

Decentralized Solar Decathlon

Control Number: 1371-1519

Applicant:

Consortium for a Decentralized Solar Decathlon (CDSO)

<https://livetozero.com/decentralized-solar-decathlon/>

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PROJECT OVERVIEW

The Consortium for a Decentralized Solar Decathlon (CDSO) will substantially increase the depth and breadth of the Solar Decathlon program's impact by hosting a yearlong competition in 20 campus communities across the country. Decentralization will renew the program's long-term fiscal sustainability and growth potential by reducing administrative costs by 75% and creating exciting new sponsorship opportunities.

The Concept

In the decentralized Solar Decathlon, twenty collegiate teams design, build, operate, and present permanent zero energy homes on or near their respective campuses.

The competition will remain an exciting challenge in which students challenge the status quo and present innovative solutions for the future. The houses will be open to the public for longer than in previous Solar Decathlons and are expected to host more visitors in total. Visitors will be more engaged and more likely to take action after visiting. The Decathletes will be empowered to spend more time on research, while still enjoying all of the benefits of a design-build competition. The event will retain its collegiate spirit by including contests focusing on local communication and education while also enabling competing students to learn from each other.

The following chronological list of project phases and milestones describes the proposed high-level operational details of the decentralized competition:

- During the design development phase, the program administrator publishes the Rules document and prepares for the construction and competition phases while the teams work on the design and documentation of their homes.
- During the construction phase, student team members install competition instruments in the houses under the direction and oversight of competition management.
- In late summer, competition management performs onsite inspections and makes baseline performance measurements. Also in late summer, Architecture and Engineering contest juries conduct remote evaluations of the houses using live video and virtual 3-D tour technologies.
- In early fall, the yearlong competition phase kicks off with **six weekends of team-led public events** in the twenty selected campus communities across the lower 48 U.S. states. The public events occur during these communities' peak weekends, when student move-ins, homecoming celebrations, tailgating parties, football games, cultural events (including the **National Tour of Solar Homes**), and the best weather of the year attract numerous visitors from around the region.
- Five contiguous days of Indoor Environment and Energy Balance contest monitoring are conducted every other week during the competition phase. During non-monitored weeks, volunteer occupant groups live in the houses and participate in "post-occupancy evaluations," which contribute to the houses' Livability contest scores.
- During late fall, winter, and early spring of the competition phase, the teams focus on their respective **Research & Development (R&D) contest projects**, host small weekend events and tours at the house, and **produce educational programs and material for the local community's K-12 students, homeowners, and other stakeholders**.

- As the weather warms up, the teams host **two weekends of public events** at their houses to celebrate the arrival of spring, the end of the school year, and the homestretch of the competition phase.
- Each team's core group of students and faculty remain on campus during the summer to write final reports that summarize the teams' research, development, and education projects and results.
- In late-summer, the R&D and Education contest juries review the teams' final reports and attend online presentations given by the student team members.
- The competition phase concludes as the fall semester begins and visitors return in large numbers to the twenty campus communities. One of the weekends of public events at the houses coincides with the **U.S. Department of Energy's awards ceremony and media event in Washington, D.C. A constituent from each of the twenty teams is invited to attend the event, where a live video feed of the teams at their house sites accompanies the announcement of the competition's top three finishers. The event is streamed live on "Solar Decathlon TV" for the general public and non-attending team members.**
- By the time the awards ceremony has occurred, the teams for the next Solar Decathlon have been selected and are deep into design development.

Please refer to the Workplan section for implementation, operational, and administrative details.

Background

CDS is an unincorporated consortium of former Solar Decathletes led by former Solar Decathlon Competition Managers. Our mission is to help EERE renew the long-term sustainability of the Solar Decathlon through decentralization.

Please refer to the Technical Qualifications and Resources section for our history, successes, and relevant experiences with respect to all areas of the Solar Decathlon project.

Project Outcome

The centralized competition requires that the teams transport 1,000 ft² houses and approximately 1,000 ft² of additional decking and outdoor structures. This is both costly and inconsistent with the sustainability message promoted by the program. Consequently, it compromises the program's intended building science education and workforce development outcomes.

Figure 1 shows the primary success factors that naturally fall into place as a direct consequence of decentralization. Without decentralization, these success factors would be missing and without these success factors, most of the intended outcomes presented in the Technical Description, Innovation, and Impact section would be unattainable.

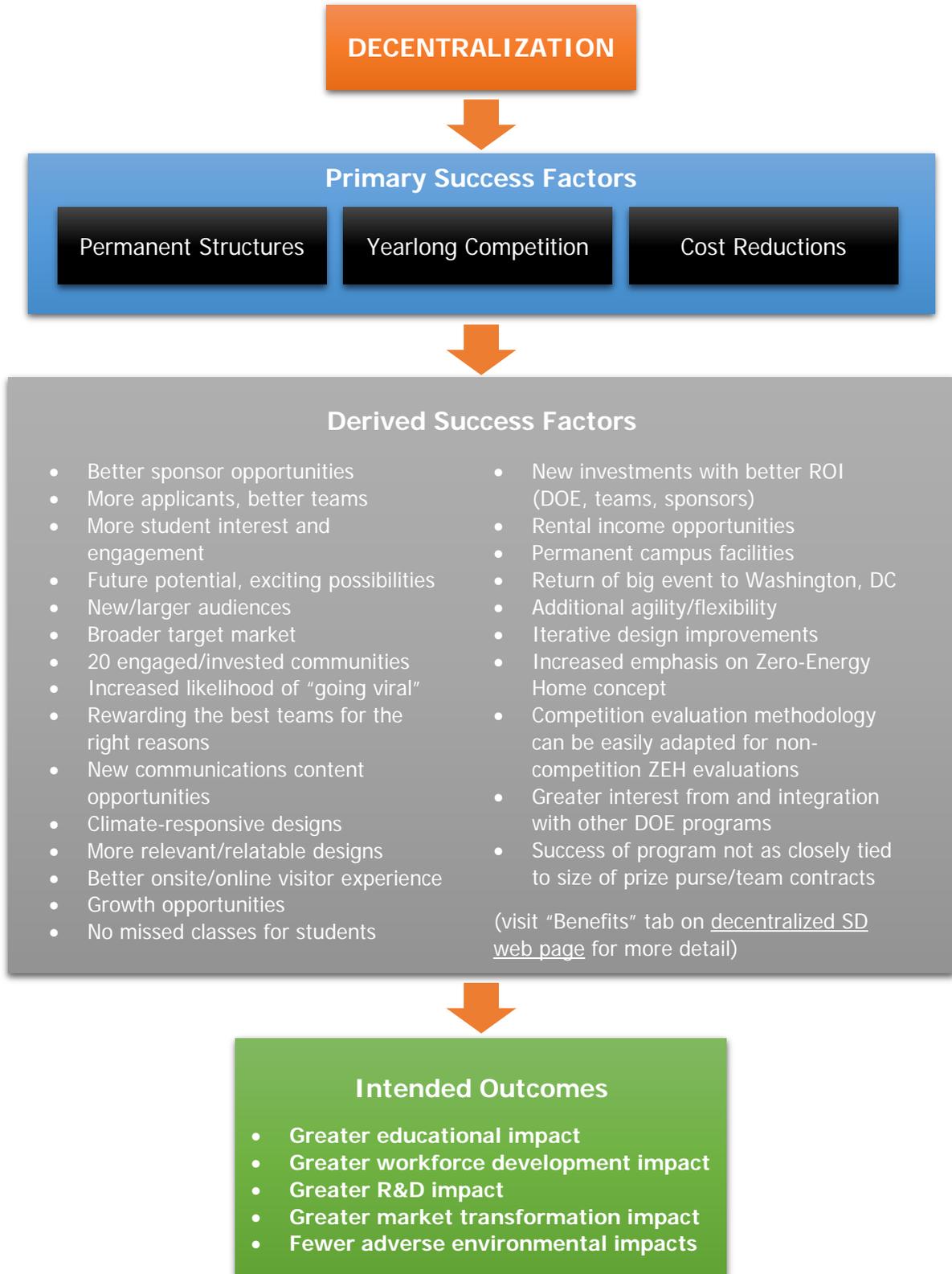


Figure 1: Decentralization outcomes and objectives

TECHNICAL DESCRIPTION, INNOVATION, AND IMPACT

CDS D's application responds to EERE's directly- and indirectly-stated FOA objectives, listed below:

Primary Objectives

- Improve the nation's science, technology, engineering, and mathematics (STEM) education efforts
- Build a more knowledge-intensive workforce.

Secondary Objectives

- Create and support education and workforce development programs that are specific to applied energy
- Develop new and better technologies to supply clean and renewable energy.
- Develop and provide educational and technical training opportunities for students and for the workforce.
- Promote energy efficiency and residential energy use awareness
- Foster greater adoption of clean energy technologies.
- Demonstrate that an aesthetically beautiful and well-designed house can generate enough thermal and electrical energy to meet the needs of a single family household.
- Educate the attending public and industry professionals about the benefits, affordability, and availability of clean energy solutions, with research papers, media coverage, and digital outreach serving as tools to amplify this message.
- Stimulate the local economy by attracting visitors to the event.

“These requirements for the venue are based on DOE's experience with Solar Decathlon competitions since 2002. DOE welcomes new ideas and or alternatives that may produce a better or more impactful event.”

In the quoted FOA excerpt above, we assume the word “venue” loosely implies “central venue” only because the competition has always been hosted at a central venue. As discussed later in the Cost Feasibility section, we have concluded that it is virtually impossible to produce a “better or more impactful” event that meets the FOA objectives at a central venue with less than 80% cost share. The decentralized model not only solves the centralized model's budget challenges and eliminates its inherent risks, but also creates new opportunities to produce a better and more impactful event.

Relevance and Outcomes

By adopting the decentralized model, EERE and CDS D can introduce and achieve new program objectives that were previously unattainable. Furthermore, the collective experience, qualifications, and passion of the CDS D members will give the program the tools required to accomplish these new objectives despite the program's significant budget cuts and challenges in recent years.

Based on our extensive experience with and observations from past U.S. and international Solar Decathlons, the decentralized Oman EcoHouse Design Competition, and numerous post-competition building monitoring projects, CSDS is confident that SD2017 and SD2019 will meet the following performance objectives related to the respective intended outcomes:

Intended Outcome #1: Greater Educational Impact

- Increase the quality and average duration of each physical and virtual house visit.
- Increase the total number of physical and virtual house visits by the general public, college students, and K-12 students during the competition.
- Increase the volume of high-quality, widely-available educational materials produced by the teams and disseminated by the administrators.

Intended Outcome #2: Greater Workforce Development Impact

- Increase the number of student team members who enter the STEM education field.
- Increase the percentage of student team leaders who work in the building sector after the competition.
- Increase the number of EERE-related companies started by student team members after the competition.

Intended Outcome #3: Greater R&D Impact

- Increase the number and quality of Solar Decathlon-related academic papers and presentations made by participating students and faculty.
- Increase the participation of Solar Decathlon teams in Building America and other federal/state/local government-sponsored EERE programs.
- Increase the number of Solar Decathlon-related patents that are filed within 3 years of the competition evaluation period.

Intended Outcome #4: Greater Market Transformation Impact

- Increase the number of new and/or retrofit residential projects within 20 miles of each participating campus that adopt significant design or physical elements of Solar Decathlon houses.
- Increase the number of homeowners within 20 miles of each participating campus who hire building energy auditors and energy efficiency experts within 1 year of the start of the competition evaluation period.
- Increase the number of media impressions per competition.

Intended Outcome #5: Fewer Adverse Environmental Impacts

- Reduce the emissions required for construction, assembly, transportation, team travel, and house visitation travel.
- Reduce the quantity of houses and constituent components that are moved, abandoned, neglected, unused, or discarded during first 12 months after completion of construction.

Other Performance Objectives

- Increase the number of SD2021 team proposals, as compared to SD2015 proposals
- Increase the rate of Solar Decathlon “franchising” by states, regions, and the international community by the end of SD2019.
- Reduce (in real dollars) the federal funds contribution for SD2021/2023, compared to SD2017/2019.
- Long-term “reach” goal: At least one prototype zero energy home on each of the Power Five conference schools’ campuses by the end of SD2025.

Immediately following the beginning of the period of performance, we will request the following from EERE to begin our benchmarking activities:

- Access to proposal statistics from each previous competition, i.e., proposals received, proposals accepted, etc.
- Administrative login credentials for archived Yahoo Groups (primarily for recruiting and hiring ex-Solar Decathletes as subcontractors)
- Raw web analytics data
- Raw media impression data
- Raw event attendance and visitor experience data
- Raw “Where Are the Houses Now” data
- Raw data from the Lockheed Martin impact study
- Other NREL and EERE data and records that may facilitate benchmarking.

The CDSO will measure program-wide performance against the objectives outlined above. Furthermore, the new contest structure and reporting requirements will motivate the teams to document their own results and contribute those results to a central clearinghouse.

