APPENDIX A - GLOSSARY

1. **Photovoltaic (PV) or Solar (interchangeable):** These are devices that generate electricity directly from sunlight via an electronic process that occurs naturally in certain types of material, called semiconductors
2. **Active and Reactive Power:** Portion of power that, averaged over a complete cycle of the AC waveform, results in net transfer of energy in one direction is known as active power. The portion of power due to stored energy, which returns to the source in each cycle, is known as reactive power
3. **Stiffness Ratio:** This is the ratio of the distribution system fault current at the point of common coupling to the aggregate maximum rated output current of the distributed generation system at the customer site. This is a measure of the risk of the distributed generation system causing problems with voltage flicker, steady-state voltage regulation or harmonics
4. **Ampacity:** This is the maximum amount of electric current a conductor or device can carry before sustaining immediate or progressive deterioration
5. **Power Factor:** This is the ratio of the real power that is used to do work and the apparent power that is supplied to the circuit
6. **Unity Power Factor:** Active power (MW) is equal to the total apparent power (MVA).
7. **Off-Unity Power Factor:** The resource is producing active power (MW) and is absorbing reactive power (MVAR). The power factor is less than 1.0.
8. **Voltage Regulation:** This is the ability of the inverter to automatically regulate the AC voltage at the point of interconnection
9. **Voltage Ride Through:** This is the ability of the inverter to stay in operation within defined voltage limits and durations
10. **Frequency Ride Through:** This is the ability of the inverter to stay in operation within defined frequency limits and durations
11. **Under Frequency Load Shedding:** The purpose of Under Frequency Load Shedding (UFLS) is to balance generation and load when an event causes a significant drop in frequency of an interconnection or islanded area
12. **Microgrid:** This is a localized group of electricity sources and loads that normally operates connected to and synchronous with the traditional centralized electrical grid, but can also disconnect to "island mode”
13. **Inverters:** This is a power electronic device, which converts DC power into AC power
14. **Cold Load Pickup Scenario:** This is defined as excessive inrush current drawn by loads when the distribution circuits are re-energized after extended outages
15. **Residential Rooftop**: small systems, interconnected at locations on residential rate schedules.
16. **Small Commercial/Industrial Rooftop**: systems between 0 kW and 500 kW.
17. **Large Commercial/Industrial Rooftop**: systems between 501 kW and 1,999 kW.
18. **Utility Scale Solar**: systems greater than or equal to 2,000 kW.

APPENDIX B – BASELINE DATA AND TRENDS BY SERVICE TERRITORY

1. METHODOLOGY FOR BASELINE DATA AND TRENDS IN MARYLAND

Daymark Energy Advisors investigated the current state of solar development, and the potential for future development, in the service territories of the four investor owned utility companies that provide distribution services within Maryland. These four utilities include: (1) Baltimore Gas & Electric("BGE"); (2) Delmarva Power & Light ("DPL"); (3) Potomac Electric Power Company ("PEPCO"); and (4) Potomac Edison ("PE"). Information describing the current baseline of solar development formed a basis for characterizing the remaining market potential for solar opportunities. The market potential was considered within the context of existing and new policy proposals, and in light of existing and new approaches to value solar, each of which may affect future adoption trends.

This appendix provides additional details about the methodology and results of the baseline analysis. The remainder of this section provides a discussion of the common methodologies applied to each of the four utility service territories. Section 2 provides the results of the baseline analysis, aggregated for all four IOUS. Finally, Sections 3-6 provide the results for each individual IOU.

1.1 Current Solar Installations Methodology

Information about currently active solar installations was gathered from each individual utility. Installation dates associated with currently active solar spanned from as early as 2002, to as current as to June 30, 2017. The data includes installations currently in place and under construction as of June 30, 2017, reflecting the most recent information available. For the purposes of this study, it was assumed that pending installations would reach commercial operation by 2018. The results of this analysis present installed capacity for each year (as new systems are interconnected) and the amount of generation that occurs each year from all installed systems (based on the "average" generation scenario presented in the next section).

Customer-sited solar panel systems are interconnected, upon approval, throughout the calendar year. In general, these systems have an expected life of 20-25 years and an expected capacity, at the end of their useful life, of between 80 and 85% of their original nameplate capacity.[1] For each year that a solar system is operating, its photovoltaic panels are expected to degrade by 0.5% on average.[2]

To more accurately model how much solar generation output was realized during each historical year, each installation and its respective nameplate capacity was modeled from the month and year of interconnection forward. For example, if a system was interconnected in March of 2002, the total amount of generation output that that system was assumed to have contributed to 2002 was calculated from March 2002 to year-end 2002. For 2003, that system was assumed to suffer from a degradation of 0.5%, and it was assumed to have operated for the entire year of 2003. The same calculation approach is applied to that system for each successive year. The result is an estimation of both capacity and generation output contributions from each solar system in each historical year. These individual system results were then aggregated according to four "categories", consistent with their relative size (capacity). These four categories included residential (small systems, interconnected by customers on residential rate schedules), small commercial (between 0 kW and 500 kW systems), large commercial (between 501 kW and 1,999 kW systems), and utility-scale (systems greater than or equal to 2,000 kW).

1.1 Generation Scenarios Methodology

Daymark developed three generation scenarios to represent the monthly output of an average solar project in the state of Maryland. These scenarios represent an average monthly output through the year, an upper bound output, and a lower bound output. The upper and lower bounds represent the variability of solar output due to weather and location. This methodology was applied to each of the four installation size categories mentioned just above, and within each of the four service territories in Maryland. They were then aggregated for the state based on capacity-weighted averaging.

The PVWatts[3] tool created by the National Renewable Energy Laboratory ("NREL") was used to develop the generation output information. The PVWatts tool estimates the electricity production by solar installations based on system characteristics like location,

[1] At an age of 25 years, solar panels will be between 80 to 85% of original capacity, but panels have the potential to last longer at a reduced capacity. (http://energyinformative.org/lifespansolar-panels/)

[2] 0.5% degradation rate estimate for modern solar panels. Photovoltaic Degradation Rates — An Analytical Review. NREL, June 2012.

[3] http://pvwatts.nrel.gov/index.php

capacity, module type, array type, inverter efficiency, array tilt angle, and array azimuth angle. Characteristics of each individual system within a region will differ based on housing factors like roof angle and orientation, as well as changes to inverter and panel efficiency through time. Given certain assumptions about the general characteristics of a solar installation, PVWatts generates an estimate of that system's AC output (in kWh) under normal weather conditions.

PVWatts was used to create output profiles for residential, commercial, and utility-scale solar systems in each of the four service territories in Maryland. Figure 1 provides a county-by-county map of Maryland, noting which of the four investor owned utilities serve each county.

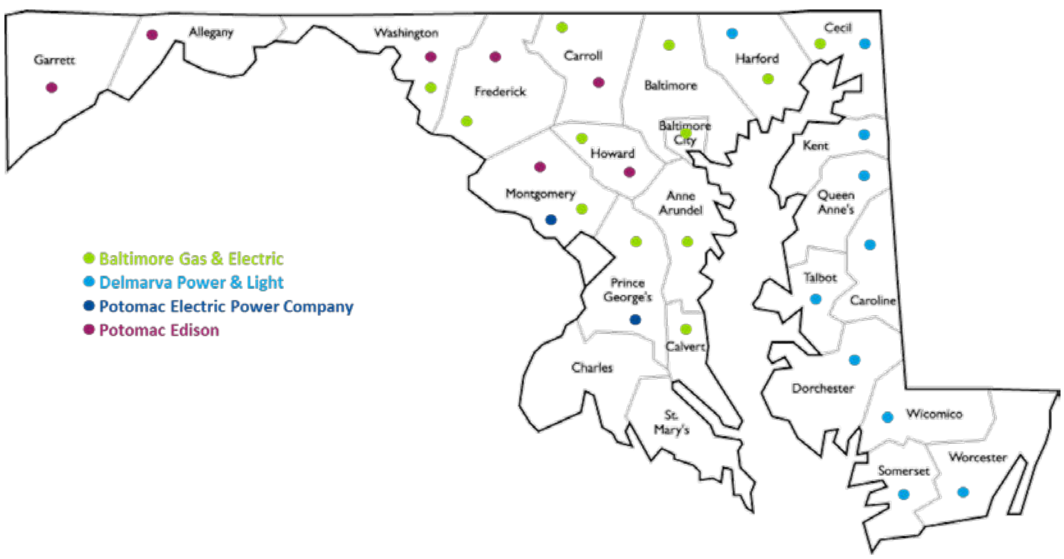


Figure 1: Map Showing Service Individual Service Territories at County Level

While there is some small overlap in these service territories, this does not affect the output profiles for the respective territories. The solar radiation and weather data used by PVWatts is derived from the nearest reporting weather station and accounts for metrics that may impact solar system efficiency such as wind speed, temperature, and cloud cover.

The system orientation assumes a south-facing panel (180-degree azimuth). Optimal panel tilt was calculated on an individual basis for each service territory.[4] Those values are provided, for reference, in Table 2.

Table 1: Solar System Optimal Tilt for Each Service Territory

BGE	32.87°
DPL	32.55°
PEPCO	32.60°
PE	33.27°

A fixed-mounted system was assumed for all residential and commercial installations and a 2-axis tracking array was assumed for all utility scale installations. PVWatts was used to simulate the generation output profile (in kWh) for a 1 kW AC system located in each of the four service territories. Generation output was then scaled up to full output based on the actual capacity (in kW AC) of each solar installation.

All other inputs for the PVWatts tool, including system losses, inverter efficiency, and module type, were set to the PVWatts default values, which are based on location, and current data on PV systems. These are assumed to be reasonable and were not adjusted for the purposes of this study. A summary matrix of these inputs is provided in Table 2.

Table 2: PVWatts Input Values

	BGE	DPL	PEPCO	PE
Nearest Weather Station(s)	Baltimore, MD/Baltimore Int'l Airport	Salisbury/ WICOMICO	Andrews AFB	Hagerstown, MD
Azimuth	180	180	180	180
Module Type	Standard	Standard	Standard	Standard
System Losses	0.14	0.14	0.14	0.14
Residential and Commercial				
Optimal Tilt	32.87	32.55	32.60	33.27
Array Type	Fixed (roof mount)	Fixed (roof mount)	Fixed (roof mount)	Fixed (roof mount)
Utility Scale				
Optimal Tilt	0	0	0	0
Array Type	2-Axis Tracking	2-Axis Tracking	2-Axis Tracking	2-Axis Tracking

[4] Solar tilt calculation (38 degrees (latitude) * 0.76 + 3.1 degrees = optimal tilt for fixed rooftop (http://www.solarpaneltilt.com)

Three output profiles were estimated using the assumed installation attributes discussed above – the output profiles included an average monthly output, an upper bound (representing 10% more than the average), and a lower bound (representing 10% less than the average). The average case assumed average weather over the past 10 years based on NREL PVWatts inputs. The lower bound assumed that 1 out of the past 10 years had lower than average solar output, setting the lower bound output to be 90% of the average. The upper bound assumed that 1 out of the past 10 years had higher than average solar output, setting the upper bound output to be 110% of the average.

2. AGGREGATE RESULTS FOR ALL SERVICE TERRITORIES

The same three output profiles (average, upper, lower) were generated for the aggregate of all IOUs in Maryland by taking the weighted average of the profiles from each individual service territory. The weights reflect the total nameplate capacity each individual utility contributes to each solar installation type (i.e. residential, small commercial, large commercial, utility scale). Table 3 provides these weights in tabular form and Figure 2 provides the same information graphically.

