SECTION 1 - GENERAL ENERGY INFORMATION

Quick Facts

- Energy (electricity, heating and cooling, transportation) is supplied to Virginians 44 percent from petroleum, 20 percent from coal, 18 percent from electricity generated outside Virginia, 13 percent from nuclear-based power generation, and 5 percent from hydro, biomass, and other renewable sources.
- Virginia's net energy balance is negative, having imported 55 percent of total energy used in 2008.
- Electricity generated in Virginia in 2008 came 44 percent from coal, 38 percent from nuclear, 13 percent from natural gas, 3 percent from renewables, and 2 percent from petroleum. Virginia's utilities imported 34 percent of the state's 2008 electricity consumption from generation facilities outside of Virginia.
- The Commonwealth is the 15th largest primary energy producer of the states, including coal, natural gas, hydro, biomass, and other renewables.
    - Virginia's mining companies produce nearly 10 percent of U.S. coal east of the Mississippi River from underground and surface mines in Southwest Virginia.
    - Virginia has nearly 6,500 natural gas wells that produce 43 percent of the natural gas the state consumes. Two Virginia coalbed methane fields and the Nora and Oakwood fields in Southwest Virginia are among the top 100 natural gas fields in the United States.
- Virginia is home to a robust energy infrastructure including:
    - 130 coal, nuclear, natural gas, hydro, oil, and biomass fueled electric power plants.
    - The southern end of the PJM Interconnection system with approximately 60,000 miles of transmission lines and approximately 6,000 substations, connected to an extensive network of local distribution lines reaching customers in almost every corner of Virginia.
    - Approximately 3,000 miles of natural gas transmission pipelines[1], approximately 3,200 miles of natural gas gathering pipelines[2], and approximately 20,000 miles of distribution pipelines.[3]
    - Two petroleum product pipelines moving gasoline, diesel, and other fuels from the Gulf of Mexico to Virginia; piers to receive water-borne petroleum products; and four major petroleum terminal hubs.
    - A petroleum refinery in Yorktown that can process 70,000 barrels per day of petroleum into gasoline, diesel fuel, and other products.[4]
- Virginia uses energy more efficiently than the nation, ranking 31st in energy use per unit of gross domestic product (GDP).
- Virginia has a voluntary goal to reduce electricity use by 2022 through conservation and efficiency, by an amount equal to 10 percent of 2006 electricity use.
- Virginia's utilities and coal and gas producers employ over 20,000 people, with an estimated $2 billion in payroll.

[1] PHMSA Pipeline Safety Program, http://primis.phmsa.dot.gov/comm/reports/safety/VA_detail1.html?nocache=9885#_OuterPanel_tab_1, June 22, 2010
[2] DMME, Division of Gas and Oil, June 23, 2010
[3] PHMSA Pipeline Safety Program, http://primis.phmsa.dot.gov/comm/reports/safety/VA_detail1.html?nocache=9885#_OuterPanel_tab_1, June 22, 2010.
[4] Western Refining, http://www.wnr.com/Refining.aspx, June 23, 2010

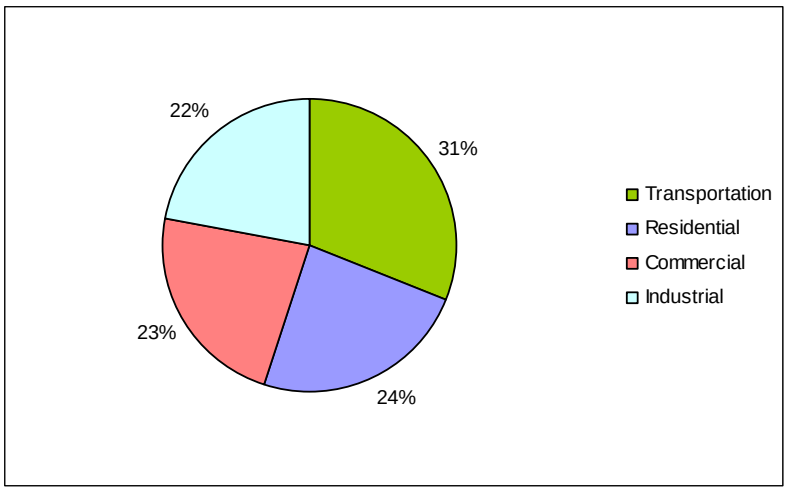
State Energy Policy

- Virginia's General Assembly set out the following broad policies and objectives in state law:[5]
- Ensure availability of reliable energy supplies at reasonable costs;
- Establish sufficient infrastructure to support energy needs;
- Use resources efficiently and facilitate energy conservation;
- Facilitate development of Virginia's low cost resources, including clean coal and natural gas;
- Facilitate development of less polluting energy sources;
- Foster energy research and development; and
- Address environmental protection with energy facilities.

Energy Consumption

- Virginians use electricity, natural gas, fuel oil, and other fuels to light, heat, cool, and operate their homes, stores, and factories; and gasoline and diesel fuel to move their cars, trucks, buses, airplanes, ships, and trains.
- This energy comes from multiple sources: 44 percent from petroleum, 20 percent from coal, 18 percent from electricity generated outside Virginia, 13 percent from nuclear-based power generation, and 5 percent from hydro, biomass, and other renewable sources.
- Energy is used in different ways and in differing quantities by residential, commercial, industrial, and transportation customers.
    - The transportation sector is the largest user of energy in Virginia. Residential, commercial, and industrial consumers use about equal amounts.
    - Compared to the average state, Virginia uses more energy for transportation and commercial use and less for industrial use.

