1 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This Environmental and Social Impact Assessment (ESIA) report presents an assessment of the potential environmental and social impacts associated with the proposed 225MW Combined Cycle Gas Turbine (CCGT) power plant and Project facilities in Myingyan Township, Mandalay Region, Myanmar ('the Project').

This report has been prepared for **Sembcorp Utilities Pte. Ltd.** (hereinafter referred to as **'the Sponsor'** or **'Sembcorp'**) by **Environmental Resources Management** (hereinafter referred to as **'ERM'**) and presents the objectives, methodology and outcomes of the ESIA study.

1.2 PROJECT BACKGROUND AND OVERVIEW

The Sponsor has been selected by the Ministry of Electric Power (MOEP) of the Government of Myanmar (GOM) as a private sector Independent Power Producer (IPP) to develop the Project on a Build, Operate and Transfer (BOT) basis in Myingyan Township, in the Mandalay region in Myanmar. The Project comprises of the following Project facilities:

- 225MW CCGT Power Plant;
- Gas Supply Pipeline;
- 230kV Overhead Transmission Line; and
- Water Supply Pipeline, Wastewater Discharge Pipeline and Water Intake Pumping Station.

The Project will proceed to invest and establish a CCGT power plant with international financing provided by Asian Development Bank (ADB), International Finance Corporation (IFC), and other banks which have adopted the Equator Principles (EPs) as syndicates.

The technology of the Project is an efficient form of CCGT power generation which was designed for high reliability and efficiency operation with lower environmental impact. The Project will operate on natural gas as its only fuel. Complete details on the Project description are provided in ***Chapter 2***.

The electrical capacity and electricity generated will be sold under a 22 year Power Purchase Agreement ("PPA"), as agreed with MEPE.

ERM has been commissioned by the Sponsor to prepare this ESIA report in order to align the Project with Myanmar's regulations, and international standards/guidelines, as described in ***Chapter 3***. The report incorporates the findings and recommendations from the Scoping Report[(1)] and provides additional studies and assessment work in a wider scoped Environmental and Social Impact Assessment.

(1) Myingyan IPP Project – Environmental & Social Consultancy Services in support of Transaction Advisory Services for Private Sector Participation – Scoping Report – Revision 4 – 18th May 2015

As part of the ESIA development process, field surveys, consultation, air quality modelling, noise modelling and Quantitative Risk Assessment (QRA) for the gas pipeline were undertaken in conjunction with extensive social studies, to develop the ESIA and outline the ESMP.

It shall be acknowledged that not all aspects of the Project are considered "detailed design". Design is ongoing and some layout logistic components will only be finalised once the EPC contractor is appointed. This phased-approach is common practice in large projects, i.e. a phased assessment commensurate with the design details available.

1.3 PROJECT NEED

Parallel to growth in GDP, electricity demand in Myanmar has increased dramatically in recent years. ADB released a report on Myanmar's energy sector in October 2012 in which the future power demand was estimated to be doubling from 12,459 million kWh in 2012-2013 to 25,683 million kWh in 2018-2019 (ADB, 2012).

As at July 2013, Myanmar's power is predominantly generated from hydropower, gas and coal, representing over 70%, 22% and 3% of the total power generation respectively. [1] Out of the 3,735 MW of total installed capacity, approximately 835 MW is of gas-fired power generation. Due to the lack of water during dry season, hydropower generation has not been able to operate at full capacity and therefore electricity supply has been unstable during that time.

To reduce the country's reliance on hydropower, MOEP in its five year plan (2011/2012 to 2015-2016) has set an ambitious target to add 1,740MW of gas-fired generation capacity by 2015-2016, which will increase the gas-fired capacity to over 50% of the total generation mix. [2]

In addition, given that the new gas supply will become available from the Shwe Gas Supply pipeline, the proposed development of a combined cycle gas turbine power plant in Myingyan Township, Myanmar will contribute towards a power source for adding capacity required to cover the shortfall in Myanmar.

