



## ADDENDUM 02

ޕްރޮޖެކްޓް ނަންބަރު Project No:	TES/2016/G-007
ޕްރޮޖެކްޓް ދާރުޞަފްޔު Issued Date:	Monday, September 19, 2016
ޕްރޮޖެކްޓް ނަންބަރު Project:	Design, Supply, Installation and Maintenance of renewable energy hybrid power plants in HaaDhaalu Atoll – Maldives
ޕްރޮޖެކްޓް ދާރުޞަފްޔު Deadline for submission:	Monday, September 26, 2016 at 1300 hrs
ޕްރޮޖެކްޓް ނަންބަރު No. of Pages: - 10	

Please include this clarification when submitting the proposal

1. Please find the Addendum 2 & **Clarification 5** issued, attached with this sheet.

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Signature:





**Ministry of Finance and Treasury**  
Male' Republic of Maldives

**Preparing Outer Islands for Sustainable Energy Development**

**Design, Supply, Installation and Maintenance of renewable energy hybrid power plants in  
Haa Dhaalu Atoll – Maldives**

**ADDENDUM 2**

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**Item #1. Section 6, Chapter 2.6.3 “Overview of possible installation locations for PV roof top systems”**

***Initial version:***

“Table 7: B03 - Analysis of the available roofs and maximum PV power installable: 334.1kWp”

***Amended version (replace the initial version):***

“Table 7: B03 - Analysis of the available roofs and maximum PV power installable: 328.9kWp”

**Item #2. Section 6, Chapter 3.2.1.1 “General”**

***Initial version:***

“The nominal cumulative DC power (STC conditions) of the PV systems shall amount at least to 2.23 MWp (+2.5%/-0%), distributed in 13 islands.”

***Amended version (replace the initial version):***

“The nominal cumulative DC power (STC conditions) of the PV systems shall amount at least to 2.23 MWp (+2.5%/-0%), distributed in 13 islands (+/- 10% DC power variation is allowed on the specific islands as long as the total contractual amount is within the above given range).

Only Monocrystalline and Polycrystalline Module technologies are allowed.”

**Item #3. Section 6, Chapter 3.2.3.2 “Materials and Installation”**

**Change No.1:**

The following is to be added to this Chapter:

Most roofs are Lysaght Trapezoidal Steel Sheets (0.47mm thick) with the following dimensions:





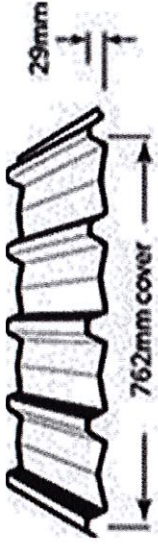


Figure 1: Typical Trapezoidal Roof Sheet

**Change No.2:**

***Initial version:***

"All nuts, bolts, screws and other fasteners shall be made out of stainless steel, suitable to withstand the environmental conditions for 20 years without any signs of visible corrosion."

***Amended version (replace the initial version):***

"All nuts, bolts, screws and other fasteners shall be made out of stainless steel, suitable to withstand the environmental conditions for 20 years and should prevent water leakages".

**Item #4. Section 6, Chapter 3.2.4.5 "Euro-Efficiency of Inverter"**

Euro efficiency of the inverter shall be changed as follows:

The requirement for the minimum euro efficiency of the proposed inverter shall not be less than 97%.

**Item #5. Section 6, Chapter 3.2.6.2 "Technical Requirements for every island"**

***Initial version:***

"Linearity:  $\pm 0.005\%$  Absolute Accuracy: 0.05%"



***Amended version (replace the initial version):***

“Linearity:  $\pm 0.01\%$  Absolute Accuracy:  $0.05\%$ ”

**Item #6. Section 6, Chapter 3.3.1 “Batteries”**

***Initial version:***

“The guaranteed cycle life (End of Life: 80% of initial capacity) shall be the following:

- A minimum of 4.000 cycles at 80% of DoD at 25°C

and

- A minimum of 800 cycles at 80% of DoD at 25°C and  
a minimum of 1.500 cycles at 60% of DoD at 25°C and  
a minimum of 2.400 cycles at 40% of DoD at 25°C and  
a minimum of 3.500 cycles at 20% of DoD at 25°C”

***Amended version (replace the initial version):***

“The guaranteed battery cycle life shall be dependent from energy throughput.

4000 cycles @80% correspond to the same energy throughput as

800 cycles @ 80% + 1500 cycles @60% + 2400 cycles @40% + 3500 cycles @20%, so both have to be fulfilled.”



**Item #7. Section 6, Chapter 3.3.2 “Battery Inverters/Chargers”**

**Change No.1:**

***Initial version:***

"The overload capability of the inverter must be at least 150% of their nominal power for at least 5 min."

***Amended version (replace the initial version):***

"The overload capability of the inverter must be at least 150% of their nominal power for at least 30 seconds."

**Change No.2:**

***Initial version:***

- Minimum conversion efficiency: ≥96%

***Amended version (replace the initial version):***

- Minimum conversion efficiency: ≥94% (one way)

**Item #8. Section 6, Chapter 3.3.3 “BESS Housing”**

**Change No.1:**

***Initial version:***

"It shall be equipped with a redundant inverter air conditioning system, where a failure of one system will not lead to a complete failure of the system. Any failure in the air conditioning system must be communicated to the operator via a control system."

***Amended version (replace the initial version):***

"It shall be equipped with a redundant inverter air conditioning system, where a failure of one system shall not lead to a complete failure of the battery system. A failure in the air conditioning system must be communicated to the operator via a control system. This can be done with a temperature sensor inside the battery inverter room."





