Republic of the Philippines

METROPOLITAN WATERWORKS AND SEWERAGE SYSTEM (MWSS)

PPP for the Rehabilitation, Operation and Maintenance of Auxiliary Turbines 4 and 5 of the Angat Hydro-Electric Power Plant (AHEPP) Project

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Abbreviations

ADB
Asian Development Bank
AHEPP
Angat Hydro Electric Power Plant
AMRIS
Angat Maasim River Irrigation System
AN
Auxiliary Number
BOP
Balance of Plant
DENR
Department of Energy and Natural Resources
DOE
Department of Energy
DSCR
Debt Service Coverage Ratio
DSRA
Debt Service Reserve Account
EIRR
Economic Internal Rate of Return
ENPV
Economic Net Present Value
EOT
Electric Overhead Travelling
EPIRA
Electric Power Industry Reform Act
ERC
Energy Regulatory Commission
FC
Financial Closure
FDC
Freedom from Debt Coalition – Philippines
FFWSDO
Flood Forecasting and Warning System for Dam Operations
FIRR
Financial Internal Rate of Return
GAA
General Appropriations Act
GAD
Gender and Development
GDP
Gross Domestic Product
GoP
Government of Philippines
HGG
Harmonized GAD Guidelines
HP
Horse Power
ICC
Investment Coordination Committee
IDEALS
Initiatives for Dialogue and Empowerment through Alternative Legal Services
IPP
Independent Power Producer
IRR
Internal Rate of Return
KWh
Kilo Watt hour
LLCR
Loan Life Cover Ratio
LWAP
Load Weighted Average Price
MCIT
Minimum Corporate Income Tax
MCM
Million Cubic Meter
MIV
Main Inlet Valve
MRA
Maintenance Reserve Account
MW
Mega Watt
MWh
Mega Watt hour
MWSS
Metropolitan Waterworks and Sewerage System
NEDA
National Economic and Development Authority
NGO
Non-Governmental Organization
NHWL
Normal High Water Level
NIA
National Irrigation Administration
NPC
National Power Corporation
NPV
Net Present Value
NWRB
National Water Resource Board
ODA
Overseas Development Assistance
OGCC
Office of the Government Corporate Counsel
PAGASA
Philippine Atmospheric Geophysical and Astronomical Services Administration
PDMF
Project Development and Monitoring Facility
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>PDP</td>
<td>Philippine Development Plan</td>
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<tr>
<td>PHP</td>
<td>Philippine Peso</td>
</tr>
<tr>
<td>PLCR</td>
<td>Project Life Cover Ratio</td>
</tr>
<tr>
<td>PLF</td>
<td>Plant Load Factor</td>
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<tr>
<td>PPGD</td>
<td>Philippine Plan for Gender Responsive Development</td>
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<tr>
<td>PPP</td>
<td>Public Private Partnership</td>
</tr>
<tr>
<td>PQ</td>
<td>Pre-Qualification</td>
</tr>
<tr>
<td>PSALM</td>
<td>Power Sector Assets and Liabilities Management Corporation</td>
</tr>
<tr>
<td>RfP</td>
<td>Request for Proposal</td>
</tr>
<tr>
<td>RfQ</td>
<td>Request for Qualification</td>
</tr>
<tr>
<td>SCBA</td>
<td>Social Cost Benefit Analysis</td>
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<tr>
<td>SPV</td>
<td>Special Purpose Vehicle</td>
</tr>
<tr>
<td>TRANSCO</td>
<td>Transmission Company</td>
</tr>
<tr>
<td>TRO</td>
<td>Temporary Restraining Order</td>
</tr>
<tr>
<td>TWG</td>
<td>Technical Working Group</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>VAT</td>
<td>Value Added Tax</td>
</tr>
<tr>
<td>WAGI</td>
<td>Women and Gender Institute</td>
</tr>
<tr>
<td>WESM</td>
<td>Wholesale Electricity Spot Market</td>
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</tbody>
</table>
Table of Content

Disclaimer........................................................................................................................................2

Abbreviations ......................................................................................................................................3

Table of Content .................................................................................................................................5

1. Introduction......................................................................................................................................6
   1.1. Background.................................................................................................................................6
   1.2. The AHEPP Complex ...............................................................................................................6

2. Project Background .........................................................................................................................8
   2.1. Sectoral Context..........................................................................................................................8
   2.2. Project Context ...........................................................................................................................9
   2.3. Operational History of AN-4 and AN-5 ...................................................................................9
   2.4. Location......................................................................................................................................10

3. Project Scope....................................................................................................................................13
   3.1. Rehabilitation & Modernization (R&M) Envisaged Scope.........................................................13
   3.2. R&M Proposal - Reference Solution..........................................................................................14
   3.3. Uprating of Project Capacity .....................................................................................................15
   3.4. Operation and Maintenance Scope ...........................................................................................15
   3.5. Sale of Power .............................................................................................................................16

