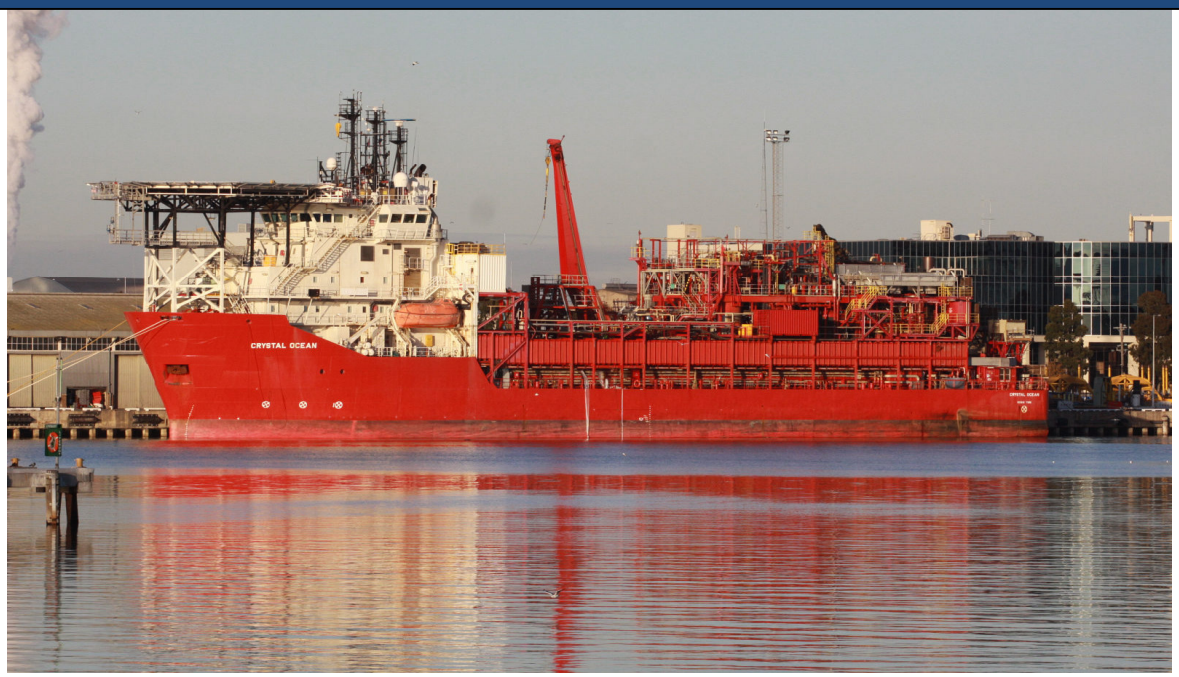
Pre-Feasibility Report

Development of LPG Import Facility

at Okha, Jamnagar District, Gujarat

Energy Infrastructure (India) Ltd.



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ENERGY INFRASTRUCTURE GROUP

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List of Abbreviations

AMSL	Above Mean Sea Level
CALM	Catenary Anchor Leg Mooring
CBM	Conventional Buoy Mooring
CRZ	Coastal Regulatory Zone
DG	Diesel Generator
DWT	Deadweight Tonnage
EIA	Environment Impact Assessment
EIG	Energy Infrastructure Group
EIIL	Energy Infrastructure (India) Limited
FRI	Fisheries Research Institute
FSO	Floating Storage Offloading
GEB	Gujarat Electricity Board
GES	Gujarat Ecological Society
GMB	Gujarat Maritime Board
HFL	Highest Flood Level
HSD	High Speed Diesel
IMD	Indian Meteorological Department
JLPL	Jamnagar Loni Pipe Line
Km	Kilometers
KVA	Kilo Volt Ampere
LFP	Land Fall Point
LPG	Liquefied Petroleum Gas
M	Meters
MCC	Motor Control Center
MRS	Main Receiving Station
MT	Million Tonnes
MTPA	Million Tonnes Per Annum
MW	Megawatts
PLEM	Pipe Line End Manifold
STDS	Sexually Transmitted Diseases
T	Tonnes
TMT	Thousand Metric Tonnes
TPD	Tonnes Per Day
TPH	Tonnes Per Hour

1 Executive Summary

Energy Infrastructure India Limited (EIIL) intends to build and operate marine facilities at Okha in the state of Gujarat for receiving, storage and transportation of imported Liquefied Petroleum Gas (LPG) for marketing in North and North West India. The offshore marine facilities shall be implemented in three phases namely Phase 1, Phase 2 & Phase 3 to match with the LPG demand growth envisaged in the Marketing Plan. In accordance with EIIL's Marketing Plans, the annual throughput in the first phase of operation is expected to be close to 2,50,000 MTPA, above 2,50,000 MTPA in the second phase & 4,50,000 MTPA in the third phase.

As the project involves handling of LPG, there is no pollution potential associated with the activities to be carried out except risk associated with handling of LPG. In addition, switching of traditional consumers from using wood/ bio-fuels/ kerosene/ coal to using LPG shall help increasing air quality and thus curbing pollution to some extent. The impacts associated with construction phase will be minimal and temporary in nature. Even though little or no adverse impacts have been envisaged due to proposed project, Environmental Management Plan will be implemented to eliminate the adverse impacts, offset them or reduce them to acceptable levels.

There will be three phases of implementing this project, namely –

a) **Phase 1:** This phase can be for throughput up to 250000 T in which demand is being built up and LPG will be imported in small carriers of 3000 to 10000 T capacities.
b) **Phase 2:** This phase can be for higher throughput to meet higher level of demand above 250,000 T and involves large size LPG carriers unloading LPG directly into CALM buoy.
c) **Phase 3:** This is for throughput nearing full capacity when the LPG-FSO, having storage capacity of 45,000 T has to be added to the various facilities. This can be for throughput of above 4,50,000 T per year.

