SECTION 2 - ELECTRICITY

Selling Electricity in Virginia

Retail

With limited exceptions, retail sale of electricity in Virginia is provided by Virginia's regulated and public utilities. Utilities serve exclusive territories and have an obligation to serve customers who request service in their territories. Rates and terms of service for retail providers are subject to State Corporation Commission (SCC) review and approval.[1]

The electric cooperatives together are well over a million, the second largest provider of electricity in Virginia.

- Utilities are entitled to recover their reasonable and prudent costs plus a reasonable rate of return on their capital investment
- Rates of investor-owned utilities base rates are reviewed by the SCC every two years
- Additions to base rates are permitted through application for rate adjustment clauses (RACs) or other mechanisms to recover the costs of
  - Fuel and purchased power (fuel adjustment clause)
  - Transmission, as approved by the Federal Energy Regulatory Commission, and demand response programs
  - Environmental and reliability improvements
  - Energy efficiency programs and peak shaving programs
  - Cost of new nuclear or offshore wind generation facilities; and
  - Financial emergencies

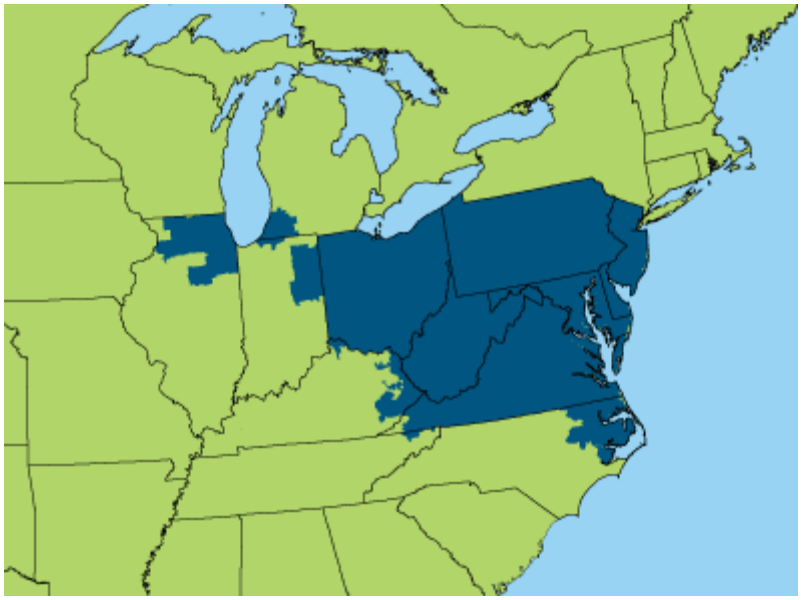
Electric utilities include three investor-owned electric utilities Dominion Virginia Power serves approximately 2.4 million customers, Appalachian Power Company (APCO) serves approximately 500,000 customers in Southern and Southwest Virginia, and Old Dominion Power (a subsidiary of Kentucky Utilities), serves customers in Wise and Dickinson Counties. In addition to investor-owned electric utilities, customers are also served by 13 electric cooperatives and 16 municipal electric providers. The electric cooperatives together serve well over a million customers, serving as the second largest provider of electricity in Virginia.

The two largest investor-owned utilities are statutorily required to be members of a regional transmission organization (RTO). PJM Interconnection is the RTO that includes Virginia. PJM operates the largest centrally dispatched electric grid in the world by coordinating the movement of electricity in thirteen states. In addition to Virginia, PJM coordinates the movement of electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, West Virginia and the District of Columbia.

[1] Virginia Electric Utility Regulation Act, Chapter 23 of Title 56 of the Code of Virginia, http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+TOC560000000023000000000000 June 19, 2010

Wholesale Electricity Markets

Figure 2-1 Map of PJM Service Territory[2]



RTOs such as PJM operate electricity "spot markets" in which generators sell and utilities or customers buy energy. These energy markets operate every day and participants in the market establish a price for electricity by matching supply (what generators want to sell) and demand (what utilities and customers want to buy).

RTO spot markets function at the "wholesale" level. Utilities and competitive retailers who purchase energy from these wholesale energy markets then resell it to final consumers at retail rates set by state regulators.

Distributed Generation

Distributed generation is defined as any small-scale power generation technology that provides electric power at a site closer to customers than central station generation. These decentralized energy technologies potentially offer significant advantages over conventional grid electricity sources and can be sited in areas where traditional generation would not be feasible. Additionally, distributed power is well suited for the use of solar, biomass, landfill gas, small hydroelectric, and small wind powered energy technologies that can be located closer to the user and can be installed incrementally to match the load requirement of the consumer.

Virginia law requires operators to connect retail customers who use distributed generation to the grid. The most common arrangement for distributed generation is for customers to net meter, that is to generate energy (typically through rooftop solar) to net against their own electric bill. As of July, 2014 there are 969 net metering customers for Dominion Virginia Power, 350

[2] http://www.pjm.com/about-pjm/who-we-are/territory-served.aspx

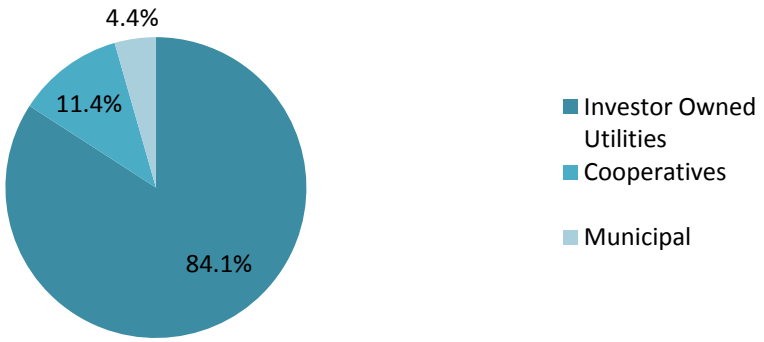
customers for APCO Virginia, and 388[3] for the electric cooperatives. In 2013, the SCC approved Dominion Virginia Power's Solar Purchase Program, which provides an additional avenue for customers to sell energy produced through distributed solar generation. Most of Virginia's electric cooperatives also offer rate riders enabling their member-consumers to purchase 100% renewable electric service through a purchase of undifferentiated energy plus the retirement of cooperative-purchased renewable energy certificates.