**Change No.2:**

***Initial version:***

"The battery shall preferably be installed in a room/additional building next to the powerhouse where the genset power system is located. In case of powerhouse relocation as for islands B04 Finey Island and B15 Vaikaradhoo Island a pre-wired ISO-Container shall be provided for battery housing. The Following specifications have to be fulfilled:"

***Amended version (replace the initial version):***

"The battery shall preferably be installed in a room/additional building next to the powerhouse where the control room is located. It is also allowed to extend the powerhouse for this purpose or provide the system in a pre-wired ISO-Container that shall be installed next to the powerhouse. It is mandatory to use proper concrete foundations for the container. In case of powerhouse relocation a pre-wired ISO-Container for battery housing is mandatory. The following specifications for the battery room must be fulfilled:"

**Item #9. Section 6, Chapter 3.5.4 "Project Requirements"**

***Initial version:***

"All Electrical works under this contract shall be carried out by qualified electrical technicians licensed by MEA or under the direct supervision of an electrical engineer licensed by MEA. Similarly mechanical and civil works shall be carried out by qualified personnel approved by relevant government authority (MEA, MHI etc.) to the satisfaction of the Employer's Representative."

***Amended version (replace the initial version):***

"All Electrical works under this contract shall be carried out by qualified electrical technicians. Similarly mechanical and civil works shall be carried out by qualified personnel. All detailed designs shall be approved by relevant government authority."

**Item #10. Section 6, Chapter 3.7.1.1 "General Approach"**

The following sentence is to be added:



“The minimum data logging interval for all relevant parameters that will be defined by the Employer during detailed design and that can be stored shall be  $\leq 1$  minute.”

**Item #11. Section 6, Chapter 3.7.5 “Data Communication Network”**

The following paragraph has to be added:

“The PCMS shall also be able to include any other sensors necessary for the functioning of the system and provide the data of additionally included sensors in the Modbus protocol. The communication protocol of the sensors to be included may be of a different kind than Modbus.”

**Item #12. Section 6, Chapter 3.9.4 “Equipment Earthing and Bonding”**

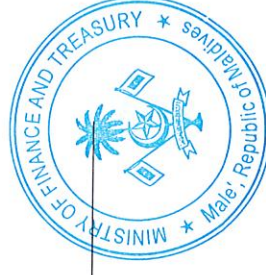
***Initial version:***

“All metal other equipment and casings (as outlined below) shall be bonded together, as they are inter-connected by the power cables. The bonding shall be made using copper conductors of 10mm<sup>2</sup> XSA minimum. A separate conductor shall be used specifically for that purpose.

- The array structure shall be bonded directly to the main earth electrode with a resistance of less than 1.7ohms.
- The inverter casings shall be bonded (directly or indirectly) to the main earth electrode with a resistance of less than 1.7ohms.
- The resistance between any enclosures in any one location, shall be less than 0.2 ohms.
- The earth resistance of the earth electrode shall be less than 10ohms.”

***Amended version (replace the initial version):***

“All metal equipment and casings shall be bonded together, as they are inter-connected by the power cables. The bonding shall be made using copper conductors of minimum 10mm<sup>2</sup>. A separate conductor shall be used specifically for that purpose.





The resistance requirement in between enclosures shall be less than 1 ohm. The resistance measured against ground shall be less than 1 ohm.

The design shall be based on international standards and codes (IEC and specific Maldivian standards and codes). The specific standards applicable for earthing requirements are:

IEC 60364-7-712 Electrical installations of buildings Part 7-712 Requirements for special installation locations-Solar photovoltaic (PV) power supply systems

IEC 60364-5-54 Electrical installations of buildings Part 5-54 Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors

IEC 62548 Photovoltaic (PV) arrays - Design requirements”

**Item #13. Section 6, Chapter 3.13.1 “Cold Commissioning: Testing of the PV Plant”**

***Initial version:***

“The verification of the Commissioning tests will be based at least on the latest published testing procedure IEC 62446: Grid-connected photovoltaic systems – Minimum requirements for system documentation, Commissioning tests, and inspection, for all electrical Commissioning. The verifications shall include, but not be limited to, the following equipment to be tested.”

***Amended version (replace the initial version):***

“The verification of the Commissioning tests will be based at least on IEC 62446-1, 2016: Grid-connected photovoltaic systems – Minimum requirements for system documentation, Commissioning tests, and inspection, for all electrical Commissioning. The verifications shall include, but not be limited to, the following equipment to be tested.”



## Clarification 5

No.	Section No and Page No	Original Statement	Question	Clarification result
1	Section6 Page159 3.5.6.3 Enclosure	Outdoor weatherproof GRP sealed enclosures shall be protected to IP 67,	It is unnecessary to satisfy IP 67 for enclosures, Is it acceptable to satisfy IP66 or IP65 ?	IP65 can be used instead of IP67
2			Electrical Drawings of Substation in B12 required	Please refer to Section 6_Drawings/01. Network Upgradation
3			Are there Cable ducts in B12 ? Presently there are tiled pavement and things are not clear	Yes there are cable ducts. And space is available in these ducts.
4			Distribution Board drawing of B12 still missing hence required	Please refer to Section 6_Drawings\02. Power House SLD
5			Network drawing of B03 & B15 is not available hence required	Its B04 & B15. Please refer to clarification 3 for answer
6			Can we discuss with some concerned person in project technical department for more clarity on installation and relocation of genset and fuel tanks?	During this stage all communications shall be done through ministry of finance.
7			Roof Structural drawings are missing hence required to understand exact installation requirements.	Roof structure drawings will be shared with winning party.

