



# 2020 National Gas Grid (NGG) Study for India



Prepared for  
**Petroleum and Natural  
Gas Regulatory Board**

Prepared by  
**ICF & Advisian**

# Purpose & Objectives of the Study

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The India National Gas Grid Technical Assistance (TA) consists of updating a 2011 study carried out by ICF. It aims at developing an economic basis for building out **India's national Natural Gas Grid (NGG)**

02

**Petroleum and Natural Gas Regulatory Board** of India has signed a cooperation agreement with **USTDA** for this Technical Assistance. This TA will support PNGRB to focus their efforts in expanding NGG and update the conceptual pipeline corridor network.

03

The TA generally shall update the gas demand analysis, update the gas supply analysis, update the conceptual pipeline corridor network and perform a detailed review of regulatory regimes governing the expansion of natural gas in India.

# Scope of Work

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## ■ **Mobilization, Kickoff Meeting & Data Collection (Task 1)**

- The contractor shall include relevant background information and analysis that is pertinent, this includes review and discussion of relevant data from 2011 study and the new data collected for this assessment. Set up project monitoring systems and conduct a kickoff meeting with the Grantee and other stakeholders identified by the Grantee.

## ■ **Gas Demand/ Supply Analysis Update (Task 2)**

- Develop a gas demand analysis covering anchor consumers, industries, city gas distribution and emerging demand centers like LNG for road transport. This includes assessment of the demand for gas and the price affordability of the demand for each district in the country.
- The demand analysis will also review the previous study analysis and update its findings, where updates are necessary.
- Update the supply outlook developed in the 2011 study, considering policy, pricing and exploratory changes since that time and the demand scenarios developed. An emphasis will be given on LNG and any possible pipeline imports. Further, domestic conventional and unconventional gas supply options will also be analyzed and discussed.

## ■ **Technical Assessment: Conceptual Design of Pipeline Corridor Network (Task 3)**

- Develop a conceptual design for the pipeline network under a BAU case and how the pipeline might be reconfigured for an accelerated gas demand case. The contractor's previous pipeline configuration from the 2011 study shall also be reviewed.
- The pipeline design shall address new demand and supply conditions identified in Task 2.

# Scope of Work

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## ■ **Economic Analysis (Task 4)**

- Conduct an economic analysis for the two conceptual designs developed for the NGG.
- Analysis shall include review and development of operating costs associated for each of the two conceptual gas grid designs developed. The analysis shall also consider the requirements of local authorities and regulatory agencies, grants, tariff and subsidies that will impact each corridor being considered.
- Assessment of alternative gas delivery models including virtual pipeline in areas where laying of pipeline is not economically feasible.

## ■ **Financing Options (Task 5)**

- Review Government of India policies including gas allocation policy, tariff policy, existing pipeline financing practices and other factors relevant to private sector financing of pipelines. Different sources of funding shall be considered in the review process.
- Review implications for India's borrowing capacity if the pipelines are state built.
- Contact relevant institutions including private banks, national, bilateral and multilateral financing institutions such as the World Bank, IFC, Asian Development bank. Provide the views of major lending institutions.

## ■ **Preliminary Environmental Analysis (Task 6)**

- Conduct a preliminary environmental analysis. The environmental analysis will follow the pipeline corridor configuration and shall identify at a high level the sensitive areas that could be encountered, such as national parks, wetlands and other environmentally sensitive areas.

# Scope of Work

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## ■ **Regulatory Issues/ Legal Framework (Task 7)**

- Develop a regulatory and legal review that will focus on regulations and government policies in six areas – 1) promoting the use of natural gas in retail applications; 2) natural gas pricing; 3) CGD authorization, development & licensing; 4) trunk- line pipeline authorization, development and licensing; 5) tariff design for trunk-line pipelines, CGD systems, LNG terminals; 6) transparency and open access and market entry of new players.

## ■ **Developmental Impacts (Task 8)**

- Prepare a developmental impact assessment report defining the appropriate concepts of progress, development impact measures, baseline parameters, and success criteria that can be used in the future by USTDA or others to monitor the potential benefits of this Project.

## ■ **Identify U.S. Sources of Supply (Task 9)**

- Develop a list of potential gas (LNG) suppliers and other suppliers of equipment and services related to pipeline construction, operations, CGD operations, and gas resource development.

## ■ **Implementation Plan (Task 10)**

- Develop an implementation plan based on changes to the gas demand and supply markets and regulatory changes in India to enable the increase in gas use, build out of a NGG, and create an operating market for natural gas.

