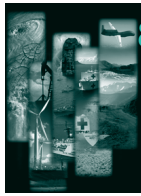

8.3 THINKING ABOUT CLIMATE AND ENERGY IN A SYSTEM-OF-SYSTEMS MANNER

Mr. Adam B. Siegel

Thank you for inviting me here. I think the symposium has proven to be an impressive event; 5 or 6 years ago, we would not have had a meeting like this. But climate and energy are certainly hot topics right now; I've received 19 invitations for energy or climate meetings so far this month, and there are two more on my Blackberry for next week. So it is good that we are having events like this. During the time that we've spent here, we've had a lot of solid examples of how the Navy is thinking about and actually investing in the climate and energy arenas that were not real several years ago.

Mr. Adam B. Siegel is the Senior Analyst, Naval/Energy, in the Northrop Grumman Analysis Center, where he is responsible for preparing in-depth assessments of military, political, technological, and economic developments worldwide. Within the Analysis Center, his principal focus is on naval, maritime, industrial (primarily shipbuilding), irregular warfare, climate, and energy issues. Before joining Northrop Grumman a decade ago, Mr. Siegel spent more than 15 years at the Center for Naval Analyses, where he worked a wide variety of issues and deployed as a civilian analyst with military forces for numerous operations, such as Desert Storm (Kuwait, 1990/1991), Uphold Democracy (Haiti, 1994), and Allied Force (Kosovo, 1999). He is a board member of several energy-related nonprofits, including the Energy Consensus, which has a leading role behind the Department of Defense (DoD) Energy Conversation lecture series. Mr. Siegel has an extensive publications record and has authored numerous reports and articles in more than 35 journals and newspapers, including the **U.S. Naval Institute Proceedings, Naval War College Review, Marine Corps Gazette, Joint Force Quarterly, Acquisition Review Quarterly, Defense Nationale,** ***and*** **USA Today.**

While I've been engaged in climate and energy issues for some time, I've learned a lot during this symposium. One of the things I've been mulling over is, how do we start thinking about climate and energy issues and integrating them in a system-of-systems fashion? To help us head in that direction, I am going to identify some specific issues that I think need more attention.

The first is, how do we start understanding the full values and costs related to energy and climate issues, from both a quantitative and a qualitative perspective? To see what I mean here, let's look in more detail at what it means to insulate the tents used to house our Marines in Iraq. We've heard that by doing so, we'll use less fuel in the generators and by doing so free up Marines for patrols. Before the tents were insulated, the air conditioners had a hard time "cooling" a tent from 130°F down to 100°F. Once the tent was insulated, they had no problem getting it down to 70°F.

Think about what that means to the Marine who is deployed for 6 months or a year. By being able to sleep in a tent at 80°F every night as opposed to 100°F, what do you think that will do to his operational effectiveness when he needs to go out on patrol? That is a value that needs to be understood and discussed. It goes beyond the value of having fewer Marines escorting convoys. It is not just that the Marines will need fewer fuel tankers, and it is not just that the Marines will be easier to deploy because they'll have fewer generators and fewer tankers. There is yet another thing to consider. I remember being deployed in Haiti and living in the tents. All of the generators were parked right next to the tents, and the fumes from those generators would blow into tents. The people in the tents were coughing, feeling sick, and having headaches.

Okay, if I am using 10% less fuel because I am more efficient and cutting it down further by using renewables, how much quieter is it, and how is the volume of noxious fumes affected? We clearly receive operational effectiveness now, but are not there long-term costs and benefits that we should consider? What is the impact on the long-term health care costs for the personnel involved?

What if I can reduce the demand for electricity? According to one estimate, about 11% of the diesel fuel that we move around

in Iraq is used to generate electricity to run our bases. My understanding is that the amount needed in Afghanistan is several times larger, although I do not have an exact number. If we can cut a significant portion of that away, we'll need to send fewer fuel trucks over the Khyber Pass. Will that make things easier for Afghanistan's civilian economy because they will now have less competition getting through the border or using the limited road space in that remote country? We need to be thinking in a more system-oriented fashion. We need to understand that it is not just about money, but it is also about operational capabilities. We need to be thinking about capability, capability, capability.

When you hear discussions about greening buildings, most of the conversation is about saved utilities. But greening also has a significant impact on worker productivity; the building is quieter, the temperature more comfortable, and the air cleaner. In one case I am aware of, about 30% of the workers in a green building ended up working several hundred hours more a year for free. It took the company several years to figure out why. It turned out that all the people with hay fever were working extra hours. They even found a woman who had brought in a sleeping bag so she could stay overnight. It was the first time she had not had hay fever in her life; the air in the building was clean. So in this case, we both increased worker productivity and lowered health care costs.