4. Asset Sharing ...................................................................................................................................16
   4.1. Common Assets..........................................................................................................................16
   4.2. Proposed Asset Sharing Arrangement .......................................................................................16

5. Water Allocation and Protocol ........................................................................................................16
   5.1 Current Water Allocation and Protocol ......................................................................................16
   5.2 Operation Rules and Rule Curve ................................................................................................17
   5.3 Proposed Water Sharing Arrangement .....................................................................................19

6. Implementation of the transaction/Selection of the private Partner ..............................................19
   6.1. Implementation ..........................................................................................................................19
   6.2. The Contract/Concession structure .........................................................................................20
   6.3. Qualification Process .................................................................................................................20

7. The Philippines ................................................................................................................................22
   7.1. Macroeconomic Outlook ........................................................................................................22
1. **Introduction**

1.1. **Background**

The Angat Hydroelectric Power Plant (AHEPP) was originally conceived in 1939 as a run-of-river plant primarily for power development. The concept was later changed to a multipurpose reservoir that would provide domestic and industrial water supply, irrigation, power, flood control and other purposes. With its operation commencing in 1968, three government agencies stood to benefit from its integrated development, namely: National Power Corporation (NPC), MWSS, and National Irrigation Authority (NIA).

Currently, the Angat Dam is the source of domestic water supply for Metro Manila’s 15 million population, irrigation supply for 28,000 hectares of farmlands in Bulacan and Pampanga Provinces, and water for hydro-electric power supply for the Luzon Grid. During rainy season, the dam also serves as a flood control facility where the reservoir serves as a buffer for the increased water inflow in the watershed catch basin.

1.2. **The AHEPP Complex**

The AHEPP has an installed capacity of two hundred forty six Megawatts (246 MW) in total, and is operated by the discharges released from the dam for domestic water supply to MWSS and irrigation water supply to NIA. The integrated powerhouse complex of the Project is composed of two (2) power stations – the Main and Auxiliary Power stations.

The Main Power Station, with installed hydroelectric generation capacity of four (4) 50 MW main turbines, is owned by PSALM and operated and maintained by NPC. The Auxiliary Power Station with a total capacity of 46 MW is composed of five (5) auxiliary turbines with the following generation capacity:

- **A. PSALM-owned auxiliary turbines:**
  - a. Auxiliary Turbine #1 (AN-1) – 6 MW
  - b. Auxiliary Turbine #2 (AN-2) – 6 MW
  - c. Auxiliary Turbine #3 (AN-3) – 6 MW

- **B. MWSS-owned auxiliary turbines:**
  - a. Auxiliary Turbine #4 (AN-4) – 10 MW
  - b. Auxiliary Turbine #5 (AN-5) – 18 MW

All the auxiliary turbines are also operated and maintained by NPC.
The key technical features of the plant are as below:

A. **Reservoir**

   The reservoir created by the dam is 35 km long when the water surface of 2300 hectares is at normal maximum pool and 3 km wide at its widest point. The key features are:

   - Drainage: 568 Sq.Km
   - Lowest river bed elevation at dam site: Elev 92.50m
   - Maximum normal pool level: Elev 217 m
   - Maximum surcharged pool: Elev 180 m
   - Usable storage: 850 MCM

B. **Main Dam**

   This is a rockfill dam with inclined earth core with the following features:

   - Maximum Height: 131 m
   - Length at Crest: 568 m
   - Widest Section: 550m
   - Elevation at Crest (Middle): Elev 223.5m
   - Elevation at Crest (Abutment): Elev 221.5 m
   - Upstream slope: 1 on 2.5
   - Downstream slope: 1 on 1.35

C. **Spillway**

   The spillways are designed for a design flood of 7500 cms. The key features are:

   - No of Gates (Dimension): 3 (12.5 m X 15.0 m)
   - Type of Gate: Radial tainter, motor driven hoist, chain lift type.
   - Elevation of Ogee Crest: Elev 202 m
Elevation of Approach channel : Elev 190 m  
Elevation of top of gates : Elev 217 m  
Maximum surcharge elevation : Elev 219 m

D. Power Intake
The power intake is composed of a short inlet channel, trash rack structure, Tunnel section, gate structure and tunnel elbow. The invert of the intake is set at Elev. 149 to permit operation with the power pool drawn down to Elev. 158 meters. The intake services both the main and auxiliary power units.

E. Power Tunnel
Water from the power intake is carried through a power tunnel 457 m long. The Power tunnel consists of two sections 8 m dia upstream concrete lined and steel lined section followed by a 7 m dia downstream steel lined section.

F. Penstocks
From the 7 meter dia power tunnel, the conduit is split into two 4.5 meter diameter penstocks. Each of these 4.5 meter penstocks in turn splits into four 3 meter diameter & four 2.5 m diameter penstock which lead to individual units.

