Inception Report

Technical Assistance on Myanmar Natural Gas Sector

Submitted to: the Ministry of Energy
and the Ministry of Electric Power

By: The World Bank

March 11, 2016

I. Background

In consultation with the Ministry of Energy ("MOE") and the Ministry of Electric Power ("MOEP"), the World Bank is pleased to submit this Inception Report that describes the current and potential technical assistance (TA) by the World Bank Group (WBG) in the natural gas sector in Myanmar.

First, under the World Bank-funded Myanmar Electric Power Project, a study "The Economic Costs of Natural Gas for the Myanmar Domestic Market" commenced in November 2015 to: (i) update the cost of supplying natural gas to various locations in Myanmar, and (ii) estimate Government revenue from future gas exports. The updated cost of supply information will help inform the Myanmar energy authorities to update the gas pricing framework in the domestic market. The Government revenue estimates will prepare the Myanmar authorities to assess the impact on Government revenue due to changes in gas export receipt.

Second, in September 2015 WBG agreed to provide TA related to liquefied natural gas (LNG) business in Myanmar following a request from MOE. WBG organized an LNG workshop in Nay Pyi Taw on October 23, 2015 to provide an update of the global LNG market and to seek inputs from government and private sector participants on options and prospects of LNG business in Myanmar. Following the workshop, WBG submitted an initial outline of potential TA to MOE on December 9, 2015.

Third, on January 28, 2016, MOE, MOEP and WBG jointly launched a series of TA in Myanmar natural gas sector, including LNG. This series of TA include four tasks: Task 1: Review of LNG imports options Phase I; Task 2: Review of LNG imports options Phase II; Task 3: Review Myanmar's natural gas infrastructure requirements; and Task 4: Update Myanmar's domestic natural gas pricing framework. The detailed terms of reference (TOR) for Task 1 are herewith submitted to MOE and MOEP with this Inception Report. Subsequently, the detailed TOR for Task 2, 3 and 4 will be prepared.

2. Objective of the Technical Assistance

The objective of this TA is to support the Government in developing a gas sector development plan by focusing on the near-to-medium term options to meet the gas demand in Myanmar. The TA is designed in the context of the Myanmar national energy strategy, policy and regulatory framework, and it also reflects the global and regional trends in liquefied natural gas (LNG) markets.

Specifically, the TA will focus on import options of LNG initially as a bridging fuel while new gas exploration gets underway in Myanmar. The focus is on the possibilities for LNG receiving facilities in Myanmar; prospects for development of floating regasification LNG terminals will be a specific element of the assignment.

3. Timeframe

Following MOE's no objection of the Task 1 TOR, the World Bank will initiate selection of international consultants and proceed with the agreed activities. Task 1 is planned for completion within six months of work commencement by the selected consultants, or tentatively in December 2016.

WBG expect to prepare detailed TOR for Task 2, 3 and 4 starting in May 2016 following consultation with MOE and MOEP. The timeframe of the activities will be agreed during TOR preparation.

4. Budget and Financing

The trust fund Energy Sector Management Assistance Program ("ESMAP") has provided a grant of US$ 400,000 to finance the study "Economic Costs of Natural Gas for the Myanmar Domestic Market" and Task 1: Review of LNG imports options Phase I.

For additional activities under Task 1, and new activities under Task 2, 3 and 4 WBG encourages MOE and MOEP to use the available IDA credit for technical assistance under the Myanmar Electric Power Project to finance the activities, subject to agreement with Ministry of Electric Power.

5. Team Members

A core team of WBG staff will implement this series of TA, supported by extended team of WBG staff and international consultants. The initial core team members include:

(i) **Dr. Dejan Ostojic**, Lead Energy Specialist and energy team leader for Myanmar. Dr. Ostojic joined the World Bank in 1998 after working for more than ten years in the private sector and teaching at universities in Europe and the US. Currently, Dr. Ostojic is Lead Energy Specialist responsible for the Bank's energy program in the Greater Mekong Sub-region countries, focusing on Myanmar where he leads policy dialog and investment operations in the energy sector since the Bank re-engagement in 2012. He holds PhD in power system engineering from the University of Belgrade, Serbia.

(ii) **Mr. Alan Townsend**, Senior Energy Specialist. Mr. Townsend is an electricity and natural gas specialist in the East Asia and Pacific energy unit of the World Bank, for which he has worked since 1998. He is an expert in liquefied natural gas (LNG) and has provided advice to about two dozen countries on matters related to development of LNG receiving terminals and integration of LNG into the power generation fuel mix. He is an energy and regulatory economist by training and holds a Master of Arts in International Economics from the Johns Hopkins University School of Advanced International Studies, USA.

