

State energy factsheet: Virginia

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This report provides a fact-based overview of Virginia's power sector. It presents key metrics, highlights recent trends and discusses the state's progress toward compliance with EPA's Clean Power Plan.

Findings

- Virginia (VA) imports the second-most electricity in the nation on a percentage basis (it consumed 43% more than it produced in 2013).¹ Retail electricity prices are below the US average, and VA maintains a relatively clean generation profile (0.41tCO₂/MWh in 2013).
- The state's power mix is changing: since 2008, gas-fired generation increased its share at the expense of coal – a phenomenon driven by falling gas prices and newly built gas capacity – and nuclear solidified its place as the state's primary generation source.
- Renewables lack clear state policy support and accounted for less than 5% of generation in 2013, nearly all from hydropower and biomass (including biogas and waste-to-energy). Our analysis, based on detailed and realistic inputs, suggests that several renewable energy technologies are or very soon will be economically viable in VA.
- VA currently ranks near the bottom of the list in terms of its overall energy efficiency efforts; state utilities spend small fractions of electricity revenues towards achieving *voluntary* state efficiency goals. But it has the potential to achieve substantial energy savings.
- Under the Clean Power Plan (CPP), states can demonstrate compliance by meeting either a rate- or a mass-based goal. VA is already about halfway to achieving compliance with its mass-based goal.

Table 1: Key power system metrics, Virginia versus US average, 2013

Metric	Units	Virginia	US average	Comment	Rank
Total retail electricity sales	TWh	110	72	Above average electricity demand	10
Total generation	TWh	77	80	Roughly average in-state generation	20
Retail electricity sales per capita	MWh	13.3	11.6	Above average on a per capita basis	23
Retail electricity prices	¢/kWh	9.0	10.1	Below average electricity prices	32
Generation from gas	%	29	28	Above average reliance on gas for electricity	18
Generation from gas and renewables	%	34	41	Below average on gas and renewables	25
Energy efficiency score	ACEEE index	12.5	19.2	Below average on efficiency efforts	16
Utility energy efficiency budget	% state revenue	0.01	1.13	Essentially no utility efficiency budget	49
CO ₂ emissions rate	tCO ₂ /MWh	0.41	0.52	Relatively clean generation profile	38
2030 CPP CO ₂ emissions reductions-mass goal	% cut from 2012	23	23	Roughly average 'ask' for CPP mass reduction goal	34

Source: Bloomberg New Energy Finance, EIA, US Census Bureau, ACEEE Notes: US ranks are in descending order (ie, 1 being highest, 50 being lowest). For some metrics it is 'good' to have a high ranking (eg, generation from renewables, energy efficiency score); for other metrics it is 'good' to have a low ranking (eg, retail electricity prices, CO₂ emissions rate).

1 These imports come in part from the 1.6GW Mount Storm coal-fired power station in neighboring West Virginia.

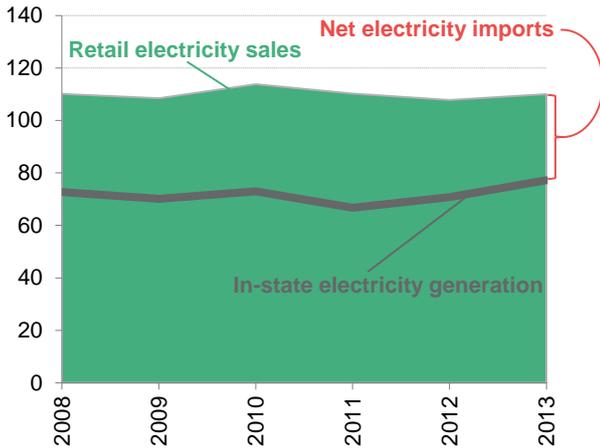
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1. BIRD'S EYE VIEW OF VIRGINIA'S POWER SECTOR

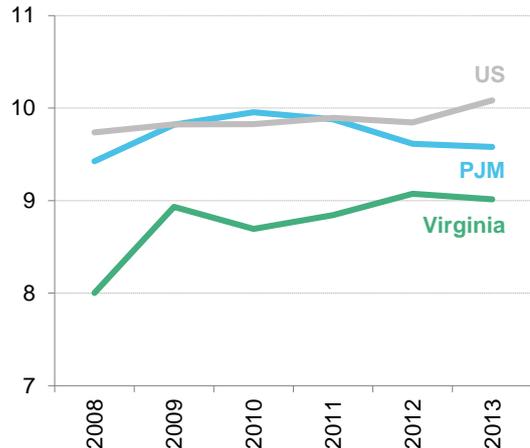
Virginia (VA) ranks 10th in total electricity consumption (110TWh in 2013) and 20th in total electricity generation (77TWh in 2013), making it one of the nation's biggest electricity importers. But VA is closing its domestic generation gap: between 2008 and 2013, retail electricity sales declined at a compound annual growth rate (CAGR) of -0.2% while in-state generation grew at 1.2% (Figure 1).

