TESTIMONY OF CHRISTINE L. TEZAK
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BEFORE THE
U.S. HOUSE OF REPRESENTATIVES
SELECT COMMITTEE ON THE CLIMATE CRISIS

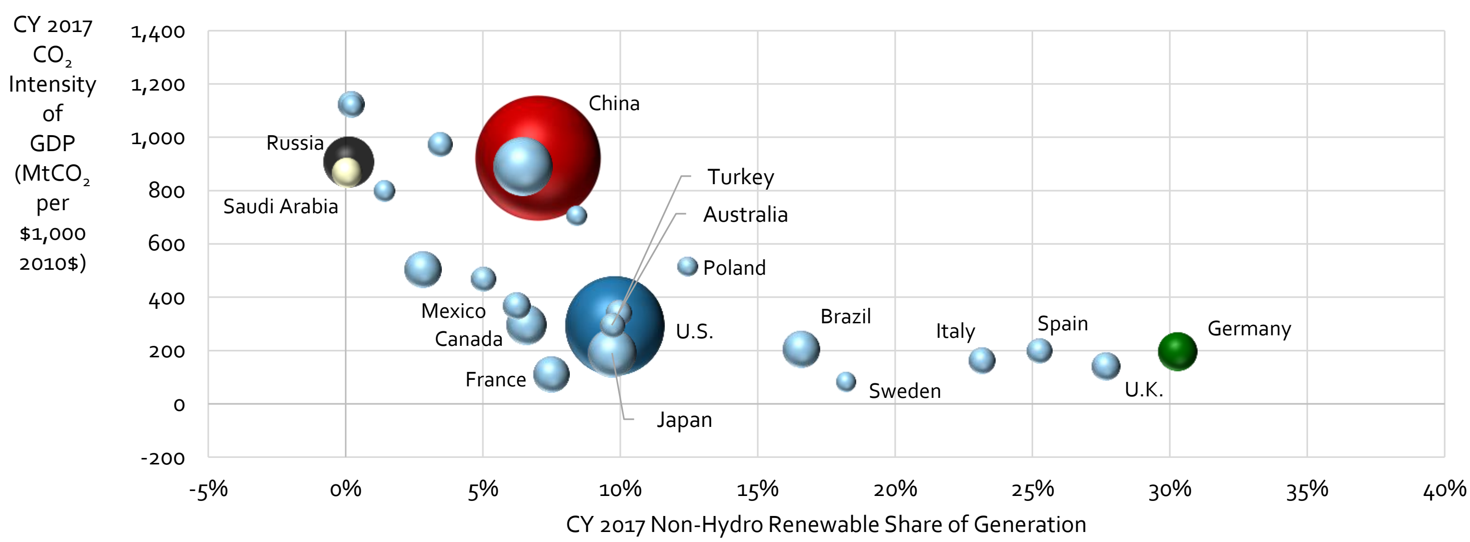
Good morning, Chairman Castor, Ranking Member Graves and distinguished Members of this Committee. My name is Christine Tezak, and I lead the power, pipelines and environmental policy practice at ClearView Energy Partners, LLC. ClearView is an independent research firm here in Washington, D.C. that serves institutional investors and corporate strategists. Thank you for inviting me today to contribute to your important discussion regarding the growth of renewables in the U.S. power portfolio. I am grateful for your diligent deliberation of climate issues on behalf of the nation's citizens, corporations and stakeholders.

My testimony today makes three points, which I will detail in the paragraphs that follow. First, the nation's electric generation fleet has seen a significant drop in its emissions intensity since 2005 as new generation resources entered and older units retired. Second, renewable energy resources are growing quickly, if unevenly, throughout the U.S., thanks in large part to state initiatives. Third, I discuss how the highly flexible operating characteristics of natural gas plants have complemented renewables' growth by playing a balancing role. Specifically, they have done so by ramping up and down to accommodate the variation in renewable resource production, whether hourly, seasonally or annually. Finally, I offer a few thoughts on natural gas' potential to economically facilitate the shift to a lower-emitting national power portfolio.

The U.S. Energy Information Administration explains that U.S. electric power sector carbon dioxide emissions (CO_2) declined 28% since 2005 because of slower electricity demand growth and changes in the mix of fuels used to generate electricity. In 2017, EIA calculated that CO_2 emissions from the electric power sector totaled 1,744 million metric tons (MM $MtCO_2$) in 2017, the lowest level since 1987. In 2018, they rose slightly to 1,762 MM $MtCO_2$.

In CY 2017, the world's ten cleanest power mixes accounted for 9.5% of power generation and averaged 84.3% emissions-free on a generation-weighted basis. On the same basis, however, they averaged 25.6% nuclear-powered and 48.1% hydro powered, and only 10.6% non-hydro renewable powered (the U.S. was 10.1% in CY 2018, according to our Firm's analysis of EIA data). In other words, most of the "green" power is blue. We're not all fortunate enough to have volcanoes and glaciers, so many nations – including the United States – find themselves installing the renewables that nature didn't provide.

Figure 1 – Carbon Intensity per unit of GDP vs. Non-Hydro Renewable Share (G20 countries)



Source: ClearView Energy Partners, LLC, using data from BP's 2018 Statistical Review of World Energy; *bubble size reflects global share of power generation*

Mid-Century "Max-Outs"

Under the *Federal Power Act*, states have the authority over electric generation adequacy within their borders. This means that siting and fuel mix decisions are under state authority. The federal Environmental Protection Agency (EPA) sets emissions standards for plants of different fuel types and all plants are required to meet them. Emissions standards have been put in place since the 1970s. EPA plans to finalize its *Affordable Clean Energy* program to address power sector greenhouse gas (GHG) emissions this month.

Individual states, at their discretion, have established targets or mandates directing their utilities to procure renewable energy resources based on the percentage of energy delivered over the course of a year. These programs differ significantly, some states are very ambitious; others do not have any program in place at all. We summarize these programs below in Figure 2.