(iii) **Mr. Myoe Myint**, Energy Specialist and Myanmar facilitator. Ko Myoe joined the World Bank in 2015 as Energy Specialist after working for more than 15 year in the private sector in

various countries focusing on energy business development. Ko Myoe is responsible for facilitating energy policy dialog, implementing Bank's electrification projects and promoting new energy-related projects in Myanmar. Ko Myoe holds Master Degree in International Energy Management and Policy from Columbia University in the City of New York, USA, Master of Business Administration from Yangon Institute of Economics, and Bachelor of Electronic Engineering from Yangon Institute of Technology.

(iv) **Mr. Rome Chavapricha**, Senior Energy Specialist. Mr. Chavapricha has been with the World Bank since 2005 and based in Yangon since 2014. At present, his work program covers the energy program activities in Myanmar and Laos, with emphasis on electrification, power system improvement, and energy policies related to sector financial viability and energy pricing. Rome holds a Master of Business Administration from Massachusetts Institute of Technology, USA.

Annex 1

Acknowledgement of Technical Assistance between the Ministry of Energy and the World Bank dated January 28, 2016.

THE WORLD BANK
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Ref. WB/158-Jan
January 28, 2016

H.E. U Zay Yar Aung
Union Minister
Ministry of Energy
Nay Pyi Taw
Republic of the Union of Myanmar

Excellency:

Re: World Bank Assistance for the Energy Sector in Myanmar

Reference is made to the Ministry of Energy (MOE) letter No. P-S/3/07 (002) 2016 dated January 5, 2016, and the meeting between your Excellency, MOE officials and the World Bank mission on December 29, 2015 regarding the Bank's technical assistance (TA) to MOE regarding the natural gas sector in Myanmar, including Liquefied Natural Gas (LNG) business plan.

Enclosed to this letter, we are pleased to submit a revised outline of the proposed TA to MOE in the natural gas sector for your kind reference. We are pleased to inform that the Energy Sector Management Assistance Program (ESMAP) has confirmed a grant support of US$ 140,000 for this TA, in addition to a US$ 260,000 grant for the TA on economic costs of natural gas. Moreover, the IDA Credit for Myanmar Electric Power Project can also be utilized for technical assistance in this area subject to agreement with the Ministry of Electric Power.

We propose to launch this TA at a workshop in Nay Pyi Taw on Thursday, January 28, 2016. The objective of the launch workshop is to confirm the scope of the first phase of TA outlined below and to discuss the overall approach and possible support for the second phase.

I look forward to your acknowledgement and a successful launch workshop. Please do not hesitate to contact me if you have any questions or if we can be of assistance in any way.

Sincerely,

Abdoulaye Seck
Country Manager, Myanmar

Acknowledged,

For Union Minister
(U Pe Zin Tun, Permanent Secretary)

The World Bank Group: No. 57, Pyay Road (Corner of Shwe Hinthar Road), 6 ½ Mile, Hlaing Township, Yangon 11051, Myanmar
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Annex 2

Presentation -- Myanmar Natural Gas Sector Technical Assistance Overview by World Bank Group, January 28, 2016

Myanmar Natural Gas Sector

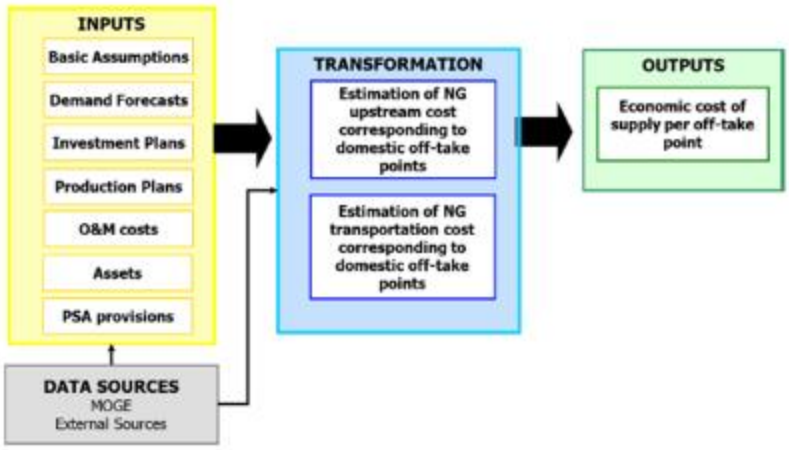
Technical Assistance Overview

The World Bank Group
28 January 2016
Nay Pyi Taw

On-going TA – Economic cost of supply valuation for Myanmar market

- Task 1: Review Myanmar's natural gas supply and demand balance;
- Task 2: Develop methodology for determining economic cost for supplying natural gas into the Myanmar market;
- Task 3: Calculate the costs at offtake points from the gas network.
- Task 4: Estimate the potential direct impact of changes in gas prices on the value of exports and government revenues.