G. Power Station
The main power station housing 4 Nos. main units of 50 MW each is pit-type and is rectangular in shape. The size of the pit is 77m(L) X 24m(W) X 37m(H). The auxiliary power station housing 5 Nos. auxiliary Units is at an elevated level and is a conventional surface type. The size of the station is 77m (L) X 9m (H).

H. Switchyard
The Switchyard serves as the switching facility of the power station. It provides the necessary connections/isolations between the AHEPP Transformers and the San Jose Substation through the 115 kV Transmission Lines.

The transformer yard houses main unit transformers and auxiliary unit transformers. The main unit transformer step-up voltage of main units from 13.8 kV to 115 kV. The auxiliary unit transformer for AN-1, AN-2 and AN-3 step up voltage from 4.16kV to 115 kV . The auxiliary unit transformer for AN-4 and AN-5 step up voltage from 3.8 kV to 115 kV.

I. Transmission System
The electric power from the plant is conveyed from the plant to the Luzon Grid through San Jose substation via three 115 kV lines. A feeder serves IPO dam, IPO Limestone Company, Inc., and the Municipality of Norzagaray.

2. Project Background

2.1. Sectoral Context

Based on the 2012 DOE Supply and Demand Outlook for 2012-2030, Luzon Grid would require 10,450 MW of additional capacity (based on an annual average growth rate [AAGR] of 4.47 percent). Moreover, said outlook also anticipates a required additional capacity of 300 MW in 2015 for the Luzon Grid. The Project, which is expected to be commissioned by 2014, would support the efforts and strategies under the 2011-2016 Philippine Development Plan (PDP) to provide adequate electric power supply as well as to ensure the reliability of such power supply with the potential overall increase in average dependable capacity of the AHEPP.
2.2. Project Context

The Project aims to extend the economic life of the MWSS-owned Auxiliary Turbines AN-4 and AN-5 by another thirty (30) years, as well as increase their plant load capacity and energy output through the rehabilitation and replacement of existing runners and electro-mechanical equipment.

The key technical features of MWSS-owned Auxiliary Units 4 and 5 are as below.

Table 1 : Technical Feature AN-4 and AN-5

<table>
<thead>
<tr>
<th></th>
<th>AN-4</th>
<th>AN-5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Turbine</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Francis, Vertical Shaft</td>
<td>Francis, Vertical Shaft</td>
</tr>
<tr>
<td>Rated Capacity</td>
<td>17000 HP</td>
<td>24000 HP</td>
</tr>
<tr>
<td>Rated Net Head</td>
<td>102 m</td>
<td>110 m</td>
</tr>
<tr>
<td>Rated Flow</td>
<td>7.03 Cumecs</td>
<td>22.00 Cumecs</td>
</tr>
<tr>
<td>Normal Speed</td>
<td>600 rpm</td>
<td>400 rpm</td>
</tr>
<tr>
<td>Runaway Speed</td>
<td>1140 rpm</td>
<td>770 rpm</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Allis Chalmer/Ebara</td>
<td>Harbin Electric Machinery China</td>
</tr>
<tr>
<td><strong>Generator</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Vertical Synchronous</td>
<td>Vertical Synchronous</td>
</tr>
<tr>
<td>Output</td>
<td>10 MW</td>
<td>18 MW</td>
</tr>
<tr>
<td>Number of Phase</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Voltage</td>
<td>13.8 kV</td>
<td>13.8 kV</td>
</tr>
<tr>
<td>Rated current</td>
<td>465 Ampere</td>
<td>837 Ampere</td>
</tr>
<tr>
<td>Frequency</td>
<td>60 Hz</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Number of Poles</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Shinko Electric Japan</td>
<td>Harbin Electric Machinery China</td>
</tr>
<tr>
<td>Commissioning Date</td>
<td>1986</td>
<td>1993</td>
</tr>
</tbody>
</table>

2.3. Operational History of AN-4 and AN-5

The following figure indicates the necessity of rehabilitation and maintenance of Auxiliary Units 4 and 5.

Table 2 Last 10 year Generation

<table>
<thead>
<tr>
<th>Year</th>
<th>AN-4 (10 MW)</th>
<th>AN-5 (18 MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual Energy Generation in MWh</td>
<td>Plant Load Factor in percentage</td>
</tr>
<tr>
<td>2002</td>
<td>8,625.90</td>
<td>9.85</td>
</tr>
<tr>
<td>2003</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2004</td>
<td>88.90</td>
<td>0.10</td>
</tr>
<tr>
<td>2005</td>
<td>8,089.90</td>
<td>9.24</td>
</tr>
<tr>
<td>2006</td>
<td>35,850.10</td>
<td>40.93</td>
</tr>
<tr>
<td>2007</td>
<td>22,559.40</td>
<td>25.75</td>
</tr>
<tr>
<td>2008</td>
<td>29,081.80</td>
<td>33.20</td>
</tr>
<tr>
<td>2009</td>
<td>31,594.70</td>
<td>36.07</td>
</tr>
<tr>
<td>2010</td>
<td>12,855.30</td>
<td>14.68</td>
</tr>
<tr>
<td>2011</td>
<td>32,311.40</td>
<td>36.89</td>
</tr>
</tbody>
</table>
An analysis of the last ten (10) year generation indicates the following:

