Dominion Generation

Virginia City Hybrid Energy Center "Well Positioned for the Future"

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Dominion Profile – Operating Segments

Dominion Virginia Power



- Electric Transmission

- 6,455 miles of transmission lines
- Favorable regulatory environment

Electric Distribution

- 57,100 miles of distribution lines
- 2.5 million franchise retail customer accounts in VA and NC

Dominion Energy



Gas Transmission

- Together with Gas Distribution, operates one of the largest natural gas storage system in the U.S.
- 12,200 miles of pipeline in eight states
- Well positioned in Marcellus and Utica Shale regions

- Gas Distribution

 21,900 miles of distribution pipeline and 1.3 million franchise retail natural gas customer accounts in OH & WV

Dominion Generation



Utility Generation

- 20,400 MW of capacity
- Balanced, diverse fuel mix
- Favorable regulatory environment

Merchant Generation

- 4,200 MW of capacity, including nuclear, gas and renewable power
- Active hedging program for energy revenue/margins

Dominion Retail

- Retail Gas & Products/Services
- 1.2 million non-regulated customer accounts in 13 states



Dominion Profile – Power & Natural Gas

Leading provider of energy and energy services in the U.S.

- 24,600 MW of electric generation
- 6,455 miles of electric transmission
- 12,200 miles of natural gas transmission, gathering and storage pipeline
- 928 billion cubic feet of natural gas storage operated
- Cove Point LNG Facility
- 2.5 million electric customers in VA and NC
- 1.3 million natural gas customers in OH & WV
- 1.2 million non-regulated retail customers in 13 states (not shown)

252 MW of contracted solar generation in 6 states (not shown)





VCHEC Fast Facts



- Legislative incentives for a power station in Southwest Virginia
 - SB 651 (2004)
 - HB 3068 & SB 1416 (2007)
- COD July 2012
- Cost ~\$1.8 billion



Equipment/Site Overview....

- Approximately 2,000 acres
- Two circulating fluidized bed (CFB) boilers
- One turbine/generator ~700 MW gross
- Two air cooled condensers
- On-site lined landfill for ash disposal
 - 35 million cubic yards storage capacity
- On-site fuel inventory of <10 days
 - Stacker/Reclaimer



VCHEC Aerial Overview





Emissions limits...tough but achievable

VCHEC has one of the most restrictive emissions permits of any coal-fired power station operating in the U.S.

	SO ₂	NO _X	PM	Hg
Combustion Technology	(TPY)	(TPY)	(TPY)	(PPY)
1960's PC Unit	56,174	29,023	133,880	562
1970's PC Unit	56,174	18,256	1,339	107
1980's CFB Unit	13,452	10,762	451	75
1990's CFB Unit	6,726	5,381	361	50
VCHEC	604	1,920	329	5
% Reduction over 1960's Technology	98.9%	93.4%	99.8%	99.1%



How to manage the Emissions Limits....

- CFB boiler reduces SO₂ and NO_X
- Selective Non-Catalytic Reduction System (SNCR) for NO_X
- Dry scrubber for SO₂ reduction
- Activated carbon injection for Hg control
- Baghouse for particulate matter control
- Baghouses on material handling systems
- Dust suppression system on coal and limestone piles
- Barrier fencing around the station property



Boiler type – PC boiler vs.CFB boiler....

Typical PC Boiler

- Low ash fuel needed (<12%)
 - No bed in boiler
 - Produces less byproduct ash

- Operates at temperatures in excess of 2,500 ° F
 - More NO_X produced
 - Temperature too high for efficient SO₂ removal in the boiler

VCHEC CFB Boiler

- High ash fuel needed (~38%)
 - Needed to maintain bed in boiler
 - Produces more byproduct ash
 - Every 1 ton of coal burned = ~.64 ton of ash produced
- Operates at temperatures of approximately 1,700 ° F
 - Less NO_X produced
 - Able to remove SO_2 in the boiler
 - Allows station to achieve much lower emissions
 - Targeted emissions reductions less than 20% of the emissions of a '90s vintage station



Boiler type – PC boiler vs.CFB boiler...

Typical Pulverized Coal Boiler

- Fuel is pulverized to a talcum powder consistency
 - Requires equipment to pulverize
- Fire in the boiler auto-ignites fuel as it is blown in
- Uses >12,000 btu/lb fuel
 - higher quality = higher cost
 - more Btus/lb = less coal per MWh

VCHEC CFB Boiler

- Granular (~¾ x 0) fuel fed into boilers
 - No pulverizers needed
- Bed smolders and is lava-like no flame or fire in the boiler
- Uses ~7,700 btu/lb fuel
 - Lower quality = lower cost
 - Less btus/lb = more coal per MWh



Water is a scarce commodity in SW VA



Boiler design allows for diverse fuels....



<u>Coal</u> •GOB/Waste Coal •ROM

- •Surface
- •Hi-Wall
- •Deep
- Washed



•Sawmill residue



<u>Limestone</u>

- •High calcium
- •2 X 1⁄2" washed



Fly Ash & Bed Ash • *Trucked to on-site landfill*



Flexibility = A coal supplier's opportunity....

Fuel Description	Typical Coal Purchases	Typical Operational Needs
BTU	3500 to 13300	8500 in winter; 7700 in summer
Sulfur	.3% to 3.5%	<1.25%
Moisture	<10%	<7% in winter; <9% in summer
Ash	8% to 65%	<38% in winter; <40% in summer
Sizing	3" top size; no fines	<10% passing 100 mesh on a wet sieve analysis



Waste Coal.... A plentiful fuel source

Example of a gob pile being mined

Example of a gob pile reclamation





Typically, over 20% of VCHEC's coal consumption is coming from waste coal.

Power Fuels Terminal provides flexibility

- 4 storage yards
- 125K tons of ground storage
- Coal blending capability
- On-site scales & truck auger sampling





A Logistical Challenge

- ~ 1750 truckloads of coal delivered weekly to VCHEC
 - Legal weight limits of 110,000 pounds
- ~1400 truckloads of coal delivered weekly to Power Fuels
- ~ 1100 truckloads of ash weekly
 - ~46% of the trucks are hauling bed ash
- ~ 200 truckloads of limestone weekly
- ~ 125 truckloads of biomass weekly
- ~ 20 truck loads of commodities weekly (ammonia and hydrated lime)





Biomass – an additional fuel source....



Why did we include biomass?

- Meet state renewable goals in Virginia and North Carolina
- Reduce carbon intensity
- Maintain a balanced, diverse generation portfolio
- Create local economic development opportunities
- Hedge against potential future rise in fuel costs



Provides an outlet for in-woods biomass chips and sawmill residues

How does it all fit together....



What makes VCHEC unique?

- CFB boiler configuration 2 boilers
 - Allows for continuous operation of the turbine
- Full arrangement of environmental equipment
- Low BTU/high ash coal quality to the boiler
- Limited fuel inventory on-site (< 10 days)
- Off-site terminal and blending yard
- 100% of fuel deliveries to the station are by truck
- Access to off-site rail yard NS/Clinch River Plant
- Co-firing of coal & biomass up to 20% of heat input



The Future

- Bright & Well Positioned
 - Economically low cost generator in competitive PJM electric market
 - Environmentally has all of the latest technology that meets strict environmental requirements
 - Fuel Supply diverse fuel mix and great access to coal supply
- Provides multiple opportunities for coal suppliers to move lower btu fuels
 - Suppliers without access to a prep plant or a rail loadout can participate; trucking radius of ~100 miles



