Chapter - 00

EXECUTIVE SUMMARY

00.01 Introduction

BPCL have embarked on the expansion of their Kochi Refinery from the present refining capacity of 9.5 MMTPA to 15.5 MMTPA. Under the expanded capacity, among other things, the production of LPG is slated to increase to about 1.26 MMTPA and as per information made available, 0.5 MMTPA of LPG is likely to be consumed at Kochi itself. Evacuation arrangement for the balance 0.76 MMTPA of LPG needs to be in place by the time the refinery expansion comes on stream. With the above aim in mind the present project was conceived by BPCL as a cross country underground LPG pipeline between Kochi Refinery and Coimbatore and accordingly an Expression of Interest (EOI) was submitted to the sector regulator i.e PNGRB.

Further, IOCL have proposed an Import facility for LPG at Puthuvypeen near Kochi which will handle the imported LPG cargoes. LPG from terminal is proposed to be transported through the pipeline to various LPG plants of IOCL in the region.

Based on the inputs / comments received on BPCL's EOI during the period of public consultation, PNGRB subsequently enhanced the scope of the project by extending the pipeline conceptualised earlier, on both sides to connect the IOCL's bottling plants at Kochi , Coimbatore , Erode and Salem on the downstream side and IOCL's LPG import facility at Kochi on the upstream side.

Hence, the present project entails, despatch terminal at IOCL import facility at Puthuvypeen near Kochi and transportation of the same through underground steel pipeline up to Kochi Refinery and IOCL bottling plant at Udayamperoor. The despatch at Kochi refinery will handle the LPG available at the refinery as well as that received from IOCL import terminal. The same would be transported through an underground pipeline to Coimbatore, Erode and Salem.

As a part of this exercise BPCL have assigned MECON Limited, New Delhi the task of carrying out a feasibility study and prepare a Detailed Feasibility Report (DFR) for the Kochi-Coimbatore-Erode-Salem LPG Pipeline project.

00.01 Need & Justification for the Project

The present LPG project proposal for laying the LPG pipeline is a step in the direction to meet the challenge of increased demand for transporting LPG in the most energy efficient way through underground pipeline. As against all the other means, transportation of LPG through pipeline works out to be the cheaper, safer and more convenient. The facilities being proposed to be installed under the present project will be catering to the LPG requirement of the whole region.

Presently, the LPG transportation in the region is primarily through road tankers. By executing the above project, IOCL & BPCL will be saving substantially on the tanker based transportation in terms of both cost as well as logistics and improve on safety. As mentioned earlier, the proposed pipeline would be transporting LPG to meet the requirements of five bottling plants in the region, out of these four belong to IOCL and one to BPCL. All of these bottling plants are currently depending on LPG transportation by road.

The present project therefore, would substantially benefit the region in terms of providing a network of pipelines comprising around 458 kms of underground LPG pipeline thus resulting in substantial saving on road transportation costs as also improved safety. Once the present project is commissioned, five LPG bottling plants in the region can switch from road tanker based LPG transportation to receiving it through pipelines. This would result in substantial financial and logistical savings for the oil marketing companies. In addition to the above, added economic and social benefits shall also accrue in the form of less of traffic congestion and improved ease of vehicular movement on the roads as with the proposed pipeline system coming on stream, a large number of LPG road tankers would be off the roads.

00.03 Optimisation Study

The flow capacity of any pipeline system is a function of the diameter of the pipeline and the associated pumping capacity. An economic design of the pipeline system involves establishing an optimum combination of pipeline diameter and pumping system (number of pumps and their capacity). A smaller diameter pipeline would require a higher pumping system and on the other hand a higher sized pipeline would need a

proportionately lower pumping infrastructure. Thus a lower capital investment in pipeline may turn out to be getting partly offset by higher pump system capital costs and the recurring higher pump operating costs.