Figure 1-1: Virginia Total Energy Consumption by Sector, 2007[6]

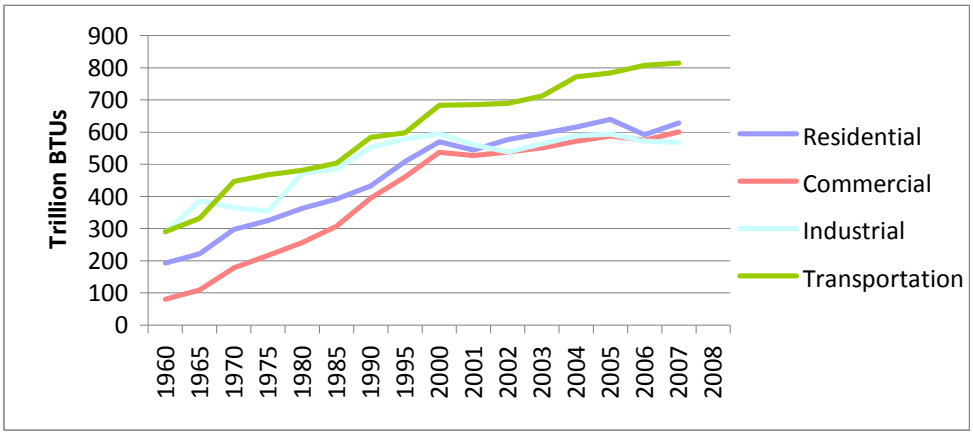


[5] Code of Virginia, Title 67, Sections 67-101 and 67-102, http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+TOC67000000001000000000000, June 29, 2010

[6] EIA, State Energy Consumption Estimates, http://www.eia.doe.gov/emeu/states/sep_use/notes/use_print2007.pdf

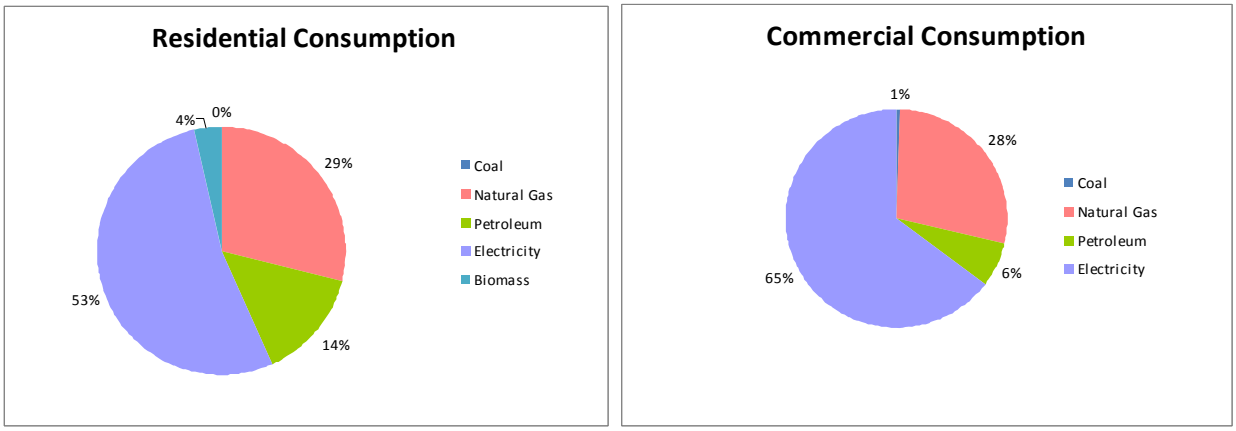
- Energy use for transportation has grown at the fastest rate. Energy use in the industrial sector has grown at the slowest rate. The residential and commercial sectors grew rapidly in the 1990s but slowed through the 2000s.

Figure 1-2: Virginia's Total Energy Consumption by Sector, 1960–2007[7]

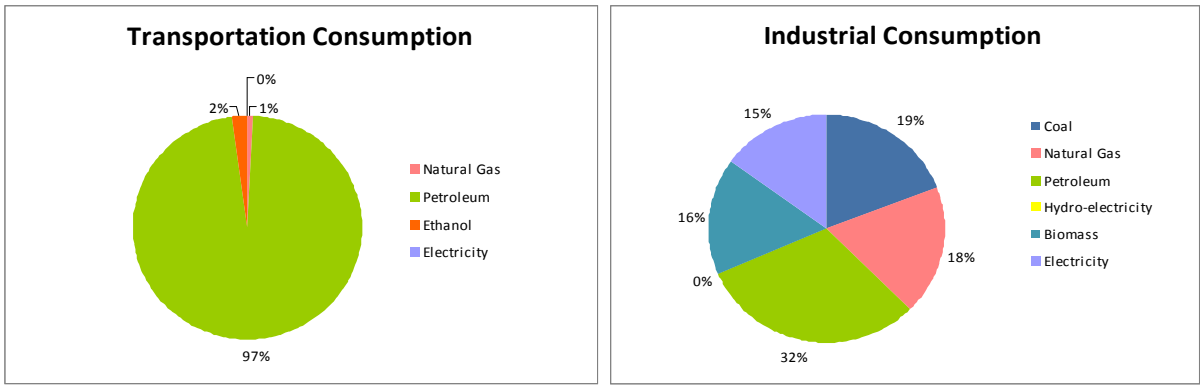


- Electricity delivers 65 percent of all energy to the commercial sector, 53 percent to the residential sector, 19 percent to the industrial sector, and less than 1 percent to the transportation sector. In contrast petroleum delivers 97 percent of energy used by the transportation sector and only 6 percent used by the commercial sector.