Table 3: Weights of Each Utility with Respect to Solar Tranche

	Total Capacity (kW AC)	BGE	DPL	PEPCO	PE
Residential	362,187	162,588 (45%)	31,100 (9%)	131,562 (36%)	36,933 (10%)
Small Commercial	61,203	31,823 (52%)	12,516 (20%)	13,184 (21%)	3,864 (6%)
Large Commercial	109,378	33,271 (30%)	30,068 (27%)	32,523 (30%)	13,516 (12%)
Utility-Scale	64,027	36,027 (62%)	12,000 (21%)	4,000 (7%)	6,000 (10%)

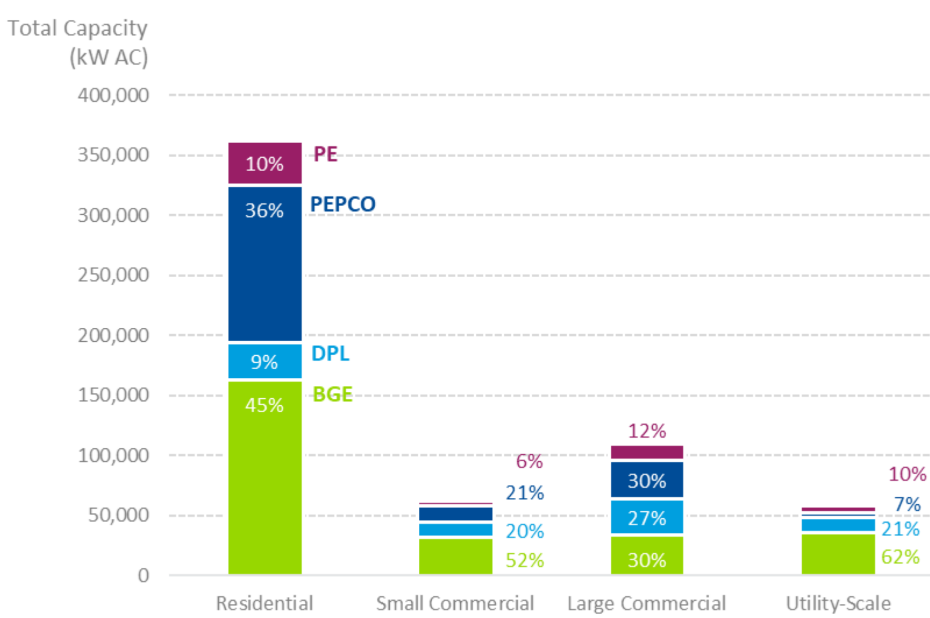


Figure 2: Weighting of Each Service Territory, per Customer Category

Average monthly production for, first, residential and small and large commercial/industrial installations, and second, for utility-scale solar installations, in each of the four utility service territories is provided in Figure 3, for comparative purposes. The variations in solar energy production are the result of the diversity in location and weather by service area since we relied on local weather stations data. We did not rely on statewide assumptions but rather maintained the local differences in the underlying assumptions data for the production estimates.

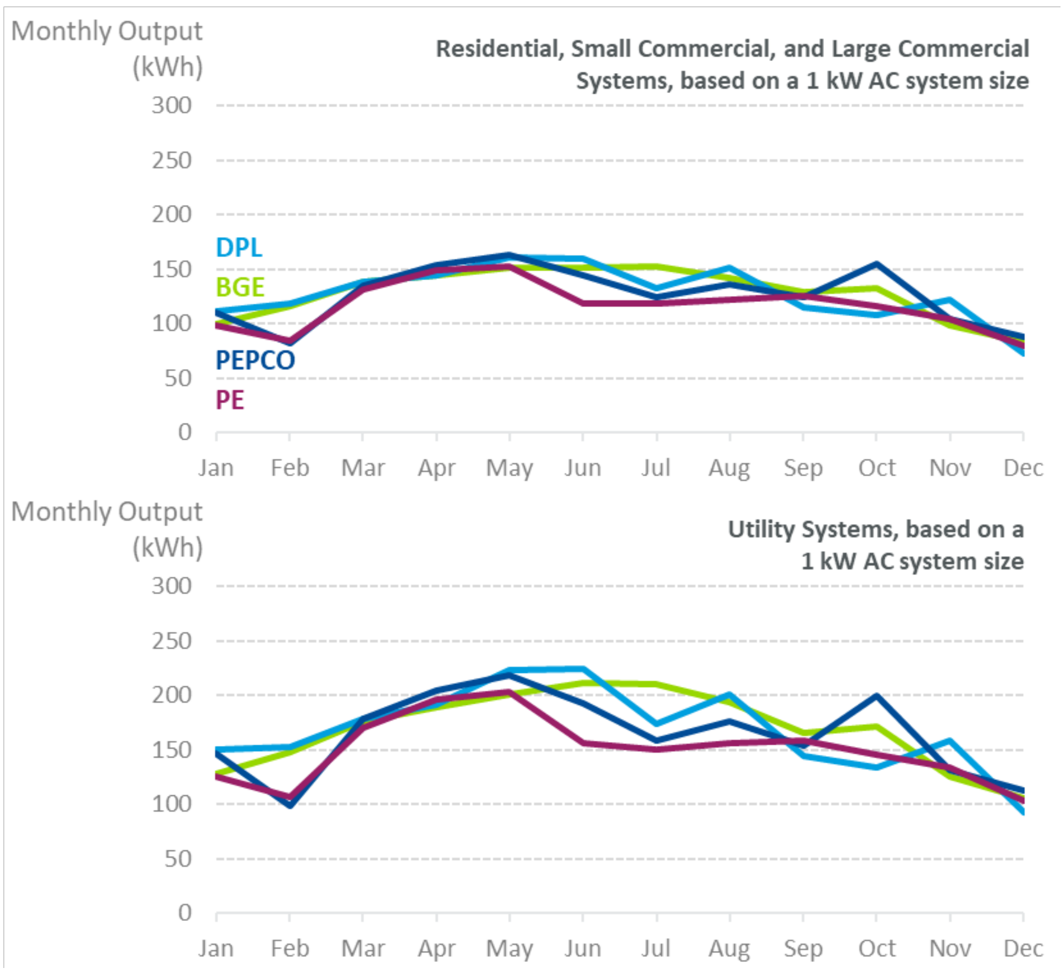


Figure 3: Comparison of Average Monthly Solar Production Between Utilities

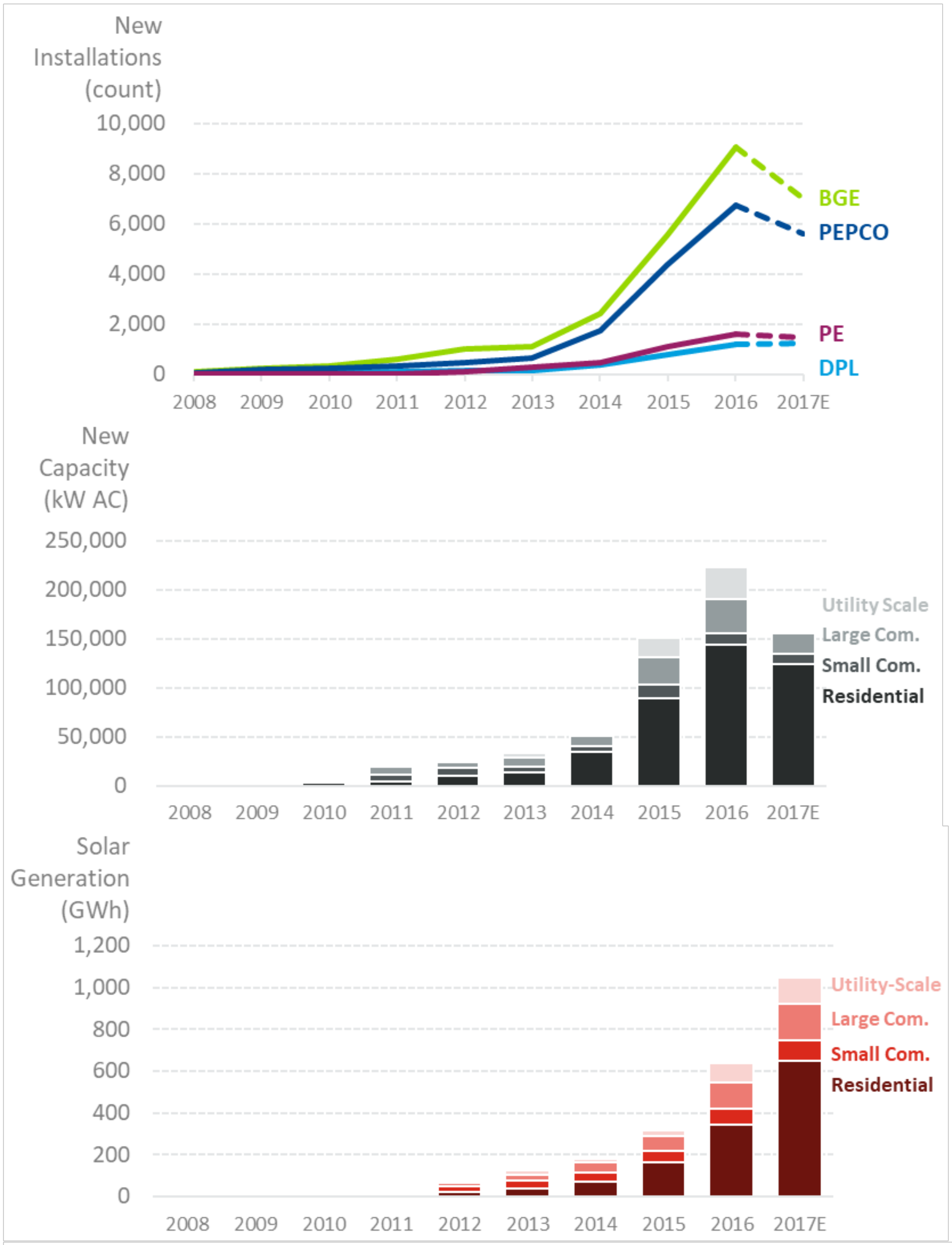
All four utilities show peak output for BTM systems in May; from there, both PEPCO and PE decline in output for June while BGE and DPL have June outputs similar to their May outputs. For utility scale systems, BGE peaks in June, whereas the other three utilities peak in May, consistent with their BTM profiles. PEPCO and PE also have dips in output in February that are not present in the BGE and DPL output profiles.

Output from systems within the DPL service territory are at or near the top of the cluster in both parts of Figure 3; this is likely due to the more southern location of DPL's service territory.

The residential solar sector shows strong growth in capacity additions over time throughout the state of Maryland. Since the first installations in 2002 the residential sector shows the fastest growth in terms of capacity additions year to year. The next most rapid growth in capacity additions year to year is seen in the large commercial/industrial category. Both the large commercial/industrial and utility-scale solar make up significant portions of annual capacity additions, especially in 2015 and 2016. Small commercial/industrial installations account for the smallest piece of annual capacity additions. The total solar capacity additions for the calendar year 2016 amounted to about 223 MW.

Output generation from all installation sizes seems to be increasing exponentially over time. From 2003 to 2009, output was low and steady from both residential and small commercial/industrial sources. Between 2010 and 2016, large commercial/industrial installations accounted for most of the generation. Utility-scale generation was a close second until 2016 when it surpassed large commercial/industrial output. Residential output began significantly increasing in 2016 when it almost matched utility-scale output and then surpassed it in 2017. Small commercial/industrial output remains the smallest part of total generation in Maryland. The magnitude of large commercial/industrial and utility-scale generation can be attributed to the larger size (capacity) of these installations. The individual large commercial/industrial and utility-scale installations are significantly large in capacity such that, regardless of the smaller number of installations, their annual output is significantly large. Total generation for all installation types as of June 30, 2017 was estimated to be 890 GWh.

Figure 4 on the next page shows the historical trend of solar installations in Maryland IOU service territories. The top of the figure shows the number of solar systems installed in each year within each service territory; the middle of the figure shows the associated nameplate capacity of those annual additions, so for example, there were a combined 144 MW of new residential solar installations across all of the four IOUs in 2016 as shown by the size of the dark gray bar in that year. The bottom of the figure shows the cumulative solar generation in each year, inclusive of the impacts of degradation.



2017E data is estimated based on a partial year of data in 2017. Actual data is as of June 30, 2017 - the half-way point in the year; full-year 2017E data is estimated by doubling the partial year actuals.

Figure 4: Aggregate Installations, Nameplate Capacity, and Generation

3. BALTIMORE GAS & ELECTRIC SERVICE TERRITORY

3.1 Capacity by Installation Type

Figure 5 depicts the total installed solar capacity in the BGE service territory, organized by four different installation types – residential, small commercial/industrial, large commercial/industrial, and utility-scale. The residential type makes up most of the installed capacity, while the small commercial, large commercial, and utility-scale installed capacities are smaller and similar in magnitude to one another (about 33,000 kW). Total installed nameplate capacity to date is around 264 MW (AC) in the BGE service territory, which is 45% of the total for all four IOU service territories.

