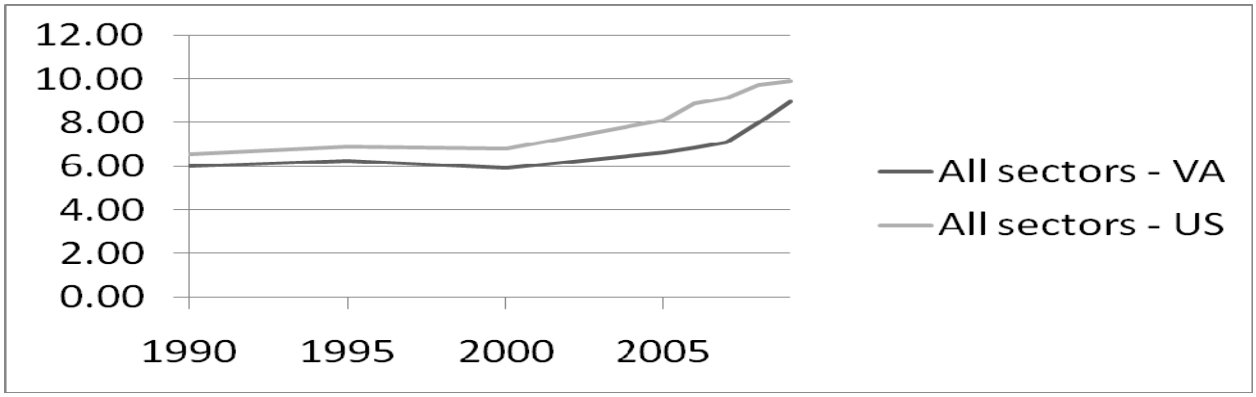
The Virginia Rate Impact Study

Coordinated by Public Policy Virginia for the Virginia Alliance for a Better Renewable Energy System
Presented to the Virginia Commission on Energy and Environment
21 September 2010

The reluctance on the part of some Virginia policy makers to support a vigorous effort to develop renewable energy generation comes from a desire to keep the Commonwealth's competitive energy pricing. In fact, Virginia electricity for all sectors costs about 90.5% of the US average. (See figure below.)

Average Retail Electric Rates by Customer Class (cents/kWh)[1]



	1990	1995	2000	2005	2006	2007	2008	2009
All sectors - VA	6.03	6.26	5.94	6.64	6.86	7.12	8.00	8.95
All sectors - US	6.57	6.89	6.81	8.14	8.90	9.13	9.74	9.89
VA as % of US	91.8%	90.1%	87.2%	81.6%	77.1%	78.0%	82.1%	90.5%