a) The annual plant load factor for AN-4 and AN-5 are 36.89% and 34.36% respectively for the year 2011.
b) The average annual plant load factor for AN-4 is 20.67% whereas the same for AN-5 is 19.11%.
c) In case of AN-5, the plant was not operational during the period of 2004 to 2008.
d) In case of AN-4, the plant was not operational during the year 2003.
e) The maximum plant load factor (annual) observed for AN-4 is 40.925% in 2006 and 63.275% for AN-5 in 2002.

Fig: 2 AN-4 and AN-5 (snapshots)

Due to age and variety of reasons, both auxiliary turbines are considerably underperforming in terms of generation and other performance indicators. Furthermore, in May 2012, a fire completely damaged AN-5, which also affected the shared transformer used by both auxiliaries, making them unusable. Thus, the need to rehabilitate and modernize AN-4 and AN-5.

2.4. Location

The AHEPP Plant is located at San Lorenzo, Norzagaray, Bulacan to the west of the Sierra Madre Mountains, approximately 58 km north east of Manila.
Fig: 1 Project Location AHEPP
Fig: 2 Map showing Angat dam, associated diversion/storage structures and Irrigation system service area
3. Project Scope

3.1. Rehabilitation & Modernization (R&M) Envisaged Scope

R&M Proposal – AN-4

The equipment which was installed in the year 1986 has expired almost 75% of their useful life. The current operating and generating figures of the plant indicate that the plant has been underperforming substantially. The generation bottlenecks such as erosion of underwater parts, heavy leakages through broken draft tube window, eroded guide vane and seals could be the reason for the decrease in plant performance parameters. It can be inferred that long course of operation of electrical and mechanical equipment without major overhaul had caused deterioration of many of the vital components and system of machines.

Bidders are recommended to pay attention to reusability of any of the main components to be featured in AN-4. However control and relay panels, power and control cables need to be completely replaced.

R&M Proposal – AN-5

AN-5 was installed in the year 1993. Theoretically this equipment should have a residual life of 10 or more years. However, the operational history of the plant presents an alarming situation where in the machine was underperforming significantly compared to the performance of AN-4 in the last 10 years.

With the recent fire accident at AN-5, most of the electrical and mechanical equipment are in a completely damaged state. The probability of overhauling is very remote except for certain turbine and generator components like Draft Tube, Spiral casing, stator frame, etc. The selected bidder has to ascertain the level of deformity in these parts due to the fire incident.

As such, the level of R&M required in AN-5 is comparatively more than that in AN-4, notwithstanding the fact that the age of AN-5 is less than AN-4. The most likely possible solution for Rehabilitation and Modernisation of AN-5 is the complete replacement of all electrical and mechanical equipment. The cost estimate used for this feasibility study considers complete replacement of all electrical and mechanical equipment.
3.2. R&M Proposal - Reference Solution

Considering the current operating condition of both units as detailed above, the following reference solution has been elaborated as a reference case for bidders.

Bidders are encouraged to provide their own solutions and/or optimizations of (parts of) this solution.

<table>
<thead>
<tr>
<th>R&amp;M – Reference Solution</th>
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<tbody>
<tr>
<td>i. The existing 1 x 10 MW (AN-4) + 1 x 18 MW (AN-5) units should be renovated, modernized and replaced incorporating the following major measures.</td>
</tr>
<tr>
<td>a. Replacement of the existing runner with a new runner of better design.</td>
</tr>
<tr>
<td>b. Change of Stator winding and core and Rotor winding &amp; change of Stator and Rotor Insulation and material of the core of the generators.</td>
</tr>
<tr>
<td>ii. Replacement of Governor with new microprocessor based digital technology.</td>
</tr>
<tr>
<td>iii. Refurbishment and Automation of Discharge Regulators.</td>
</tr>
<tr>
<td>iv. Replacement of Exciter &amp; AVR with new technology.</td>
</tr>
<tr>
<td>v. Replacement/recalibration of locally mounted instruments.</td>
</tr>
<tr>
<td>vi. Replacement of control and Protection System by the state-of-the art system.</td>
</tr>
<tr>
<td>vii. Refurbishment of Power transformers.</td>
</tr>
<tr>
<td>viii. Replacement of Unit Auxiliary transformers</td>
</tr>
<tr>
<td>ix. Replacement / Renovation of switch yard equipment including breakers with independent outgoing 115kV bays for both the units.</td>
</tr>
<tr>
<td>x. Replacement of all 13.8 kV and LT switchgear</td>
</tr>
<tr>
<td>xi. Replacement of power and Control Cables.</td>
</tr>
<tr>
<td>xii. Provision of separate control room with Air conditioning system.</td>
</tr>
<tr>
<td>xiii. Provision of new 90/20T EOT Crane exclusively for AN-4 &amp; AN-5</td>
</tr>
<tr>
<td>xiv. General refurbishment through repair/overhaul and replacement of defective mechanical and electrical items.</td>
</tr>
<tr>
<td>xv. Common Balance of Plant equipment for both Unit # 4 &amp; Unit # 5 particularly DC control system, compressor system or Nitrogen accumulator system, drainage &amp; dewatering system, earthing &amp; lightning protection, lighting system, ventilation system, firefighting system, DG set etc.</td>
</tr>
<tr>
<td>xvi. Construction of new switchyard (115kV) for AN-4 and AN-5 feeding power directly into the utility network.</td>
</tr>
</tbody>
</table>

