PRE-FEASIBILITY R E P O R T

ON

AMMONIA / UREA FERTILIZER PROJECT

WITHIN PLANT PREMISES OF

OF

FERTILIZER CORPORATION OF LIMITED (FCIL)

SINDRI UNIT, DHANBAD, JHARKHAND

FOR ENVIRONMENTAL CLEARANCE

Prepared By

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1.0 EXECUTIVE SUMMARY

1.1 Background

Fertilizer Corporation of India Limited (FCIL) has the credit to be the first Public Sector Undertaking of Government of India operating since 1951. Sindri unit of FCIL was commissioned in 31st October, 1951 in the name of Sindri Fertilizer Factory for production of ammonia and urea. Fertilizer Corporation of India Limited (FCIL), incorporated in January 1961, operated four fertilizer units namely Sindri (Jharkhand), Ramagundam (Andhra Pradesh), Talcher (Orissa) and Gorakhpur (Uttar Pradesh).

Sindri Modernisation Plant, 900 MTPD single stream ammonia and 1000 MTPD urea plants were commissioned on 1st October 1979. In addition to the main plants, fertilizer complex at Sindri has self-contained utility and off-site facilities including township. The complex also has plants to produce products like Ammonium bi-carbonate, Ammonium Nitrate, Nitric acid and a power generation plant of 80 MW.

The existing unit of closed Ammonia-Urea fertilizer complex at Sindri of Fertilizer Corporation of India Limited (FCIL), at that time, was one of the new generation fertilizer plants based on LSHS / Fuel-oil as a feed stock.

Due to under performance of all the plants, FCIL had made huge losses. These losses had their own cascading effect. The company was declared sick and was referred to BIFR in 1992. The Sindri unit was declared shut down in January 1999. The Government of India had decided to close down the company in December 2002. Subsequently all the units of FCIL including Sindri were closed down and all the employees, barring a few (5 to 10 in each unit), were released under VSS on 31-12-2002.

Due to closure of all fertilizer units namely Gorakhpur, Barauni, Sindri, Durgapur, Haldia, Talcher and Ramagundam, a great gap between demand and supply of India was experienced both by consumers and Government. In 2007, Govt. decided to have a second look at the decision to close the fertilizer units due to huge infrastructure facilities available at the plant locations and increasing gap between domestic production and demand of urea. Various options of revival of units have been considered at different point of time.

Recently a decision regarding revival of closed units of Sindri, Gorakhpur and Barauni of FCIL and HFCL by PSUs though nomination route was taken by PMO.

The project proponent proposes to set up a new Ammonia-Urea Fertilizer Manufacturing Complex at the existing site at FCIL Sindri. The Proposed Project falls under the Category-"A" of project listed in Schedule 5 (a) as per EIA Notification, 2006 of MOEF.

The proposed project shall be established within the existing premises of FCIL Sindri unit in the free unencumbered available land.

The existing Sindri unit of FCIL is located in the District of Dhanbad in the State of Jharkhand. Sindri is well connected with major cities by rail / road. Dhanbad district headquarter is about 26 km from Sindri is an important divisional headquarter of East Central Railway. The historical Grand Trunk Road and National Highways NH-02 connecting Kolkata and Delhi passes only about 25 km from Sindri Factory area. Other major highways NH-32 is also passing nearby. Nearest Airport having regular commercial flights are at Ranchi 180 km, Kolkata 256 km and Patna 296 km away from Sindri. Kolkata 256 km on Bay of Bengal is the most important seaport of the eastern India where all major sea liners of world have anchors. Location map has been presented in Annexure-1 & 2.

1.2 Project at a Glance

S.No.	Parameter	:	Description
1.0	Name of the Project	:	Ammonia-Urea Fertilizer Project
2.0	Name of the Project Proponent	:	Fertilizer Corporation of India Limited
3.0	Project Location		Sindri (Jharkhand)
4.0	End Product	:	Urea
5.0	Plant Capacity (MTPD)		
	- Ammonia	:	2,200
	- Urea (Neem coated prilled)	:	3,850
6.0	Plant Stream Days	:	330
7.0	Annual Production (MT)	:	12,70,500
8.0	Man Power Requirement (Nos.)	:	460
9.0	Project Time Schedule (Months)	:	36
10.0	Mode of Implementation	:	EPCM

S.No.	Parameter	:	Description
11.0	Annual requirement of Raw Material & Utilities		
	- Natural Gas (1000 Sm^3)	:	7,20,007
	- Water (100 m^3)	:	1,00,188
12.0	Delivered Price of Raw Material		
	- Natural Gas (Rs. per 1000 Sm^3)	:	17,254 (7.50 US$/MMBtu)
13.0	Project Capital Cost (Rs. Crore)		
	- Total	:	5,456
	- FC (Foreign Currency)	:	1,358
14.0	Debt: Equity Ratio	:	2:1
15.0	Cost of Production of Neem Coated Urea at Rated Capacity (Rs./MT)	:	17,729
16.0	Realisation Price of Neem Coated Urea (Rs/MT)	:	22,043
17.0	Financial Indices	:	
	Return at rated capacity	:	
	- On Total Capital (%)	:	17.65
	- On Equity Capital (%)		33.29
18.0	Break Even Points (%)	:	
	- Profit	:	57.78
	- Cash		69.24
19.0	Pay Back Period (years)	:	5.75
20.0	I.R.R. (Post Tax) %		14.80

1.3 Environment Consideration

Though Dhanbad industrial area falls in the list of 88 industrial clustures identified for preparation of Comprehensive Environmental Pollution Index (CEPI). FCIL Sindri which is located at a distance 28 kms, does not fall in the list of 88 industrial clustures identified

for preparation of Comprehensive Environmental Pollution Index (CEPI). It is also worth mentioning that the moratorium has been lifted in 2013.

The rate of growth of nearby towns, is similar to the rate of growth of other towns. All the required civic amenities like School, College, medical facilities etc are available within 15 km radius of FCIL.

1.4 Need & Justification

The need and justification of the proposed project is summarized as under:

- It will reduce overall gap between demand and supply in the country especially in Eastern region.
- It will maintain stability in indigenous / domestic market for Urea.
- It will check the import of urea to some extent and yield national savings.
- It will generate employment opportunity for the people in the region.
- It will ease the availability of urea to farmers.

1.5 Conclusion

The proposal of revival of ammonia/urea plant at FCI-Sindri in Dhanbad district of Jharkhand state can be seen as a corrective step towards reducing the growing supply gaps for fertilizer urea in eastern zone and to minimize import dependence to fill the supply-gap. Indirectly, by producing the fertilizer within the consumption region, it will lessen the pressure on the long distance transport network as well as the transport cost involved in such long distance movement between production units and the consuming points.

The proposed plants at FCIL Sindri shall be implemented based on state of the art technologies. Energy consumption for ammonia and urea approximately 7.005 Gcal/Te of ammonia and 4.904 Gcal/Te of Urea.

2.0 INTRODUCTION

2.1 Background

The first fertilizer complex under the name of Sindri fertilizer factory was commissioned on 31st October 1951. A number of new plants were added to the factory as need arose time to time.

Fertilizer Corporation of India Limited (FCIL), incorporated in January 1961, operated four fertilizer units namely Sindri (Jharkhand), Ramagundam (Andhra Pradesh), Talcher (Orissa) and Gorakhpur (Uttar Pradesh).

Due to various reasons, all the units of FCIL including Sindri Unit continued to make financial losses. The company became financially sick and was referred to Board for Industrial and Financial Reconstruction (BIFR) in 1992. Subsequently BIFR gave its consent to wind up the company in the absence of any rehabilitation proposal. Finally, Govt. of India also approved the closure of fertilizer units.