Table 1: Project Summary

S.NO.	Description	Details
1	Name of the Project	Offshore and Onshore LPG Import Facility at Okha
2	Location of the facility	Arambhada Village, Dwarka Taluka, Jamnagar District, Gujarat 1st Phase Latitude 22° 29' 22 "N Longitude 69° 03' 02" E 2nd & 3rd Phase Latitude 22° 32' 26 "N Longitude 69° 03' 13" E
3	Product	LPG Import
4	Total Land Requirement for the project	Approx 104 acres for shore terminal and 2.47 acres (1 hectare) for pipeline installation between terminal & landfall point
5	Total Water requirement & source	17 m^3/day met from Desalination Plant
6	Man Power (operation)	48 persons
7	Estimated Cost of Project	Rs. 909 Mn (Phase I) Rs. 461 Mn (Phase II) Rs. 3300 Mn (Phase III)

2 Introduction of the Project/Background

2.1 Identification of the project and project proponent

Energy Infrastructure (India) Limited is a 100% subsidiary of Energy Infrastructure Butano(Asia) B.V., Netherland, with interest in energy. EIIL has been formed to plan, develop, finance and manage the infrastructure, contractual arrangements for supply and logistics, sales and marketing programme for the import, storage, bottling and distribution of LPG.

It intends to build and operate marine facilities at Okha in the state of Gujarat for receiving, storage and transportation of imported Liquefied Petroleum Gas (LPG) for marketing in Northwestern India.

2.2 Brief description of nature of project

The proposed LPG import, Loading and Floating Storage offloading (FSO) at Okha falls in schedule 6(b) and Category 'A'.

2.3 Need for the project and its importance to the country and or region

a) Offering consumers a better cooking fuel, improving lifestyles

About 90% of rural India and 30% of urban India use wood, crop residue/ biomass for their cooking fuel. The instant heat available from LPG will save significant time for residential consumers and thus enable productive activities and additional economic growth.

b) Importing LPG to bridge the gap between supply and demand

Domestic LPG production and existing import facilities are inadequate to meet existing demand. The Project will help meet the current and forecasted between domestic LPG production and demand.

c) Enhancing the environment and the health of the rural population providing a more reliable rural energy supply

LPG is an environment friendly fuel compared to traditional fuel sources such as wood, bio-fuels, kerosene and coal. Hence, it is envisaged that more usage of LPG shall add to the curbing of traditional fuels that are more hazardous. In addition, usage of LPG will reduce emissions and pollution and curb deforestation, saving up to 16mn trees per year and improving the ambient air quality.

d) Providing employment in the Project company, distributors and suppliers

The project will have nearly 48 employees during operation. Distributors will provide around 500 additional jobs while further employment will be created through the shipping, trucking and construction services provided to EIIL.

e) Generating substantial revenue for the government of India

The project will contribute to government revenue. These payments are made as import duties, port revenue taxes, sales tax, and tax on profits and dividends.

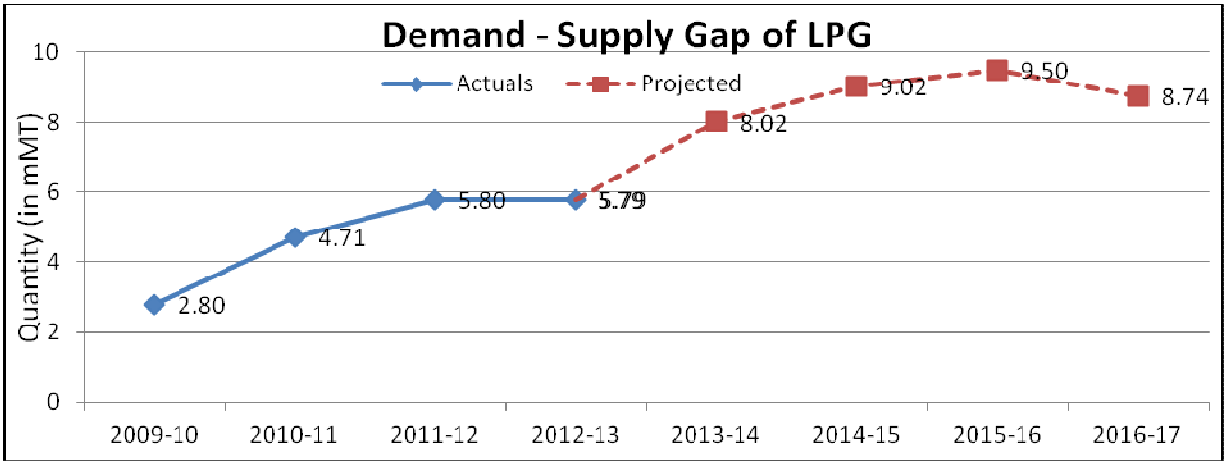
2.4 Demand-Supply Gap

India is the fifth largest consumer of LPG in the world after USA, China, Saudi Arabia and Japan. Major market of LPG is domestic sector with India being 3rd largest consumer in domestic sector in the world after China and USA. The sale of domestic LPG cylinders constitutes around 87% of the total LPG sales. There is a steady growth in LPG consumption in India with demand growing at 8%. The gap between

demand and supply is rising as the domestic production is not able to meet domestic demand for LPG. Indigenous LPG production takes place through state run, private and fractionators.