## ■ **Final Report (Task 11)**

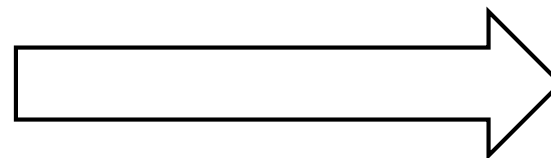
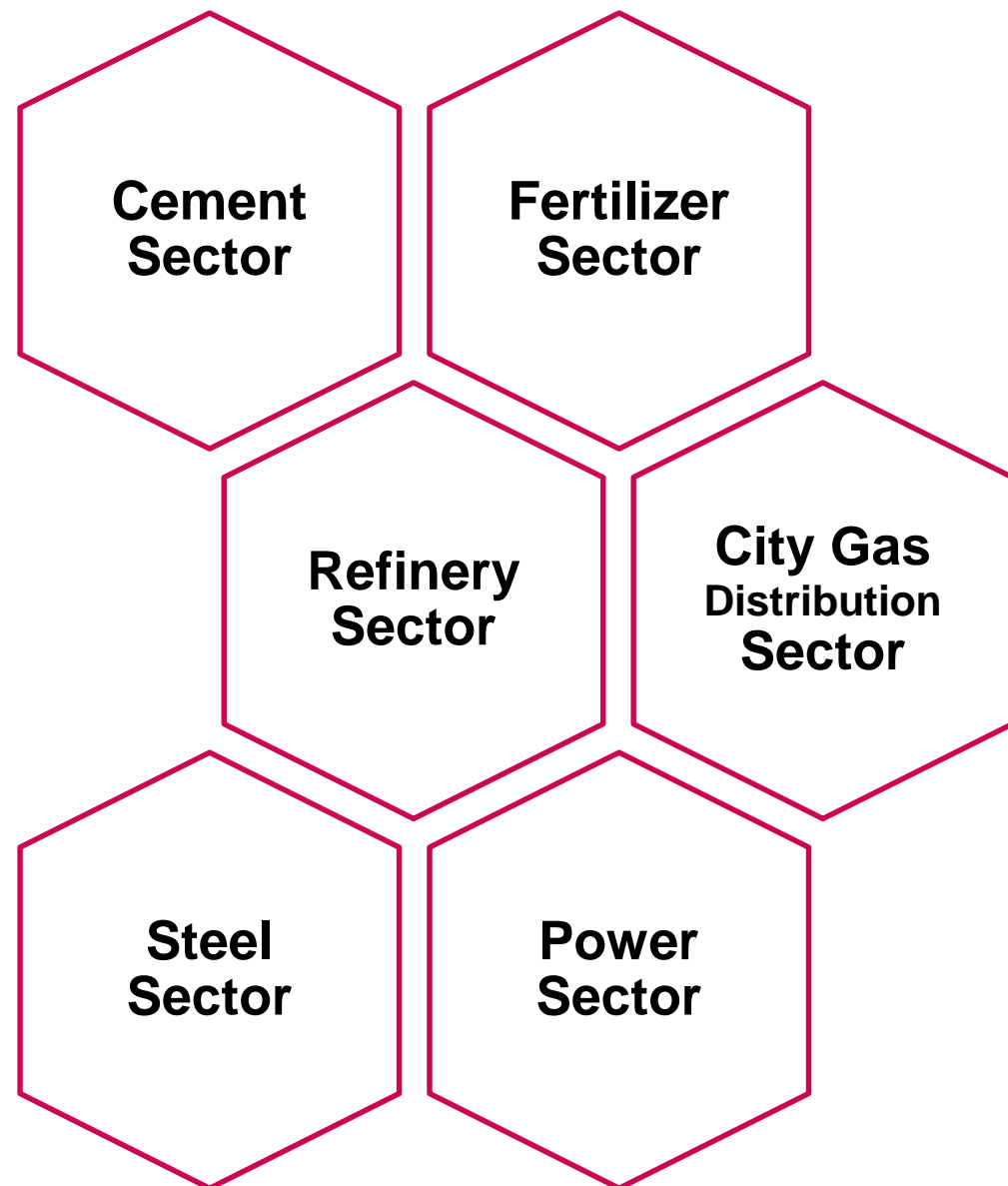
- Prepare and deliver to the Grantee and USTDA a substantive and comprehensive final report of all the work performed under these tasks.