Creation of new separate facilities and assets

The new facilities which would be created as part of the rehabilitation and modernization works, are outlined below:

a) **Control Room**
   
   At present, AN-4 and AN-5 are controlled from a common control room meant for Angat Main Plant and Auxiliary Units 1, 2 & 3. With the selection of a private partner, there would be two operators in the auxiliary power house leading to possible conflict and issues related with sharing of these assets. In view of ease of operation as well as need for better management control of both the operators, it is recommended that a new control room be created by the selected private partner. MWSS has identified required land in the close vicinity of the powerhouse which may be used for constructing a control room.

b) **Switchyard and Transformer Area**
   
   It is recommended that a new switch yard and a transformer area with independent transformers may be created by the selected bidder as part of the rehabilitation and modernization works. The space for such creation of independent switch yard and transformer area can be carved out of the existing facility of other operator. MWSS may facilitate the arrangement of such land from the other operator.
3.3. Uprating of Project Capacity

The selected private partner will have the option of uprating the capacity from the existing capacity of twenty eight megawatts (28 MW). However, the minimum prescribed capacity by MWSS for development by the private partner shall be twenty eight megawatts (28 MW). Uprating of capacity will be possible considering the fact that MWSS is planning increase in dam height/storage of Angat Dam.

The increase in dam storage would provide increased head and increased water allocation for drinking water and auxiliary power generation. As such, any increase in uprating of project capacity will result in increased generation.

3.4. Operation and Maintenance Scope

On successful completion of R&M the plant is expected to perform significantly better in terms of plant load factor (PLF). Since the plant has the potential to generate energy throughout the year, theoretically the plant would be able to achieve more than ninety percent (90%) annual PLF.

The key performance parameters to be adhered while operation of the plant by the private partner shall be the following:

a) Plant Load factor (Capacity Factor)

The net plant load factor (Capacity factor) of a power plant is the ratio of the actual output of a power plant over a period of time and its potential output if it had operated at full installed capacity the entire time. In case of this Auxiliary Units 4 and 5, the minimum prescribed plant load factor shall be sixty percent (60%).

b) Plant Availability Factor

The availability factor of a power plant is the amount of time that it is able to produce electricity over a certain period, divided by the amount of the time in the period. In case of
Auxiliary units, considering the events of annual maintenance, preventive maintenance and other exigencies, a minimum performance level shall be eighty-five percent (85%).

The selected private shall be responsible for Operation and Maintenance of the power plant as per the respective Electricity Grid Code of Philippines. The operator shall abide by the requirement of grid such as black start.

3.5. Sale of Power

The selected private partner shall be responsible and free for any power sale arrangement of its choice.

4. Asset Sharing

4.1. Common Assets

Though the ownership of Auxiliary Units 4 and 5 is with MWSS, other supporting assets which facilitate power generation are owned by PSALM. At present there is considerable amount of asset sharing among the units.

Assets which are shared by PSALM with MWSS owned Auxiliary Units 4 and 5 can be broadly be categorized into the following:

A. Non Power Components
   i. Dam
   ii. Spillway
   iii. Reservoir

B. Power Components
   i. Power House Building
   ii. Power Intake
   iii. Power Tunnel
   iv. Penstocks
   v. Control Room
   vi. Switchyard and Transformer area
   vii. EOT Crane
   viii. Cooling water arrangement

4.2. Proposed Asset Sharing Arrangement

An asset sharing agreement shall form part of the RfP documents that shall be issued to qualified bidders.

5. Water Allocation and Protocol

5.1 Current Water Allocation and Water Right

Based on the National Water Resources Board (NWRB) Resolution No. 016-0806, the updated water allocation for the Angat-Umiray System is as follows:
a. **Domestic Supply.** The current water allocation to MWSS is 46 cubic meter per sec. (cms)\(^1\) and through which MWSS meets the requirement of its two concessionaires responsible for water supply in Metro Manila.

b. **Irrigation.** Some 28,000 hectares of farmlands in the Provinces of Bulacan and Pampanga is being served under the service area of Angat Maasim River Irrigation System (AMRIS) of NIA. Water allocation for irrigation is 26 cms.

c. **Power Generation.** Power generation is a by-product of the combined water allocation for MWSS and NIA that passes through the auxiliary turbines and the main turbines of the AHEPP, respectively. Thus, NPC water right essentially constitutes the water allocation for MWSS and NIA. Water release for hydropower generation is considered transit water and is nonconsumptive compared to releases for domestic water supply or irrigation water.