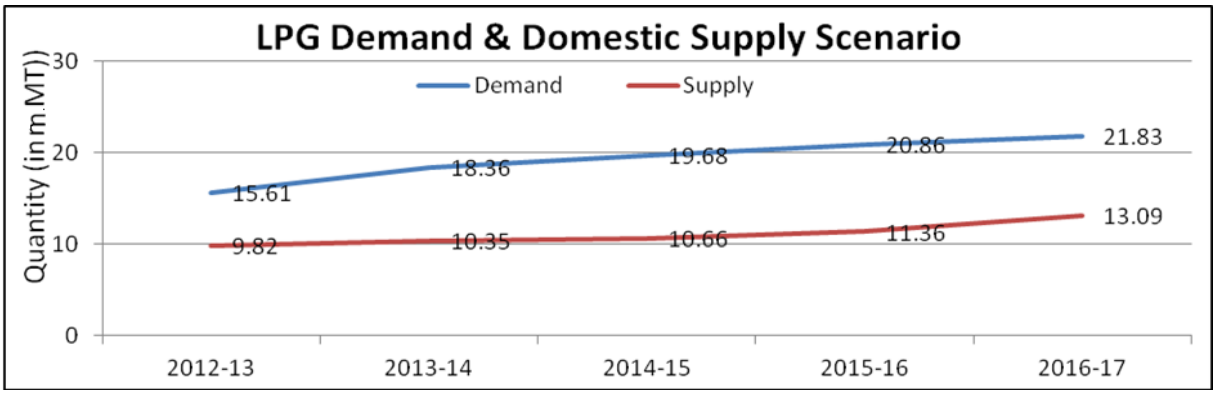
Demand for LPG in FY 2013 was 15.61 million tones and it is expected to grow to 21.83 million tons by FY 2017 growing at a CAGR of 8.75%. Whereas, domestic supply for LPG in FY 12-13 was short of demand by 5.79 million tones and the expected supply in FY 2017 will grow to 13.09 MT at a CAGR of 7.45%. Due to this difference in growth rates of supply and demand, the gap will widen with time as can be seen from Figure 1 & 2. This gap between demand-supply is met through imports and with the proposed LPG import facility at Okha, there will be a boost provided to imports in order to meet this gap.

Figure 1: Demand Supply Gap



Source: PPAC, Working Group Report of the Petroleum and Natural Gas Sector (2012-17)

Figure 2: LPG Demand & Supply Scenario



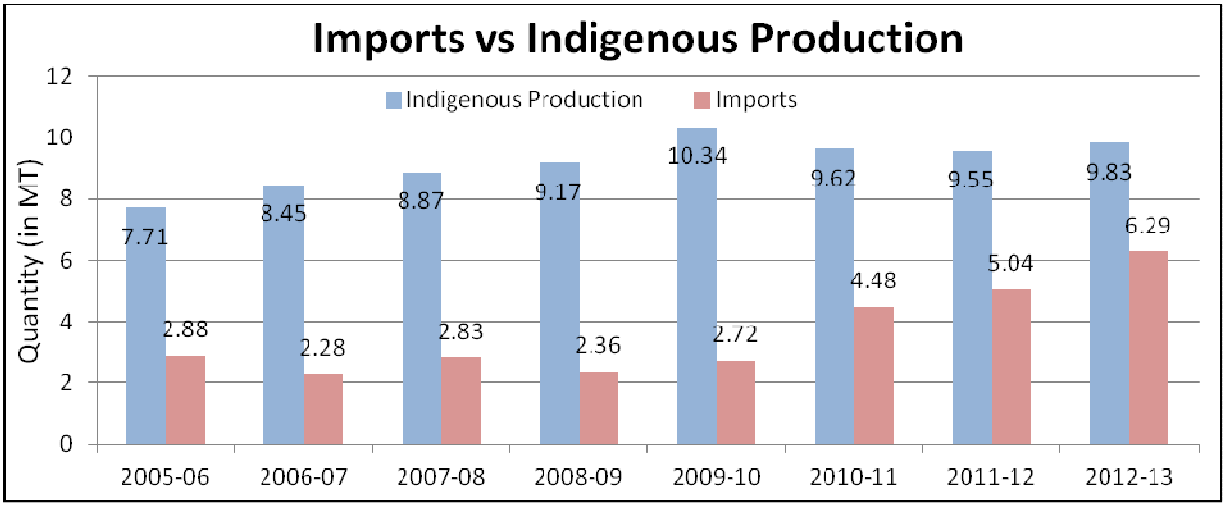
Source: Working Group Report of the Petroleum and Natural Gas Sector (2012-17)

2.5 Import vs. Indigenous production

The requirement of LPG over and above the indigenous availability is met by imports. New LPG import facilities are being set up and existing capacity is being augmented. However, to fill in the gap, the private sector and joint venture companies are setting up LPG import facilities at different locations.

With LPG consumption growing due to expansion of LPG coverage in urban as well as rural areas, and the indigenous production of LPG remaining at around the same level during last 5 years, the country is heavily dependent on the import of LPG as seen from the rising LPG imports in Figure 3. During the year 2012-13, almost 40% of the requirement of LPG was met through import of 6293 TMT LPG.

Figure 3: Imports vs Indigenous Production



Source: PPAC

2.6 Export possibility

LPG imported at Okha terminal would be used to meet domestic demand in India and would help in reducing the demand-supply gap of LPG. Hence there is no export possibility.

2.7 Domestic Markets

India is the fifth largest consumer of LPG in the world after USA, China, Saudi Arabia and Japan. However, with almost 90% of its LPG consumption in the domestic Sector, India is the third largest consumer of domestic LPG after USA and China. Penetration of LPG in domestic sector in urban and rural areas is 88% and 19.6% respectively. The Government of India has, for the purposes of improving

penetration levels in rural India and providing economic alternative fuel introduced Rajiv Gandhi Gramin LPG Vitran Yojana (Rajiv Gandhi Rural Distribution Scheme) in 2009 and has a target to increase the penetration levels to 75% by 2015. The Okha Port, lies in the Jamnagar district of Gujarat, is the most economic LPG import location on the west coast of India to help deliver these Government targets. This port will receive, store and transport the imported LPG to residential, commercial and industrial consumers in north western India.