Optimization study has been carried out for pipeline diameter of 8" & 12" considering appropriate wall thickness (with maximum safety margin of 40% as per OISD 141 for over crowded area). The entire system has been designed with maximum pressure rating of the main pipeline of 600# from Kochi Refinery to IOCL's Salem terminal and with 300# between IOCL's import facility to Kochi refinery and upto IOCL's bottling plant at Udayamperoor

For transportation of the required quantity of the LPG throughput, under the prevailing process conditions of the limiting available pressure at Kochi Refinery / import terminal end and the required minimum pressure of 13 kg/cm2(g) at any receipt terminal, various options have been evaluated through software simulation.

From the study it has been found that the most optimum pipeline system would be as follows :

- From IOCL's Import terminal to IOCL's Coimbatore terminal and to Udayamperoor bottling plant : Line of size 12" and total length of 288 km.
- From IOCL's Coimbatore terminal to IOCL's Salem terminal : Line size of 8" diameter and total length 170 km.

Optimisation study and analysis has further shown that requirement of 296 m^3/hr flow is possible with 12" & 8" diameter pipeline combination with only one mainline pumping station at Kochi Refinery without requirement of any intermediate pumping.

The minimum throughput of the system desired by PNGRB for the pipeline is 1.28MMTPA including common carrier margin of 25%, accordingly, the present pipeline system is designed for the said throughput. However, in the event of the throughput exceeding 1.28MMTPA, it will be required to provide an additional Booster Pumping station at a suitable location in between Kochi and Coimbatore.

00.04 Process Facilities

The process facilities take into account transportation of LPG at 1.28 MMTPA. Two product sources are identified namely IOCL Import Terminal at PuthuVypeen and Kochi refinery. MLPUS at IOCL Import Terminal will cater the pumping requirements upto IOCL bottling plant Udayamperoor, Kochi as well as the suction pressure requirement for MLPUs at Kochi Refinery. 12" dia. pipeline is proposed from IOCL Import Terminal to IOC Udayamperoor and the distance is 50 km. MLPUs at Kochi Refinery will pump the product through 12" dia. x 238 km. pipeline to IOCL Bottling Plant at Coimbatore via BPCL bottling Plant at Coimbatore and thereafter through 8" dia. x170 km. pipeline to reach IOCL Bottling Plant at Salem via IOCL Bottling Plant at Erode. Pump (1w + 1s) is planned at IOCL Import Terminal. In the case of Kochi Refinery, 1 booster + 1 stand-by and 1 MLPU + 1 stand-by pump is proposed.

Proposed receipt and despatch terminals will have filtration, metering, control valve, etc. The underground pipeline shall be provided with cathodic protection system. There will be 44 nos. SV Stations and 1 no. Intermediate Pigging Station along the entire route of the pipeline.

00.04.01 IOCL Import Despatch Terminal

LPG will be supplied from the proposed LPG mounded storage at the terminal which is not a part of the pipeline system. Despatch facilities shall include installation of two nos. MLPUs (1 working + 1 spare) at dispatch terminal. The MLPs are provided to meet the required output for IOCL Kochi Import terminal flow rate and also to meet the NPSH required for mainline pumps at Kochi Refinery. The MLP will also take care of the pressure drop at filter and mass flow meter. Pumps with VFD will be used to maintain the flow rate from 0.5 to 1.28 MMTPA. Scrapper Launcher will be provided for intelligent pigging operation. Basket Filter, Flow Meter, Control Valve shall also be provided.

00.04.02 Kochi Refinery Despatch Terminal

LPG will be supplied from the existing LPG mounded storage in Kochi Refinery. Despatch facilities, including installation of two nos. booster pumps (1 working + 1 spare) and two nos. mainline pumps (1 working + 1 spare) at dispatch terminal to be located inside Kochi Refinery at

Ambalmugal, Kochi, Kerala. The Booster pumps are provided to meet the required output and also to meet the NPSH required for mainline pumps. The booster pump will also meet pressure drop required for filter and mass flow meter. Pumps with VFD will be used to maintain the flow rate from 0.5 to 1.28 MMTPA.