Closed circuit cameras will be installed in each house for rules compliance verification, model calibration, and communication. The cameras will also be invaluable for tracking visitor traffic and behaviors. Video surveillance signs will notify visitors that cameras are in use.

In the past, most information about the teams and their houses was located on the respective team websites. A survey of team website URLs from past Solar Decathlons showed that much or all of the content is removed or outdated within a few years. In many cases, the project URLs have been abandoned and re-registered with entirely unrelated businesses. In SD2017/2019, each team will be given a portal on a new Solar Decathlon content management system (CMS) instead of creating its own website. The “portal-per-team” approach is used by all major U.S. sports leagues to improve the experience for fans. Portal-per-team will guarantee that all the team-produced content can be reviewed and tracked and that quality control can be enforced. It will also encourage the teams to focus less on site design and more on site content. Most importantly, the use of a central CMS is critical to maximizing and measuring the long-term impact of each Solar Decathlon project.

Technical Description

Table 1 lists the ten “decathlon” contests that CDSO recommends for meeting the objectives and achieving the outcomes outlined herein. The technical implementation details for these contests

are not included in this document because members of the CDS D team have developed nearly all of the required implementation details and associated assets for either previous Solar Decathlons or for other competitions. The technical details can be supplied upon request.

Table 1: Proposed contests (subject to change per EERE recommendations)

Contest	Points	Brief Description
Architecture	100	Similar to previous “Architecture” contests
Engineering	100	Similar to previous “Engineering” contests
Livability	100	Similar to previous “Market Appeal” contests, but post-occupancy evaluation (PoE) data are also considered by a jury of experts
R&D	100	Teams design and execute one or more R&D projects and publish results, which are evaluated by a jury of experts
Education	100	Teams design and execute one or more education projects and publish results, which are evaluated by a jury of experts
Outreach	100	Teams design and implement strategies that maximize the number of individuals impacted by the project and the quality of those individuals’ experiences; results are evaluated by a jury of experts
Comfort	100	Similar to previous “Comfort Zone” contests, but the evaluation is broader in scope and more rigorous in execution, as required by a yearlong competition in diverse climates.
Energy Efficiency	100	Conceptually similar to a <u>HERS rating</u> or <u>Home Energy Score</u> , but PV production is disregarded
Energy Balance	100	Similar to previous “Energy Balance” contests, with PV production included; smart grid/demand response element likely added, which presents opportunities to partner with the <u>DOE Office of Electricity Delivery & Energy Reliability</u>
TBD	100	Will be developed during discussions between CDS D and EERE; may be modeled after previous “Affordability” or “Commuting” contests
TOTAL POINTS	1000	

Members of the CDS D team are the world’s foremost experts at designing and implementing the Solar Decathlon and similar competitions. We are uniquely qualified to develop the technical details and procedures required to implement a fair and compelling competition that is responsive to EERE’s intended outcomes. We have successfully developed competitions for sponsor organizations with significantly different missions, requirements, and operational environments.

The graduated prize purse structure will give the teams an unprecedented level of motivation to respond directly and thoroughly to the competition rules and contest criteria. CDS D will leverage

this to reduce administration costs and achieve desired outcomes. In the new Education contest, for example, the teams will be highly motivated to produce excellent educational materials that will be disseminated for public use via the Solar Decathlon website. In past years, the administrators' ability to produce their own original educational materials was limited by budget constraints and the teams were not motivated to produce educational materials because of the limited emphasis placed on education in the Communications contest. The direct and indirect constraints imposed by the centralized model and the brief competition phase further limited the administrators' and teams' options.

Decentralization removes many of the technical and logistical constraints that severely limited the teams' design options in the past. A list of new design options follows:

- Climate- and market-responsive designs
- Quality construction with focus on air-sealing and performance instead of modularity
- Significantly larger houses
- Permanent foundations
- Diverse geometries
- Multi-level houses
- Diverse construction methods
- High-mass thermal storage strategies
- Site integration.

The yearlong competition introduces the following new opportunities that were impossible or impractical in a 9-day competition:

- Rigorous yearlong performance evaluation under monitored conditions
- Periods of occupancy by members of target market
- Long-term R&D projects
- Long-term education projects
- Long-term outreach strategies.

CDSO believes that every Solar Decathlon team should be required to answer the following high-level research questions by the conclusion of the completion:

- What is the measured yearlong energy balance under typical conditions? Is the measured energy balance within 10% of the predicted energy balance? If not, why not?
- Which elements of the design perform as intended? Which of the most innovative elements have good market potential? Justification your claims and present preliminary commercialization plans.
- Which elements of the design do not perform as intended? Why do they not perform as intended? How can they be modified in future projects so they perform as intended?
- What is the local community's response to the Solar Decathlon program? What is the local community's response to the team and its design? Be specific. Collect and present survey, interview, and anecdotal data.

These questions were mostly unanswered during the '02-'15 Solar Decathlons because of the brief competition period, the budget pressure imposed by the centralized model, and the house characteristics imposed by the centralized model. The reduced administration and team costs; design flexibility; yearlong evaluation; new Livability, R&D, Education, Outreach, Energy Efficiency contests; improved Comfort and Energy Balance contests; and centralized CMS proposed herein virtually guarantee that all the above research questions will be answered by every Solar Decathlon team and all the results will be disseminated for widespread use via the Solar Decathlon website.

Feasibility

Cost Feasibility

The FOA specifies the following key funding and budget provisions:

- \$3-4 million in federal funding from EERE over the next four years (\$1.5-\$2 million for SD2017 and \$1.5-\$2 million for SD2019)
- \$4 million in prize money distributed to the teams over the next four years (\$2 million for SD2017 and \$2 million for SD2019)
- Minimum 50% cost share percentage by the new Program Administrator and its sponsors/partners.

Assuming \$8 million (\$4 million for administration + \$4 million for prize money) in total required budget (see the EERE 335.1 Budget Justification spreadsheet for details) over the next four years, CDSO must raise \$4-5 million from sponsors (mostly cash, some in-kind) to meet or exceed the minimum 50% cost sharing threshold. A draft sponsorship program outline is published on the [CDSO web page](#). CDSO will hire a professional sponsorship salesperson/coordinator immediately after the contract is awarded to review the draft outline, develop the complete sponsorship program, and sell corporate sponsorships.

According to data published in a publically-available EERE BTO Program Peer Review presentation, a traditional, centralized Solar Decathlon costs about \$20 million over four years (\$16 million for administration + \$4 million for prize money). After the \$4 million federal funds contribution, \$16 million in sponsorships (or 80% cost share) would be required. Creating a “better and more impactful” version of the centralized Solar Decathlon will require additional investment, which could raise the cost sharing requirement above 80%.

We believe that a paradigm shift away from centralized competition concept is necessary if the program is to achieve financial sustainability and become better and more impactful. The decentralized model is the only realistic option to reduce the competition hosting and administration costs from \$16 million to \$4 million. It also frees the collegiate teams from spending large percentages of their budgets on house transportation, travel, lodging, multiple assembly/reassembly cycles, and other expenses that are required in a centralized competition and are the most difficult expenses to get sponsored.

By removing these collateral cost burdens and empowering the teams to spend nearly every dollar on a long-term, highly-leveraged “campus community asset” instead of a short-term

“competition asset,” our expectation is that the teams will achieve longer-term and higher-impact education, workforce development, economic, and R&D results than they have previously.

Furthermore, the move to a decentralized competition adds the budget flexibility required to initiate projects that support and coordinate the teams’ local efforts and turn the Solar Decathlon website into an immersive Virtual Solar Decathlon Village and a valuable clearinghouse of team-produced education and workforce development content. These online resources will expand the reach and impact of the competition beyond what was possible in past competitions and will do so at a fraction of the cost.

Technical Feasibility

Through its implementation of all technical elements of the ongoing Oman EcoHouse Design Competition (EHDC), Live to Zero LLC has and is continuing to demonstrate the technical feasibility of a long-term decentralized competition. The technical details and results of the EHDC requires ongoing, explicit, consensus approval from both the teams and a third-party project steering committee. Consequently, the technical rigor and transparency with which Live to Zero’s has approached the technical challenges is very high. Live to Zero has successfully identified or developed reasonable solutions to all the technical challenges that the decentralized model has presented.

During Phase 1 of the EHDC, which concluded in December 2014, the collegiate teams submitted no protests and all results were approved by the steering committee. The EHDC sponsor’s confidence in Live to Zero’s ability to competently administer the technical elements of the project was reinforced when the 30-day evaluation period of Phase 1 was expanded to a yearlong evaluation for Phase 2 and a second contract was awarded to Live to Zero. By the time Solar Decathlon 2017 reaches the construction phase, all the new Solar Decathlon contest elements will have been thoroughly tested and refined in the EHDC.

All EHDC Phase 1 technical details and data are available at <https://ecohousecompetition.org> and Phase 2 technical details can be supplied to the review committee upon request.

CDS D will leverage video streaming technologies and rapidly-maturing 3D virtual reality technologies (see Matterport, for example) to create a new Virtual Solar Decathlon Village experience for online visitors and jurors. The Education and Outreach contests will motivate the teams to interact with Solar Decathlon stakeholders and followers in exciting new ways.

WORKPLAN

This section summarizes the high-level operational, organizational, and administrative details required to achieve the intended outcomes and meet the performance objectives presented earlier in this Technical Volume.

Technical Scope Summary

CDS D anticipates that EERE will be substantially involved in all major decisions that affect the direction of the program. Most of the critical decisions that affect the 55-month period of performance will be made during the first 6 months. EERE’s involvement will be very important

during this period. CDS D members have collaborated successfully with EERE to develop and execute the Solar Decathlon since 2003 and we look forward to continuing this relationship.

Although we have made a conscious decision to present a fairly developed vision for the decentralized competition in our application, we expect that EERE will request modifications as the program makes its transition toward decentralization. We will, of course, accommodate these requests.

We also recognize that EERE may consider some elements of our decentralized competition vision to be impractical for SD2017, given that the SD2017 teams will have been selected on the basis of their ability to deliver a house to a traditional competition. If EERE is concerned that SD2017 inertia may complicate the immediate decentralization of the competition, we respectfully request that EERE consider and discuss alternative approaches with us that may ease the transition.

Budget Periods

From the teams’ perspective, the project has three primary phases: design development, construction, and competition. For convenience, these phases are also used to identify the program administration budget periods.

Table 2: Budget periods

Budget Period #: Project Phase(s)	Month Range	Period Duration (months)
#1: SD2017 Design Development	M1-M9	9
#2: SD2017 Construction	M10-M19	10
#3: SD2017 Competition/SD2019 Design Development	M20-M31	12
#4: SD2019 Construction	M32-M43	12
#5: SD2019 Competition/SD2021 Design Development	M44-M55	12

Work Breakdown Structure and Task Description Summary

Table 3 below shows the high-level work breakdown structure. In CDS D’s internal work breakdown structure and project management tools, the tasks will be further divided into approximately 200 subtasks. Each subtask is assigned to one and only budget period and to one and only one contiguous date range. Whereas tasks encapsulate related subtasks, subtasks encapsulate discrete “chunks” of work to which resources can be assigned.

