



**Maldives Energy Authority**

**Manual**  
**for**  
**Photovoltaic Grid-connection Application**

February 2013

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# **1 INTRODUCTION**

## **1.1 Background**

In order to mitigate the climate change and to provide energy security to Maldivians, the Government plans to promote the use of indigenous and clean sources of energy in addition to promoting energy conservation and efficiency.

While at present, the current source of fuel for electricity production is diesel, introduction of PV system into the generation mix is part of the broader objective which is expected to be achieved by the introduction of solar Photovoltaic (PV) grid connected systems.

## **1.2 Objective of Manual**

This manual has been developed to guide application procedure for the customers who introduce Grid-connected PV system in the Maldives. Also it describes validation flow and approval method by related organizations. The technical requirements which will be verified during the application procedure are described in “Guidelines on Technical Requirements for Photovoltaic Grid-connection”.

## **1.3 Intended Users**

The intended users of these guidelines are primarily the followings:

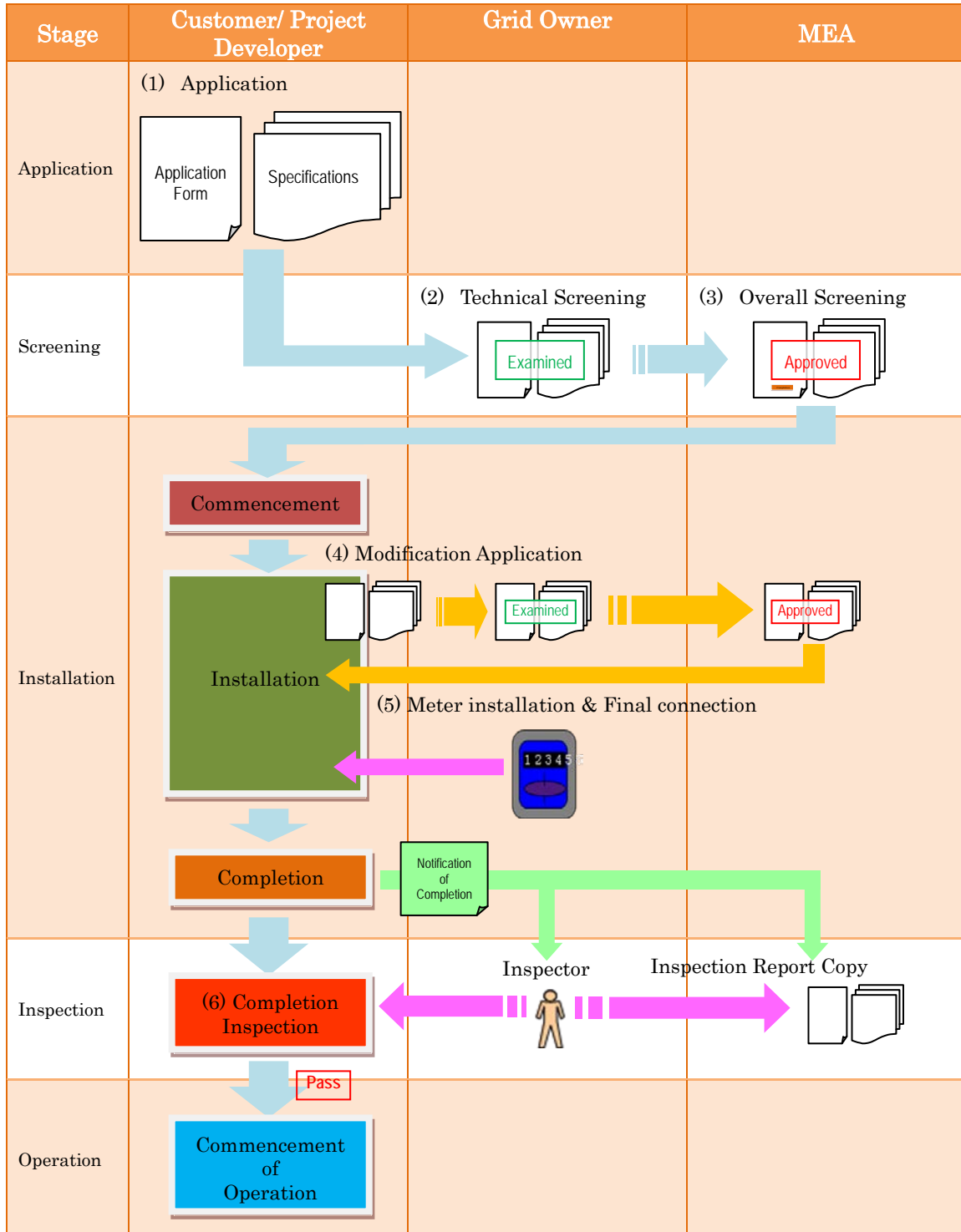
- Maldives Energy Authority (MEA)
- Grid Owner
- Private PV project developers
- Customers who install Grid-connected PV system

