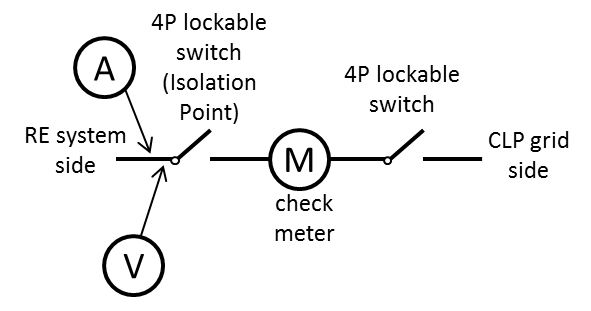
Testing and Commissioning Procedure

Disclaimer: This sample document is an example for purposes of illustration only and is intended to serve only as a general resource, not as a form or recommendation.

**Check-list before the Site Test**

1. Perform visual inspection for the whole RE system.
2. Check all wiring connections for the whole RE system.
3. Anti-islanding Test
   1. Connect the voltage terminals & current transformer (CT) of oscilloscope / data logger to the RE system side of 4P lockable switch (Isolation Point).



* 1. Close XXA 4P lockable switch located at XXXXX from the grid supply side.
  2. Close XXA 4P lockable switch (Isolation Point) located at XXXXX from the RE system side.
  3. Close all the below switching devices in MCB board,
     1. XXXXX
     2. XXXXX
  4. Simulate the system disturbance by opening the lockable isolation switch (Isolation Point), record the voltage and current waveforms by oscilloscope/data logger to demonstrate the anti-islanding time <200ms.

1. Check for the “Grid Turn-on Delay” for the RE system is 300 sec.
2. The harmonic content of voltage and current waveforms will be recorded by oscilloscope/data logger.
3. Review and download the record waveform/data from oscilloscope/data logger.
4. Complete the T&C Report & Electricity (Wiring) Regulations, Work Completion Certificate – WR1 form, and receipt issued by EMSD evidencing payment for Registration of Generating Facility, if applicable, then sent to CLP for arranging CLP witness of site test.

**Testing and Commissioning Procedures for Grid Connection of RE System**

1. Check installation, earth bonding and wiring for the grid-connection section.
2. Harmonic current distortion test as per “Check-list before the Site Test”.
3. Demonstrate anti-islanding protection circuit to meet 0.2s protection time as per “Check-list before the Site Test”.
4. Measure the earth fault loop impedance of the RE system.
5. Measure the line-neutral loop impedance of the RE system.
6. Measure the RCD/RCBO trip time if applicable.
7. Inspect DC & AC dual-source warning labels along the path from RE system to CLP’s power infeed.

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| **Part 1 – Grid Connected Renewable Energy System Summary** | | | | | | | | |
| **A) RE System Information** | | | | | | | | |
| CLP’s Application No. | | | |  | | | | |
| RE Type | | | |  | | | | |
| Power Rating (kW) | | | |  | | | | |
| Current Rating (A) - | | | |  | | | | |
| No. of Phase | | | |  | | | | |
| RE Installation Address | | | |  | | | | |
| **B) Lift Availability (only apply to new construction building)** | | | | | | | | |
| Lift availability? | | | | Yes | No Remarks: |  | | |
| **C) Contractor Information** | | | | | | | | |
| Contact Person | | | |  | | | | |
| Phone Number | | | |  | | | | |
| **D) Documents Submitted** (Please tick where applicable) | | | | | | | No of Sheet | Remarks |
|  | Part 1 – Grid Connected Renewable Energy System Summary | | | | | |  |  |
|  | Part 2 – T&C Results & Photos | | | | | |  |  |
|  | Part 3 – Photos for Renewable Energy System Installation | | | | | |  |  |
|  |  | 3.1 - Overview of RE equipment (e.g. PV Panels, Wind Turbine & etc) and RE equipment inside Plant Rooms (e.g. Inverter, switchgear & etc) | | | | |  |  |
|  |  | 3.2 - Nameplate & Technical Data Plate & Installation of RE equipment (e.g. Inverter, isolation transformer & etc) | | | | |  |  |
|  |  | 3.3 - Earthing Connection of RE equipment | | | | |  |  |
|  |  | 3.4 - DC warning labels at all DC Switchgear & panel and rating of all DC switchgears | | | | |  |  |
|  |  | 3.5 - AC dual source power supply warning labels at all AC switchgear & panel and rating of all AC switchgears (along the path from RE system to CLP’s power infeed) | | | | |  |  |
|  |  | 3.6 - PV Schematics & Main Electrical Schematic Diagram (with cloud mark of RE System) in Plant Rooms | | | | |  |  |
|  |  | 3.7 - FiT/RE Meter Location, Meter Board’s dimension & Cable Terminations | | | | |  |  |
|  |  | 3.8 - CLP’s Revenue Meter & Substation | | | | |  |  |
|  | Part 4 – RE System Setting | | | | | |  |  |
|  |  | 4.1 - Voltage Protection | | | | |  |  |
|  |  | 4.2 - Voltage Control | | | | |  |  |
|  |  | 4.3 - RE System re-closing time should be ≥ 5 minutes | | | | |  |  |
|  | Part 5 – Other Related Information (e.g. other related RE system or special information) | | | | | |  |  |
|  | Operation Procedure | | | | | |  |  |
|  |  | Cover Page (Basic Information, Safety Procedure, Attachment List, REC & REW Information & Signature) | | | | |  |  |
|  |  | Renewable Energy System Schematic | | | | |  |  |
|  |  | Main Electrical Schematic | | | | |  |  |
|  |  | Renewable Energy System Location Plan in the Premises | | | | |  |  |
|  |  | CLP’s RE/FiT Meter Location Plan with access route | | | | |  |  |
|  | Electricity (Wiring) Regulations, Work Completion Certificate – WR1 form | | | | | |  | |
|  |  | | Part 1, 2 & 3 from Form WR1 | | | |  |  |
|  |  | | Renewable Energy System Schematic | | | |  |  |