Table 3: High-level work breakdown structure

<p>Task 1: Client Relations Participate in meetings and have discussions with client to update project progress, plan future activities, solicit input, and solve problems.</p>
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<p>Task 2: Project Management Participate in and provide oversight of Communications and IT tasks; track project costs; manage project schedule; make high-level decisions; etc.</p>
<p>Task 3: Project Intranet Set up project intranet (project site and team sites) at the start of the project, administer the intranet during the project, and archive content at the end of the project.</p>
<p>Task 4: Team Support Host regular meetings with teams, respond to team questions/comments/concerns.</p>
<p>Task 5: Rules Develop general competition rules, contest criteria, competition details, and deliverable requirements; write and publish Rules document; perform Rules inspections; review camera footage and measured data for Rules compliance; enforce Rules by assessing penalties.</p>
<p>Task 6: Team Deliverables Review and provide comments on teams' schematic design, design development, construction documentation, and as-built deliverables.</p>
<p>Task 7: Juried Contests Recruit jurors; publish juror bios; attend teams' progress presentations and provide feedback; and plan, manage, and summarize the jury evaluations. Recruit Livability contest occupant groups, develop post-occupancy evaluation questionnaires, schedule/manage occupancy events, and prepare questionnaire data for jury.</p>
<p>Task 8: Data Acquisition System (DAS) Specify components and component layouts based on deliverable reviews; order, preassemble, test, and ship DAS components; remotely supervise teams' DAS component installation; physically inspect, commission, and maintain the DAS components; remotely collect and prepare the raw measured data for input into the scoring engine; remotely supervise the removal, packing, and shipping of all non-consumable DAS components; physically inspect, test, and store the retrieved DAS components; and ship a subset of DAS components to a calibration lab for testing and calibration.</p>
<p>Task 9: Energy Models Create building energy models for prototype and reference houses based on teams' deliverables; solicit reviews and comments from teams; calibrate models to measured data, camera observations, and onsite inspection observations; run simulations for Energy Efficiency contest.</p>
<p>Task 10: Scoring/Measured Data Design, develop, test, deploy, and maintain the scoring engine, scoring administration portal, and public scoring portal; manage measured data and administer scores during the competition phase.</p>
<p>Task 11: Prizes Collect payment instructions from schools; distribute prize money after competition completion.</p>
<p>Task 12: Team Selection Draft technical requirements and criteria for SD2019 team selection FOA; review, score, and provide comments for team applications.</p>
<p>Task 13: Branding Develop, maintain, and enforce project communications standards.</p>

<p>Task 14: Website/Social Media Design, develop, test, deploy, and maintain the project website; create new content for the website and social media platforms; curate the content submitted by the teams.</p>
<p>Task 15: Village Multimedia Design, develop, test, deploy, and maintain the Virtual Solar Decathlon experience for the website and house sites; support teams’ integration and maintenance of village multimedia content.</p>
<p>Task 16: Printed Materials Design and produce site signage, event signage, brochure, visitor’s guide, and other printed assets; support teams’ integration and maintenance of printed materials.</p>
<p>Task 17: Sponsorships Design, develop, and distribute the sponsorship kit; research potential sponsors; make pitches to potential sponsors; deliver benefits to sponsors; and manage sponsor relationships.</p>
<p>Task 18: Marketing Develop marketing strategies and assets; measure outcomes of marketing strategies and assets; and adjust marketing strategies and assets, as necessary.</p>
<p>Task 19: Advertising Develop advertising strategies and assets; purchase advertising; measure outcomes of advertising strategies and assets; and adjust advertising strategies and assets, as necessary.</p>
<p>Task 20: Public/Media Relations Develop public/media relations strategies and assets; create and distribute the media kit; measure outcomes of public/media relations strategies and assets; and adjust public/media strategies and assets, as necessary.</p>
<p>Task 21: Events Plan and remotely manage coordinated public events at house sites; plan and host the awards ceremony in Washington, DC.</p>

A primary benefit of the decentralized model is that many expensive tasks (see Table 4) can either be eliminated or responsibility for completing the tasks can be shifted to the teams. Colleges/universities can complete most of these tasks for a much lower cost than the program administrator because they can leverage existing campus infrastructure and resources. The students will also gain valuable experience integrating a new facility into a new or developed site.

Table 4: Sample of eliminated and transferred tasks

Task	Decentralization Consequence
Multiple House Assembly and Disassembly Cycles at Construction, Competition, and Permanent Sites	Eliminated
Competition Site Selection, Procurement, Planning, Infrastructure (tents, benches, restrooms, etc.), Power, Water, Sewer, Internet, Security, ES&H, Sanitation, Medical, Transportation, Parking, Lodging, Vehicle Management, Volunteer Recruiting/Coordination, and Registration	Responsibility Shifted to Teams

Task	Decentralization Consequence
Public Workshops, K-12 Education and Outreach, Public Education and Outreach, and Education Days Coordination (Field Trip Program)	Responsibility Shifted to Teams via the Education and Outreach Contests
Solar Village Design and Planning	Replaced by Virtual Solar Village
Certificate of Occupancy Issuance	Local AHJ Assumes Full Responsibility
Observer Recruiting and Management	Eliminated

Milestone Summary

The milestones are listed chronologically in the table below. The number before the period in the ID column is the associated task number.

Table 5: Milestones

ID	Qtr	Description	Verification
M5.1	1	SD2017 Rules published	EERE downloads document from SD website
M6.1	1	SD2017 Schematic Design deliverable reviews published	EERE downloads documents from team sites on intranet
M6.2	2	SD2017 Design Development deliverable reviews published	EERE downloads documents from team sites on intranet
M10.1	3	Scoring URL published on intranet	EERE explores scoring portal in browser
M14.1	3	Website URL published on intranet	EERE explores website in browser
M7.1	3	SD2017 juror bios published	EERE views bios on SD website
M6.3	4	SD2017 Construction Documentation deliverable reviews published	EERE downloads documents from team sites on intranet
M8.1	4	Preassembled data acquisition system components shipped to SD2017 teams	EERE downloads shipping invoices and photos from team sites on intranet
M6.4	5	SD2017 As-Built deliverable reviews published	EERE downloads documents from team sites on intranet
M7.2	6	SD2017 Architecture and Engineering contest evaluations completed	CSDS presents results to EERE in online or physical meeting
M8.2	6	SD2017 data acquisition system completed	EERE downloads photos from team sites on intranet
M21.1	7	Coordinated SD2017 fall public events completed	EERE views photos on SD website
M5.2	7	SD2019 Rules published	EERE downloads document from SD website
M6.5	8	SD2019 Schematic Design deliverable reviews published	EERE downloads documents from team sites on intranet

ID	Qtr	Description	Verification
M8.3	8	SD2017 mid-competition site visits completed	EERE downloads photos from team sites on intranet
M21.2	9	Coordinated SD2017 spring public events completed	EERE views photos on SD website
M7.3	9	SD2017 Livability contest evaluations completed	CSDS presents results to EERE in online or physical meeting
M10.2	10	SD2017 results finalized	EERE reviews confidential final results on private intranet site before awards ceremony
M11.1	10	SD2017 prize money distributed to teams	EERE downloads payment confirmations from team sites on intranet
M21.3	10	SD2017 final awards ceremony completed	EERE views photos on SD website
M6.6	10	SD2019 Design Development deliverable reviews published	EERE downloads documents from team sites on intranet
M7.4	10	SD2017 R&D, Education, and Outreach contest evaluations completed	CSDS presents results to EERE in online or physical meeting
M9.1	10	SD2017 Energy Efficiency contest modeling completed	EERE downloads energy model files from team sites on intranet
M7.5	11	SD2019 juror bios posted on intranet	EERE views bios on SD website
M6.7	12	SD2019 Construction Documentation deliverable reviews published	EERE downloads documents from team sites on intranet
M8.4	12	Preassembled data acquisition system components received by SD2017 teams	EERE downloads shipping invoices and photos from team sites on intranet
M6.8	13	SD2019 As-Built deliverable reviews published	EERE downloads documents from team sites on intranet
M7.6	14	SD2019 Architecture and Engineering contest evaluations completed	CSDS presents results to EERE in online or physical meeting
M8.5	14	SD2019 data acquisition system completed	EERE downloads photos from team sites on intranet
M21.4	15	Coordinated SD2019 fall public events completed	EERE views photos on SD website
M8.6	16	SD2019 mid-competition site visits completed	EERE downloads photos from team sites on intranet
M21.5	17	Coordinated SD2019 spring public events completed	EERE views photos on SD website
M7.7	17	SD2019 Livability contest evaluations completed	CSDS presents results to EERE in online or physical meeting
M10.3	18	SD2019 results finalized	EERE reviews confidential final results on private intranet site before awards ceremony
M11.2	18	SD2019 prize money distributed to teams	EERE downloads payment confirmations from team sites on intranet
M21.6	18	SD2019 awards ceremony completed	EERE views photos on SD website
M7.8	18	SD2019 R&D, Education, and Outreach contest evaluations completed	CSDS presents results to EERE in online or physical meeting

Go/No-Go Decision Points

The proposed go/no-go decision points occur at the conclusion of each budget period (see Table 2). The schedule can be modified as requested by EERE.

Project Management

Mike Wassmer, President of Live to Zero LLC (the prime recipient), will be EERE’s main point of contact for all high-level matters that affect the overall program direction or the contractual arrangement between CDS and EERE. General project management duties will be shared among Mike and two Live to Zero subcontractors—Joe Simon and Chris Wassmer. Task management will be delegated to Live to Zero’s subcontractors, as appropriate.

Anyone who has actively participated in the Solar Decathlon understands that the uniqueness of its challenges and rewards is what makes it special. CDS believes that individuals with intimate knowledge and experience with Solar Decathlon are uniquely qualified to administer the program. The ability of our subcontractors to hit the ground running will be of paramount importance in 2016 because the timeline is extremely compressed.

During the past six weeks, we have had face-to-face meetings with three companies in an attempt to quickly fill project team roles before the application submission deadline. However, this “recruiting” process felt rushed and we eventually decided to defer the recruiting process until after the submission deadline. We also decided to defer this process so that we could recruit individuals who have recently participated in Solar Decathlon 2015. Our objective is to fill as many project roles as possible (see Table 6) with ex-Decathletes or members of the extended Solar Decathlon community.

Table 6: Primary roles and task delegation

	Role/Title	Person/Company	Primary Tasks
Project Principals	Principal Engineer	Mike Wassmer (Live to Zero Principal)	<ul style="list-style-type: none"> ▪ Client Relations ▪ Project Management ▪ Prizes ▪ Data Acquisition System ▪ Scoring/Measured Data ▪ Rules ▪ Team Deliverables ▪ Team Support ▪ Team Selection
	Architect/Engineer	Joe Simon (Subcontractor)	<ul style="list-style-type: none"> ▪ Juried Contests ▪ Team Deliverables ▪ Rules ▪ Team Selection
	Senior Engineer	Chris Wassmer (Subcontractor)	<ul style="list-style-type: none"> ▪ Energy Models ▪ Team Deliverables ▪ Rules ▪ Team Selection
	PR/Marketing Manager	Subcontractor	<ul style="list-style-type: none"> ▪ Marketing ▪ Public/Media Relations Advertising, Events ▪ Branding ▪ Team Selection

	Role/Title	Person/Company	Primary Tasks
Project Support	Sponsorship Coordinator	Subcontractor	<ul style="list-style-type: none"> ▪ Sponsorships
	Web Developer	Subcontractor	<ul style="list-style-type: none"> ▪ Website/Social Media
	3D Visualization Artist	Subcontractor	<ul style="list-style-type: none"> ▪ Village Multimedia
	Blogger/Writer	Subcontractor	<ul style="list-style-type: none"> ▪ Website/Social Media ▪ Printed Materials
	Graphic Designer	Subcontractor	<ul style="list-style-type: none"> ▪ Printed Materials ▪ Website/Social Media ▪ Advertising

CDSO will use Microsoft Project (or similar) for project management; FreshBooks (or similar) for bookkeeping and invoicing; Microsoft SharePoint (or similar) for document and resource sharing; and Citrix GoToMeeting (or similar) for online meetings. Live to Zero has used these tools with success in administering the EcoHouse Design Competition.

TECHNICAL QUALIFICATIONS AND RESOURCES

Unique Qualifications and Expertise

Table 7 summarizes CDSO's background in the Solar Decathlon-related project areas.

Table 7: Relevant experience

Project Area	Summary of Background
Competition Management	<ul style="list-style-type: none"> • Managed '05, '07, '09, '11, '13, and '15 Solar Decathlon competitions • Primary designer of Solar Decathlon contests • Primary author of Solar Decathlon Rules, which have been adopted with amendments by international competitions • Administered all technical aspects of Oman EcoHouse Design Competition (EHDC); mentored and actively supported the EHDC manager • Mentored and actively supported SD Europe, SD China, and SD Latin America and Caribbean competition managers • Supported DOE's Race to Zero student design competition. • Instrumented numerous Solar Decathlon houses on permanent sites • Primary student and faculty contact before, during, and after the competition • Project Manager of a 2nd Place Solar Decathlon team • Core member and building energy modeler for a 1st Place Solar Decathlon team
Site Operations	<ul style="list-style-type: none"> • Collaborated and coordinated with the '05-15 Solar Decathlon Site Operations teams • Managed site operations-related aspects of the Oman EHDC during the competition's evaluation period. • Managed a large land-grant university student team through construction and multiple assembly and disassembly cycles.
Event Production	Collaborated and coordinated with the '05-'15 Solar Decathlon Event Production teams
Communications	<ul style="list-style-type: none"> • Collaborated and coordinated with the '05-'15 Solar Decathlon Communications teams • Developed the Oman EHDC website at no charge to client • Was primary liaison between the teams and project management for the '05-'15 Solar Decathlons and Oman EHDC

Project Area	Summary of Background
Sponsorship Recruitment	<ul style="list-style-type: none"> • Initiated the Solar Decathlon Resource Sponsorship program and successfully recruited resource sponsors for '07-'15 Solar Decathlons • Successfully recruited technical resource sponsors for the Oman EHDC • Successfully led a Solar Decathlon team's effort to raise over \$600,000 from sponsors and grants
Volunteer Recruitment	<ul style="list-style-type: none"> • Recruited and managed volunteer observers for the '05-'15 Solar Decathlon measured contest administration • Recruited and managed the '05-'15 Solar Decathlon protest resolution committees and Rules inspector volunteers • Managed '05-'15 Solar Decathlon juror recruiting • Recruited and managed U.S. jurors for the Oman EHDC • Maintained a network of past student team members, past faculty team leaders, colleagues, and fans who may volunteer in the future.
Education and Outreach	<ul style="list-style-type: none"> • Provided data acquisition system and building science training to numerous Solar Decathlon and Oman EHDC students over 8 years • Designed and led the Oman EHDC workshop for teams, residential building practitioners, and stakeholders

Equipment and Facilities

Live to Zero designed the EcoHouse Design Competition data acquisition system to be extremely robust and reliable so that it can be administered and maintained from the U.S. without any site visits. Most of the components are preassembled at the Live to Zero workshop and all components are clearly labeled and documented to facilitate rapid installation by students.