The approved water allocations are governed by board resolution of the NWRB issued on a monthly basis.

Other key agencies involved in water allocation and plant operation are the following:

- Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) provides weather forecasts to NPC, NWRB, MWSS and NIA. These forecasts are vital in the operation of the plant and spilling Operation.

- Flood Forecasting and Warning System for Dam Operations (FFWSDO) at NPC is responsible for the opening of the spillway gates during the rainy season. The FFWSDO has the authority to disseminate flood warning. The spilling operation is designed to control the flooding of low lying areas and prevent any damage to the dam in case of sudden inflow of water to the reservoir.

5.2 **Operation Rules and Rule Curve**

5.2.1 **Operating Level**

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\(^1\) Includes the 15 cms conditional allocation from NIA based on NWRB Board Res. No. 03-0188.
The NWRB Operation Rules for Angat Reservoir divides the reservoir into three zones as below:

a. Flood Control Zone is the reservoir storage above the normal high water level (NHWL) which is set at Elev. 212 m (Dec. 1 – April 30) during non-flood season and Elev. 210 m (May 1 – Oct. 31) during rainy season.

All demands for water supply and irrigation are met and electricity can be generated at the full capacity of the turbine units. Excess inflow is discharge through the spillway. Water releases through the spillway are controlled and regulated by NPC.

b. Operating Zone is the reservoir storage bounded by the NHWL and the minimum water supply is set at Elev. 180 m.

All demands for water supply and irrigation are satisfied. Generation of electricity is limited to the water released for water supply and irrigation. Further water releases for power generation are allowed provided that the auxiliary units are supplied first before the main units.

c. Drought Zone is the reservoir storage from Elev. 180 m and below.

The remaining water in the reservoir is reserved for water supply. Generation of electricity is limited to these water releases. No further water releases for power generation at the main turbines is allowed.

The operational plans of the reservoir are prepared by the Technical Working Group ("TWG"), composed of representatives from the MWSS, NIA, NPC, and NWRB. The TWG submits Annual, Seasonal, Monthly, and 10-day Operational plans to the NWRB for approval.

The protocol also provides for the following general rules in the operation of the reservoir:

- All water releases from the reservoir, in principle, shall be made by turbine discharges and must be recommended by the TWG and approved by the NWRB, except when the water level is above the NHWL.

- When the water is above the NHWL, the reservoir operations shall be in accordance with the flood operation rule reviewed by the TWG and prepared by FFWSDO.

- When there is sufficient available water supply from the reservoir as determined by the NWRB, all of the water requirements of municipal and irrigation uses shall be satisfied. However, during periods when there is a deficit in the available water supply, the water releases for municipal and irrigation uses shall be reduced in accordance with the Philippine Water Code.

- The water level at any given time shall not be allowed to fall in the drought zone, except during critical water shortages where water releases shall be made on the following order of priority: 1) municipal use, 2) irrigation use, 3) river maintenance.

- Requests for additional water releases for power generation or for the maintenance of the minimum elevation of the Bustos and Ipo Dams shall be subject to the approval of the NWRB.

- When there is an incoming weather disturbance, pre-release shall be allowed provided that the release should not affect the requirements of water supply. The operator shall submit the pre-release plan to the NWRB for approval.
NWRB approval is not required for water releases during emergency reservoir operation provided the releases do not affect the requirements of water supply. Emergency reservoir operations are defined as follows:

- **Black Start** – In time of system black out, the plant may be dispatched for immediate restoration of power to the Luzon Grid.
- **Major Earthquake** – After a major earthquake, when the safety of the dam is at stake, the reservoir water must be lowered at a safe reservoir level as determined by the Operator.
- **Abnormal seepage** – When an abnormal seepage trend is observed that might compromise the safety of the dam, the reservoir level must be lowered as determined by the Operator to relieve the dam from high hydraulic pressure.

The TWG shall review the Angat Reservoir operation rules every 5 years or whenever necessary to incorporate the long-term changes in hydrological conditions and to improve operation. Any revision made is subject to NWRB approval.

### 5.3 Proposed water sharing arrangement

A detailed mechanism/agreement on water sharing along with supporting contracts shall be prepared prior to the bidding/RfP stage.