# Workplan and Schedule

	Jan	Jan	Jan	Jan	Feb	Feb	Feb	Feb	Mar	Mar	Mar	Mar	Apr	Apr	Apr	Apr	May	May	May	May	Jun	Jun	Jun	Jun	Jul	Jul	Jul	Jul			
Task List	W 1	W 2	W 3	W 4	W 5	W 6	W 7	W 8	W 9	W 10	W 11	W 12	W 13	W 14	W 15	W 16	W 17	W 18	W 19	W 20	W 21	W 22	W 23	W 24	W 25	W 26	W 27	W 28	W 29	W 30	W 31
Interim discussions with PNGRB on the progress of project																															
Task 1: Mobilization, kick off and data collection				①																											
Task 2: Gas demand/supply analysis update																															
Task 3: Technical Assessment: Conceptual design of network																															
Task 4: Economic Analysis																															
Task 5: Financing Options																															
Task 6: Preliminary environmental analysis																															
Task 7: Regulatory issues/Legal Framework																															
Task 8: Developmental Impacts																															
Task 9: U.S Sources of supply																															
Task 10: Implementation Plan																															
Task 11: Draft Report / Discussions																															
Task 12: Final Report																															

# Demand Estimation

A demand Analysis will be developed covering the following sectors -



The **CGD sector** is further divided into the following :



**Residential Sector**



**Transport Sector**



**Industrial & Commercial Sectors**



# Three sources of Natural Gas Supply

- **ICF's approach will be to examine the supply potential for each of these sources.**
- **Domestic production**
  - Review domestic resource base and estimate potential economic production from existing resources, proved resources, and potential resources
  - Provide supply nodes and price points for the pipeline network
- **LNG imports**
  - Develop a forecast of LNG supply globally and pricing
  - Identify locations of planned and potential LNG import terminals as supply nodes for LNG
- **Pipeline imports**
  - Review the status and evaluate the likelihood of trans-national pipelines to serve Indian demand



# Approach to the Domestic Supply Forecast

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- **Overall goal: create "supply curves" of potential supplies at various prices in each supply region. Regional curves will be sum of curves by type of resource:**
  - Domestic conventional fields
  - Domestic unconventional resources
  - **Types of conventional field for which data will be sought**
    - Producing fields
    - Fields now under development
    - Discovered fields under appraisal or currently judged uneconomic
  - **Types of unconventional fields for which data will be sought**
    - Shale resources
    - Coal bed methane resource

# *ICF Analysis of World LNG Supply and Demand*

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- **ICF maintains a forecasting model of world LNG supply and demand which we will use to develop consistent planning scenarios for this study**
- **Approach consider “key factors” that determine (1) world total energy use, (2) market share for natural gas versus other energy sources, (3) what portion of natural gas demand will be met by LNG and (4) how well suppliers of LNG will compete against each other.**
- **Scenarios are intended to explore a range of credible outcomes through 2040 based on variations in the ICF base case caused by:**
  - Different economic growth rates in OECD and non-OECD countries.
  - Combination of factors that influence natural gas market share versus other fuels.
  - Construction of new international gas pipelines that provide alternative transportation mode to LNG.
  - Government policies

# *Pipeline Design Philosophy and Approach*

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## **Fundamental NGG Objective**

### **Key Considerations**

- Change in demand centers
- Meeting national natural gas goals
- Opening of gas markets to a greater extent than is currently in place
- Addressing client change
- Energy security

### **Key Outputs**

- Conceptual pipeline corridor network,
- Conceptual design for the pipeline network under a BAU case and reconfiguration for an AGD case
- Virtual pipeline use to meet gas demand
- Provide low cost expansion options for connecting future nodes of supply, and operating costs.
- Assessment of environmentally sensitive and high consequence areas
- Develop routing options, construction and operating costs, and financing models

# Pipeline Design Philosophy and Approach

## Route Selection

- Existing and approved pipelines
- CGD concession area
- Direct-served end-users
- Gas supply sources
- Topology
- Environmentally sensitive areas
- Rail and Highways

## Network Modeling

- Gas supply capacity
- Gas demand load
- National pipeline footprint
- Regional pipelines
- Pipeline Interconnects
- Compressor Stations
- Virtual Pipeline

## Construction and Operating Cost

- Material Requirements
- Material and facility cost
- Factored Unit construction cost
- Contingency Requirements