2.2 Revival of Sindri Unit of FCIL

Sindri unit of FCIL under the name of Sindri Fertilizer Factory was commissioned in 1951 for urea production with coal as feedstock.

In addition to the main plants, fertilizer complex at Sindri has self contained utility and off-site facilities including township. The complex also has plants to produce products like Ammonium bi-carbonate, Ammonium Nitrate, Nitric acid and a power generation plant of 80 MW. The existing unit of closed Ammonia-Urea fertilizer complex at Sindri of Fertilizer Corporation of India Limited (FCIL), at that time, was one of the new generation fertilizer plants based on LSHS / Fuel-oil as a feed stock. However, the operation of the plant has been suspended from 1990, due to non-viable economic operations. The unit was declared closed by Govt. of India on 10.09.2002.

2.3 Facilities available at closed unit of FCIL Sindri

2.3.1 Land

The total land available under FCIL - Sindri unit ownership is around 6653 Acres including factory area and township. The total land is having free hold status.

Out of the total available 6652.61 Acres, almost 693 Acres land has been leased to CPSU/State Govt. and other organizations. Around 478 Acres of land has been

permanently transferred to organizations like BIT, Jharkhand Housing Board, Bokaro Industrial Development Authority. Presently, the land available with FCIL is 5481.59 Acres. The distribution of land area available with FCIL is as follows:

Total factory area and factory utility excluding Gowai Barrage (467.15 Acres) is 1194.77 Acres.

Township area including parks, agricultural land, education, recreation play ground, market etc. is 1993.61 Acres.

Air Strip including approach road is 196.07 Acres.

Other undeveloped area is around 1630 Acres.

2.3.2 Township

The total number of quarters in the township is around 5026 of various sizes. The other facilities in the township include Guest House, Officers Club, Kalyan Kendra, Model English High School, JET Hostel etc.

2.3.3 Railway Siding inside Factory

Railway siding exists inside the factory complex which can be used after refurbishment.

2.3.4 Raw Water & Power

Water from Damodar river has been considered as source of water for the Sindri. Source of Power is through hydro power project called Damodar Valley Corporation (DVC) which is located at Maithon and Panchet near Sindri.

2.3.5 Other Infrastructure Facilities

The other infrastructure facilities available with the existing plant premises include administrative building, canteen, first aid, central stores and yard, workshops, telephone exchange etc.

As the Sindri unit is closed since last 13 years most of the facilities are not in usable condition.

3.0 SITE ANALYSIS

3.1 Location of the Project

The existing Sindri unit of FCIL is located in the District of Dhanbad in the State of Jharkhand. Sindri is well connected with major cities by rail / road. Dhanbad district headquarter is about 26 km from Sindri is an important divisional headquarter of East Central Railway. The historical Grand Trunk Road and National Highways NH-02 connecting Kolkata and Delhi passes only about 25 km from Sindri Factory area. Other major highways NH-32 is also passing nearby. Nearest Airport having regular commercial flights are at Ranchi 180 km, Kolkata 256 km and Patna 296 km away from Sindri. Kolkata 256 km on Bay of Bengal is the most important seaport of the eastern India where all major sea liners of world have anchors.

3.2 Co-ordinates of the project

The Geo Co-ordinate of Sindri fertilizer complex is at Longitude 23º 39’ 43.56” N and Latitude 86º 29’ 14.43” E at an elevation of 160 m above mean sea level (MSL).

3.3 Details of Alternate Site

The choice for selection of alternate site is not open as the proposed Ammonia / Urea Plants shall be installed within plant premises of old existing Sindri fertilizer complex. The project shall be centrally located within the battery limit of the complex.

The proposed project shall be located in the existing premises of FCIL Sindri unit in the free unencumbered available land.

3.4 Ownership of the Land

FCIL Sindri Unit is the sole owner of entire 6653 acres of land.

3.5 Eco-sensitive Areas

Wild Life Sanctuary, National Park and Reserved Forest have not been identified in the vicinity of Sindri fertilizer complex.

4.0 PROJECT DESCRIPTION

4.1 Project Facilities

The proposed project consists of new ammonia and urea plant of 2200 MTPD & 3850 MTPD capacity respectively and related offsite and utility facilities considering utilization of the existing facilities to the maximum extent possible. The details of the facilities of proposed Fertilizer Complex are given below in Table 4.1.

Table – 4.1

List of Facilities in the proposed Fertilizer Complex

SI. No.	Facility	Capacity
1.0	NG/LNG Receiving & Metering	Corresponding to 2.2. MMSCMD Natural Gas
2.0	**Process Plants**	
2.1	Ammonia Plant	2200 MTPD
2.2	Prilled Urea (Neem Coated) Plant	3850 MTPD
3.0.	**Offsite Facilities**	
3.1	**Ammonia Storage (Atm.)**	(2x5000) MT & associated facilities
3.2	Urea Storage & Handling Facilities	
	a] Silo b] Empty Bag Storage c] Bagged Storage d] Bagging Plant	60000 MT 2.0 Million 1000 MT (on platform) (7+1) Slats of 60 MTPH each
3.3	ETP	300 m^3
4.0	**Utility facilities**	
4.1	Raw water pipeline and pumping from source	Corresponding to 1265 m^3/hr capacity
4.2	Raw water storage and pumping	Corresponding to 1265 m^3/hr capacity
4.3	DM water system including storage and pumping	(1+1) x100 m^3/hr
4.4	Condensate Polishing Unit	(2+1) x250 m^3/hr
4.5	**Cooling Tower**	
	a] Ammonia Plant & CPP b] Urea Plant	(8+1) Cell of 3500 m^3/hr each (5+1) Cell of 3500 m^3/hr each
4.6	**Instrument & Plant Air System**	
	a] Compressor (Centrifugal) b] Drying Unit	(1+1)×3000 Nm^3/hr (1+1)×3000 Nm^3/hr

SI. No.	Facility	Capacity
	c] Receiver	Provided
4.7	Inert Gas System	600 Nm^3/hr
4.8	**Steam & Power Generation System**	
	a] GTG b] STG c] Emergency D.G. Set d] HRSG	15 MW 10 MW 1 × 2000 kVA 1 x 130 MTPH
4.9	**Transport Facilities**	
	a] Locomotive b] Railway Siding and lead line c] Road Transport	(1+1) of 1200 HP Lead line available, 10 km existing railway siding considered after renovation. Provision made
5.0	Construction equipment	Provided

4.2 Description of Project

Type of Project

The proposed project is based on recent best available technology with an aim to optimum energy consumption per tonne of production by adopting the modern proven, state-of-the-art technology.

The proposed project is an independent project and not interlinked with any other project. Implementation of new technology which consumes approximately 7.005 Gcal/Te of ammonia and 4.904 Gcal/Te of Urea shall facilitate low emission from proposed ammonia / urea plants.

Ammonia Plant

The Ammonia Plant will be of single stream having a capacity of 2200 MTPD. The plant will be designed to use NG/RLNG as feed and fuel. The modern high capacity plant has the advantage of economy of scale as well as lower energy consumption thereby resulting in lower production cost. The Ammonia Plant will be self-sufficient in steam. Part of steam requirement for Urea Plant will be met from ammonia plant. The remaining steam requirement to urea plant will be met from the steam generated in HRSG of Gas Turbine (GT) driven captive power plant.

Urea Plant

The Urea plant will be laid out in single stream having nameplate capacity of 3850 MTPD prilled urea plant with stripping process technology. High-pressure steam imported from the Ammonia Plant will be used to drive the CO_2 Compressor with extraction arrangement for meeting the process requirements.