Figure 1: VA electricity sales and generation, 2008-13 (TWh)



Source: Bloomberg New Energy Finance, EIA

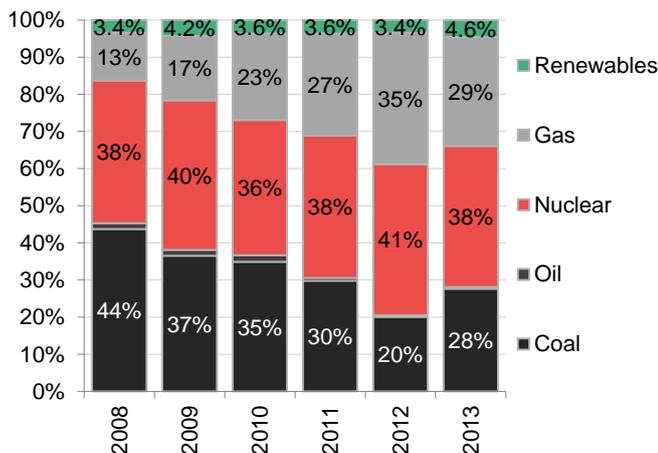
Figure 2: VA electricity prices relative to regional (PJM) and US averages, 2008-13 (¢/kWh)



Source: Bloomberg New Energy Finance, EIA Notes: PJM is VA's wholesale power market, composed of 13 neighbouring states.

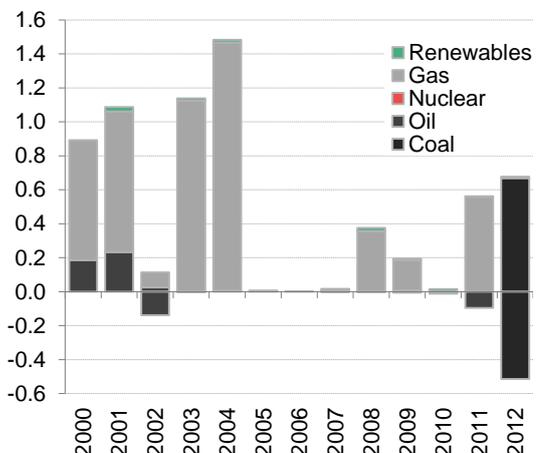
The retail price of electricity in VA was 9¢/kWh in 2013, 13% higher than in 2008, yet still below regional and US averages (Figure 2). Nuclear continues to provide baseload power for VA but there have been changes in its fossil mix with natural gas increasing share at the expense of coal. Gas-fired plants provided 29% of electricity in 2013 – up from just 13% in 2008 (though down from the 2012 record, when 35% came from gas). Meanwhile, generation from renewables – mainly biogas, biomass and waste-to-energy – grew from 3.4% to 4.6% over that period (Figure 3).

Figure 3: VA electricity generation mix by technology (%)



Source: Bloomberg New Energy Finance, EIA

Figure 4: VA utility-scale capacity additions (build, above x-axis) and retirements (below x-axis), 2000-12 (GW)



Source: Bloomberg New Energy Finance, EIA Note: Build is almost entirely gas; new renewable build is too small to be seen clearly in chart.

Natural gas has been the fuel of choice for building new power plants in VA, accounting for 81% of capacity additions since 2000. VA may have built its last coal plant ever in 2012, with the commissioning of the 585MW Virginia City Hybrid Energy Center – a coal plant that burns up to 20% biomass (EPA’s New Source Performance Standards all but prevent new coal build) (Figure 4).