Figure 2 – State Power Generation Shares, Dynamics and Renewable Portfolio Standards

State	State Share of U.S. Coal Shut-Downs, CY 2012-18 (%) [1]	CY 2018 State Coal-Fired Power Share (%) [2]	CY 2018 State Gas-Fired Power Share (%) [2]	CY 2018 State NHR Power Share (%) [3]	CY 2018 State Non-Fossil Power Share (%) [4]	RPS Target Details [5]
AK	0.0%	10.5%	49.6%	2.9%	27.95%	
AL	5.7%	21.9%	40.5%	2.6%	37.48%	
AR	0.0%	44.7%	28.5%	2.5%	26.75%	
AZ	0.5%	27.4%	33.4%	5.3%	39.16%	15%/2025 *
CA	0.4%	0.1%	46.7%	29.6%	51.90%	60%/2030 ["state policy" of 100%/2045]
CO	1.1%	47.1%	30.0%	19.8%	22.73%	20% or 30%/2020
CT	0.3%	0.8%	50.6%	2.2%	46.43%	40%/2030
DC	0.0%	0.0%	28.8%	71.2%	71.17%	100%/2032
DE	0.5%	4.5%	86.5%	2.2%	2.19%	25%/2025-2026
FL	3.1%	12.3%	70.5%	3.1%	15.17%	
GA	4.6%	24.7%	41.1%	5.5%	33.75%	
HI	0.0%	13.1%	0.0%	13.8%	14.86%	100%/2045
IA	1.2%	44.5%	11.9%	34.2%	43.34%	105 MW
ID	0.0%	0.1%	18.0%	21.2%	81.50%	
IL	3.8%	31.8%	8.5%	7.1%	59.39%	25%/2025-2026 *
IN	6.1%	69.1%	22.6%	5.8%	6.06%	
KS	0.4%	38.6%	7.4%	36.5%	53.90%	
KY	5.2%	74.7%	18.4%	0.7%	6.65%	
LA	0.0%	11.6%	61.0%	2.7%	20.56%	
MA	2.4%	0.0%	67.2%	9.8%	28.04%	39.5%/2030 + 1%/Y
MD	0.8%	22.9%	31.7%	3.5%	44.05%	50%/2030
ME	0.0%	0.7%	19.7%	43.2%	74.68%	40%/2017 *
MI	3.1%	37.0%	26.3%	6.9%	34.00%	15%/2021
MN	0.7%	37.0%	14.5%	22.8%	47.79%	25%-26.5%/2025
MO	0.7%	72.9%	8.3%	3.9%	18.63%	15%/2021
MS	0.0%	8.3%	77.9%	2.8%	13.72%	
MT	0.3%	48.2%	1.7%	8.2%	47.29%	15%/2015
NC	3.9%	23.6%	32.9%	7.6%	42.72%	12.5%/2021
ND	0.3%	66.2%	1.6%	25.8%	31.82%	
NE	0.0%	62.9%	3.3%	14.4%	33.73%	
NH	0.0%	3.8%	17.0%	11.3%	77.89%	25.2%/2025
NJ	1.2%	1.6%	51.6%	3.0%	45.41%	50%/2030
NM	2.3%	41.1%	35.3%	23.0%	23.55%	100%/2050
NV	3.4%	6.2%	67.1%	21.8%	26.56%	50%/2030 [goal of 100%/2050]
NY	0.7%	0.5%	37.7%	5.3%	60.00%	50%/2030
OH	14.1%	47.1%	34.2%	2.1%	17.22%	12.5%/2026-2027 *
OK	0.7%	17.1%	48.1%	32.1%	34.72%	
OR	0.0%	2.3%	27.2%	13.8%	70.45%	50%/2040
PA	6.7%	20.5%	35.7%	2.8%	42.94%	18%/2021-2022
RI	0.0%	0.0%	93.3%	5.7%	5.80%	40%/2035
SC	2.2%	19.6%	22.1%	3.2%	57.98%	
SD	0.0%	21.0%	8.8%	24.5%	70.10%	
TN	4.9%	26.1%	16.0%	1.5%	57.72%	
TX	7.4%	23.5%	50.0%	17.0%	25.97%	10,000 MW/2025
UT	0.4%	65.0%	22.1%	9.0%	12.19%	
VA	2.8%	9.8%	52.8%	5.3%	36.10%	
VT	0.0%	0.0%	0.1%	40.6%	99.67%	75%/2032
WA	0.0%	4.6%	8.9%	7.8%	86.03%	100%/2045
WI	3.8%	49.5%	26.2%	5.2%	24.07%	10%/2015
WV	4.4%	92.3%	2.1%	2.6%	5.31%	
WY	0.1%	85.5%	2.0%	9.0%	11.43%	
US		**27.4%**	**35.1%**	**10.1%**	**36.24%**	

Note:

1 Based on EIA Form 860 retirement data. The EPA finalized its *Mercury and Air Toxics Standards* (MATS) rule in December 2011.

2 Based on EIA generation data.

3 Based on EIA generation data. Non-hydro renewables (NHR) includes wind, solar, geothermal and biomass generation

4 Based on EIA generation data. Reflects generation from fuels and technologies other than oil, natural gas, coal and petroleum.

5 Summary-level data; some RPS programs include complex subsets subject to different standards. Asterisks (*) denote RPS targets subject to change and under active consideration by state policymakers.

Source: ClearView Energy Partners, LLC, using sources noted above

The details of these state-led programs differ, both in scope and in stringency. Washington, D.C. and Hawaii have requirements for their utilities to deliver 100% renewable energy by 2032 and 2045, respectively. The state of Washington and New Mexico also have binding requirements, but these programs require 100% "zero carbon" generation by 2045 and 2050, respectively. California and Nevada have established non-binding goals to procure 100% of electric power needs from zero carbon resources by 2050.

Complex Market Dynamics and Operational Challenges

In many areas of the country, renewable energy growth has been modest, and it has not presented significant challenges to the regional transmission operators (RTOs) that manage multi-state markets. However, some markets are seeing significant operational impacts and growing queues of new projects seeking interconnection.

