Development of an AC Module System

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GreenRay, Inc.
Project Objective

Create a Simpler PV System

- Easier system design
- Faster system installation
- Safer to work with
- Size flexibility
- Performance advantages
- Improved reliability
- Easier performance monitoring

Lower cost energy to the customer
## Meeting DOE Goals

<table>
<thead>
<tr>
<th>TIOs</th>
<th>Metrics</th>
<th>Performance Efficiency</th>
<th>Cost</th>
<th>O&amp;M</th>
<th>Reliability</th>
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<td>Tier 1 TIOs</td>
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The GreenRay Team

GreenRay is leading the team

Our key partners:

- World class PV module manufacturer
- PV installers
- Electric utilities
- Sandia, NREL, SWRES, SERES
Budget Summary

TPP Project DOE Funding Breakdown: Year One

<table>
<thead>
<tr>
<th>Award Date</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
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<td>July 2007</td>
<td>$1.04M</td>
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GreenRay, Inc.

Subsystems Total: $6,600,000
Total Funding: $51,600,000
Systems Total: $45,000,000
Development Activity

Innovative Micro-Inverter

Frame and Mounting System

Data Communication Elements
Micro-Inverter

Accomplishments

• Reviewed AC module history
• Thermal issues analyzed; outdoor experiments conducted; thermal environment of a PV module characterized
• Design study completed; approach selected;
• Alpha prototype fabricated in desired form factor for optimum integration and heat rejection
• Design reviews completed – reliability, emissions, construction, etc.
• Bench testing underway
Micro-Inverter

Next Steps

- Tweak the design; fabricate Beta version
- Sequence of thermal and electrical stress tests
- Operational testing to standards
- Accelerated lifetime testing
Frame and Mounting System

Accomplishments

• Stakeholder input and concept review
• Innovative frame and mounting system design developed; IP generated
• SLA prototypes fabricated for form and fit evaluation

Next Steps

• Fabricate Alpha prototypes
• Full-scale tests
• Stakeholder review
Plug and Play Wiring

Accomplishments

- Design and engineering of components underway

Next Steps

- Fabricate prototypes
- Evaluation and review with stakeholders
- Finalize, obtain certification
**Data and Communications**

**Accomplishments**

- Specifications created for data communications in the AC Module System
- Technology options researched; design approach developed; IP secured
- Communications circuitry incorporated in Alpha micro-inverter

**Next Steps**

- Communications demonstrated in lab
Looking Ahead...FY 08/09

Key Challenge

- Develop a reliable micro-inverter that can withstand the harsh thermal environment under a PV module

Main Activities

- Finalize all elements of the AC Module System
- Testing, testing and more testing
- Behind-the-fence demos
- Plan for manufacture and market launch