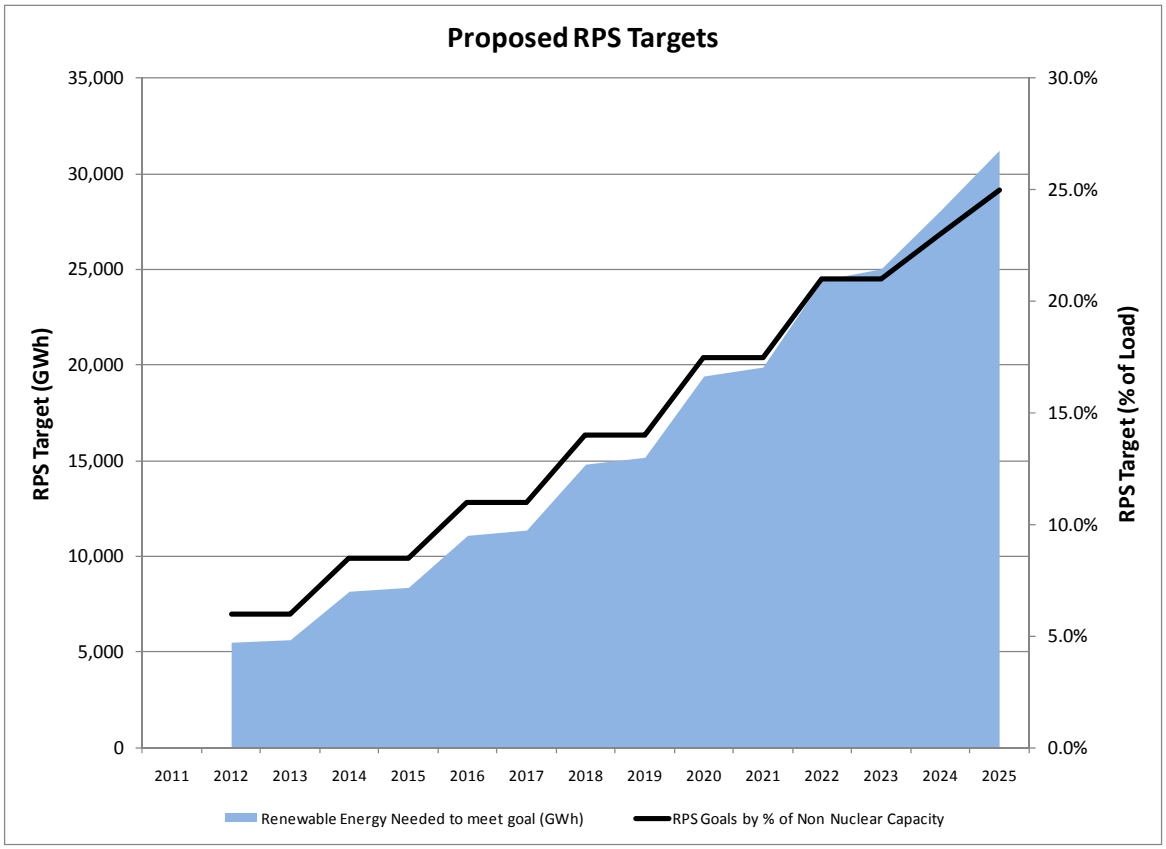
A key challenge is that we have minimal information and data regarding how much adding a significant amount of renewable energy to Virginia's mix would cost and impact electric ratepayers. Moreover, there has yet to be a public discussion about what is going to happen to energy prices without a renewable component—this study does that.

Under the current voluntary Renewable Portfolio Standard (RPS), Virginia has a goal of 15% of all electricity delivered to retail customers to be from renewable sources (in any of 27 states, the District of Columbia and even the province of Manitoba) by 2025. The major utilities have already filed their plans to reach this goal and will have earned a substantial enhanced performance bonus as a result of meeting them. Importantly, this voluntary goal will require minimal additional renewable generation in the Commonwealth, as most of the renewables being counted have already been in production and are just being identified now to meet the VRPS.

[1]Source: EIA State Electricity profiles, as quoted in Virginia Energy Plan, Table 2-6.