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| **Part 2 – T&C Results & Photos** | | | | |
|  | Single Phase RE System (Please only provide test results for the connected phase L1/L2/L3) | | | |
|  | Three Phase RE System (Please only provide test results for all three phase L1, L2 & L3)  (Remark: either one photo for all three phases test result or three separate photos for single phase results) | | | |
| **Tests** | | **Photos & Results** | | |
| **Phase L1** | **Phase L2** | **Phase L3** |
| Anti-islanding time | |  |  |  |
|  | | Results: ms | Results: ms | Results: ms |
| Total Harmonic Current Distortion (should not exceed 5%) | |  |  |  |
|  | | Results: % | Results: % | Results: % |

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| **Part 2 – T&C Results & Photos** | | | | | | | |
| **Tests** | | | **Photos & Results** | | | | |
| **Phase L1** | | **Phase L2** | | **Phase L3** |
| Earth fault loop impedance  (should comply with EMSD’s CoP) | | |  | |  | |  |
|  | | | Results: Ω | | Results: Ω | | Results: Ω |
| Line to neutral loop impedance | | |  | |  | |  |
|  | | | Results: Ω | | Results: Ω | | Results: Ω |
| RCD/RCBO trip time  (if applicable) | | |  | |  | |  |
|  | | | Results: ms | | Results: ms | | Results: ms |
| **Part 3 – Photos for Renewable Energy System Installation** | | | | | | | |
| **3.1 - Overview of RE equipment (e.g. PV Panels, Wind Turbine & etc) and RE equipment inside Plant Rooms (e.g. Inverter, switchgear & etc)** | | | | | | | |
| **Description** | |  | | | |  | |
| **Photos** | |  | | | |  | |
| **Description** | |  | | | |  | |
| **Photos** | |  | | | |  | |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | | | | | |
| **3.2 – Nameplate, Technical Data Plate & Installation of RE equipment (e.g. Inverter, isolation transformer & etc)** | | | | | | | |
| **Description** | |  | | | |  | |
| **Photos** | |  | | | |  | |
| **Description** | |  | | | |  | |
| **Photos** | |  | | | |  | |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | | | | | |
| **3.2 - Nameplate & Technical Data Plate of RE equipment (e.g. Inverter, isolation transformer & etc)** | | | | | | | |
| **Description** | |  | | | |  | |
| **Photos** | |  | | | |  | |
| **Description** | |  | | | |  | |
| **Photos** | |  | | | |  | |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | | | | | |
| **3.3 - Earthing Connection of RE equipment** | | | | | | | |
|  | PV System (Please only provide information in **3.3.1**) | | | | | | |
|  | Wind Turbine System (Please only provide information in **3.3.2**) | | | | | | |
|  | **3.3.3** Others | | |  | | | |
| 3.3.1 Earthing Connection of PV system | | | | | | | |
|  | PV Panels Metallic Frame to PV Panels Metallic Frame (Typical) | | | | | | |
|  | PV Panels Metallic Frame to PV Panels Metallic Supporting Frame (Typical) | | | | | | |
|  | PV Panels Metallic Supporting Frame to Earthing Terminal (Typical) | | | | | | |
| **Description** | | Choose an item. | | | | Choose an item. | |
| **Photos** | |  | | | |  | |
| **Description** | | Choose an item. | | | | Others: | |
| **Photos** | |  | | | |  | |