In addition to its “assembly line,” Live to Zero has installed a complete data acquisition system in its workshop. The system is used for demonstration, testing, optimization, prototyping, and YouTube tutorial videos.

Live to Zero owns a blower door, Duct Blaster, and other diagnostic equipment that will be used for model calibrations.

FOA FAQ #38 states that “DOE does not own any equipment that pertains to Solar Decathlon.” If DOE manages to transfer the DOE-owned data acquisition components from NREL that are currently used to administer the Solar Decathlon, CDSO may be able to reuse some of these components to defray some of the costs in the Budget Justification’s “Equipment” sheet.

Demonstrated Innovations

Mike Wassmer of CDSO has successfully designed, implemented, and administered the world’s first decentralized collegiate zero energy home building competition and led two major evolutions of the Solar Decathlon in 2004/2005 and 2008/2009. The Solar Decathlon 2009 Rules (with minor amendments) are still in use today and have been adopted with amendments by several international competitions.

CDSO is uniquely qualified to lead the next major evolution of the Solar Decathlon.

APPENDIX A RESUMES

Resumes for the following key team members are on subsequent pages:

- Principal Engineer: Mike Wassmer
- Architect/Engineer: Joe Simon
- Senior Engineer: Chris Wassmer.

EMPLOYMENT

President and Owner **Live to Zero LLC** **Fall 2011 – Present**

Technical Administrator, Oman EcoHouse Design Competition (<https://ecohousecompetition.org>)

- Designed and implemented all technical and communications elements and assets for the world's first collegiate, decentralized, zero-energy home building competition.
- Currently designing and implementing a yearlong follow-up competition for The Research Council of Oman that focuses on education, outreach, R&D, energy performance, and thermal comfort.

Primary Technical Services

- Residential building performance measurement, verification, analysis, and data dissemination
- Design, management, instrumentation, scoring, rules development, and communications services for visionary zero energy home building competitions

Live to Zero's complete project portfolio is at <https://livetozero.com/projects/>.

Senior Engineer **National Renewable Energy Laboratory** **Summer 2003 – Fall 2011**

Competition Manager, U.S. Department of Energy Solar Decathlon (2003 – 2010)

- Led a major review and revamp of all competition rules and contest operations in the mid-2000's.
- Managed all jury evaluation, scoring, instrumentation, inspection, and cost estimating activities.
- Coordinated communications among the DOE/NREL organizers, 58 collegiate teams, and approximately 9,000 participating students and faculty during the Solar Decathlon's period of peak popularity.

Staff Engineer **LTK Engineering Services** **Summer 1998 – Winter 2001**

- Supervised HVAC, braking, and noise/vibration testing for Amtrak's Acela Express trainset project.
- Performed technical reviews of drawings, design documents, test procedures, and test reports.

EDUCATION

Boulder, CO **University of Colorado at Boulder** **Fall 2001 – Fall 2003**

- M.S. in Civil, Environmental, and Architectural Engineering, December 2003. GPA: 4.0.
- Thesis: "A Component-Based Model for Residential Air Conditioner and Heat Pump Energy Calculations"; research funded by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers).
- Graduate Coursework: Green Building Design; Advanced Solar Design; Computer Simulations for Buildings; Distributed Generation of Electricity; Energy and Environmental Policy; Advanced HVAC Design; etc.
- Teaching Assistantships: Thermodynamics; Building Electrical Systems.

New Brunswick, NJ **Rutgers University** **Fall 1998 – Spring 1999**

- B.S. in Mechanical Engineering, May 1999. GPA: 3.5.

Notre Dame, IN **University of Notre Dame** **Fall 1995 – Winter 1997**

- Majored in Mechanical Engineering. GPA: 3.5.

ADDITIONAL EXPERIENCE, AWARDS, AND LICENSES

- **University of Colorado Solar Decathlon Team – First Place Overall (2001 – 2002):** Led 1st prize-winning building energy analysis; designed and installed the building's solar hot water heating system; presented competition results at four professional conferences.
- **Professional Engineering License (Architectural Engineering Discipline):** State of Colorado, license number PE.0043387.

LANGUAGES AND TECHNOLOGIES

- Expert-Level: Campbell Scientific-based data acquisition system design and programming
- Intermediate-Level: TRNSYS; DOE-2; C#; SQL; Javascript; WordPress; Visual Studio
- Beginner/In-Training: Python; Django; OpenStudio; EnergyPlus; Cassandra; Revit; AutoCAD; SketchUp

JOE SIMON

jjsimon@gmail.com

2462 S. Winona Ct, Denver 80219

847-602-3453

EXPERIENCE

NATIONAL RENEWABLE ENERGY LABORATORY

Golden, CO

Senior Engineer

May 2010 – Present

- Responsible for over \$2M annually of in-house labor across 5 projects, including over \$1M of new work for group
- Project lead for NREL technical support of over 20 Department of Energy SunShot Incubator Awardees
 - Coordinate 10-15 simultaneous projects involving 30+ staff to deliver unique to start-up company awardees
 - Managed work focused on reducing solar soft-costs, including data analysis, automated analysis & validation
 - Grew managed budget from \$250K of support in FY14 to \$2M for all incubator assistance in FY15
- Technical Project Lead for three EPA Re-Powering America's Lands feasibility studies at brownfields across US
 - Developed template report for all solar project leads to use, increasing efficiency, consistency and report quality
- Technical Reviewer for \$121M of Treasury 1603 PV rebate applications, identifying over \$710k in unallowable costs
- Project lead for solar building code work and developing new lab capabilities in urban building energy efficiency
- Supported several other NREL projects including solar building code impacts, solar feasibility, demand response, energy efficiency technical assistance, utility energy efficiency standards and proposal reviews

Project Manager – Solar Decathlon Competition

May 2010 - Present

- Manage all competition aspects of the Solar Decathlon 2011, 13 and 15 - a competition challenging 20 university teams to design, develop, construct, and present fully functional solar powered houses on a national stage
- As project competition manager, led development and oversight of rules, building code, team & subcontractor selection and management, deliverable reviews, project communications, juries, scoring development, and on-site coordination
- Responsible for oversight and direction of project budget, reporting, and staffing.
- Achieved a 45% budget reduction for Solar Decathlon 2013 and 2015 compared to previous editions under manager
- Primary liaison for 500+ students, 60+ staff, and 5 project support subcontractors
- Served as on-site DOE representation at Solar Decathlon China, ensuring overall project success
- Secured international consulting contract to support Solar Decathlon Latin America 2015, helping lead their 1st event

ACCUPLANS, LLC

Champaign, IL

Founder

April 2006 – May 2010

- Founded company to measure properties and create floor plans for real estate agents & property managers
- Documented over 900,000 sq.ft. of residential and commercial space throughout Illinois
- Established continuous revenue growth, realizing over \$30,000 net income annually & over 80% repeat clients

UNIVERSITY OF ILLINOIS

Champaign, IL

Project Manager, Solar Decathlon

August 2006 – September 2009

- Led 2009 team of 100 students to a 2nd place finish in the international Solar Decathlon competition
- Managed all team leaders, meetings, documents, deadlines, purchases, construction and required submittals
- Delivered project 20% under-budget, raising over \$600,000 in funding, including 3 grants and 60 sponsors

PROJECT MANAGEMENT ADVISORS, INC.

Chicago, IL

Intern Project Manager

May 2009 – August 2009

- Support owners representation and management work for multiple construction projects ranging from \$1 - \$30 million
- Approved pay applications, submittals, budget forecasts, construction schedules, subcontractor RFPs, and punch lists

FGM ARCHITECTS

Oak Brook, IL

Architecture Intern

Summer 2007 & Summer 2008

- Completed all construction documents and show drawing reviews for a 18,000 sq.ft. LEED Silver \$5 million fire station
- Coordinated with consultants, sales representatives and client for timely delivery of documents

EDUCATION

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Master of Business Administration, Finance/Real Estate & Master of Architecture

May 2010

Bachelor of Science, Architectural Studies with business minor

May 2007

AWARDS & SERVICE

Solar Hero – Published interview in Fine Homebuilding magazine regarding role as competition manager, October 2011

Team Leader – Academy for Entrepreneurial Leadership Business Plan Competition 2008, 2nd place winner

Recipient, Charles G. Rummel Fellowship in Architecture & Director's Scholarship in Business, 2007-2010

Recipient, Eagle Scout Award for oversight of design, funding and construction of new masonry sign, 2003

EMPLOYMENT

President and Owner **Boulder Bear Design LLC** **Spring 2015 – Present**

Energy Modeling Lead, Oman EcoHouse Design Competition (<https://ecohousecompetition.org>)

Building and calibrating energy models for five eco houses competing in the competition. The models are built in SketchUp with OpenStudio and use EnergyPlus as the modeling engine. The models will be used for the energy efficiency contest in the competition.

Managing Consultant **Navigant Consulting** **Winter 2012 – Spring 2015**

- Managed a regional business case development for smart grid deployment in the Pacific Northwest of the United States (Bonneville Power Administration).
- Played an integral role in developing Navigant's Analytica-based smart grid benefit-cost tool which evaluates the cost effectiveness of over thirty smart grid functions for specific jurisdictions. Mr. Wassmer used the tool to advise clients in Great Britain, Ontario, CA, the Pacific Northwest and Massachusetts.
- Worked as a consultant to support the development of a long-term strategic plan for implementing demand response (DR) programs at a large public utility in Southern California.
- Mr. Wassmer managed teams of energy modelers and personally built energy models to evaluate a wide range of energy efficiency programs for large investor owned utilities in New York City, Southern California and Philadelphia, PA.
- Researched existing and planned energy efficiency (EE) and demand response (DR) to characterize demand-side resource development (including EE, DR, smart grid, distributed generation and storage) within the Eastern Interconnection for the National Association of Regulatory Utility Commissioners (NARUC).

Research Assistant **University of Colorado** **Winter 2010 – Winter 2012**

- Developed and tested building energy modeling calibration procedures for accuracy using short term monitored data.
- Produced a calibration tool within Matlab to optimize EnergyPlus input parameters.

Research Participant Program **National Renewable Energy Laboratory** **Spring 2009 – Winter 2010**

Served as the objective contest official for the U.S. Department of Energy Solar Decathlon, 2009. Mr. Wassmer's role involved overseeing several contests to simulate and measure typical end use activities within the home. He spent two weeks in Washington, DC supporting competition management staff during the event.

Aerospace Engineer **Northrop Grumman/Goodrich** **Fall 2005 – Spring 2009**
Aerostructures

Prior to graduate school, Mr. Wassmer worked in the aerospace field in various capacities including airframe structural design and flight test instrumentation in both the commercial and military sectors. In both capacities, Mr. Wassmer worked collaboratively with international teams of engineers from England, France, the Netherlands and Australia.

EDUCATION

Boulder, CO **University of Colorado at Boulder** **Fall 2009 – Winter 2012**

- M.S. in Civil Engineering, 2014, GPA: 4.0.
- Thesis: "Energy Model Creation and Calibration Procedures for a Residential Home Using Short Term Monitored Data"; research funded by NREL.

Ann Arbor, MI **University of Michigan** **Fall 2001 – Spring 2005**

- B.S. in Mechanical Engineering, 2005, Cum Laude.
- B.S. in Aerospace Engineering, 2005, Cum Laude.

ADDITIONAL PUBLICATIONS

A complete list of publications that Mr. Wassmer authored or co-authored are available upon request.

APPENDIX B LETTERS OF COMMITMENT

Official letters of commitment from several past Solar Decathlon faculty leads are included on the following pages. Additional statements of commitment and intent are embedded in several of the email responses in Appendix C.

Between the FOA application deadline and the contract award date, additional supporters, potential sponsors, and potential subcontractors will be directed to the Decentralized Solar Decathlon web page at <https://livetozero.com/decentralized-solar-decathlon/>.