Figure 1-3: Virginia's Energy Consumption by Sector, 2007[8]

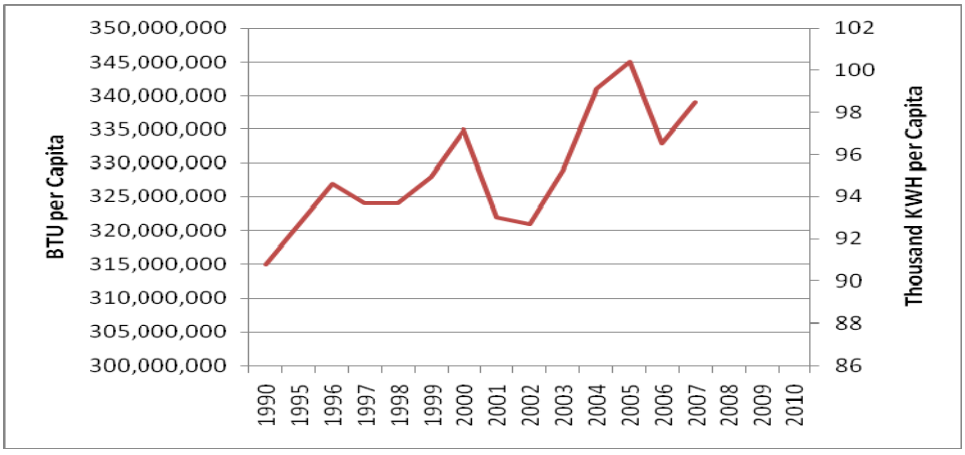


[7] EIA, State Energy Consumption Estimates, http://www.eia.doe.gov/emeu/states/sep_use/notes/use_print2007.pdf
[8] EIA, State Energy Consumption Estimates, http://www.eia.doe.gov/emeu/states/sep_use/notes/use_print2007.pdf



- Per capita energy use has increased over time, generally tracking economic activity. Energy use also has increased due to increases in energy used for transportation and as consumers use more energy-consuming devices in their homes and businesses.

Figure 1-4: Virginia's Per Capita Energy Use, 1990–2007[9]



- The average household in 2008 spent $6,599 for electricity, other household energy, and gasoline.

Figure 1-5: Average Household Energy Expenditures[10]

Energy Type	Annual Expenditures
Electricity	$990
Gasoline	$4,185
Other	$1,424
Total	$6,599

[9] EIA, State Energy Consumption Estimates, http://www.eia.doe.gov/emeu/states/sep_use/notes/use_print2007.pdf
[10] DEQ, http://www.deq.virginia.gov/export/sites/default/info/documents/climate/Virginia_Energy_Analysis_091008.pdf, June 20, 2010

Energy Balance – Imports and Exports

- Virginia has a net negative energy balance, importing 55 percent of the total amount of energy the state uses.[11] The Commonwealth is a net exporter of coal and a net importer of all other fuels.
- In 2007 Virginians spent $30.5 billion to purchase energy.[12] On a net basis, this included $13.7 billion on imported fuels and electricity.
- With expected growth in use, 2020 imports would cost $21.6 billion in today's prices.

Figure 1-8: Virginia's Net Energy Imports/(Exports), 2007[13] (Trillion Btus)

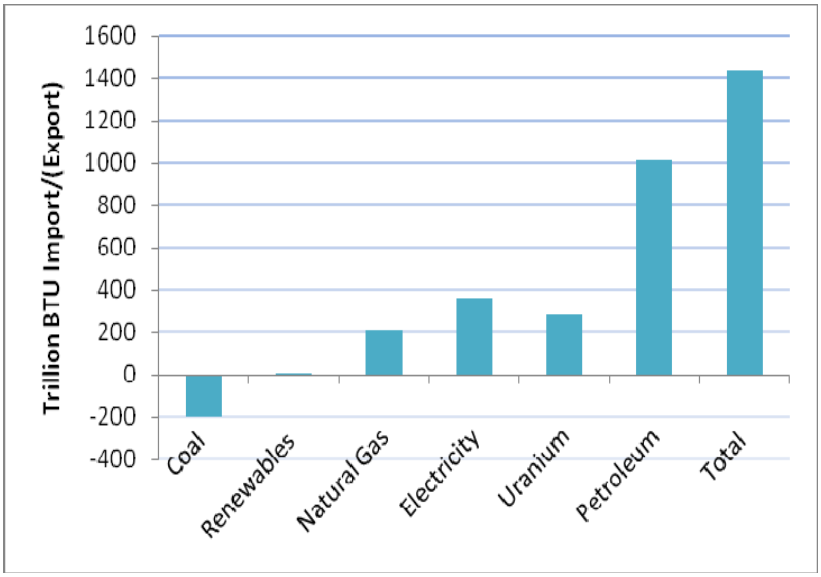
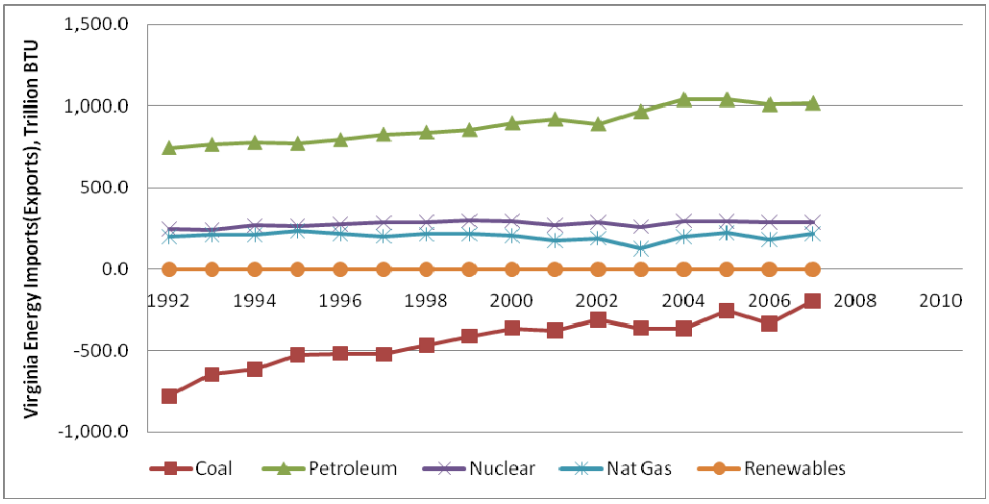