Figure 3 – RTO Generation Mixes

PJM	By GWh		Portfolio Share	
	2017	2018	2017	2018
Coal	256,614	239,612	31.75%	28.61%
Natural Gas	287,576	256,702	35.58%	30.65%
Nuclear	216,759	286,155	26.82%	34.16%
Solar	1,469	2,111	0.18%	0.25%
Wind	20,714	21,628	2.56%	2.58%
Hydro	14,868	19,416	1.84%	2.32%
Other	10,230	12,025	1.27%	1.44%
Battery Storage	25	14	0.00%	0.00%
Demand Response	63	49	0.01%	0.01%
Total	**808,230**	**837,648**		

MISO	By GWh		Portfolio Share	
	2017	2018	2017	2018
Coal	288,474	296,900	48.37%	46.84%
Natural Gas	142,674	168,928	23.92%	26.65%
Nuclear	96,051	99,015	16.10%	15.62%
Solar	N/A	N/A	N/A	N/A
Wind	50,718	50,249	8.50%	7.93%
Hydro	9,598	9,328	1.61%	1.47%
Other	8,901	9,411	1.49%	1.48%
Battery Storage	NA	NA	NA	NA
Demand Response	NA	NA	NA	NA
Total	**596,416**	**633,830**		

CAISO	By GWh		Portfolio Share	
	2017	2018	2017	2018
Coal	302	294	0.15%	0.15%
Natural Gas	89,588	90,691	43.41%	46.51%
Nuclear	17,925	18,268	8.69%	9.37%
Solar	24,359	27,266	11.80%	13.98%
Wind	12,867	14,244	6.23%	7.30%
Hydro	43,304	26,344	20.98%	13.51%
Other	18,034	17,901	8.74%	9.18%
Battery Storage	NA	NA	NA	NA
Demand Response	NA	NA	NA	NA
Total	**206,379**	**195,008**		

NYISO	By GWh		Portfolio Share	
	2017	2018	2017	2018
Coal	567	692	0.43%	0.51%
Natural Gas	50,832	55,120	38.75%	40.65%
Nuclear	42,175	43,003	32.15%	31.72%
Solar	47	49	0.04%	0.04%
Wind	4,219	3,985	3.22%	2.94%
Hydro	29,554	29,045	22.53%	21.42%
Other	3,788	3,691	2.89%	2.72%
Battery Storage	NA	NA	NA	NA
Demand Response	NA	NA	NA	NA
Total	**131,182**	**135,585**		

ISO-NE	By GWh		Portfolio Share	
	2017	2018	2017	2018
Coal	1,684	1,109	1.64%	1.07%
Natural Gas	49,198	50,511	47.98%	48.71%
Nuclear	31,538	31,385	30.76%	30.26%
Solar	880	1,212	0.86%	1.17%
Wind	3,280	3,367	3.20%	3.25%
Hydro	8,572	8,708	8.36%	8.40%
Other	7,382	7,410	7.20%	7.15%
Battery Storage	NA	NA	NA	NA
Demand Response	32	25	0.03%	0.02%
Total	**102,534**	**103,702**		

SPP	By GWh		Portfolio Share	
	2017	2018	2017	2018
Coal	120,658	116,939	45.30%	42.40%
Natural Gas	50,874	64,537	19.10%	23.40%
Nuclear	17,846	14,893	6.70%	5.40%
Solar	NA	552	NA	0.20%
Wind	58,864	64,813	22.10%	23.50%
Hydro	17,047	13,238	6.40%	4.80%
Other	533	83	0.20%	0.03%
Battery Storage	NA	NA	NA	NA
Demand Response	NA	NA	NA	NA
Total	**266,354**	**275,800**		

ERCOT	By GWh		Portfolio Share	
	2017	2018	2017	2018
Coal	115,141	93,249	32.13%	24.80%
Natural Gas	138,844	167,206	38.74%	44.47%
Nuclear	38,504	41,125	10.74%	10.94%
Solar	2,258	3,240	0.63%	0.86%
Wind	62,203	69,796	17.36%	18.56%
Hydro	856	811	0.24%	0.22%
Other	571	592	0.16%	0.16%
Storage	NA	NA	NA	NA
Demand Response	16	15	0.00%	0.00%
Total	**358,377**	**376,019**		

Source: ClearView Energy Partners LLC based on RTO Annual Reports for CY2017 and 2018

We offer two examples. California and the Southwest Power Pool. The first has a high penetration of solar, the latter, of wind. California has seen significant changes in its market, as both its behind-the-meter (a.k.a., distributed, or "rooftop") and utility-scale solar deployments have grown. Solar power production has contributed to a "duck curve" phenomenon,[1] where net load (demand) in this market falls in the middle of the day, only to ramp up strongly in the late afternoon and evening. This differs from the prior load curve, which reflected a ramp up in the morning, fairly stable daytime demand, an incremental evening ramp and then a tapering off as most folks retired for the evening. Solar has been making strong contributions to California's electricity needs over the last several years, meeting 14% of annual demand needs in 2018. Even though renewables contributed 26.6% of the gigawatt hours (GWh) needed to serve California over the course of last year, the provision of peak service still relies heavily on natural gas facilities (see Figure 4).

California's natural gas fleet is becoming smaller, in part through retirements associated with age and a state-level regulation governing once-through cooling systems. We expect natural gas facilities to continue to play a key role going forward in the California market, even as the Golden State closes in on its 60%/2030 RPS goal. Modest natural gas prices, efficient production and flexible response time remain key operational characteristics relied on by the grid operator. During its top 50 demand hours, California continues to rely heavily on in-state natural gas resources, even as renewable resources shoulder a larger share of demand at peak times, as Figure 4 illustrates.

Figure 4 – Annual v. Peak Hour Energy Supply in California 2011 - 2018

Source: ClearView Energy Partners, LLC, using California Independent System Operator Data

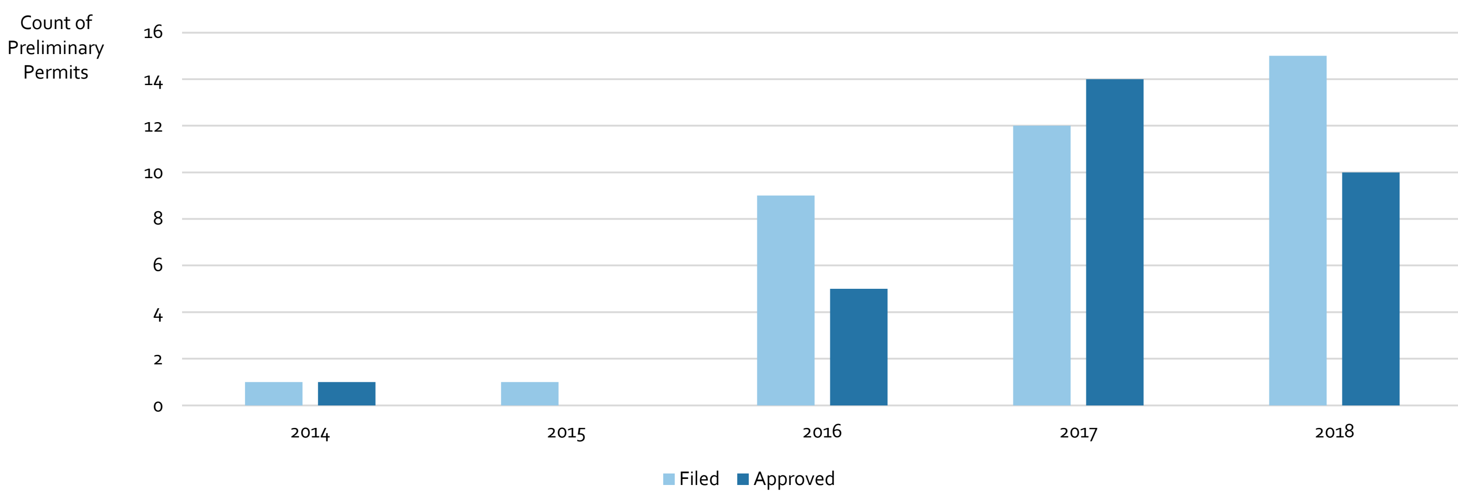
[1] For further information on the "duck curve," see https://www.nrel.gov/news/program/2018/10-years-duck-curve.html