## 2 Application Procedure

### 2.1 Application Flowchart

The transaction from application to approval is shown in Figure 2-1. And the description for each step is mentioned in the following paragraphs.

Figure 2-1 Application flowchart for PV Grid-connection



(1) Application

Customers who install PV systems shall submit an application form with related specifications to Grid Owner before they start the installation work. (ANNEX 1) The application should accompany technical specification of equipments, single line diagram of the PV system showing the necessary connection, safety devices, connection points, etc

(2) Technical Screening by Grid Owner

Grid Owner shall examine adaptability of specifications taking guidelines and their requirement from existing facilities into consideration. In case that reverse power flow is allowed, sell power meter shall be procured by them. Also setting values for protection relays shall be determined during this screening. (ANNEX 2)

(3) Overall Screening by MEA

MEA (or any party designated by MEA) shall check the final application and if it agrees with their requirements in accordance with guidelines, they approve the interconnection of PV system. After the approval, customers can start their installation. (ANNEX 2)

(4) Modification Application

Any modification concerning the approved system specification shall be submitted immediately utilizing the same application form. (ANNEX 1)

(5) Meter installation & Final connection by Grid Owner

Meter installation and final connection work shall be done by Grid Owner in the presence of customer or customer' representative. Those costs shall be born by customers including meter and connection terminal.

(6) Completion Inspection

When the installation completes, customers shall submit "Notification of Work Completion" (ANNEX 3) to Grid Owner and MEA to request a completion inspection.

After reception of it, Grid Owner shall send inspectors to verify the adaptability of PV system. (ANNEX 4)

## 2.2 Role of Each Organization

The role of each organization is shown in Table 2-1.

**Table 2-1 Role of Each Organization**

Stage	Customer	Grid Owner	MEA
Application	<ul style="list-style-type: none"> <li>● Preparation of application form and specifications</li> </ul>		
Screening		<ul style="list-style-type: none"> <li>● Screening of technical adaptability</li> <li>● Investigation of setting values for protection relays</li> </ul>	<ul style="list-style-type: none"> <li>● Screening of overall adaptability with guidelines</li> <li>● Approval of grid-connection</li> </ul>
Installation	<ul style="list-style-type: none"> <li>● Installation of PV system</li> </ul>	<ul style="list-style-type: none"> <li>● Installation of Meter</li> <li>● Final connection</li> </ul>	
Inspection	<ul style="list-style-type: none"> <li>● Submission of notification of work completion</li> </ul>	<ul style="list-style-type: none"> <li>● Completion of Inspection</li> </ul>	<ul style="list-style-type: none"> <li>● Receive inspection report and provide final endorsement.</li> </ul>

(Application Form for PV Grid-connection [new / modification])

(Category of interconnection)

(Item)	(Specification)
(Electric system)	1 φ, 230V <input type="checkbox"/> , 3 φ, 400V <input type="checkbox"/> , 3 φ, 11kV <input type="checkbox"/>
(Reverse power flow)	(With) <input type="checkbox"/> , (Without) <input type="checkbox"/>
(Type of contract)	(Domestic) <input type="checkbox"/> , (Business) <input type="checkbox"/> , (Government) <input type="checkbox"/> (Others) <input type="checkbox"/>
(Requesting date of interconnection)	