Natural Gas Costing Model



3

TA on Liquefied Natural Gas

- Does Myanmar need LNG?
- If yes, when and where and how?
- What if Myanmar has substantial gas find in the future?
- What is the cost to stakeholders?
- What about LNG pricing?
- Swapping Myanmar's gas with LNG?

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Task 1: Review of LNG imports options Phase I

- Siting analysis of potential locations of LNG import facilities
- Prepare prioritization framework for LNG import options and locations. Consider implementation timeframe, investment value, lease versus buy, off-shore versus on-shore, etc.
- Overview of the physical swap market for natural gas

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Task 2: Review of LNG imports options Phase II

- Consultations with Government and private sector on the feasibility, timeframe, and likelihood of existing LNG import proposals
- Identify the required technical, financial, and governmental supports to enable LNG imports
- Review the options for scaling up bilateral or regional natural gas trade, supported by LNG imports by Myanmar and neighboring countries
- Prepare scenarios for physical swap of gas

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Task 3: Review Myanmar's natural gas infrastructure requirements

- Update Myanmar's natural gas supply and demand balance
- Identify gas transportation and distribution infrastructure for domestic demand. Consideration for power generation, industrial, commercial, transport and residential gas usage
- Identify options to optimize existing and future gas export infrastructure considering pipeline and LNG options
- Develop the scope of long term master plan for the gas sector in Myanmar

Task 4: Update Myanmar's domestic natural gas pricing framework

- Transmission tariffs
- Distribution tariffs
- End-user tariffs
- Taxes and fees
- Subsidies mechanism

Annex 3

Presentation – LNG Market Update, October 23, 2015

[Provided separately]

Annex 4

Detailed TOR -- Technical Assistance on Liquefied Natural Gas Import Options for Myanmar Phase 1

1. Background of Myanmar Gas Sector

Myanmar energy consumption is among the lowest in the world. About 70 percent of the population has no access to electricity, and the consumption per capita (around 160 kWh per annum) is twenty times less than the world average. Rural areas remain mostly unelectrified, with only 16 percent of rural households with access to grid-based electricity. Also, access to modern fuels for cooking (such as LPG) is limited to urban areas. Consequently, traditional biomass (fuelwood and animal dung) is widely utilized and accounts for about two-thirds of Myanmar's primary energy consumption.

The commercial use of natural gas occurred in the early 1970s during the time when the oil and gas industry was nationalized. Following the promulgation of the Foreign Investment Law in 1988, gas production sharing arrangement with the private sector began and led to the first foreign holding of natural gas exploration concession in the early 1990s. Since 1990, foreign companies have signed 20 offshore production sharing contracts and are currently exploring and/or developing 21 blocks.

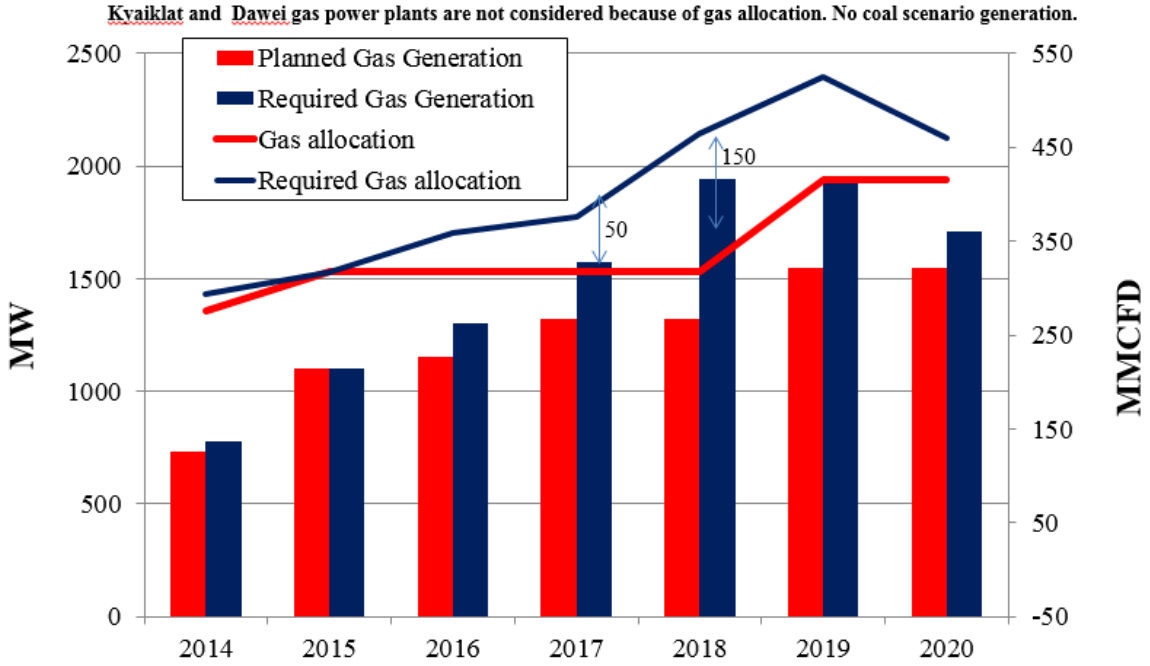
Offshore gas discoveries have been significant. Two major offshore gas fields, Yadana (5.7 TCF) and Yetagun (3.16 TCF), were discovered in the 1990s in the Gulf of Mottama. In 2004, the discovery of the offshore Shwe field was announced with estimated gas reserves of about 5 TCF. In FY2013/14, the natural gas production totaled about 482 BCF. Of the total gas production, most were from offshore Yadana (56%), Yetagun (30%), Shwe (8.7%), Zawtika (0.2%) fields; the remainder was from domestic onshore fields (4.5%). The Shwe field started production in 2013 and is expected to increase annual gas production to about 182 BCF.