Ammonia Storage

The provision of two new (2x5000) MT atmospheric ammonia storage tank with all associated facilities have been considered for the proposed Project.

Urea Storage, Handling and Bagging

The new urea silo of 60000 MT capacities has been envisaged keeping product inventory of about 15 days. Provision of new automatic bagging plant has been considered. For the proposed project, (7+1) bagging streams, each of 60 MTPH, have been considered. Modern and automatic system has been conceived for bagging and loading of product into railway wagons/trucks. The system broadly consists of lifting of empty bags from the sack magazine, placement of empty bags on the bag holder, stitching of filled bags and flattening of filled bags on subsequent flat belt conveyor, loading of filled bags into rail wagons/trucks shall be completely automatic involving very little manual labour.

Water Supply, Treatment and Distribution

Raw water is considered to be sourced from nearby Damodar River through pump houses with intake well pumps. Necessary facilities have been considered to get the required level of water for normal operation of the pumps. Water will be pumped from Damodar River to the Water Treatment Plant through pipeline. A new reservoir, pump house and pre-treatment plant have been considered.

For the proposed fertilizer complex, DM Water Plant (1+1) 100 m^3/hr capacity catering to the requirements of the DM Water to the Steam Generation and Process Units has been considered. .

Considering the minimum condensate recovery from the complex, condensate polishing unit of capacity (2+1) 250 m^3/hr has been considered.

Cooling Water System

The Cooling water system will cater to the cooling water requirements of all facilities of the complex. The bearing cooling water requirements of pumps, compressors etc. shall also be met from cooling water system. The cooling water system envisaged for the proposed fertilizer complex is fresh water recirculating type.

The cooling water system provides cooling water to all users and controls the chemical composition of circulating cooling water to prevent corrosion, biological growth and solids deposits in piping etc. Cooling water return from various units is to be routed to the cooling tower.

The cooling water system will consist of two independent cooling water generation & distribution systems.

Steam & Power Generation System (Captive Power Plant (CPP))

In order to have best optimized energy consumption for the complex the CPP has been integrated with Ammonia unit. The CPP will meet all the requirements of ammonia unit for normal as well as start-up/emergency operations; in addition CPP shall supply the required power and steam to rest of the facilities of the complex.

CPP is the central unit supplying steam (HP/ MP/ LP) and power to all process units, utility systems & offsites. It consists of GTG/ HRSG, Deaerators and other auxiliaries.

i) Steam System

Steam is consumed in the complex at three levels, viz. High Pressure (HP) Steam, Medium Pressure (MP) Steam, Low Pressure (LP) Steam. Steam is also generated at all three levels within process units / facilities of complex either in process steam generators or through steam turbines for process pump / compressor turbine drives.

Steam is used in the fertilizer complex mainly for the following purposes besides the internal demand of CPP:

- Process use (Chemical reaction, Stripping steam etc.)
- Steam drives for some of the compressors/pumps
- As heating medium for steam heated exchangers
- Steam tracing of lines
- De-aeration
- Intermittent requirement like decoking, purging etc.

ii) Power System

Power is used in the complex for following main purposes, besides the internal power demand of captive power plant (CPP):

- For driving motors to run various rotating machinery (pumps, compressors, blowers, etc.)
- For meeting the power demand of instruments
- For operating electric heaters (like instrument air dryer heater, electric tracing of lines if specified, etc.)
- For plant lighting and other miscellaneous purposes, etc.

To meet the requirement of the proposed fertilizer complex, provision of natural gas based gas turbo generator (GTG) set (1) of 15 MW ISO rating capacity and STG (steam turbine generator) of 10 MW capacity has been kept to ensure uninterrupted power supply to the plant. The exhaust gas from the gas turbine (GT) shall be utilised for generating HP steam required in urea plant and STG.

Instrument Air Facilities

The normal instrument air requirement for the plant will be met from the Process Air Compressor. However, as instrument air is very vital for process control instruments, (1+1) Centrifugal Air Compressors each having a capacity of 3000 Nm^3/hr along with air dryer and receiver units have been provided for the Project. This arrangement will add to the fail-safe system of instrument control.

Fire Fighting System

Fire-fighting system including firewater storage, pumps etc. shall be provided which will be adequate to meet the requirement of proposed plant. Provision has been made for firewater ring and other fire & safety equipment including fire tenders

Effluent Treatment

Urea plant shall be provided with deep Urea Hydrolyser System, which will generate condensate for re-utilization in the Plant itself. Ammonia Plant shall be provided with Condensate Stripper for stripping and re-using of ammonia. Disc. oil separator shall be provided for removal of oil from oil bearing effluents generated in various compressors system.

The occasional effluent generated during plant upset conditions shall be stored in effluent delay pond from where it shall be discharged to treat effluent pond at controlled

rate after treatment in steam stripper. The capacity of existing untreated and treated effluent pond is not sufficient to meet the requirements hence provision has been made against this head in the Project.

Auxiliary & General Welfare Facilities

The following facilities have been considered under this head.

- Safety
- Smoke detection system
- Workshop Equipment
- Communication System
- NDT Equipment
- Laboratory Equipment incld. Lab Chemicals
- Weigh Bridges
- Public address system
- Computers & Software
- Pollution Monitoring System
- Furniture's & Fittings (Plants & Township)
- Office, Canteen, First Aid etc.
- Hospital Equipments

Transport Facilities

Provision for (1+1) locomotives each of 1200 HP, two nos. of cars, two nos. of jeeps, one ambulance and one bus, etc. has been provided for the Project. Existing railway siding of about 10 km has been considered after necessary renovation. Development of parking area for truck movement within the complex has been also provided.

Construction Facilities

The following facilities have been considered under this head.

- 400 Te Crane (1 no.)
- 75 Te Crane (1 no.)
- 12.5 Te tyre mounted crane (1 no.)
- 5 Te tyre mounted crane (2 nos.)
- Tractor with trailer (2 nos.)
- Fork Lift (4 nos.)
- Bull dozer (2 nos.)
- Fire Tenders (2 nos.)

- Tools and Tackles
- Hutments & Shelters
- Shed yards
- Fencing

4.3 Raw Material & Utilities

4.3.1 Raw Material & Utility Consumption

The requirement of raw material and utilities for the proposed project has been worked out on the basis of rated capacity operation of the ammonia urea plants. The requirements of various inputs for 2200 MTPD ammonia and 3850 MTPD urea plants are summarized in Table- 4.2:

Table-4.2
Raw Material & Utility Requirement

Raw Material/Utilities	Unit	Requirement
Natural Gas (LHV 8653 kcal/Nm3)	Nm3/hr	90910
Treated Water	m3/hr	1100
Neem Oil	Kg/hr	56.15

4.3.1.1 Natural Gas

NG will be available for the proposed project through GAIL's Jagdishpur-Phulpur-Haldia pipeline. The Jagdishpur - Phulpur - Haldia pipeline will consist of a 36 inch diameter, 922 km mainline, and 1,128 km of spur lines and feeder lines of between 12 and 30 inches diameter.

The material and energy balance for the project has been developed assuming LHV of natural gas as 8653 kcal/Nm3. The total requirement of natural gas at rated capacity operation of the plants is estimated at about 90910 Nm3/hr (about 2.22 MMSCMD) including energy as natural gas which is generally consumed during planned shut-down and start-up of the complex. This requirement includes the gas to be used as raw material for the ammonia plant and utilities as power generation etc.

4.3.1.2 Water

The total requirement of raw water for the complex is envisaged to be around 1265 m3/hr. Water requirement will be made available from Damodar river through pipeline. Pre-treatment of raw water has been considered for process use.

