ANNEX B

Energy Efficiency National Partnership Award 2014 Recipients

1. Award Recipients in the Category of "Excellence in Energy Management"

This award recognises companies that have demonstrated a high level of commitment to excellence in energy management. The four award recipients under this category are:

- Abbott Manufacturing Singapore Private Limited
- City Developments Limited
- HSL Constructor Pte Ltd
- Shell Eastern Petroleum (Pte) Ltd (Pulau Bukom Manufacturing Site)

2. Award Recipients in the Category of "Best Practices"

This award recognises corporate teams whose implementation of energy efficiency projects have led to improvements in the energy performance of their facilities. The five recipients are:

- German Centre for Industry and Trade
- NatSteel Holdings
- Tien Wah Press
- United Microelectronics Corporation (Singapore Branch)
- Joint application by:
    - Micron Semiconductor Asia; &
    - Singapore Oxygen Air Liquide Pte Ltd

3. Award Recipients in the Category of "Outstanding Energy Manager of the Year"

This award recognises outstanding Energy Managers (EMs) within the organisation who have demonstrated leadership in driving energy efficiency improvements across the organisation, and who have played an instrumental role in promoting energy efficiency initiatives within the organisation. The award recipients under this category are:

- Mr Cheong Kok Onn – Glaxo Wellcome Manufacturing Pte Ltd
- Mr Syed Yousuff s/o Jakkariya Mohamed – MSD International GmbH (Singapore Branch)
- Mr Wong Tat Choon – Singapore Newspaper Services Pte Ltd

4. Award Recipients in the Commendation for "Best Energy Efficiency Practices in the Public Sector"

In addition, the commendation for "Best Energy Efficiency Practices in the Public Sector" was presented to four public sector agencies. This commendation recognises outstanding public sector agencies that have demonstrated exemplary performance and commitment to energy management efforts and have been proactive in implementing energy efficiency improvements. The award recipients under this category are:

Large Building

- Housing Development Board

School

- Punggol Primary School
- Sembawang Secondary School
- Innova Junior College

ANNEX B

Energy Efficiency National Partnership Award 2014 Recipients

The National Energy Efficiency Award winners represent a wide range of industries including petrochemicals, pharmaceuticals, printing and marine engineering. All have either demonstrated their commitment to excellence in energy management or achieved significant energy savings through the implementation of innovative energy management systems with some companies achieving both. The following section outlines each winner's achievements.

1. Award Category: Excellence in Energy Management

This recognises companies that have demonstrated their commitment to excellence in energy management.

Abbott Manufacturing Singapore Private Limited

As part of its efforts to safeguard the environment, Abbott has significantly reduced energy usage at the Abbott Manufacturing Singapore plant. Since 2012, Abbott has achieved reductions of 40% in energy intensity and 25% in energy costs. These improvements were achieved through a culture that engages employees in finding new ways to deliver sustained energy efficiency and improvement, as well as investments in technology including a new energy management system to provide greater visibility into energy usage. By significantly reducing its energy usage, Abbott is reducing its carbon footprint, lowering costs and helping to protect the environment in Singapore.

City Developments Limited

In line with its vision of 'Conserving as it Constructs', eco-developer and landlord CDL implemented a 10-year green programme to enhance energy efficiency at its commercial properties in 2006. Under the programme, energy goals and targets are set on an annual basis, and reviewed every quarter, while energy performance and improvements are closely monitored on a monthly basis. Since then, CDL has achieved a 17% reduction in total energy intensity over the last seven years, and a 28% reduction in total energy consumption annually, which is equivalent to energy savings of 14GWh/yr and cost savings of $3.6million/yr. In 2014, CDL became the first property developer in Singapore to achieve the ISO 50001 certification for Energy Management Systems.