Over time, we expect electric storage technologies – including batteries and pumped storage – to seek to fill the balancing role that natural gas currently plays in markets such as California. Natural gas sector participants also continue to explore carbon capture and sequestration or beneficial reuse technologies. Batteries offer great promise in terms of meeting predictable system shifts (such as the increase in demand in the morning and evenings (morning and evening ramp), as the four-hour duration of many batteries could complement this need well.

Six states have storage adoption targets in place, and the Federal Energy Regulatory Commission (FERC) and the regional wholesale market operators are implementing a 2018 rule to facilitate the participation of storage resources in the wholesale markets that it oversees. Nationally, battery costs remain high relative to the operating profile of installed and new natural gas units. Rare earth mining for the key elements of battery technologies has environmental consequences of its own. It is also an industry that currently relies on foreign supply chains and could be unsettled during periods of trade tensions.

Longer-duration storage (around eight hours) such as pumped hydro, has also been eying this balancing role. The FERC has seen an uptick in preliminary permit applications for pumped hydro storage projects. However, like other large-scale industrial efforts, stakeholders have concerns about potential adverse environmental consequences and local community impacts. Such projects also require significant upfront capital investment. While the new applications are promising, it's not yet clear how quickly new projects will come online given that they are all still in the preliminary permitting stage. Eleven preliminary applications, representing nearly 11 GW of installed capability, have been filed at FERC in calendar 2019.

Figure 5 – Pumped Hydropower Early Permitting Applications at the FERC



Source: ClearView Energy Partners LLC, using FERC data

Natural gas assets can also fill in long-term supply gaps such as supporting hydropower-dependent areas particularly in the event of multi-year drought. Many hydropower resources lack pumped storage capability and are dependent on winter precipitation to refill their reservoirs.

Wind energy growth has challenged system operators in the Midwest in a different way. For example, wind production meets an average of 25% of daily power needs in the Southwest Power Pool (SPP). Wind served 48% of load on the morning of December 20, 2018. Twenty-four hours later, wind's contribution at the same time of day had eased to 17% of load, and the difference was accommodated with a doubling of natural gas generation and a 60% increase in coal-fired dispatch. Minimum wind output over the last 12 months in the SPP territory clocks in at 148 MW (August 2018) compared to a high of 16.5 GW on May 19. The maximum one-hour ramp (increase) observed to date is 3.7 GW, and the largest swing in production was a drop of 14.8 GW over 18 hours).

SPP has a significant number of new wind projects in its queue. These high penetration regions illustrate that operational challenges are likely to remain as renewables expand their participation in the organized regional markets. Balancing significant changes to wind loads currently is met by dispatchable natural gas (and other resources, including coal) while other options are developed and become more affordable.

Considering Affordability

Last week, former New York City Mayor Michael Bloomberg announced a $500 MM commitment to advocate for the closure of the nation's remaining coal plants by 2030 and to work to prevent construction of new natural gas plants in an effort to address climate change on a shorter timeline envisioned by most existing state programs (and the judicially stayed *Clean Power Plan*).

We built a cursory estimate of hardware costs required to replace 1.15 TWh of electricity provided by coal facilities in 2018. This simplified *pro forma* estimate considered only power plant substitution (i.e., exclusive of financing, transmission interconnection, etc., but inclusive of storage capability for solar and wind). We also did not account for residual asset values assigned to retired fleet. Assuming equal-shares of wind, solar, and biomass, with storage to complement wind and solar (but not biomass) at 4Wh/W, our back-of-the-envelope estimate implies that plant facilities alone – at today's prices – could require as much as $941 B in capital expenditures.

Policymakers here at the federal level and in the states are cognizant of the impact higher electricity rates can have on consumers, whether individuals or businesses. In our analytical work, our Firm sometimes frames energy security in three dimensions: adequacy, attributes and affordability. Our experience is that affordability can be a real-world constraint when it comes to policy formulation. Put another way, focusing on attributes to the exclusion of affordability can undermine security. Natural gas may still have a key role to play as the nation deploys an increasing number of low-emitting resources in our portfolio.

Our annual *Energy Policy by the Numbers* report, due to be released this month, estimates state-level, average gasoline, home heating and electricity expenses as a percentage of *per capita* disposable personal income (DPI), a proprietary statistic we call "consumer energy leverage" (CEL). In preparing our CEL estimates, we rely on EIA's state-level, residential retail electricity rate data.

Applying those data to this discussion, we looked at the potential impact of increasing electricity rates through the addition of a $0.01/kilowatt hour (kWh) surcharge on our estimated average residential bill for each state. A surcharge of this sort might notionally be used to fund the replacement of existing generation assets such as the plan proposed by former Mayor Bloomberg. Our analysis shows that this uniform charge has disparate rate impacts (bill increases of 3-11%), given differences in the underlying cost of power in each state and differences in average consumption, as we illustrate in Figure 6. In other words, a uniform surcharge could exert disparate economic impacts on different regions.

Taking advantage of the geographic diversity here on this Committee, I also included data summarizing the resources and technologies that comprise the power generation mixes in each of your home states (Figures 7-17).