1.4 PROJECT SPONSOR / PROJECT DEVELOPER

Sembcorp Utilities Pte. Ltd., a subsidiary of Sembcorp Industries (SCI), is the main Project Sponsor for the Project. SCI is a leading energy, water and marine group operating across six continents worldwide. With facilities with over 8,200 megawatts of gross power capacity and over 9.5 million cubic metres of water per day in operation and under development, SCI is a trusted provider of essential energy and water solutions to both industrial and municipal customers. It is also a world leader

(1) MEPE (2013). http://www.ubifrance.com/medias/press/mepe_9_7_2013_29_31.pdf Accessed 8 June 2015.

(2) Sharma, Vikas (2013). An Overvoew of Electricity Market in Myanmar. http://www.slideshare.net/VikasSharma128/myanmar-electricity-industrydec2013 Accessed 8 June 2015.

in marine and offshore engineering as well as an established brand in urban development.

The SCI Group has total assets of over S$17.2 billion and employs more than 8,000 employees. Listed on the main board of the Singapore Exchange, it is a component stock of the Straits Times Index and several MSCI and FTSE indices. SCI's key facts are highlighted in ***Table 1.1***.

Table 1.1 Key Facts of SCI

Key Facts	Descriptions
Year of Incorporation	1998
Listing	Singapore Exchange (SGX)
Market Capitalisation	S$8.0 billion
Shareholders	Temasek Holdings – 49.5% Public – 50.5%
Number of Employees	Over 8,000
FY2014 Turnover	S$10.9 billion
FY2014 Net Profit	S$ 801 million
Key Business	Sembcorp Utilities – 100% Sembcorp Marine – 61% Sembcorp Development – 100%
Global Presence	Singapore, China, India, Indonesia, Philippines, Vietnam, Myanmar, Australia, Oman, UAE, South Africa, Norway, UK, Panama and the Caribbean, Brazil, Chile

Source: (Sembcorp 2015)

1.5 ENVIRONMENTAL, SOCIAL AND HEALTH EXPERTS

Environmental Resources Management (ERM) has been contracted by the Sponsor to prepare an ESIA report for the Project. This report presents the objectives, methodology and outcomes of the impact assessment.

ERM is the world's leading provider of environmental, health and safety, risk and social consulting services. As a global organization with an unparalleled pool of expertise, ERM is uniquely able to leverage prior project experience to efficiently deliver projects of any size in a responsive and flexible manner.

ERM has high international standing, and an unrivalled track record in preparing successful Environmental and Social Impact Assessments (ESIAs) for high profile and often controversial development projects. ERM has over 20 years' experience undertaking ESIAs for the power sector worldwide, including many high profile power projects.

For this Project, ERM has selected the qualified sub-consultant, **Resource and Environment Myanmar Co., Ltd (REM)**, who has experience in carrying out the baseline survey and public consultation meetings in the local context. Note that all the works provided by REM are under ERM supervision.

REM is a leading resource and environmental consultancy firm based in Myanmar, consisting of former and current university faculty members of various disciplines relating to environmental and social management.

They have worked extensively across Myanmar undertaking Environmental Impact Assessment related works including terrestrial biodiversity surveys, habitat and land use mapping, health and social impact surveys and development of post project monitoring surveys.

1.6 ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT OBJECTIVES

The specific objectives of this ESIA are as follows:

- Facilitate an understanding of the elements of the existing baseline conditions that are relevant to resources/receptors that could be potentially impacted by the Project;
- Identify the aspects of the Project that could potentially result in significant environmental and social impacts on resources/receptors;
- Document how stakeholders have been engaged during the ESIA Process, and how stakeholder feedback has been considered in the ESIA;
- Predict and evaluate the significance of the potential environmental and social impacts of the Project;
- Identify the aspects of the Project that need to be managed, and recommend appropriate and justified mitigation and enhancement measures;
- Determine the significance of residual impacts, taking into account the implementation of mitigation measures;
- Generate plans for the management and monitoring of impacts, including plans for ongoing stakeholder engagement; and
- To meet international environmental and social requirements.

1.7 IMPACT ASSESSMENT SCOPE

It is noted that the IFC launched a scoping study to obtain environmental baseline data and to determine the Terms of Reference (ToR) for the ESIA study.

This report has been prepared to cover the proposed ToR stated in the IFC Scoping study and to ensure compliance with ADB and IFC requirements. It identifies the potential environmental and social impacts that could be associated with the proposed Project activities and its associated facilities including those of an indirect and cumulative nature.