October 17, 2015

Mike Wassmer, PE
President, Live to Zero LLC
840 Mohawk Dr.
Boulder, CO 80303

Dear Mike,

I am pleased to provide my letter of support and full throated support for the creation of a new approach to the Solar Decathlon that would enable teams to compete through the design and construction of solar homes in the environments of their campuses and communities. I served as the lead advisor for Penn State's 2007 entry in the Solar Decathlon which resulted in the creation of the MorningStar Solar Home now located permanently on our University Park campus. Since the Decathlon, the MorningStar has helped to transform academic programs and outreach activities at Penn State, and is visited annually by thousands of students and community members. The home is also part of a new program at Penn State called the National Energy Leadership Corps in which students learn about energy and sustainability using the MorningStar, and then conduct home energy assessments in our community. The lessons learned through the MorningStar were also utilized to build a second solar home (GridSTAR) at another PSU campus location in Philadelphia as a shared teaching and research asset.

My view on this subject is also shaped by the invitation you offered to me to serve as a judge for the 2014 *EcoHouse Competition* in Oman. This experience further opened my eyes to the power of a competition in which permanent homes were built on the campuses of universities. I was deeply struck by the level of energy and commitment that we encountered in the Omani students and universities to create and host prominent structures dedicated to renewable energy and sustainability. Based on my experiences in the wake of the Decathlon, I believe the time has come for a decentralized approach to be embraced for a wide variety of reasons including but not limited to:

In-situ solar homes offer extensive value-adding processes to universities and communities that only a fraction of Solar Decathlon participants have been able to observe due to the expense and challenge of building and relocation of homes multiple times. A decentralized approach could elevate and reward teams for their creative plans to use the permanent homes as instruments to transform their communities.

Relocation and blitz-building of homes introduces significant health and safety risks to students that could be reduced through a decentralized approach. A decentralized approach would enable students to work in safer environments and reduce the health, safety, and climate impacts of travel to the central location.

Currently the attendance of the Solar Decathlon is limited to those able to travel to the event. A decentralized approach would increase the duration and visibility of the Solar Decathlon as homes would be observed across diverse audiences and teams would be able to focus on the engagement of their communities and regions for the actual event and also into the future.

Designs of solar homes in the current format are highly constrained by the need for relocation as well as the size restrictions of the event space. This results in the creation and perpetuation of the impression that solar homes require a sacrifice of many features that consumers have become accustomed to, but that are entirely possible to be included in full scale and responsibly built homes.

(Continued)

In support of a new initiative for the Solar Decathlon I will commit the following support:

- Identification of corporate sponsors including these organizations: Alstom Grid, SolarCity, UMC-Power, NRG, East Penn Manufacturing, Eaton Corporation, and the National Electrical Contracting Association,
- Serve on a Board of Advisors to help design solutions to logistical challenges in a new approach that would retain or enhance student learning and the overall impact of the Decathlon,
- Nominate alumni from Penn State solar programs to serve as judges or mentors to teams,
- Cultivate proposals from universities in the Mid-Atlantic region including mentoring of teams, faculty, and administrators,
- Invite your team to include Penn State as a participant in a trial version of a decentralized Solar Decathlon completion that would appeal to past SD competitors and honor the creative applications that have emerged through the long term operation and use of past entries.
- Presentation of a webinar to competing teams describing successful methods to utilize solar homes in their communities as instruments to transform thinking and build consumer interest in energy efficiency and renewable energy technologies,
- Sponsor the dissemination of a free online curriculum about home energy efficiency and renewable energy leadership.

I commend you in your efforts to challenge and evolve the vitally important role the Solar Decathlon has played in the past and support the advancement of its purpose into the future. Please let me know how I may be of further service to your efforts.

Respectfully,



Dr. David Riley
Associate Professor
Department of Architectural Engineering
driley@psu.edu



Mike Wassmer
PE President, Live to Zero LLC
840 Mohawk Dr.
Boulder, CO 80303

2015.10.28

Dear Mike:

I'm pleased to provide this letter of support for a decentralized Solar Decathlon. There are many sound reasons for exploring this possibility — from financial to performance to research to the benefits of broad outreach to the student experience — but I am sure these topics are thoroughly addressed in your proposal. Rather, I will illustrate my support with some observations about the recent Eco House Design Competition that took place in Oman from 2012-2014. Modeled after the Solar Decathlon, there were nonetheless significant departures in the Omani event that merit consideration.

1. The houses were three times as large, and were built in concrete and steel, typical Omani construction materials and strategies. Those characteristics meant that the houses stayed at their home universities with all the benefits of engagement in the universities' respective communities.
2. The contests took place over a more extended period of time, giving teams a chance for extended outreach into the community, as well as more time for group events.
3. Most significantly, houses could directly address the microclimate of their respective situations, without having to sacrifice to perform in the competition climate.
4. The competition traveled to the houses, and not the reverse. This meant that in each location, there was ample opportunity for events, outreach, publicity and education around the visit of the competition students, jurors, organizer teams, government agencies, sponsors, media, and the like. Rather than all of the outreach happening in one concentrated short burst, the event itself had as many highlights as there were houses.
5. That the event travelled from house to house meant that there was a rich display of culture and climate response that was acknowledged and celebrated.

Over the course of the two-plus years of the competition, there were several workshops and events, of which I attended two. I was also a juror in twice during the course of the two years. From this experience, I can say that I would be honored to:

- Serve on a Solar Decathlon Board of Advisors that would solve new logistical challenges associated with building permanent houses on campuses, help refine contest criteria and the rules, help new teams navigate the project, and help new teams navigate the project's challenges.
- Nominate outstanding students, graduates, and colleagues or volunteer, intern, and/or permanent positions with the Solar Decathlon program.
- Volunteer as a contest juror and/or nominate potential jurors from your professional network.

Thank you for bringing this opportunity to light with your proposal. I hope this brief letter is useful!

Kind regards
Amy Gardner

Amy E Gardner FAIA LEED-AP
Clinical Professor
Principal Investigator / Solar Decathlon 2007 & 2011
SCHOOL OF ARCHITECTURE, PLANNING, AND PRESERVATION
University of Maryland
College Park, Maryland 20742



October 26, 2015

Mike Wassmer, PE
President, Live to Zero LLC
840 Mohawk Dr.
Boulder, CO 80303

To Whom It May Concern,

I am excited to offer this letter as an indication of my support for a revised Solar Decathlon contest and specifically the new structure proposed by the **Consortium for a Decentralized Solar Decathlon (CDSO)**. I think that this new structure would remove many of the consistent issues of the contest, while re-focusing the competition on its core values and goals. These comments and suggestions should be seen only as an attempt to help support the continued relevance and health of the Solar Decathlon, a program that has meant a great deal to me over many years.

Background:

I'm a partner in a small design and consulting firm (Building-Type LLC), and a teacher at Parsons School of Design, Stevens Institute, and the Passive House Academy. Our office does primarily energy-efficiency envelope consulting for architects, builders and other designers. I've been in charge of two Solar Decathlon projects now (Parsons/Stevens 2011 and Stevens 2015), and participated in the competition-site assembly/disassembly of a third (Stevens 2013). I was also one of the Construction Managers for the Parsons graduate design-build program (Parsons Design Workshop) for several years, so have quite a bit of experience leading student design-builds.

Initial thoughts:

1. **What & Who is the Solar D for? What is the purpose?**

I love the Solar D, really appreciate all the great work done by the organizers, and am grateful to have had the privilege to spend many years working on great projects because of it. But I do think that the Solar Decathlon contest has, to an extent, lost some of its focus over the past couple cycles and this has impacted the quality of the houses, the number of students willing to participate, the number of faculty interested in engaging with the project, and the number of sponsors willing to contribute funds. I think that the latest round (2015), with 6 teams dropping out and several other teams having serious difficulties on-site, should clearly illustrate the trouble the contest is having at this point.

Quite simply, the contest hasn't kept up with the markets it helped to create, whether in terms of the current solar market (no demand response contest, no batteries, no vehicle-to-grid, etc...) or in terms of building science (no air-sealing contest, no IAQ contest, no thermal bridging, vapor profile or Energy Modeling contest) which means that it just isn't as interesting to faculty or sponsors looking to push the boundaries of the green-building sector.

If the contest is able to re-focus itself as a vital reservoir of data and experimentation for the building-science community, it could re-establish itself as a premier venue for those interested in



this kind of work. In my work teaching 'Passive House' techniques to architects, engineers and builders (for Passive House Academy) I can tell you that a coherent set of long-term, measured data for North-American high-performance homes would be tremendously helpful and well received. But to do this, building-science practitioners need to see much more data, across a wider variety of climates and seasons, and over much longer time-frames, all of which I think this new contest form does very well.

In general though, I think it is vital to move away from a focus on the general public (the public exhibit) and the 'home-show' side of things, and towards a focus on the building science community of architects, builders, companies, policy-makers and engineers if the contest is to continue to be relevant and successful.

2. **Remove the huge risks of transportation and on-site erection. This should not be a 'Pre-Fab' contest.**

I've been in charge of 2 on-site assemblies (and participated in a third) and have experienced first hand the challenges and issues with the rapid deployment (and then deconstruction) of these homes. Both from a logistics, financial, and site-safety perspective - I think this part of the contest is an unneeded burden on team management and student participants.

This contest should not be about pre-fab buildings, it should be about designing quality built, energy-efficient buildings: whether the building can be erected in 8 days shouldn't have any impact on a team's performance or score.

3. **On the Loss of the 'Event' excitement, networking, connections, etc...**

I definitely do understand this issue, and having made many friends and contacts during the on-site portion I think this is the main strike against this new model. However:

- a. The students do NOT initially get involved because they are looking forward to the on-site event. Many do not even understand the nature of the on-site event when they choose to get involved. Instead, they choose to get involved because of the value of the project work to their careers and interests. Therefore I wouldn't expect the 'loss' of this aspect to affect overall student participation.
- b. Already, many teams DO NOT have their main students on-site to exhibit the houses. Many teams bring in special or alternate 'exhibitors' (Sponsors, communications majors, volunteers, etc...) and the student design/construction team very often does not participate in this aspect of the competition. Again, I do not see a huge loss to student interest or team cohesion because of the loss of this aspect of the contest.
- c. There are plenty of other venues where teams could be brought together to 'exhibit' their homes together - whether at conferences like **Greenbuild**, **NESEA** or the **Passive House** conferences or something like the **NAHB**, **JLC** or other conferences - team members could be brought together to exhibit and demonstrate (digitally or through smaller physical mockups or prototypes) and 'compete' for points in the Education or Outreach contests. This would also serve to better align the Solar Decathlon to the rest of the Greenbuilding communities and raise the profile of the contest.
- d. In addition, there would likely be MORE chance for public viewing / impact in this new scenario since the homes would be open much longer. In addition - having the opportunity



for local stakeholders and public to view the houses would increase the impact and relevance of the projects on local markets. In addition, local sponsors would be more likely to participate as opposed to a remote (for most teams) viewing location

Specific suggestions / thoughts on contest modifications:

1. Correct the Misalignment with University Schedules

One of the consistent difficulties with the Solar Decathlon is the schedule and its misalignment with the academic schedule:

- a. Misalignment of the notification: Feb notification of acceptance into the contest is too late to form a 'class' for the spring semester as most students and faculty already have their schedules set far in advance. In addition, most classes begin late Jan - so even scheduling of university space is difficult when notification comes in Feb. An earlier notification period (even if it means an earlier submittal period) is critical to integrating the Solar Decathlon into curriculum and getting the best students involved. The only way to get the best students is to make Solar Decathlon part of the curriculum and this requires more advance planning.
- b. 'Exhibit' timeframe is particularly difficult as students have only been in a few weeks of class before they have to leave. Exhibit really should align to semester breaks (Summer or Winter)
- c. One additional challenge is that without the certainty of a project, developing curriculum around building-science issues re: houses is very hard. Shifting to a longer time-frame where acceptance into the contest is known earlier would allow for more 'prep' classes teaching fundamentals, history and theory, etc...

2. Allow for 'Renovation' projects, 'Urban' projects, etc..

While the suburban single-family home model is certainly critical to address (esp. in this country), a wider variety of project types should be allowed which would lead to more interest from schools and students.

Urban projects would require some modification to the visualization and Architecture Jury rules to allow for visuals that demonstrate the project in context and as a part of an urban fabric (right now the rendering rules require a flat, featureless buffer zone around the home....). I agree 100% that teams should **NOT** be allowed to show alternate (un-built) versions of the home - but the home in context should absolutely be a part of the Architecture contest and would lead to better buildings.

As for renovations - esp. here in the northeast (I'm based in Brooklyn, NY) new-builds are a very small part of the problem - we need to look much more closely at how we rehabilitate our poorer performing and unhealthy buildings long before we focus more attention on bespoke, single-family, architectural projects.

3. Include 'remote demonstrations' as a contest / criteria for Arch contest (maybe even an 'Architectural Photography' sub-contest)

Architecture is more and more experienced online and through media, as evidenced by the



explosion of design blogs and magazines. Therefore it isn't a stretch to insist that teams 'exhibit' their homes digitally and through media rather than on-site. This 'exhibition' should be a part of the scoring and judging which would encourage teams to come up with novel ways to communicate their projects (both the designs, and the built object). This past cycle, Stevens Institute utilized very simple, quick 3D Scanning during our construction (<http://www.popsi.com/3d-walkthrough-sure-house-fully-airsealed>) and other online / video / Social Media could be utilized to effectively deliver the project, its design, and its performance to the public.