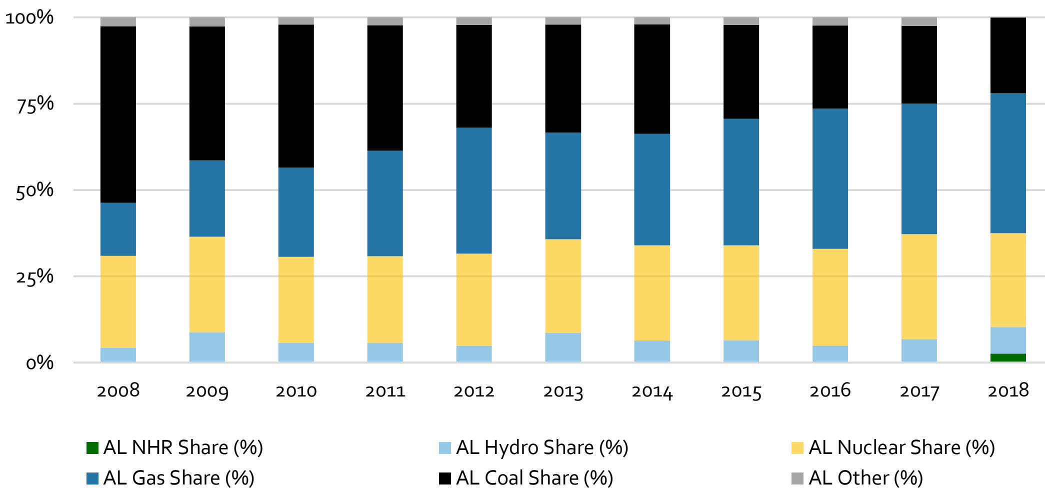
Madam Chair, this concludes my written testimony. I look forward to any questions you or your colleagues might have at the appropriate time. ▼

Figure 6 – Key Residential Rate Statistics 2018

State	Average Usage kWh/Mo	Average Rate/ kWh	Average Monthly Bill	Average Disposable Personal Income	Impact of $0.01/kWh charge on Electric Bill (Hypothetical)
AK	1,230	$0.22	$127	$54,951	4.52%
AL	1,144	$0.12	$151	$38,369	8.13%
AR	1,034	$0.10	$112	$38,540	10.21%
AZ	545	$0.13	$132	$39,345	7.83%
CA	693	$0.19	$102	$53,944	5.33%
CO	724	$0.12	$84	$49,801	8.26%
CT	787	$0.21	$154	$63,893	4.70%
DC	980	$0.13	$102	$70,045	7.74%
DE	1,104	$0.13	$125	$45,786	7.86%
FL	1,139	$0.12	$129	$44,609	8.59%
GA	518	$0.11	$129	$40,870	8.83%
HI	867	$0.32	$168	$48,905	3.08%
IA	942	$0.13	$110	$43,770	7.88%
ID	744	$0.10	$96	$38,826	9.78%
IL	993	$0.13	$94	$50,157	7.93%
IN	923	$0.12	$120	$41,915	8.29%
KS	1,156	$0.13	$121	$45,171	7.63%
KY	1,283	$0.10	$121	$37,441	9.53%
LA	607	$0.09	$120	$41,487	10.72%
MA	1,003	$0.22	$131	$59,681	4.63%
MD	551	$0.13	$134	$54,780	7.49%
ME	664	$0.16	$89	$43,291	6.20%
MI	774	$0.16	$103	$42,202	6.43%
MN	1,099	$0.13	$104	$48,858	7.46%
MO	1,237	$0.11	$121	$41,589	9.05%
MS	836	$0.11	$140	$34,949	8.81%
MT	1,117	$0.11	$94	$42,341	8.89%
NC	1,106	$0.11	$127	$40,779	8.83%
ND	1,005	$0.11	$117	$49,056	9.42%
NE	620	$0.11	$109	$46,879	9.21%
NH	690	$0.20	$122	$55,165	5.08%
NJ	640	$0.15	$107	$58,760	6.46%
NM	958	$0.13	$81	$37,655	7.88%
NV	603	$0.12	$115	$43,102	8.33%
NY	910	$0.18	$111	$58,256	5.41%
OH	1,133	$0.12	$113	$43,093	8.09%
OK	905	$0.10	$116	$42,011	9.74%
OR	863	$0.11	$99	$43,460	9.12%
PA	589	$0.14	$120	$49,042	7.16%
RI	1,162	$0.21	$122	$48,577	4.83%
SC	1,017	$0.12	$145	$38,487	8.03%
SD	1,280	$0.12	$119	$45,731	8.53%
TN	1,182	$0.11	$137	$43,218	9.33%
TX	739	$0.11	$135	$44,720	8.76%
UT	1,157	$0.11	$78	$40,291	9.52%
VA	560	$0.12	$137	$49,886	8.45%
VT	965	$0.18	$101	$48,206	5.55%
WA	686	$0.10	$93	$54,103	10.36%
WI	1,132	$0.14	$99	$44,953	6.91%
WV	831	$0.11	$128	$36,805	8.85%
WY	1,230	$0.11	$95	$54,657	8.74%
Range	**518-1,283**	**$0.09-0.32**	**$77-168**		**3.08-10.72%**
Median	**923**	**$0.12**	**$119**		**8.13%**
Average	**902**	**$0.14**	**$116**		**7.81%**

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

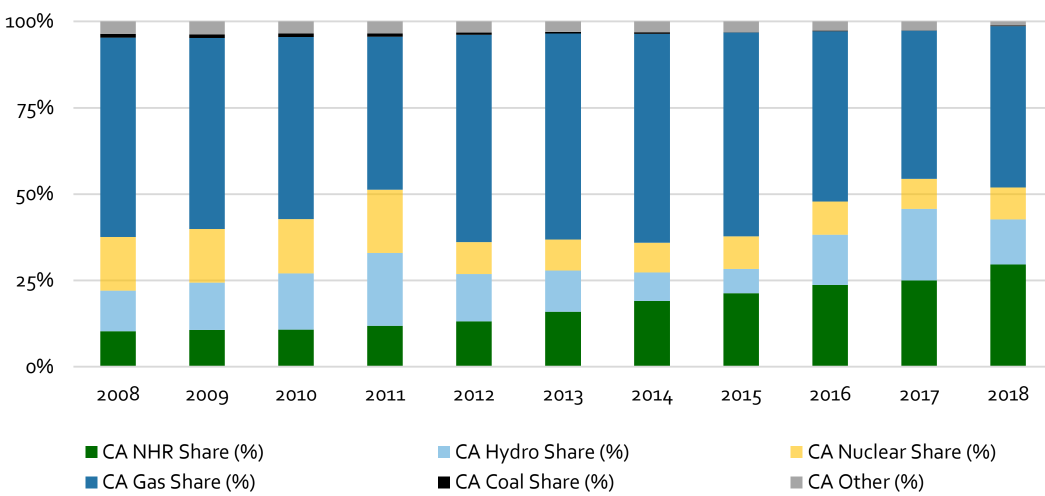
Figure 7 – Generation Mix 2008-2018, Alabama



