Introduction of JET O&M Certification

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Japan Electrical Safety & Environment Technology Laboratories
## Contents

1. Introduction

2. Guideline for Inspection of PV Systems

3. JET PV O&M Certification Business
1. Introduction

Test standards such as JIS C 8990(IEC61215), JIS C 8991(IEC61646), JIS C8992-1,2(IEC61730-1,2) apply for PV modules. They indicate that as a minimum, the PV modules have the performance and safety as industrial products. But their tests do not guarantee the performance and safety for 20 years and above. Actually, there occur some cases that PV modules in a large-scale system do not generate as is designed due to power output drop, cracked cells, hot spots, junction box failures, etc.

For this reason, appear business operators who contract for maintenance and inspection (O&M), and perform the maintenance and inspection (O&M) based on their individual standards, and so the maintenance and inspection (O&M) have not been unified.

In August, 2015, JET requested that the chairman of the Japan Solar Energy Society set up the third-party committee to investigate a method of maintaining and inspecting PV power systems whose output power is not less than 50 kW. Thus, experts who belong to universities, modules, components and materials, support structures, etc. manufacturers, testing equipment makers, underwriters, related organizations, etc. were called on to participate in the third-party committee. As a result, the Study Committee for Monitoring and Inspection Technologies for PV Power Systems were set up in JET in October, 2015 and the monitoring and inspection technologies for PV Power Systems were deliberated from each professional point of view. This report was deliberated and edited in an easily usable form aiming at the technical guideline, on the basis of which O&M business operators can perform properly and efficiently maintenance & inspection and investigation.

This report was enacted in JET guidelines. In accordance with this guideline, JET began PV-O&M certification business from August 1, 2016.

An overview of the guidelines and JET PVO&M authentication business described in the following
2. Guideline for Inspection of PV Systems

(1) Scope
This guideline shall cover DC electrical circuit etc. from PV modules/arrays, junction boxes to power conditioners (PCS), etc. which comprise PV power systems for non-residential use whose rated DC voltage is not more than 1500V and whose output power is not less than 50kW, and site environment.

(2) Purpose
This aim of this guideline is that the regular inspection and failure investigation which PV maintenance & inspection business operators perform are properly and efficiently implemented to operate stably the PV power system for a long term from the viewpoint of stable supply of electric power. However, this guideline does not guarantee performance and stability of individual PV power systems.

Photo.1 Guideline for Inspection of PV Systems
Left/Published by JSES, Center/JET PV-O&M guideline, Right/PV-O&M guideline (English)
2. Guideline for Inspection of PV Systems

(3) Inspection system
1) PV power system illustration
The inspection power system and site environment is given in Figur. 1

Fig. 1 PV system illustration and site environment
2. Guideline for Inspection of PV Systems

2) Inspection flow
The inspection flow is given in Fig.2.

Fig.2 Inspection flow
2. Guideline for Inspection of PV Systems

(3) Kinds of inspection

The inspection is classified into periodic inspection, failure inspection, and precise inspection. The content of each inspection is given in Table 4. The inspection that meets the purpose shall be selected and performed in accordance with the request of clients who have PV power systems.

Table 1 Kinds of inspection and the contents

<table>
<thead>
<tr>
<th>Kinds of inspection</th>
<th>Purpose and definition of inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periodic inspection</td>
<td>It shall be performed based on the safety regulations. Items except the prescribed ones shall be performed according to clients’ requests. Based on the periodic inspection results, recommend to the clients reconsideration of inspection frequency or precise inspection if necessary.</td>
</tr>
<tr>
<td>Failure inspection</td>
<td>It shall be performed according to clients’ requests. Based on the results of failure inspection, recommend to the clients the periodic inspection or precise inspection.</td>
</tr>
<tr>
<td>Precise inspection</td>
<td>Based on the results of the failure inspection and periodic inspection, perform the specified items. Based on the results of the failure inspection, perform an I-V curve measurement, an IR imaging measurement, an EL imaging measurement, a cell line check, etc. for PV modules etc. whose failure may affect power generation and safety. In case the PV module has to be removed from the system and measured, perform it with the client’s permission.</td>
</tr>
</tbody>
</table>
2. Guideline for Inspection of PV Systems

(4) Contents of inspection

1) Periodic inspection

The periodic inspection shall be performed on the contents as shown in Table2.