While residential net metering customers with systems up to 10 kW receive full retail reimbursement for the energy that they generate, proper and equitable cost recovery for utilities remains a concern regardless of the installation's size. Virginia law also allows utilities to collect a monthly standby charge from those residential customers with a system with a capacity greater than 10 kW and less than 20kW (who can partially meet their electricity needs from their own sources such as solar panels.[4] The standby charge is approved by the SCC and allows utilities which have approved standby charges to recover only the portion of infrastructure costs that are properly associated with those customers. In 2010 and 2011, the SCC examined the benefits and costs of net metering on the electric grid. The SCC also considered this question in 2011, before they established the stand-by charge referenced above.

Buying Electricity in Virginia

Virginia's retail electric customers are served by three investor-owned utilities (IOUs), thirteen electric cooperatives and sixteen municipal utilities.[5]

Figure 2-2 Retail Providers of Electricity in Virginia, 2012[6]



[3]Electric cooperative net metering customers based on best-available 2013 data, and exclude other distributed generators not operating under the net metering rules. For electric cooperatives, the overwhelming majority of these accounts (over 80 percent) are residential member-consumers. Not included in this number are the net metering customers of Powell Valley Electric Cooperative ("PVEC"). PVEC's net metering customers participate in net metering through a unique, three-party arrangement involving the federal Tennessee Valley Authority, PVEC's wholesale power supplier.

[4] http://lis.virginia.gov/cgi-bin/legp604.exe?000+cod+56-594

[5] http://www.eia.gov/electricity/state/virginia/ Table 9. Retail Electricity Sales Statistics, 2012

[6]http://www.eia.gov/electricity/state/virginia/ Table 9, Retail Electricity Sales Statistics, 2012.

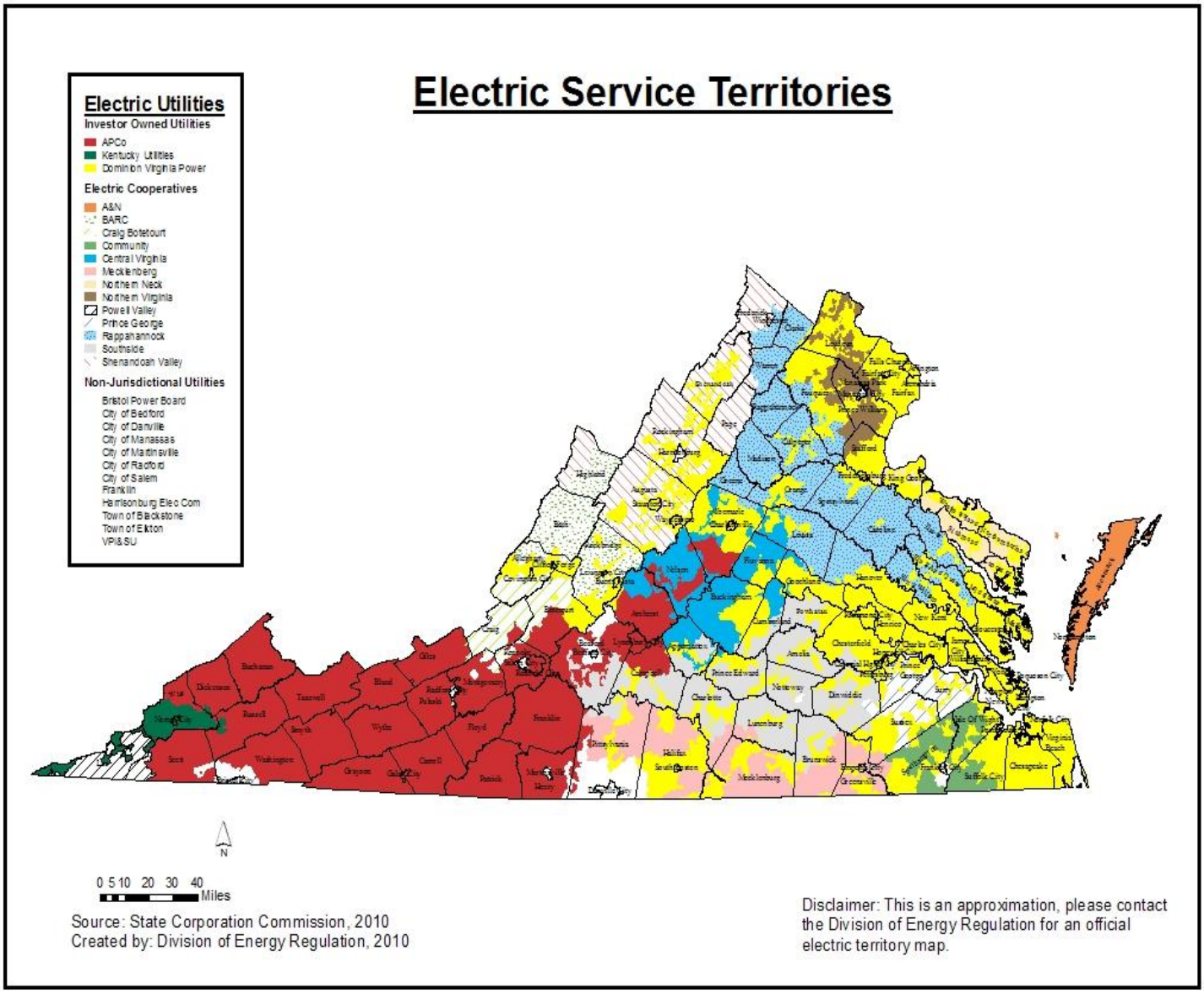
In June 2010, the service territory of a fourth investor-owned utility, Allegheny Power, was split and sold to two cooperatives – Rappahannock Electric Cooperative and Shenandoah Valley Electric Cooperative. Allegheny no longer provides retail electric service to Virginians.