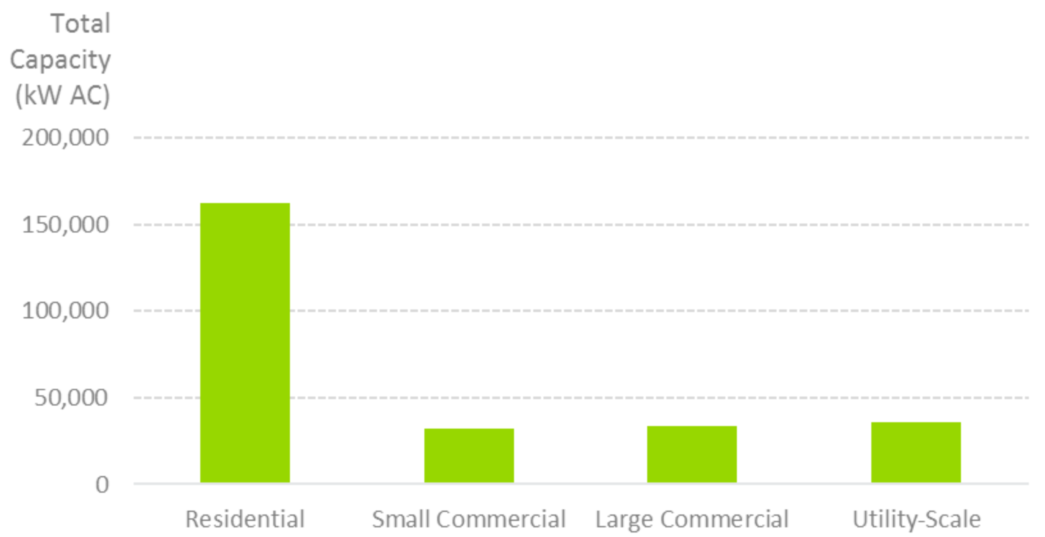


Figure 5: Installed Solar Capacity by Installation Type for BGE Service Territory

3.2 Generation Profile by Installation Type

Because of differences in technology, a utility scale system produces more kWh in a year than a behind the meter installation of the same size (capacity). Figure 6 shows the monthly output for a 1 kW AC system – the top graph shows the output shape for a residential, small commercial, or large commercial installation (based on a fixed roof mount system). The bottom graph shows the output shape for a same-sized utility installation (based on a 2-axis tracking array). The magnitude of the annual output, in kWh, is greater for the utility scale system as is the shape of the output, with more variation between winter and summer months

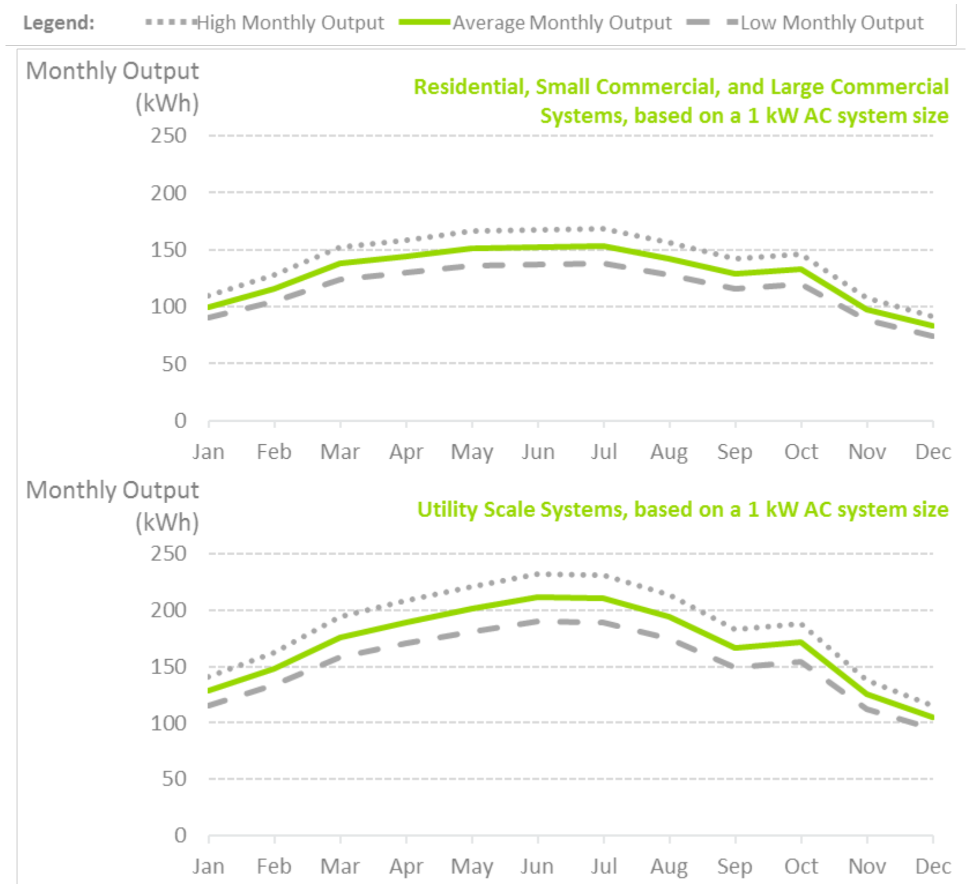
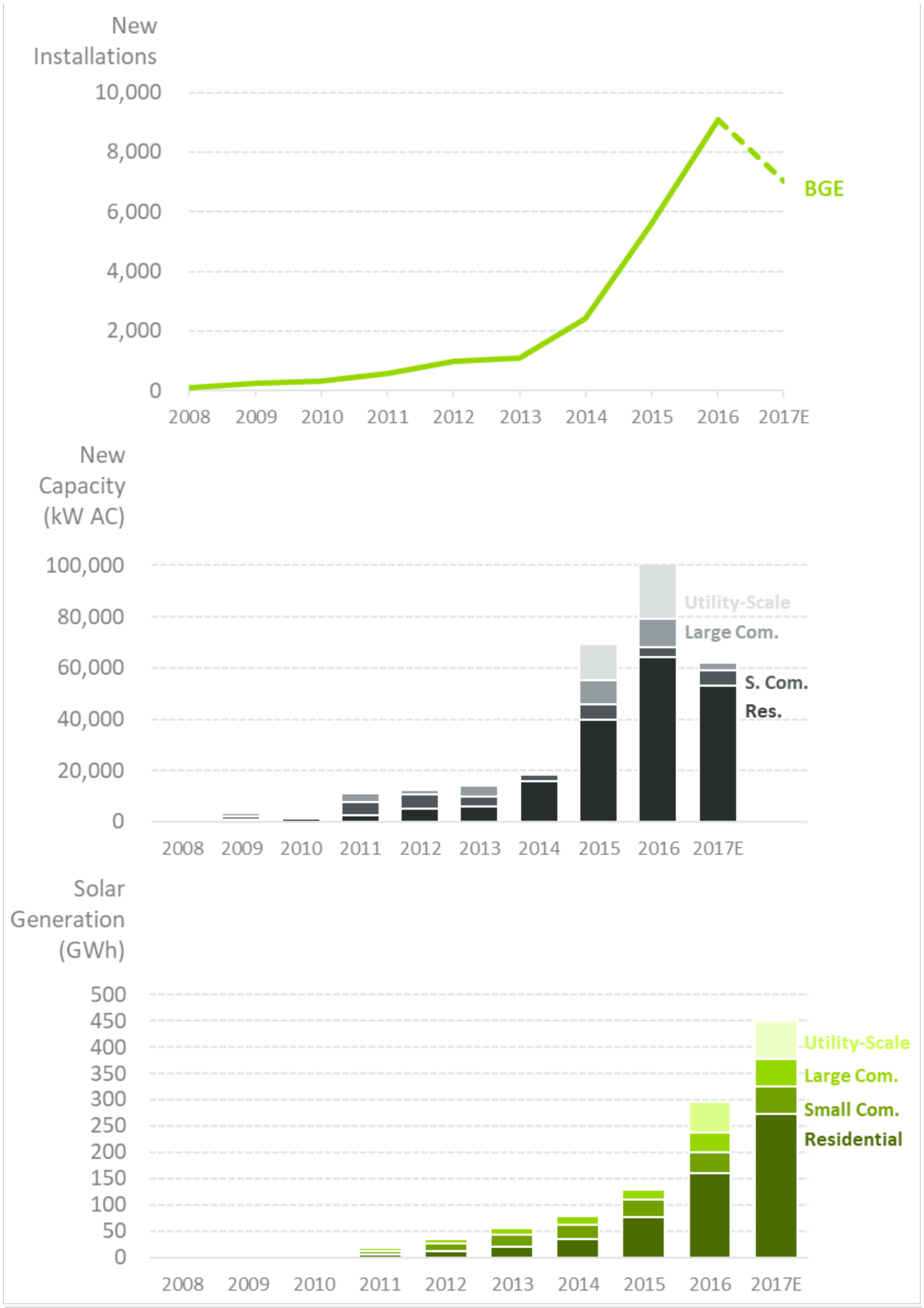


Figure 6: Solar Generation Output (monthly kWh) for 1 kW AC Installation in the BGE Service Territory

3.3 Solar Capacity Additions

Residential solar additions in BGE's service territory showed exponential growth since the first installations in 2008. Capacity additions began to ramp up in 2011 but increased more significantly in 2015 and 2016. The greatest amount of capacity was added in the residential sector; however, in 2015, large-scale solar capacity additions began to exceed small-scale solar capacity additions. Utility-scale solar is still new to the BGE service territory, with the first systems interconnected as recently as 2016 and 2017.

Figure 7 shows the historical trend of solar installations in the BGE service territory. The top of the figure shows the number of solar systems installed in each year; the middle of the figure shows the associated nameplate capacity of those annual additions; the bottom of the figure shows the cumulative solar generation in each year, inclusive of the impacts of degradation.



2017E data is estimated based on a partial year of data in 2017. Actual data is as of June 30, 2017 - the half-way point in the year; full-year 2017E data is estimated by doubling the partial year actuals.

Figure 7: BGE Installations, Nameplate Capacity, and Solar Generation

Residential installations were the largest contributor to customer-sited solar energy generation from 2010 onward. Generation from utility-scale systems, meaning any system with a capacity of greater than or equal to 2 MW, has been quickly catching up to generation from residential-scale systems. This is due to the larger number of MW per installations that these systems represent. The utility-scale installations are significantly larger in capacity than the residential-scale installations, so regardless of the smaller number of installations, their annual output is similarly large. Total generation for all installations types as of June 30, 2017 was estimated to be about 410 GWh.

3.4 Average Installation Size

Figure 7 depicts the average size of each type of installation over the years. The average size of a residential installation (top left) in the BGE service territory has grown at a steady rate since 2008. The average small commercial/industrial installation size (top right) has risen over time as well but shows much more variability year to year. While utility-scale installations (bottom right) are a new addition to the BGE system (the first installation was in 2015) their average size increased significantly from 2015 to 2016. The average large commercial/industrial installation size (bottom left) shows no discernable trend over time.

Figure 8: Average Installation Sizes in BGE's Service Territory

4. DELMARVA POWER & LIGHT SERVICE TERRITORY

4.1 Capacity by Installation Type

Figure 8 depicts the total installed solar capacity in the DPL service territory, organized by four different installation types - residential, small commercial/industrial, large commercial/industrial, and utility-scale. The residential type makes up most of the installed capacity (31 MW), followed closely by the large commercial/industrial type (30 MW), which is only 1 MW AC less. Total installed nameplate capacity to date, from all installations types together, is around 86 MW (AC), or 14% of all nameplate capacity across all four IOU service territories.

