Alternative Energy Solutions at Dominion

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Leading provider of energy and energy services in the Midwest, Northeast and Mid-Atlantic regions of the U.S.

- 27,500 MW of electric generation
- 6,000 miles of electric transmission
- 12,000 miles of natural gas transmission, gathering and storage pipeline
- 942 billion cubic feet of natural gas storage operated
- Cove Point LNG Facility
- 2.4 million electric customers in VA and NC
- 1.3 million natural gas customers in OH & WV
- 2.0 million non-regulated retail customers in 12 states
Alternative Energy Solutions

Transmission and Distribution Technologies
- Smart Grid
- Demand Side Management
- Distributed Generation
  - Solar
  - Wind
- Electric Vehicles

Renewables
- Fuel Cells
- Tidal
- Storage
- Solar
- Offshore Wind
A balanced and flexible portfolio of reliable, cost-effective energy resources including an offering of energy conservation programs

Environmentally friendly generation, including clean coal, natural gas, renewable, possible nuclear

Transmission and delivery system improvements
4,500 megawatts needed over next decade
   - Enough to power 1.1 million additional homes

$4.2 billion planned for regulated infrastructure in Virginia from 2010-12

New generation under construction
   - Virginia City, Bear Garden
   - Warren County, NA3, wind projects on drawing board
   - Uprates

Transmission and distribution upgrades

Focus on energy efficiency, conservation

Goal: Maintain competitive rates
AES objectives

• Evaluate emerging technologies and impact on Dominion’s business
• Foster the development of new and emerging technologies
• Develop long-term strategic plan for incorporating new technologies into Dominion’s infrastructure plan
• Participate in the shaping of state and federal, regulatory and legislative energy policy
• Identify business opportunities
AES: Areas of Focus

Transmission and Distribution

- Smart Grid
- Electric Vehicles
- Solar Distributed Generation

Generation

- Offshore Wind
- Large Scale Solar
- Storage
- Fuel Cells
AES: Areas of Focus

Transmission and Distribution
Smart Grid and Tomorrow’s AMI-Enabled Home

Customer

- Web Portal Energy Management
- Distributed Renewable Generation
- Battery Storage
- Plug-in Vehicle
- Smart Appliances
- AMI Meter
- PCT

Dominion Virginia Power

- Distributed Intelligence
- Advanced Transformer & Feeder Monitoring
- Automated Switchgear
- Substation Automation
- Distributed Renewable Generation

Advanced Two-Way Communications Infrastructure
Conservation Voltage Reduction (CVR)

- Uses readings from AMI meters to decrease the voltage during off-peak hours
- Results in ~ 3% reduction in total energy consumption
- Patent pending
- Announced partnership with Landis & Gyr to market CVR
Electric Vehicles: Approximately 35 New Models by 2013

Potential downward pressure on emissions, increasing CAFE standards, reductions in incremental cost, advancing battery technology, availability of tax incentives, and higher gasoline prices may provide sustainable support for manufacturers.
Electric Vehicles: Proposed EV Pilot Program

- Pilot program offering time-of-use pricing options
- DVP hopes to learn about the EV penetration, customer’s charging patterns, and impacts on the grid
- Supports customers’ adoption of EVs while attempting to minimize grid modifications by encouraging off-peak charging
  - EV-only rate: 35 cents/night for 40-mile commute
  - Whole-house rate: 33-41 cents/night for 40-mile commute
  - Compares to 86 cents/night using standard residential rate
  - Up to 750 participants in each rate option
National cumulative growth trend indicates growing strong market interest in this sector
- Tax credits available through 2016 for solar and small wind <100 kw

Significant growth in DVP Net-Metered Systems in 2010
- Total installed capacity is greater than 2 MW
- 330% annual increase from 2009 to 2010

*Note: Includes all applications through March 11, 2011
Commonwealth of Virginia Legislation: HB 1686 - Solar DG Demonstrations
- Authorizes SCC to approve petitions for:
  - Utility-owned solar DG
  - Special tariffs to facilitate customer-owned solar DG
- Dominion intends to file for approximately 30 MWs of utility-owned DG
AES: Areas of Focus

Generation
Offshore Wind Generation

- Potentially one of the largest sources of renewable, carbon-free energy in Virginia
- More costly to install and maintain than onshore wind
- DOE grant to look at ways to reduce the cost
- Virginia Offshore Wind Development Authority
- Transmission studies
- Expect Federal Call for Information in Q4 2011

Draft map of VA offshore parcels
Dominion’s Solar with Integrated Battery Project

- 4 MW ground-mounted solar photovoltaic project in Halifax County
- 12.5 MW hrs of nickel-iron battery storage
  - Battery chemistry first developed by Edison in mid-1800’s
  - Long shelf life and slow discharge rate
- Objective to test the integration of solar and battery storage on Dominion’s system
- Gap exists between solar peak and utility’s peak load

Dimensions: 40’x 61’
Battery Array Weight: 264,240 lbs
Capacity: 12.5 MWH
Voltage: 48V
Energy Storage Technologies

- Bath County Pumped Storage Station
- Evaluating other energy storage applications
  - Batteries
  - Fuel cells
Summary: Powering Virginia

- 4,500 megawatts needed by 2019
- $4.2 billion planned for infrastructure in Virginia over next three years
- Meet demand with balanced fuel mix, competitive rates
- Renewable energy, smart grid infrastructure, play important roles
Considerable technology advancements

No “Silver Bullet”

Evolution, not revolution

Costs must come down

Scalability is critical