2.8 Employment Generation (Direct and Indirect) due to the project

The Proposed LPG facility at Okha would aid in direct employment generation of hundreds of persons during construction and for 48 persons during operation per annum whereas the indirect employment generation will be almost 5 times more than the figures quoted above in this unemployment prone area with a high non workers population.

3 Project Description

3.1 Type of project including interlinked and interdependent projects, if any

- Offshore marine facilities- conventional mooring buoys & pipeline upto land fall point
- Pipeline from landfall point to onshore terminal - 2.47 acres (1 ha)
- Onshore facilities- Approx 104 acres land, main receiving station, mounded tanks

Phase 1 will be upto 250,000 TPA and Phase-2 will be above 250,000 TPA. Thereafter, under phase-3 after achieving 450,000 TPA and above, a pipeline is envisaged to be laid from the LPG terminal at Okha to connect with northern India for further distribution.

3.2 Location (map showing general location, specific location and project boundary & project site layout) with coordinates

The proposed site for subsea pipeline route corridor and that of shore terminal is near Arambhada Village in Dwarka Taluka (Sub-district) of Jamnagar district, in the Saurashtra region of Gujarat. The site is located within Okha port limits. The terminal is located 3.5 km south-west of Humani Point. For phase 1, the offshore location has been identified at Latitude 22^{o} 29’ 22’’ N and Longitude 69^{o} 03’ 02’’ E. The

location map of the area is as shown in Figure 4 below. The proposed project falls in Survey of India Toposheet No. 41B/14 & 15 and 41F/2 & 3 (restricted) and lies in the following coordinates:

Table 2: Location Coordinates of LPG Facility

Facility	Latitude	Longitude
CBM	22° 29'22" N	69°03'02" E
Calm Buoy/FSO	22° 32' 26'' N	69° 03' 13'' E
Land Fall point of sub-sea pipeline	22° 27' 40'' N	69° 02' 51'' E
On shore storage terminal	22° 27' 26'' N	69° 02' 36'' E

The location of FSO/CALM terminal is latitude 22° 32' 26'' N and longitude 69° 03' 13'' E. This has been permitted by Gujarat Maritime Board.

3.3 Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted

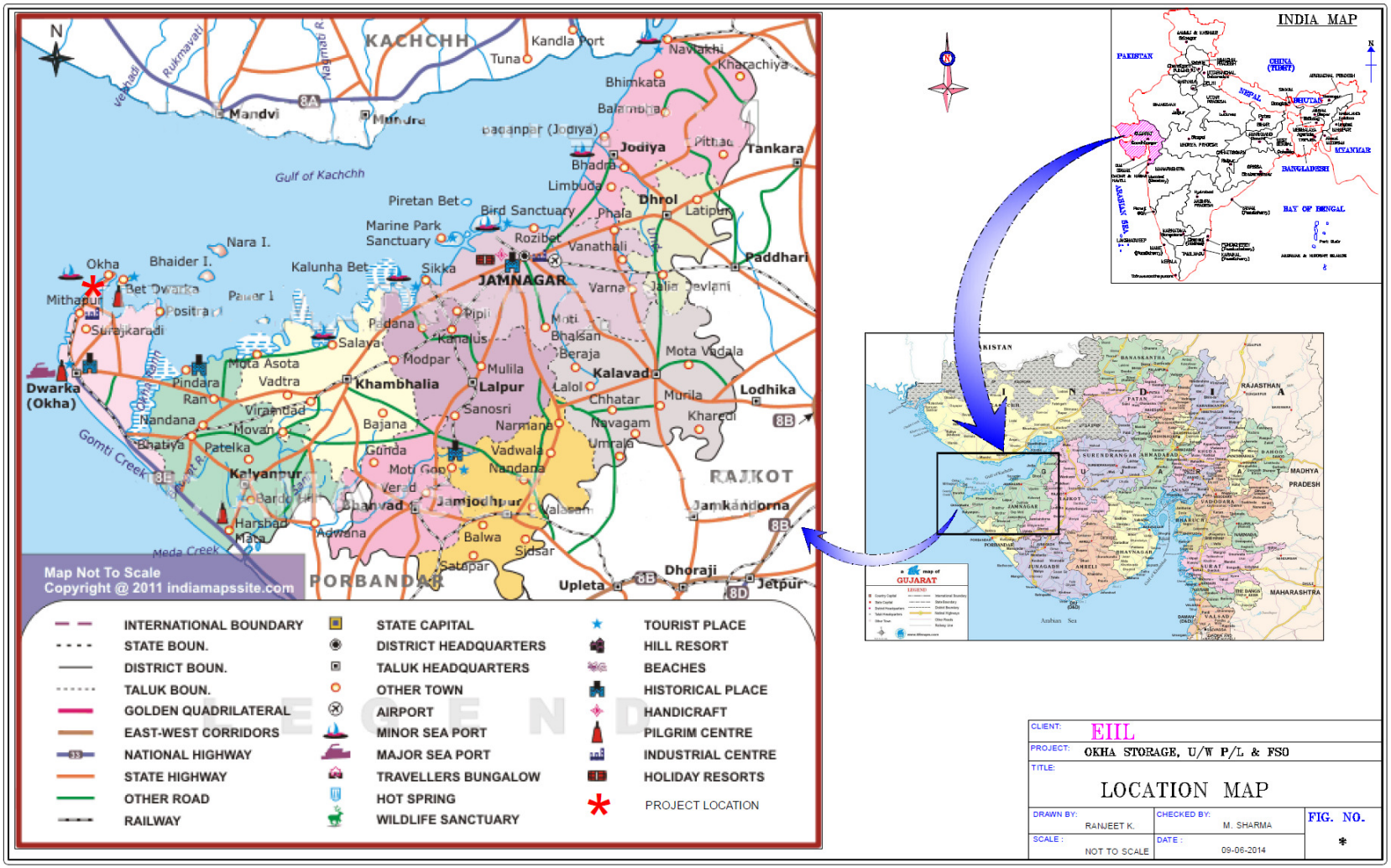
Okha was shortlisted after considering various other site locations like Haldia, JNPT, Paradeep, etc. The criteria used for selection is detailed below.