(Customer information)

.....  
(Customer name)

.....  
(Meter number)

.....  
(Address)

.....  
(Contact number)

(Protection relay specification)

(Relay name)	(Setting range)	(Setting value)
(Over-Voltage-Relay)	Relay:	
	Time delay:	
(Under-Voltage-Relay)	Relay:	
	Time delay:	
(Over-Frequency-Relay)	Relay:	
	Time delay:	
(Under-Frequency-Relay)	Relay:	
	Time delay:	
(Islanding operation detection)	(Active type)	Method: —
		Relay:
		Time delay:
	(Passive type)	Method: —
		Relay:
		Time delay:

(PV System specification)

(Item)	(Specification)
(PV brand & model)	
(PV rated capacity)	W <sub>p</sub>
(Inverter brand & model)	
(Inverter rated output)	kVA
(Inverter rated output voltage)	V
(Inverter rated power factor)	

Application Reference Number:

(Grid Owner & MEA only)

**Grid Owner**

Sell Power Meter Brand & Model:

Date:

**MEA**

Date:

\* All necessary specifications shall be submitted as attachments.

## (Application Screening Sheet)

Screening items	View points	Grid Owner	MEA
1. System configuration	/ Unnecessary equipments / Unusual connection / Inadequate combination		
2. Capacity of existing facilities	/ Overload of existing cables / Overload of existing transformer		
3. Interconnection voltage	/ conformability between system voltage and grid voltage		
4. Electric system	/ Phase arrangement		
5. Interconnection facilities	/ Unusual connection		
6. Metering	/ With or without reverse rotation protection		
7. Power factor	/ Rating and control function of inverter / Present power factor		
8. Voltage fluctuations	/ Amount of surplus power / Existing voltage fluctuations		
9. Protection relays	/ Setting values / Relay type		
10. Islanding operation detection	/ Detection method / Unnecessary in case of no reverse power flow		
11. Automatic recovering function	/ With or without a condition of receiving voltage confirmation before recovering		
12. Automatic load limiting and power generation suppression	/ Possibility of overload		

Examined by:

Application Reference Number:

\_\_\_\_\_ Date:

Grid Owner

\_\_\_\_\_ Date:

MEA



## (Inspection Sheet)

Screening items	View points	Grid Owner	MEA
1. System appearance	/ Abnormal noise and/or smell / Overheat		
2. Specifications	/ Conformability with documents (name plate)		
3. Location	/ Wet and/or dirty place		
4. Mounting	/ Fastening of bolts and nuts		
5. Interconnection facilities	/ Parallel-in and off test / Automatic synchronizer		
6. Metering	/ Calibration / Direction (reverse rotation protection)		
7. Cable connection	/ Loose of terminal / Inadequate cables or connections		
8. Protection relays	/ Relay type / Setting values		
9. Power quality	/ Voltage & Frequency fluctuations / Power factor / Harmonics		
10. Islanding operation detection *	/ Detection method / Setting value		
11. Automatic recovering function *	/ With or without a condition of receiving voltage confirmation before recovering		
12. Automatic load limiting and power generation suppression *	/ Test utilizing actual facilities or practical examinations		

\* Only in case that system requires functions

Application Reference Number:

Inspected by:

\_\_\_\_\_ Date:

Grid Owner

\_\_\_\_\_ Date:

MEA

Attention: Maldives Energy Authority  
Grid Owner

## Notification of Work Completion

Dear Sirs,

We notify that following installation work for grid-connected Photovoltaic system has been completed and request your inspection.

1. Application reference number : \_\_\_\_\_
2. Customer name : \_\_\_\_\_
3. Address : \_\_\_\_\_
4. Completion date : \_\_\_\_\_

\_\_\_\_\_