One inclusion, along this vein, would be to have an '**Architectural Photography**' sub-contest which challenges the students to document their work through imagery (an increasingly important task in today's architecture landscape)

4. Allow Batteries, judge 'Demand Response'

A difficulty, as of late, is getting solar and utility companies to get excited about the contest since the questions of solar deployment (how do we put solar panels on houses?) has been largely solved at this point (thanks in large part to the work of folks in the Solar Decathlon!). The more pressing questions now regard the use of batteries to reduce homeowner costs and increase reliability, vehicle-to-grid connections and demand-response controls among other issues. Solar Decathlon Europe is an interesting model for the Demand Response contest esp.

I think including contests along this vein would help push research dollars towards the projects and get Solar companies excited about the work again. Solar Decathlon teams should be asking questions we don't know the answer to, not simply deploying technology we already know works well.

5. Change Energy Use category to be judged on a kWh / SF basis.

Almost every energy efficiency standard (Passive House, HERS, etc) uses a 'energy-per-square-foot' metric to judge buildings on. This makes it possible to compare the efficiency of very different size projects. The Energy use contest should shift to this model rather than using a simple gross 'energy used' figure as a limit. This figure should be carefully calibrated to align with the most stringent energy standards used today (Passive House, Living Buildings, Energy Star, etc..) in order to encourage teams to take energy use seriously and in a repeatable manner.

Alternately, folks like Mark Rosenbaum have argued for years that there should be a energy budget for a building which is based on a 'fair-share' PER-PERSON amount (instead of per-SF). This would be a defensible alternate criterion, but in any event a simple lump sum cap on energy use (regardless of SF or # of people) doesn't make sense.

The Energy Use contest should also REQUIRE branch-circuit energy monitoring and open public datasets for all houses. It isn't enough to simply show the total house consumption - individual equipment and component level data needs to be demonstrated and shared in order to effectively develop low-energy buildings.

6. Include an 'Energy Modeling' task inside the Energy Use category (allow PHPP, TrnSys, HERS, Energy+, WUFI, etc....)



Increasingly, energy modeling is being used by professionals to drive design decisions from the beginning of projects, and these student projects should be no different. Teams should be allowed to use any tool of their choosing, but SOME form of energy model should be posted online or made available for review and judging. This should include Thermal-Bridge (2D heat flow) analysis of critical details as well as an overall Heating, Cooling, Hot Water, Plug-Load and appliance use as well as full Primary (Source) Energy limits. The contest points should also be re-structured to allow for minimal point loss for going slightly over the limit, with increasing point loss for drastic over-limit consumption (similar to how the Affordability contest is judged now)

7. Include IAQ in the comfort zone contest, as well as surface temps (esp. at glass or temp. asymmetry contest). Possibly include Airtightness contest? Blower-Door test requirement? Vapor Profile assembly testing (WUFI)

In my experience, folks in the building science world are increasingly interested in questions of IAQ, thermal comfort and durability in these new super-insulated and air sealed envelopes people are building. These questions should absolutely be part of the new Solar D.

IAQ can be simply measured via CO² PPM monitors, and would incentivize teams to include ERV or HRV technology (and then, when installed, to actually RUN them during the competition measured portion)

Surface temps should also be part of the 'comfort' contest as these have a large effect on perceived comfort in a space - this is particularly important at glass faces and reducing temp. asymmetry should be a focus for the student design team in addition to careful control of temp. and RH. The 'comfort' contest should also include a lower limit for RH, esp. if the contest is going to stretch throughout the winter period (as low Wintertime RH can lead to as much discomfort and health problems as too high RH can). There should also be a lower temp limit if the contest stretches through the winter - in winter in the Northeast 68° is common as a set point and design temp, not the 72° currently used in the comfort contest. Maybe the target temp is adjusted seasonally (or monthly?)

I would also like to see a Blower-Door test added and an 'air-tightness' contest. This would NOT preclude manual ventilation schemes (as some argue) during the measured portion, as the tests are conducted with all openings closed but this does NOT mean you can't open fenestration later (windows, louvers, etc...) as part of a thermal-comfort strategy. But all building codes are moving towards much more strict Airtightness levels. The limits could be either gross (ACH) or more envelope-specific (CFM/SF-Envelope) as either are effective ways to measure airtightness. This would force teams to think carefully about this critical layer and test throughout construction. Points could be awarded on a sliding scale down to 0.6 ACH@50 or something similar as a target value (perhaps something more appropriate to small buildings - 0.6 is a VERY aggressive target for 1,000sf buildings....)

8. Do not eliminate the affordability contest.

While I understand the issues with the affordability contest limiting 'innovation' from teams - I think it is very, very important to incentivize teams to work to reduce their costs. I think that this 'dampening' effect could be counteracted by requiring teams to include coherent, complete



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business plans or proposals which model the long-term price of any of their 'innovations' if they were deployed at scale or as real businesses. In this way, teams could, if they put in the hard work, continue to experiment and develop novel mechanical / electrical / solar systems but only if they justify and prove that their projects could work.

Conclusion:

I hope that these comments are received in the spirit of encouragement with which they are intended. The Solar Decathlon is a tremendous project with many dedicated people and I only wish to see it grow and thrive in the future. An intentional 're-focusing' is common for many successful organizations and Solar Decathlon is no different. It has reached the point where it must step back and ask: "What is our mission" and make sure that the on-site centralized assembly truly supports this mission and values. I believe that the Solar Decathlon could reach more students, create more good data, and create better and more useful buildings by shifting to a decentralized model and I hope that the contest decides to move this direction.

Sincerely,

Ed May
Faculty Project Manager
2015 SURE HOUSE
Stevens Institute of Technology
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Mike Wassmer
Live to Zero LLC
840 Mohawk Dr.
Boulder, CO 80303
USA

Ames Iowa October 25th, 2015

Dear Mike Wassmer,

Thank you very much for initiating a proposal for a 'Decentralized Solar Decathlon' in response to the US DOE FOA 0001371. As the lead Principal investigator for the Iowa State University's 2009 entry into the US DOE Solar Decathlon, I fully support your proposal to the Department of Energy.

Our Iowa State University entry into the 2009 US DOE Solar Decathlon, The Interlock House, provided incredible learning opportunities for our students, but due to the enormous financial obligations to our university thus remained a one-time opportunity. Our team was fortunate to find a partner for the Interlock House in the Iowa Department of Natural Resources, who now owns and operates the house as the Activity Center at Honey Creek Resort State Park in Southeast Iowa. Yet, the competition house itself would not have been possible with the generous contributions of my university leadership at the time with many contributions from multiple colleges and the president's and provost's office. We were even more fortunate that we were able to develop the house into a state resource for energy efficiency education, outreach and research by including the house into a \$20 Mio NSF EPSCOR project to conduct research into human behavior and energy utilization in energy efficient home from 2011 to 2016. (<http://iowaepscor.org/research/energy/utilization/buildingscience>).

Your contracted consultancy with our data acquisition system for the Interlock House was invaluable and shows how much can be assessed and visualized remotely. I also followed your recent competition organization for the EcoHouse competition in Oman, where university teams built their house on their own campus and was very impressed by the impact these houses had on their individual campus. I strongly believe that a consortium led by a former Solar Decathlon Competition Manager is well positioned to lead the competition into the future.

Our research team at the Center for Building Energy Research (CBER) monitors the energy performance of the Interlock House and compares measured data with design predictions based upon whole building energy and computational fluid dynamics models. These analyses provide beneficial insights into spatial composition for new construction, building operation strategies, and controls. The goal of the project is to research the interaction of passive and active design strategies for the Iowa climate and to develop home prototypes, solely powered by the sun, which are both sensible and delightful. I thus understand the request to conduct climate related building energy research and demonstration from this project

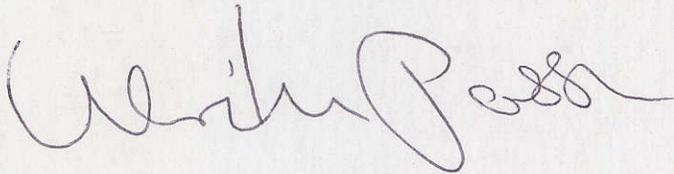
very well. This house provides one example of how net-zero energy living can be affordable today. It has been occupied in the Iowa landscape for the past four years while researchers study its energy base line and comfort parameters. The house has been the basis for research and scholarship with numerous journal articles, conference presentations and proceedings and trained over 25 undergraduate research students over the past five years.

Through our outreach we have collected strong evidence, that the generally public in the Midwest would be receptive to building more solar projects. With the increasing adoption of recent international energy conservation codes in various US states, good examples are still rare in most communities. Thus a decentral Solar Decathlon could provide this knowledge for many years to come.

If your consortium is selected to administer the 2017 and 2019 Solar Decathlon competitions, I volunteer my time to serve as a member to the Board of Advisors and I would also volunteer as a contest judge for those future Solar Decathlon competitions.

I wish you good luck for the proposal.

With best regards,

A handwritten signature in blue ink, appearing to read 'Ulrike Passe', written in a cursive style.

Ulrike Passe, Dipl.-Ing. Architekt | Associate Professor of Architecture
Director Center for Building Energy Research | Iowa State University
146 College of Design | Ames Iowa 50011 USA | upasse@iastate.edu

Designing Spaces for Natural Ventilation:
<http://www.tandf.net/books/details/9780415817776/>
http://www.design.iastate.edu/news/6/9/2015/passe_book

UNIVERSITY OF ILLINOIS
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Illinois School of Architecture

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611 East Lorado Taft Drive
Champaign, IL 61820-6921 USA



Subject: In Support of a Decentralized Solar Decathlon

To, The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy,

As the architectural faculty lead for Illinois' submissions in the 2009 and 2011 Solar Decathlons I feel compelled to write in support of a decentralized approach for future Solar Decathlon Competitions.

Throughout the history of the Decathlon rules have been modified to reflect market trends and advances in technology, and through these changes thousands of young lives have been prepared to be on the cutting edge of careers in the energy efficient building industry. This is a great story, however, the fact that six of the twenty teams selected to compete in 2015 did not make it to the start line in competition is deeply troubling, and cannot be overlooked. Historically each year one or two teams have struggled to fulfill their obligations for a varying array of reasons, however as it was pointed out in the Architectural Record on October 21st this year, transporting homes across the country is an ***“energy-consuming, if not wasteful, maneuver, with long-distance transfers exceeding \$100,000 (adding to the funding the teams must typically raise themselves).”***

It is true that a decentralized, or more regional approach to the Decathlon will present new challenges to those who write the rules and conduct the judging, but these challenges would not be insurmountable, and could actually result in better architecture that is more optimally designed to suit a particular region and context. Changes in the rules in 2011 reflected the public's desire to see more affordable solutions, however due to the transportation logistics few if any of the houses have ever been replicated outside of the competition. New rules, and new local partnerships could help foster great change in a region's building industry. Another progressive rule change that was introduced in 2011 could also set a direction for future competitions. Requiring teams to produce high quality video descriptions of their homes could be a “gift” to a TV network that could be engaged to cover the competition with reports and pre-recorded material from around the country.

It is true there is a degree of drama and excitement in having all teams located in one location when the final awards are announced. If it was thought this was a component of the competition that should be retained it could be possible to gather representatives of each team in a TV studio to review the highlights of the contest and announce the winners of the subjective contests and overall winners.

My hope is that those who will decide what format the next Solar Decathlon will consider a decentralized approach, with greater formal ties to television media. It is my belief that this will result in to a competition that is locally relevant and nationally impactful.

Sincerely,

A handwritten signature in black ink, appearing to read 'Mark Taylor'.

Mark Taylor
Assistant Professor
Architectural Faculty Lead for SD 2009 & 2011

APPENDIX C STATEMENTS OF SUPPORT AND COMMITMENT

Solar Decathlon 2015 Team Survey

On August 24, 2015, Live to Zero LLC emailed a link to the following survey to the Solar Decathlon 2015 main contacts listed on the [Solar Decathlon web site team pages](#):

Centralized vs. Decentralized Solar Decathlon

This survey has been published by [Live to Zero LLC](#), which is not affiliated with the U.S. Department of Energy or the National Renewable Energy Lab. Live to Zero is deciding whether to submit a proposal for the management of the 2017 and 2019 Solar Decathlons and it will use the survey results to inform its decision. Thank you for your participation.

*** 1. Where should future Solar Decathlon competitions be hosted? Assume that seed funding and/or prize money amounts in either scenario are identical.**

- Each house should be constructed on a permanent site on or near campus and the competition should be hosted virtually.
- All the houses should be shipped to a centralized site so they are co-located for the competition, as they have been in the past.