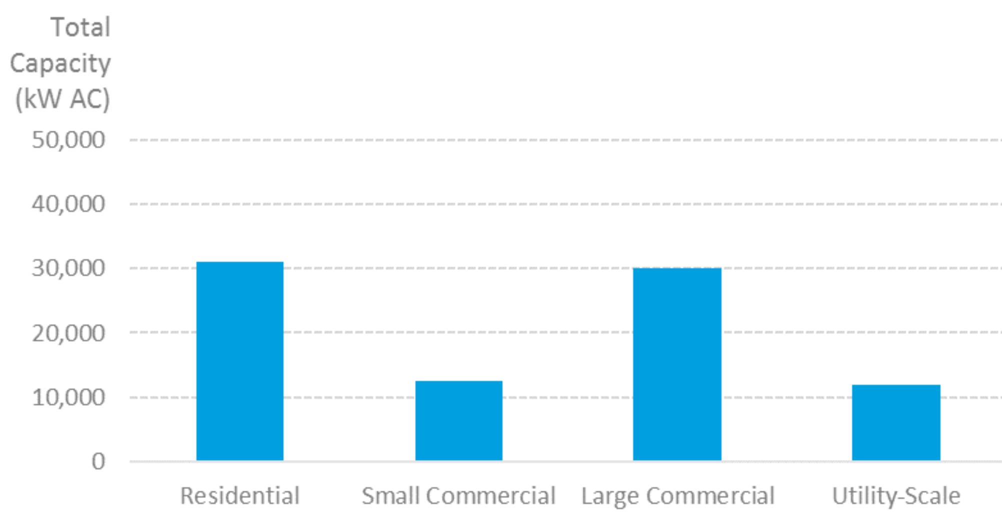


Figure 9: Installed Solar Capacity by Installation Type for DPL Service Territory

4.2 Generation Profile by Installation Type

Because of differences in technology, a utility scale system produces more kWh in a year than a behind the meter installation of the same size (capacity). Figure 9 shows the monthly output for a 1 kW AC system – the top graph shows the output shape for a residential, small commercial, or large commercial installation (based on a fixed roof mount system). The bottom graph shows the output shape for a utility scale installation of the same size (based on a 2-axis tracking array). The magnitude of the annual output, in kWh, is greater for the utility scale system. The shape of the output also shows a difference, with more variation between months, as compare with a smother shape for the residential, small commercial, and large commercial systems.

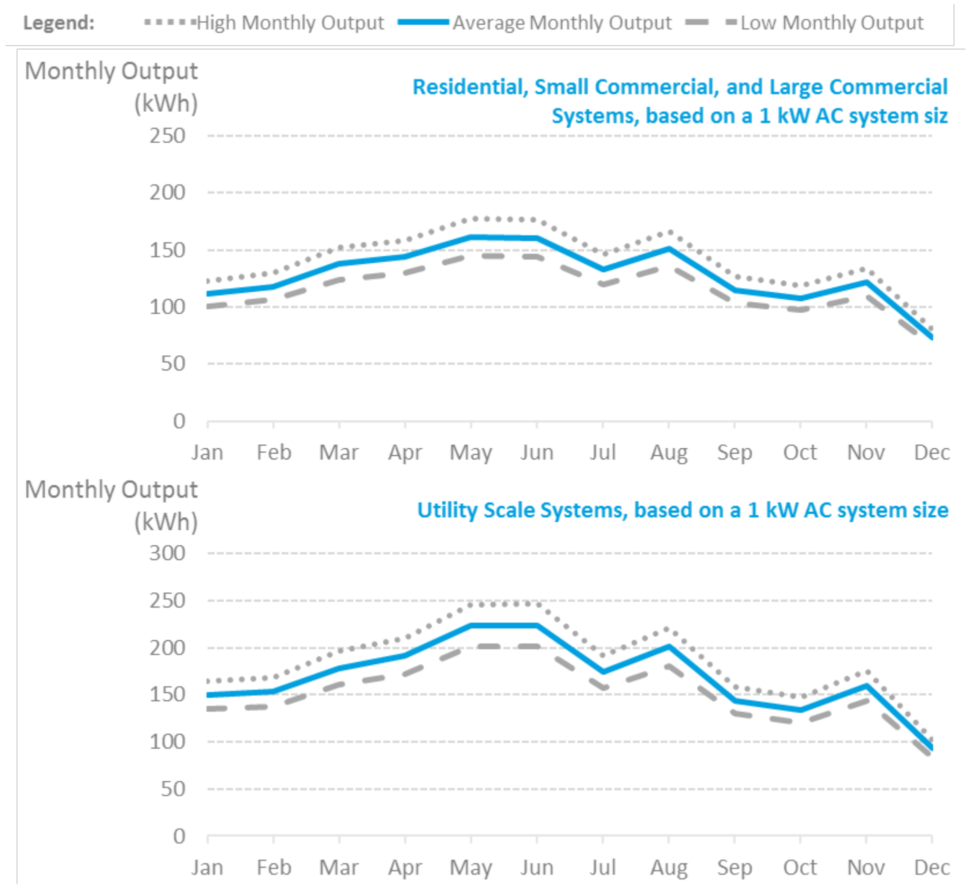


Figure 10: Solar Generation Output (monthly kWh) for 1 kW AC Installations in DPL's Service Territory

4.3 Solar Capacity Additions

While there were a few residential solar installations in service in DPL's territory as early as 2002, these installations did not add up to very much in the way of total capacity. Following the first solar installations in 2002, additions of solar capacity were virtually non-existent until 2006 when installation of PV solar began to ramp up. Since 2006, both residential and small commercial/industrial solar additions have shown exponential growth. Large commercial/industrial additions have varied more on a year-to-year basis but also seem to have an increasing trend overall. The capacity additions in 2016 are significantly larger than any previous year, with large commercial/industrial additions exceeding those of residential solar and utility-scale solar, contributing a total of 14 MW of additional capacity in that year.

Figure 10, on the next page, shows the historical trend of solar installations in the DPL service territory. The top of the figure shows the number of solar systems installed in each year; the middle of the figure shows the associated nameplate capacity of those annual additions; the bottom of the figure shows the cumulative solar generation in each year, inclusive of the impacts of degradation.

Residential installation output, in GWh, is eclipsed by both the large commercial/industrial generation and the utility-scale generation in the DPL service territory as early as 2012 and 2009, respectively. This is because large commercial and utility-scale installations are significantly larger in capacity than the residential installation, so despite the smaller number of installations, their annual output is larger. Output from the small commercial/industrial installation type is the smallest of any of the four types. Total generation from all installation types as of June 30, 2017 was estimated to be about 140 GWh.

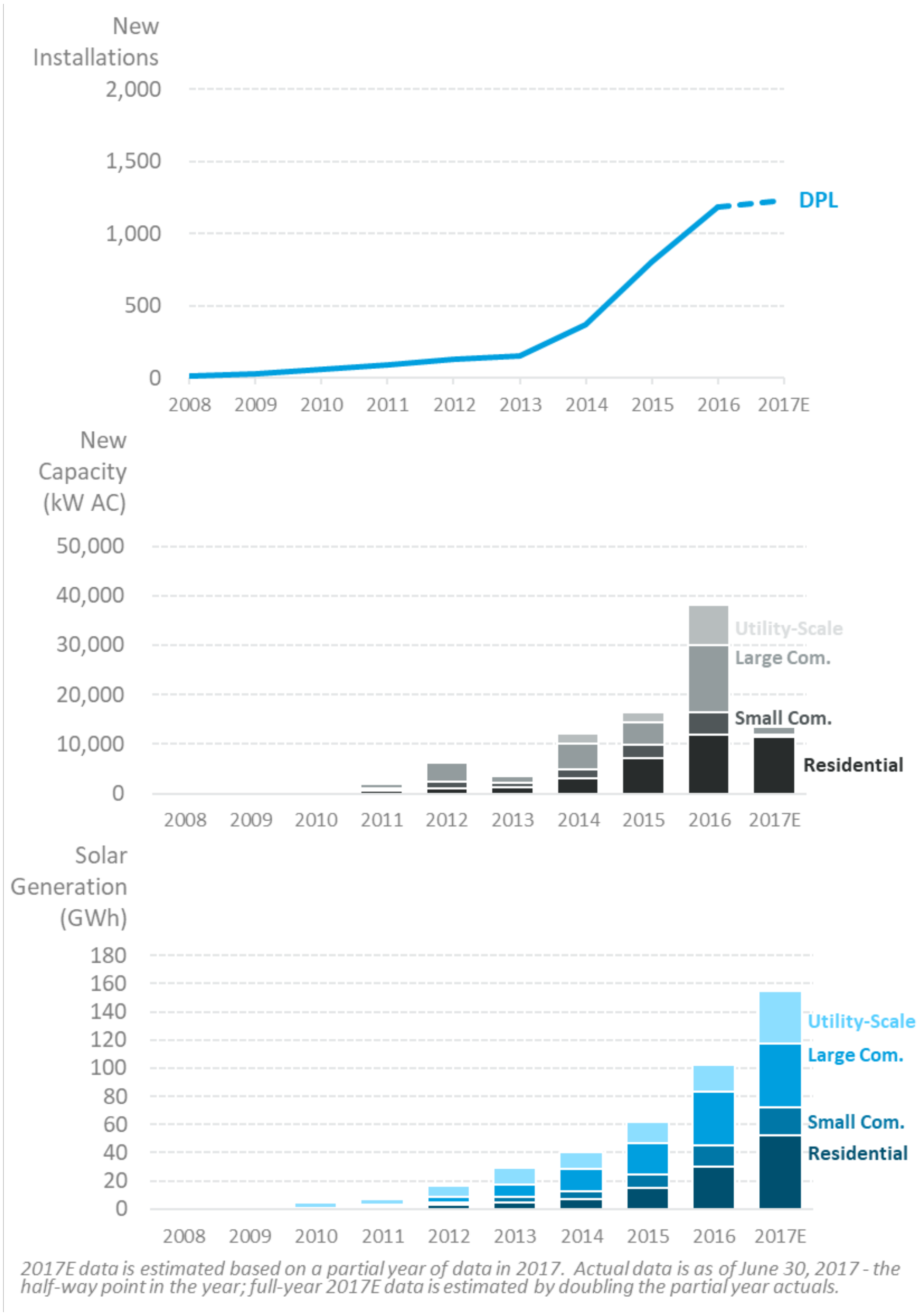


Figure 11: DPL Installations, Nameplate Capacity, and Solar Generation

4.4 Average Installation Size

Figure 11 depicts the average size of each type of installation over the years. Looking at the trend in residential installation sizes (top left), we saw that the average residential installation size has increased steadily over time, with some variability year to year. This same increasing trend was observed in the small commercial/industrial installation type as well (top right), though average installation size seems to have peaked in 2015 at slightly over 120 kW. The average large commercial/industrial installation size shows no discernable trend over time, ranging between as low as 640 kW and as high as 1,700 kW in the space of three years (2012 – 2014). Utility scale installations began in 2015 and have had the same average size in every year (2 MW).

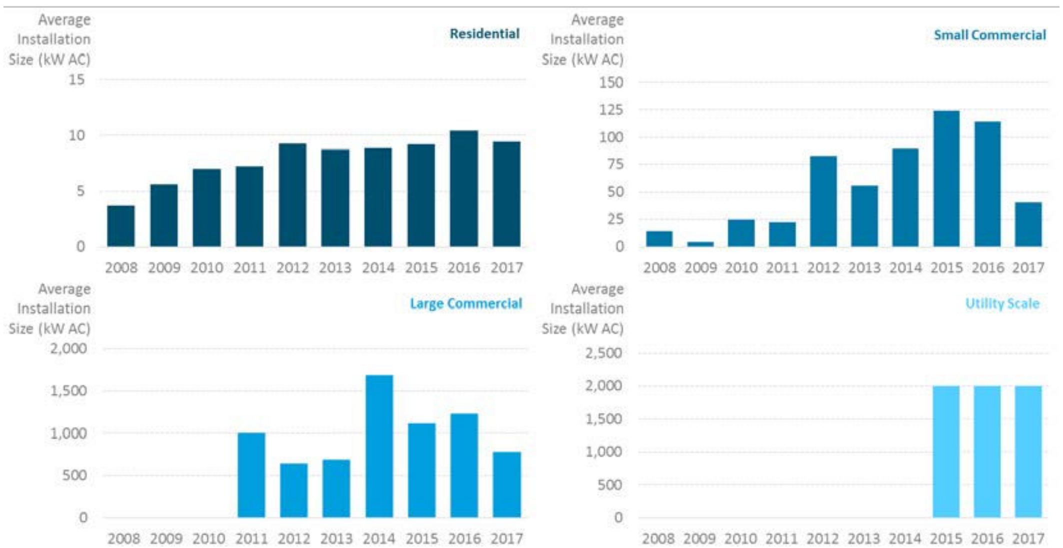


Figure 12: Average Installation Sizes in DPL's Service Territory

5. POTOMAC ELECTRIC POWER COMPANY SERVICE TERRITORY

5.1 Capacity by Installation Type

Figure 12 depicts the total installed solar capacity in the PEPCO service territory, organized by four different installation types – residential, small commercial/industrial, large commercial/industrial, and utility-scale. The residential type makes up the majority (73%) of the installed capacity, with about 132 MW in total. The large commercial/industrial type is the second-largest capacity total, at about 33 MW, or about 100 MW less than the residential capacity. The capacity of utility scale systems is about 4 MW, or 2% of the total installed nameplate capacity for all installation types, which is 181 MW (AC) for the PEPCO service territory. By comparison, this represents about 31% of the nameplate capacity across all four of the IOUs in Maryland.