Basis of selecting Okha

The Gujarat maritime board has identified the development of Okha as a priority in its port modernizations plan and with this project coming up at Okha, the modernization scheme will gain impetus and the project will be mutually benefited. The other criteria for selecting Okha are as follows:

- Okha was an optimal port site suiting Business plan
- Economical to develop for big ships
- Closest to supply sources and target market
- Available sufficient flat economical land nearby
- Nearby BG rail and National highway
- Reception of big ships feasible

Figure 4: Location Map



3.4 Size or magnitude of operation

The proposed LPG import facility has estimated project cost of Rs. 3170 million for all the three phases over the period of 60 months.

3.5 Project Description with process details (a schematic diagram/flow chart showing the project layout, components of the project, etc should be given)

Offshore Process Flow

In Phase 1, LPG will be imported in smaller parcels through LPG carriers (of capacity 3000 to 10000 tons dwt). These smaller LPG carriers will be moored to Conventional Mooring Buoys (CBM) at one end and held with anchors at the other to hold them steady in one position while the LPG is off-loaded through a flexible hose connected to a small PLEM (Pipe Line End Manifold) which is turn is connected to the shore installation with the normal steel sub-sea pipeline. Figure 5 depicts the process through a line diagram.

Onshore Process Flow

Onshore facilities will be minimal. The overland pipeline will be laid on-shore from the LFP (Land Fall Point) to the shore terminal at Okha and connected to three mounded tanks, each of 1400 ton capacity. From these tanks, LPG shall be pumped via a booster station, through a pipeline to be constructed connecting Okha to Jamnagar. The flow of product is depicted in Figure 5. The main receiving station (MRS) for electricity is located to west of LPG storage area. MCC room is located at load centers in such a way that distance from farthest motor is minimum. The water supply system, compressed air station, DG room and fire fighting facilities are located to the west of tanks so as to minimize the length of service lines.

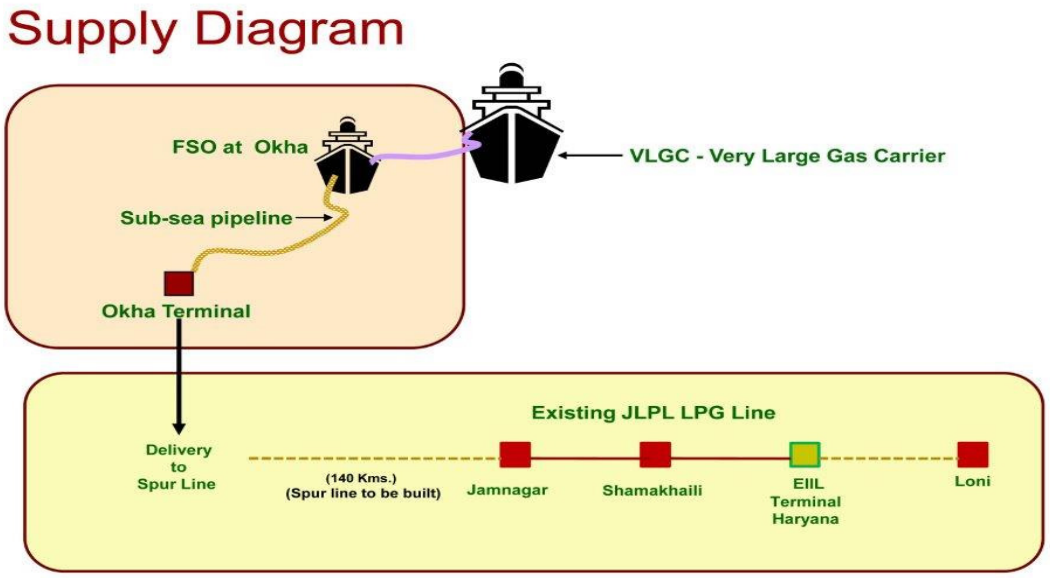
LPG Storage Process

LPG, unloaded from the Storage Tanker, and transported through the link pipeline, to the shore terminal, will be stored in Mounded Bullets at atmospheric temperature of net capacity of 1400 MT each. The system is designed for a maximum flow rate of 250 tonnes/ hour of LPG from the storage tanker.

Pipeline

A pipeline is envisaged to be constructed in Phase 3 to connect Okha with Jamnagar, which is about 140 km from proposed terminal and will be linked for onward pumping through existing cross country JLPL (Jamnagar-Loni) pipeline (as in figure 5).

Figure 5: Product Flow Diagram



3.6 Raw material required along with estimated quantity, likely source, marketing area of final product, mode of transport of raw material and finished product)

Raw material is LPG which will be received via ships (gas carriers) and transported through sub-sea pipelines to onshore terminal where it will be stored in three mounded tanks each of 1400 tons capacity. This LPG will be imported mostly from the Middle East since it is relatively very near to the Project location at Okha.

3.7 Resource Optimization/recycling and reuse envisaged in the project, if any, should be briefly outlined

Cooling water, which is sent to compressors for heat exchange, at the outlet of the compressors is at a higher temperature. This hot water from the compressors is recycled back to the water storage tank/ (cooling tower)

3.8 Availability of water, its source, Energy/ power requirement and source should be given

Power Requirement

The total power requirement of the LPG shore terminal is estimated at approximately 1500 KVA on 30 minutes maximum demand basis. Electrical power for Okha area is presently received at 11KV, from Varwala 66/11KV substation, of Gujarat Electricity Board (GEB), located approximately 7 kms from Okha,

on the Okha-Mithapur route. The present load on the transformer is barely 20% of capacity. It is proposed to draw requisite amount of power for the shore terminal from the 66/11 KV GEB substations, Varwala, through a new 11 KV overhead line. Two diesel generating (DG) sets (one main and one small capacity), each of adequate capacity, have been envisaged for stand by captive power generation in case of reported short fall of power availability through GEB system.

