U.S. DEPARTMENT OF ENERGY
SOLAR DECATHLON

Solar Decathlon 2009
Washington, D.C.

Solar Decathlon 2011
Washington, D.C.

Solar Decathlon 2013 & XPO
Irvine, California

U.S. Department of Energy Solar Decathlon

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Purpose & Objectives

Problem Statement:

How to provide workforce training, improve building science instruction, foster innovation in whole-building design, and educate building professionals and the public:

The U.S. Department of Energy Solar Decathlon is an award-winning competition that challenges 20 collegiate teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive.

Impact of Project:

The Solar Decathlon is a proven training program for students to enter the clean-energy workforce with hands-on experience. The Solar Decathlon also results in broader consumer understanding of how to save money at home with clean-energy solutions.

Purpose & Objectives

Project Focus:

Residential Program Roadmap Strategic Pursuit Area:

4b, Integrate advanced technology solutions

A biennial intercollegiate competition of highly energy-efficient houses that effectively combines:

1. R&D advancements with integrated energy efficiency and renewable energy technologies resulting from research projects carried out at each participating institution,
2. Educational benefits to students from engineering, architecture, and other academic disciplines working together on the design, construction, and operation of energy efficient housing,
3. Unique workforce development training to prepare students for clean energy jobs in energy efficiency and renewable energy, and
4. Extensive outreach and public awareness of residential energy use and generation.

Approach

Approach:

- Conduct a safe and successful 6th Solar Decathlon event in 2013 during which more than 2,000 collegiate team students culminate their learning experience by delivering a competition entry of an innovative new house
- More than 100,000 visitors to Orange County Great Park, 200,000 visitors to the Web site, and millions of media readers, viewers, and listeners expand their knowledge of highly energy-efficient homes
- Project has managed task areas:
  - Competition
  - Site Operations
  - Event Production
  - Communications
  - I.T.
  - Collegiate Team Subcontracts

Approach

Key Issues:

- Devise rules and implement scoring of 10 contests, including subjective (juried) and objective (measured), that relate to how energy is typically used in U.S. homes
- Design and safely implement village for electrical microgrid, internet, logistics, infrastructure, and visitor education
- Collaborate with the DOE Golden Field Office and cooperative agreement recipient Orange County Great Park to support Solar Decathlon logistics and implement an XPO
- Recruit and recognize industry partners in sponsor program
- Provide an inspiring venue that showcases the beneficial work conducted by the U.S. Department of Energy.

Distinctive Characteristics:

Since 2002, the Solar Decathlon has:

- Educated the public about the benefits, affordability, and availability of clean energy solutions by generating widespread media coverage and harnessing digital tools to reach tens of millions of people
- Involved 112 collegiate teams that pursued a multidisciplinary approach to requirements for designing and building energy-efficient, solar-powered houses
- Established a worldwide reputation as a successful educational program and workforce development opportunity for thousands of students

Distinctive Characteristics: (continued)

- Impacted nearly 18,000 collegiate decathletes and thousands of K-12 students
- Generated industry involvement with partnerships and sponsorships
- Leveraged a 4:1 investment by teams to U.S. Department of Energy funding
- Expanded internationally to currently include 62 participating teams and an estimated 6,000 students participating in competitions around the world: Solar Decathlon China 2013, Solar Decathlon 2013, and Solar Decathlon Europe 2014

- Resulted in significant competition to be chosen as a team. Colleges and universities utilize their Solar Decathlon successes and current team status for recruiting students.

Distinctive Characteristics: (continued)

- NREL has demonstrated:
  - Creative design and management to foster innovation in whole-building design by generating and continuously improving design problems that educate student teams on the issues and tradeoffs facing industry
  - Technical expertise necessary to define and adjudicate the competition rules and building code to incentivize integrated building design solutions and measure building performance
  - Skill in coaching and mentoring the teams to safely and effectively implement and prove their concepts
  - Expertise to implement a temporary electrical microgrid with interconnection and two-way power flow for operation of competition houses and net metering
  - Skills necessary to present this technical information for effective consumer outreach

Accomplishments:

U.S. Department of Energy Solar Decathlon 2011

- 20 innovative house designs with complete construction specifications publically available on www.solardecathlon.gov
- With the challenge of reduced construction costs, larger houses, and cloudy weather, most entries achieved or came very close to energy balance, indicating a very strong performance in energy efficiency
- 357,000 house visits, including 5,000 K-12 students & teachers
- Media Highlights
  - More than 2 billion total media impressions, including Web site hits
  - Online: over 1,200 online articles covered Solar Decathlon
  - Print: 250 articles in nearly 150 print publications around the world
  - Broadcast: 500 television and 87 radio interviews worldwide

Accomplishments: (continued)

U.S. Department of Energy Solar Decathlon in FY 2012

- Completed selection of 20 collegiate teams
- Conducted Schematic Design Review and Webinar
- Collaborated on planning with Orange County Great Park
- Submitted Solar Decathlon 2013 Implementation Plan
- Outreach highlights of Web site www.solardecathlon.gov
  - 5th most popular EERE site
  - Home page 2nd most popular (after the EERE home page)
  - 2nd and 5th most popular EERE search phrases
  - More fans/likes on Facebook than EERE and Energy Savers