Scrapper Launcher will be provided for intelligent pigging operation. Basket Filter, Flow Meter, Control Valve shall also be provided. Booster pumps will also take care of supply of LPG to IOCL bottling plant at Udayamperoor and mainline pumps will take care of supply of LPG upto Salem via Coimbatore and Erode BPCL/ IOCL Bottling Plants.

00.04.03 Pipeline

Mainline

Laying of 12" dia. pipeline, approx. 288 km. long from IOCL Import Terminal to IOCL Bottling Plant, Udayamperoor via Kochi Refinery and Kochi Refinery to IOCL Bottling Plant, Coimbatore via proposed BPCL Bottling Plant, and laying of 8" dia., approx. 170 km. pipeline from IOCL Coimbatore to IOCL Salem via IOCL Bottling Plant, Erode. The transportation capacity will be 1.28 MMTPA.

Simultaneous withdrawals at IOCL Bottling Plants at Coimbatore, Erode and Salem are considered for the design.

I. P. Station

Intermediate Pigging Stations (IPS) shall consist of Scrapper Launcher and Scrapper Receiver along with SV Station at Chainage 151 km. for 12" pipeline and another Intermediate Pigging Station (IPS) shall consist of Scrapper Launcher and Scrapper Receiver along with SV Station at IOCL Bottling Plant, Erode for 8" pipeline.

SV Station

Sectionalising Valve Stations at suitable locations as per OISD along the route @12 km on an average and wherever additionally required as per Safety standards and requirements of approving authorities.

00.04.04 Receipt Terminals at BPCL Bottling Plant and IOCL Bottling Plant at Coimbatore

Receipt facilities,
Including Scrapper Receiver, Basket Filter, Control Valve, Flow Meter, etc.

00.04.05 Flare System

At Kochi Refinery Despatch Terminal, relief from vents, drains and TSV relief, depressurising lines from Filters, Pumps and Launcher, etc. will be hooked up to refinery flare header. Cold flaring facility has been envisaged at IOCL Bottling Plants at Coimbatore, Erode and Salem and BPCL Bottling Plant at Coimbatore.

00.04.06 Instrumentation and SCADA system

PLC -based instrumentation & control system is envisaged for terminal and pipeline facilities. For effective, reliable management, monitoring and control of terminal & pipeline, SCADA system has been envisaged.

00.04.07 Leak Detection and APPS

Suitable leak detection and APPS system are also envisaged for this pipeline.

00.04.08 Fire Protection Facilities

Depending upon the nature of the units to be protected from fire, various types of fire protection systems viz. Fire hydrant and Monitor system, Automatic Medium Velocity Water Spray System and Automatic Fire Detection-cum-Alarm System and Portable Fire Extinguishers have been envisaged. Fire fighting pumps and fire water storage and fire fighting compressors are to be extended from the respective IOCL/ BPCL installations. Only extension of Fire water network from the existing fire water ring is considered.

00.04.09 Other Facilities

Facilities like sampling, cathodic protection system, telecommunication system, CCTV system and video conferencing, etc. have also been

provided for essential & reliable operation of the pipeline. Suitable external coating shall be provided to protect the pipeline against external corrosion. Arrangement for 4 nos. mobile flares shall be made.

50 m. x 50 m. area will be used for each mainline SV Station. Each SV Station will be provided with underground Motor Operated Ball Valve of 12" / 8" size. The power supply for MOV will be met from SEB Electric Supply or DG Set. However direct power from Battery will be used for operation of SVs. Single A/C Room for SCADA and UPS will be provided at each SV Station. Other facilities include MCC room (including inert gas flooding), battery room, guard room etc.