Fuel Requirement

High speed Diesel (HSD) will be required for the DG sets. A fuel oil storage area is provided for unloading, storage and pumping of oil for the DG sets. Two fuel oil storage tanks have been envisaged for storing the HSD. 75 l/hr will be the consumption for a 500 KVA generator and 45 l/hr will be consumed by 250 KVA DG set.

Water Requirement

The plant shall require water for make-up (cooling), firewater and drinking. In order to meet the water requirement for cooling, water will be drawn from the storage tank through pumps. Service water will be required for various purposes, such as cleaning, toilet services, etc and will be pumped from same main water tank. The water received would be given adequate treatment to meet specifications of drinking water. For this purpose, a desalination plant will be put up for terminal operations based on sea water. The daily requirement of fresh water to be made up would be approximately 17 m^3/day, consisting of 3 m^3/day for industrial use, 2 m^3/day for potable & stationary use and 12 m^3/day for green belt and plantation.

3.9 Quantity of wastes to be generated (liquid and solid) and scheme for their management/disposal

Solid waste during construction

Construction waste will be rubble and soil. Rubble generated can be used as good filling material for low lying areas, foundations and even road base. Another solid waste generated is sludge from the septic tank, which will be periodically removed and composted for use as manure.

No negative impact is predicted except for brief period of site clearing. This is going to be only temporary and transitional stage. The terminal area is plain hence no leveling or land filling is involved. Thus, the solid waste will be utilized for raising aesthetics by planting with trees and will not have any negative impact.

Because of a large work force working at site, and temporary establishment of commercial activities, there will be generation of sizeable amount of garbage. The accumulated garbage can have adverse

primary impact on land environment through fouling of soil and atmosphere and lead to secondary impact of health hazard for the workers. Garbage will be managed through composting. As a large component of garbage will be organic in nature, it will be possible to get good quality and quantity of compost from it.

The predominant solid waste that will be generated will be the dredged sand from sea bottom when the construction of sub-sea pipeline will be taking place. In that case, the sand will have to be stored for some time over land or some other temporary storage provision made till the pipe is laid and the sand can be reused. In case sand cannot be used for refilling the trench, then it has to be compacted and stabilized at proper location to avoid nuisance.

Solid Wastes during operation

Shore Terminal: Industrial solid waste will comprise of rags and sludge. Salts from the drying of desalination waste water will also be a solid waste. Office waste will comprise of papers, card boards and sweepings. Domestic solid waste will not be generated during operation except canteen waste. Waste generated will be collected by city garbage system and processed. Septic tank sludge will also be generated every year for disposal. The sludge generated will be used either as manure or as land fill.

Sub-sea pipeline: No solid waste is anticipated to be generated from sub-sea pipeline operation.

3.10 Schematic representations of the feasibility drawing which give information of EIA purpose

Schematic diagram showing activities involved in the project which are potential sources for air pollution, water pollution, noise, land degradation and impact on other environment attributes are given in Fig 5.

Various studies that will be carried out for estimating the potential impact of proposed facilities on the environment are as follows:

Environment Impact	Study/Data Collection
Climate	IMD Station at Okha – Data about rainfall, temperature, wind, relative humidity
Air	Air quality using measuring levels of PM10, PM2.5, NOx, SO2, CO, HC
Land	Land use pattern based on FCC satellite imagery by IRS-IB, Census data
Ecology	Phyto-sociological study of vegetation
Marine	Primary data using Marine bioproductivity study

	Secondary data from Fisheries Research Institute (FRI), Okha (flora, fauna) and from GES (Gujarat Ecological Society) Study (corals)
Water	Bioproductivity study, Physio-chemical analysis – bathymetry study
Noise	Noise Monitoring Stations
Traffic	Traffic Primary Data
Socio-economic environment	Census Data

4 Site Analysis

4.1 Connectivity

The site is located within the Okha port limits. The terminal is 3.5 km south west of Humani point.

Road Link- It has road connectivity to Jamnagar and Rajkot via the 2 laned SH 6 and to Porbander, Pipavav & Veraval by road through the 4 laned NH8E.

Rail Link- Okha also has rail connectivity through the Okha-Jamnagar broad gauge single line. However, the railhead available near Okha is in an unusable condition at present.

Air Link- The nearest airport is at Jamnagar, about 160 km from Okha.

4.2 Land form, Land use and Land ownership

EIIL has about approx. 104 acres of land available for the purpose of development near the existing Okha port (operated by GMB). Out of it, about 100 acres of land has already been acquired/ tied up with land owner and most of it is under EIIL possession. Apart from owned land, four survey areas namely survey number 476, 478, 353 & 352 will be acquired for use of onshore facility. The total land of terminal falls under category CRZ-II according to Coastal Regulation Zone Notification of 19th February, 1991 by Ministry of Environment and Forest, Government of India and amended up to 3rd October 2001. The area however falls under notified limits of Okha Port vides Notification No. G/PF/13/98/IPA/G/647-GH dt 21-07-1998.

4.3 Topography (along with map)

The general topography of the project area is coastal plain of Western Gujarat. The area comprises about three-fourths of sea and about one-fourth of land, and belongs to the portion of Gulf of Khambat.

The general elevation lies between 0 m to 20 m AMSL. The general gradient of the area is from South to East, North and West.

