Request for Comments: Quadrennial Technology Review for DOE

A. DOE Energy Technology Mission: Is the mission statement, "[t]o facilitate the invention, refinement, and early deployment of meaningful technologies that enable options for scaling by the private sector toward energy goals," appropriate for energy technology development and deployment programs of the Department? By facilitate, we mean that we convene and fund various entities—the national laboratories, academia, the private sector—as well as perform the basic research that underpins invention and refinement. By invention and refinement, we mean that we work on both revolutionary and evolutionary technologies. By early deployment, we mean that we support some activities beyond first commercial demonstration. By meaningful technologies, we mean that we pursue technologies that could have a material impact when deployed. Accordingly, scale, economics, and timeliness are important criteria. By enable options, we mean that we do not pick winners and losers; the markets make those choices. By scaling by the private sector, we mean that we support commercialization as an essential part of what we do. With reference to national energy goals, we mean that we would not pursue all technologies; only those that enhance energy and national security, reduce environmental impacts, and increase U.S. competitiveness.

We have three comments regarding the DOE's Energy Technology Mission. First, we believe that the Department should have more responsibility than "to facilitate". The Mission should be to "facilitate and support" or to "cause implementation".

Second, while "enhancing energy and national security, reducing environmental impacts, and increasing U.S. competitiveness" indeed provides initial clarity about the goals of the Department, it may be important to follow this with a statement that recognizes the need for academia and national laboratories to perform research that will reduce the costs of technologies, allowing these goals to be met. While the Department cannot and should not select technologies for the market place, it is important to create a strong foundation for viable options and to foster these options to a point where market selection will determine their fate. This will increase competition, create more opportunities, and strengthen US competitiveness.

Finally, in regard to early deployment, we suggested that the Department consider supporting some activities that would facilitate early deployment, such as testing and validation required for markets to securely make required investments.

B. U.S. Energy Framework: DOE has identified six strategies to address our National energy goals. These strategies divide into two trios: One for transport, and one for stationary energy

(heat and power). The transport strategies are: [1] Increase vehicle efficiency, [2] promote progressive electrification of the vehicle fleet, and [3] develop alternative fuels. The stationary strategies are: [4] Increase building and industrial efficiency, [5] modernize the grid, and [6] drive adoption and deployment of a clean electricity supply. Have we correctly identified and structured these six strategies?

In regard to the stationary strategies, this framework seems to lack a focus on generation, and strategies to make generation more efficient, like an effective capability for storage. For example, removing the qualifiers in [4] of building and industrial and broadening it to include the likes of wind and solar will allow generation improvements to be directly included. We therefore suggest that you integrate a discussion of the requirement of these sources into this section.

C. Clean Energy Leadership: How can DOE activities best support leadership in clean energy innovation? In clean energy manufacturing? In clean energy deployment? How do we balance international competitiveness against international cooperation?

No comments.

D. Program Definition and Management: What principles should the Department follow for allocating resources among technologies of disparate maturity and potential time to impact? How many technology options should the Department provide for the private sector, and how should the value of that diversity be weighed against timeliness, scale, and cost-effectiveness? What should the threshold be for entry of a technology into the DOE portfolio? Does every technology deserve a program? Conversely, when should we declare ‘‘mission accomplished’’ for a government RD&D effort, or cease efforts on a program whose costs may outweigh its benefits? How can DOE be more effective at each stage of the innovation chain? Are technology targets (e.g., cost or deployment targets) useful markers to orient and structure DOE activities?

The Department must be clear about “success”. Without a definition of success, you can’t judge completion and you can’t judge the usefulness of a potential program. Can success be defined by showing what Figure 1 (U.S. Energy Flow) should look like in 2030, 2050, and 2100? The Department should balance the risk of a project versus the value that would be created if successful. This would be a useful metric for teams requesting funds to use also.

These metrics also need to be integrated into funded projects from a project management perspective. Researchers are helped by knowing a clear set of metrics from the beginning of a project, including direction for how those metrics will be followed and what happens when they are not followed. This could create a more disciplined, national clarity for those writing proposals to know what they should be writing against and how managed if they win. For example, the ARPA-e metrics and process for managing awards is an excellent model to consider and a strong step forward to bringing industry-standard project management into the energy arena.

E. Private Sector Partnership: What are the optimal roles for the private sector, government laboratories, and academia in accelerating technology innovation? How can DOE best coordinate activities between and among these types of organizations (including the wide variety of institutions within each class)? How should we gauge the effectiveness of this coordination? How can the basic/applied coupling be optimized? Are there examples in other sectors or other countries that can serve as models? Are ‘‘technology user facilities’’ analogous to the Department’s scientific user facilities possible, or even desirable? If so, what would be the most effective model for their operation? How can the Department best gather technology market information? How can information on private sector innovation be captured without compromising competitive advantage?

The Department should stimulate collaboration by requiring that collaborations exist in certain circumstances. However, the requirement for this collaboration should be aligned with the stage that the concept exists, i.e., more collaboration closer to demonstration, less collaboration closer to the science.

F. Technology Demonstration: What are best practices in performing large scale demonstration projects? How close to commercial viability does a demonstration have to be? What are the optimal cost sharing arrangements? How might demonstrations be coordinated with DOE financing activities? How can demonstration projects better benefit all stakeholders beyond the immediate participants? How are lessons-learned best captured and promoted, and how is intellectual property best handled? How should DOE determine the number of demonstrations needed to address technical and operation risks? How do we think about failure in the demonstration phase?

Demonstration funding from the Department will play a critical role in whether technology makes it to market, and we believe that the Department is making a wise decision to build it into its strategy. When funding these demos, we think you should abide by four principles:

- ***The Department’s call for demonstration projects should be viable and the budget from the Department should be sufficient to complete it. By viable, we mean that the project should have a high likelihood of actually being completed, and completed on budget. There should be a clear idea of the expected ROI and a clear explanation of why the demonstration is needed.***
- ***Even prior to demonstration, a clear DOE plan for testing and validation for renewable technologies should be funded. It is less costly, takes less time, and will provide early information before major dollars are put into demonstration.***
- ***Regarding cost sharing, we in principle recommend that it can be higher for demonstrations because it is closer to the market place, but it should be a flexible percentage based on the dynamics of the community, of the demonstration, and of the economic factors revolving around the effort. For example, some project may be at the level of 80% cost share, whereas others could reasonably only bring 20%...yet in both***

cases, the project would still be done on time and within budget. Due to the uncertainties of projects, remaining open and flexible should be a goal for the Department

- ***Our fourth principle is one that believes the Department should consider the entire community when distributing funds for a project. Ideally, in a demonstration, more than one partner should take a role to help implement a project. Supply chains are varied and inputs are varied into that chain; such must be accounted for when funding demonstrations.***

G. Non-Technical Barriers: A number of non-technical barriers—including Federal, state, and local regulations, market failures, and non-technical risks—impact the rate of deployment of energy technologies. What, if any, role should the Department have in addressing these barriers?

The response to the energy issues must have three inputs – these are policy, technology, and commercialization. It is easy to rely on and to develop technology, but that alone will not have an impact. Policy includes regulatory issues, federal taxes, and amount of money invested by private companies into R&D. Electric companies in China are reported to be investing 1% of revenue into R&D.

However, without a national energy policy, commercialization of technology will continue to be a challenge. The change in behavior that will be required will need all three inputs--policy, technology, and commercialization—and this must be present in a DOE strategy. If there were a policy the barriers would weaken.

<u>For additional information:</u>

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