00.05 Process Design Basis

00.05.01 Basic Parameters

i.	Products to be transported	Liquefied Petroleum Gas (LPG)
ii.	Product properties/specifications	50:50 (Propane : Butane). Properties and specification as per IS 4576.
iii.	Pipeline Design Throughput	296 m^3/hr (≈1.28 MMTPA)
iv.	Turn Down	40% or the minimum continuous flow of mainline dispatch pumps, whichever is higher.
v.	Design codes	ASME B31.4 and OISD-141 Guidelines will be followed as applicable. However, in case of contradictory stipulations, the more stringent conditions will prevail.
vi.	Design capacity of pumps	Pumps will be specified for I0% extra flow.
vii.	Sparing philosophy for pumps	100% for Single pump (1W+ 1S)
viii.	Type of pump driver	Electric motor.

00.05.02 Project Scope

- Despatch facilities at IOCL, Import terminal at Kochi by providing suitable LPG Pumping facilities of desired flow rate along with hooking up with proposed storage at IOCL import facility at Kochi at the battery limit.

- Despatch facility at Kochi Refinery by providing suitable pumping facilities of desired flow rate along hooking up with existing mounded storage at the battery limit

- Laying of 12" x 39 Km. LPG Pipeline from IOCL import despatch terminal to Kochi Refinery despatch terminal from where 12"x 11Km. LPG pipeline upto IOCL bottling plant at Kochi (Udayamperror), and 12"x 238 Km.LPG pipeline upto IOCL Bottling Plant at Coimbatore via proposed BPCL Bottling plant at Coimbatore and 8" x 170 Km. LPG pipeline from Coimbatore to Salem via IOCL, Bottling Plant, Erode with SCADA & TELECOM.

- Construction of Intermediate Pigging station and Sectionalising Valve station as per OISD- 214,141 etc. with all allied facilities.

- Construction of Receipt Terminal facilities at IOCL, Bottling Plant, Kochi (Udayamperror), proposed BPCL Bottling Plant, at Coimbatore, IOCL Bottling plants at Coimbatore, Erode and Salem

- Associated fire water network along with MV spray system at Despatch & Receipt facilities, as per OISD 214 , OISD 144 and all other applicable codes. Fire water requirement for the respective terminals and despatch terminals will be made available from the existing fire fighting facilities of the bottling plants /KR/Import Terminal as the case may be and only tapping from the nearest fire ring main has been considered.

- Construction of all other facilities as per various applicable codal requirement such as OISD , BIS , IE , API etc.

- BPCL would like to get the Detailed Feasibility Report of

above along with EIA, RRA done.

00.05.03 Project Battery Limits

IOCL Import Despatch Terminal
MOVs' inlet flange of suction header of mainline pump located at import despatch terminal at IOCL Kochi.

Kochi Refinery Despatch Terminal
MOVs' inlet flange of suction header of Booster pump located at despatch terminal at Kochi Refinery.

Receipt Terminal at IOCL Bottling Plant at Udayamperoor
ROV's outlet flange of metering skid located at IOCL bottling plant at Udayamperoor

Receipt Terminal at BPCL Bottling Plant at Coimbatore
ROV's outlet flange of metering skid located at BPCL bottling plant at Coimbatore.

Receipt Terminal at IOCl Bottling plant at Coimbatore
ROV's outlet flange of metering skid located at IOCL bottling plant at Coimbatore

Receipt Terminal at IOCL Bottling plant at Erode
ROV's outlet flange of metering skid located at IOCL bottling plant at Erode.

Receipt Terminal at IOCL Bottling plant Salem
ROV 's outlet flange of metering skid located at IOCL bottling plant at Erode.

00.06. Pipeline Route

The site of the proposed DT at Kochi Refinery lies to the east of the IOCL Import facility with thickly populated city of Ernakulam lying between them thus the route south of Kochi Refinery up-to Karimughal in-spite of being shorter and along the road is not considered due to presence of dense habitation.

The route selected for this part generally follows the National Highway route. The route takes off from the IOCL Import facility runs in a direction slightly north of east along the NH for nearly 5 kms and then turns northwards all along the NH. After traversing another 5 kms the NH takes a turn towards north-east and the pipeline route follows it. At nearly 20 kms from the start point, the route crosses NH-47 and from thereon the route goes in a south-eastern direction and then further south, finally reaching the Kochi Refinery. For reaching the IOCL bottling plant at Udayamperoor the route moves a further 11 kms towards south.