Table 1-1: Virginia's Net Energy Imports/(Exports), 2007[14] (Trillion Btus)

Fuel	Production	Consumption	Net Imp/(Exp)
Coal	656.3	457.9	(198.44)
Renewables	114.2	114.2	0.013
Natural Gas	116.5	332.7	216.161
Electricity	15.61	380.7	365.09
Uranium	0	286	286
Petroleum	0.1	1,016.60	1016.496
Total	1,173	2,611	1,438

[11] Unless otherwise noted, Virginia energy production and consumption data used in this section comes from: EIA, State Energy Profiles, Virginia, http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=VA, May 26, 2010
[12] EIA, State Energy Data System Consumption, Price, and Expenditure Estimates, http://www.eia.doe.gov/emeu/states/_seds.html
[13] EIA, State Energy Profiles, Virginia, http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=VA
[14] EIA, State Energy Profiles, Virginia, http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=VA

Figure 1-9: Virginia's Net Energy Imports/(Exports) by Fuel, 1992–2007[15]



- Reducing energy imports would allow the Commonwealth to expand its economy.
- For each 1 percent that Virginia reduces its energy imports, we would keep nearly $150 million in the state's economy.
    - Reducing imports of electricity by 1 percent by adding in-state generation would increase state gross domestic product by $20 million dollars and result in increased jobs in electric generating plants and businesses supporting the plants.
    - Increasing coal exports by 1 percent through increased production that would increase state gross domestic product by nearly $7 million, with the attendant jobs in coal mining and support service, railroad, and ports across the state.

Table 1-2: Impact of 1 Percent Change in Virginia's Energy Imports/Exports

CHANGE IN NET IMPORTS					
Fuel	2007 Net Imports (Billion Btus)	1% of Net Imports (Billion Btus)	Equivalent Amount	Units	Market Value ($Million)
Natural gas	190,399	1,904	1,851,420	MCF	$12.8
Electricity	109,472	1,095	320,750	MWh	$20.1
CHANGE IN NET EXPORTS					
Fuel	2007 Net Exports (Billion Btus)	1% of Net Exports (Billion Btus)	Equivalent Amount	Units	Market Value ($Million)
Coal	364,609	3,646	136,227	Tons	$6.8
Thermal conversion factors: 1 cubic foot natural gas = 1,028.4 Btus; 1 kWh electricity = 3,413 Btus; 1 lb coal = 12,867.4 Btus					

[15] EIA, State Energy Data System. Energy Consumption Estimates by Source, Virginia, http://www.eia.doe.gov/emeu/states/hf.jsp?incfile=sep_use/total/use_tot_va.html&mstate=VIRGINIA

Energy Consumption and Production Forecasts

- Future energy use depends on population growth, personal income and economic activity, use of transportation, development of new products, and implementation of energy efficiency and conservation practices.
- Virginia's energy consumption is expected to grow at its historic long-term rate of about 1.5 percent per year.
- Virginia will need to grow its energy supply by 14.6 percent (397.8 trillion Btus) to meet the growing energy demand through 2020.

Table 1-3: Energy Production and Consumption Forecasts for Virginia (Trillion Btus) [16]