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.12
Avg. kWh/Month (2018)	1,230
Avg. monthly bill (2018)	$151.24
Impact of $0.01/kWh charge	8.13%
Avg. *per capita* DPI (2018)	$38,369

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

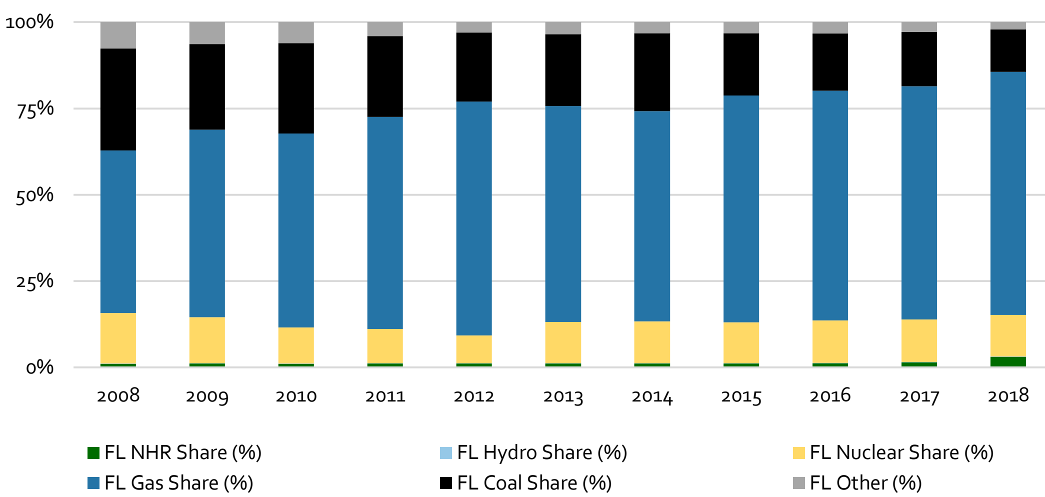
Figure 8 – Generation Mix 2008-2018, California



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.19
Avg. kWh/Month (2018)	545
Avg. monthly bill (2018)	$102.30
Impact of $0.01/kWh charge	5.33%
Avg. *per capita* DPI (2018)	$53,944

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

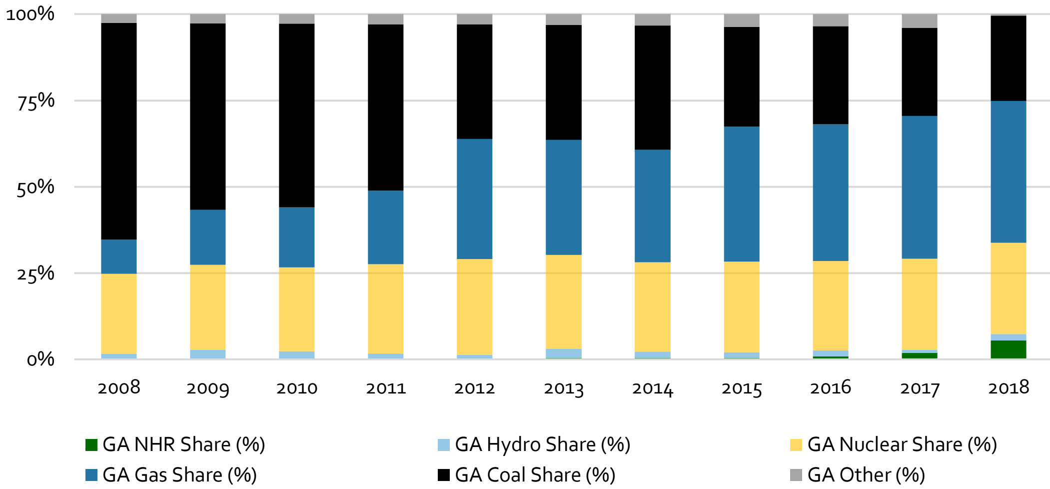
Figure 9 – Generation Mix 2008-2018, Florida



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.12
Avg. kWh/Month (2018)	1,104
Avg. monthly bill (2018)	$128.61
Impact of $0.01/kWh charge	8.59%
Avg. *per capita* DPI (2018)	$44,609

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

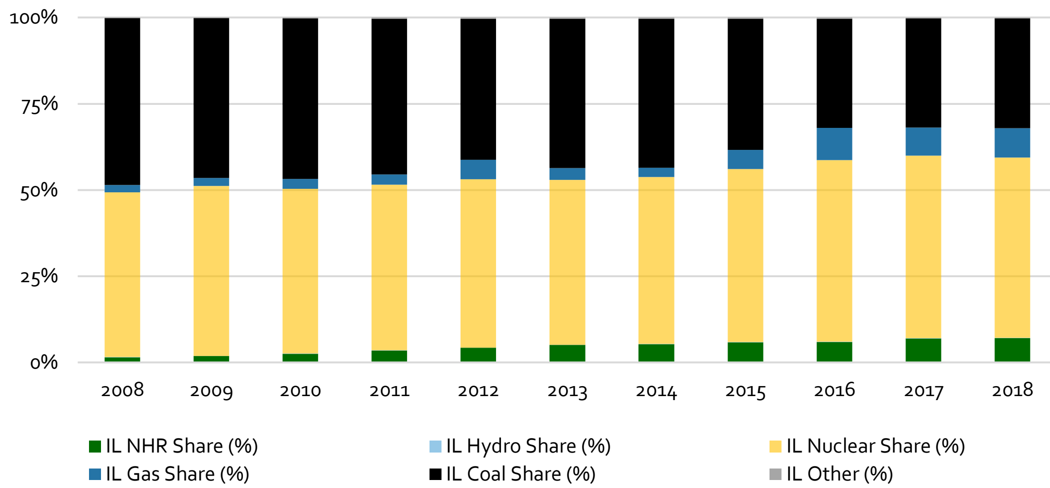
Figure 10 – Generation Mix 2008-2018, Georgia