The marine area has marine ecology backed by mudflats and sand flats, coastal salt marsh, sand and rocky beaches. Some mangrove clumps stand in the Eastern side of the terminal (south of Okha port). The intertidal region is sandy and muddy or with substones of vast expanse and prolonged exposure. There is a clear indication of a relative change in the levels of land and the sea in the past as is evidenced by the raised coral reef at Okha, still intact near the railway station.

4.4 Existing Land use pattern (agriculture, non-agriculture, forest, water bodies (including area under CRZ)), shortest distances from the periphery of the project to periphery of the forests, national park, wild life sanctuary, eco sensitive areas, water bodies (distance from the HFL of the river), CRZ. In the case of notified industrial area, a copy of the Gazette notification should be given

The proposed facility area falls under the category CRZ-II according to Coastal Regulation Zone Notification of 19th February, 1991 by Ministry of Environment and Forest, Government of India and amended upto 3rd October 2001. The study area however falls under notified limits of Okha Port vide Notification No. G/PF/13/98/IPA/G/647-GH dt 21-07-1998.

a) Core Zone

The core area comprises land area required for overland pipeline and shore terminal. The land requirement for terminal and pipeline facilities is indicated below:

Table 3: Land use pattern of Core Zone

OWNERSHIP	TYPE	AREA (acres)
Shore Terminal		
EIIL	Waste Land	Approx 62
Private Land	Waste Land	Approx 42
Pipeline between Land Fall Point and Shore Terminal		
EIIL	Waste Land	2.47

It may be noted that the area up to 500 m from High Tide Line (HTL) falls under CRZ-I hence part of the 20 m strip for pipeline laying lies in it for which permission from CRZ at state level will be required.

b) Study Zone

An impact zone (study area) of 10 km radius around the proposed site has been considered from the edge of the terminal, for identifying and assessing impact in respect of air, noise, water, land use, aquatic and land based biota and socio-economic environments.

Table 4: Land use pattern of study zone

Land Use	Census 2001	
	AREA(ha)	%
Irrigated	73.69	0.14
Unirrigated	2997.72	5.79
Culturable waste land	998.82	1.93
Not available for cultivation	6787.10	13.11
Forest(revenue)	610.98	1.18
Sub total	11468.31	22.15
Sea(including inter-tidal zone)	40313.00	77.85
GRAND TOTAL	51781.31	100.00

No forest is involved in the core zone area. Gujarat Ecological Society study does not exactly delineate the boundaries of the Marine National Park (MNP&S) but specifies that the MNP&S area (457.92 km^2) is restricted to part of Gulf of Kachchh (The area of Gulf of Kachchh is about 6000 km^2). There are no places of archaeological, tourist, socio-cultural and historical importance in the plant area. No marine sanctuary or national park exists at or around the land fall point or CALM buoy. Local temples and mosques are present in nearby villages. A Krishna temple and a Hanuman temple are located in Beyt Island which is located at a distance of over 4 km and 8 km respectively from the shore terminal.

4.5 Existing Infrastructure

There are no well developed townships in the near-by region except for Jamnagar. In the immediate vicinity, Mithapur, located approximately 7 km from the site, has some amount of semi-developed facilities apart from a well planned private township, with associated amenities, owned by Tata Chemicals. Core zone is well equipped with all types of facilities viz. electricity, telephone line, pucca road, water supply, etc.

Okha Port is presently served by two jetties, namely Dry Cargo Berth and Sayaji Pier, both having a draft of 8-10 meters. A passenger jetty and a vessel repair establishment are located adjoining the southern flank of the port. INS Dwarka, the Indian Navy establishment and a storage depot of the Indian Oil Corporation, are located on the southern side of the shore installations, across a narrow stretch of road.

4.6 Soil Classification

The pH of the soil is slightly acidic. The conductivity is critical for germination. The soil is deficient in Potassium (K) and optimum in organic carbon, phosphorous (P) and calcium. The soil is iron-rich.

4.7 Climatic data from secondary sources

The climate of the region is tropical and is characterized by annually recurring seasons. However the rainfall is extremely scanty. Okha is the nearest meteorological observatory station situated near the project area. The long term data from IMD Okha has been briefly discussed below.

a) Wind

May to September: W and SW directions

October to April : W and NW directions

Cyclonic storms are extremely rare.

b) Temperature

The monthly minimum and maximum ambient temperatures during the year vary from 18.8-27.6 & 24.1-32.5 degree Celsius, respectively. June is the hottest month. January is the coldest, with a minimum temperature of 10 degree Celsius observed in 1963.

c) Relative Humidity

The average monthly relative humidity ranges from 61% to 87%. Visibility is generally good throughout the year.

d) Rainfall

The south west monsoon from June to September contributes a major part of the otherwise scanty annual rainfall.

The data collected from IMD includes wind speed, wind direction, atmospheric pressure, temperature, relative humidity and rainfall cover over a period of 10 years (1994-2004). The monthly maximum, minimum and average values are collected. The collected data is tabulated in below.

Table 5: Climate Data

Month	Temperature (in °C)		Relative Humidity (%)		Rainfall (mm)
	Min.	Max.	0830	1730	
January	19.04	24.86	66	59	1.58
February	20.00	25.86	71	63	0.38
March	22.38	28.28	78	70	0.06
April	24.84	30.83	80	72	0.04
May	27.37	32.56	77	72	11.89
June	28.14	33.08	78	74	62.19
July	27.51	30.59	80	76	184.98
August	26.18	30.81	83	77	57.60
September	25.93	30.97	81	74	22.37
October	25.59	31.13	78	72	19.41
November	24.01	29.48	61	60	0.00
December	21.14	26.97	63	59	0.18

Source: Indian Metrological Department

4.8 Social Infrastructure available

All the infrastructure facilities in the villages in the 10 km radius of the project are available such as education, medical facilities, electricity, post & telegraph, banks, pucca road, cultural facilities etc.