Member owned electric cooperatives[7] are A&N Electric Cooperative, BARC Electric Cooperative, Central Virginia Electric Cooperative, Community Electric Cooperative, Craig-Botetourt Electric Cooperative, Mecklenburg Electric Cooperative, Northern Neck Electric Cooperative, Northern Virginia Electric Cooperative, Prince George Electric Cooperative, Rappahannock Electric Cooperative, Shenandoah Valley Electric Cooperative, Southside Electric Cooperative, and Powell Valley Electric Cooperative. Ten of these are served by the wholesale Old Dominion Electric Cooperative.[8]

The 16 municipal electric utilities[9] serving customers located in their localities are the Cities of Bristol, Danville, Franklin, Harrisonburg, Manassas, Martinsville, Radford, and Salem; the Towns of Bedford, Blackstone, Culpeper, Elkton, Front Royal, Richlands, and Wakefield; and Virginia Tech (serving the Town of Blacksburg).

[7] Electric cooperatives are authorized to increase or decrease rates by 5 percent in a three-year period (not including the fuel factor adjustments) without SCC approval.
[8] Powell Valley Electric Cooperative ("PVEC") is organized pursuant to the laws of the Commonwealth and serves approximately 8,100 member-owners in Virginia in addition to its members in Tennessee. PVEC is regulated by the Commission as to service, and by the federal Tennessee Valley Authority as to rates.
[9] Rates and terms of service for municipal electric utilities are set by each City or Town Council.

Figure 2-3: Electric Utility Service Territories[10]



Electricity Rates

Virginia's rates have generally been below the national average, but in recent years have moved closer to that number, though there is significant variation among rates by electric provider within Virginia.

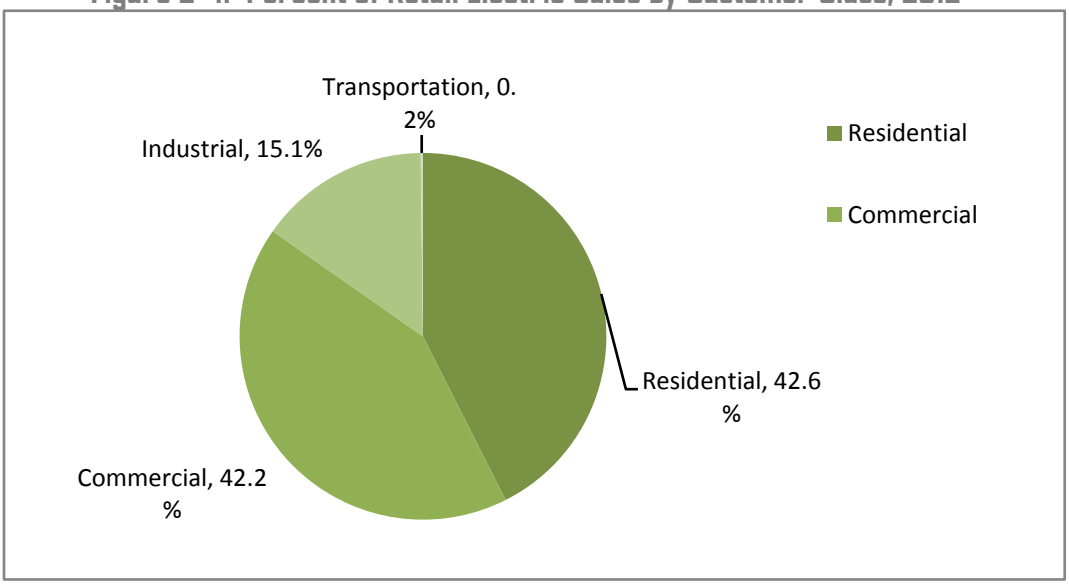
Electricity Consumption[11]

- Virginians purchased 107,794,985 megawatt hours of electricity in 2012

[10] SCC, https://www.scc.virginia.gov/pue/elec/el_map.pdf2010.
[11] Adapted from EIA, Virginia Electricity Profile**, Table 8.**, *Retail Sales, Revenue, and Average Retail Price by Sector, 2000 and 2004 Through 2010*, http://www.eia.gov/cneaf/electricity/st_profiles/virginia.html., January1990- 2012. http://www.eia.gov/electricity/state/virginia/. June 10, 2014.

- The residential sector consumed more electricity than other sectors in 2012 - over 43 million megawatt hours of the total
- The commercial sector used 43.4% in 2012, including major military bases, one of the largest ports in the United States, and a large share of the computer infrastructure supporting the Internet and centralized computing
- The industrial sector used 16.1% of electricity in 2012

Figure 2-4: Percent of Retail Electric Sales by Customer Class, 2012[12]