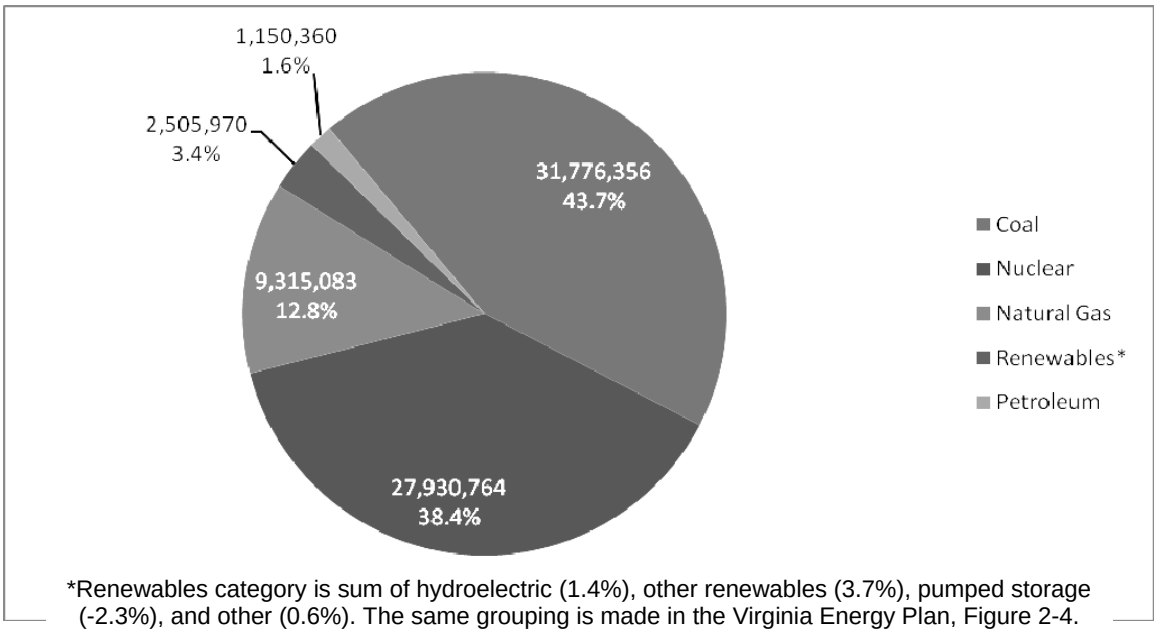
The Virginia Alliance for a Better Renewable Energy System (VABRES) was formed because we believe Virginia can do better—better for ratepayers, better for Virginia's economy and better for the environment. With a grant from the Energy Foundation, VABRES was able to commission the Virginia Rate Impact Study (VRIS), prepared by La Capra Associates, a Boston-based consulting firm who conducted an RPS study and provided supporting analysis for our neighbor to the south, North Carolina.[i]

The VRIS starts with an assumption that we will have meaningful renewable energy standard (RES) goals. The study assumes a goal of 25% renewable energy by 2025, with interim targets along the way. The actual target figures are those set out in US Senator Udall's federal mandatory RES amendment. These targets are shown in the figure below. The VABRES model builds on the Udall goals, and includes that all renewable will be generated in Virginia and that, to be counted, generation must come on line after 2010.



To be clear, VABRES is not advocating this particular RES but, rather, has chosen it as a model to demonstrate how at least one relatively aggressive goal would affect Virginia's retail electricity rates. The model also assumes that the renewable goals are percentages of non-nuclear electricity, which roughly equals 75% of the electricity delivered to Virginia's retail customers. (See figure, next page.)

In-State Net Generation by Fuel Type (MWh), 2008[2]



*Renewables category is sum of hydroelectric (1.4%), other renewables (3.7%), pumped storage (-2.3%), and other (0.6%). The same grouping is made in the Virginia Energy Plan, Figure 2-4.