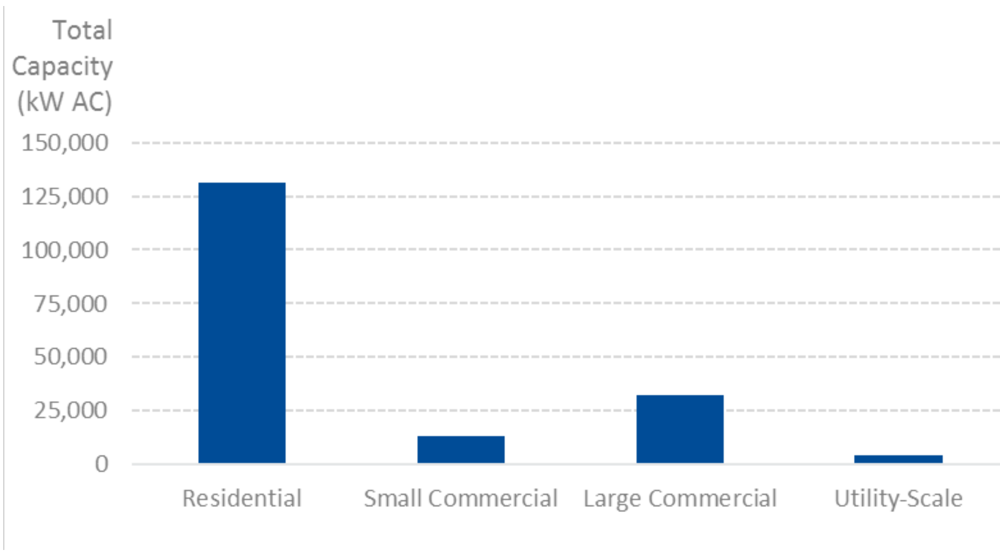


Figure 13: Installed Solar Capacity by Installation Type for PEPCO Service Territory

5.2 Generation Profile by Installation Type

Figure 13 provides the monthly output profile for a 1 kW AC system in the PEPCO service territory – the top graph shows the output shape for a residential, small commercial, or large commercial installation (based on a fixed roof mount system). The bottom graph shows the output shape for a utility scale installation of the same size (1 kW AC), based on a 2-axis tilt array. The shapes of these two profiles are more similar to one another than they are in the BGE or DPL service territories discussed earlier. Like the earlier territories, though, the magnitude of the annual output, in kWh, is greater for the utility scale system.

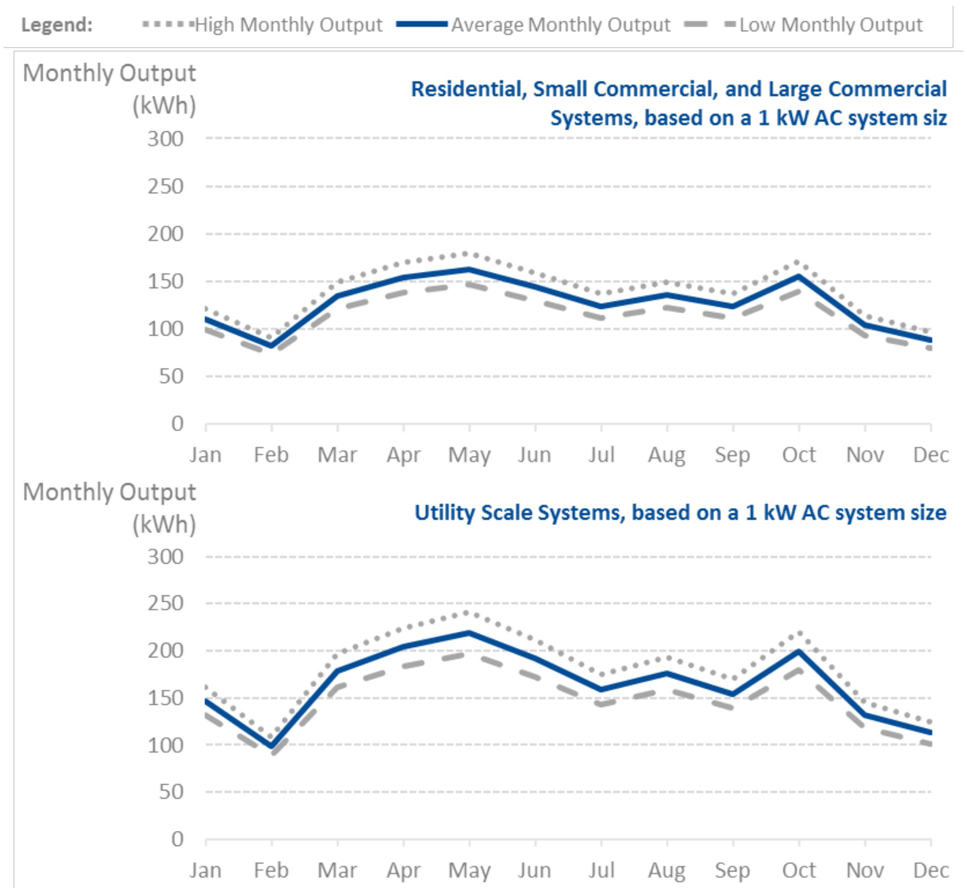
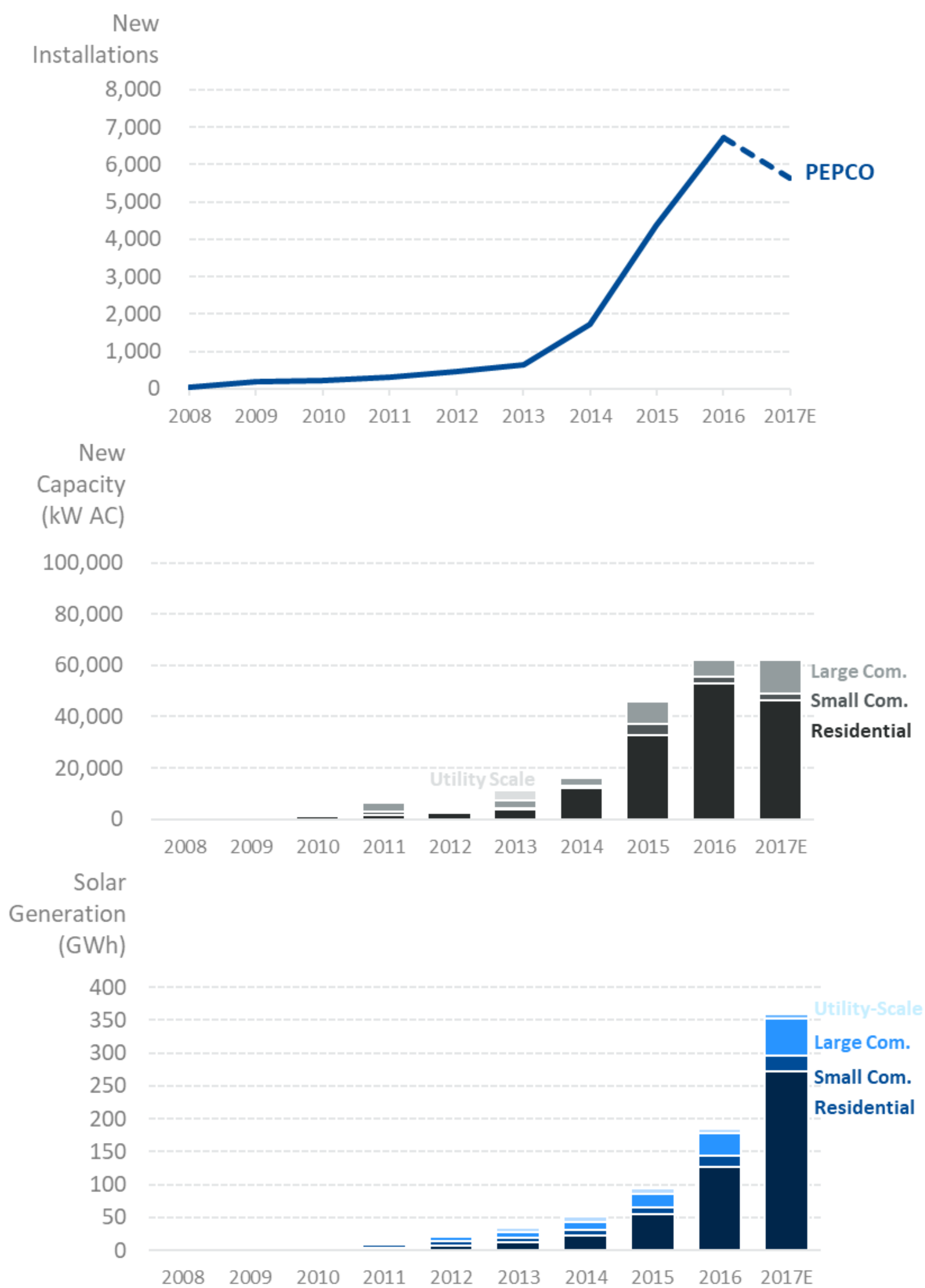


Figure 14: Solar Generation Output (monthly kWh) for 1 kW AC Installations in PEPCO's Service Territory

5.3 Solar Capacity Additions

Starting in 2012, residential solar capacity additions began to surpass those in all other installation size types. The capacity additions from the residential type then grew exponentially between 2009 and 2017, increasing dramatically in 2015 and 2016 in particular. The small and large commercial/industrial installation types show high variability in annual additions throughout the historical years shows. Utility-scale additions only occurred in 2013, including two installations totaling 4 MW.



2017E data is estimated based on a partial year of data in 2017. Actual data is as of June 30, 2017 - the half-way point in the year; full-year 2017E data is estimated by doubling the partial year actuals.

Figure 15: PEPCO Installations, Nameplate Capacity, and Solar Generation

From 2012 until 2017, large commercial/industrial installations were the largest generator of solar energy. The partial data from 2017 shows that residential output has already surpassed that of all other installations types, though the data only represents about half of the year. The large commercial/industrial installations still contribute significant output annually compared to residential while small commercial/industrial and utility scale installations contribute much smaller amounts of output annually. Total generation for all installation types as of June 30, 2017 was estimated to be about 265 GWh.

5.4 Average Installation Size

Figure 14 depicts the average size of each type of installation over the years. The average size of a residential installation (top left) in the PEPCO service territory has grown at a steady rate. The average large commercial/industrial installation size (bottom left) showed high variability from 2010 through 2012 but has risen steadily since 2013. The small commercial/industrial installation size (top right) shows no discernable trend over time. The utility scale sample size (bottom right) is so small (limited to one year) that no trend is discernable.