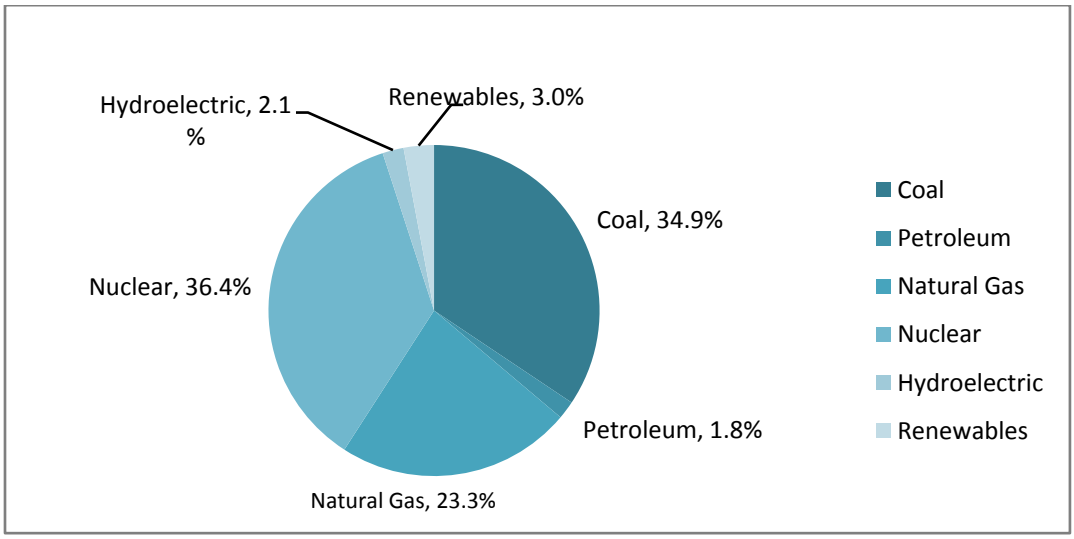


Electric Generation Capacity and Energy Serving Virginia

- Electric generation is measured two ways, net (or actual) generation (energy) and generation capacity. Energy is the amount of electricity generated over time. It is expressed in megawatt hours (MWh). Capacity is the amount of electricity that can be generated at any one time. It is expressed in megawatts (MW). In order to meet customer demand, Virginia's utilities own in-state and out-of-state generation facilities, and make contractual purchases of electricity from in-state and out-of-state producers, and spot purchases of electricity from the PJM wholesale market.
- Electricity generation facilities located in Virginia produced 70,739,235 megawatt hours of electricity in 2012.[13]
    - 56,188,401 megawatt hours (79 percent) were generated in plants owned and operated by electric utilities
- 14,550,834 megawatt hours (21 percent) were generated in plants operated by independent power producers and industrial combined heat and power facilities. Electricity generated in Virginia relies on a diverse portfolio of fuels. That portfolio includes nuclear, natural gas, coal, biomass and other renewables and hydroelectric power.

[12] Ibid.
[13] As compared to 107,794,985 megawatt hours consumed by Virginia users in 2012, per the Energy Information Administration.

Figure 2-5: Actual Electric Power Generation by Primary Source, (Megawatt hours)[14] 2012

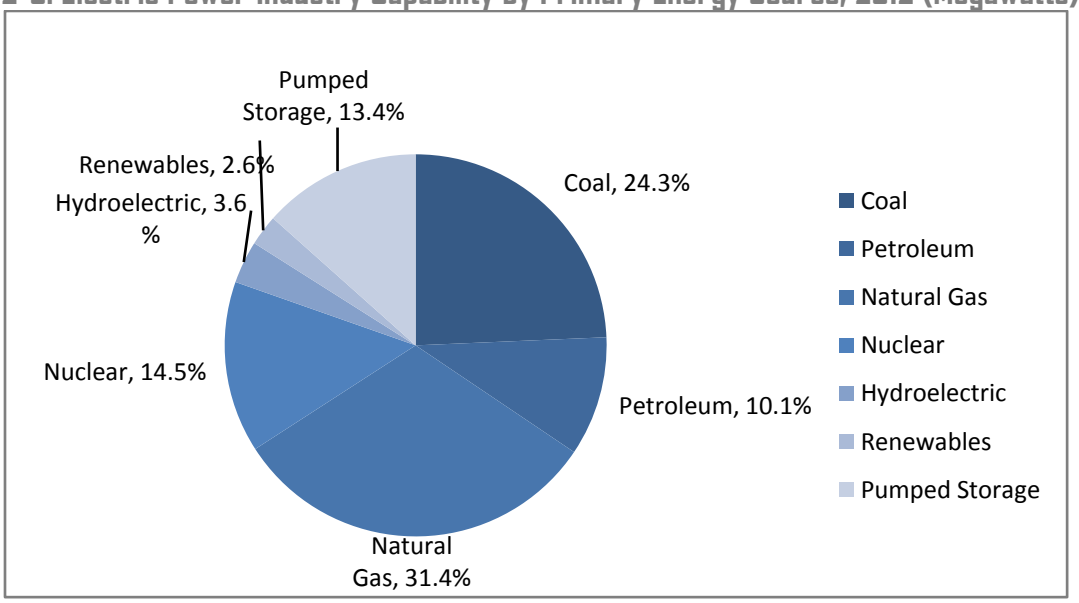


The total net summer generation capacity in Virginia is 24,849 megawatts.[15]

Of that:

- Electric utilities own 20,626 megawatts of generation capacity, and
- Independent power producers and combined heat and power facilities offer 4,223 megawatts

Figure 2-6: Electric Power Industry Capability by Primary Energy Source, 2012 (Megawatts)



[14] Adapted from EIA, Virginia Electricity Profile, Table 5. Electric Power Industry Generation by Primary Energy Source, 2000 and 2004 through 2010, http://www.eia.gov/cneaf/electricity/st_profiles/virginia.html , January 2012

[15] EIA, Virginia Electricity Profile, Table 4. Electric Power Industry Capability by Primary Energy Source, 1990 Through 2012 (Megawatts) http://www.eia.gov/electricity/state/virginia/June 2014.