Please provide a justification for your answer (OPTIONAL)

2. Which SD2015 team are you affiliated with?

3. Should Live to Zero LLC publish additional surveys regarding the future of the Solar Decathlon competition?

- YES
- NO

Done

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See how easy it is to [create a survey](#).

Request for Support and Comment

On October 5, 2015, Live to Zero LLC emailed the following letter to approximately 90 past Solar Decathlon faculty advisors:

Dear Fellow Solar Decathlon Alumnus,

This is Mike Wassmer ('02 Solar Decathlete, '05-'09 Competition Manager, and President of [Live to Zero LLC](#)). I hope that you have been well since your participation in the Solar Decathlon. The Department of Energy recently announced a Funding Opportunity Announcement (FOA) for a new program administrator to manage the 2017 and 2019 competitions. Together with several partners, I have formed the "Consortium for a Decentralized Solar Decathlon" to respond to the FOA with a proposal to decentralize the Solar Decathlon. We are writing to request your support.

Over the past 2 years, DOE has challenged the community to propose significant, impactful changes to the program. Decentralization and its increased use of technology, new storylines, reduced risk, and greater ROI for all stakeholders is the concept that meets DOE's challenge.

The Decentralized Solar Decathlon concept will substantially increase the depth and breadth of the Solar Decathlon program's impact by hosting the competition across 20 campus communities across the country; as opposed to the previously centralized location of the competition in one flagship city. Decentralization will exponentially expand the reach and impressions of the event; create exciting new sponsorship opportunities in a diverse slate of U.S. cities; and will allow for integration of an innovative interactive and digital element to the program. We strongly suspect that future teams will support decentralization because it will eliminate the burden on the teams to transport a house and students to a remote destination and to assemble/reassemble the house multiple times. At the end of the project, each participant will have a permanent, climate-appropriate, market-responsive, zero-energy demonstration home on its campus.

We believe that more diverse and interesting photo, video, media, educational, research, feature story, profile, and other content opportunities exist in this more diverse approach. This concept also allows for permanent houses in high-traffic locations to attract diverse audiences over many years, expanding the reach of the program exponentially.

If you support the decentralization concept and believe that a consortium led by a former Solar Decathlon Competition Manager is best positioned to lead the competition into the future, then we would like YOU to be part of our bid process to the DOE. We are seeking partners and sponsors from the community to commit their support to this concept.

Here are some easy ways to pledge your support:

- **If you have a few seconds**, send a quick email to decentralizedsolardecathlon@livetozero.com in which you state your support for decentralization. If you don't support this concept, we'd like to know that too.
- **If you have a few minutes**, send a PDF letter of support to decentralizedsolardecathlon@livetozero.com in which you justify your opinion that Solar Decathlon should be decentralized.

- **If you have an hour**, think of some ways in which you could contribute to the decentralized Solar Decathlon if it moves forward and send a letter of intent or a letter of commitment to decentralizedsolardecathlon@livetozero.com. Some ideas for future contributions follow:
 - Identify potential sponsors from your professional network (DOE will require 50% cost sharing from its new Solar Decathlon Program Administrator).
 - Serve on a Solar Decathlon Board of Advisors that would help us and the teams solve new logistical challenges associated with building permanent houses on campuses, help us refine contest criteria and the rules, help new teams navigate the project, and help new teams navigate the project's challenges.
 - Nominate outstanding students, graduates, and colleagues (or yourself!) for volunteer, intern, and/or permanent positions with the Solar Decathlon program.
 - Submit a proposal to compete in a future Solar Decathlon and/or encourage colleagues from other schools to submit proposals.
 - Volunteer as a contest juror and/or nominate potential jurors from your professional network.
 - Invite us to include your past SD house(s) in a small, decentralized, pilot Solar Decathlon competition in late-2015/early-2016.
 - Use your past SD house(s) for education, workforce development, and/or research activities and tell us about your successes and challenges.

A major criterion in DOE's evaluation is the quantity and quality of letters of support, intention, and commitment that are included in the proposal, so we appreciate your help!

Sincerely,

Consortium for a Decentralized Solar Decathlon

Mike Wassmer (President, [Live to Zero LLC](#))

Survey and Email Responses

The following survey and email responses were received through October 27, 2015.

Individuals and teams IN FAVOR of decentralization are highlighted green

Individuals and teams UNDECIDED about decentralization are highlighted orange

Individuals and teams OPPOSED to decentralization are highlighted red

Mona Azarbayjani

North Carolina (SD13)

Faculty Lead

Hi Mike,

I think it sounds like a great idea. I believe, it will be a more sustainable solution as transporting the projects were extremely inefficient. that also prevent the SD houses ended up in landfills.

I support the idea and if I can help in anyway along the way, I will be happy to do so.

Thanks

Mona

Stuart Baur

Missouri S&T (SD07)

Main Contact/Faculty Lead

Initial Response:

Hi Mike,

Thanks for the reminder email. I am curious as to whether DoE is seriously willing to consider decentralizing the Solar Decathlon. I am currently assisting S&T's solar house team with preparing the proposal for the 2017 SD. Talk about restructuring the way DoE funds are rewarded. While it does not address the location for the 2017 SD, the idea that rewards will be provided in amounts that are directly tied in with a team's final placement is concerning. That might be a discussion item for another day.

On the other hand, I have for many years been a proponent of a local grown and displayed SD competition for participants, that would promote sustainable design that truly reflects its local environment. I realize the logistics of monitoring from an objective point of view would be somewhat difficult but doable. On the other side the subjective parts of the contest would be very difficult. Any thoughts on how the logistics might be coordinated?

Stuart

Follow-Up Response After Phone Conversation:

I support a decentralized Solar Decathlon!

Stuart Baur
Solar Decathlon Alum!

Vincent Blouin

Clemson (SD15)

Main Contact/Faculty Lead

Hi Mike,

I totally support the Decentralized Solar Decathlon. Since I have "a few seconds", I will send an email to decentralizedsolardecathlon@livetozero.com to state my support.

Can you please tell me more about the small, decentralized, pilot Solar Decathlon competition in late-2015/early-2016 mentioned in your email?

Thank you.

Vincent

Vincent Blouin, PhD

*Associate Professor
2014-2015 Robert Mills Endowed Professor
School of Architecture / Department of Materials Science and Engineering
Clemson University
2-138 Lee Hall
Clemson, SC 29634
Phone: (864) 985-3124
Email: vblouin@clemson.edu*

Martha Bohm

U at Buffalo (SD15)

Main Contact/Faculty Lead



#2

COMPLETE

Collector: Email Invitation 1 (Email)
 Started: Monday, August 24, 2015 3:13:13 PM
 Last Modified: Monday, August 24, 2015 3:14:03 PM
 Time Spent: 00:00:50
 Email: marthabo@buffalo.edu
 Custom Data: None
 IP Address: 128.205.119.78

Edit Delete Export

PAGE 1

Q1: Where should future Solar Decathlon competitions be hosted? Assume that seed funding and/or prize money amounts in either scenario are identical.

Each house should be constructed on a permanent site on or near campus and the competition should be hosted virtually.

Please provide a justification for your answer (OPTIONAL)	Shipping costs are an undue portion of the team's budget. (10% of total project cost for the team I am currently working with)
--	--

Q2: Which SD2015 team are you affiliated with?

UB

Q3: Should Live to Zero LLC publish additional surveys regarding the future of the Solar Decathlon competition?

YES

Mike Brandemuehl

Colorado (SD02/07)

Main Contact/Faculty Lead

Hey Mike,

I gotta admit, the proposition is intriguing. I fully agree that a decentralized approach would reduce costs and the environmental impact of the competition, especially for the teams. The houses would be more realistic and inherently designed for and embedded into a native community, rather than the sterile and artificial context of a contrived village. The long-term impact, especially in terms of return on investment, would be much greater. I just returned from the 2015 Solar Decathlon and was struck by the remoteness of the venue. I was there only during the monitoring and juried period when the houses weren't open to the public. Needless to say, it was a ghost town. With 104 F temperatures the previous weekend, turnout was very light and they were hoping for decent weather this past weekend to attract some crowds. It seemed like such a waste.

Having said that, though, it seems that the decentralized approach would deny the student the benefits of that culminating experience. Personally, I found that the most fun and most rewarding part of the whole two-year process was being on the National Mall, being part of that

community. I would really like to hear your thoughts on the importance of the “gathering” and what could compensate for this missing element in a decentralized event.

I'm back in Colorado and would be happy to meet for breakfast or a beer to talk more about it and how I might help your efforts.

Mike

Follow-Up Message:

Mike,

I echo David's endorsement of Ed's suggestions/insights and hope that you can include them in your proposal. I would specifically like to reinforce a couple of his comments about demand response and affordability.

Ever since the Solar Decathlon shifted from autonomous to grid-connected houses, there has been an opportunity to focus attention on building and grid integration issues that has largely been ignored by the Solar Decathlon organizers. In my mind, grid integration issues are the single biggest barrier to wholesale adoption of renewable technologies and buildings dominate grid demand. Solar Decathlon would be a perfect venue to address these issues. One thought might be to change the Energy Balance contest to include a component of load tracking where the scoring is based on when the house feeds and draws from the grid. Ultimately, you could also tie it cost by using day-ahead pricing or even set up a “market” where teams bid energy supply and demand.

I also agree with Ed that some measure of affordability should be retained in the contests. One of my main criticisms of the early Solar Decathlon events was the lack of a counterbalance to elegant but impractical architectural designs. On the engineering side, there has always been a balance between innovation and functionality imposed by the measured contests. While innovation is clearly encouraged, teams are restrained from going too wild by the reality that the systems actually have to work. I view the affordability contest as a similar set of brakes on the architecture side.

Finally, my only hesitation about the decentralized model is that the culminating event, especially on the National Mall, was so much fun and so rewarding. However, I also agree that there are other “events” that can be organized to make up for this loss. While a final awards ceremony in Washington, D.C., complete with virtual tours is certainly one component, there are also opportunities for conferences, workshops, demonstrations, and exhibits that could be coordinated with industry events. David's idea of faculty workshops is just such an opportunity.

And to Ed - CONGRATULATIONS! The Stevens SureHouse deserves every accolade.

Mike

Michael J. Brandemuehl, PhD, PE, FASHRAE
Professor Emeritus of Civil, Environmental, and Architectural Engineering
University of Colorado Boulder

t 303 492 8594 | f 303 492 7317 | c 720 289 6854
michael.brandemuehl@colorado.edu

Jeffrey Brownson

Penn State (SD09)

Main Contact/Faculty Lead

I definitely support the concept, I would just like some time to think of a reasoned answer.

Cheers,

Jeffrey

Jeffrey R. S. Brownson

John and Willie Leone Family Department of Energy and Mineral Engineering
Associate Professor of Energy and Mineral Engineering / Materials Science and Engineering
Co-Director: *2iE-PSU Centre for Collaborative Engagement*
[Solar Option Lead: iMPS in Renewable Energy & Sustainability Systems](#)
The Pennsylvania State University

814-867-4227 [265 MRL Building]
<http://nanomech.ems.psu.edu/>

Ralph Bruce

Team Tennessee (SD15)

Main Contact/Faculty Lead

Mike – Having been one of the Team Tennessee faculty leaders, I agree with your effort especially as it impacts transportation costs to a central site. These costs (and the inability to raise the funds) caused us to withdraw from the 2015 competition. I would, on a personal level, endorse any efforts that you would make to decentralize the competition thus making the effort more cost effective while playing to the particular regional needs/advantages of the participants. If I can be of further assistance, please do not hesitate to contact me

Best regards,

Ralph

Ralph W. Bruce, Ph.D.
Professor of the Practice in Electrical Engineering
EECS Dept.
Vanderbilt University
Nashville, TN 37235
Ralph.W.Bruce@Vanderbilt.Edu
O: 615-322-2962
F: 615-322-6702
C: 443-822-3605

Estefania Caamaño

Madrid (SD05)

Main Contact/Faculty Lead

Dear Mike,
thanks for your emails and sorry for not answering before. I honestly thought that it was for U.S. universities (or at least universities willing to participate in the U.S. Solar Decathlon).
I have to say that I fully support the proposal of a Decentralized Solar Decathlon and share the benefits described in your e-mail.

Professor Emeritus, Texas A&M University
Co-Director + Co-Founder
Center for Maximum Potential Building Systems
8604 FM 969 | Austin, TX 78724
p 512.928.4786
--



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Richard Garber **Team New Jersey (SD11)** **Main Contact/Faculty Lead**

Mike:

I am in support of this concept. I'd like to get some of our junior faculty involved so please keep me in the loop

Best,

Richard

Geoff Gjertson **Louisiana (SD09)** **Main Contact/Faculty Lead**

Mike-

This sounds great. I've been advocating a regional decathlon for years. Here's an email I sent two years ago- although I got a lot of good responses nothing materialized.