The study area for environmental and social impact assessment covers all Project operational areas, including where supporting activities take place.

The scope of the impact assessment includes Project activities that may affect the existing environment and social setting. Details of the Project include location, Project overview and components, schedule, Project facilities and activities, associated facilities, construction and operational process, as described in ***Chapter 2***.

The scope does not provide an assessment for any other/future developments or activities, either at the site location or anywhere else within the Project, unless these activities are specifically identified in ***Chapter 2*** of this report.

Should any further development be planned, either as result of this Project or other related work, additional planning and assessment must be carried out specifically in relation to that proposed development.

ERM does not endorse or take responsibility for any use of this report outside of or inconsistent with the scope of the Project as defined in ***Chapter 2*** of this ESIA report.

1.8 STRUCTURE OF THIS REPORT

An outline of the ESIA report is provided in ***Table 1.2***.

Table 1.2 ESIA Report Structure

Chapter	Title	Description
0	Executive Summary	Summary of entire ESIA report
1	Introduction	This *Chapter* will outline the development and structure of the ESIA report including the Project background, objectives, Impact Assessment scope and the report structure.
2	Project Description and Alternatives	This *Chapter* will provide a concise description of the Project and its geographical and temporal context. It will include a site description, an overview of the Project Facility design and details of Project inputs and outputs. This *Chapter* will also include discussion of the Project background, objectives, need for the Project, value of the Project, envisioned sustainability, alternatives considered, development options considered and site selection. The *Chapter* will also include a description of best available technologies.
3	Administrative Framework	The policy, legal and institutional framework in which the ESIA study has been conducted will be discussed in this *Chapter*. National regulations will be summarized along with relevant international agreements, as well as applicable international best practice guidelines and standards.
4	Impact Assessment Methodology	This *Chapter* outlines the impact assessment methodology and approach used for this ESIA report.
5	Description of the Environment – Biophysical Baseline	This *Chapter* will summarize the available baseline data on the environmental and biological resources and receptors within the Project Study Area. It will be based on both primary and secondary data sources and will consider changes in the baseline condition without the development in place. It will focus on the description of the biological environment and physical environment.
6	Description of the Socio-Economic Baseline	This *Chapter* will summarize the available baseline data on the socio-economic within the Project Study Area. It will be based on both primary and secondary data sources and will consider changes in the baseline condition without the development in place. It will focus on the description of the human environment.
7	Air Quality	This *Chapter* will summarize the predicted impacts of the Project in terms of Air Quality.
8	Greenhouse Gases	This *Chapter* will summarize the predicted impacts of the Project in terms of Greenhouse Gas.
9	Surface Water Quality	This *Chapter* will summarize the predicted impacts of the Project in terms of Surface Water Quality.
10	Noise and Vibration	This *Chapter* will summarize the predicted impacts of the

Chapter	Title	Description
		Project in terms of Noise and Vibration.
11	Landscape and Visual	This *Chapter* will summarize the predicted impacts of the Project in terms of Landscape and Visual.
12	Soils and Groundwater	This *Chapter* will summarize the predicted impacts of the Project in terms of Soil and Groundwater.
13	Waste	This *Chapter* will summarize the predicted impacts of the Project in terms of Waste Management.
14	Terrestrial and Marine Biodiversity	This *Chapter* will summarize the predicted impacts of the Project in terms of Terrestrial and Marine Biodiversity.
15	Social Impact Assessment	This *Chapter* will summarize the current socio-economic status and the identification of potential negative and positive impacts.
16	Stakeholder Engagement and Public Disclosure	This *Chapter* will summarize the stakeholder engagement and public disclosure activities undertaken for the Project.
17	Cumulative Impact Assessment	Cumulative impacts will be assessed as appropriate.
18	Environmental and Social Management Plan (ESMP)	The ESMP will draw together the possible mitigation measures; group them logically into components with common themes; define the specific actions required and timetable for implementation; identify training needs, institutional roles and responsibilities for implementation; develop a monitoring program and estimate the costs of the measures.
19	Disaster Risk Plan	This *Chapter* provides a summary of the Risk and Disaster Management Plan prepared for the Project.
20	Conclusion and Recommendation	This *Chapter* will summarize conclusions that are made based on the assessment as well as outline any further recommendations.
21	References	
	Annexes	