Yet another potential impact of lowering energy demand is that it improves resilience by reducing the demand on the electrical grid. While I truly appreciate the Secretary of the Navy's five energy goals, what did he say about the USS *Makin Island*? It saved $2 million dollars on its first run, and it is going to save $250 million dollars over its lifetime. Well, think about it this way: if he were talking to a room full of Navy Commanders and saying "I am about to give you a job choice. You can take command of Ship A, which has magnificent capability; it is got 6000-nautical-mile range. Or, you can take command of Ship B, which is basically the exact same ship but it is going to need a little bit less maintenance, it is got a little bit better capability because it can support directed energy weapons, it is got a 7000-nautical-mile range, and it comes at a lower cost. Which ship do you want?" We need to

focus on capability, capability, capability as part of our thinking. And, we need to do that in a system-of-systems way so that we take advantage of the fact that a hybrid power plant can support things like directed energy weapons in a way that our old steam plants cannot.

I agree completely with Dr. Gulledge's observation that we need to change the way that we think about climate change. The IPCC is wrong because it is underestimating the risks and doing so in a potentially quite significant way. Simply using the average can be dangerous. After all, if Warren Buffet comes into the room, that does not make us all billionaires although if the room is small enough, on average, we might be billionaires.

So how do we start looking at that full end cost, that long tail, and not use the average but take a more conservative approach? Let's look at one possibility. I think that economists who use discounted costs end up significantly underplaying the economic cost risks associated with climate change. There is some reasonable work, as I recall, that says that climate change could impose a 30–40% hit on the U.S. economy.

What happens to America's ability to support its military, which some people say requires 4% of gross domestic product (GDP)? If GDP goes down by 40%, what are the implications for DoD? Vice Admiral McGinn raised another interesting point. If the number of Katrina-like events increases, each of those will impose a hit on the economy, making it harder to support the military. We may also have climate migrants being driven by economic factors. How do we deal with the possibility of drastic changes in our national security posture?

When I look at the tail-end risk, I think perhaps there is a discussion that could come from the military that says when we look at this far-end tail, the risks appear so severe that our reasoned military judgment says that the nation needs to "go all in" to ensure that we can avoid this highest end risk. The tail end is so dangerous, we need an insurance policy.

Another important issue that deserves analysis is: what strategic communication should be going on within the Navy,

both internally and externally? Let me begin by focusing on the internal side. In keeping with my earlier comments, I think the answer is to emphasize capability, capability, capability. I would like financial considerations to be a footnote at all times. How can we possibly convince our young sailors and marines that they should risk their lives so that we can save a little money? You've got to be kidding me. Are you willing to risk your life to save a penny? Efficiency enhancements need to be sold by providing convincing arguments that they improve capability. The Commandant of the Marine Corps is doing this fantastically well. The Navy is doing this by advertising the 7000-nautical-mile range attained by the USS *Makin Island*. That needs to be the message throughout the Department.

Although the Navy is also addressing climate issues, the military remains a hotbed of global warming skepticism. Perhaps we need a strong internal strategic communication effort based on Dr. Gulledge's argument that the IPCC is wrong; they are too optimistic and climate change will be worse than projected. There is a nice case for laying that out.

The critical challenge for strategic communication is: how do we use it to affect cultural change and get people to think differently about energy and climate issues? What is the best strategic communication pathway for convincing the average sailor, the average marine? The fact that the Commandant of the Marine Corps is willing to spend all day at energy meetings sends a pretty strong signal. But we need to do the same for average civilian and military personnel across the entire Department of the Navy. We also need to engage professional societies and organizations, other militaries, and even public/private partnership. And we need to make certain that we include energy and climate considerations when we submit requests for proposals to industry. Unless we do that, commercial firms are almost legally obligated to ignore the issue unless we can figure out how to make a profit from it because the chief executive officer is obligated financially. It is just a truism. All of the words are well and good, but unless it is reflected in the government's requests for proposals that we ask industry to respond to, it will not be part of what goes on.

In terms of strategic communications, we need to ensure that we take advantage of every opportunity. The Secretary of the Navy is doing that. He wants to change how the Navy uses energy, and by doing so, influence how the larger society uses energy. Rear Admiral Titley is doing that by engaging with the other services and with other government agencies in order to create what is essentially an interagency for more effective environmental modeling. Rear Admiral Cullom is doing that by focusing on biofuels. Where else can the Navy and its money be used effectively?

Let me offer just one example. The Navy is considering buying some 25,000 hybrid vehicles to use on their bases. However, the Navy's buying 25,000 hybrids over the next 5 years will do little to change the economics associated with manufacturing those vehicles. On the other hand, if the Navy were to buy several hundred hybrid school buses, that might really make a substantial difference. Replacing standard diesel-powered school buses with plug-in hybrid electric vehicles would cut fuel use in half. The Department of Energy says that if somebody can place an order for 100 such buses, manufacturers could cut the cost by 40%. Lowering the purchase price per bus by 40% makes the hybrid cost-equivalent to a regular diesel-powered bus after 7 years because of the savings in the amount of fuel that needs to be purchased. And, by the way, according to medical research, the number one health risk to America's public school youth is exposure to diesel fumes from school buses. With plug-in hybrid electric school buses, you cut the exposure by 80%. Could the Navy, which has several hundred buses across all of its bases, be that purchaser of a hundred that drops the price from $200,000 per vehicle to under $130,000?

Finally, we should also be looking, in a system-of-systems manner, at the full set of structural impediments that hinder our ability to change the way that we use energy and respond to climate change, whether those impediments are legal, fiscal, or otherwise.