4.5 Process Technologies

Urea is commercially produced as part of an integrated facility consisting of ammonia and urea plants. The steam reforming of natural gas leads to production of ammonia and carbon dioxide. Urea is produced by reaction of ammonia and carbon dioxide at elevated pressure via formation of intermediate ammonium carbamate.

4.5.1 Ammonia Plant

Production Process

The ammonia production process has the following major steps:

- Hydrogen production (usually by reforming of natural gas or partial oxidation of heavier hydrocarbon feedstocks including coal)
- Synthesis gas purification (including CO_2 removal)
- Ammonia synthesis, refrigeration and purging of inerts

Air is the ultimate source of nitrogen, and methane or heavier hydrocarbons are usually the main source of hydrogen. Of the hydrogen feedstock sources - natural gas, coal, and petroleum fractions – natural gas is the most often employed in commercial ammonia plants, with coal derived synthesis gas making up the majority of the remainder.

A typical ammonia system will consist of the following steps:

- **Desulphurization** – Natural gas contains large percentage of methane along with ethane, propane, butane, pentane, carbon-di-oxide, nitrogen & sulphur compounds. Small quantities of sulphur compounds in the gas are removed by passing the gas through desulphurisation unit.
- **Reforming** – Sulphur free gas is then mixed with steam and sent to Primary Reformer where reforming reaction takes place in the presence of catalyst & produces a gaseous mixture of hydrogen, carbon monoxide & carbon-di-oxide. Further reforming takes place in the Secondary Reformer where air is added to furnish the nitrogen required for Ammonia synthesis.
- **Shift Conversion –** Hot reformed gases from Secondary Reformer are cooled by heat recovery in waste heat boiler and introduced in the shift converters where most of carbon monoxide gets converted to carbon-di-oxide.
- **CO_2 Removal -** Carbon-di-oxide from the gaseous mixture is separated in the CO2 Absorber using 2- stage GV process and sent to Urea Plant.

- **Methanation -** Residual oxides of carbon in the synthesis gas leaving Absorber are converted to methane in the Methanator.
- **Ammonia Synthesis –**. Pure synthesis gas from Methanator is compressed and sent to Ammonia convertors where Ammonia is formed. Ammonia product obtained is sent to urea plant for the production of Urea.

Technology Suppliers

The most prominent ammonia process technology suppliers at present are as follows:

- **Haldor Topsoe (HTAS), Denmark**
- **Kellogg Brown & Root (KBR), USA**
- **Uhde, Germany**

4.5.2 Urea Plant

Production Process

The urea production process consists of five process steps:

- **Synthesis** - Ammonia and carbon dioxide are synthesised to form ammonium carbamate, which in turn is partly dehydrated to urea.
- **Decomposition -** The unconverted ammonium carbamate is decomposed back to ammonia and carbon dioxide.
- **Recovery -** ammonia and carbon dioxide gases released from the decomposition step are scrubbed out with water, cooled and usually totally or partly recycled to the synthesis section.
- **Concentration** – The excess water is removed to produce molten urea. Usually, evaporation is used to produce fertilizer grade urea, whereas crystallization is used to produce technical grade urea.
- **Finishing** – The highly concentrated urea solution from the concentrators is processed either through a prilling tower or urea granulator to produce urea.

Process Licensors

The current global leading licensors of urea technology are as follows:

- **Stamicarbon, Netherlands**
- **Saipem, Italy**
- **Toyo Engineering Corporation (TEC), Japan**

Stamicarbon and Saipem have been market leaders in terms of installed capacity with approximately 90 per cent of the total.

There is no major variation in plant cost and energy consumption levels and the selection of a particular process shall be based on competitiveness in that particular project or comfort level of the project owner based on his past experience and expertise achieved in operating similar technology based plants.

For the proposed project Haldor Topsoe and Saipem Technologies has been considered for Ammonia and Urea respectively.

5.0 NEED OF THE PROJECT

Urea as a major source of Nitrogen continuous to dominate the seen of Nitrogenous Fertilizers in the country.

5.1 Production and Consumption Trends

Though the level of fertilizer consumption in the country has all along been very low, the indigenous production of urea in India has always been lagging behind the consumption requirement except for the year 2000-01.

Table-5.1

Gaps between Consumption & Production of Urea

(Lakhs Tonns)

Year	Consumption	Production	Gap	% of Gap to Consumption
1960-61	0.14	0.12	(-) 0.02	14.29
1970-71	11.78	10.96	(-) 0.82	6.96
1980-81	60.44	33.84	(-)26.60	44.01
1990-91	140.76	128.35	(-)12.41	8.82
2000-01	191.86	196.23	(+) 4.47	2.28
2005-06	222.95	200.85	(-)22.10	9.91
2006-07	233.38	203.10	(-)30.28	12.97
2007-08	259.63	198.60	(-)61.03	23.51
2008-09	266.49	199.22	(-)67.27	25.24
2009-10	266.73	211.12	(-)55.21	20.85
2010-11	281.13	218.72	(-)62.41	22.20
2011-12	295.65	219.92	(-)73.73	25.61
2012-13	300.02	225.86	(-)74.16	24.72
2013-14	304.54	227.18	(-)77.36	25.40
2014-15 (p)	306.10	225.93	(-) 80.17	26.19

(-) deficit (+) surplus

It may be seen from the above table that gap increased from 0.82 Lakh MT in 1970-71 to 26.61 Lakh MT in 1980-81 and to 80.17 Lakh MT in 2014-15. Surplus availability of urea in the year 2000-01 has been due to decline in consumption on one hand and excess domestic availability particularly in view of high opening stock on the other.

5.2 Future Supply Estimates

5.2.1 Indigenous Existing Supply

To meet the domestic demand for urea, production from the existing units in the country stood at 225.93 Lakh MT during 2014-15. Almost 21 plants operated above 100 % capacity utilization. It is likely that the same trend shall be continued in the near future.

5.2.2 Additional Capacity

Around 12.70 Lakh MT of additional capacity of urea through green field project by Matix Fertilizers & Chemicals at Panagarh (West Bengal) is under implementation and commercial production is likely to start in 2016-17.

5.2.3 Projected Demand-Supply Gap

The following Table-5.2 gives scenario of the demand-supply gaps that are likely to emerge in 2019-20 and 2020-21.

Table-5.2
Projected Demand Supply Gap for Urea

(Lakh MT)

Item	2019-20	2020-21
Demand Estimates (FAI)	353.07	360.64
Supply Estimates		
• Plants under Operation	227.18	227.18
• Matix Fertilizers & Chemicals	12.70	12.70
Total Indigenous Supply	**239.88**	**239.88**
• Import from OMIFCO JV	16.50	16.50
Total Supply	**256.38**	**256.38**
Demand-Supply Gap	**96.69**	**104.26**

There is almost 4-5 Lakh MT of urea demand per annum for manufacturing of complex fertilizers and for exports to neighboring countries like Nepal, Myanmar etc. This will increase the projected deficit level of urea further.

On the supply side, a critical assumption is that the existing installed capacity is not only retained in good working condition but is also able to maintain the high capacity utilization levels. As much as 15 lakh MT of urea capacity is from plants based on costlier feedstock such as naphtha. It would call for change over of feedstock, if the Country were to continue to have this much capacity available for production. Even the gas based plants commissioned in 1980's and thereafter would call for timely

revamping and retrofitting to ensure that they are able to maintain present operating rates and low energy consumption.

5.2.4 Available Options

The apparent choice to fulfill this demand supply gap may be through increase in indigenous capacity by expansion/grassroot plants, by joint venture and import of urea.