Year	Consumption	Growth	Primary Production	Growth	Gap/Imports	Growth
1995	2144.3		1355.5		788.8	
1996	2207.8	2.9%	1415.7	4.3%	792.1	0.4%
1997	2213.1	0.2%	1425.1	0.7%	788	-0.5%
1998	2242.6	1.3%	1374.5	-3.7%	868.1	9.2%
1999	2296.5	2.3%	1346	-2.1%	950.5	8.7%
2000	2384.7	3.7%	1353.9	0.6%	1030.8	7.8%
2001	2317.5	-2.9%	1300.1	-4.1%	1017.4	-1.3%
2002	2341.8	1.0%	1235.7	-5.2%	1106.1	8.0%
2003	2422.7	3.3%	1339.7	7.8%	1083	-2.1%
2004	2547.3	4.9%	1311.8	-2.1%	1235.5	12.3%
2005	2605.2	2.2%	1221.8	-7.4%	1383.4	10.7%
2006	2546.3	-2.3%	1279.9	4.5%	1266.4	-9.2%
2007	2610.9	2.5%	1173.1	-9.1%	1437.8	11.9%
2008	2650.68	1.5%	1147.9	-2.2%	1502.78	4.3%
2009	2690.46	1.5%	1122.7	-2.2%	1567.76	4.1%
2010	2730.24	1.5%	1122	-0.1%	1608.24	2.5%
2011	2770.02	1.4%	1122	0.0%	1648.02	2.4%
2012	2809.8	1.4%	1122	0.0%	1687.8	2.4%
2013	2849.58	1.4%	1122	0.0%	1727.58	2.3%
2014	2889.36	1.4%	1122	0.0%	1767.36	2.3%
2015	2929.14	1.4%	1122	0.0%	1807.14	2.2%
2016	2968.92	1.3%	1122	0.0%	1846.92	2.2%
2017	3008.7	1.3%	1122	0.0%	1886.7	2.1%
2018	3048.48	1.3%	1122	0.0%	1926.48	2.1%
2019	3088.26	1.3%	1122	0.0%	1966.26	2.0%
2020	3128.04	1.3%	1122	0.0%	2006.04	2.0%

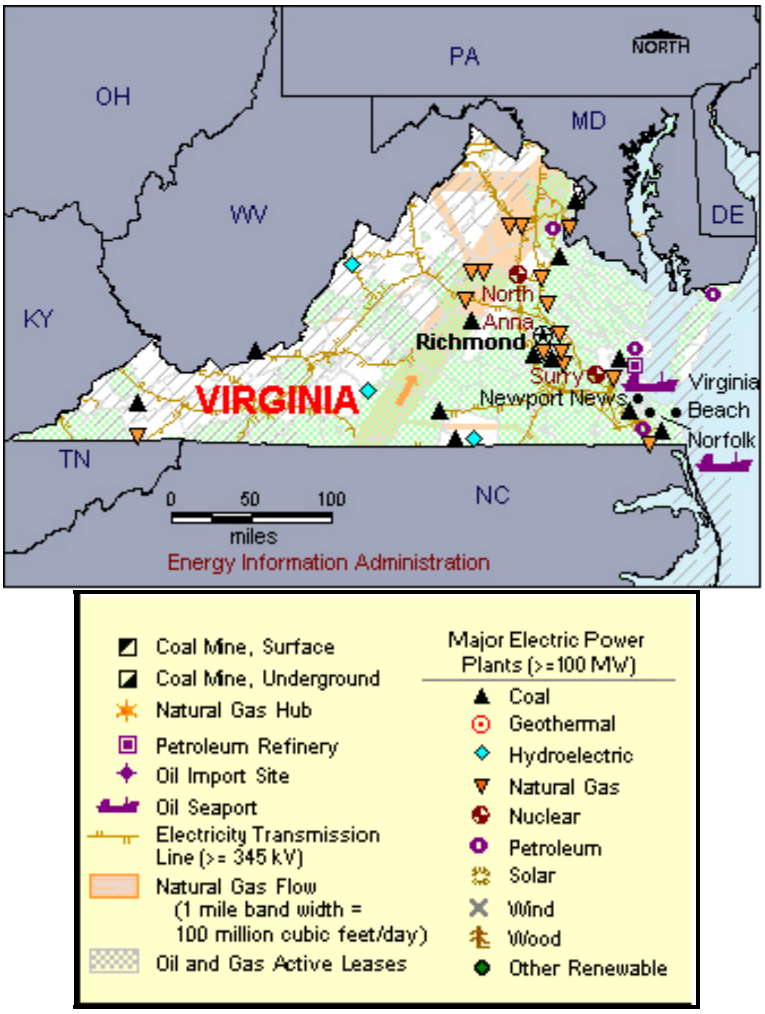
[16] EIA, State Energy Data System, Virginia, http://www.eia.doe.gov/emeu/states/state.html?q_state_a=va&q_state=VIRGINIA

Energy Infrastructure

A robust infrastructure is needed to deliver affordable, reliable energy supplies to energy users. Virginia's energy infrastructure (see Figure 4-1) includes facilities required for:

- Electricity generation, transmission, and distribution;
- Natural gas production, transmission, and storage;
- Petroleum production, refining, transportation, and distribution;
- Coal mining, transportation, and export;
- Propane production, transportation, and distribution; and
- Wood/biomass production and transportation.

Figure 1-10: Virginia's Energy Infrastructure[17]