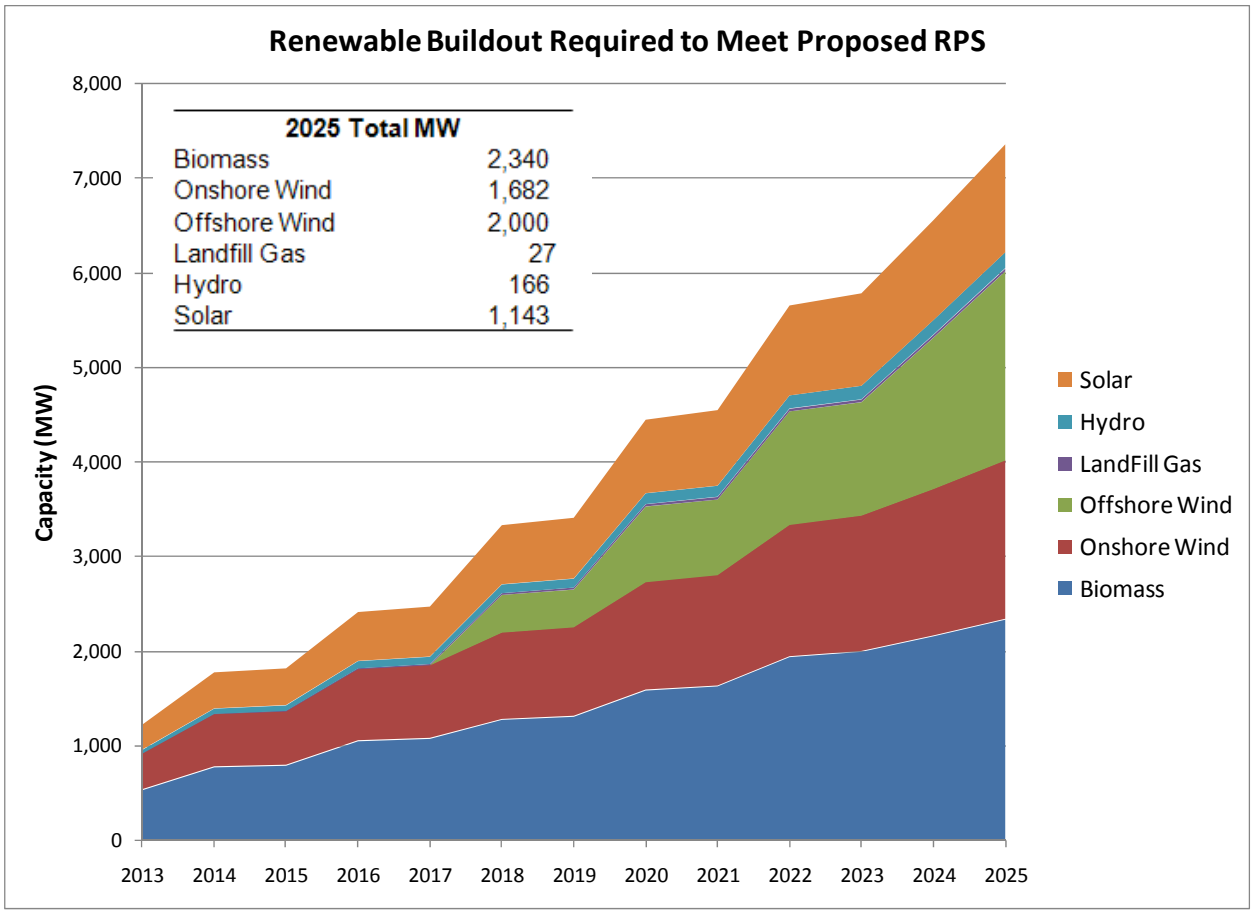
The practical effect of this existing mix of generation sources is that a 25% goal works out to about 12.5 % of total electricity delivered. The chart below compares the current voluntary RPS to the VABRES model used in this study.

Comparison of Current RPS and the VABRES Model

RPS Attribute	Current RPS	VABRES Model
Mandatory/Voluntary	Voluntary	Mandatory
Percentage Renewables	15% of 2010 retail sales by 2025	25% of 2025 retail sales in 2025
RECs	Bonus RECs for onshore wind, offshore wind and solar	All resources receive the same RECs
Existing generators eligible?	Yes	No
Eligible Resources	Solar, wind, geothermal, hydropower (excluding pumped storage), wave, tidal, and biomass energy	Solar, wind, geothermal, hydropower (excluding pumped storage), wave, tidal, and biomass energy
Location of Resources	Virginia or in the interconnection region of the regional transmission entity	Virginia only

[2] Source: EIA, State Electricity Profile, http://www.eia.doe.gov/cneaf/electricity/st_profiles/sept05va.xls.

In order to project where Virginia's renewable generation might come from, the VRIS generally accepts the potential capacity estimates published in the 2010 Virginia Energy Plan. (See figure below.[3])



The two significant differences from current Virginia capacity estimates relate to the potential for offshore wind and biomass energy. The VRIS looks only at offshore wind at depths of 30 meters and less (and of those 2000 MW rather than 3000 MW) reasonably projecting that more ambitious projects would not come on line before 2025.

