

**Barry K. Worthington**  
**Keynote Address**  
**IEEE National Capital Area (NCA) Annual Awards Banquet**  
**Crowne Plaza**  
**Silver Spring, Maryland**  
**May 1, 2010**

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**Intro**

Raj, thank you very much for the kind introduction. Let me say it truly in an honor and a privilege for me to be invited to your annual IEEE Award banquet. USEA and I personally have always had a friendly relationship with IEEE. Congratulations in advance to those of you who will be recognized and honored this evening for your contributions. You personally have much to be proud of. IEEE has much to be proud of and Electrical and Electronic Engineers have much to be proud of. You make it look easy – flick the switch – the power is there!

Our public, our customers, our government and political leadership takes you for granted. Because of IEEE members, airplanes fly, computers work, building elevators operate properly and our military is by far the best in the world. We have clean air, clean water, and food and medicine, thanks to advanced electronics.

The Dulles Airport Sky Train works without an onboard operator. Automotive engines, and in fact, entire automobiles, are more electronic than mechanical systems. Today, we burn three times as much coal as we did 30 years ago with total air emissions less than 1/3 of 30 years ago. Why? Engineering achievements!

Maybe those civil and mechanical guys played a role as well as both petroleum and nuclear engineers, but if you trace the true

technological developments that we as a society have deployed to improve the lives of our citizens, you see an IEEE member!

I started my career in the energy business 32 years ago, while still a student at Penn State. I had an internship that I actually got paid for working for the Governor's Energy Council in Harrisburg, which was essentially the State Energy Office. One day while in Harrisburg working on an energy efficiency project, we had the incident that became known as Three Mile Island, on March 28, 1979. We have not started a new nuclear plant in the ensuing 30 years.

My boss at the time came to me at about 2:00 in the afternoon and suggested that we go play tennis. I was shocked and expressed how I thought I was to stay and work until five o'clock. He assured me that no one would be calling that afternoon with any questions about energy efficiency. I suspected he was right, so I followed my boss to the tennis court, and promptly allowed him to beat me in three sets. I was finishing a Penn State PE class in tennis, and I was in much better shape than him. I was quick to get it... playing tennis with the boss and losing was definitely a winning strategy.

And you know what about Three Mile Island? There were:

- No three-headed calves born.
- No radioactive milk.
- No dead fish in the Susquehanna River.
- No loss of human, animal or plant life.
- No injuries, except if you count the stock price of General Public Utilities and some bruised egos on the part of both utility executives and state government officials.

I had the opportunity a few years later to be involved with the construction of the South Texas Project while with Houston Lighting

and Power Company. South Texas in the 1980s was the most troubled nuclear construction project in the history of U.S. commercial nuclear power, and I mean troubled! The Nuclear Regulatory Commission pulled the construction permit, the first and only time in history. Brown & Root was fired as Architect/Engineer and constructor and replaced by Bechtel as A/E & Ebasco for construction. Not a lot of folks recognize the name Ebasco anymore.

Mark White was running for Governor on an anti-electric utility platform – rate increases were supposed to go through the roof, the news media, the press reports were awful, and years later... the South Texas Project became one of the most efficient, highest capacity factor, highly reliable plant in our nuclear fleet, and I might say one of the true nuclear cash cows for its owners. I suspect that some IEEE members had something to do with that overwhelming, against all odds-triumph of engineering excellence.

Now, as we hopefully embark on a long overdue nuclear renaissance here in the United States, IEEE members will be in the thick of determining if we can repeat our successes of the 1960's, 70's and 80's.

But nuclear is not the only key issue. How about smart grid? Talk about a matter that IEEE is in the thick of!

I was in a room where six different electric utility CEOs had six different definitions of what smart grid meant to their company. To some, it was just a replacement for meter readers, labor costs reducer, remote connection/disconnection, reduction in force, and smaller future rate increases. To others it was integrating remote and intermittent wind and solar resources to existing or new transmission lines. And, to others, everything in between.

To meet our energy security, cyber security, environmental and climate goals, and to continue to provide reliable, affordable, always available 24/7 supplies of electric power in an electronic/digital world, we need every available energy supply resource: the traditional coal, natural gas, petroleum, nuclear, and hydroelectric, but also all of the new: unconventional and renewable sources, solar, wind, geothermal, tidal power, biofuels, bio-power and some not yet commercial technologies.

Investments over the next few years – perhaps the next decade – will largely determine what our energy world will look like in 2050 – and what kind of an energy world we will leave for future generations. Energy investments have long lives. Most energy infrastructure is expected to last 40 to 60 years. So iron in the ground in 2010 will likely be still standing in 2050.

And 2050 is a key year because it is when we in the United States are expected to achieve our carbon dioxide emissions reduction targets, which is to reduce CO<sub>2</sub> emissions by 83% from 2005 levels. This represents an enormous challenge in every respect. Attracting the financial investment needed to make this happen is perhaps the largest challenge. Globally we need to invest about \$15 trillion over this timeframe. Attracting the students of tomorrow into engineering and other science related fields – and assuring that our policy framework supports a sustainable energy future, are all major challenges as well. We must deploy low carbon and no carbon technologies as rapidly as possible to meet our sustainability goals while protecting national security and assuring economic growth and prosperity.

