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Good morning, ladies and gentlemen. It is a pleasure to share the stage this morning with my friend Dr. Dorothy Robyn. Doctor Robyn is a truly outstanding public servant who has shown exemplary commitment to this country through her service in several administrations. Boeing shares in her vision of moving the country on a path to develop secure, affordable, abundant and clean energy for our military installations and nation. I also wish to acknowledge and express my appreciation to Larry Farrell, CO of NDIA and Mike Aimone of Battelle for extending the invitation for me to speak today. To complete the circle I wish to complement Dr. Kevin Geiss on his presentation. As you may know, I worked with and for Mike Aimone in the Air Force and later when I was

the DASA Energy & Partnerships in the Army, I hired Dr. Geiss as my Highly Qualified Expert. So, now we have completed the circle of energy leadership.

Clearly, much needs to be done to meet our nation's energy objectives. For the most basic data point to prove it, just think about how much you spent this week to fill up your car. To quote my friend Yogi Berra, "It's déjà vu all over again". Today's energy environment is not new or unique. President Obama – and every president before him starting with President Nixon - has proposed a national energy policy to move the country away from its addiction to oil and toward energy independence.

Certainly over the years, we've made progress. Cars and trucks are far more efficient today than they were 30 years ago. At home and increasingly at work, we see more emphasis on Energy Star certification; just in 2010, energy conservation efforts

prevented greenhouse gas emissions equal to emissions from 33 million cars. We saved \$18 billion on utility bills and more and more buildings are getting Energy Star-certified. Solar and wind power have increased their presence in our National policy dialogue.

Despite our energy initiatives- and despite the political will to change our energy consumption - relatively little has changed for our country. We are still consuming billions of gallons and tons of BTUs of fossil fuels per year, with an overwhelming percentage of our oil and natural gas imported from foreign sources. The challenge isn't just to reduce consumption – it's to also meet federal mandates regarding consumption.

Of all the federal departments, the Department of Defense faces the greatest challenge regarding energy mandates. The Defense

Department fell short of meeting its 2010 energy reduction and renewable energy goals that were established as part of the Energy Independence & Security Act of 2007. With over 2.1 billion square feet of buildings on 533 installations and bases around the world, this is understandable. Many of the buildings are 50-year old historic buildings that are both difficult and expensive to make energy efficient. However, where there are challenges there are opportunities, particularly for leadership. This is why the DOD is viewed by the Administration and industry as a “poster child” for leading our nation towards a brighter energy future. As the largest energy consumer it also has a bull’s eye on that poster!

The United States has established ambitious energy goals in the past, but other than the Synthetic Fuel Corporation established under President Carter, there has been little interest in large-scale, programmatic energy programs on a national basis. This has created a funding vacuum that is dependent upon the private

sector to make sizable investments in a market that has not enjoyed overwhelming support.

We are not talking about a program that the country has never attempted in the past. During WWII the US built an oil pipeline from Texas to New Jersey. Actually two pipelines called the Big Inch and the Little Big Inch to ensure that our fleet could receive oil without having oil tankers sunk by the Nazi submarines. The government also build 15 synthetic rubber plants to replace the natural rubber from Malaysia that would be cut off from by a war with Japan. More recently, the DoD spent \$200M for steel plant upgrades to ensure that enough US made steel was available for the newly upgraded MRAPS. It also funded the construction of a second MRAP tire manufacturing plant. So, government investment for national security of critical assets for our military is more familiar than it is commonly known and I have only touched the tip of the iceberg.

A major challenge is the difficulty prioritizing funding for energy programs when the overall federal budget is being reduced. This is particularly acute for the DoD when our warfighters are deservedly the central focus of our financial and technical resources. Give credit to the US Marine Corp and General Conway for having several forward operating bases in Afghanistan operating on solar power today.

As a nation, we must ask ourselves some tough questions. What challenges do we face that hinder us from developing secure, affordable, abundant, and clean domestically produced energy? Is it the lack of Renewable Portfolio Standards in 20 states? Will it be the sunset of the 1603 program regarding payments for specified energy property in lieu of tax credits and the fact that projects have to start this year to earn the credit? Or, is it the new solar accounting rules that will redefine power purchase agreements and leases as assets and liabilities on corporate

balance sheets? I have not even mentioned OMB scoring of energy projects and the implications it has on the size and type of renewable projects on military bases.

All of these policy, legislative and regulatory issues don't even begin to address the technological challenges associated with 160,000 miles of transmission lines covering a fragile and antiquated electric grid...much less the fact that we have 3,273 power producing utilities governed by Public Utility Commissions and state laws that in some cases severely limit the amount of renewable energy that can be produced and consumed. Power that could be making DoD installations energy self sufficient and secure sooner rather than later.

Do we have the technological resources needed to make energy independence and security a reality? Even more so, do we have

the collective will power? Even if we all answered yes to these questions, where will the estimated \$1.4 trillion required to upgrade our nation's transmission grid come from in this economic environment?

Any infrastructure program of this magnitude will require private industry, utilities, regulators, and the government to collaboratively develop industry-wide standards – and a timetable for their adoption – to ensure a smarter, more efficient electric grid.

It is also evident that America needs a 22nd Century energy system that's affordable, efficient, reliable and secure to help us maintain global competitive advantage. This reminds me of Gov. Haley Barbour's speech at the 2008 USAF Energy Forum. One of his keynote messages was his desire to make Mississippi a net energy exporting state to make the state more attractive to

business. A specific area to address this opportunity is in developing solutions to move our electric grid system toward a smart grid composed of hundreds of thousands of independent microgrids that can work together more effectively and efficiently.