For biomass energy the VRIS uses estimates of available feedstock from woody biomass and fuel crops only, although even these figures don't include up to 1000 MW of other biomass resources identified in the Ignosh study cited in the appendix, "Estimates for Virginia Biomass Potential." The fuel crop estimates were developed by Public Policy Virginia using data described in the appendix.

[3] Note that the installed renewables required to meet the RPS are close to or greater than the potential given in the Virginia Energy Plan. The Plan gives the following potentials: Onshore Wind (1,793 MW), Offshore Wind (28,000 MW, 3,000 MW in less than 30 M depth), Biomass (760 MW), LFG (30 MW). In addition, the near term hydro potential given in "A Study of Increased Use of Renewable Energy Resources in Virginia" is estimated to be only 200 MW.

The following are the key assumptions used to derive the rate impact.

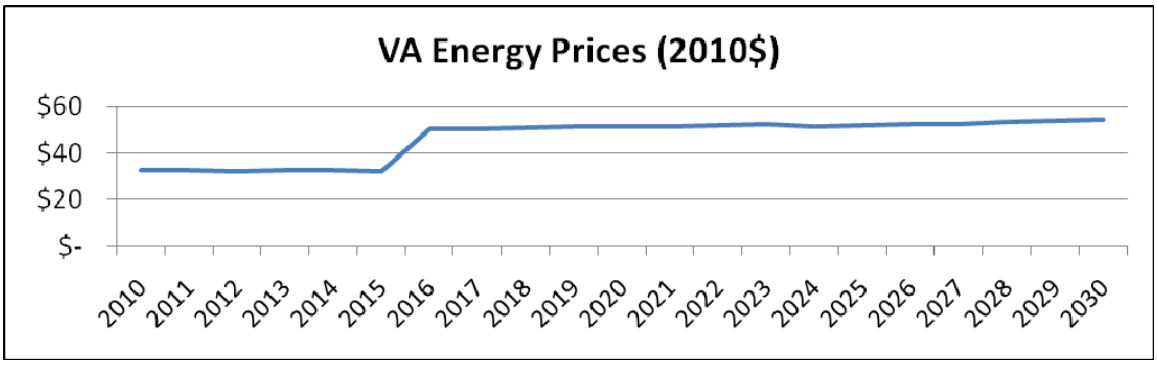
- Assumed VA load growth of 1.94% based on a weighted average of Dominion and AEP growth rates in PJM's 2010 projections.
- Production Tax Credit (PTC) expires in 2012/2013 and is not re-extended.
- Technology improvements will reduce the capital costs of offshore wind by one percent per year and solar power by two percent per year.
- Nuclear and CCS in the nuclear/CCS scenario assume that 60% of incremental generation required to meet load comes from nuclear power and that 40% comes from CCS.
- No transmission upgrade costs are included.

The general methodology followed is:

- Required energy to meet RES model was calculated using estimated VA load and RES percentage in the Udall RES.
- Renewable build-out was determined based on proportionate amounts of renewable energy capacity listed in the Virginia Energy Plan (2010) and with modifications as noted. (See build-out figure, above.)
- A levelized revenue was estimated based on expected energy prices in VA and capacity prices in PJM.
- A levelized cost was calculated for each resource type for each year.
- The net cost was calculated for each resource type:
  - Net cost = levelized cost – levelized revenue.
- The net cost was multiplied by the incremental energy required each year and added to the total net cost from the previous year increased by inflation, so:
  - Total Renewable cost in $Year_X$ = (Cost in $Year_{X-1}$)x(1+inflation) + (net cost x energy needed).
- The total cost in each year is divided by the total load to determine the rate impact

The figure below projects the general increase in energy prices. The chart is in 2010 dollars and includes the EIA projection of carbon pricing at $34/ton starting 2016.