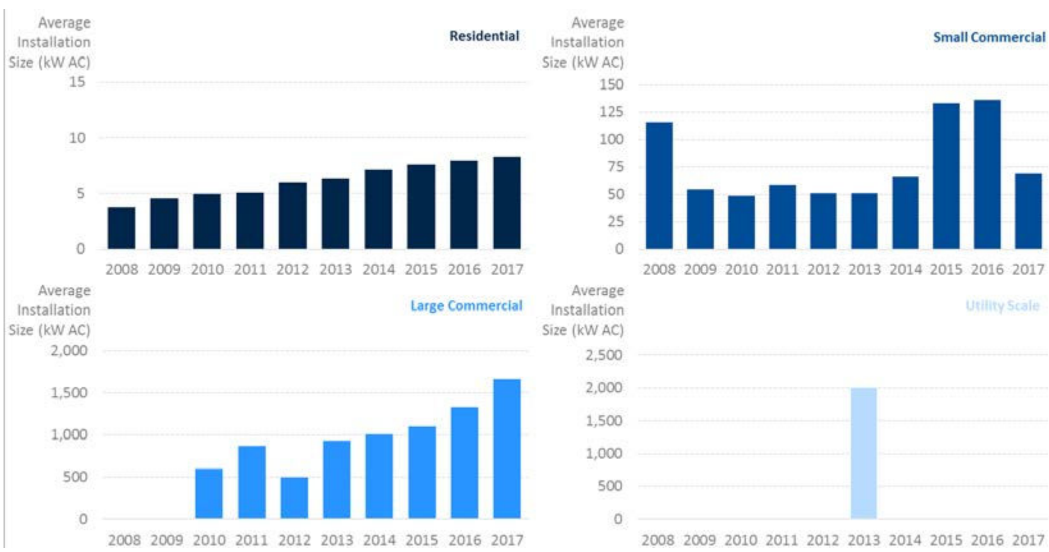


Figure 16: Average Installation Sizes in PEPCO's Service Territory

6. POTOMAC EDISON SERVICE TERRITORY

6.1 Capacity by Installation Type

Figure 17 depicts the total installed solar capacity in the PE service territory, organized by four different installation types – residential, small commercial/industrial, large commercial/industrial, and utility-scale. The residential type makes up most of the installed capacity (37 MW (AC), or 61% of all installations in PE's territory). The large commercial/industrial tranche accounts for the second-most total capacity but this amounts to only 14 MW, or 14% of all installations in PE's territory, about 23 MW less than residential capacity. Small commercial/industrial total capacity makes up a small fraction of the total installed nameplate capacity and utility-scale capacity is only slightly larger than that. The total installed nameplate capacity to date is around 60 MW, or 10% of the total for all four IOU service territories.

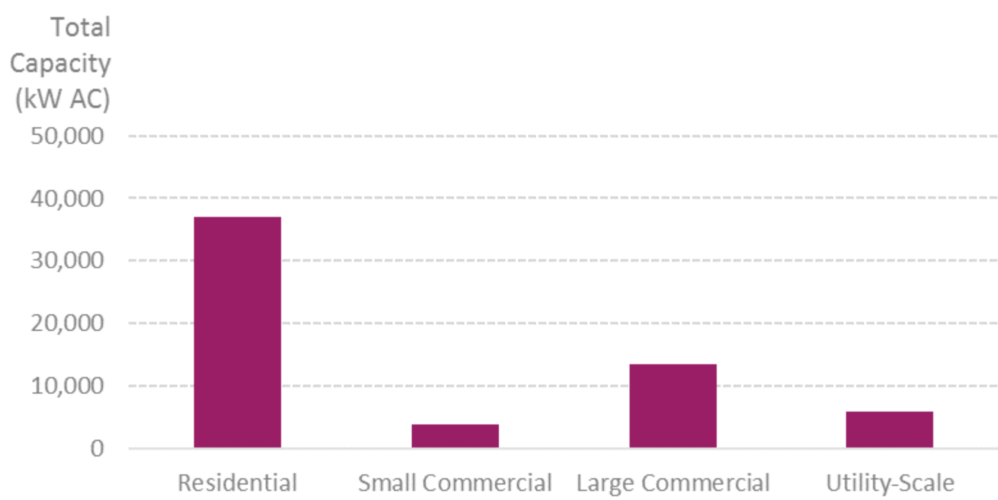


Figure 17: Installed Solar Capacity by Installation Type for PE's Service Territory

6.2 Generation Profile by Installation Type

Figure 15 provides the monthly output profile for a 1 kW AC system in the PEPCO service territory – the top graph shows the output shape for a residential, small commercial, or large commercial installation (based on a fixed roof mount system). The bottom graph shows the output shape for a utility scale installation of the same size (1 kW AC), based on a 2-axis tracking array. Like the other IOU territories described earlier, the magnitude of the annual output, in kWh, is greater for the utility scale system, and it's more varied than the BTM shape, which is flatter.

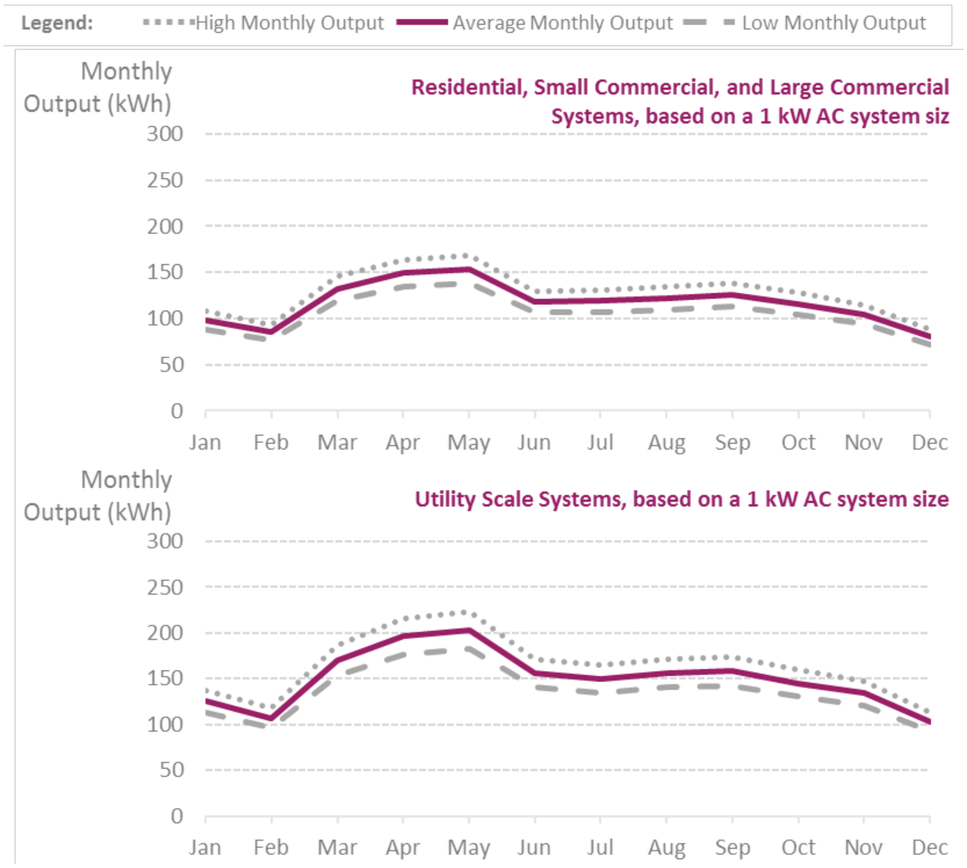
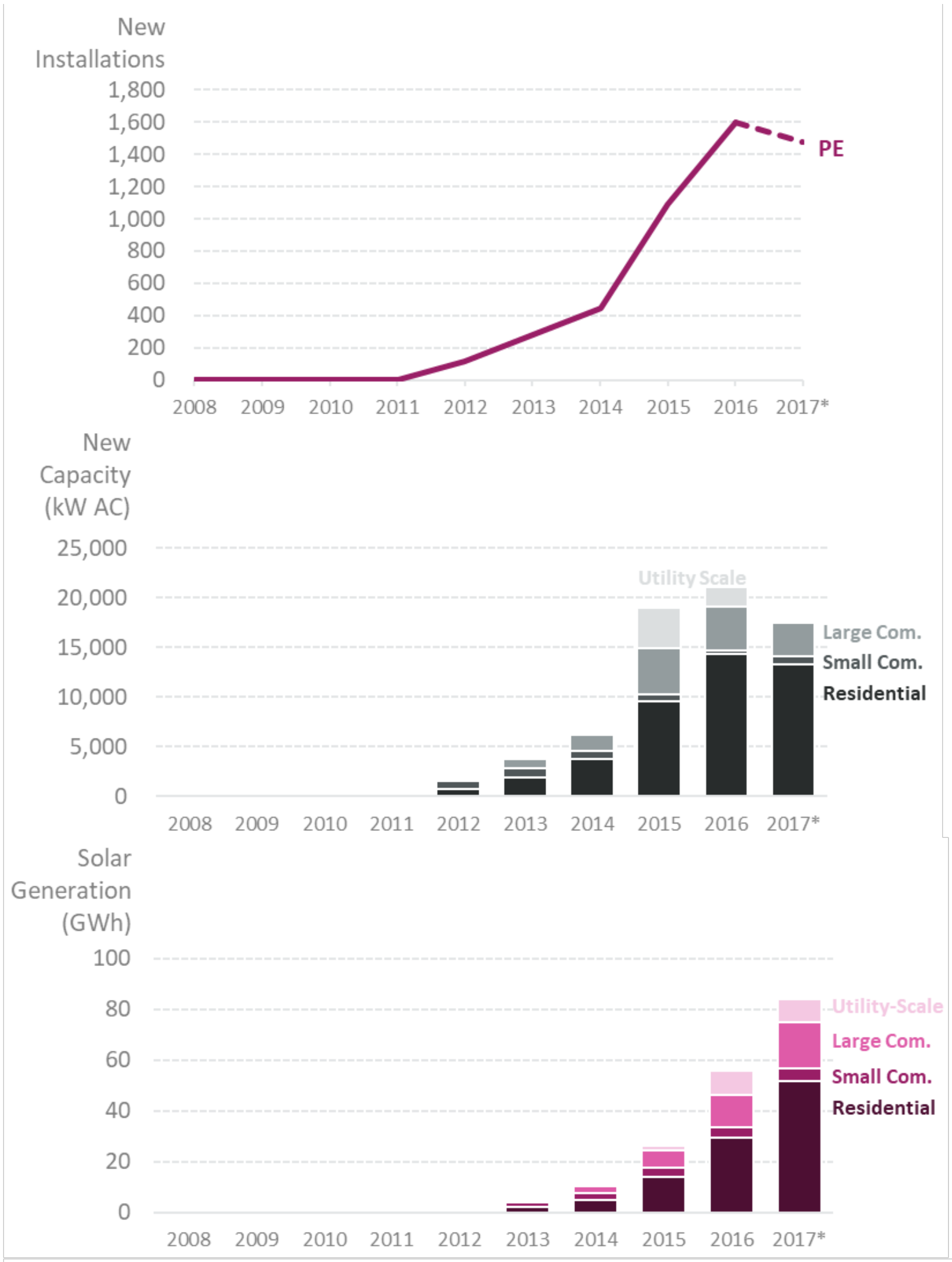


Figure 18: Solar Generation Output (monthly kWh) for 1 kW AC Installations in PE's Service Territory

6.3 Solar Capacity Additions

Residential solar additions in PE's territory showed exponential growth since the first installations in 2012. Capacity additions for residential solar increased significantly in 2015 and 2016. The greatest amount of capacity is added in the residential sector each year, followed by the large commercial/industrial sector. Small commercial/industrial capacity additions remain the lowest year to year. Utility-scale is new in the PE service territory, with the additions only occurring in 2015 and 2016.

Figure 17 shows the historical trend of solar installations in the PE service territory. The top of the figure shows the number of solar systems installed in each year; the middle of the figure shows the associated nameplate capacity of those annual additions; the bottom of the figure shows the cumulative solar generation in each year, inclusive of the impacts of degradation.



2017E data is estimated based on a partial year of data in 2017. Actual data is as of June 30, 2017 - the half-way point in the year; full-year 2017E data is estimated by doubling the partial year actuals.

Figure 19: PE Installations, Nameplate Capacity, and Solar Generation

Residential installations are the largest contributor to solar generation from 2013 onward. Large commercial/industrial contributes the second most output each year from 2014 onward. Output from both types seems to increase steadily over time. Utility-scale generation is a significant portion of annual output beginning in 2015, helped by the larger size of these systems. Total generation for all installations as of June 30, 2017 was estimated to be about 74 GWh.

6.4 Average Installation Size

Figure 18 depicts the average size of each type of installation over the years. The average size of a residential installation in the PE service territory (top left) has grown a bit since 2012. Neither small commercial/industrial (top right) nor large commercial/industrial (bottom left) show any discernable trend over time in average installation size. Utility-scale installations are all 2 MW in capacity, this size is steady in 2015 and 2016, the only years where there were installations.