Table 2-2: Ten Largest Plants by Generation Capacity, 2012, in Virginia[16]

	Plant	Primary Energy Source	Operating Company	Net Summer Capacity (MW)
1	Bath County	Pumped Storage	Virginia Electric & Power Co	3,003
2	North Anna	Nuclear	Virginia Electric & Power Co	1,887
3	Possum Point	Natural Gas	Virginia Electric & Power Co	1,733
4	Surry	Nuclear	Virginia Electric & Power Co	1,676
5	Chesterfield	Coal	Virginia Electric & Power Co	1,650
6	Yorktown	Petroleum	Virginia Electric & Power Co	1,141
7	Tenaska Virginia Generating Station	Natural Gas	Tenaska Virginia Partners LP	926
8	Clover	Coal	Virginia Electric & Power Co	865
9	Doswell Energy Center	Natural Gas	Doswell Ltd Partnership	814
10	Ladysmith	Natural Gas	Virginia Electric & Power Co	783
	Total			14,478

Voluntary Renewable Energy Goals

Virginia established voluntary renewable energy goals for investor-owned utilities and for several years provided an incentive for achieving those goals.[17] The goals are measured against 2007 base load sales (less sales attributable to nuclear generation). The goals are:

- 4 percent by 2010
- 7 percent by 2016
- 12 percent by 2022 and
- 15 percent by 2025

- Investor-owned were met. Energy produced from onshore wind, solar power, and facilities in Virginia fueled primarily from animal waste receive double credit toward meeting renewable energy goals.[18]
- Energy produced from offshore wind receives triple credit toward meeting renewable energy goals.[19]

[16] EIA, Virginia Electricity Profile, Table 2. Ten Largest Plants by Generation Capacity, .2012http://www.eia.gov/electricity/state/virginia/, , June 2014.
[17] See § 56-585.2 of the Code of Virginia: http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+56-585.2
[18] Ibid.
[19] Ibid.

Dominion Virginia Power (Dominion)

- The SCC approved Dominion's Application to participate in the Renewable Portfolio Standard program on May 18, 2010.[1]
- According to its November 1, 2010 Annual Report to the SCC on Renewable Energy, Dominion projects that it will meet or exceed its 2010 VA RPS Plan renewable target of 1,732,746 MWh through implementation of its RPS Plan approved by the SCC.
- On January 31, 2011, McGuireWoods LLP submitted documentation on Dominion Virginia Power's behalf to confirm that it had indeed met the 2010 RPS Goal I established under § 56-585.2 of the Code of Virginia.
- Dominion's 2011 Annual Report was filed November 1, 2011 describing Dominion's ongoing efforts to meet the RPS goals.
- Verification of compliance with Dominion's 2011 goal was included as part of the 2012 Annual Report filed on November 1, 2012.
- On November 1, 2013 Dominion filed its Annual Report describing the Company's efforts to support renewable energy development as well as advances in renewable generation technology. The 2013 Annual Report also contains verification of Dominion's compliance with its 2012 RPS goals.

- Hydroelectric power accounts for about 57 percent of Dominion's RPS renewable energy mix, with the remainder 43 percent by waste wood biomass.[20]
- Dominion has other renewable programs besides its RPS. Dominion is currently in the process of implementing its 30 MW Solar Partnership Program, approved by the State Corporation Commission pursuant to 2011 legislation. The company is purchasing 3 MW of solar at a feed-in tariff rate from small systems, and has a new rate schedule through which large users may purchase renewable power from third-party producers through a contract with Dominion to 2011 legislation.

Appalachian Power Company (APCo)

- Appalachian Power Company (APCo) was initially approved to participate in the RPS program on February 7, 2008 by the SCC, with the Final Order issued on August 11, 2008.[21] [22]
- By Commission order in the Biennial Filing Case No. PUE-2011-00037, the Company met Goal I for 2010.

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[1] Case No. PUE-2009-00082
[20] Ibid
[21] Commonwealth of Virginia State Corporation Commission Docket Search, "Case Summary for Case Number: PUE-2008 00003",http://docket.scc.virginia.gov/vaprod/main.asp, June 24, 2011
[22] Commonwealth of Virginia State Corporation Commission, "Report to the Commission on Electric Utility Regulation of the Virginia General Assembly", http://www.scc.virginia.gov/comm/reports/2010_veur.pdf, June 24, 2011

- APCo Annual Reports on November 1, 2012 and November 1, 2013 describing the Company's ongoing efforts to meet the RPS Goal II for the respective years 2011 and 2012.[23]

Appalachian Power has utilized a combination of purchased power wind and company-owned hydro generation in its ongoing effort to meet renewable goals.

Electricity Imports in Virginia

- Virginia utilities do not own in-state generation capacity sufficient to meet their territory's peak load plus the reserve required by the Federal Energy Regulatory Commission.
- In 2012, 34 percent of the electricity consumed was purchased on the wholesale market pursuant to existing contracts.[24]
- All three of Virginia's investor-owned utilities and the wholesale power provided to many of Virginia's electric cooperatives comes from out-of-state generation facilities dedicated to serving their Virginia customers.
- In 2007, the law adopted to re-regulate electricity generation included incentives available to investor-owned utilities for building new generation facilities. Several of these incentives were repealed by 2013 legislation, with the only incentives remaining being for capital intensive projects such as, offshore wind and nuclear power.

PJM Wholesale Electricity Pricing Systems

- Wholesale electric prices in the PJM system are affected by the cost and availability of generation and the availability of transmission capacity to carry power from generating plants to load centers. This method of wholesale power pricing is called Locational Marginal Pricing (LMP).
- Wholesale prices are higher in areas that do not have sufficient local generation, long-distance transmission capacity or demand response to meet peak electric loads as the demand in these areas must be met by local, more costly generating plants.
- LMP in coastal areas with more congestion, such as Virginia, generally runs higher than in areas to the west, such as Illinois or Kentucky. Congestion refers to heavy use of the transmission system in a particular area.
- Electric service providers that purchase wholesale power to serve demand in generation- and transmission-constrained areas pass higher LMP along to their customers through higher retail rates.
- Pricing in the PJM wholesale market changes on a real time basis in response to demand capacity.