The route of the pipeline further takes off from Kochi Refinery then it runs in the North-East direction for its initial 28 km length, the pipeline traverses through North-West direction for nearly 60 kms stretch. From thereon route turns Northwards and then North-west. The route then runs along the east side of the SH-22 and subsequently runs along the SH-74, leaving it near the town of Kavassery around Ch. 208.00 the route moves East to reach NH 544. Thus after traversing 68.00 km length detour to avoid the core area of PEECHI Wild Life Sanctuary the route again follows North-East direction along NH 544 to cross the Pollachi-Coimbatore section of NH. Subsequent to the above route takes a turn towards and reaches the IOCL Bottling Plant.

From thereon the route moves in North-eastern direction mostly following the Pollachi-Avinashi-Tirrupur-Palladam Road. Near the town of Tirrupur it leaves the highway in order to circumvent the town. Beyond Tirrupur it again follows the highway route and runs along the North-east direction reaches the NH-47 and then runs along it in the same direction and reaches the termination point near Salem.

00.07 IP Based SCADA and APPS System

To ensure effective and reliable control, management and supervision of the pipeline, new pipeline **Kochi – Coimbatore – Erode – Salem LPG Pipeline** shall have dedicated SCADA & APPS system with centralized Master control station (MS) and backup Emergency Control Station (EMS). Remote work station (RWS) has to be installed at other receiving /despatch manned locations (total 05). The MS shall be inter-linked with

Remote Telemetry Unit (RTU) along the pipeline. The APPS system shall run at Master Control Station (MS).

00.07.01 IP SCADA & APPS System Requirements

A. To ensure effective and reliable control, management and supervision of the pipeline, the pipeline is envisaged to be monitored and controlled from IP Based SCADA system consisting of Master Stations (MS) proposed at Kochi Refinery Despatch Terminal- Kochi, Kerala and Emergency Master Station (EMS) proposed at BPCL Coimbatore BP Receipt Terminal, Tamilnadu. The MS & EMS shall be connected through dedicated OFC links (proposed to be laid along the pipeline in same trench) and Leased Line as back-up (will be finalised based on the feasibility) & as per networking philosophy proposed. The MS & EMS shall be inter-linked with remote telemetry along the pipeline on dedicated LAN network. The APPS system shall run only at MS.

One RWS (Remote work station) each at all the manned locations has been proposed. These locations are:

IOCL Import Despatch Terminal

IOC, BP, Kochi (Udayamperoor)

IOCL, BP receipt terminal Coimbatore

IOCL, BP receipt terminal, Erode

IOCL, Salem

The RWS will be connected to MS & EMS by dedicated LAN on main OFC based Telecom network connectivity as proposed **Kochi – Coimbatore – Erode – Salem LPG Pipeline**

B. The following pipeline facilities shall be considered for telemetry purposes and hook-up to Centralised SCADA through Remote Terminal Units (RTUs) located at these locations for **Kochi – Coimbatore – Erode – Salem LPG Pipeline**

- Despatch Terminal facilities - 2 Nos.
- Intermediate Pigging Station - 2 Nos.
- Receipt terminals - 5 Nos.
- Sectionalizing valve stations / CP stations - 44 Nos.

C. The SCADA software would need to have the following features:

- On-line configuration
- Configuration Toolbar

- Object-orientated Graphics
- Real Time and Historical Trending
- Alarming and Alarm Management
- Rational Database Support

Along with SCADA system, pipeline will have facility for APPS SYSTEM to run the following APPS modules/ functionality;

- Leak detection module based on transient modelling
- Batch Scheduling & Batch Tracking
- Inventory analysis & Stock accounting
- Survival time analysis
- Pipeline transpiration efficiency and scraper tracking module
- Contingency Analysis
- Predictive Module
- Planning Module
- Operator learning

00.08 Telecom System

The IP based telecommunication system shall provide dedicated Voice, Data, CCTV and Video communication & Video Conferencing to cover stations of pipeline facilities.