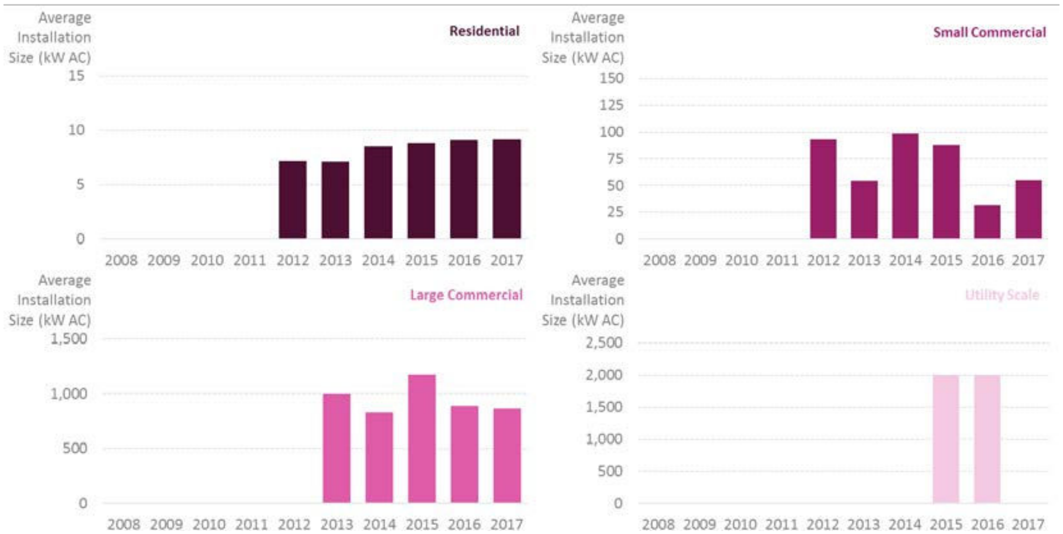


Figure 20: Average Installation Sizes in PE's Service Territory

APPENDIX C: TWENTY-YEAR OUTLOOK

1. BALTIMORE GAS & ELECTRIC

1.1 Utility Scale

1.1.1 Reference Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.045	$ 0.048	$ 0.048	$ 0.048	$ 0.049	$ 0.052	$ 0.053	$ 0.056	$ 0.059	$ 0.061	$ 0.063	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.078	$ 0.081	$ 0.084	$ 0.088	$ 0.091
Energy Market Price Effects	$/kWh	$ 0.002	$ 0.009	$ 0.006	$ 0.005	$ 0.005	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.007	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007
Avoided Capacity	$/kWh	$ 0.011	$ 0.008	$ 0.008	$ 0.009	$ 0.010	$ 0.011	$ 0.012	$ 0.013	$ 0.014	$ 0.016	$ 0.017	$ 0.019	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.022	$ 0.021	$ 0.021	$ 0.021
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.071**	**$ 0.080**	**$ 0.077**	**$ 0.076**	**$ 0.079**	**$ 0.083**	**$ 0.086**	**$ 0.090**	**$ 0.094**	**$ 0.100**	**$ 0.102**	**$ 0.107**	**$ 0.112**	**$ 0.116**	**$ 0.120**	**$ 0.123**	**$ 0.127**	**$ 0.130**	**$ 0.134**	**$ 0.138**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.019	$ 0.022	$ 0.018	$ 0.025	$ 0.023	$ 0.024	$ 0.024	$ 0.026	$ 0.026	$ 0.027	$ 0.027	$ 0.028	$ 0.029	$ 0.029	$ 0.030	$ 0.031	$ 0.031	$ 0.032
Economic Benefits	$/kWh	$ 0.087	$ 0.084	$ 0.081	$ 0.079	$ 0.077	$ 0.076	$ 0.075	$ 0.074	$ 0.073	$ 0.072	$ 0.072	$ 0.071	$ 0.070	$ 0.069	$ 0.069	$ 0.068	$ 0.067	$ 0.066	$ 0.066	$ 0.065
Health Benefits	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Subtotal Economic/Social Benefits/((	**$/kWh**	**$ 0.095**	**$ 0.102**	**$ 0.104**	**$ 0.105**	**$ 0.099**	**$ 0.106**	**$ 0.102**	**$ 0.102**	**$ 0.101**	**$ 0.103**	**$ 0.102**	**$ 0.102**	**$ 0.102**	**$ 0.102**	**$ 0.102**	**$ 0.102**	**$ 0.103**	**$ 0.103**	**$ 0.103**	**$ 0.103**
Total Quantified Benefits	**$/kWh**	**$ 0.167**	**$ 0.182**	**$ 0.181**	**$ 0.181**	**$ 0.178**	**$ 0.189**	**$ 0.188**	**$ 0.191**	**$ 0.195**	**$ 0.202**	**$ 0.205**	**$ 0.209**	**$ 0.214**	**$ 0.219**	**$ 0.222**	**$ 0.226**	**$ 0.229**	**$ 0.233**	**$ 0.237**	**$ 0.241**

1.1.2 High CO_2 Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.045	$ 0.048	$ 0.058	$ 0.059	$ 0.060	$ 0.063	$ 0.066	$ 0.068	$ 0.072	$ 0.074	$ 0.077	$ 0.080	$ 0.083	$ 0.087	$ 0.090	$ 0.094	$ 0.098	$ 0.102	$ 0.106	$ 0.111
Energy Market Price Effects	$/kWh	$ 0.002	$ 0.009	$ 0.006	$ 0.005	$ 0.006	$ 0.007	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008
Avoided Capacity	$/kWh	$ 0.011	$ 0.008	$ 0.008	$ 0.009	$ 0.010	$ 0.011	$ 0.012	$ 0.013	$ 0.014	$ 0.016	$ 0.017	$ 0.019	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.022	$ 0.021	$ 0.021	$ 0.021
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.071**	**$ 0.080**	**$ 0.086**	**$ 0.088**	**$ 0.091**	**$ 0.095**	**$ 0.099**	**$ 0.102**	**$ 0.108**	**$ 0.111**	**$ 0.116**	**$ 0.121**	**$ 0.127**	**$ 0.132**	**$ 0.136**	**$ 0.140**	**$ 0.144**	**$ 0.148**	**$ 0.152**	**$ 0.157**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.018	$ 0.015	$ 0.009	$ 0.021	$ 0.018	$ 0.018	$ 0.020	$ 0.019	$ 0.020	$ 0.020	$ 0.021	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.023	$ 0.023	$ 0.024
Economic Benefits	$/kWh	$ 0.087	$ 0.084	$ 0.081	$ 0.079	$ 0.077	$ 0.076	$ 0.075	$ 0.074	$ 0.073	$ 0.072	$ 0.072	$ 0.071	$ 0.070	$ 0.069	$ 0.069	$ 0.068	$ 0.067	$ 0.066	$ 0.066	$ 0.065
Health Benefits	$/kWh	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009	$ 0.009
Subtotal Economic/Social Benefits/((	**$/kWh**	**$ 0.097**	**$ 0.104**	**$ 0.105**	**$ 0.100**	**$ 0.093**	**$ 0.103**	**$ 0.099**	**$ 0.098**	**$ 0.099**	**$ 0.098**	**$ 0.098**	**$ 0.098**	**$ 0.098**	**$ 0.098**	**$ 0.098**	**$ 0.098**	**$ 0.098**	**$ 0.098**	**$ 0.098**	**$ 0.098**
Total Quantified Benefits	**$/kWh**	**$ 0.168**	**$ 0.184**	**$ 0.191**	**$ 0.188**	**$ 0.184**	**$ 0.198**	**$ 0.198**	**$ 0.200**	**$ 0.207**	**$ 0.210**	**$ 0.214**	**$ 0.219**	**$ 0.225**	**$ 0.230**	**$ 0.234**	**$ 0.238**	**$ 0.242**	**$ 0.246**	**$ 0.250**	**$ 0.255**

1.1.3 Low Gas Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.042	$ 0.043	$ 0.042	$ 0.041	$ 0.042	$ 0.044	$ 0.046	$ 0.048	$ 0.050	$ 0.052	$ 0.054	$ 0.056	$ 0.059	$ 0.061	$ 0.064	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.078
Energy Market Price Effects	$/kWh	$ 0.003	$ 0.005	$ 0.004	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.005	$ 0.007	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007
Avoided Capacity	$/kWh	$ 0.011	$ 0.008	$ 0.008	$ 0.009	$ 0.010	$ 0.011	$ 0.012	$ 0.013	$ 0.014	$ 0.016	$ 0.017	$ 0.019	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.022	$ 0.021	$ 0.021	$ 0.021
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.071**	**$ 0.070**	**$ 0.068**	**$ 0.071**	**$ 0.073**	**$ 0.076**	**$ 0.079**	**$ 0.082**	**$ 0.085**	**$ 0.090**	**$ 0.093**	**$ 0.097**	**$ 0.102**	**$ 0.106**	**$ 0.109**	**$ 0.112**	**$ 0.115**	**$ 0.117**	**$ 0.121**	**$ 0.124**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ (0.004)	$ 0.021	$ 0.016	$ 0.021	$ 0.026	$ 0.024	$ 0.029	$ 0.028	$ 0.034	$ 0.033	$ 0.034	$ 0.034	$ 0.035	$ 0.036	$ 0.037	$ 0.037	$ 0.038	$ 0.039	$ 0.040	$ 0.041
Economic Benefits	$/kWh	$ 0.087	$ 0.084	$ 0.081	$ 0.079	$ 0.077	$ 0.076	$ 0.075	$ 0.074	$ 0.073	$ 0.072	$ 0.072	$ 0.071	$ 0.070	$ 0.069	$ 0.069	$ 0.068	$ 0.067	$ 0.066	$ 0.066	$ 0.065
Health Benefits	$/kWh	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.088**	**$ 0.110**	**$ 0.103**	**$ 0.106**	**$ 0.109**	**$ 0.106**	**$ 0.110**	**$ 0.108**	**$ 0.113**	**$ 0.112**	**$ 0.112**	**$ 0.112**	**$ 0.112**	**$ 0.113**	**$ 0.113**	**$ 0.113**	**$ 0.113**	**$ 0.114**	**$ 0.114**	**$ 0.114**
Total Quantified Benefits	**$/kWh**	**$ 0.159**	**$ 0.179**	**$ 0.171**	**$ 0.177**	**$ 0.182**	**$ 0.182**	**$ 0.188**	**$ 0.190**	**$ 0.198**	**$ 0.202**	**$ 0.205**	**$ 0.210**	**$ 0.214**	**$ 0.218**	**$ 0.222**	**$ 0.225**	**$ 0.228**	**$ 0.231**	**$ 0.235**	**$ 0.238**

1.2 Behind the Meter Scale

1.2.1 Reference Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.045	$ 0.048	$ 0.048	$ 0.048	$ 0.049	$ 0.052	$ 0.053	$ 0.056	$ 0.059	$ 0.061	$ 0.063	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.078	$ 0.081	$ 0.084	$ 0.088	$ 0.091
Energy Market Price Effects	$/kWh	$ 0.002	$ 0.009	$ 0.006	$ 0.005	$ 0.005	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.007	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007
Avoided Capacity	$/kWh	$ 0.005	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.058**	**$ 0.068**	**$ 0.064**	**$ 0.063**	**$ 0.065**	**$ 0.069**	**$ 0.071**	**$ 0.074**	**$ 0.078**	**$ 0.082**	**$ 0.084**	**$ 0.088**	**$ 0.091**	**$ 0.095**	**$ 0.098**	**$ 0.102**	**$ 0.105**	**$ 0.108**	**$ 0.112**	**$ 0.116**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.019	$ 0.022	$ 0.018	$ 0.025	$ 0.023	$ 0.024	$ 0.024	$ 0.026	$ 0.026	$ 0.027	$ 0.027	$ 0.028	$ 0.029	$ 0.029	$ 0.030	$ 0.031	$ 0.031	$ 0.032
Economic Benefits	$/kWh	$ 0.273	$ 0.257	$ 0.241	$ 0.226	$ 0.213	$ 0.201	$ 0.190	$ 0.180	$ 0.170	$ 0.162	$ 0.154	$ 0.147	$ 0.139	$ 0.132	$ 0.126	$ 0.119	$ 0.114	$ 0.108	$ 0.102	$ 0.097
Health Benefits	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.281**	**$ 0.276**	**$ 0.264**	**$ 0.252**	**$ 0.234**	**$ 0.230**	**$ 0.217**	**$ 0.208**	**$ 0.199**	**$ 0.193**	**$ 0.185**	**$ 0.178**	**$ 0.172**	**$ 0.166**	**$ 0.160**	**$ 0.154**	**$ 0.149**	**$ 0.144**	**$ 0.139**	**$ 0.135**
Total Quantified Benefits	**$/kWh**	**$ 0.339**	**$ 0.344**	**$ 0.328**	**$ 0.316**	**$ 0.300**	**$ 0.300**	**$ 0.288**	**$ 0.282**	**$ 0.276**	**$ 0.275**	**$ 0.269**	**$ 0.266**	**$ 0.263**	**$ 0.261**	**$ 0.258**	**$ 0.256**	**$ 0.254**	**$ 0.252**	**$ 0.251**	**$ 0.251**