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.11
Avg. kWh/Month (2018)	1,139
Avg. monthly bill (2018)	$128.94
Impact of $0.01/kWh charge	8.83%
Avg. *per capita* DPI (2018)	$40,870

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

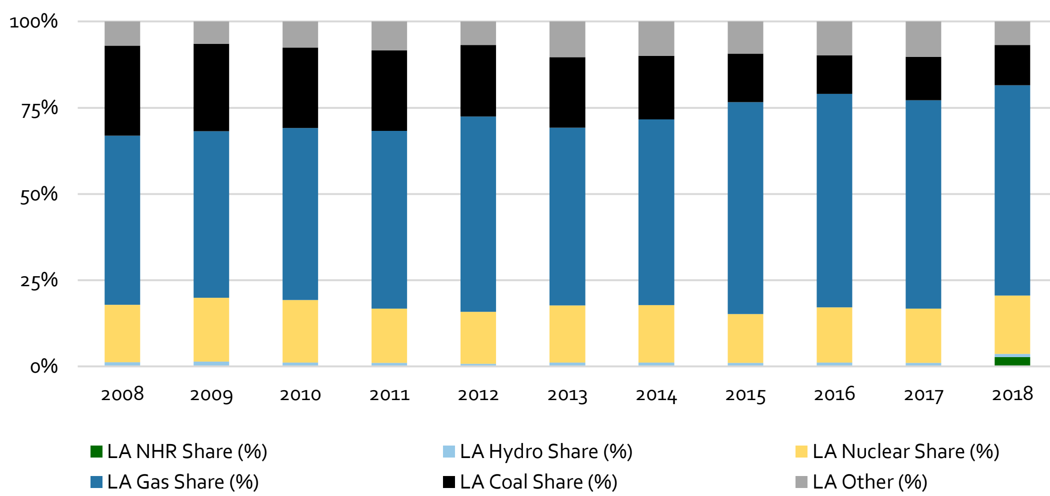
Figure 11 – Generation Mix 2008-2018, Illinois



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.13
Avg. kWh/Month (2018)	744
Avg. monthly bill (2018)	$93.78
Impact of $0.01/kWh charge	7.93%
Avg. *per capita* DPI (2018)	$50,157

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

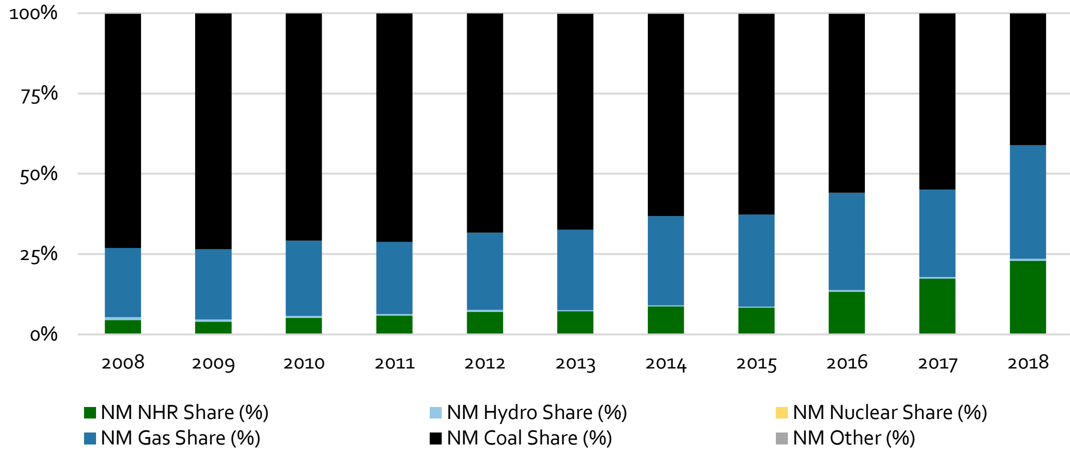
Figure 12 – Generation Mix 2008-2018, Louisiana



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.09
Avg. kWh/Month (2018)	1,283
Avg. monthly bill (2018)	$119.70
Impact of $0.01/kWh charge	10.72%
Avg. *per capita* DPI (2018)	$41,487

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

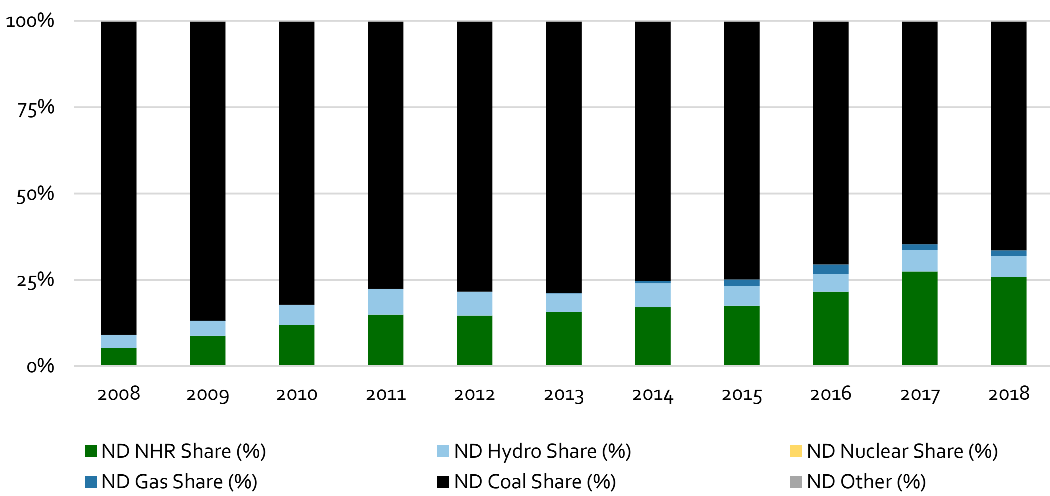
Figure 13 – Generation Mix 2008-2018, New Mexico



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.13
Avg. kWh/Month (2018)	640
Avg. monthly bill (2018)	$81.20
Impact of $0.01/kWh charge	7.88%
Avg. *per capita* DPI (2018)	$37,655

