.6.1)	112,141,000
11.11	Accessories for Electrical Rooms: Includes all accessories as per Exhibit E5.1, Section 1.13.	6,018,000
11.12	Other	4,462,000

Notes:

A) Above given list shall be adapted and/or extended by the Contractor if necessary.

B) Bidder shall explain main cable types and quantities used in No. 11.7

C) Bidder shall explain power and domestic socket types given in No. 11.9.

1. Contingency and Risk

BECHTEL POWER CORPORATION
Frederick, Maryland

GASSNOVA
Karsto CO2 Capture & Compression FEED Study-UNIQUE
Norway
25474-UNI

ESTIMATED COST:

Est. Cost Excl. Contingency	\$	422,000,000	
Accuracy Excl. Contingency *	+	15.4	- 3.724
Most Probable Cost	\$	439,957,000	

MANAGEMENT DECISION:

Probability of Overrun	50.0%
Contingency in %	4.3%
Contingency in \$	\$ 18,168,000
Estimate Accuracy Incl. Contingency *	+ 11.1% - 8.0%

* Based on standard deviation