HSL Constructor Pte Ltd

HSL identified three energy targets to ensure the sustainability of energy saving efforts: 1) Reduce consumption of electricity; 2) Improve energy management system; 3) Enhance knowledge of energy uses. In 2012, HSL became the first local company in Singapore to be certified ISO 50001 – Energy Management System. From 2011 to 2014, HSL reduced its energy consumption by 36.9%. HSL supports and inculcates energy efficiency culture through various ways such as quarterly energy efficiency campaigns and both internal and external training programmes. The strong commitment and support from HSL's top management also contributed significantly towards their energy-saving efforts.

Shell Eastern Petroleum (Pte) Ltd (Pulau Bukom Manufacturing Site)

For Shell Pulau Bukom Manufacturing site (Bukom), energy efficiency means making its products in an economically, environmentally and socially responsible way. It aspires to have a 2% year–on-year energy efficiency improvement. To achieve this, Bukom leverages upon a comprehensive energy monitoring system that identifies where they can improve their energy use throughout the site. A dedicated cross-disciplinary team works to identify opportunities and implement energy efficiency initiatives. Finally, the team has put in place a good energy efficiency programme that provides current and future energy solutions. Bukom tracks two key energy performance indicators: the global industry benchmarks Solomon Energy Intensity Index for the refinery and tSRf/C2 (ton of standard refinery fuel to produce 1 ton of ethylene) for their Ethylene Cracker Complex (ECC). Bukom refinery's energy performance, based on Solomon EIITM, has improved in the last 5 years by about 14%. Since 2011, Bukom's Ethylene Cracker Complex has also raised its energy efficiency by about 16%.

2. Award Category: "Best Practices"

This recognises corporate teams that have implemented energy efficiency projects which have led to improvements in the energy performance of their facilities.

German Centre for Industry and Trade

Project Title: Chiller System and Air-Con Upgrading Works

German Centre embarked on an energy strategy at the end of 2012. An accredited energy services company conducted an energy audit for German Centre building and found that the 19-year-old chiller plant was operating inefficiently at about 1.2 KW/RT.

A series of conservation measures were implemented in 2013 and 2014. The old chilled water plant is replaced with three sets of water-cooled chillers and energy-efficient variable speed drives. In addition, the following retrofits are also made:

1. Variable speed drives for control of pumps, cooling towers and air-handling units;
2. Digital thermostat and moderating valves for fan coil units;
3. Motion sensors in restrooms;
4. Carbon monoxide sensor-operated carpark ventilation; and
5. LED light tubes for office and common-area lighting.

The existing building management system (BMS) is also upgraded to improve and optimize the monitoring and control of system performance. Among the upgrades made are high accurate temperature sensors, flow meters & power meters for the chiller plant to meet the BCA Green Mark requirements.

NatSteel Holdings

Project Title: Organic Rankine Cycle (ORC) Waste Heat Recovery System for Steel Rolling Mill Reheating Furnace

In a rolling mill, electricity and fuel oil are used in daily operations. Electricity is used mainly to drive the mill roll stands and auxiliary equipment such as cranes, lightings and cooling systems. Fuel Oil is used to heat up billets in the reheating furnace to a temperature suitable for hot rolling.

In NatSteel, an Organic Rankine Cycle (ORC) Waste Heat Recovery System is installed to recover large amount of heat energy from the reheating furnace's hot off-gas. This

technology is thermodynamically one of the most efficient ways to convert heat energy to electrical energy which is used by other rolling mill equipment.

A benefit of this project is that the organic working fluid is neither consumed nor discharged into the atmosphere. The system does not require continual attendance by operation personnel and has a low maintenance and operating cost.

Tien Wah Press

Project Title: Upgrading of Chiller Plant Room, Air Handling Unit and Exhaust Fans

The energy savings project is divided into 3 sections:

a. Chiller plant room,
b. Air handling units,
c. Exhaust fans

a. <u>Chiller Plant Room</u>
The existing chiller plant room was retrofitted and upgraded in the year of 2007 which improved the system efficiency from 0.956kW/RT to 0.62kW/RT. To achieve better system efficiency, retrofitting works are carried out to replace existing 15-year-old deteriorating cooling towers and modify condenser water piping. Variable speed drives for cooling towers and auto tube cleaning system to the existing chiller are also installed.