5 Planning Brief

5.1 Planning Concept (type of industries, facilities, transportation etc) Town and Country Planning/Development authority Classification

The existing road will be strengthened in and around the facility for transportation of LPG from facility. This will also enhance the transportation of the area. The construction and operation phase of the LPG storage terminal will generate employment for a number of persons from the nearby villages. With

improved earnings and economic activities at the terminal, medical facilities, schools, playgrounds, drinking facilities, bank, post offices and other such amenities will be surely improved.

5.2 Population Projection

The Proposed LPG facility at Okha port would aid in direct employment generation of hundreds of persons during construction and for 48 persons during operation per annum whereas the indirect employment generation will be almost 5 times more than the figures quoted above in this unemployment prone area with high percentage of non workers population.

5.3 Land use planning (breakup along with green belt etc)

The total land use for the terminal will be approx. 104 acres and another 2.47acres (1 hectare) area will be required for the erection of on shore operation of pipeline between the land fall point and the LPG shore terminal.

5.4 Assessment of infrastructure demand (physical & social)

Adequate physical and social infrastructure is available in this area.

5.5 Amenities/Facilities

Core Zone is well equipped with almost all types of facilities like electricity, telephone line, pucca road, water supply, health facilities, education etc. which makes site region adequate in amenities.

6 Proposed Infrastructure

6.1 Industrial Area (Processing Area)

The land identified for receiving terminal at village Arambhada, Okha is spread over an area of approx. 104 acres for industry use. A 20 m wide land strip will be required over the distance between the shore terminal and the land fall point of the sub-sea pipeline (500 mtrs approx.) and laying the terrestrial pipeline has been considered.

6.2 Residential Area (Non processing Area)

No residential area is proposed for the facilities.

6.3 Green Belt

Plantation will be carried out within the terminal premises and the selection of trees will be based on climate, soil characteristics and the survival rate of various species. The scheme will involve planting over various areas along the internal roads, open space around buildings, stretch of open land away from buildings and along boundary wall. Any open space around buildings is proposed to be afforested. More than 30 m wide green belt is to be maintained around the plant premises.

6.4 Social Infrastructure

EIIL will take several measures to ensure benefit to the local populace. Some of these measures are:

a) Adopt one or two villages including Arambhada for comprehensive infrastructure development of health care, drinking water supply, sanitation, communication, etc. besides raising social forestry for better greenery and aesthetic appeal
b) Assistance in organization of community centers for local people, specially rural women, to impart awareness regarding water management, environment, healthcare, alternate energy resources, etc
c) Promotion of small scale trading for supply of essentials such as groceries, vegetables etc for colony and canteen use
d) Preference in employment to local people
e) Contribute 2 % of sales tax incentive availed in case of exception towards Gokul Gram Yojana of the Government of Gujarat

6.5 Connectivity, water, sewerage, waste water, solid waste, power

Connectivity (Traffic and Transportation Road/Rail/Metro/Water ways etc.) has been given in Section 4.1 earlier.

Drinking Water Management (Source and Supply of water) has been given in Section 3.8 earlier.

Sewerage System : To dispose sewerage from administrative building, workers amenities block, fire station, etc, one septic tank and soak pit has been considered.

Industrial Waste Management has been given in Section 3.9 earlier.

Solid Waste Management has been given in Section 3.9 earlier.

Power Requirement & Supply / Source has been given in Section 3.8 earlier.

7 Rehabilitation and Resettlement Plan

The total land is barren and totally un-inhabited even though it is well connected to habitation. Therefore there is no displacement, resettlement or rehabilitation required.

8 Project Schedule and Cost Estimates

a) Likely date of start of construction & likely date of completion

The total construction is divided into 3 phases. Phase wise Plan of construction is given below:

Table 6: Project Schedule

	Tentative Date of Start	Tentative Date of Completion	Total Duration
Phase I	July 2014	March 2016	20 months
Phase II	April 2017	December 2017	9 months
Phase III	July 2018	June 2019	12 months
Overall Project	July 2014	June 2019	60 months

b) Estimated project cost along with analysis in terms of economic viability of the project

The project has a good expected IRR in terms of financial viability.

Estimated Project Cost is outlined for each phase in Table 7.

Table 7: Project Cost

	Phase I	Phase II	Phase III
CALM Buoy		110	
FSO			1650
Sub-sea Pipelines	189	31	
On Shore Terminal	350	120	
Professional Fees/Studies	150	200	150
Conventional Buoy/Misc	220		
Total Cost	**909**	**461**	**1800**

*All figures in Million Rupees

Spur pipeline is a separate project of Rs. 1500 million.

9 Final Recommendations

Based on the growing demand for LPG in India and widening demand supply gap of LPG over the next 10 years, Okha port could provide a much needed alternate port facility to meet this gap and reduce it. Also, the location advantage of Okha being nearest Indian port from middle east, and availability of natural deep-water draft acts in favor of project. The area is poor in agricultural and forest wealth. The development of the project will significantly benefit life in this area, providing employment and increased opportunities besides providing basic services and communication, transport, education and medical facilities. A socio-economic plan for rural development will be prepared and implemented in phased manner, thus uplifting the living standards of the local population.

Financial viability:	Good rate of return with the growing LPG demand
Employment:	Preference will be given for locals for employment based on qualifications and requirement. Short term and long term employment during construction and operation phases will be provided.
Medical Facilities:	Regular health check-ups will be carried out and medical help provided to the workers. Systematic in-house programs will be drafted to bring awareness regarding dangers of STDS.
Infrastructural Facilities:	Approach roads will be developed at par with plant roads.
Additional:	The establishment of project will facilitate additional auxiliary facilities like green belt plantation, communication, transport services, etc.