




As the newly appointed Senior Advisor to the President for Electric Energy, what would you tell POTUS is the top challenge facing the electric utility industry and what should be done about it? Also, what is the “game-changing” energy technology out there and how should POTUS support it?

 Dr. Mani Vadari

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Meet the Author.

An IEEE Fellow, electricity industry visionary, and leader, Dr. Mani Vadari delivers strategic services to a global set of utilities, vendors, and service providers seeking deep subject matter expertise in setting the business and technical direction to develop the next-generation electric/energy system. As a Business Architect, Dr. Vadari has been delivering solutions focusing on Transmission/ Distribution/ generation operations, Energy markets, and Smart Grid for over 35 years. In addition, he is an Adjunct Professor at Washington State University and an Affiliate Professor at the University of Washington. He has published two popular books, "[Smart Grid Redefined: Transformation of the Electric Utility](#)" and "[Electric System Operations – Evolving to the Modern Grid, 2nd Edition](#)", in addition to over a hundred industry papers, articles, and blogs. His books are serving as textbooks at several universities in the US and around the world

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It is 5:45 AM. I am just putting on my running clothes and getting ready for my morning run. The phone rings – Ring!!!!, Ring!!!!. I look at the phone – who could be calling at this time of the day. The caller-ID reads “White House.” Oh boy – Is this a crank call? Why would the President of the United States want to talk to me?

My curiosity gets the better of me and I pick up the phone anyway. A very professional-sounding voice says, “Please hold for the president of the United States.” After a short time that seems much longer, the president comes on the line. The president greets me warmly, and after a few short pleasantries (boy he knows way too much about me!!!), gets to the purpose of the call. The president says, “Dr. Vadari, I recognize how critical electric power is to the welfare of the nation, and I know the industry is facing significant challenges. My staff tells me you are on top of what is happening in the utility industry, and I am hoping you can help me out.”

After a short pause, where you wonder how you can say, “That depends,” you reply, “Of course, how can I help?” Hearing the expected response, the president continues, “Glad I can count on you Mani (we are now on a first-name basis – but no way, I am going to call him Barack). I want you to join my team for the next four years as Senior Advisor to the President for Electric Energy.

For your first assignment, I need you to give me the top challenge facing the industry during my first term, and then tell me what I should do about it. Next, I need you to let me know what “game-changing” energy technology is out there and how I can support it. Can you do that for me, Mani?”

My response is, (of course) “It would be an honor – this is the least I can do for my country.” And then I start talking.

Mr. President – As you know, Energy is one of the single most important commodities that drives a nation whether it is towards self-reliance or towards dominance in the world. Even internally, its importance comes from the absolute need to power everything around us. Every aspect of society depends on energy. It is used to power transportation (cars, trucks, trains, buses, planes, and others), electronics (everything from healthcare, communications, and others), appliances and pretty much everything around us is dependent on energy in some form or the other.

However – there are several top challenges and there are no easy answers. The problem with these challenges is that solving one ends up creating more problems in another area. For example –

- **Gasoline and natural gas coming down in price:**
 - Mining of gas from shale and other domestic sources is directly responsible for the tremendous reduction in their prices and also for enabling the US to move from a net importer to a net exporter. However, the downside to this is that this kind of extraction has the potential to cause extreme levels of pollution, even earthquakes in some instances, and harm to the environment.

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- **EPA regulations leading to several coal-fired plants being shut down:**
 - While regulations are necessary for the reduction of pollution from these coal-fired plants, they are also causing a severe shortage of available generation capacity that is so critical for maintaining the reliability and resiliency of the electric grid. This shortage is being met by additional capacity from gas-fired turbines and to a smaller extent from new and renewable sources.
- **State Renewable Portfolio Standards (RPS) and federal tax mandates leading to an increased penetration of generation from renewable sources:**
 - Renewable sources such as wind and solar while being very gentle on the environment when they are producing energy have a great degree of variability of their output since it depends on the velocity of wind and exposure to sun and so on. Given that in an electric grid, supply and demand need to be balanced at all times, this variability in renewable sources of supply is met by fossil-fired generating units that need to be running as stand-by.

Mr. President, I do realize that I may have gone into several rabbit trails and taken you down into more details than necessary – but I felt that it was important to use these three examples to drive my key point on the various challenges and how their solutions all intertwine with the other.

The key takeaway from all of this is my advice to you – about not going down with one solution or the other – The energy problem in our country needs an all-of-the-above strategy. Given the diversity of our country that is coming from the Northwest (rains and clouds), Arizona (lots of sun) and others – our country cannot go in one direction alone and try to aim for all of our generation coming from renewables alone or, for that matter from any other specific source of energy.

We **MUST** implement an all-of-the-above strategy which means that fossil-fired generation may need to stay for a long time mainly to give renewable sources of power time to innovate and mature and also come down on a cost-performance scale.

Now, Mr. President, let us move to the next question that you asked of me – about the “game-changing” technology.

I firmly believe, and you have been championing this as well that our future is in renewables – that means that at some point in time in the future, and the sooner the better, we need something that has the ability to store extra energy when these sources are over-generating and deliver it back to the grid when they are under-generating.

This feature is critical to our dominance in the energy and related industries and to support our advanced way of life. I don't believe that we need to curb our consumption at periods of high demand – reminds me of the rationing of food and everything else that was prevalent from where I came. But, if Demand or consumption needs to be flexible, then we need to have something that converts today's generation from renewable sources that generate in a variable manner to something that is predictable and dispatchable by the grid operator.

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This disruptive technology is called Energy Storage:

POTUS question: I have heard of energy storage – but I get the feeling that I am missing something in this picture. Tell me more.

Mr. President, the key to storage is that it needs to allow us to mirror the profile of the generation that we used to have – comes in a broad variety of capacity/response rates. Let me explain what they actually mean:

- *Capacity: This is exactly what the name suggests. Capacity is all about how much energy it can store and retain.*
- *Response rates: This is where it gets interesting. It is all about how quickly this energy can be released into the grid. Very often, the same technology cannot do large capacity and quick release – this means that we need both kinds so that we can mirror the consumption patterns of our consumers.*

This specific technology, Mr. President, while not exactly a moon-shot moment as President Kennedy's speech was, will position the United States of America to lead the world in allowing the penetration of distributed (and centralized) renewables into our electric system while at the same time allowing the people of our great country to continue to enjoy their current way of life while still being good to the environment. It allows you to seriously consider retiring more of the fossil-fired plants and the combination of renewables + storage to become the de-facto source of generation.

POTUS final comments: Wow, Mani, you have given me a lot to think about. Can I deliberate on this a little and come back to you for more background? Maybe, I can invite you to the White House for a beer and talk more about it.

Mr. President, it will be an honor for me.