IEC TC82 Working Group 6
Balance of System Components

Chuck Whitaker
Solar ABCs NISC Panel Stakeholder Meeting
June 2-4, 2008
To develop international standards for **balance-of-system components** for PV systems. These standards will be in the general areas of **performance**, **safety**, **environmental durability** (reliability), **quality assurance** and **quality assessment** criteria.

The standards ultimately produced should be universal and non-restrictive in their application, taking into account different environments and manufacturing technologies.

In addition to the basic **electrical** and **mechanical characteristics**, standards will be written for other important factors such as **thermal performance**, **electromagnetic interference**, and **climate applicability/rating**.
# WG 6 “Official” Participation

<table>
<thead>
<tr>
<th>Country</th>
<th>Members</th>
<th>Country</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1</td>
<td>Great Britain</td>
<td>2</td>
</tr>
<tr>
<td>Australia</td>
<td>2</td>
<td>Italy</td>
<td>2</td>
</tr>
<tr>
<td>Canada</td>
<td>3</td>
<td>Japan</td>
<td>2</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2</td>
<td>Korea</td>
<td>2</td>
</tr>
<tr>
<td>Germany</td>
<td>3</td>
<td>Netherlands</td>
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<td>Denmark</td>
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<td>Thailand</td>
<td>1</td>
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<td>Spain</td>
<td>3</td>
<td>USA</td>
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<td>France</td>
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<td>TOTAL</td>
<td>31 (-5)</td>
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*IEC TC82 WG 6 SF 2008-05-22*
WG6 Meetings Since Tokyo (October 2006)

- Pamplona, Spain, April 2007 (w/ WG3)
- Burgdorf, Switzerland, October 2007 (w/ WG3)
- San Francisco, May 2008
- 62109 Project Team has held 8 teleconference calls
- Next meeting is tentatively scheduled for October 2008 in Korea
WG6 Current Work Program

• IEC 62109-1, -2, -3, and -??? Ed. 1.0, Safety of power converters for use in photovoltaic power systems. Project Leader Tim Zgonena

• IEC 62116 Ed. 1.0, Testing procedure - Islanding prevention measures for power conditioners used in grid connected photovoltaic (PV) power generation systems. Project Leader Izumi Tsuda.

• IEC 62509 Ed 1.0, Performance and functioning of photovoltaic battery charge controllers. Project Leader Nigel Wilmot
• Minimum requirements for protection against electric shock, energy, fire, mechanical and other hazards for POWER CONVERSION EQUIPMENT (PCE) used in PV
• 62109-1 General Requirements
• 62109-2 Inverter Requirements
• 62109-3 Charge Controller Requirements
• Cooperatively developed with TC22
  - Will provide support for 61800-5-1 (TC22)
CDV Voting Results (2008-04-25):
- 24 Yes
- 2 No
- 2 Abstain

Reviewed Comments—most were resolved

Expect to submit revised document for circulation as FDIS in August
62109-2: Inverter Requirements

- Project Team has made substantial revisions via 8 teleconferences.
- Provided progress updates at WG meetings.
- Needed input from WG6 to address critical details of protection for transformerless PV inverters.
- A few issues left to resolve.
- Expect to submit 62109-2 draft for CDV in August.
62109-3: Charge Controller Requirements

- No progress on this document due to extended activities on -1 and -2, and 62509
• Korea has suggested a possible new project to address design safety of PV Array Combiner boxes.
• Presented outline of Draft Korean Standard
• Will provide Draft prior to next WG meeting
IEC 62116 Ed. 1.0, *Testing procedure - Islanding prevention measures for power conditioners used in grid connected photovoltaic (PV) power generation systems*

- CDV comments were addressed in Pamplona and Burgdorf
  - Reinserted sentence allowing local pass/fail requirements
  - Added discussion of frequency and voltage trip settings
- Submitted to CO for circulation as FDIS
- French translation has been received in the past few days
- Expect FDIS to be circulated soon
IEC 62509 Ed 1.0 Performance and functioning of photovoltaic battery charge controllers

- NWIP Approved in Nov 2006
- Project team produced several drafts, discussed at each WG meeting
- Current Draft has been circulated as a CD
  - NC Comments are due May 23
WG6 New Work
Ideas/Priorities

• Have developed a prioritized list of topics for future work that includes
  - Inverter Performance (8 to 10 parts)
  - DC Plug
  - Array Combiner Box
  - Design Qualification and Type Approval
  - EMC
  - Switches and connectors
  - Surge Protection
BOS Performance Characterization Series

- 62xxx-1 General Document
  - Introduction
  - Measurement requirements
  - Source (Battery, PV, grid/gen) requirements
  - Reporting requirements
- 62xxx-2 Grid-connected Inverters
- 62xxx-3 Stand-alone Inverters
- 62xxx-4 Charge Controllers (from 62509)
## BOS Performance Characterization Series

<table>
<thead>
<tr>
<th>Item</th>
<th>GC Inverter</th>
<th>SA Inverter</th>
<th>Charge Controller</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>X Whitaker</td>
<td>X (+p f) Spooner/Suponthana</td>
<td>X</td>
<td>61683, some commonality</td>
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<tr>
<td>MPPT</td>
<td>X Infield</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Reporting/labeling/Std Specs.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Coordinate with 62109</td>
</tr>
<tr>
<td>Tare/standing/ standby/ start up/shut down/nighttime losses</td>
<td>X Mauch</td>
<td>X</td>
<td>X</td>
<td>Coordinate with WG2</td>
</tr>
<tr>
<td>Overall Performance Measure (Energy Rating)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Power Factor</td>
<td>X Kim</td>
<td>--</td>
<td>--</td>
<td>Covered by GC standard.</td>
</tr>
</tbody>
</table>

**GC – Grid Connected; SA – Stand Alone**
## BOS Performance Characterization Series

<table>
<thead>
<tr>
<th>Item</th>
<th>GC Inverter</th>
<th>SA Inverter</th>
<th>Charge Controller</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foldback/derating (Overtemp/Overpower)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Potentially common</td>
</tr>
<tr>
<td>Ratings</td>
<td>X</td>
<td>X (+pf) Spooner</td>
<td>X</td>
<td>Potentially common 62109</td>
</tr>
<tr>
<td>Power Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harmonics</td>
<td>X Koerner/Igarashi</td>
<td>X Koerner/Igarashi</td>
<td></td>
<td>62109 only for standalone, IEEE 519, 61000-3-4, 61727</td>
</tr>
<tr>
<td>DC Injection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User Interface measurement accuracy</td>
<td>X Mauch/Kim</td>
<td>X Mauch</td>
<td>X</td>
<td>Common?</td>
</tr>
<tr>
<td>DC Ripple (Current)</td>
<td>X Koerner</td>
<td>X</td>
<td>X</td>
<td>Mauch to investigate battery effect</td>
</tr>
</tbody>
</table>

GC – Grid Connected; SA – Stand Alone
Additional Items Under Consideration

- Standardized DC (appliance) plug
- Standardized module/combiner/inverter connector (WG2?);
- Fuses: failures due to insufficient fault current.  
  1) Fuse and MCCB testing for PV  
  2) System and BOS Requirements for fuse-less PV installations (WG3?)
- PV wire and disconnect switches (define what’s appropriate)
Proposed IEC Rodent Warning Mark for High Voltage PV Wiring