5.2.5 Expansion / Grass root plants

To reduce the demand-supply balance during twelfth and subsequent plan periods, a number of expansion projects are under consideration. Indo Gulf Fertilizers - Jagdishpur expansion, Chambal Fertlizers & Chemicals – Gadepan expansion, RCFL – Thal expansion, Nagarjuna Fertilizers & Chemicals Ltd. – Kakinada expansion GNFC – Bharuch expansion, IFFCO- Kalol expansion and Tata Chemicals - Babrala expansion proposals for 2200 MTPD ammonia and 3850 MTPD Urea are under active consideration. LSTK bids in respect of expansion projects of RCF –Thal and CFCL-Gadepan have already been opened and have been approved by their respective boards for implementation.

Proposals for revival of the closed urea units of HFCL and FCIL have already been cleared by the cabinet. The revival of these plants will be on NG/LNG except Talcher (Odisha) which shall be based on coal gasification. Most of these closed units are located in industrially backward areas. The units of these closed companies have excellent existing infrastructure in the shape of residential colonies, coal and electricity tie-ups, water filtration plants, railway sidings and a very sizeable area of land. This infrastructure is ideal for Brown Field Projects. However, the progress on the above mentioned projects is not very encouraging.

5.2.6 Joint Venture Abroad

Due to constraints in the domestic availability of natural gas for increasing the production of urea in the Country, the Government of India is encouraging Indian fertilizer companies to have joint venture projects with buy back arrangements in gas rich countries.

The following overseas JVs have sponsors from the Indian fertilizer industry in urea sector.

One Joint Venture Project Oman India Fertilizer Company (OMIFCO) with IFFCO, KRIBHCO and Oman Oil Company is already operating at Oman with installed capacity of 16.54 lakh MT urea.

Some other JV Projects are in the pipeline in countries like Iran, Ghana, Nigeria, Saudi Arabia, Kuwait and Egypt.

The progress on the above mentioned joint venture projects are not very encouraging.

5.2.7 Import

The quantity of urea available for international trade is limited. The analysis of past 15 years data reveal that increase and decrease in the world export supply or import demand by 10 million MT has led to violent fluctuations in the prices from US$ 70 to US$ 800 per MT of urea. This variation in prices is basically due to changes in the output by either 'low cost exporters' or 'swing producers' who account for about 6 million MT of world trade. Low cost producers are export oriented facilities based on low cost gas. Swing producers are primarily domestic suppliers who either (i) enter the export market when prices are high even ignoring domestic supplies, or (ii) stop even domestic supplies when prices are low. Manufacturers in free markets like USA fall under this category.

When the demand is strong, it is the demand-supply balance which would determine the price level that the market can sustain at that particular point of time. It has no relation to manufacturing costs.

When market is weak, it is the cost profiles of the producers and more specifically their cash costs which would determine the price levels. Low cost exporters do not normally reduce their export volumes and prefer to maximize sales volumes even when prices are dropping so long as they recover their cash costs. Generally, the swing producers have higher manufacturing costs and they would start exiting the market as prices drop, thereby reducing exports to balance the reduction in import demand and maintain prices.

It is apparent that urea is a strategic commodity and capacity of international market is rather limited to meet significant increases in demand. An additional demand of even 1-2 million MT would cause serious imbalance and prices would shoot up. Higher levels of demand could result in a situation when urea would not be available in spot markets at any price.

Therefore, it would not be prudent to depend on imports for more than 5-6 Lakh MT of urea. This in other words means that the country shall be required to have in place additional domestic capacity of urea for indigenous consumption.

6.0 ENVIRONMENT CONSIDERATION

Though Dhanbad industrial area falls in the list of 88 industrial clustures identified for preparation of Comprehensive Environmental Pollution Index (CEPI). FCIL Sindri which is located at a distance 28 kms, does not fall in the list of 88 industrial clustures identified for preparation of Comprehensive Environmental Pollution Index (CEPI). It is also worth mentioning that the moratorium has been lifted in 2013.

The rate of growth of nearby towns, is similar to the rate of growth of other towns. All the required civic amenities like School, College, medical facilities etc are available within 15 km radius of FCIL.

6.1 Waste Management & Disposal System

Waste Management & Disposal System for the proposed project is described below:

Gaseous Emissions During Combustion of Fuel

Fuel used in the proposed project is Natural gas. Hence, no S02 emissions are anticipated. Low NOx burners will be installed to reduce NOx.

Production Processes

Urea dust (less than 50 mg/m3) and ammonia (less than 150 mg/m3) are the emissions from prilling tower.

Flare and vent stacks of adequate height shall be provided in the Ammonia and Urea Plants.

Material Handling

To control the emissions in the bagging plant where urea is handled, the plant has been provided with de-dusting system. Dust from various points will be collected and sent to urea plant where it will be dissolved in urea solutions and reprocessed in urea plant.

6.2 Liquid Effluents

Pollutants that can contaminate the land and water shall be treated within the complex.

- Ammonia plant process condensate will be treated in the ammonia plant process condensate stripper, recycled to the process as boiler feed water.
- Urea plant process condensate treated in urea plant (hydrolyser stripper), recycled to the process as boiler feed water.

- Cooling tower and DM plant effluent shall be treated in Effluent Treatment Plant (ETP) and the treated effluent shall be used for green belt development, to the extent possible.
- Domestic effluent after treatment in the Sewage Treatment Plant (STP) shall be used for green belt development, to the extent possible.

The treated effluent from STP and ETP will be discharged after meeting the MINAS standard to outside water body in consultation with State pollution control board.

6.3 Solid Waste

Hazardous waste generated in the plants such Spent Catalyst, used Oil etc. shall be sold to authorized vendors as per Hazardous Waste Management Rules.

7.0 EMPLOYMENT GENERATION

It is envisaged that the proposed project would generate sufficient employment opportunity during construction phase as well as operation basis. For carrying out construction related activities, it is envisaged to engage skilled, semi-skilled and unskilled workers from local area to the maximum extent.

7.1 Manpower Requirement

Based on the organizational pattern followed in the existing fertilizer plants, it is envisaged that, the total number of personnel required for operating in different plants and establishments during normal operation in three shifts and at full rated capacity would be about 460 directly employed & 1500 indirectly employed. The breakup of direct employment is given in Table-7.1.

Table- 7.1

Man Power Requirement

S. No.	Description	Estimated Manpower Requirement
1.	Plant Head	10
2.	Production / Operation	210
3.	Maintenance	112
4.	Technical Services	22
5.	Materials Management	28
6.	Safety & Fire Fighting	15
7.	Finance & Accounts	13
8.	Personnel, Admn. & Medical	40
9.	Marketing	10
	Total	**460**

8.0 REHABILITATION & RESETTLEMENT PLAN

Old & closed FCIL Sindri fertilizer complex is spread over an area of 6652 acres of land. The total area of land is under the administrative possession of FCIL Sindri. The proposed fertilizer project shall be implemented within plant premises of existing Sindri Fertilizer Complex. Hence, any planning with respect to rehabilitation & resettlement is not applicable.

9.0 PROJECT SCHEDULE & PROJECT FINANCIALS

9.1 Project Schedule

The likely date of start of construction shall commence after getting Environmental Clearance (EC) from MoEF&CC. The project is scheduled to be completed within 36 months after issuance of EC.

The Time Schedule for the proposed project is attached as Annexure-7.

9.2 Project Financials

9.2.1 Cost Estimates

The Project Capital Cost of the proposed project 2200 MTPD ammonia and 3850 MTPD urea along with associated offsite & utility facilities, as per the scope is estimated at Rs. 5455 Crores.

9.2.2 Cost of Production

The cost of production for need coated urea from the proposed project is worked out as Rs. 17,729 at rated capacity.