[23] http://scc.virginia.gov/pue/renew.aspx
[24] EIA, Virginia Electricity Profile, Table 10. Supply and Disposition of Electricity, 1990-2012, .http://www.eia.gov/electricity/state/virginia/, June 2014

Table 2-3: Average Retail Price of Electricity to Ultimate Customer by State (Cents per Kilowatt hour), 2013-2014[25]

			Difference as
State	**Jan-14**	**Jan-13**	**Percent of Jan-13**
Hawaii	34.08	34.87	2.32%
Alaska	16.87	15.72	-6.82%
Connecticut	16.82	15.54	-7.61%
New York	16.51	15.20	-7.93%
New Hampshire	15.49	14.50	-6.39%
Vermont	14.47	14.21	-1.80%
Massachusetts	14.71	13.59	-7.61%
Rhode Island	17.41	13.50	-22.46%
California	14.08	13.25	-5.89%
New Jersey	14.53	13.16	-9.43%
Maine	13.79	12.45	-9.72%
District of Columbia	12.83	11.78	-8.18%
Maryland	12.35	11.23	-9.07%
Delaware	11.65	10.98	-5.75%
Michigan	11.05	10.86	-1.72%
Wisconsin	10.44	10.42	-0.19%
Florida	10.66	10.29	-3.47%
Pennsylvania	10.72	9.94	-7.28%
Tennessee	9.20	9.32	1.30%
Colorado	9.54	9.22	-3.35%
Kansas	9.42	9.10	-3.40%
Arizona	9.36	9.08	-2.99%
Minnesota	9.37	9.07	-3.20%
South Carolina	9.76	8.96	-8.20%
Georgia	10.07	8.93	-11.32%
North Carolina	9.15	8.90	-2.73%
Ohio	9.27	8.84	-4.64%
Alabama	9.25	8.77	-5.19%
Virginia	8.89	8.72	-1.91%
New Mexico	9.05	8.70	-3.87%
Mississippi	9.38	8.62	-8.10%
Texas	8.79	8.60	-2.16%
Montana	8.64	8.35	-3.36%

[25] Energy Information Administration, Sources & Uses, Table 5.6.A. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector

			Difference as
State	**Jan-14**	**Jan-13**	**Percent of Jan-13**
Oregon	8.80	8.35	-5.11%
Indiana	8.76	8.34	-4.79%
South Dakota	8.56	8.32	-2.80%
Nevada	9.14	8.24	-9.85%
West Virginia	7.83	7.95	1.53%
Illinois	8.27	7.82	-5.44%
Nebraska	8.06	7.81	-3.10%
Iowa	7.85	7.79	-0.76%
Missouri	7.94	7.79	-1.89%
Louisiana	7.51	7.71	2.66%
Utah	7.73	7.53	-2.59%
Arkansas	7.25	7.52	3.72%
Wyoming	7.52	7.39	-1.73%
North Dakota	7.60	7.28	-4.21%
Kentucky	8.19	7.21	-11.97%
Washington	7.33	7.15	-2.46%
Idaho	7.52	7.13	-5.19%
Oklahoma	7.29	6.74	-7.54%
U.S. Total	10.13	9.66	-4.64%

Generation Under Construction in Virginia

Virginia's utilities and regulators consider a variety of factors when deciding to build or approve a new generation facility. Many of the same factors considered at the micro level also can be aggregated and averaged at a macro (national) scale to express the levelized cost of power of different fuel sources and technologies. Levelized cost of power generation assets represents the present value of the total cost of building and operating a generating plant over an assumed financial life and duty cycle, converted to equal annual payments and expressed in terms of real dollars to remove the impact of inflation. Levelized cost is theoretical and does not reflect the cost of new generation facilities as those costs will be reflected in rates.

Table 2-4. Estimated Levelized Cost of New Generation Resources, 2019[26]

		U.S. Average LCOE (2012 $/MWh) for Plants Entering Service in 2019						
Plant Type	Capacity Factor	Capital Cost	Fixed O&M	Variable O&M (including fuel)	Trans-mission	Total System LCOE	Subsidy	Total LCOE including Subsidy
Dispatchable Technologies								
Conventional Coal	85	60.0	4.2	30.3	1.2	95.6		
Integrated Coal-Gasification Combined Cycle (IGCC)	85	76.1	6.9	31.7	1.2	115.9		
IGCC with CCS	85	97.8	9.8	38.6	1.2	147.4		
Natural Gas-fired								
Conventional combined Cycle	87	14.3	1.7	49.1	1.2	66.3		
Advanced Combined Cycle	87	15.7	2.0	45.5	1.2	64.4		
Advanced CC with CCS	87	30.3	4.2	55.6	1.2	91.3		
Conventional Combustion Turbine	30	40.2	2.8	82.0	3.4	128.4		
Advanced CombustionTurbine	30	27.3	2.7	70.3	3.4	103.8		
Advanced Nuclear	90	71.4	11.8	11.8	1.1	96.1	-10.0	86.1
Geothermal	92	34.2	12.2	0.0	1.4	47.9	-3.4	44.5
Biomass	83	47.4	14.5	39.5	1.2	102.6		
Non-Dispatchable Technologies								
Wind	35	64.1	13.0	0.0	3.2	80.3		
Wind – Offshore	37	175.4	22.8	0.0	5.8	204.1		
Solar PV[2]	25	114.5	11.4	0.0	4.1	130.0	-11.5	118.6
Solar Thermal	20	195.0	42.1	0.0	6.0	243.1	-19.5	223.6
Hydroelectric[3]	53	72.0	4.1	6.4	2.0	84.5		

Meeting Future Electric Demand

- Demand in Dominion's service territory is expected to grow an average 1.8 percent[27] per year over the next 10 years. This is among the highest growth expected in the 13-state PJM region.
- Demand in Appalachian Power's service territory is predicted to grow by 0.5 percent per year over the next 10 years.
- Demand in electric cooperative service territories is predicted to grow by 1 to 2 percent per year over the next 10 years based on these growth rates, Virginia utilities must add

[26] DOE EIA 2014 Annual Energy Outlook. Estimated Levelized Cost of New Generation Resources entering service in 2019, http://www.eia.gov/forecasts/aeo/pdf/electricity_generation.pdf, April 2014

[27] PJM Load Forecast Report (January 2014, revised February 2014), http://www.pjm.com/~/media/documents/reports/2014-load-forecast-report.ashx, June 2014

generation (or reduce demand?) by over 14,000 megawatts of new generation capacity by 2024 to keep up. A megawatt represents enough energy to serve approximately 250 homes.

