TECHNICAL TRACK: MARKET TRANSFORMATION



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> The Crowder MARET Center provides educational programs for renewable energy and construction technologies, applied research in new renewable energy technologies, and renewable business assistance, especially for incubator or start-up companies.

Quality, Productivity and Accomplishments (Average Rating 2.7) Rating Comments

- 3.0 This project demonstrated several valuable innovations integral solar water heating and photovoltaic panels; seasonal thermal storage using the ground as a heat sink, and desiccant dehumidification. I believe that the quality of the work is generally quite good.
- 2.0 It is hard to judge the quality of the work or the people involved. The concepts are interesting, but there are no details. The PI has some background in organizing and promoting solar events (rayces), but no formal training or experience in solar technologies or engineering. There is no task or budget breakdown. There is no data on the performance of the model building built so far, and no projections of performance expected from the current project, although the PI indicated some analyses had been done. In fact, the PI indicated that the building would be LEED Platinum and might even be a net energy producer. If that is in fact the case, the building would represent a significant accomplishment.
- 3.0 **Quality** - This is a project that seems full of quality ideas that could have some broad application. However, the reason I could only rate it as "good" rather than "outstanding" is that I see little what they have done and connection between what they promise to do. That is not meant to demean their efforts so far. Clearly they have taken appropriate steps to prove out what they have done already in preparation for their next steps in the MARET prototype structure. They have procured a used wind turbine as the cornerstone of the project, as well. However, the MARET building's multiple collection system and the thermal storage modes seem to be a promise that still needs to be proved out before they move forward.

Productivity - The project designers have a reasonable level of productivity, however the presentation did not situate very well what they have done and where they hope to be on a time line of goals and deliverables. From the presentation, the best I could see was that they were part of the solar decathlon back in 2002 and now were hoping to build a large structure with various

complicated energy systems. It would be useful to see more of the steps in between.

Scientific/Technical Approach (Average Rating 2.7)

Rating Comments

- 3.0 Although the MARET Center is a demonstration project, it did more than demonstrate off-the shelf components and systems, and the technical approach to innovative systems was well thought-out.
- 3.0 There is not technical approach other than the obvious design, build, display but some of the activities are quite interesting. The hybrid PV Thermal collectors are interesting. The conventional wisdom used to be that combining the two either diluted the PV too much or provides too little thermal energy to be useful. This project seems to be able to take advantage of the low-grade thermal energy so the hybrid approach may be useful. The other interesting aspect of this project is the possible use of seasonal thermal energy storage. I have done a lot of work in seasonal storage and am a strong advocate. My preliminary judgment is that the project is probably too small for cost effective seasonal storage, but, if the geotechnical conditions are suitable, it may work. Even if the system is too small for seasonal storage, shorter-term storage could be quite effective. The PI mentioned TRNSYS simulation of the seasonal storage system, and TRNSYS does have some SS models. More extensive modeling has been done with several European programs such as MINSUN. Seasonal storage for solar systems was the topic of International Energy Agency Task VII and there are many reports in the literature.
- 2.0 The ideas in this proposal are impressive and possibly ground-breaking. The PVT hybrid design was simple and elegant and holds great promise. However it would have been helpful to see either the results of a working model or a computer model report of the design's output. Without more information about its performance, it seemed to be as much of a promise as an actual technological improvement. How, for instance, do they plan to over-come drawbacks of previous PVT hyrbrid systems? According to the presentation, the MARET facility has been architecturally visualized since 2004. Surprisingly little was reported on just how it would meet its promise of an efficient envelope, LEED certification and, especially, positive net energy to grid. The presenter did not give an adequate answer as to how they would prevent water leakage from the roof/multiple collection system on such a large building.

In fact, the seasonal thermal storage mode system, while inspiring, was key to the building being a positive net energy building. Without that working properly, the building would not meet that goal.Yet, the presenter seemed to say that they had not done much to prove out the thermal storage idea for that location. So, the building's future and the good use of the DOE funding rested on PVT hybrid panels, the multiple collection system and the thermal storage working properly "out of the box." While I'm certain this team has the knowledge to make these things work, it just seemed that there needed to be more ground-work before significant money was spent to implement the full plan.

Relevance/Impact (Average Rating 3.0)

Rating Comments

- 4.0 The MARET Center project made excellent progress toward DOE goals of making buildings significantly more energy efficient, through seasonal thermal storage and desiccant dehumidification to reduce cooling, daylighting using a saw-tooth roof configuration, and an integral water heating and PV panel.
- 3.0 There are some elements that, assuming they are successful, could have an impact on future solar development. The Hybrid PVT panels are an example. Conventional wisdom has always been the attempting to use the thermal energy rejected by the PV panel results in unacceptable efficiency

loses. How has this changed? The possible use of seasonal storage is also interesting. I am a big supporter of seasonal storage, with or without solar, but the MARET projects seems way too small for seasonal storage to be cost effective.

2.0 As mentioned in the previous section, most of the ideas behind the MARET Center seemed to be untested or in the very early test stages, even for demonstration as an educational tool. Therefore, it did not seem that these tasks were ready to address market barriers. In fact, they did not seem designed to address market barriers at all. That is not to say, however, that these plans did not have the potential for significant contribution to DOE goals and society. The most promising of these was the PVT hybrid system along with the multiple roof system. If proven out, they could produce an important product team that could be easily dispatched for emergency or low-income, modular, compact and mobile residences. Overall, the project contributes to DOE goals and objectives in the broad sense, but the lack of specificity of design and results made it difficult to place the importance of this project.

Overall (Average Rating 2.3)

Rating Comments

- 3.0 I believe that the MARET Center project deserves priority attention because it demonstrates several building energy efficiency features in an effective manner.
- 2.0 I like the ideas in this project, but the supporting documentation does not convince me that they know what they are doing.
- 2.0 This project did the least of others in the March 2009 Peer Review demonstration track of truly demonstrating. Perhaps that was because many of the ideas behind the project are in their infancy. Even so, the project report would have benefited from details about plans to student education, curriculum and public demonstration.

However, as is the case with all of the demonstration projects, at least of this year, there was little attention paid to proving that any actual demonstration was done to any groups larger than those immediately around the demonstrators. If the goal is to get the maximum demonstration for the tax dollar, then I would ask the following questions:

1) Was there a plan to target a certain audience, other than students or those who are predisposed to support solar energy?

2) If there was a plan, how was it executed? Were there goals established for the number of people who would see the project? Was there an attempt to get media attention for the project?3) What metrics will the team use to track the reach of their demonstration in society, in education, among opinion leaders or among skeptical observers?

If any team cannot answer these questions, then why demonstrate anything at all?