## Road Map

- Construction Schedule
- Capital Investment Schedule
- Potential Barriers

# Legal and Regulatory

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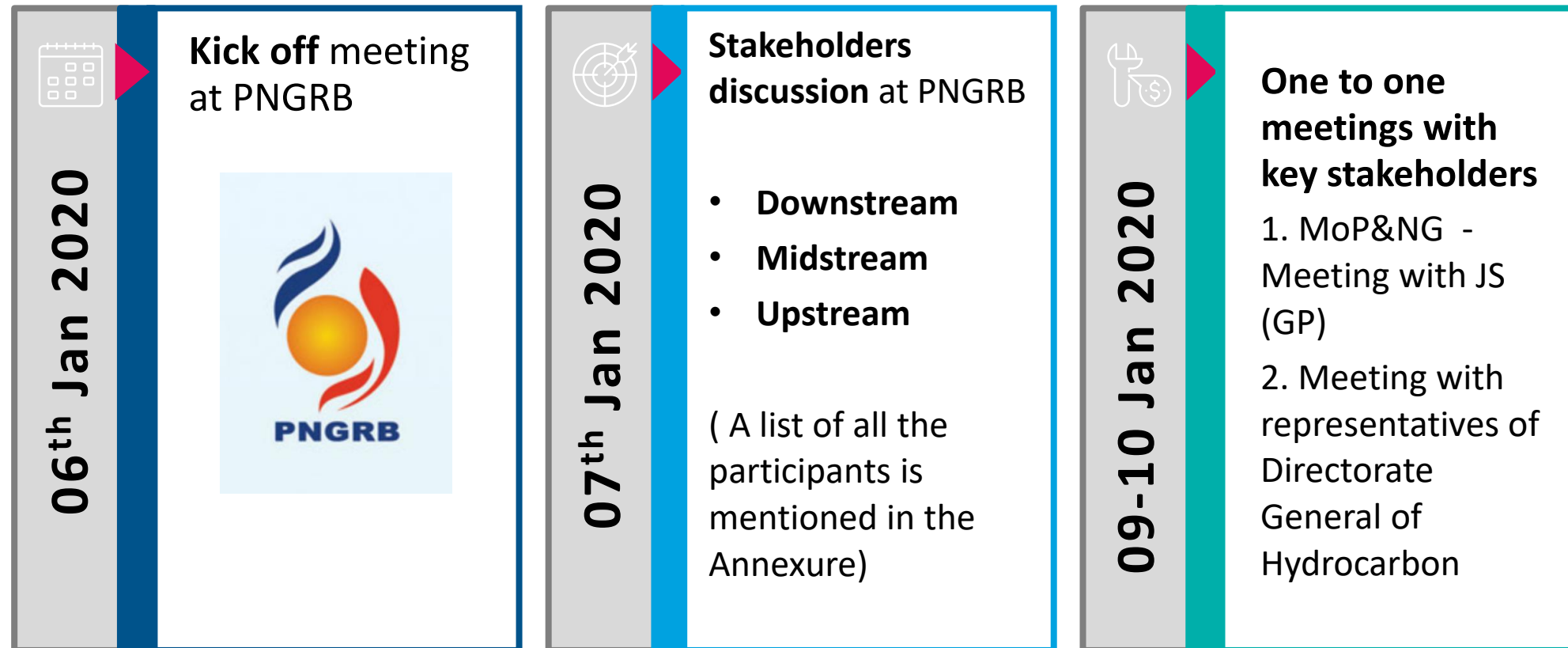
- **Areas to be covered in the review:**
  - Promote retail gas usage
  - Review gas pricing concepts
  - Improve CGD authorization, development, and licensing;
  - Improve trunk-line pipeline authorization, development, and licensing;
  - Identify tariff options for trunk-line pipelines, CGD systems, LNG terminals;
  - Promote market transparency, open access, and market entry of new players
- **Begin with a review of GoI regulations in each of categories above**
- **For each category compare India with the regulations in other countries where gas markets are thriving**
  - United States – most successful hub and market operations and streamlined gas pipeline authorization
  - United Kingdom – successful market hub and reform history, plus large LNG usage, pipeline authorization rules
  - European Union – major successful hub in TTF and different pricing strategies (postage stamp, zones)
  - Canada – successful market, with different ways to authorize new pipelines

# Other Activities

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- **Include in environmental review the carbon impact of introducing natural gas**
- **Develop an Implementation Plan**
  - Based on regulatory recommendations and market forecasts identify what Gol must do to achieve the vision for a NGG
- **Prepare a developmental impact assessment report**
  - Define the appropriate concepts of progress, development impact measures, baseline parameters, and success criteria that can be used in the future by USTDA or others to monitor the potential benefits of this Project.
- **Potential U.S. suppliers of goods and services to India related to the NGG**

# Plan for the Week



The inputs obtained will form the basis of preparation of Inception Report of the project



# Annexure

<b>List of Stakeholders</b>	
<b>Downstream Entities</b>	Gujarat Gas, MGL, ExxonMobil, IGL, Think Gas, Bengal Gas, MNGL, Bharat Gas Resources Limited, HPOIL, IRM Energy Pvt. Ltd., PPAC, AG&P, TNGCL, IOCL, GAIL Gas, FIPI, Indian Oil Adani Gas Private Ltd.
<b>Midstream Entities</b>	Pipeline Infrastructure Limited, GAIL, Gujarat State Petronet Limited, Shell Energy, IOCL, Hindustan Petroleum Corporation Limited, H-Energy, Petronet LNG Limited, Bharat Petroleum Corporation Limited, Adani Total Private Limited, FIPI
<b>Upstream Entities</b>	ONGC Videsh Limited, Welspun, Oil India Limited, ONGC, Reliance, Cairn, Hindustan Oil Exploration Limited, British Petroleum



**Thank you**