b. <u>Air Handling Units (AHUs)</u>
There are 24 AHUs in Tien Wah Press. 3 units of AHUs were replaced from 2007 to 2010 and the remaining 21 units of AHUs are replaced in this project. The new 21 units of AHUs are selected based on the following design criteria:

- Low face velocity AHU coil (200 fpm-300 fpm),
- Low air and water pressure drop coil design,
- Deletion of return air duct if applicable,
- Low pressure drop disposable filters

In the retrofit works, a new continuous monitoring and control system is introduced to the AHU system.

c. <u>Exhaust Fans</u>
Variable speed drives and direct drive system are installed to control and reduce the energy consumption of two exhaust fans.

United Microelectronics Corporation (Singapore Branch)

Project Title: Installation of Heat Pump System for Hot De-ionised Water System

The boilers of the hot de-ionised water (DIW) system consume town gas to supply hot water. To reduce town gas consumption by the boilers, UMC embarked on a feasibility study to explore other ways to supply the required high and low temperature hot water. As a result, two sets of heat pump system are installed to supply hot water at 82°C and 57°C. Besides generating heat, the cooling effect generated from heat pumps is used to pre-cool water that is used for cooling of air compressor.

The new heat pump system helps to reduce existing boiler load and in turn reduce town gas consumption by as much as 30%. With the success of this project, UMC intends to replace

all 3 units of boilers with heat pumps by 2015.

Joint project between:

i) Micron Semiconductor Asia; &

ii) Singapore Oxygen Air Liquide Pte Ltd

Project Title: Micron Fab 7 bulk gas energy efficiency project

Through employing new technology and equipment integration, this project aims to reduce the overall energy consumption in SOXAL-designed nitrogen gas plants and simultaneously meet Micron's operational demands. A new and larger capacity gas plant is constructed to replace the existing gas plants. The two major improvements are featured at the front end purification unit and the cryogenic distillation.

In the original gas plant design, the front end purification unit required an electrically-driven refrigerator unit to remove moisture from the air. In the new improved design, the refrigerator unit is not required in the front end purification unit, resulting in electricity savings. The second improvement is featured at the cryogenic distillation section, where the mechanical work derived from turbine gas expansion is recovered for booster compression, saving on electricity consumed by motor-driven recycle compressor in the old gas plant. The innovative design and equipment integration approach achieve a significant amount of energy savings.

The project achieves an annual energy savings of about 7,954 MWh.

3. Award Category: "Outstanding Energy Managers of the Year"

This recognises outstanding Energy Managers who have demonstrated leadership in driving energy efficiency improvement across the organisation, and played an instrumental role in promoting energy efficiency initiatives within the organisation.

Mr. Cheong Kok Onn
Energy and Utility Manager
Glaxo Wellcome Manufacturing Pte Ltd

Mr Cheong Kok Onn leads the Energy Management Committee in Glaxo Wellcome Manufacturing, and is the project manager for most of the 60 energy saving projects that were completed from 2011 to 2013. These projects resulted in a total saving of 5,821 MWh or $1.3M (16% of energy usage). To raise awareness of energy efficiency (EE) throughout his company, Mr Cheong also carries out annual energy conservation campaigns which include site tours to EE projects, and recognition to staff who provided good initiatives and participated in energy conservation activities. In addition, Mr Cheong also raised awareness of EE in other companies, by sharing his company's EE practices and projects with energy managers from GlaxoSmithKline (GSK) sites in other countries, and at the National Energy Efficiency Conference 2012 and the 2013 BioPharma Asia Convention. Mr Cheong is also the Chairman of Bio-Pharmaceutical Manufacturers Advisory Committee (BMAC) Utilities Workstream since 2012, which facilitates sharing of energy-saving measures and setting of targets for the pharmaceutical sector.