### 6. Implementation of the transaction/Selection of the private Partner

#### 6.1 Implementation

The procurement procedure of choice for this project is the Public Bidding Process under R.A. 7718 (BOT Law). A dual stage process shall be followed where in bidders are first asked to pre-qualify followed by Request for Proposal (RfP). Based on the set evaluation criteria and on the final offer, a private partner would be selected. The selection of the private partner will be followed by signing of contract and rehabilitate-operate-maintain agreement. The signed contract will take effect after the Preferred Bidder has reached financial close. The procedure will start with the invitation to pre-qualify that is anticipated to be advertised in December 2012. Selection of the private partner is expected to be completed by July 2013. Financial Close is anticipated to be reached in the last quarter of 2013. The selected private partner shall be commencing the full-fledged operation of Auxiliary Units 4 and 5 within a period of 15 months from financial close.

The approach to the tender does not split any of the project implementation phases such as design & engineering, erection associated with rehabilitation, operation including maintenance and sale of energy into separate tender procedures, but aims to source an integral solution for the whole of the processes detailed above, the bidder shall offer an integrated solution wherein the above responsibilities shall be accepted. The proposed phases of this tender procedure will be as below:

- **Phase 1:** Prequalification stage and Criteria
- **Phase 2:** Detailed bid/RfP stage

The tender process will be followed by contract close and financial Close. The preferred Bidder will be invited to sign the contract with the Implementing Agency, which will be subject to reaching Financial Close before the stipulated date. The Winning Bidder will then be asked to organize Financial Close in line with the Financial Plan submitted by the bidder. On or before the stipulated
date the Winning Bidder will sign the Financial Close after which the project will be assumed to start.

6.2. The Contract/Concession structure

The contract structure of this concession is aimed at equitable sharing of risk among MWSS and the selected private partner. The below table revisits the concession structure envisaged for the project:

<table>
<thead>
<tr>
<th>Concession Structure</th>
<th>Item</th>
</tr>
</thead>
</table>
| **Asset Ownership** | • The ownership of the asset will be with MWSS.  
• MWSS will be charging a nominal lease on the facilities and land provided for creation of control room. |
| **MWSS Role** | • Water availability and water allocation among Operator 1 (operator of the ANs 1, 2 & 3) and Operator 2 (private partner/operator of ANs 4 & 5). This will be subject to the water protocol and NWRB guidelines  
• Providing additional land for creation of separate facilities such as control room, service bay.  
• Arrangement for agreement for sharing of resources such as non-power components. |
| **Private Partner Role/Scope of Work** | • Detailed Assessment of R&M requirement. This includes preparation of a detailed project report covering assessment of individual component, field test of equipment, residual life assessment of individual component, design & engineering of new facilities and capital cost estimation.  
• Arrange and invest Capital for Renovation and Modernization.  
• Undertake complete R&M of the plant with in a contract defined period of 15 months. Private partner shall be liable to pay liquidated damages in case of any delay in completion of R&M.  
• Management, Operation and Maintenance of Power Plants as per the agreed performance measures and standards. The key performance measures will be the agreed plant load factor. Private partner will be liable to pay penalties in case of decreased generation or plant load factor. The other key performance standard will be Plant Availability Factor. Percentage Forced Outage.  
• Sale arrangement for sale of energy and revenue realization. The private partner shall be free to sell energy under wholesale Electricity Spot Market and applicable ERC regulation.  
• The private partner shall enter into transmission service agreement with NGCP for usage of transmission lines. All applicable transmission charges shall be borne by private partner or its buyer agencies. |
| **Revenue and Compensation terms** | • For private partner, revenue is generated from sale of energy.  
• For MWSS, revenue will be the revenue share offered by the private partner. |

6.3. Qualification Process

The competitive public bidding for the MWSS AHEPP Project will be conducted in accordance with the procurement rules and procedures for public bidding set under the
BOT Law and its Revised Implementing Rules and Regulations, the applicable provisions of which are incorporated herein by reference.

The procedure for Submission and Opening of Qualification Documents is as follows:

(i) On the Qualification Documents Submission Date, Prospective Bidders are required to submit their Qualification Documents to:

Attention: Nathaniel C. Santos  
PBAC Head  

Prequalification, Bids and Awards Committee for PPP for the  
MWSS AHEPP Project  
Metropolitan Waterworks and Sewerage System,  
MWSS Compound, Katipunan Avenue, Balara, Quezon City

(ii) The Qualification Documents must be submitted before 2:00 PM of 31 January 2013, on the Qualification Documents Submission Date. The date and time of submission shall be recorded through the use of an official clock designated by the PBAC for that purpose. Each set of the Qualification Documents submitted shall be numbered in the order received and stamped with the time of receipt. In addition, the receipt of each set of Qualification Documents will be recorded in a register in the order of receipt specifying the date, time and name of the Prospective Bidder submitting the same.

