2010 Solar Annual Review Meeting

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U.S. DEPARTMENT OF ENERGY

Relationship to Solar Program Goals

Project description:

System solution approach focusing on design and optimization of the supporting structure, coupled with reflector surface material and coating technology.

Project objective:

Demonstrate that life cycle cost savings and subsequent cost of energy (LCOE) reductions are achievable through the design optimization of aluminum-intensive collectors (supporting structure and reflector).

Project scope:

- To support DOE Solar Energy Technologies Program (SETP) goals of ***lowering the cost of major trough system components and establishing U.S.-based manufacturing capabilities*** for these components, Alcoa proposes to develop an aluminum-intensive collector (supporting structure and reflector) that will provide a superior (lower) total life cycle cost of energy compared to current baseline collectors.
- Alcoa anticipates that its proposed approach to developing both the reflector and the supporting structure design will result in a ***25-50% cost savings for the solar field***, which includes the collector assembly but excludes the CSP power plant. The capabilities for mass assembly and production of aluminum-intensive collector components exist in the U.S.; therefore, an additional benefit of an aluminum-intensive collector is its strong potential to substantially and positively impact the U.S. manufacturing base.

To support the DOE Solar Energy Technologies Program (SETP) goals of lowering the cost of major trough system components and establishing U.S.-based manufacturing capabilities.

Phase 1: Concept Feasibility Study

March 2008 – November 2008

Major Phase 1 activities:

- Reflector surface development
- Trough system ideation and design
- Concept down-selection

Phase 1 SOPO milestones:

Task Number	Task Description	Task Completion Date				Progress Notes
		Original Planned	Revised Planned	Actual	Percent Complete	
1.1	Reflector surface optimization	11/6/08	11/6/08	11/6/08	80%	Optimization work to continue in Phase 2 as per Task 2.1
1.2	System ideation/ structural development	5/19/08	6/1/08	6/1/08	100%	
1.3	Down-select preliminary concepts	8/8/08	8/29/08	8/29/08	100%	
1.4	Develop Phase 2 plan	11/13/08	11/13/08	11/13/08	100%	
1.5	Phase 1 prep and review with DOE	11/20-26/08	11/20-26/08	11/20-26/08	100%	Go/No Go meeting completed December 3rd at Alcoa

Phase 2: Design & Prototype Development

January 2009 – April 2010

Major Phase 2 activities:

- Detailed design & prototype build
- Trough system validation

Phase 2 SOPO milestones (progress to-date):

Task #	Task Description	Task Completion Date				Progress Notes
		Original Planned	Revised Planned	Actual	Percent Complete	
2.1	Reflective Surface Optimization	8/6/09	8/5/09	8/5/09	100%	Thin film and silver film reflective surface development activities discontinued. Commercially available reflective surface utilized on trough prototype.
2.2	Detail System Design	4/15/09	5/20/09	5/20/09	100%	Gen2 design activities and FEA model coorelation will continue throughout Phase 2.
2.3	Internal Critical Design Review	4/20/09	5/15/09	5/20/09	100%	Completed 5/20/09
2.4	Prototype Build	10/8/09	11/5/09	11/20/09	100%	Final assembly complete
2.5	System Validation	11/06/09	3/12/10		50%	V-shot testing complete at Alcoa, preparation for testing at NREL on-going.
2.6	Update Phase 3 Plan	3/16/10	4/16/10		0%	
2.7	Phase 2 Prep and Review with DOE	3/25/10	4/27/10		10%	Beginning initial end-of-phase planning and documentation

Major Accomplishments

- Reflective surface development
  - Results from two independent approaches to reflective surface development showed performance or cost parity with commercially available technology
  - As a result, this portion of the program is being discontinued
  - A commercially available reflective surface from Alanod was chosen for utilization on the full-scale trough prototype
- Trough system development
  - Performed detailed design, performance analysis, and cost modeling on an advanced, aluminum-intensive trough concept.
  - Cost modeling indicates that 20-25% solar field cost saving is achievable.
  - Full-scale trough prototype fabricated and assembled at the Alcoa Technology Center (Pittsburgh, Pa)
  - Validation testing at Alcoa included:
    - Dimensional control verification
    - Static load testing
    - VSHOT testing (by NREL)

Future Activities

- Trough validation testing at NREL
  - Wind load testing
  - VSHOT testing
  - Thermal efficiency testing
- Complete Phase 2 activities (April 2010)
- Go/No Go for Phase 3 (May 2010)
- Kick-off Phase 3: Commercialization planning

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