- These growth forecasts may change in the future as the state and national economy continues to recover, and as the electric market changes due to electric cars, added computing capacity, and other factors such as the effects of conservation and efficiency measures.
- A combination of a long permitting process and the high cost of some technologies make it more difficult to finance the large capital investments required for many types of generating facilities.

- To help reduce the financial risk, Virginia provides, subject to SCC approval, for investor-owned utilities:
  - An increased rate of return on equity for utility investments in new, nuclear and offshore wind generating plants; and
  - Construction work in progress (CWIP) cost recovery to reduce the regulatory lag in recovering capital investments in new plants

Integrated Resource Plans

- Investor-owned electric utilities are required to complete a 15-year Integrated Resource Plan (IRP) that describes how the utilities expect to meet future demand for electricity and maintain adequate and reliable service.[28] IRPs must be updated every two years.[29] As a practical matter, Dominion files an IRP every year, as it is required to file one in Virginia in odd-numbered years and one in North Carolina in even-numbered years with updates required to be filed with the and both sets of regulators in the years it is not required to be filed.

- Dominion's 2013 Integrated Resource Plan recommends a path forward to follow the least-cost methodology of the Base Plan, while concurrently continuing forward with reasonable development efforts of the Fuel Diversity Plan.
  - New generation capacity will come from Warren County Power Station (1,337 MW) and the Brunswick County Power Station (1,375 MW), which are currently under construction. Previously coal-fired Altavista, Southampton, and Hopewell Power Stations (153 MW total) were repowered with primarily wood waste biomass at the end of 2013.
  - The Base Plan includes approximately an additional 4,120 megawatts (MW) of generation and 544 MW of demand side management programs by 2028. In

[28] Electric Utility Integrated Resource Planning, Chapter 24 of Title 56 of the Code of Virginia, http://leg6.state.va.us/cgi-bin/legp604.exe?000+cod+TOC560000000024000000000000,
[29] IRPs for all investor-owned utilities can be downloaded from the SCC's website: http://docket.scc.virginia.gov/vaprod/main.asp

addition to traditional supply- and demand-side options, the Base Plan includes a 20 MW biomass non-utility generation (NUG), and a renewable 15 MW solid waste NUG, both in 2015. The Base Plan also includes a 50 MW solar NUG and 24 MW from the Solar Partnership Program. Due to the Base Plan's almost exclusive reliance on natural gas, the reasonable development efforts of the additional resources of the Fuel Diversity Plan include 220 megawatts of solar, 1,453 megawatts of nuclear, 12 MW from an offshore wind demonstration project and 247 megawatts of onshore wind, while removing the need for a 1,375 MW of new natural gas combined cycle plant in the Base Plan.

- Appalachian Power's 2013 Integrated Resource Plan (IRP) included provisions pending before the Virginia State Corporation Commission and the West Virginia Public Service Commission that required the company to file an update to the IRP in 2014. Appalachian Power filed with the State Corporation Commission an Updated 2014 Integrated Resource Plan on March 11, 2014.
    - The IRP includes by mid-2015 the retirement of 1,245 MW of older coal-fired power plants. Two of the plants are located in Virginia – Glen Lyn (325 MW) and Clinch River unit 3 (230 MW).
    - Added generation capacity to Appalachian Power comes from the transfer of unit 3 of Amos (867 MW – Appalachian already owns units 1 and 2) and the expected conversion of Clinch River units 1 and 2 to natural gas (484 MW).
- In addition to traditional resources, Appalachian Power's preferred plan also includes "non-traditional" resources from demand-side management as well as distributed solar generation and utility-scale wind and solar generation.
- Multiple federal, state, and local approvals are required:
    - The SCC must certify the need for and approve the location of the project.
    - The Department of Environmental Quality (DEQ) is responsible for necessary air, water, and waste discharges permits
    - The Department of Conservation and Recreation (DCR) is responsible for erosion and sediment control and storm water management;
    - The Departments of Game and Inland Fisheries (DGIF) and Agriculture and Consumer Services are responsible for threatened or endangered plant, animal, or insect species;
    - The Department of Historic Resources (DHR) is responsible for state and federally-protected historic or other natural or cultural resources;
    - The Department of Transportation is responsible for access to public highways;
    - The Virginia Marine Resources Commission is responsible for state waters;
    - Multiple federal agencies are responsible for environmental controls, such as:
        - The Environmental Protection Agency (EPA);
        - The Army Corps of Engineers;
        - The U.S. Fish and Wildlife Service; and
        - The U.S. Forest Service.

- Local governments must approve the land use and enforce building codes for many electric generating facilities.

- Virginia has taken a number of actions to facilitate permitting of new electric infrastructure.
  - The state natural resource agencies (DEQ, DCR, DHR, DGIF) offer a pre-application planning and review process to provide for an efficient and coordinated review of the proposed project. The plan includes:
    - A list of the permits or other approvals likely to be required based on the information available;
    - A specific plan and preliminary schedule for the different reviews;
    - A plan for coordinating those reviews and the related public comment process; and
    - Designation of points of contact, either within each agency or for the Commonwealth as a whole, to facilitate this coordination.
  - Renewable energy projects of 100 megawatts or less may take advantage of a Permit by Rule (PBR) process.
    - A PBR is an expedited permitting process created by statute that ensures the proper balance between development of renewable energy projects and environmental protection.[30]
  - The SCC, in considering its Certificate of Public Convenience and Necessity for electric generating plants and associated facilities, cannot impose additional conditions with respect to environmental protection, building codes, transportation plans, and public safety when a separate permit is granted by a federal, state, or local government entity.