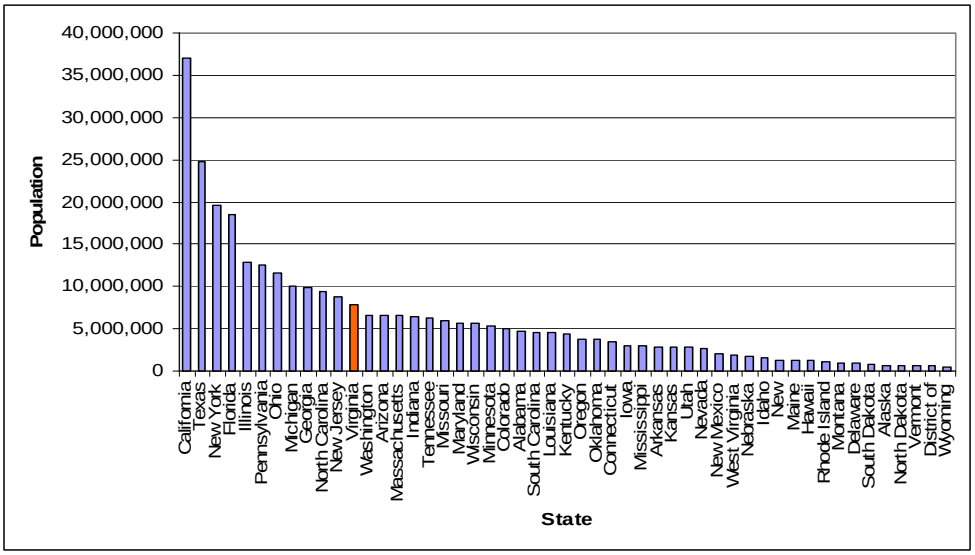
[17] EIA, State Energy Profile, Virginia, http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=VA

State Rankings

As shown in the following comparisons of states, the Commonwealth has an economy that ranks among the top tier of states, while using energy more efficiently than the majority of states.

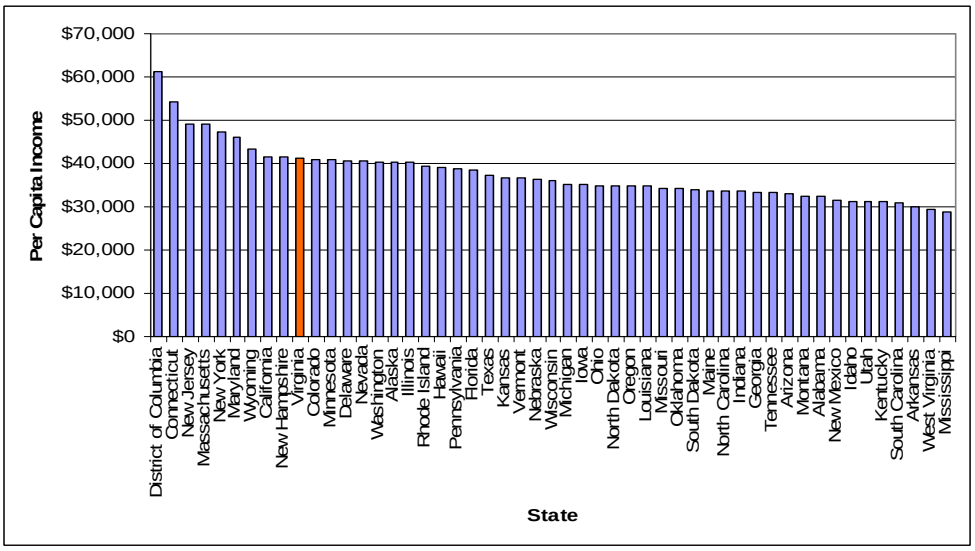
- In 2009, Virginia was home to 7.8 million people, the 12th largest of the states.[18]

Figure 1-11: State Rankings – Population, 2009



- In 2007, Virginia's per capita personal income was $41,347, the 9th highest of the states (not including the District of Columbia), 107 percent of the national median income.

Figure 1-12: State Rankings – Per Capita Income, 2007[19]

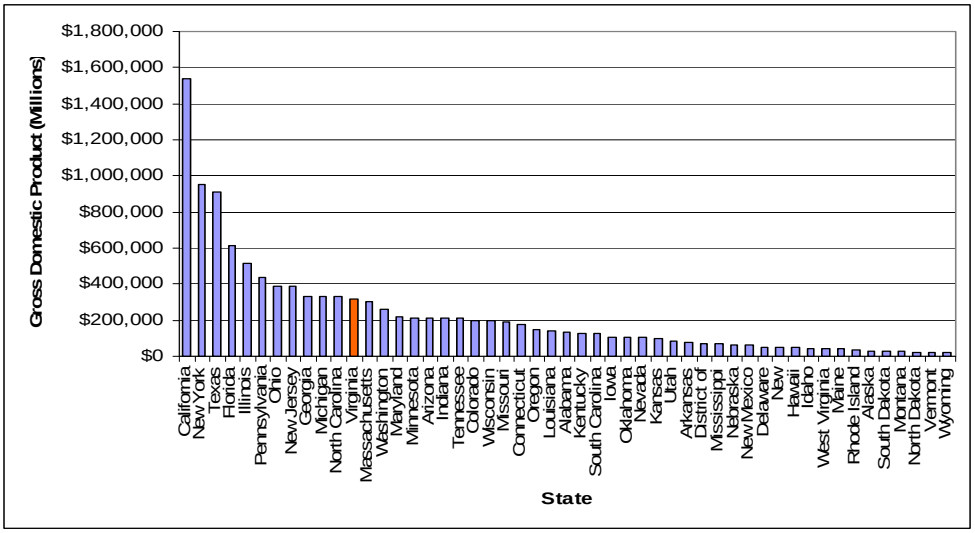


[18] U.S. Census Bureau, Annual Estimates of the Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2009, http://www.census.gov/popest/states/tables/NST-EST2009-01.xls, June 16, 2010

[19] Bureau of Economic Analysis, State Personal Income, 2007, http://www.bea.gov/newsreleases/regional/spi/2008/pdf/spi0308.pdf, June 16, 2010