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

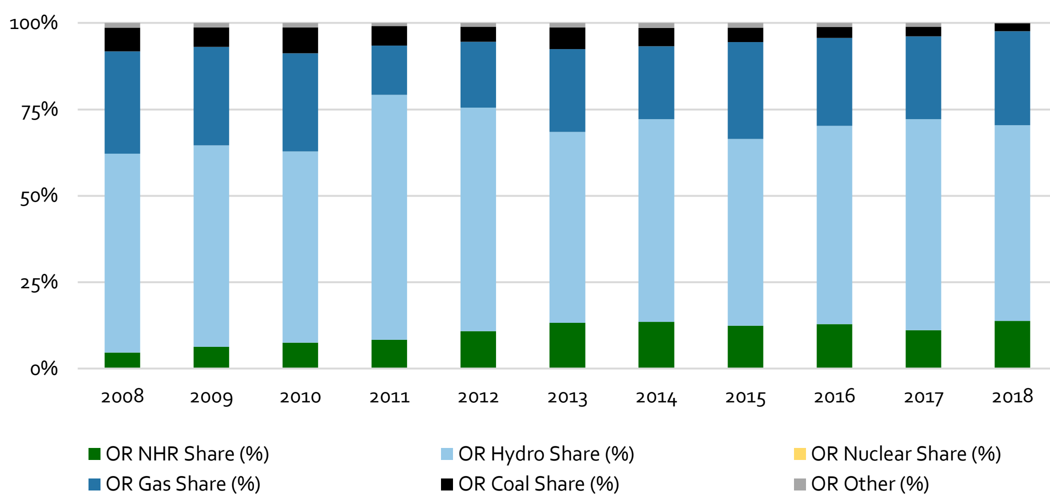
Figure 14 – Generation Mix 2008-2018, North Dakota



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.11
Avg. kWh/Month (2018)	1,106
Avg. monthly bill (2018)	$117.47
Impact of $0.01/kWh charge	9.42%
Avg. *per capita* DPI (2018)	$49,056

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

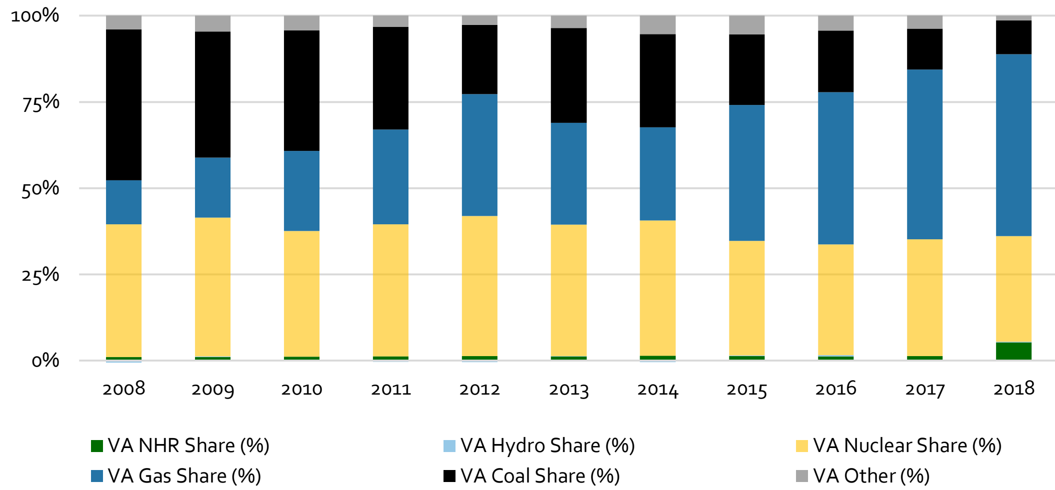
Figure 15 – Generation Mix 2008-2018, Oregon



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.11
Avg. kWh/Month (2018)	905
Avg. monthly bill (2018)	$99.20
Impact of $0.01/kWh charge	9.12%
Avg. *per capita* DPI (2018)	$43,460

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

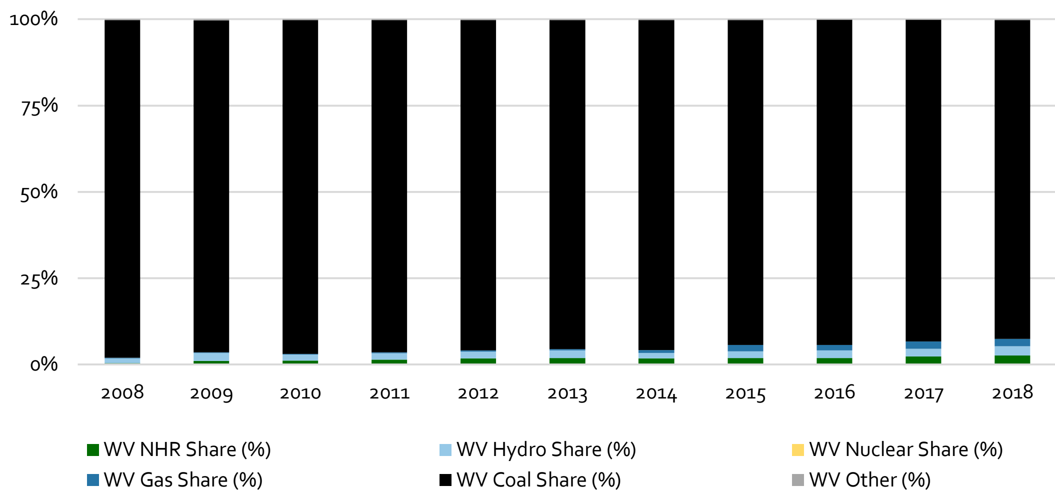
Figure 16 – Generation Mix 2008-2018, Virginia



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.12
Avg. kWh/Month (2018)	1,157
Avg. monthly bill (2018)	$136.93
Impact of $0.01/kWh charge	8.45%
Avg. *per capita* DPI (2018)	$49,886

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

Figure 17 – Generation Mix 2008-2018, West Virginia



KEY DATA (RESIDENTIAL)	
Avg. $/kWh (2018)	$0.11
Avg. kWh/Month (2018)	1,132
Avg. monthly bill (2018)	$128.00
Impact of $0.01/kWh charge	8.85%
Avg. *per capita* DPI (2018)	$36,805

Source: ClearView Energy Partners, LLC, using BEA, Census Bureau and EIA data

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