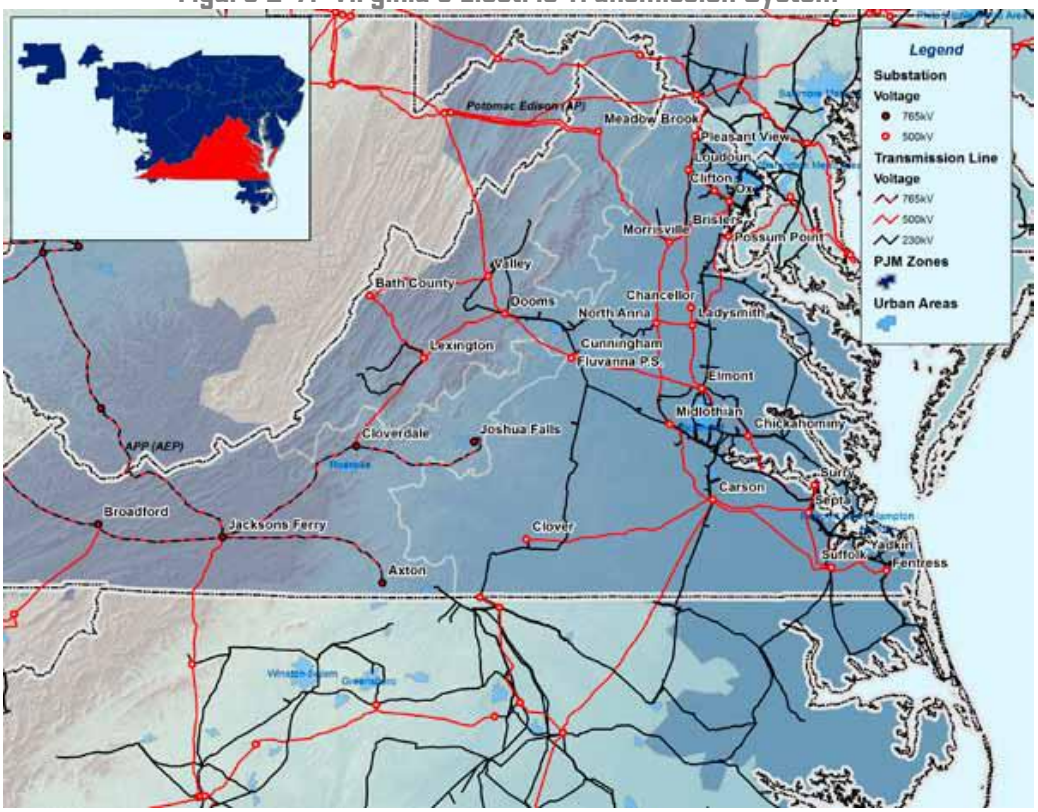
Transmission and Distribution of Electricity

- Electricity is delivered to end users through a network of high-voltage transmission and local distribution lines.[31]
- Transmission is regulated by the Federal Energy Regulatory Commission, pursuant to federal law. FERC, together with the Regional Transmission Organizations, review and approve proposed new transmission projects and set rates of recovery for those projected developments.
  - PJM is charged with the responsibility of assuring the reliability of the transmission grid in its territory.
  - Dominion Virginia Power, Appalachian Power, Delmarva Power, and Allegheny Power own and maintain transmission facilities in Virginia.

[30] See 10.1-1197.6 of the Code of Virginia: http://lis.virginia.gov/cgi-bin/legp604.exe?000+cod+10.1-1197.6

[31] PJM 2009 RTEP Report – Section 12.12, Virginia, http://www.pjm.com/documents/reports/~/media/documents/reports/2009-rtep/2009-section12-12-va.ashx, June 18, 2010

Figure 2-7. Virginia's Electric Transmission System[32]



- PJM publishes annually a Regional Transmission Expansion Plan (RTEP) to identify the need for new transmission resources.[33] The RTEP process involves a 15 year planning window to address transmission investments to ensure grid reliability and improve economic efficiency.
    - Allegheny and Dominion's 500 kV Trans Allegheny Interstate Line (TrAIL) runs from the 502 Junction in western Pennsylvania to Loudoun County; this line was completed and energized on May 19, 2011.
    - Dominion's 500 kV Carson to Suffolk line was placed into service on June 1, 2011.
    - PJM continues to assess the ongoing reliability of transmission facilities throughout the Commonwealth. This includes examination of such aging infrastructure as the Cloverdale-Lexington and Mt. Storm-Dobbs 500 kV transmission lines.[34]
- The Virginia SCC must certify the need for and approve the location of proposed new electric transmission lines. For a transmission line of 138 kV, a public utility has the option to seek SCC approval or seek approval from the locality or localities in which the 138 kV transmission line will be located.

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[32] PJM. PJM 2011 Regional Transmission Expansion Plan, Section 13.0, Virginia RTEP Overview, Map 12-53, Page 267
[33] PJM Fact Sheet, http://www.pjm.com/documents/~/media/about-pjm/newsroom/fact-sheets/rtep-fact-sheet.ashx, March 2012.
[34] PJM 2011 RTEP, Book 5, Page 270. http://pjm.com/~/media/documents/reports/2011-rtep/2011-rtep-book-5.ashx

Within the electric system, transmission lines carry bulk power from power stations to substations. Substations “step-down” voltages from the very high voltages used in the bulk power system to lower voltages needed to serve retail customers. Distribution lines carry power from substations to individual homes and businesses. These lines include main lines and smaller “tap” lines. These lines are owned and operated by the incumbent electric utility serving the areas in which they are located.

Since the early 1990s most neighborhood tap lines have been placed underground as a matter of course to improve reliability. In 2014, the Virginia General Assembly approved legislation to place up to 20 percent of the worst performing neighborhood lines underground, in order to reduce the frequency and duration of electricity outages in neighborhoods served by overhead distribution lines. It should be noted that placing distribution lines underground is less expensive than doing the same for transmission lines. Transmission lines are typically placed overhead unless doing so is infeasible from an engineering standpoint, due to the high costs of undergrounding transmission lines compared to overhead alternatives. Virginia had implemented a pilot program to assess the cost and effectiveness of placing transmission lines underground. The pilot program was ended due to the large cost of placing the lines underground.