9.2.3 Financial Indicators

The financial indicators for the proposed project at NG price of US $7.5 /MMBTU are as under:

Table-9.1
Financial Indicators

Urea Plant Capacity	MTPD	3850
Project IRR (Post-Tax)	%	14.80
Equity IRR	%	18.18
Cash-Breakeven	%	69.24
Payback	Years	5.75

10.0 ANALYSIS OF PROPOSAL

The final analysis of proposed may be briefed as under:

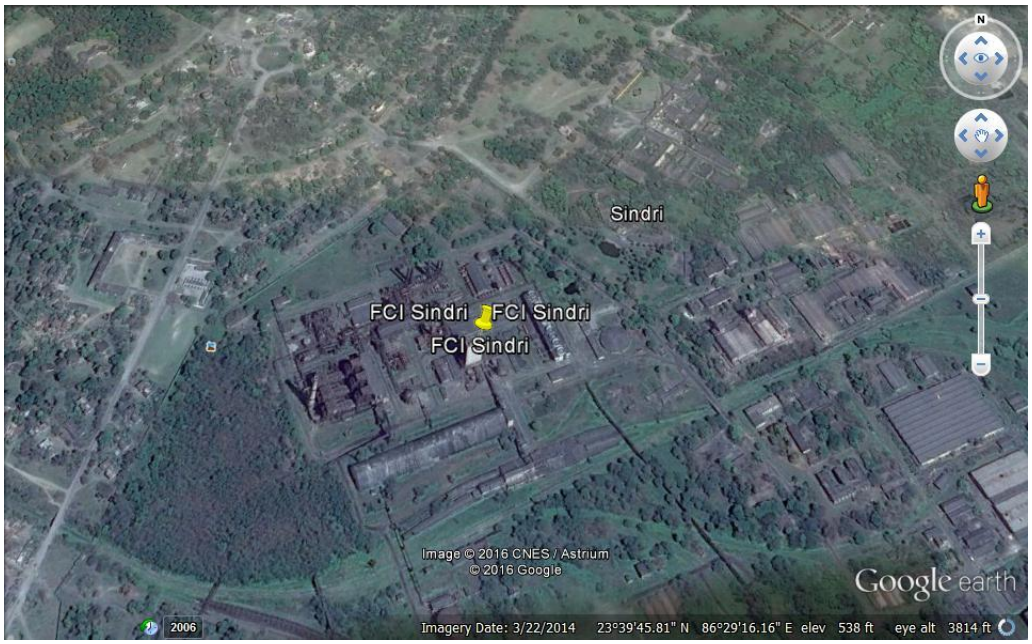
a) The revival of FCIL Sindri will narrow the gap between demand and supply of Urea in eastern zone of the Country.

b) The site is well suitable for establishment of proposed Ammonia/ Urea Plants at Gorakhpur as area around FCIL Sindri has ***never been identified as "CRITICALLY POLLUTED AREA/ ZONE" by CPCB.***

c) The implementation of recently developed Best Available Technology (BAT) which is a reliable and reproducible in different environment throughout the globe.

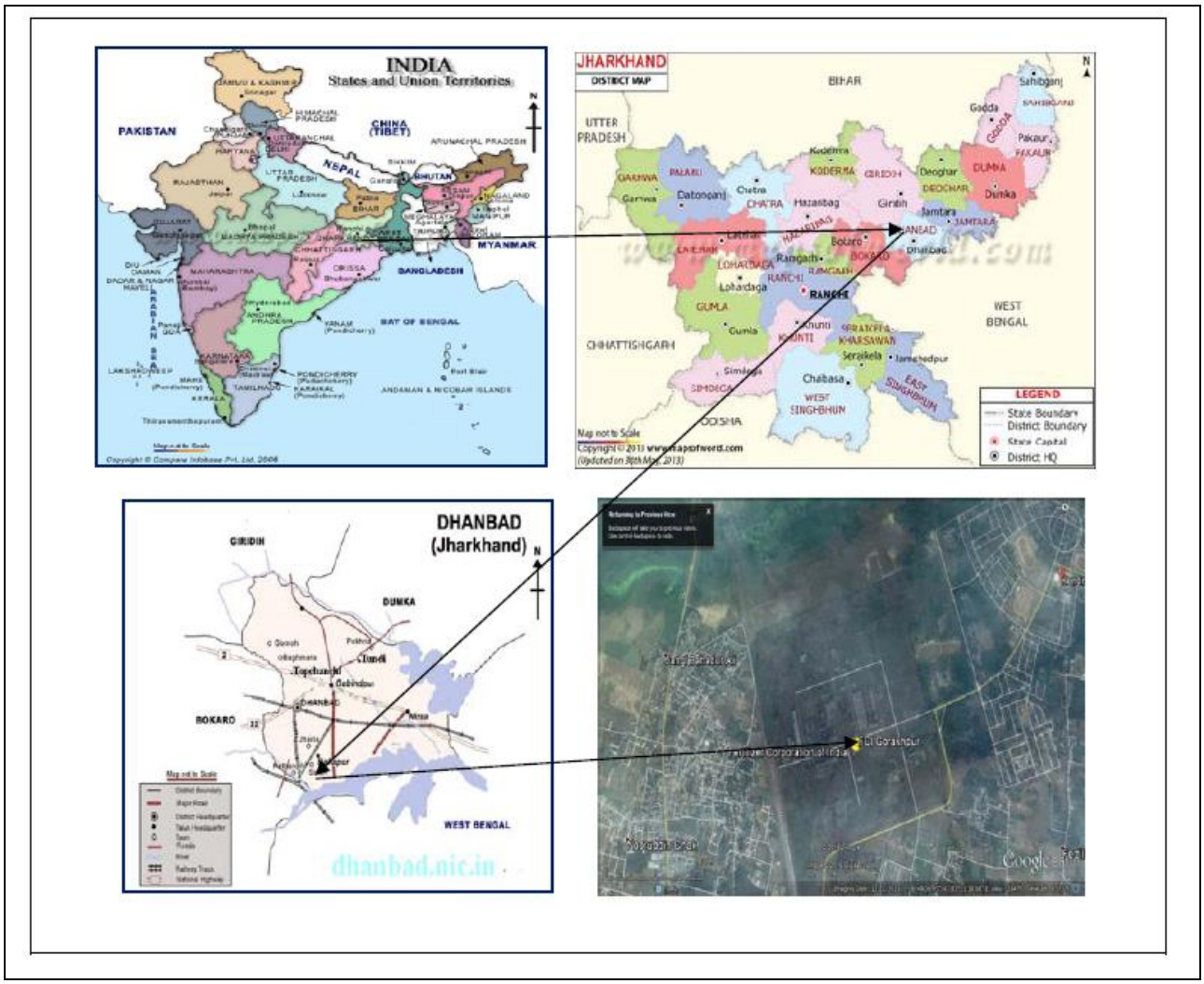
d) The new technology will reduce the carbon load of the country and will be able to save and conserve the natural resources like NG, Water etc., in compliance to the resources conservation and reuse act.

e) The proposed project is a part of "***India Low Carbon Strategy"*** and INTENDED NATIONALLY DETERMINED CONTRIBUTION (INDC) under UNEPCCC Protocol.



