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June 10, 2011

Dr. Steven E. Koonin
Under Secretary for Science
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Under Secretary Koonin:

Thank you for encouraging me to submit comments on the Quadrennial Technology Review Framing Document. I am sorry I did not get them to you during the formal submission period, but I hope they will be helpful nonetheless.

I will first provide some overarching comments, and then a list of minor quibbles and suggestions.

Main comments

The six strategies identified in the document seem reasonable and sensible to me. I wish that CCS was afforded a somewhat higher priority given that it is listed virtually last, but I'm not sure if that ranking indicates less interest or not on the part of DOE. In general, I believe the problem is not the choice of technology areas, but rather the strategy for getting the many technologies that already exist (that will be improved upon with further R&D) demonstrated, into early commercialization, and eventual widespread deployment.

The framing document excessively focuses on individual technologies, not on how to strengthen the U.S. energy innovation system as a whole. As you said in your remarks at the American Academy event, technologies alone do not a transformation make. This document certainly acknowledges this fact, but one is still left with the impression that DOE is still not seriously considering how it interacts with other agencies, the Congress, and the private sector so that scientific discoveries and evolving technologies originating from the Department are effectively utilized in the United States and around the world. In other words, DOE seems too oriented toward technology "push," which results in the new

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"baby" being left at the threshold of the door. The Department is one of the pillar institutions in the U.S. energy innovation system, but does it actually support research to understand how that system works, as well as its role in it? Do we understand the gaps in the system? How the Department might be able to better fill those gaps? Such analysis would certainly require system-level research, as well as policy evaluation and additional social science research. This whole paragraph relates to 5.2.5 of the QTR. The question of what role the Department should have in addressing non-technical barriers is raised in 5.2.5 – in my view, who else but the Department will support the research needed to answer these questions? Such research is relatively inexpensive, but it could potentially provide huge pay-off to the Department if it resulted in better utilization of DOE-led technologies.

Consideration of the competition appears to be absent. There is no discussion of the energy-technology strategies of the European Union, Japan, or major emerging economies. It seems to me that it would be worthwhile to better understand what these other governments in terms of their technology investments so that the United States can then choose to develop its own strategic niches, abandon some programs where we are not competitive, or even choose to cooperate or cost-share on certain programs or technology demonstrations. I sent you a new paper where my colleagues and I estimate the public expenditures of the major emerging economies, and that would be a place to start. But, I believe that much more research in this regard would be worthwhile. Research dollars will be scarce, and we need to make funding allocation decisions carefully, with all due consideration to America's competitiveness in the global market.

Similar to my point about understanding the competition at the national level, I am surprised there is so little discussion of what the U.S. private sector is doing. One would hope that the Department is not duplicating effort, but rather doing the pre-competitive research that the private sector is not doing or catalyzing the private sector to do different kinds of research. Strategically, this is another missing piece in the document.

<u>Comments on specific items</u>

- Section 2.4 – You make the assertion here that supply "changes slowly" – I'm not sure that supply is really changing at all. One always wants to presume that when long-lived infrastructure is ready to be turned over, the next technology choice will be cleaner and more efficient. But, without policy incentives, this is unlikely to occur.
- Section 2.7 – I would add taxation and procurement to the list of policy tools.

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- Section 2.8 – What is the data source here. I would argue we don't really know (see my comments above about the private sector – surveys and research are badly needed).
- Section 3.2.2 – It seems you skip over demonstration, and "early" deployment. In the forthcoming Global Energy Assessment, we invented a new term of "market formation" that occurs somewhere between demonstration and commercial deployment. This is where the government steps in to help create conditions for early sales and experimentation with the technology (through niche market formation, production tax credits, and so forth).
- Section 3.2.3 – Great that you recognize that most of the rapid growth is abroad. As I wrote above, we ought to be developing strategies for taking advantage of that growth. This is exactly what the Chinese did with solar PV – and look how successful they were. We need to be demonstrating technologies abroad, promoting our technology. From my research in China, I can tell you that the Japanese and Germans are running circles around us in the clean energy space there.
- Section 5.1 – It is just plain false that the Department doesn't pick winners. Just don't even say this. Of course you do, and that's why we taxpayers pay you – for your careful judgment and educated guesses about which technologies are likely to have the highest reward for us.
- Section 5.2.2 – I am not supportive of an arbitrary timeframe for commercial application. We have no historical data about the rate at which technologies will improve. All of our learning curve analysis is historical and, if anything, proves that technologies improve at different rates and under different conditions (including policy support!). I think the target is a much better way to go. A clear goal like $1/Watt is much more sensible and also galvanizing.
- Obviously, it doesn't seem like demonstration is currently working well at DOE. I was one of the PCAST working group members who pushed for a clear and strong recommendation that a separate entity be set up within DOE but with leadership from the private sector with the mission of experimentation. There was too much disagreement on this point within PCAST, but that is my own view. I am also of the view that because demonstration is expensive we ought to be looking much more carefully at joint demonstration projects with other nations – we all learn from the demonstrations and get to share cost and risk by doing the demonstrations jointly.
- Pg. 16. I like the idea of scientific user facilities. You could look at the Danish wind example. Dr. Lena Neij has done some terrific research looking at how common test facilities were key to learning in Danish wind developments.

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Many of the comments I've made above highlight and reinforce questions that are explicitly raised in the framing document, so it is clear that DOE already recognizes the need to answer these questions. My concern upon finishing it is that I do not see the plan for how DOE will arrive at answers to these questions. The programming seems to be mainly in the technology programs, not in the wider analysis of the effectiveness of energy policies in spurring the development and deployment of advanced energy technologies.

Please do not hesitate to contact me. I can be reached at 1-617-627-2706, or via email at kelly.gallagher@tufts.edu.

Sincerely,

Kelly Sims Gallagher, Ph.D.
Associate Professor of Energy and Environmental Policy