2. SUSTAINABLE ENERGY DEPLOYMENT

2.1. Natural gas

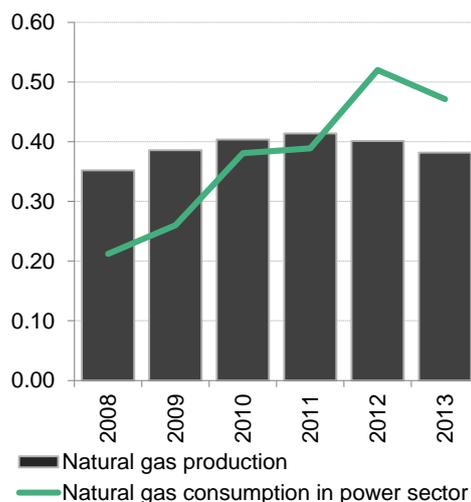
While VA’s natural gas production steadied over the last five years, the amount of gas burned for power generation grew sharply – at a CAGR of 17.3% from 2008-13 – and eclipsed total in-state production for the first time in 2012 (Figure 5). Increased natural gas production flowing out of the Northeast (specifically, the Appalachian Basin) has driven gas prices down nationwide, but especially in VA (which is linked to the ‘App Basin’ through a major pipeline), improving the economics of the state’s gas-fired power plants (Figure 6). Gas-fired generation eclipsed coal-fired generation for the first time in 2012, and then repeated the feat in 2013.

Table 2: VA policies relevant to sustainable energy sectors

Renewables
Voluntary renewable energy portfolio goal
Sets a voluntary goal for investor-owned utilities (IOUs) to procure 15% of base year (2007) retail electricity sales by 2025 from eligible renewable technologies
Net metering
Net excess generation from non-residential (<500kW) and residential (<20kW) eligible renewable systems is credited to customer’s next bill at retail rate
Energy efficiency
Voluntary energy efficiency resource goal
Calls for 10% electricity savings by 2020 relative to 2006 base retail sales
Various state financial incentives for energy efficiency
Loan programs for energy efficiency projects in state facilities; other personal and property tax incentives

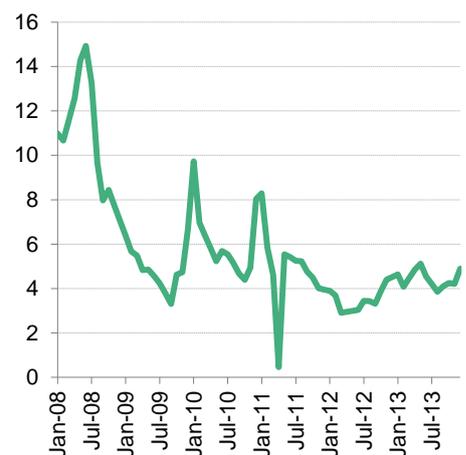
Source: Bloomberg New Energy Finance, ACEEE, DSIRE

Figure 5: VA natural gas production and power sector consumption, 2008-13 (Bcfd)



Source: Bloomberg New Energy Finance, EIA

Figure 6: VA natural gas price for electric power consumers, 2008-13 (\$/MMBtu)



Source: Bloomberg New Energy Finance, EIA

Virginia’s renewable energy and energy efficiency goals are voluntary

2.2. Renewables

VA has a *voluntary* renewable portfolio goal of procuring 15% of base year (2007) electricity sales from renewables by 2025. In 2013, however, renewables provided less than 5% of electricity generation, and nearly all of this came from biomass (including biogas and waste) and hydropower facilities. Between 2008 and 2012, VA built 54MW of utility-scale renewable capacity (2MW of hydro and 52MW of biomass) (Figure 7), bringing cumulative installed utility-scale renewable capacity to 4.7GW in 2012 (Figure 8).

Virginia has very little utility-scale wind or solar capacity

Figure 7: VA utility-scale renewable capacity additions, 2008-12 (MW)

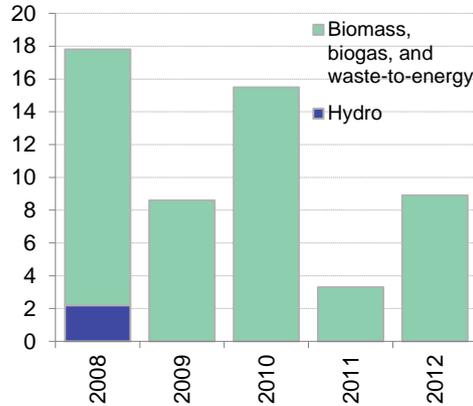
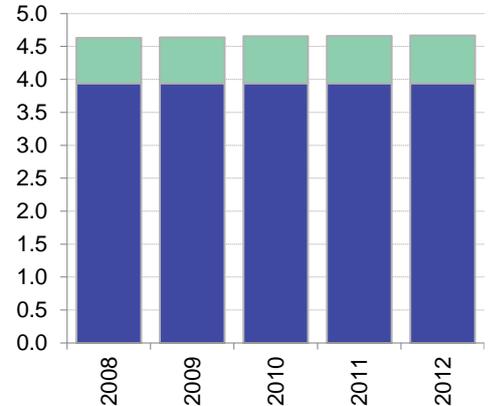
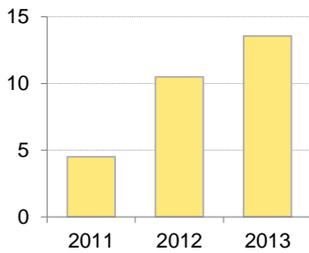


Figure 8: VA cumulative utility-scale renewable capacity, 2008-12 (GW)



Source: Bloomberg New Energy Finance, EIA Note: There exist a few utility-scale renewable energy installations not captured by the EIA (and thus not shown here), but the capacity of these is very small.

