

April 4, 2016

CAPER Meeting – Charlotte, NC

PACKING THE INNOVATION PIPELINE

Good morning. What a great opportunity today to come together and think about how we collaborate together. My company, the Electric Power Research Institute, or EPRI, is all about collaboration. EPRI was formed more than 40 years ago to work together with industry to solve the problems of the day, and to look forward and prevent the problems of tomorrow. We do this together with industry, collaborating across company lines, even across country lines with an international concentration that is now approaching 25% of our membership. EPRI is really about working with industry to shape the future, and we do so using the best minds of the time. That's where I believe we can work together.

Let me begin by explaining my title a bit. I worked in the Gas Pipeline industry for a time, and I learned a unique lingo there, much like any business. In Houston, I was the VP of Engineering – which meant I designed and built natural gas pipelines all around the world. When a new pipeline went into service, the first thing you had to do is pack the pipeline. To pack a pipeline, you pull the raw materials, in this case, Natural Gas. You take the raw materials from many sources and you bring it together at compressor stations, heating it or cooling it, merging it together to produce a common stream of supply that fed into the pipeline. But the pipeline would not operate until it filled to optimal operating pressure. In some cases it took days to fill the pipeline sufficiently to build up operating

pressure. Once we reached operating pressure, customers could pull out of the line and it was able to ebb and flow with demand. Because of the pipeline pack, we could meet periods of high demand by borrowing from the pack, then replace the pack during periods of low demand.

I see the innovation pipeline much the same way. The raw material of course is not natural gas, but people. People anxious to make a difference, but lacking the skills to become a part of the pipeline pack. You take these people and heat them and cool them, you merge them together and fill the pipeline with skilled people. And you keep the pipeline at optimal pressure, able to deal with the ebbs and flows that come from talent extraction in our industry.

And perhaps it would be a good idea to talk for a moment about the industry you are supporting with these talented folks. The Energy industry is in a period of rapid change. Gone are the days of 50 year plans, long range recover of centralized assets. Today we are seeing the earliest stages of the influence of the internet of things on our business. Our revered asset systems are becoming not service providers but position enablers. Green energy systems are sprouting everywhere, but they are enabled using traditional assets. Likewise customer choices are exploding and they are being enabled using our traditional assets. Even within utility companies, the assets are being leveraged to provide solutions to challenges with water and air emissions, even carbon reduction. The 21st century utility will be tremendously different from the past. Of course the pathway from the past to the future is complex and difficult. The pipeline of

talent that you enable provides the means to traverse this challenging road. We need people able to see the convergence of traditional assets with emerging technologies. We need people who understand how business used to work, yet can visualize how business could work. We need people to hold our hands as we walk along the innovation road. It's a tough road, the end is not clearly in sight, and it takes special people to boldly step forward into the unknown.

So let me get more specific this morning about what we need at EPRI from Universities – after all that's why you invited me here. I have given this a lot of thought, and I can sum this up in five key areas. Since we are at a University, I thought an alliteration using five U's might resonate. From you I see opportunity specifically in these five areas.

From you we need a pipeline packed with people that possess an ***understanding of fundamentals***. Real advancements in our business come from people that have the underlying knowledge of the complexity of the electricity business. You understand this. Electricity is perhaps the most complicated commodity on the face of the earth. We serve it up daily, essentially made exactly when it is used and shipped to your door at the speed of light across a complex interconnected system. As we move into the 21st century, the basics of our industry are changing. In the past it was sufficient to generate power centrally and to balance that power using the advantages of wide-scale diversity. Still human operators oversee the system 24/7/365 – managing thousands of points of information to keep the dance alive. Yet in the future, we find not thousands of information points but millions. Consider the impact the internet of things will make on the

energy business. The traditional balance seems simple compared to the added complexity of individual appliance control, thousands of distributed energy resources, and the introduced intermittency of renewable resources. Our future energy systems will demand distributed intelligence, and they will demand algorithmic control verses the traditional hands on human interface. We need people who see through the promises and hype of the latest new product to clearly understand the integration and aggregation challenges. People that can develop and deliver solutions to an energy system that is more dynamic, more user controlled. The idea of such a future is exciting, and daunting. Only those with a true understanding see both the excitement and the challenge. And if you never see the challenge, you find yourself surprised with the exciting no longer excites because it falls flat. You are well positioned to undergird the pipeline with people that have a grasp of the fundamentals – it is a core part of your mission, and it is something we continue to value.

