

Testimony on “The Energy Water Nexus: Drier Watts and Cheaper Drops”

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I would first like to thank the committee and its leadership for the opportunity to testify on the Energy-Water Nexus.

I have worked at Advanced Cooling Technologies, a small business located in Lancaster, Pennsylvania, for over 13 years. The company started in 2003 and has grown to 130 employees. The company was predominantly funded through government sponsored research programs in the early days, and today it still relies on government funding for many of its new technology development initiatives. I currently serve as the Vice President of R&D at Advanced Cooling Technologies.

I have closely led several large research programs related to the Energy-Water Nexus while serving as the principal investigator. In the ARPA-E ARID program, I led the development of a technology that could effectively cool power plants using air instead of water. Our technology is analogous to a DVR for heat: we demonstrated that you can store cold at night, and later cool the power plant during the day when the ambient temperature is warm and the electricity demand from the grid is the greatest. Through the Department of Energy’s Small Business Innovative Research program, we have developed non-wetting coatings and surface structures to improve condensation to more effectively remove heat from the steam circulating through power plant steam turbines. In another effort funded through the Department of Energy Fossil Energy Crosscutting Research Program, we are developing longer life non-wetting coatings that are capable of being replenished to maintain their cooling effectiveness for decades.

Researchers in our R&D group are looking to solve other key water issues. Through the Department of Energy’s Small Business Innovative Research program, we are looking at new ways to desalinate water. Through another Department of Energy funded program, we are developing new ways to collect sunlight to use the energy to directly drive the desalination of brine. Finally, for the U.S. Department of Agriculture, we are looking at ways to desalinate brackish water and use the water to directly feed the roots of plants by using a system of underground plumbing. This innovation may make it possible for the agricultural industry to tap into the vast amounts of brackish water available, which will free up fresh water supplies for other critical applications.

Recently, I was invited by the Arizona Public Service Company to tour the Palo Verde Generating Station. Palo Verde is the nation’s largest net power generating station. The nuclear power plant is located in the desert regions of Arizona, not near any large bodies of water. Their current water solution is interesting. The power plant water is completely supplied by treated sewage that is purchased from several large municipalities. However, the demands on this water supply are causing the municipalities to increase the price of this precious water supply, which will ultimately lead to an increase in the cost of power. I met with their senior engineering team to present some of the water reduction cooling solutions that we have developed, and we hope to begin working with them in the next few months. Without the substantial funding and experience gained through the numerous government sponsored research programs that I mentioned, we would not be talking

with the Arizona Public Service Company to solve their water and cooling problems. The government sponsored funds are critical to small businesses, such as ours, so that we can take our ideas and mature them to the levels demanded by the marketplace.

Finally, I would like to discuss some recommendations to the committee about some legislative features that would help industry better solve the Energy-Water Nexus problem. I want to first remind and impress upon the committee with the scale with which power plants operate: it is simply massive. Further, power plants are not built every day, as a matter of fact, they are not built often at all. This makes the often mentioned “valley of death” that much more deadly for companies, universities and national labs as they try to commercialize their research. How do you go from the bench top in a lab to power plant sized systems? Any legislation in this area should aim to address this question, by allotting some portion of the funding for scale-up and sub-scale demonstrations, perhaps as a follow on for successful programs. I also want to discuss the cost share requirements that has been common for many of the Department of Energy funded programs as of late. Given the difficulties of scaling up, and the large follow on investment that is required by companies to reach utility scale, the R&D cost share requirements seem to unnecessarily hinder industry’s flexibility to use financial resources where they are needed most. I recommend that cost share be eliminated or at the very least, changed, to allow the companies to get their cost share credit through non-R&D based investments, such as capital spending on related production equipment.

It has been my privilege to testify in front of you today. Thank you again for the opportunity. I look forward to answering any of your questions.