A smart electric grid holds the promise to revolutionize the way we use energy. But standards need to be in place to ensure that new technology is compatible and operating at the highest cyber security standards to protect the smart grid from terrorists, hackers, and natural disasters. Cyber security, simulation and command-and-control capabilities will become increasingly important as interconnection and technological changes expose the grid to greater risks. Risks both “known and unknown” to paraphrase a former DoD Secretary. All market players need to recognize that a collaborative approach will be the only way to make this a reality. But, where does our nation’s energy picture stack-up when we are facing a debt crisis, health care challenges,

and high unemployment? Any Administration and Congress can only handle so much, and this may be a stretch.

The smart, secure grid of the future would use a variety of technology applications to optimize the distribution and use of energy. This includes the abilities to meet all energy demands, provide advanced generation and storage options, quickly diagnose and resolve power disruptions, and secure against both physical and cyber attack. Additionally, the smart grid will revolutionize how consumers use energy by enabling them to monitor and track their usage in real-time and choose to power up or power down their usage to meet their unique needs or save money.

At the highest levels, by contributing to U.S. energy independence, smart grid technology can serve to insulate all

energy consumers from fluctuations in global energy prices and supply. Consumers, from individuals and families to major business operations, would benefit from the cost-savings associated with careful management of the power grid. For government customers, specifically the Defense Department, the first priority would be to increase efficiency onsite at each installation. Energy assets are capital-intensive, so a microgrid plan must work with these legacy assets and incorporate them using augmentation, rather than replacement. The smart microgrid creates enhanced energy security and DoD is supportive of microgrid development. However, there is no specific funding at the installation level for energy security. This continues to be a major challenge for the Services.

Why Boeing and Energy? What is the Connection?

One example of Boeing's historic work with energy is the International Space Station. The ISS features an advanced, solar-powered microgrid, and many of its features can be adapted to support a microgrid (*storage in Nickel-Hydrogen Batteries; 1.2Mw of power; four solar arrays producing 61Kw of power). For distribution, ISS combines smart fault detection and isolation, load sharing, and tiered distribution architecture to limit propagation of failures. As an example, the station switches to NiH₂ batteries during the daily earth eclipse window. At all times, the ISS microgrid needs to integrate load demands across multiple ISS users, and can shed load to support critical operations.

The B-787 has 1.5Mw of power generation with its power requirement systems it is the most sophisticated aircraft in production. By comparison, a B-737 on has 180Kw of power generation on board. After Assistant Secretary Sharon Burke toured the B-787 she sat in the cockpit after being briefed on the

power management system and she said, “This airplane is a microgrid!” I could not have said it better myself.

Over the past year, Boeing embedded smart grid technologies at multiple company locations to reduce energy consumption and costs. Over the last several years, Boeing has attained a 32 percent improvement in energy efficiency, reducing its carbon profile significantly across 85 million square feet of facilities in the United States. We also have four plants in North America that are now net-zero for waste. Our new B-787 plant in Charleston, SC will be net zero for energy by installing thin film solar on the roof and acquiring renewable energy credits from a biomass to energy plant for the remaining power.

These efficiency efforts were recognized this year, as Boeing received an ENERGY STAR Partner of the Year award from the

U.S. Environmental Protection Agency for its ongoing commitment to protecting the environment through energy efficiency.

I want to reiterate what I view as a driving issue for the DoD.

Energy security is an operational imperative for the DOD and the numerous military installations across the country. Installations, tactical operations and soldier training all require secure and uninterrupted access to energy. The U.S. Army, for example, designed its Army Energy Security Implementation Program to address these needs through what is called the Five S's: Surety, Supply, Sufficiency, Survivability, and Sustainability.

Building efficient, secure microgrids for government installations, both domestic and international, addresses all of these areas.

Load demand must be integrated across program and training missions, multiple buildings, zones, and hosted tenants.

Generation needs to cover multiple sources ranging from geothermal, solar, and wind, and be attuned to both the seasonal environment and the local weather. This all needs to work in concert with the installation's local utility provider.

In this respect, Boeing's goal and vision has been validated in part by the DOE grants that we've been awarded to demonstrate advanced smart grid technology and capabilities.

We also are working with industry partners and several federal agencies to develop and demonstrate a smart, highly-automated, secure, and self-healing electric distribution management system.

The system will allow for integration of customer-owned and renewable energy resources into an automated distribution system, increasing the value and decreasing the energy costs for both customers and utilities.

Conclusion

The smart grid will revolutionize how the national power grid handles the distribution of energy. At its simplest, it will be a more reliable solution to manage, distribute, measure, utilize and conserve electricity use throughout the nation. At its most aspirational, it will be an important tool the U.S. can employ to achieve energy independence by incorporating renewable energy sources into the nation's energy supply. This approach provides for a secure energy supply; increases energy efficiency and saves billions of dollars while reducing our carbon footprint.

I have covered a lot of information, but I want to bring it back to my opening comments about the military being a leader in energy and microgrid technology. Under the leadership of Dr. Robyn and the Services Energy offices, the DOD has the ability to serve as the market initiator for large-scale renewable and clean energy projects. It will take everyone's support, from the White House to Congress to the uniformed military to make this a reality. If everyone works together for this important initiative, then we can deliver on our nation's energy policy ambitions that so many Commanders in Chief have called for, in the process writing a new chapter in our nation's energy policy history.

I would like to close with a quote from President John F. Kennedy at his inauguration on January 1961 that I feel was as true then as it is today, "One man can make a difference and every man should try" I hope you share this enthusiasm for making our country better and you will do your best to make a difference!

Thank you very much.