But we also need people that come to us with ***unrestricted ideas***. We expect university students to come to us unburdened by past failures, emboldened by what may be possible. We expect you to foster the potential and encourage students to explore both what is possible and what is impossible. Nothing inserts life into a project or a problem like a fresh perspective. I remember designing a power line around I-85 many years ago, perplexed by a particular challenge. Finally a lineman stopped by with a really simple but practical idea that was cheaper and easier in the long run. All through my career I could give you example after example where fresh thinking delivered dramatic results. You are in the fresh thinking

business. You have the wherewithal to graduate fresh perspectives and we need that desperately.

We also need people ***unbiased by traditional business practices***.

Experience, while one of our greatest advantages, can also be one of our greatest challenges. As our teams and people build experience, they build history. Within that history are failures that build up our resistance. Over time the resistance becomes a limiting factor. We need people that are not just fresh thinkers, but are unlimited by their failures. When I interviewed for the job of Vice President of Gas Pipeline Engineering, I was under a considerable amount of pressure from my wife to blow the interview. We were well entrenched in Charlotte, with two kids in high school and one at NC State. The last thing we needed was to move to Houston. We talked long and hard and decided while I wouldn't blow the interview on purpose, I also wouldn't pull any punches. Over and over again I continued to respond the same way – "You understand I know absolutely nothing about gas pipelines don't you?" I left the interview thinking I had pretty much swept that opportunity under the rug. Imagine my surprise, and my wife's, when I received a call from Houston inviting me down for a site visit. We were even more surprised when a realtor picked us up at the airport and showed us houses all day. When I finally resumed the conversation with my soon to be new boss the next day, I reiterated my mantra – "I know nothing about gas pipelines". At the end of the day, they offered me the job. I asked them why me, and he told me, "We decided we needed someone that knew nothing about gas pipelines." They wanted someone who wouldn't say, that will never work, we already tried it ten years ago. In

the end it was a good partnership. I learned a great deal, and I helped them see things they had long since abandoned. That's the value of no baggage, of no bias, and it's my third request of you, people with unbiased ingrained business practices.

My next "U" is a little obtuse. We also need to figure out together how we can get **unbounded access to funding**. Yes this is a tough one for you, just like it is for me, so let me explain this a bit. This is perhaps less about your people than it is your politics. Like us, you also do research and for most universities research is a vital part of staying relevant. At EPRI we engage universities through a number of forums, like this one, and including national organizations like PSERC. Throughout these connections, one thing is really clear to me. We are working on a number of the same things. Somehow we have to figure out how to leverage our work together. You are very good at the theoretical, we are perhaps better at the practical. There is opportunity for us to come together and learn from each other. When we assign society's R&D funds to the same activity, we reduce the impact we can have together. No, this is not about the people you produce, but about the policies that you AND I have. We have become comfortable working on whatever, and for that matter, whenever, funding becomes available. Let's look closer at the opportunity to work together, to leverage each other's strengths, and to back-stand each other's weaknesses.

Finally, we demand ***unbridled passion*** –we need people to pack that pipeline that love making a difference. EPRI exists not to enable utility success, but to serve society. We are a 501.c.3, a charitable organization chartered to enable safe, reliable, affordable and clean energy for people

all around the world. This is not only a job, this is a mission. We need people that love what they do. If you burn them out before they break out, well then we have to rebuild them. Somehow you need to figure out how to push people through a demanding and rigorous curriculum without extinguishing the fire that brought them to your doors in the first place. We need that fire. It is that fire that moves us away from average and makes us spectacular. I encourage you to do everything you can to protect it, to coddle it, to grow it. It will enhance your reputation even more than fundamentals.

So I know that's a tough list, your job is not easy. But, you asked. At EPRI we are not just looking for PhD's, Masters of Engineering, or Bachelors of Engineering, although we seek all of the above. At EPRI we are also looking for people that have a passion for making a difference. We need a pipeline packed with people and processes that yield a dependable supply. A supply that possesses:

- Understanding of fundamentals
- Unrestricted ideas
- Unbiased business experiences
- Unbounded access to funding
- Unbridled passion.

I know you can do this, you have demonstrated it over and over again. I thank you for your hard work and your valued perspective and I look forward to what collaborations like this one might produce for our future together.