Progress on Goals:

U.S. Department of Energy Solar Decathlon in FY 2013

- Awarded subcontracts and funding for 20 collegiate teams
- Conducted Design Development Review Workshop to prepare teams for safety & health, building code inspections, logistics, schedule, public exhibit, and media relations
- Completing final design reviews for safety, rules, and building code compliance
- Finalizing microgrid design for new location and layout
- Finalizing event production logistics
- Continued collaboration with Orange County Great Park
- Re-installing scoring database and measurement protocols
- Ramping up Web site outreach content

Awards/Recognition:

- Harvard Kennedy School Ash Center, 2012 Bright Ideas in Government Award
- Public Relations Society of America, 2012 Silver Anvil Award, Government Events category:
- PR Daily's Digital & Social Media 2012 Award for Best Government Social Media
- National Building Museum 2010 Honor Award

Project Plan & Schedule

Project Management Milestones

- Produce in-person collegiate team design development workshop at OCGP, in Irvine, California, in January 2013. *Completed*
- Execute Phase 2 of the 20 university subcontracts for the competition collegiate teams within 3 months of receipt of funds. *Expected Completion:* May 2013
- Prepare, conduct, and close-out a safe and fair Solar Decathlon 2013 competition and a public exhibit at Orange County Great Park, and award a winner by October 2013. *Expected Completion:* December 2013

Collegiate Team Submittals

Schematic Design Summary	Apr. 19, 2012
Team Website	Aug. 16
Design Development BIM with Safety Plan	Oct. 11
Walkthrough Video and Renderings	Dec. 20
Final Design BIM and Safety Plan	Feb. 14, 2013
As-Built BIM and Exhibit Materials	Aug. 22
Pass Safety and Building Code Inspections	Oct. 1
Competition and Public Exhibit	Oct. 3-13
Disassembly Complete	Oct. 18
Final Report	Nov. 14

Project Budget

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Project Budget: Annual DOE funding level to NREL of $3.2 – 5.2 M since FY2007

Variances:

- Delivered SD 2009 slightly under budget, applied funds to SD 2011
- FY 2011 cost variance above plan to accommodate late site change. Project wish list items reduced and following "off-year" scope reduced.

Cost to Date:

- 38% through Feb. in FY2013 (new and carryover funds)

Additional Funding:

- $1M DOE/BTO funding to Orange County Great Park
- EERE Communications & Outreach Office for media relations
- Cost-share includes sponsor contributions for competition and collegiate teams

Budget History					
FY2011		FY2012		FY2013	
DOE to NREL	SD 2011 Cost-share	DOE to NREL	Cost-share	DOE to NREL	SD 2013 Cost-share
$5.1 M	$13 M	$4.3 M		$4.2 M	$13 M

Project Integration, Collaboration & Market Impact

Partners, Subcontractors, and Collaborators:

- DOE EERE Communications & Outreach Office
- Private Sector Sponsor Partners: Schneider Electric, Bosch, Wells Fargo, Applied Materials, Ingersoll Rand, and others
- Non-Profit Sponsor Partners: University of California at Irvine, DOE EERE Vehicle Transportation Office, Irvine Ranch Water District, International Code Council, NFPA, NIBS, and others
- 20 Collegiate Teams competitively selected for 2013, with universities and sponsors providing 80%+ of team project costs
- City of Irvine Orange County Great Park with cost share
- Spanish Ministry of Public Works: Solar Decathlon Europe 2010 & 12
- French Ministry of Housing: Solar Decathlon Europe 2014
- Chinese National Energy Administration and DOE EERE International Program: Solar Decathlon China 2013

Technology Transfer, Deployment, Market Impact:

- *Impact Evaluation of the U.S. Department of Energy Solar Decathlon Program* led by DOE EERE Strategic Programs concludes:
  - More than 80% of decathletes learned more from their Solar Decathlon experience than they would have learned in the classroom alone.
  - 76% of decathletes are working in a clean-energy field since leaving college. That is five times the number of comparable non-decathletes who have worked in the clean-energy field.
  - 92% of decathletes credit their Solar Decathlon experience with helping them get the job.
  - 92% of decathletes have convinced someone to install energy-efficient equipment in homes and buildings.
  - Visitor Homeowners reported a high degree of satisfaction and learning from their Solar Decathlon event visit.

http://www1.eere.energy.gov/analysis/pdfs/solar_decathlon_impact_report2012.pdf

Project Integration, Collaboration & Market Impact

Technology Transfer, Deployment, Market Impact: (cont'd)

- Side-by-side comparison of building technologies
- Iterative design process drives improvement

Virginia Tech

2002 2005

2009

Project Integration, Collaboration & Market Impact

Communications:

- www.solardecathlon.gov with companion mobile website
- Social/digital media channels
- Papers at the 2012 World Renewable Energy Forum on Solar Decathlon 2011 collegiate team design results and electrical microgrid performance
- "U.S. National CAD Standard and AutoDesk Revit" training course posted to the DOE National Training & Education Resource (NTER)
- Event Visitor Guide

Next Steps and Future Plans:

- Reinvent Solar Decathlon 2015 competition rules, public exhibit, and implementation
- Issue competitive RFP for the Solar Decathlon 2015 collegiate teams