I mentioned the nuclear renaissance earlier, and this will be vitally important as nuclear power offers the opportunity for large base load generating capacity that is essentially carbon free as well as not releasing other atmospheric pollutants. We will continue to utilize coal and other fossil fuels as will the rest of the world, including fast growing

economies like India and China. To do so, we must deploy carbon capture and storage systems on all new fossil plants, coal and natural gas, as well as all existing coal and natural gas plants. Facilities that cannot be retro-fitted and continue to operate economically will be retired, some prematurely.

And renewables will be called upon to play an ever growing role. The Obama Administration just approved this week the Cape Wind project off Hyannis Point, Massachusetts. This is the first offshore wind project in the United States. It took nine years to get the permits for this project, which consists of 130 wind turbines. The size of the project was reduced from the 170 turbines originally proposed. This project is not out of the woods, though, because numerous legal hurdles can further delay construction.

If Cape Wind can go forward, the potential exists for dozens of major offshore wind facilities along the east coast stretching from Maine to Florida. These projects will bring carbon-free renewable power to areas of high demand in Boston, New York, New Jersey, Philadelphia the Washington, DC area and further south.

This will also reduce the need for long distance interstate transmission line construction. The notion of a massive national interstate highway style transmission system is being met with opposition not only from mid west landowners, but by state regulators in the mid-Atlantic and New England regions. These state officials prefer to see localized renewable investments, rather than support long distance investments. Offshore wind offers, at least, a partial substitute for transmission.

And onshore wind will continue to grow at least as long as favorable tax treatment encourages investments. In 2008, 2009 and expectedly in 2010, wind power will be the largest form of capacity additions in the United States. As the Cape Wind project has shown, wind faces the

same NIMBY issues – “Not In My Backyard” – that other energy infrastructure issues face. NIMBY has evolved into BANANA “Build Absolutely Nothing Anytime Nor Anywhere”, which has further evolved to NOPE – “Not On Planet Earth”, and finally – DADA – “Design, Announce, Defend and Abandon.”

Investments in all forms of solar energy also look promising. Solar thermal systems and solar photovoltaic systems are gaining traction every day. New facilities all across the country are being announced. New Jersey may end up leading in residential solar deployment due to aggressive state policy.

California and parts of the desert southwest are obviously attractive locations for solar deployment. Solar currently is restrained by economics. Even with aggressive tax credits, the high capital cost of all solar technologies is pushing investors toward wind instead. Given future research and development efforts, continued favorable tax treatment, falling commodity prices and friendly government policy, solar will have an increasing opportunity to contribute to a low carbon future.

I am often asked if China and India are going to beat us to the clean energy future. We, in the United States, have just one of the top five wind manufacturers in the world, GE Wind. We have only one of the top ten solar manufacturers here in America. But I am bullish on American ingenuity. While we have to be alert to China’s intention to beat us to nuclear deployment and to carbon capture and storage deployment, as important as those technologies are, they are the mid-term, not the ultimate long-term energy solution.

The long-term energy solution is going to be discovered by some American kid, probably today in elementary, or middle school -- a

future Thomas Edison, or George Westinghouse, or Edwin Drake, or Bill Gates, or Steve Jobs.

My wife, Louise, is with me tonight. She is the Principal of Baker Middle School here in Montgomery County, in Damascus Maryland. I hope our future Thomas Edison comes from Baker Middle School. And SHE could. 20 plus years ago, while I was with Houston Lighting & Power, Louise was a science teacher at LaPorte High School, outside Houston. I was a guest speaker in her classroom.

We designed a series of in-school science experiments related to energy efficiency, teaching students how to use light meters, how to read electric meters, and understand some of the basics of energy efficiency.

But then in the 1980's, our industry left the classroom. Houston Lighting & Power had half a dozen people who did nothing but work with teachers and talk to students – electric safety, electric appliances, energy conservation. In an era of deregulation, we gave up. We exited the schools and others filled the void. And what did we get for it? -- Two generations that are energy and electricity illiterate!

One senior political leader is known for saying, *“We don't need oil, coal, natural gas or nuclear. We just need electricity.”* Another, somewhat more senior official said we will never need to rely on fossil fuels again, because we have natural gas. For those of you who dozed off, natural gas is in fact, a fossil fuel. Now where do we go from here?

Much of our U.S. energy future rests on the climate legislation pending in the Senate and to be reconciled with what the House of Representatives passed. The political gyrations are incredible. Today, it all boils down today to the interworking of the Senate, and their ability to execute a compromise.

A little over a year ago, Penn State played Notre Dame for the NIT championship, the National Invitational Tournament. Neither university could make the big dance, the NCCA Tournament, but it was a triumph for Penn State to make it to the finals of the NIT. Any basketball win at Penn State is to be celebrated.

So Penn State beats Notre Dame, which is great. I think this victory alone moved Penn State up to the number 1 party school for 2009. We were always in the top 5, but never before #1. But the point is, one of the basketball commentators, speaking about both Penn State and Notre Dame said, “They both played a great game except when it came to shooting the ball.”

Alas, each team was something like 35% from the floor and less than 50% from the foul line. For those who aren't basketball fans, you execute and win by making baskets, and the execution of Congress on climate is incredibly important.

In closing, IEEE has historically, and continues to serve as a very effective voice of the professional engineering community in our public policy debates. I implore you to remain and increase your involvement to two very specific and meaningful ways:

1. Increase your interaction with government officials, elected and appointed. They need to hear your perspective.
2. Personally get back into school. Schools and students need you and the country needs you back in the classroom.

Thank you for your kind attention.