The following consideration/ assumptions are made:

i) All Sectionalizing valves shall have remote operation.

ii) 07 Nos. of Stations which are to be telecom attended stations. (MS & EMS and other despatch & receiving).

iii) No. of stations (qty refer information provided elsewhere- mostly sectionalising valve stations) which are telecom unattended stations.

Overall following locations telecom equipments for telemetry purposes and hook-up to Centralised SCADA through Remote Terminal Units (RTUs) shall be considered for **Kochi – Coimbatore – Erode – Salem LPG Pipeline**

- Despatch Terminal facilities - 2 Nos.
- Intermediate Pigging Station - 2 Nos.
- Receipt terminals - 5 Nos.

- Sectionalizing valve stations / CP stations - 44 Nos.

In line with the above, following requirements/ systems adopted:

A) ***IP based Optical Fiber Communication System***

i) Providing voice communication at the various through IP phones; Ordinaries (Analog), Digital, Weather proof and Explosion proof telephones with acoustic Booth and beacon (at hazardous areas).

The same shall include the following:

- Direct dialling facility between attended stations and at various unattended locations.
- Video Conference facility connecting all the attended stations.
- Voice communication, Pipeline Maintenance / Securities / Watchman connections all stations Attended and Unattended.
- Hotline facility connecting attended manned stations. (All despatch / receiving stations total 07 Nos).
- One video monitoring phone at all manned stations for station I/c.

ii) Providing high-speed data communication (on Ethernet LAN) for SCADA.

iii) Providing high-speed data communication for network management system for telecom (as required).

iv) Providing facsimile communication amongst attended stations.

v) Providing IP EPABX network connecting attended & unattended stations.

vi) Providing video conferencing amongst all the attended manned receiving / despatch stations (total 07 locations)

vii) Providing CCTV PTZ & Fixed type Cameras & System for station surveillance. Explosion proof PTZ cameras at all pumping stations. Client work stations to all the manned stations. (total 07 locations). One CCTV Server (1+1) with NAS at MS and EMS.

viii) Network Management System to facilitate remote monitoring & control of Telecom equipments at various stations to be installed at MS and EMS.

B) ***Dedicated Leased Line***

For the back – up communication minimum 10 mbps leased line between MS Kochi & EMS Coimbatore locations shall be considered for from the external service provider. For the back – up communication between end stations minimum 2 mbps leased line with router / switch at RWS IOCL Import Despatch Terminal and IOCL, Salem stations to MS / EMS shall be considered.

00.09 Electrical

The electrical distribution system of various terminals for electrical power supply system of LPG pipeline from Kochi Despatch Terminal to Kochi Refinery to BPCL Coimbatore and IOCL Coimbatore via SV's to IP Erode and RT Salem shall be as follows:

TRANSFORMER(11kV/415V,25KVA)

Transformer with double pole structure of 11kV/415V, 25kVA shall be provided at each SV stations.

DG SET(415V, 400kVA/ 300kVA / 25kVA)

To take care of the emergency power requirements a 400 KVA DG Set shall be provided for despatch terminal at IOCL Import facility. A 300kVA DG Set each shall be provided for RT at BPCL Coimbatore and IOCL, Coimbatore. Further, for RTs at IOCL Erode, Salem and for each SVs station a 25kVA DG Set shall be provided.

HT/LT MOTOR WITH VFD PANEL

AT the Kochi Refinery despatch terminal Mainline pump motor shall be HT type and Booster Pump motor shall be of LT motor. For Despatch terminal at IOCL import facility the pump motor shall be LT type.

Uninterrupted Power supply(UPS)

30 KVA UPS shall be provided for DT at Kochi Refinery, 10 KVA UPS for RT stations and 5 KVA UPS to be provided for each SV station.