Domestic gas demand in FY2013/14 was about 76.3 BCF (16% of annual production), comprising gas-fired power plants (60.6 BCF), fertilizer production (6.1 BCF), compressed natural gas (7.2 BCF), and feedstock for refineries and LPG (2.4 BCF). However, demand for electricity in Myanmar has grown significantly in recent years, leading to a higher demand for natural gas. The annual peak power demand reached 2,300 mega-watts (MW) in FY2014/15, growing on average 10 percent per annum in the past five years. During this same time, the electric energy supply to the national grid grew on average 16.4 percent per annum.

By 2015, the installed capacity of gas-fired power plants reached 1,100 MW consuming around 300 mmcfd, as shown in Figure 1. According to MOEP estimates, the gas demand in the power sector will increase sharply in the coming years even in a conservative case (Figure 1) which

does not include Kyaiklat and Dawei new gas-fired power plants. Based on the current allocation of gas to the power sector, it is very likely that gas-fired power generation will face major shortages of gas estimated at about 50 mmcfd in 2017 and 150 mmcfd in 2018.

Figure 1. Supply and demand of natural gas in the power sector



The value of Myanmar's gas exports reached US$ 4.3 billion, or 7% of GDP, in FY 2014–15. Gas accounts for around 40 percent of Myanmar's exports and a third of the government's revenue. While the gas exports are priced competitively in the context of regional gas market, the price of natural gas for domestic consumption is set by the government and averaging about US$ 7.50 per MMBtu for the power sector and around US$ 6–7 per MMBtu for CNG. Therefore, domestic gas prices have been generally below the export parity prices. Such regulatory environment and declining commodity prices in the global/ regional market, will have a negative impact on the gas sector and the government's revenue.

The Myanmar authorities are interested to review natural gas supply options to meet the rising domestic demand for gas. The supply options can include importing LNG to supplement domestic gas while new gas exploration got underway. The options can also include Myanmar's swapping LNG with domestic gas. And, the supply options can include cooperation with neighboring countries on bilateral or regional gas trade, to jointly benefit from existing and future natural gas supply/import infrastructure among the countries.

2. Objectives

The objective of this TA is to support the Government in developing a gas sector development plan by focusing on the near-to-medium term options to meet the gas demand in Myanmar.

Specifically, the TA will focus on import options of LNG initially as a bridging fuel while new gas exploration gets underway in Myanmar. The focus is on the possibilities for LNG receiving facilities in Myanmar; prospects for development of floating regasification LNG terminals will be a specific element of the assignment.

3. Scope of Work

The scope of work includes four tasks.

- Task 1: Review of LNG imports options Phase 1:

  a) Siting analysis to assess potential locations of LNG import facilities in Myanmar

  - Three potential locations are: (i) Kyauk Phyu, Rakhine State; (ii) Nga Yoke Kaung, Ayeyarwaddy Region; (iii) Kalagut Island, Mon State. It is expected that the task will not necessarily include a site visit to each location. The prospective sites will be provided to the client by Government. Consultants should specify in their proposals what data they will need to perform the analysis though it is expected that consultants will identify the required metocean data from available sources.