Annexure-1

Location of Old Closed FCIL Sindri Fertilizer Complex on Google Map

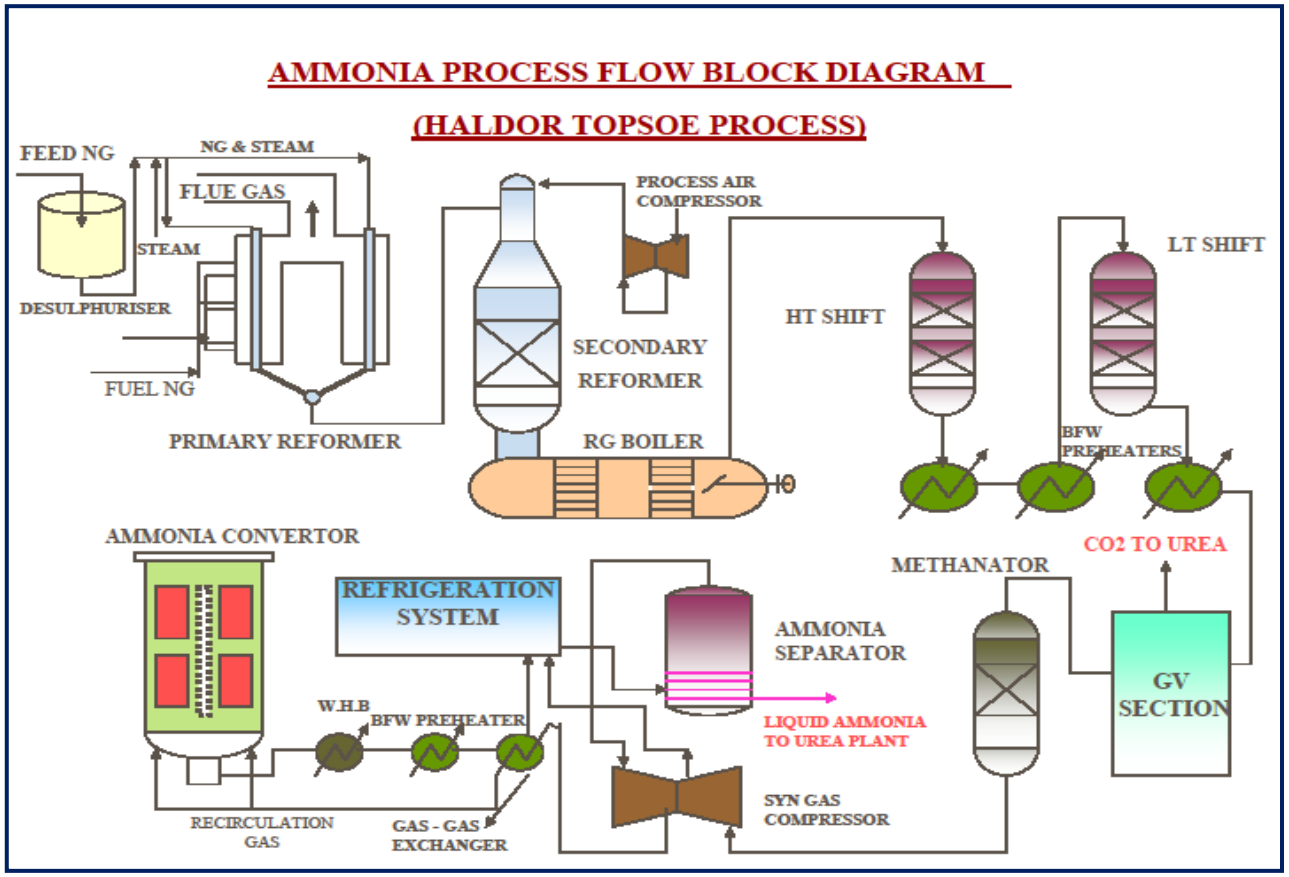


Annexure-2

Location of Old Closed FCIL Sindri Fertilizer Complex on Geographical Map

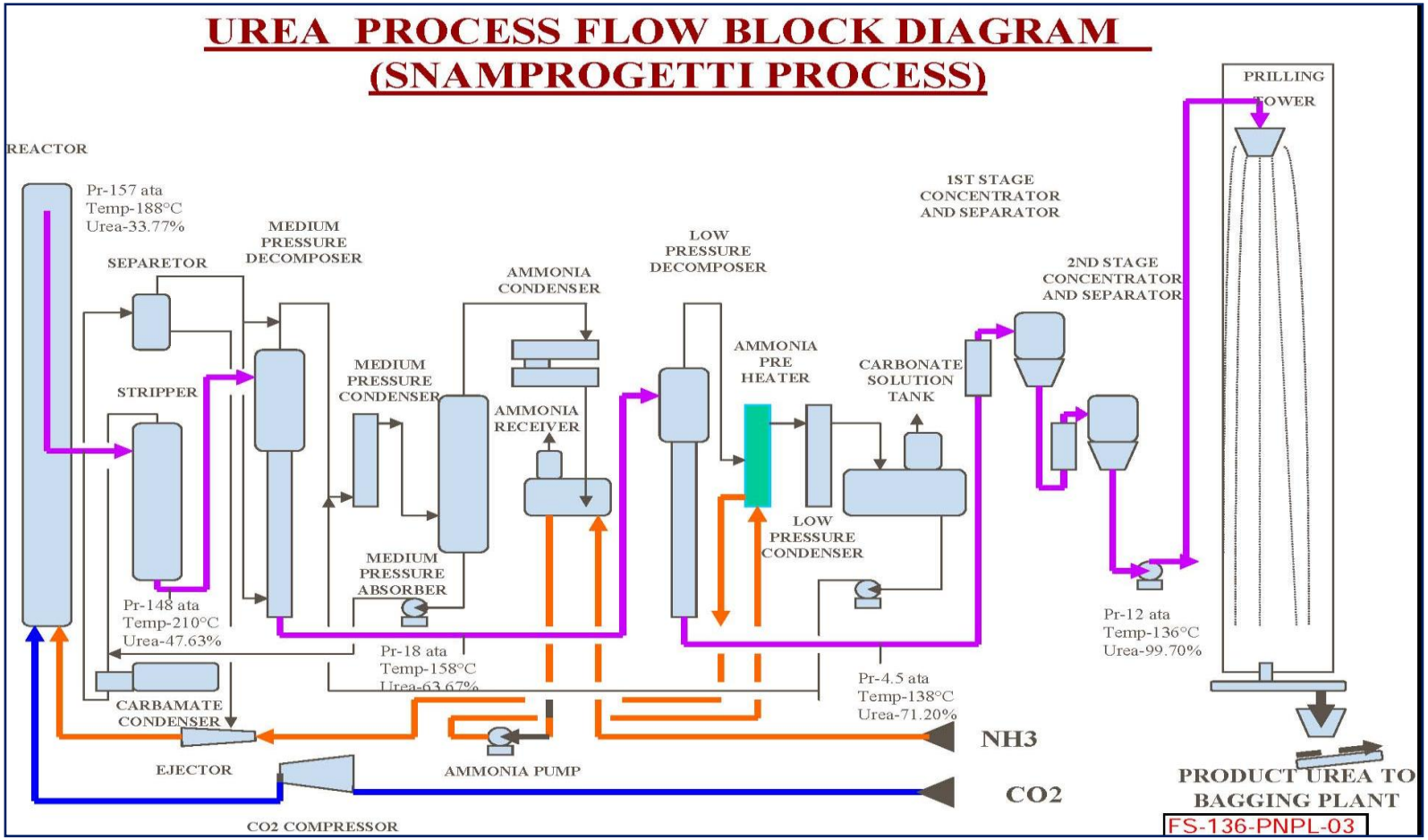
Annexure-3

KEY PLAN OF FCIL SINDRI UNIT



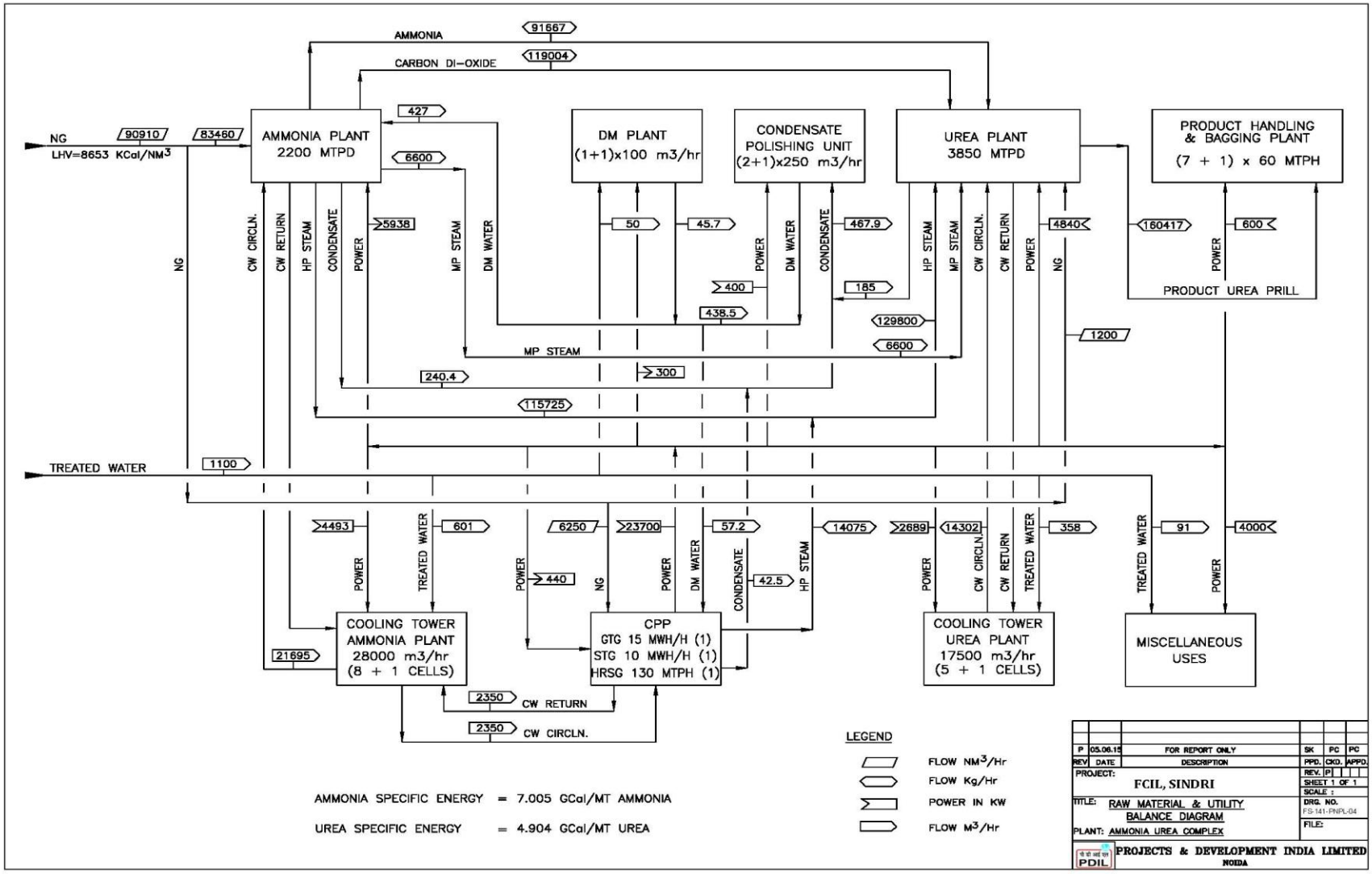
Annexure-4