PMCC Panel, PDB and LDBs

PMCC Panel, PDB and LDB to be provided for the two DTs and PDB LDBs shall be provided for each SVs station & IP station and RT station.

XLPE Cable, Earthing Pit and Miscellaneous

All cable shall be XLPE type, Conventional Earthing pit(IS 3043) and other additional items to complete the electrical works.

00.10 Instrumentation & Control

Instrumentation and control shall be provided for safe and efficient operation of the pipeline. Dispatch Station, Pumping station & Intermediate Pigging stations, SV stations tap off points and Receipt Terminals. Control rooms shall be provided in Pipeline Dispatch terminals, Intermediate pumping stations and at each Pipeline Receipt terminals with facility to monitor and control the station from the station PLC based control system. Additionally necessary interface is envisaged in each station including SV stations and stations to connect pipe line/terminal parameters to the SCADA system for remote and tele-metering.

00.11 Capital & Operating Cost Estimates

Capital cost estimate for the project facilities envisaged for dispatch terminals at Puthuvypeen & Kochi Refinery, Five nos Receipt Terminals (at Udayamperoor, Coimbatore, Erode & Salem), 458 km long steel pipeline along with SV / IP stations and all other associated facilities works out to **Rs 997.88 Crores**. The project cost summary is presented in the Table below :

Table-00.01

CAPITAL COST SUMMARY

In Rs Lakhs

Sl. No.	DESCRIPTION	Amount		
		FC	LC	TOTAL
A	**Plant & Machinery**			
1	Despatch Terminal at IOCL Import Facility Kochi	204.8	1468.4	1673.2
2	Pipeline from IOCL Import Facility to Kochi Refinery and IOCL Udayamperoor	0.0	10812.5	10812.5
3	Despatch Terminal at Kochi Refinery	2136.8	2343.9	4480.7
4	Receiving Terminal at IOCL BP, Udayamperoor	0.0	801.8	801.8
5	Pipeline from Kochi Refinery to IOCL, Udayamperoor	0.0	41093.3	41093.3
6	Receiving Terminal at BPCL Coimbatore	78.8	871.5	950.3
7	Receiving Terminal at IOCL Coimbatore	0.0	1009.3	1009.3
8	Pipeline from Coimbatore to Erode and Salem	0.0	22827.8	22827.8
9	Receiving Terminal at IOCL Erode	0.0	872.6	872.6
10	Receiving Terminal at IOCL Salem	78.8	894.3	973.0
11	SCADA & Telecom	0.0	2813.2	2813.2
	Sub-Total (A)	**2499.0**	**85808.6**	**88307.6***
B	**Engineering Costs :** PMC Fees, @6.5% (Incl Service Tax)			5740.0
C	**Owner's management expenses @4%**			3532.3
E	**Contingency @2.5%**			2207.7
	Total cost before IDC & MM			**99787.5**
3	Interest during construction period & financing charges			0.0
4	Margin money for working capital			0.0
	Sub-Total (E)			**0.0**
	GRAND TOTAL COST			**99787.5**

* - *Cost is for a total system throughput of 1.28MMTPA of LPG. In the event of the throughput exceeding 1.28 MMTPA, additional intermediate pumping station would be required which may cost approx. Rs 65 Crores for a Greenfield facility, at current prices*

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00.12 Operating Costs

Annual operating costs for the pipeline system works out to **Rs 39.99 Crores**, considering 8000 hour operation for Booster and Mainline pumping units at the two dispatch terminals.

00.13 Implementation Schedule

The overall project may be perceived as broadly comprising the following ;

- Despatch Terminals at IOCL Import Facility and Kochi Refinery
- 458 km long Cross Country LPG Pipeline
- Receipt Terminal at Udayamperoor, Coimbatore, Erode and Salem

The above and the other associated facilities envisaged under the project are proposed to be implemented in total in one phase by the end of the 3rd year of the project. Considering the size, length and the area / terrain to be negotiated, it would need about 36 months time for completion even if the laying work is got executed in two spreads and by independent agencies.