  - Provide a high-level pre-feasibility level of analysis that covers, for each site: marine factors, land-side issues, technical configuration, capex and opex estimates, and (at a very high level only) key environmental factors.

  - CAD drawings of how the recommended technical design will look at a specific site should be provided

  - Both utility scale (FSRU) and mid-scale LNG import options should be considered.

  b) Prepare prioritization framework and accompanying analytical tool for LNG import options and locations.

  - The consultants shall recommend a prioritization framework to support decision-making by the Myanmar energy authorities. An analytical tool accompanying the recommended prioritization framework shall be prepared.

  - Multiple dimensions should be considered under the prioritization framework such as: (i) implementation timeframe; (ii) value of investment (including associated infrastructure such as for existing gas pipeline system upgrade); (iii)

estimated Union budgetary requirements for the required investment; (iv) lease versus buy options; (v) off-shore versus on-shore options, etc.

c) Prepare an overview of the LNG markets that Myanmar may access with a view of procuring LNG to be physically swapped with gas export partners.

- Apart from directly importing LNG into Myanmar, there may be opportunities for Myanmar to procure LNG in the international LNG markets and supply to Myanmar's gas export partners in lieu of Myanmar's domestic gas.

- The consultants shall review detailed Myanmar's gas exports statistics in recent years in terms of gas specifications, quantity, price and timing.

- The consultants shall provide an overview of the potential LNG markets where Myanmar may access to enable a physical swap, considering recent Myanmar's gas exports statistics. The overview shall include--but not limited to—(i) the minimum and recommended scale of LNG quantity and the transaction frequency to enable an effective procurement by Myanmar; (ii) the contractual framework (e.g. spot and/or term) for Myanmar's procurement of LNG; (iii) an overview of counterparties to enable a transaction to move forward; (iv) the required financial, legal and other commitments for Myanmar to provide, including an overview of payment terms for LNG procurement.

4. Confidentiality Agreement

All data and information provided by the Ministry of Energy is strictly confidential. The Consultant will sign a confidentiality agreement for the benefit of the Ministry of Energy for the study and shall not be entitled under any circumstances to release or use any data or information acquired during the process of the study.

5. Reports and Time Schedule

The study will be completed within 6 months after awarding the Consultant contract and it is envisaged that a final report and presentation, including supporting documentation, will be submitted to Ministry of Energy at the end of the study. A more detailed time schedule is set out below.

6. Summary of Deliverables

The suggested timeline appears below. The consultants may propose a modified timeline.

Timing	**Deliverable**
Inception Stage	
Contract signature + 3 weeks	Kick off
Kick off + 4 weeks	Draft Inception Report

Task 1a	
Kick off + 10 weeks	Draft Report "Siting Analysis" and accompanying Presentation
Kick off + 14 weeks	Final Report "Siting Analysis" and accompanying Presentation
Task 1b	
Kick off + 10 weeks	i) Draft Report "LNG Import Prioritization Framework" and accompanying Presentation ii) Draft quantitative prioritization analytical tool
Kick off + 14 weeks	i) Final Report "LNG Import Prioritization Framework" and accompanying Presentation ii) Final quantitative prioritization analytical tool
Task 1c	
Kick off + 10 weeks	Draft Report "LNG Physical Swap Overview for Myanmar"
Kick off + 14 weeks	Final Report "LNG Physical Swap Overview for Myanmar"

7. Level of Effort and Indicative Team Composition

The level-of-effort for this assignment is estimated at 5 man-months.

The key team positions (with indicative qualifications) are:

- **LNG Expert/Project Director**: 12+ years experience in LNG receiving terminal design, costing, and project management.
- **Marine Expert**: 10+ years experience in the marine issues that influence siting possibilities for LNG terminals, encompassing the implementation, operation, safety, reliability, high-level environmental issues, and other aspects; should be fully knowledgeable on factors relating specifically to FSRUs such as potential for single buoy mooring and other technical design issues.
- **LNG Commercial Expert**: 10+ years experience in LNG trading, procurement, etc. Experience in introducing LNG to new markets is valuable.

8. Short-listing Criteria

The shortlisting criteria are:

(i) The interested consulting firms should have previous experience in technical and commercial feasibility assessment and implementation of LNG options for countries with no prior LNG infrastructure;

(ii) A minimum of 10 years of experience in carrying out Consulting Services as a consulting firm in the field of assignment; and

(iii) At least 3 contracts of similar nature and complexity, or more complex and relevant, that the firm has successfully completed in the past 10 years.