(iii) Immediately after 2:00 PM on the Qualification Documents Submission Date, the PBAC will begin the opening proceedings by announcing the names of the Prospective Bidders who have submitted Qualification Documents and any such other details as the PBAC may consider appropriate. The PBAC will then proceed with opening the envelopes of each Prospective Bidder, one at a time, in the order in which the same were received. The duly authorized representatives for each Prospective Bidder who attend the opening proceedings shall sign the register confirming their attendance.
7. The Philippines

7.1. Macroeconomic Outlook

The Philippine economy is estimated to expand by 5.4% in 2012. Forecasts for 2013 are set around 6% growth. Private consumption, amounting currently to roughly 70% of GDP, will expand by 5.1% - contributing a little under 4% to overall economic growth. Analysis has it that private consumption will be underpinned by moderate global growth, through remittances from overseas labour and continued government transfers.

Fixed investment will grow at a slower rate in 2013, reflecting in part a temporary slowdown from the strong expansion seen in 2012. Being given investment-grade rating by international credit rating agencies will also likely provide a big boost. Between 2014 and 2017 real GDP is expected to average 5.9% per annum. Both private consumption and investment are expected to grow at similar levels. Export growth between 2014 and 2017 is estimated to average 7.4% per year. Import growth will be largely linked to this as import-export flows are substantially comprised of parts/goods assembly activities.

<table>
<thead>
<tr>
<th>Table 2 - Economic growth</th>
<th>2012 Estimates</th>
<th>2013 Forecasts</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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<tr>
<td>GDP</td>
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<td>5.6</td>
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<td>Exports of goods and services</td>
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<td>6.9</td>
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<td>Imports of goods and services</td>
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<tr>
<td>Services</td>
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<td>7.6</td>
<td>6.9</td>
<td>6.2</td>
<td>6.6</td>
<td>6.4</td>
</tr>
</tbody>
</table>

(Source: Economist Intelligence Unit 2012)

7.2. Taxation

Corporate Income Tax

Generally, a corporation organized and existing under the laws of the Philippines is subject to a regular corporate income tax ("RCIT") of thirty percent (30%) imposed on its taxable income derived during each taxable year from all sources within and without the Philippines.\(^1\) In addition, beginning the fourth taxable year immediately following the year it commenced business operations, a minimum corporate income tax ("MCIT") of two percent (2%) of the gross income is imposed on a corporation when the MCIT is greater than RCIT. Any excess of the MCIT over RCIT shall be carried forward and credited against the RCIT for the three (3) immediately succeeding taxable years.\(^2\)

The income derived by the proponent from the Project shall be subjected to RCIT. The four year period prior to the imposition of the MCIT shall be reckoned from the registration of the proponent with the BIR.

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\(^1\) Republic Act No. 8424, as amended, ("Tax Code"), Sec. 27(A)(1).

\(^2\) Id., Sec. 27(E)
Value Added Tax

Value-Added Tax ("VAT") is a form of sales tax. It is a tax on consumption levied on the sale, barter, exchange or lease of goods or properties and services in the Philippines and on importation of goods into the Philippines. It is an indirect tax, which may be shifted or passed on to the buyer, transferee or lessee of goods, properties or services.  

Any person who, in the course of trade or business, sells barters, exchanges, leases goods or properties, renders services, and any person who imports goods shall be subject to the value-added tax (VAT) equivalent to twelve percent (12%) of the gross selling price or gross value in money of the goods or properties sold, bartered or exchanged, such tax to be paid by the seller or transferor; or gross receipts derived from the sale or exchange of services, including the use or lease of properties.

Sales of generated power by a generation company is zero-rated for the purpose of imposition of VAT. Therefore, the income derived by the Proponent from the electricity generated shall be subjected to zero percent (0%) VAT.

Local Government Taxes

Consistent with the principle of local autonomy of Local Government Units ("LGUs") under the 1987 Philippine Constitution, LGUs have authority under the Local Government Code ("LGC") to levy taxes, fees and charges within their respective political subdivisions.

Local government units shall have a share based on the preceding fiscal year from the proceeds derived by any government agency, government-owned or controlled corporation, or private corporation engaged in the utilization and development of the national wealth based on the following formula whichever will produce a higher share for the local government unit:

(a) One percent (1%) of the gross sales or receipts of the preceding calendar year; or

(b) Forty percent (40%) of the mining taxes, royalties, forestry and fishery charges and such other taxes, fees or charges, including related surcharges, interests, or fines the government agency or government-owned or -controlled corporation would have paid if it were not otherwise exempt.

The local government shall have a share in the income derived by the Proponent in the Project Based on the foregoing schedule.

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1 Tax Code, Sec. 105.
2 Id.
3 Revenue Memorandum Circular Nos. 7-2006, 8-2006, and 22-2006.
4 Tax Code, Sec. 106.
5 Id., Sec. 108.
7 1987 Philippine Constitution, Art. X, Sec. 2.
8 Republic Act No. 7160 ("RA 7160").
9 1987 Philippine Constitution, Art. X, Sec. 5.
10 Section 66 of R.A. 9136 and 2, Rule 29B, Sec. 2, of its Implementing Rules and Regulations extended the applicability of Section 291 of R.A. 7160 to private corporations.
11 R.A. 7160 Section 291.