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| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.3 - Earthing Connection of RE equipment (Cont’d)** | | | |
| 3.3.2 Wind Turbine Metallic Parts to Earthing Terminal | | | |
| **Description** |  | |  |
| **Photos** |  | |  |
| 3.3.3 Others | | | |
| **Description** |  |  | |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.4 - DC warning labels at all DC Switchgear & panel and rating of all DC switchgears (Cont’d)** | | | |
| Please attach the PV Schematic and add cloud mark indication for DC warning labels at DC switchgear/DC switchgears’ metal box and attach their photos with description on the next page. | | | |
|  | | | |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.4 - DC warning labels at all DC Switchgear & panel and rating of all DC switchgears (Cont’d)** | | | |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.4 - DC warning labels at all DC Switchgear & panel and rating of all DC switchgears (Cont’d)** | | | |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.4 - DC warning labels at all DC Switchgear & panel and rating of all DC switchgears (Cont’d)** | | | |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.5 - AC dual source power supply warning labels at all AC switchgear & panel and rating of all AC switchgears (along the path from RE system to CLP’s power infeed)** | | | |
| Please attach the PV Schematic and add cloud mark indication for AC dual source power supply warning labels at all AC switchgear & panel and attach their photos with description on the next page. | | | |
|  | | | |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.5 - AC dual source power supply warning labels at all AC switchgear & panel and rating of all AC switchgears (along the path from RE system to CLP’s power infeed) (Cont’d)** | | | |
| Please attach the Main Electrical Schematic and add cloud mark indication for AC dual source power supply warning labels at all AC switchgear & panel and attach their photos with description on the next page. | | | |
|  | | | |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.5 - AC dual source power supply warning labels at all AC switchgear & panel and rating of all AC switchgears (along the path from RE system to CLP’s power infeed) (Cont’d)** | | | |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.5 - AC dual source power supply warning labels at all AC switchgear & panel and rating of all AC switchgears (along the path from RE system to CLP’s power infeed) (Cont’d)** | | | |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.5 - AC dual source power supply warning labels at all AC switchgear & panel and rating of all AC switchgears (along the path from RE system to CLP’s power infeed) (Cont’d)** | | | |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.5 - AC dual source power supply warning labels at all AC switchgear & panel and rating of all AC switchgears (along the path from RE system to CLP’s power infeed) (Cont’d)** | | | |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.6 – PV Schematics & Main Electrical Schematic Diagram (with cloud mark of RE System) in Plant Rooms** | | | |
| **Description** |  | |  |
| **Photos** |  | |  |
| **Description** |  | |  |
| **Photos** |  | |  |
| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | | |
| **3.7 – FiT/RE Meter Location, Meter Board’s dimension & Cable Terminations** | | | |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |
| **Description** | Choose an item. | | Choose an item. |
| **Photos** |  | |  |

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| **Part 3 – Photos for Renewable Energy System Installation (Cont’d)** | | |
| **3.8 – CLP’s Revenue Meter & Substation** | | |
| **Description** | Choose an item. | Choose an item. |
| **Photos** |  |  |
| **Description** | Choose an item. | Choose an item. |
| **Photos** |  |  |

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| **Part 4 – RE System Setting** | | |
| **4.1 – Voltage Protection – (Please provide RE information/photos as below example)** | | |
| **Description** |  |  |
| **Photos** |  | |  |  | | --- | --- | | **Abnormal Voltage Range**  **(% of nominal voltage)** | **Trip time Requirement**  **(second)** | | 120 < V | ≤0.16 | | 110 < V ≤120 | 1 | | 70 ≤ V ≤ 110 | Continuous operation | | 45 ≤ V < 70 | 2 | | V < 45 | 0.16 | |
| **Description** |  |  |
| **Photos** |  |  |

|  |  |  |
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| **Part 4 – RE System Setting** | | |
| **4.2 – Voltage Control – (Please provide RE information/photos as below example)** | | |
| **Description** |  |  |
| **Photos** |  | Recommended setting:  V3 = 103%, Q3 = 0% rating of the RE System  V4 = 105%, Q4 = Qmax ≥ 43% rating of the RE System |
| **Description** |  |  |
| **Photos** |  | **(p.u.)**  Recommended setting:  V1 = 106%, P1 = 100% rating of the RE System  V2 = 110%, P2 = Pmin ≤ 20% rating of the RE System |

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| **Part 4 – RE System Setting** | | |
| **4.3 – RE System re-closing time should be ≥ 5 minutes** | | |
| **Description** |  |  |
| **Photos** |  |  |
| **Description** |  |  |
| **Photos** |  |  |

|  |  |  |
| --- | --- | --- |
| **Part 5 – Other Related Information (e.g. other related RE system or special information)** | | |
| **Description** |  |  |
| **Photos** |  |  |
| **Description** |  |  |
| **Photos** |  |  |

|  |  |  |
| --- | --- | --- |
| **Part 5 – Other Related Information (e.g. other related RE system or special information)** | | |
| **Description** |  |  |
| **Photos** |  |  |
| **Description** |  |  |
| **Photos** |  |  |