Figure 9: VA cumulative installed small-scale solar capacity, 2011-13 (MW)



Source: Bloomberg New Energy Finance, IREC, Virginia SCC
Note: Includes grid-connected PV installations only

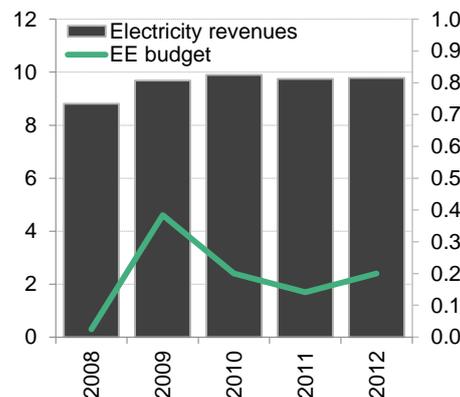
An estimated 13.6MW of residential and commercial-scale solar capacity was installed in VA through 2013 (not visible in Figure 7 and Figure 8, but shown in Figure 9). The state has no utility-scale wind installations, but it houses six manufacturing facilities that produce components for the wind industry, and various entities have been exploring opportunities for offshore wind.

2.3. Energy efficiency

VA ranks near the bottom of the list (36th) in terms of its overall energy efficiency efforts, according to a scoring system devised by the American Council for an Energy Efficient Economy (ACEEE), which gave the state a relatively low overall efficiency score (12.5 out of 50) and its lowest score (0 out of 20) for utility and public benefits programs and policies (a component of ACEEE's overall score). Figure 10 shows VA's annual utility electricity revenues (black bars, left axis, \$bn) and utility energy efficiency program spending (green line, right axis, \$m) from 2008 to 2012 while Figure 11 shows how VA stacks up to its neighbours on the latter metric. For reference, utilities in New Jersey (NJ) and Maryland (MD) – states that operate in the same wholesale power market as VA – dedicated 3.9% and 2.9% of state-wide electric revenues to efficiency programs, compared with 0.01% for utilities in VA in 2013.

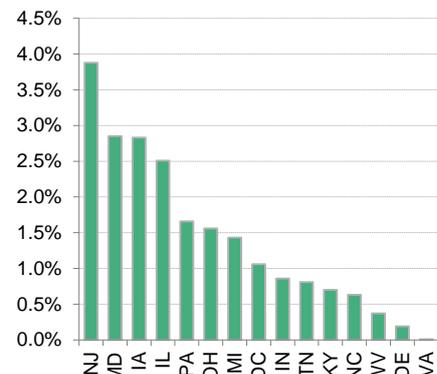
State utilities spend near-zero percentages of electricity revenues on energy efficiency programs

Figure 10: VA utility electricity revenues (left axis, \$bn) and utility electric program spending (right axis, \$m), 2008-12



Source: ACEEE

Figure 11: States' utility electric program spending as a fraction of state-wide electricity revenue, 2013 (%)



Source: ACEEE

3. CLEAN POWER PLAN

The US Environmental Protection Agency (EPA) released the Clean Power Plan (CPP), its landmark power sector regulation, on August 3. Under the final CPP, Virginia must reduce the carbon emissions rate of its power sector to 0.42tCO₂/MWh in 2030, a 32% cut from the 2012 baseline of 0.62tCO₂/MWh. This is a looser target than what the state had faced under the proposed plan released last year, which had set a 2030 emission rate of 0.37tCO₂/MWh. Virginia also must meet an interim emission rate goal of 0.47tCO₂/MWh, on average over the period 2022-2029.

In addition to the emission rate targets, the final CPP provides a set of mass-based targets (which states may choose to use for compliance instead of the rate targets) for states that wish to pursue mass-based compliance routes. Virginia's 2030 mass goal is 24.9MtCO₂, a 23% reduction from the 2012 baseline of 32.4MtCO₂.