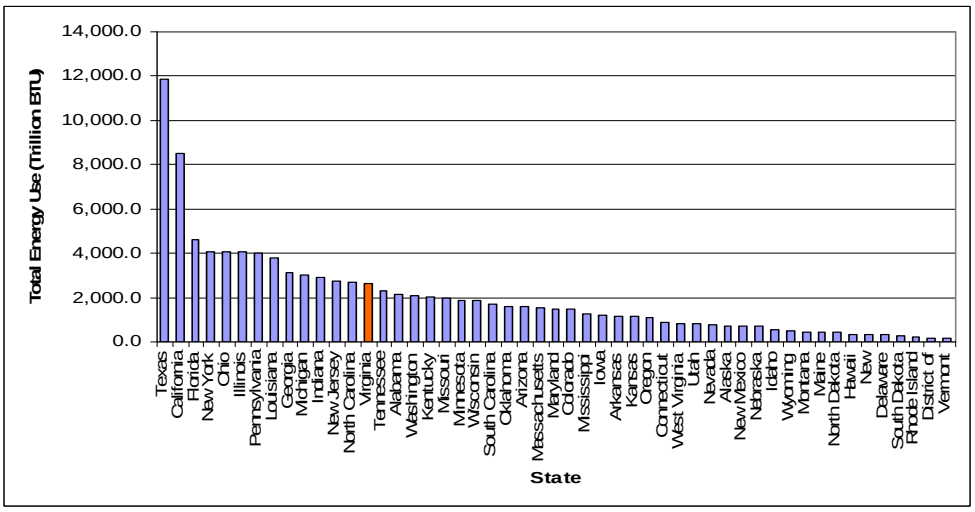
- In 2007, Virginia's gross domestic product (GDP) was $320 billion, 12th among the states, 143 percent of the average state GDP.

Figure 1-13: State Rankings – Gross Domestic Product, 2007[20]



- In 2007, Virginia ranked 14th in total energy consumption, using 2,611 trillion Btu's of energy, 131 percent of the average state's energy consumption.

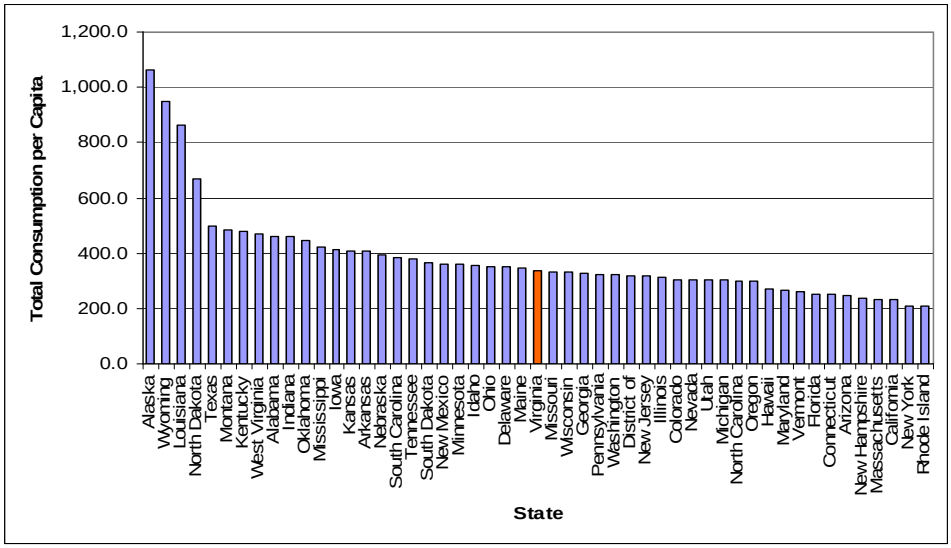
Figure 1-14: State Rankings - Total Energy Consumption, 2007[21]



[20] http://www.bea.gov/scb/pdf/2009/06%20June/0609_gdp_state.pdf, June 16, 2010
[21] EIA, Total Energy Consumption by Sector, Ranked by State, 2007, http://www.eia.doe.gov/emeu/states/sep_sum/html/pdf/rank_use.pdf

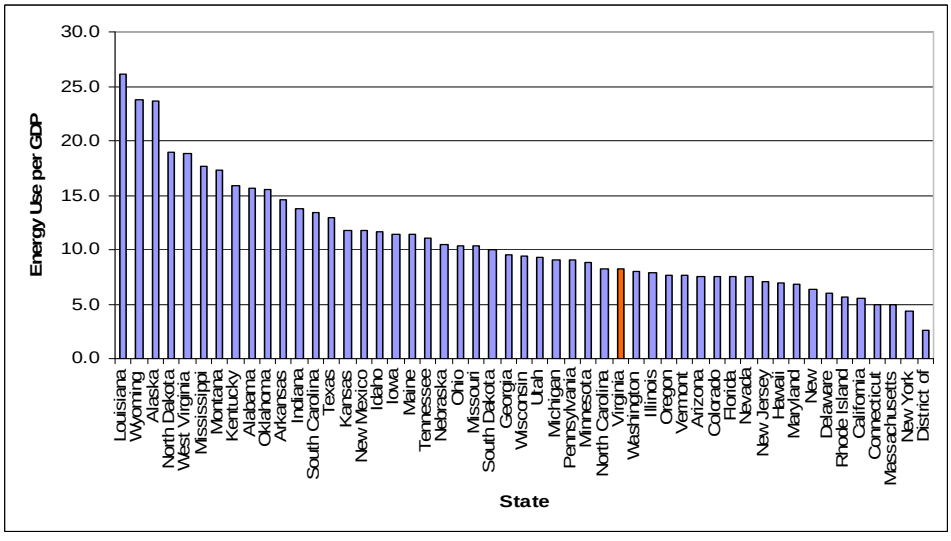
- In 2007, Virginia ranked 26th in energy use per capita among the states, using 339 million Btu's per person, 100.7 percent of the national average.