BLOCK DIAGRAM OF PROCESS OF PROPOSED AMMONIA PLANT



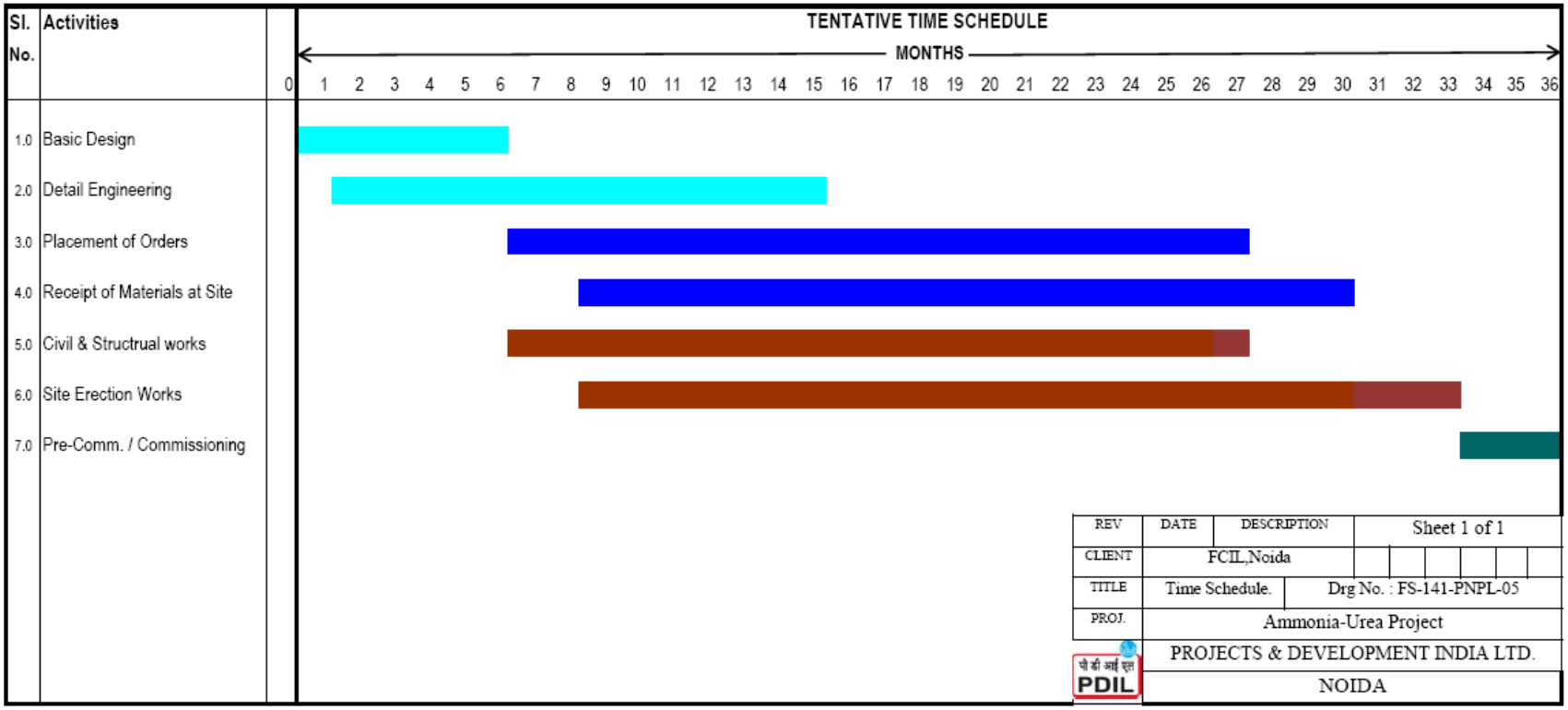
Annexure-5

BLOCK DIAGRAM OF PROCESS OF PROPOSED UREA PLANT



Annexure-6

BLOCK DIAGRAM OF RAW MATERIAL & UTILITY BALANCE



Annexure -7

BAR CHART SHOWING PROJECT COMPLETION SCHEDULE

Note: Zero date will start after issuance of EC from MoEF&CC