Given the state's current and pending emission reduction activities, Virginia will have an easier time meeting its mass-based goal than the rate-based target. Current and pending retirements from its fossil fleet will put Virginia halfway down the path to achieving its 2030 mass target. Under a rate goal, however, Virginia still has a long way to go—its current and pending retirements and renewables build only takes it 18% of the way towards its 2030 rate goal.

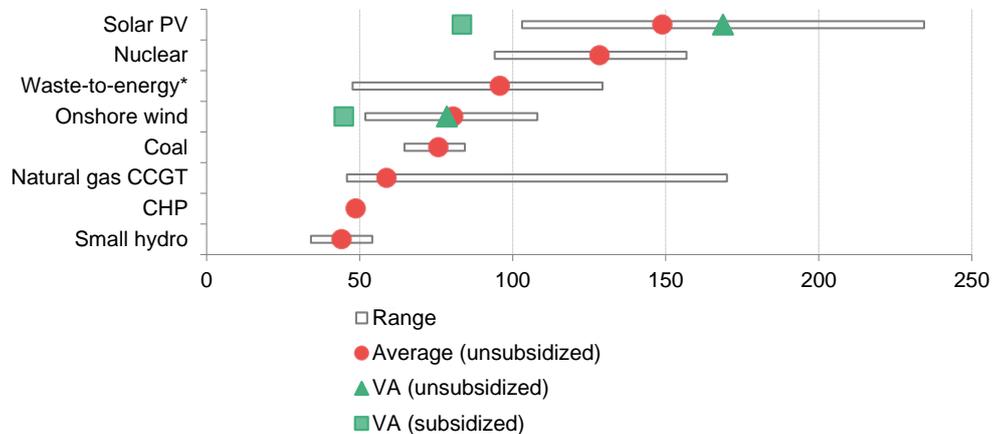
4. OPPORTUNITIES

The Bloomberg New Energy Finance levelised cost of electricity (LCOE) analysis compares the cost of producing electricity from different technologies in the US (Figure 12). The long thin rectangles show the range of unsubsidized LCOEs for these technologies in the US. The red circles show US or global average LCOEs (prior to the inclusion of policy – ie, unsubsidized); the green triangles and squares show subsidized and unsubsidized Virginia-specific LCOEs, respectively, for onshore wind and solar PV. (These are the two technologies for which Bloomberg New Energy Finance already has detailed, state-specific inputs.)

Virginia is already halfway toward meeting its 2030 mass-based goals under the CPP.

Several clean energy technologies are already, or on the verge of being, economically viable in Virginia

Figure 12: Unsubsidized levelised cost of electricity (LCOE) of select technologies in the US*, and subsidized and unsubsidized LCOE of onshore wind and solar PV in VA, H2 2014 (\$/MWh)



Source: Bloomberg New Energy Finance Notes: *LCOE for waste-to-energy in this report is a global estimate, as opposed to all other LCOEs in Figure 12, which are either US or VA-specific. Variations in VA versus US average result from variations in capacity factor, capex and financing rates. Bars indicate the range of unsubsidized LCOE for each technology in the US. Key policies such as the \$23/MWh Production Tax Credit (PTC) and accelerated depreciated (MACRS) bring down unsubsidized LCOEs to subsidized levels. LCOE for combined heat and power (CHP) is for reciprocating engines with CHP. LCOE for small hydro assumes 60% capacity factor, but this can vary significantly depending on annual rainfall conditions.

Renewables

- The LCOE analysis indicates that, in VA, several clean energy technologies are already, or are on the verge of being, economically viable without incentives (unsubsidized LCOE close to or below CCGT): namely, small hydro, combined heat and power (CHP) and onshore wind. Based on LCOE, solar PV (subsidized) is cheaper than nuclear in VA, and so is waste-to-energy.
- Given that VA is one of the three largest waste-importing states in the nation there is considerable room for growth in the waste-to-energy sector.

Natural gas

- The LCOE analysis also highlights the economic merit of natural gas CCGT – especially if proposed new natural gas pipeline capacity materializes, which would increase southward flowing natural gas from the Appalachian Basin. The state benefits from its proximity to the Williams’ Transcontinental (Transco) system, a major gas pipeline and key source of future takeaway capacity from Northeast natural gas producers in the Appalachian Basin.

Energy efficiency

- Energy efficiency represents an obvious area of opportunity for Virginia (and an area in which the state has room for improvement). ACEEE places VA’s energy efficiency savings potential at 23% cumulative energy savings in 2030 relative to 2012 consumption. That’s equivalent to avoiding 25TWh of generation in 2030.

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