Figure 1-15: State Rankings - Energy Use Per Capita, 2007[22]



- In 2007, Virginia ranked 31st (tied with North Carolina) in energy use per gross domestic product, using 8,200 Btus per dollar of GDP, 92 percent of the national amount of energy per GDP.

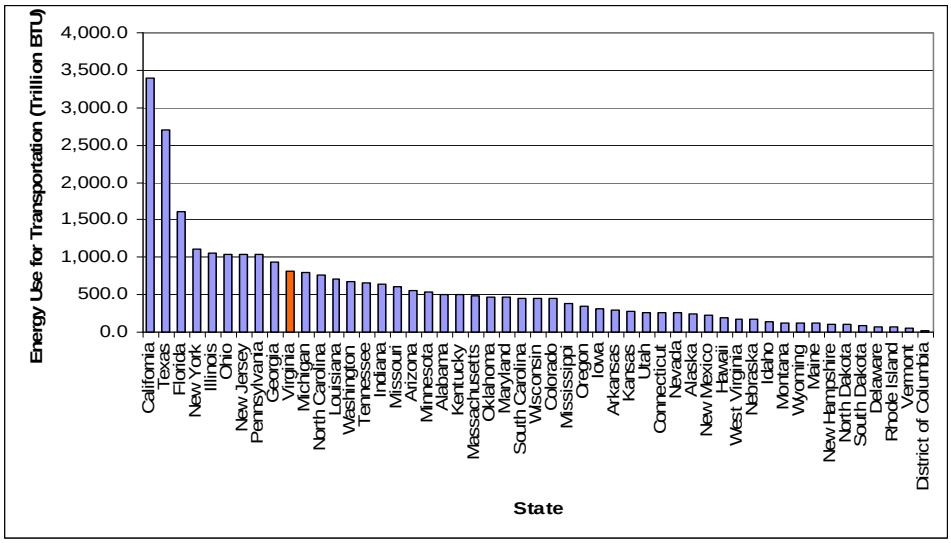
Figure 1-16: State Rankings - Energy Use Per Gross Domestic Product (GDP), 2007[23]



[22] http://www.eia.doe.gov/emeu/states/sep_sum/plain_html/rank_use_per_cap.html, June 16, 2010
[23] http://www.eia.doe.gov/emeu/states/_seds.html, Data: http://www.eia.doe.gov/emeu/states/sep_sum/html/pdf/rank_use_gdp.pdf, June 16, 2010

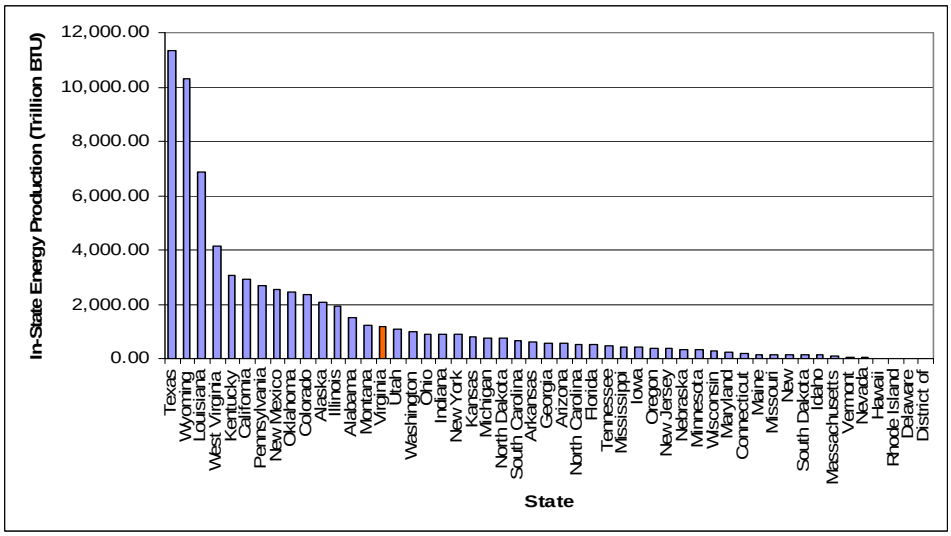
- In 2007, Virginians used more energy for transportation than in any other sector, ranking 10th among the states in total energy used for transportation. Virginia ranks 28th in vehicle mile per capita, at 96 percent of the national average. Transportation energy use has risen at a greater rate than energy use in other sectors.

Figure 1-17: State Rankings – Energy Use for Transportation, 2007[24]



- In 2007, Virginia produced more energy than most states, ranking 15th among the states.

Figure 1-18: State Rankings – In-State Energy Production[25]



[24] http://www.eia.doe.gov/emeu/states/sep_sum/html/pdf/rank_use.pdf, June 16, 2010
[25] http://tonto.eia.doe.gov/state/state_energy_rankings.cfm?keyid=89&orderid=1, June 16, 2010