Mr Syed Yousuff s/o Jakkariya Mohamed

Associate Director – Engineering and Energy Manager

MSD International GmbH (Singapore Branch)

Mr Syed Yousuff leads the Singapore site Energy Management and Business Improvement team to deliver MSD's energy target of 30 percent reduction in energy consumption by 2015 (from 2011 baseline). One of Mr Syed's achievements was leading and conducting an Energy Treasure Hunt in November 2013. The Energy Treasure Hunt was the first-of-its-kind in Singapore, and the objectives were to reduce cost, drive reductions in energy consumption and greenhouse gas emissions, and improve efficiency. More than 100 participants from MSD Global Energy Team, Bio-Pharmaceutical Manufacturers Advisory Committee, energy service providers and internal cross functional team were involved. The Energy Treasure Hunt identified potential 40% energy reduction opportunities, with corresponding elimination of 23,300 MT of greenhouse reduction, and potential operational savings of US$9.77 million – far exceeding the initial goal of US$4 million. In 2013, Mr Syed completed 31 energy efficiency projects and saved 11,522 MWh (equivalent to about 8% of MSD Singapore's energy use).

Mr Wong Tat Choon

Assistant Vice President

Singapore Newspaper Services Pte Ltd

Mr Wong Tat Choon is a dedicated and enthusiastic energy manager for his company. He led the SNS Energy Team to conduct energy audits, identify energy saving opportunities and formalise proposals for Management's approval. One of Mr Wong's greatest challenges was to overcome the misconception that energy conservation work required high capital investment and long return on investment (ROI). To do so, Mr Wong searched for opportunities to reduce energy usage and operational cost, with little or no capital investment, and immediate returns. Mr Wong achieved this by monitoring and trending the maximum demand of the plant from 2007 to 2008, and lowered their maximum demand thereafter. This resulted in annual energy savings of about $440,000. Mr Wong also assessed and optimised the requirements recommended by SNS's building consultants and equipment manufacturers, through a series of evaluations, trials and close monitoring which resulted in further annual saving of $480,000. Through his efforts, SNS's building and support equipment were able to run SNS's operations in a more energy efficient manner, without any disruption to operations, or compromise on safety and health.

4. Award Category: Best Energy Efficiency Practices in the Public Sector

Recognises outstanding public sector agencies that have demonstrated exemplary commitment in adopting good energy efficiency practices and have been proactive in implementing energy efficiency improvement measures for their buildings. There are two categories: a) Large building and b) School.

Large Building

Housing Development Board

HDB Hub achieved > 20% reduction in energy consumption between 2011 and 2013 through a series of energy conservation measures such as retrofitting their chilled-water plant system for a guaranteed efficiency of 0.641 kW/RT, and retrofitting energy intensive high bay lightings to LED lamps. The management also embarked on a project to encourage tenants, such as KouFu Food Court, to use their chilled-water system instead of a less efficient unitary/VRV system for air-conditioning requirements."

Schools
Punggol Primary School Punggol Primary School implemented more than seven environmental education packages on energy conservation topics for their students, and hosted several EE-related workshops, such as the NEA Environment Champion workshop, between 2009 to 2013. The school also committed funds to change the lightings in 10 classrooms to high efficiency super T8 lamps (22 W per tube) and replaced 77 older air-conditioners with inverter units to reduce energy consumption.
Sembawang School Sembawang Secondary School involved Green Club and Project Work teachers to lead students to participate in environmental related activities such as community outreach programme, and integration of energy conservation topics in Science and Geography lessons. The Operations Manager leveraged on technology to cut down the school's energy usage such as the installation of sub-meters to monitor high energy usage buildings, and replaced half of the school's older air-conditioners with inverter units. The school has consistently reduced its energy consumption over the past ten years.
Innova Junior College Innova Junior College adopted the Physical Resource Management framework to plan annual EE reduction actions for the school. Various ideas were implemented to control the school's energy consumption, such as the installation of timers to control unitary air-conditioner usage and BAS to control air-conditioning usage for lecture theatres. Trees were also strategically planted next to the windows of the office to reduce the heat entering the office, and IJC's staff also set up natural ventilated study corners to encourage students to minimise the usage of air-conditioned facilities.