Energy and Capacity Price Assumptions



- Energy price forecast was estimated from La Capra's Aurora model.
- Energy prices include a carbon price based upon EIA's basic case modeling for the American Power Act and start at $34 per ton in 2016

- Capacity prices start at $27.75 per MW Day in 2013 and increase with inflation based on PJM Reliability Pricing Model Auction results for 2013

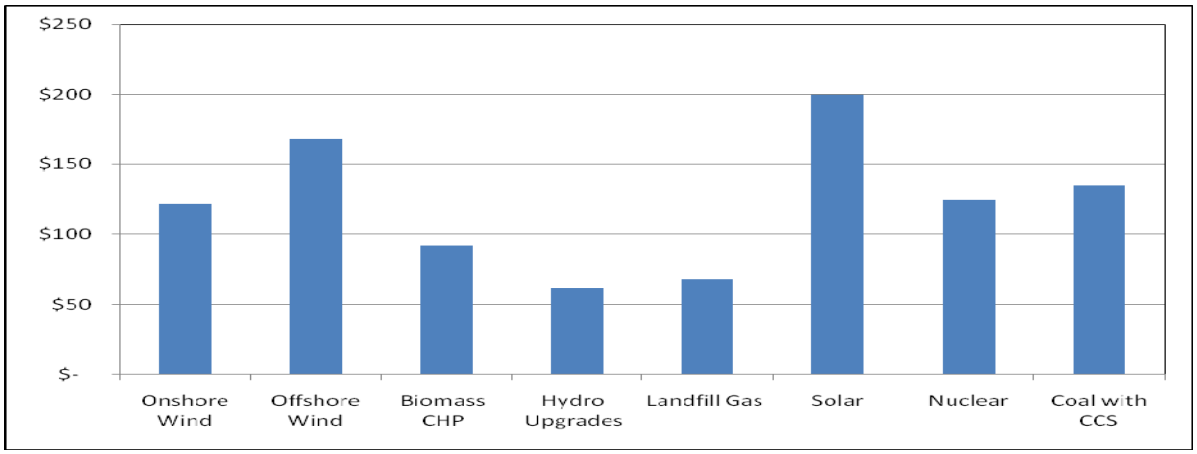
The next figure lists the specific cost projections for each of the six renewable technologies considered significant in the 2010 Virginia Energy plan, and includes EIA estimates of the cost of new nuclear and CCS coal generation.

Resource Cost Assumptions[4]

	Capacity Factor	Modeled Project Size (MW)	Total Installed Cost (2010$/kW of rated max output)	Technology Decline Rate (% in Real$)	Fixed O&M (2010$/kw-yr)	Variable O&M Costs (2010$/MWh)	Fuel Heat Rate (btu/kWh)	PTC Eligible	2025 Levelized Cost ($2010)
Onshore Wind	33%	60	$ 2,300	0.0%	$ 47	$ 2.00		100%	$122
Offshore Wind	38%	400	$ 4,100	1.0%	$ 105	$ 2.00		100%	$168
Biomass CHP	83%	20	$ 4,500	0.0%	$ 105	$ 11	17,500	0%	$92
Hydro Upgrades	50%	5	$ 1,800	0.0%	$ 25	$ 5		0%	$92
Landfill Gas	90%	5	$ 2,400	0.0%	$ 105	$ 13.00	10,000	50%	$62
Solar	15%	2	$ 5,500	2.0%	$ 6	$ -		0%	$200
Nuclear	90%	1350	$ 4,013	0.0%	$ 96	$ 0.53	10,488	0%	$125
Coal with CCS	85%	380	$ 3,967	0.0%	$ 41	$ 4.75	8,765	0%	$135

This bar chart shows the levelized cost figures for these resources in 2025 in real 2010 dollars.