Dear esteemed colleagues, friends, and advisors- I have a crazy idea I'd like to run by you. We all know about the Solar Decathlon and the challenges and terrible irony of having to move houses across the country to compete in a climatic and contextual environment very different from our own. But we also know about the benefits of face-to-face competition on a national stage. Therefore, I am proposing a regional design-build contest in New Orleans where universities in the gulf states compete. Also, unlike the decathlon, the homes would be designed for a specific site and would remain there permanently after the competition and be sold to pre-qualified families in need (like the Habitat for Humanity model.) Sustainability would be at the forefront but not necessarily solar. Although one advantage of building a grouping of homes (possibly even multi-family) is that they could share infrastructure and be much more sustainable. Passive energy techniques and affordability would be the primary focus. One possibility is holding the competition at the same time as the USGBC's Greenbuild 2014 (fall) in New Orleans. As I said, this is a crazy idea, but one that I am excited about. What do you think? I would love to hear your feedback both pros and cons.

Thanks, Geoff

Julee Herdt **Colorado (SD05)** **Main Contact/Faculty Lead**

Hello Mike,

Congratulations on your great success in continuation of the Solar Decathlon.

I'd like to go on record in support of decentralization of the Solar Decathlon event. This method will keep the competition work by the teams at the highest caliber while providing greatest exposure of the event to the public.

With best regards

Julee Herdt
Architecture Faculty Lead for the
University of Colorado's
First place winning 2002 and 2005
Solar Decathlon Projects
Architect; Professor of Architecture
BioSIPs, Inc. CEO and founder

Andrea Kerz-Murray

Middlebury (SD11/13)

Main Contact/Faculty Lead

Hi Mike,

Thank you for your email. I think this is a very interesting idea.

One reason Middlebury kids were lukewarm about submitting a proposal for SD 2015 was their reluctance to ship/truck/train the house all the way across the country, believing that the energy and money involved in doing this was contrary to our overall sustainability goals for the project. I suspect Middlebury students would be very interested in participating in a decentralized competition. Middlebury has just inaugurated a new president, and I have not spoken with her about SD; so I really do not know the institutional position regarding the competition in any form.

That said, we come from very different parts of the country where climate conditions vary substantially. I am not sure how you would level the playing field and equally judge each submission.

Having been through this twice (both in DC and Irvine), I would also recommend that Competition Organizers schedule events where all teams come together, similar to the Schematic Design review, as the energy is amazing, and it is important for our students to meet and learn what other schools are doing. It would be great if the final completion winners were announced in DC with all of us together.

I would consider being an advisor to the competition should approval to decentralize be achieved.

I did nominate fellow advisor and my business partner, Ashar Nelson, as a juror for SD 2015 for which he did serve. I am always happy to do that.

Thanks for being a forward thinker.

Andrea

Andrea Kerz-Murray, AIA, NCARB, LEED AP BD+C
Visiting Instructor, Architectural Studies
Lean Faculty Advisor, Solar Decathlon Teams 2011, 2013

802-443-5897
akmurray@middlebury.edu

Steve Lee **Carnegie Mellon (SD02/05/07) Main Contact/Faculty Lead**

Hi Mike:

Your original request is still in my "To Do" folder.

Yes, I am a huge supporter of the de-centralized Solar Decathlon for multiple reasons:

pedagogically it reinforces the notion of regionally adaptive architecture

in terms of outreach, the predominantly "local" visitors would see meaningful solutions for their own climate zone and local homebuilders, manufacturers, et al would see new approaches to every and environmentally effective housing

minimizing transportation energy and effort would be huge

we have so many endeavors in Pittsburgh right now, from Urban Design/ Build Studio, Trade Institute of Pittsburgh, Energy Innovation Center, Pittsburgh Green Innovators, it would be a no-brainer for Pittsburgh to host the event

Hope this helps.

Best Regards,
Slee

Stephen R. Lee, AIA, LEED AP

Professor & Head | School of Architecture
Carnegie Mellon University | Pittsburgh, PA 15213
412.268.3528(v) 412.268.7819(f) www.cmu.edu/architecture

Mark McGinley **Kentucky/Indiana (SD13)** **Faculty Lead**

Mike:

In general Principal, I support the principal of a decentralized Solar decathlon. I suspect participation costs would go down and you would have a broader impact. However, there would be many logistic issues to address as well as the how to mitigate the loss of the team interactions.

Mark

Dr. W. Mark McGinley, PE
Professor and Endowed Chair for Infrastructure Research

Civil and Environmental Engineering
University of Louisville
Louisville, Kentucky 40292
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Marilys Nepomechie

Florida Int'l (SD11)

Main Contact/Faculty Lead

I've been writing and advocating this approach for years!

Long, long overdue.

Marilys Nepomechie, PI SD2011

Marilys R. Nepomechie | FAIA || Associate Dean for Strategic Initiatives | Architect + Professor | College of Architecture + The Arts || President | Association of Collegiate Schools of Architecture || Florida International University || 11200 SW 8th Street | Miami FL 33199 || PCA 275-A || Tel.: Office: 305 348 1887 | Mobile: 305 790 8057 | Email: Marilys.Nepomechie@fiu.edu || <http://carta.fiu.edu>

David Peronnet

Tidewater Virginia (SD13)

Main Contact/Faculty Lead

Mike,

Thank you for the reminder. I definitely support a decentralized Solar Decathlon. The proposal supports more direct interaction with local populations who live in a similar environment of the solution.

David J. Peronnet, RA

Assistant Professor
Hampton University

M: 757.352.0748

O: 757.727.5442

Heath Pickerill

Missouri S&T (SD13/15)

Faculty Advisor

Dear Mike,

I enthusiastically support the proposal for a decentralized Solar Decathlon. This would reduce the financial burden immensely as well as the stress on the students of being away from classes for multiple weeks. Our project as always been accomplished with undergraduates, so this would be a significant benefit to them. Since our houses come back to the Missouri S&T campus to be a part of our one of a kind solar village, this would allow us to build a home in its permanent location and showcase it alongside the previous six homes that we have designed and built. There has been talk of this being the direction that the Decathlon should head among some of us involved at our university for years. I am so pleased to see that someone has taken the incentive to propose this idea to DOE. Best of luck as you move forward.

Sincerely,

Heath

SD 2013 & 2015 Missouri S&T team advisor

Heath A. Pickerill

Director, Missouri Local Technical Assistance Program
Manager, Missouri Rural Transit Assistant Program
Lead Advisor, Solar House Team
Missouri University of Science and Technology
pickeril@mst.edu
(573) 341-7637

Joe Richardson

Team NY Alfred (SD15)

Main Contact/Faculty Lead

Hello Mike,

Yes I would support a decentralized Solar Decathlon. I don't think it demonstrates "green building" by trucking modules across the country. At the latest Decathlon, one team said that they had 11 trucks. The shipping costs almost exceed the cost of construction. I realize it is a great draw for the public to be able to walk through up to 20 solar homes at one venue. But it also a nice concept to build the home as it would be built on a building lot, not built so it can be trucked on the highway. Having it displayed and used on the college campus would also expose thousands of visitors to each teams concept home, so it would still be educating the public on solar and sustainable building.

Thank you,

George (Joe) Richardson
Chairman – Building Trades
School of Applied Technology
2530 River Road
Wellsville, New York 14895
Office: 607-587-4574
Cell: 607-661-0654

Sandy Stannard

Cal Poly (SD05/15) Fac. Lead (SD15)/Advisor (SD05)

Thanks and apologies; I did get through.

Yes, Cal Poly supports a decentralized Solar D.

Please change the web site to say Cal Poly (2015 and 2005).

Are you aware of the "Living Building Challenge?" See: <http://living-future.org/lbc>

It might be good to perhaps take a chapter from them, to encourage more intense holistic focus on ecologically responsive projects.

Being more place/site based.....there might be a category developed to give points toward place-responsive design. Or at minimum....this should be recognized within one of the categories.

[I really think it could take up that last open category, all on its own....]

As an architect....I do have concerns that there appear to be less "design" related contest strategies.

I feel this may be of concern for schools of design in general.
[For example....in 2005, there were 200 pts for architecture and another 100pts for lighting,
and those were just the "direct" design related categories].

May have additional thoughts later; thanks for soliciting input.
Good luck,

Sandy Stannard
SD 2015 and 2005

Stevens (SD15)

#4  **COMPLETE**

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PAGE 1

Q1: Where should future Solar Decathlon competitions be hosted? Assume that seed funding and/or prize money amounts in either scenario are identical.

Each house should be constructed on a permanent site on or near campus
and the competition should be hosted virtually.

Q2: Which SD2015 team are you affiliated with?

Stevens

Q3: Should Live to Zero LLC publish additional surveys regarding the future of the Solar Decathlon competition?

YES

Team Tennessee (SD15)

#1  **COMPLETE** Edit Delete Export

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Q1: Where should future Solar Decathlon competitions be hosted? Assume that seed funding and/or prize money amounts in either scenario are identical.

Each house should be constructed on a permanent site on or near campus and the competition should be hosted virtually.

Please provide a justification for your answer (OPTIONAL)

The primary reason for Team Tennessee's withdrawal from the competition was due to its inability to raise the \$250k in cash needed to transport the house as well as transport and maintain the team participants while at the current competition site.

Q2: Which SD2015 team are you affiliated with?

Team Tennessee

Q3: Should Live to Zero LLC publish additional surveys regarding the future of the Solar Decathlon competition?

YES

Texas/Germany (SD15)

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Q1: Where should future Solar Decathlon competitions be hosted? Assume that seed funding and/or prize money amounts in either scenario are identical.

Each house should be constructed on a permanent site on or near campus and the competition should be hosted virtually.

Q2: Which SD2015 team are you affiliated with?

Texas/Germany

Q3: Should Live to Zero LLC publish additional surveys regarding the future of the Solar Decathlon competition?

YES

Christian Volkmann	Team New York (SD11)	Main Contact/Faculty Lead
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To Whom It May Concern:

I support the idea of a decentralized Solar Decathlon.

Much of the money (6-digits \$) we spent in 2011 was for transportation and hotel fees, which could have been avoided.

This would have helped to reinstall the house much earlier and make it accessible for the public and a teaching tool for our students.

I also think that part of this concept should consider monitoring all featured houses permanently after they are reinstalled.

I believe that our house is still "undercover" at the DOE's Solar Decathlon website ("Where are the houses now..."), even though it returned to our campus more than a year ago. (see poster attached).

Thank you Mike for organizing this effort.

Best,
Prof. Christian Volkmann

2011 Program Manager "Team New York"
City College of New York

Mark Walter

Ohio State (SD09/11)

Main Contact/Faculty Lead

To Whom it May Concern,

I was one of the faculty advisors for the 2009 and 2011 Ohio State University Solar Decathlon entries. I have also visited the 2013 and 2015 competitions and am affiliated with the 2015 Team OC entry. I have witnessed the cost and waste associated with transporting houses long distances to participate in the competition. It goes against many of the same goals that each team tries to promote. The need to transport a house creates design challenges and constraints which are not realistic for new-home construction. The transportability also makes it difficult, if not impossible, to achieve certain performance characteristics. While the competition at one location is exciting and educational and truly something all participants will never forget, I think it may also be time to try something new. For this reason I support the goals of Decentralized Solar Decathlon.

regards,
mark

Bill Hutzal

Purdue (SD11)

Main Contact/Faculty Lead

A proposal for a decentralized solar decathlon is a good way to address the un-necessary/exorbitant costs of building a competition home that must be moved. This would allow students to focus on the home and its technology, not the logistics of moving a home. The downside is that the competition will lose the publicity and student interaction that accompanies a competition that is conducted on a national scale.

Bill Hutzal
School of Engineering Technology
765-494-7528 (Office)
hutzalw@purdue.edu

Team Orange County (SD15)

#7  **COMPLETE** Edit Delete Export

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PAGE 1

Q1: Where should future Solar Decathlon competitions be hosted? Assume that seed funding and/or prize money amounts in either scenario are identical.

All the houses should be shipped to a centralized site so they are co-located for the competition, as they have been in the past.

Please provide a justification for your answer (OPTIONAL)

A virtual presentation is not nearly as competitive or interesting.

Q2: Which SD2015 team are you affiliated with?

Team OC

Q3: Should Live to Zero LLC publish additional surveys regarding the future of the Solar Decathlon competition?

YES

Sacramento State (SD15)

#3  **COMPLETE** Edit Delete Export

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Time Spent: 00:00:37
IP Address: 130.86.98.183

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Q1: Where should future Solar Decathlon competitions be hosted? Assume that seed funding and/or prize money amounts in either scenario are identical.

All the houses should be shipped to a centralized site so they are co-located for the competition, as they have been in the past.

Q2: Which SD2015 team are you affiliated with?

Sacramento State

Q3: Should Live to Zero LLC publish additional surveys regarding the future of the Solar Decathlon competition?

YES