Table2  Contents of periodic inspection

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Object</th>
<th>Content of inspection</th>
<th>Inspection frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>① Design document</td>
<td>Confirm it (if it is stored).</td>
<td>First time only. Thereafter confirm that it is kept.</td>
</tr>
<tr>
<td></td>
<td>② Generated energy</td>
<td>Integrated generated energy</td>
<td>Every hour ~ every year (PR value, PR + temperature correction)</td>
</tr>
<tr>
<td>Environment</td>
<td>③ Investigation of installation environment</td>
<td>Visual inspection</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td>(the ground, fence, plants, shadows, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>④ PV array, support structure, foundation</td>
<td>Visual inspection</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td>⑤ Point of grounding work</td>
<td>Measurement (grounding resistance)</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td>⑥ Array junction box</td>
<td>Visual inspection and operation</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td>Generator junction box</td>
<td>Measurement (insulation resistance)</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td>⑦ PCS</td>
<td>Visual inspection and Measurement (insulation resistance)</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td>⑧ Tightened portions of junction box, PCS</td>
<td>IR imaging measurement</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td>⑨ String</td>
<td>IV curve measurement /open circuit voltage measurement</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td>⑩ Module (including terminal box)</td>
<td>Visual inspection</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IR imaging measurement</td>
<td>Every time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV measurement, EL measurement, cell line check</td>
<td>If necessary</td>
</tr>
</tbody>
</table>
2. Guideline for Inspection of PV Systems

2) Failure inspection

The inspection performed in case the inspection of a portion where a failure occurs was requested by electric utilities which have PV power systems is called failure inspection. It is performed selecting from the following ① or ②, or combining ① with ②.

① Inspection related to failures of generated energy, modules, PCS, etc.
② Inspection related to specific components etc. of PV power systems based on the periodic inspection results.

There are some cases that the business operator who has implemented the inspection of failures recommends the periodic and precise inspection to electric utilities which have PV power systems.

3) Precise inspection

Inspection performed by request of electric utilities which have PV power systems based on the periodic inspection and inspection results of failures is called precise inspection. It is performed selecting from the following ① ② ③ ④, or combining them.

① Precise inspection of PV modules, PV arrays
   Visual inspection, IV curve, IR imaging, EL imaging, insulation resistance, etc. measurements
② Terminal box of PV modules
③ Confirm soundness of bypass route, whether wiring of circuit is disconnected or not, etc.
④ Wiring, disconnection of wire
   Confirm the disconnection of electrical circuits in a PV module, soundness of bypass route, and check the conduction failure part of connectors between PV modules, etc.
⑤ The others-----Determine them if requested.
3. JET PV O&M Certification Business

The scheme of JET PV O&M Certification Business started from 1st August, 2016. This certification business consists of three items which are registration of O&M company, "Registration of O&M engineer" and "Certification of O&M report".

Review board of JET PV O&M certification which is composed of experts and professionals, perform a review of the certification requirements and guidelines about once or twice a year. The review board has to be held for the purpose of obtaining fairness according JET's regulations. The scheme JET PV O&M Certification business is given in Fig.3, and The requirements for O&M registration and certification are given in Table.3
Fig. 3 The Scheme of JET PV O&M Certification

### JET PV O&M Certification Business

**Review Board of JET PV O&M Certification Scheme**
(once or twice per year)

1) Advisory for revision of guidelines.
2) Reporting of current situation

1) Review of Guideline
2) Comments

**Impartial committee**

**JET (Japan Electrical Safety & Environment Technology Laboratories)**

1. **Registration after reviewing**
2. **Registration after reviewing**
3. **Certification of O&M report**

**O&M company**

1. Completion of O&M training by JET Renewing / every 3 year.

**O&M Engineer**

1. O&M engineer must belong to the above O&M company.
2. Engineer must have the carrier of PV business of more than three years.
3. Completion of O&M training by JET

**O&M report**

O&M report must prepare by using the measurement equipment which are provided in the guideline.

**Requirements for O&M registration and certification**

1. More than three years of PV business and more than 5 O&M actual achievement.
2. Acquisition of ISO9001 certification or its equivalent scheme.
3. Permission of the general electric business by construction industry law.
4. The list of O&M measurement equipment which were calibrated.

**JET registers**

1. O&M company
2. O&M engineer who belong to the above company

JET certifies the O&M report based on “JET PV O&M Guideline”.

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3. JET PV O&M Certification Business
# 3. JET PV O&M Certification Business

## Table 3 Requirements for O&M registration and certification

<table>
<thead>
<tr>
<th>Certification type</th>
<th>Requirements for O&amp;M registration and certification</th>
<th>Validity of the registration and certification</th>
</tr>
</thead>
</table>
| O&M Company        | ① More than three years of PV business and more than 5 O&M actual achievement.  
                     ② Acquisition of ISO9001 certification or it’s equivalent scheme  
                     ③ Permission of the general electric business by construction industry law  
                     ④ The list of O&M measurement equipment which were calibrated. | Update the registration confirm every three years |
| O&M Engineer       | ① O&M engineer must belong to the above O&M company  
                     ② Engineer must have the carrier of PV business of more than three years.  
                     ③ Completion of O&M training by JET | Update the registration confirm every three years |
| O&M report         | O&M report must prepare by using the measurement equipment which are provided in the guideline. | Certification to each report application |