RENEWABLES: 20-year levelized cost of renewable technologies – 2025 (2010$)



[4] **Sources for Resource Cost Assumptions**

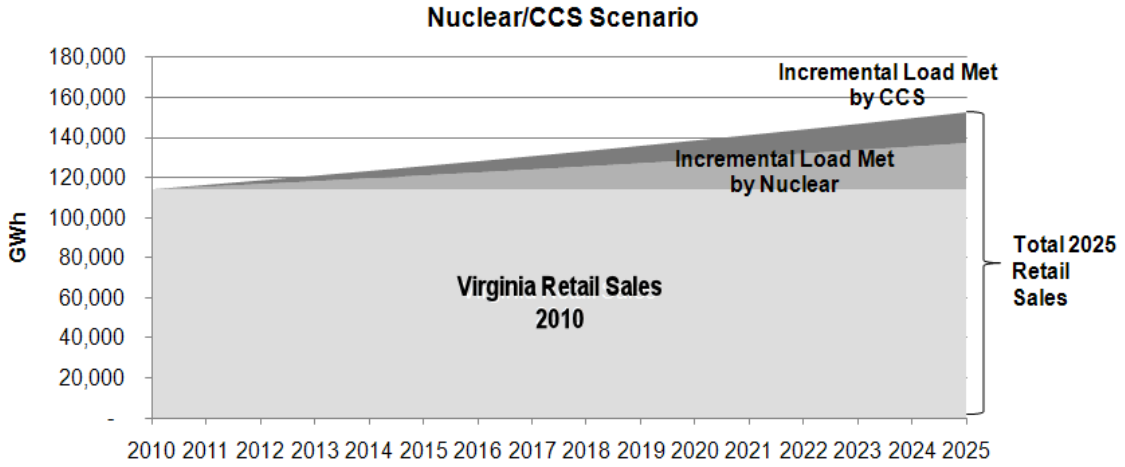
- Onshore Wind, Offshore Wind, Solar and Landfill Gas information comes from La Capra Associates work with developers and research on recent projects.
- Biomass Capital and O&M Costs come from work La Capra Associates did from NYSERDA, and the fuel cost of $1.95/MMBTU comes from Public Policy Virginia.
- Hydro Costs come from the Idaho National Laboratory database of potential hydropower projects (http://hydropower.inel.gov/resourceassessment/index.shtml).
- Nuclear and CCS Costs were taken from the 2010 EIA Annual Energy Outlook.

The following figure shows the impact of incremental demand being met by new CCS and Nuclear.

Nuclear and Carbon Capture and Storage (CCS) Scenario

- In this scenario, we assume that all load growth in Virginia from 2010 through 2025 is met by nuclear power or CCS.

- Nuclear satisfies 60 percent of the load growth and CCS satisfies the remaining 40 percent.



Study Results: Based on these assumptions, in 2025, should Virginia choose a public policy path that would result in 25% of fossil energy then required to meet projected demand being replaced by renewable electricity, ratepayers would be paying $.01 per kWh more than they would otherwise be paying. If, however, the increased demand projections are met by a combination of new nuclear (60%) and CCS Coal, the rates would be $.016 higher than otherwise.

Preliminary Rate Impact

Rate Impact per KWh (2010$)		
	Nuclear/CCS	**Model**
2015	NA	$ 0.002
2020	$ 0.011	$ 0.006
2025	$ 0.016	$ 0.010

ENDNOTES

[i] La Capra Associates provide consulting services regarding energy planning and risk management, market analysis, ratemaking, and regulatory policy in the electricity, natural gas, and water industries. Their services help clients to address broad-based industry issues as well as specific transactions in both retail and wholesale markets. La Capra Associates specialize in objectively analyzing the changes that have resulted from the deregulation of the power and gas markets and the restructuring and privatization of utilities.
La Capra also deploys their experience and knowledge in litigation support, power contract reviews and audits, asset valuations including project financial analysis, and renewable energy policy and analysis. Their experts draw from interdisciplinary backgrounds in economics, finance, law, management, and engineering to provide a full range of professional services for the energy industry and associated sectors.