1.2.2 High CO_2 Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.045	$ 0.048	$ 0.058	$ 0.059	$ 0.060	$ 0.063	$ 0.066	$ 0.068	$ 0.072	$ 0.074	$ 0.077	$ 0.080	$ 0.083	$ 0.087	$ 0.090	$ 0.094	$ 0.098	$ 0.102	$ 0.106	$ 0.111
Energy Market Price Effects	$/kWh	$ 0.002	$ 0.009	$ 0.006	$ 0.005	$ 0.006	$ 0.007	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008
Avoided Capacity	$/kWh	$ 0.005	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.058**	**$ 0.068**	**$ 0.074**	**$ 0.075**	**$ 0.078**	**$ 0.081**	**$ 0.084**	**$ 0.087**	**$ 0.091**	**$ 0.094**	**$ 0.098**	**$ 0.102**	**$ 0.106**	**$ 0.111**	**$ 0.114**	**$ 0.118**	**$ 0.122**	**$ 0.126**	**$ 0.131**	**$ 0.135**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.018	$ 0.015	$ 0.009	$ 0.021	$ 0.018	$ 0.018	$ 0.020	$ 0.019	$ 0.020	$ 0.020	$ 0.021	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.023	$ 0.023	$ 0.024
Economic Benefits	$/kWh	$ 0.273	$ 0.257	$ 0.241	$ 0.226	$ 0.213	$ 0.201	$ 0.190	$ 0.180	$ 0.170	$ 0.162	$ 0.154	$ 0.147	$ 0.139	$ 0.132	$ 0.126	$ 0.119	$ 0.114	$ 0.108	$ 0.102	$ 0.097
Health Benefits	$/kWh	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009	$ 0.009
Subtotal Economic/Social Benefits/((	**$/kWh**	**$ 0.283**	**$ 0.278**	**$ 0.265**	**$ 0.248**	**$ 0.228**	**$ 0.228**	**$ 0.214**	**$ 0.204**	**$ 0.197**	**$ 0.189**	**$ 0.181**	**$ 0.174**	**$ 0.167**	**$ 0.161**	**$ 0.155**	**$ 0.150**	**$ 0.144**	**$ 0.139**	**$ 0.135**	**$ 0.130**
Total Quantified Benefits	**$/kWh**	**$ 0.341**	**$ 0.346**	**$ 0.339**	**$ 0.322**	**$ 0.306**	**$ 0.309**	**$ 0.299**	**$ 0.291**	**$ 0.288**	**$ 0.282**	**$ 0.279**	**$ 0.276**	**$ 0.274**	**$ 0.272**	**$ 0.270**	**$ 0.268**	**$ 0.266**	**$ 0.266**	**$ 0.265**	**$ 0.265**

1.2.3 Low Gas Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.042	$ 0.043	$ 0.042	$ 0.041	$ 0.042	$ 0.044	$ 0.046	$ 0.048	$ 0.050	$ 0.052	$ 0.054	$ 0.056	$ 0.059	$ 0.061	$ 0.064	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.078
Energy Market Price Effects	$/kWh	$ 0.003	$ 0.005	$ 0.004	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.005	$ 0.007	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007
Avoided Capacity	$/kWh	$ 0.005	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.057**	**$ 0.058**	**$ 0.056**	**$ 0.058**	**$ 0.060**	**$ 0.062**	**$ 0.064**	**$ 0.066**	**$ 0.069**	**$ 0.073**	**$ 0.075**	**$ 0.078**	**$ 0.081**	**$ 0.085**	**$ 0.087**	**$ 0.090**	**$ 0.093**	**$ 0.096**	**$ 0.099**	**$ 0.102**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ (0.004)	$ 0.021	$ 0.016	$ 0.021	$ 0.026	$ 0.024	$ 0.029	$ 0.028	$ 0.034	$ 0.033	$ 0.034	$ 0.034	$ 0.035	$ 0.036	$ 0.037	$ 0.037	$ 0.038	$ 0.039	$ 0.040	$ 0.041
Economic Benefits	$/kWh	$ 0.273	$ 0.257	$ 0.241	$ 0.226	$ 0.213	$ 0.201	$ 0.190	$ 0.180	$ 0.170	$ 0.162	$ 0.154	$ 0.147	$ 0.139	$ 0.132	$ 0.126	$ 0.119	$ 0.114	$ 0.108	$ 0.102	$ 0.097
Health Benefits	$/kWh	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009
Subtotal Economic/Social Benefits/((	**$/kWh**	**$ 0.275**	**$ 0.284**	**$ 0.263**	**$ 0.253**	**$ 0.244**	**$ 0.230**	**$ 0.225**	**$ 0.214**	**$ 0.211**	**$ 0.202**	**$ 0.195**	**$ 0.188**	**$ 0.182**	**$ 0.176**	**$ 0.170**	**$ 0.165**	**$ 0.160**	**$ 0.155**	**$ 0.151**	**$ 0.147**
Total Quantified Benefits	**$/kWh**	**$ 0.332**	**$ 0.341**	**$ 0.319**	**$ 0.311**	**$ 0.304**	**$ 0.292**	**$ 0.288**	**$ 0.280**	**$ 0.280**	**$ 0.275**	**$ 0.270**	**$ 0.266**	**$ 0.263**	**$ 0.260**	**$ 0.257**	**$ 0.255**	**$ 0.253**	**$ 0.251**	**$ 0.250**	**$ 0.249**

2. DELMARVA POWER & LIGHT

2.1 Utility Scale

2.1.1 Reference Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.043	$ 0.048	$ 0.047	$ 0.047	$ 0.049	$ 0.051	$ 0.053	$ 0.056	$ 0.058	$ 0.061	$ 0.064	$ 0.067	$ 0.070	$ 0.073	$ 0.076	$ 0.079	$ 0.083	$ 0.087	$ 0.091	$ 0.095
Energy Market Price Effects	$/kWh	$ (0.008)	$ 0.013	$ 0.005	$ 0.002	$ 0.002	$ 0.001	$ 0.002	$ 0.002	$ 0.001	$ 0.003	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Capacity	$/kWh	$ 0.015	$ 0.014	$ 0.018	$ 0.019	$ 0.020	$ 0.021	$ 0.022	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.022	$ 0.022	$ 0.022	$ 0.022	$ 0.021	$ 0.021
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.063**	**$ 0.089**	**$ 0.085**	**$ 0.082**	**$ 0.084**	**$ 0.087**	**$ 0.091**	**$ 0.095**	**$ 0.097**	**$ 0.102**	**$ 0.104**	**$ 0.107**	**$ 0.110**	**$ 0.113**	**$ 0.116**	**$ 0.120**	**$ 0.123**	**$ 0.127**	**$ 0.131**	**$ 0.135**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.019	$ 0.022	$ 0.018	$ 0.025	$ 0.023	$ 0.024	$ 0.024	$ 0.026	$ 0.026	$ 0.027	$ 0.027	$ 0.028	$ 0.029	$ 0.029	$ 0.030	$ 0.031	$ 0.031	$ 0.032
Economic Benefits	$/kWh	$ 0.087	$ 0.086	$ 0.083	$ 0.081	$ 0.079	$ 0.078	$ 0.077	$ 0.075	$ 0.075	$ 0.074	$ 0.073	$ 0.072	$ 0.072	$ 0.071	$ 0.070	$ 0.069	$ 0.069	$ 0.068	$ 0.067	$ 0.066
Health Benefits	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.095**	**$ 0.104**	**$ 0.106**	**$ 0.107**	**$ 0.101**	**$ 0.107**	**$ 0.104**	**$ 0.103**	**$ 0.103**	**$ 0.104**	**$ 0.104**	**$ 0.104**	**$ 0.104**	**$ 0.104**	**$ 0.104**	**$ 0.104**	**$ 0.104**	**$ 0.104**	**$ 0.104**	**$ 0.104**
Total Quantified Benefits	**$/kWh**	**$ 0.158**	**$ 0.193**	**$ 0.191**	**$ 0.190**	**$ 0.185**	**$ 0.195**	**$ 0.195**	**$ 0.198**	**$ 0.200**	**$ 0.206**	**$ 0.208**	**$ 0.211**	**$ 0.214**	**$ 0.217**	**$ 0.220**	**$ 0.224**	**$ 0.227**	**$ 0.231**	**$ 0.235**	**$ 0.239**

2.1.2 High CO_2 Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.043	$ 0.048	$ 0.053	$ 0.054	$ 0.055	$ 0.057	$ 0.060	$ 0.063	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.079	$ 0.082	$ 0.086	$ 0.090	$ 0.094	$ 0.099	$ 0.103	$ 0.108
Energy Market Price Effects	$/kWh	$ (0.008)	$ 0.013	$ 0.006	$ 0.003	$ 0.004	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.003	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.003	$ 0.003	$ 0.003
Avoided Capacity	$/kWh	$ 0.015	$ 0.014	$ 0.018	$ 0.019	$ 0.020	$ 0.021	$ 0.022	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.022	$ 0.022	$ 0.022	$ 0.022	$ 0.021	$ 0.021
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.063**	**$ 0.089**	**$ 0.091**	**$ 0.089**	**$ 0.093**	**$ 0.094**	**$ 0.098**	**$ 0.102**	**$ 0.106**	**$ 0.109**	**$ 0.112**	**$ 0.116**	**$ 0.119**	**$ 0.123**	**$ 0.127**	**$ 0.131**	**$ 0.135**	**$ 0.140**	**$ 0.144**	**$ 0.149**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.018	$ 0.015	$ 0.009	$ 0.021	$ 0.018	$ 0.018	$ 0.020	$ 0.019	$ 0.020	$ 0.020	$ 0.021	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.023	$ 0.023	$ 0.024
Economic Benefits	$/kWh	$ 0.087	$ 0.086	$ 0.083	$ 0.081	$ 0.079	$ 0.078	$ 0.077	$ 0.075	$ 0.075	$ 0.074	$ 0.073	$ 0.072	$ 0.072	$ 0.071	$ 0.070	$ 0.069	$ 0.069	$ 0.068	$ 0.067	$ 0.066
Health Benefits	$/kWh	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.097**	**$ 0.106**	**$ 0.107**	**$ 0.102**	**$ 0.095**	**$ 0.105**	**$ 0.101**	**$ 0.100**	**$ 0.101**	**$ 0.100**	**$ 0.100**	**$ 0.100**	**$ 0.100**	**$ 0.100**	**$ 0.099**	**$ 0.099**	**$ 0.099**	**$ 0.099**	**$ 0.099**	**$ 0.099**
Total Quantified Benefits	**$/kWh**	**$ 0.160**	**$ 0.195**	**$ 0.198**	**$ 0.192**	**$ 0.188**	**$ 0.199**	**$ 0.199**	**$ 0.201**	**$ 0.207**	**$ 0.210**	**$ 0.212**	**$ 0.216**	**$ 0.219**	**$ 0.223**	**$ 0.226**	**$ 0.230**	**$ 0.234**	**$ 0.239**	**$ 0.243**	**$ 0.248**

2.1.3 Low Gas Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.040	$ 0.040	$ 0.039	$ 0.038	$ 0.040	$ 0.042	$ 0.044	$ 0.046	$ 0.048	$ 0.051	$ 0.054	$ 0.056	$ 0.059	$ 0.062	$ 0.065	$ 0.069	$ 0.072	$ 0.076	$ 0.080	$ 0.084
Energy Market Price Effects	$/kWh	$ 0.008	$ (0.000)	$ (0.003)	$ 0.002	$ 0.002	$ 0.004	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004
Avoided Capacity	$/kWh	$ 0.015	$ 0.014	$ 0.018	$ 0.019	$ 0.020	$ 0.021	$ 0.022	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.023	$ 0.022	$ 0.022	$ 0.022	$ 0.022	$ 0.021	$ 0.021
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.075**	**$ 0.068**	**$ 0.067**	**$ 0.074**	**$ 0.076**	**$ 0.081**	**$ 0.083**	**$ 0.086**	**$ 0.089**	**$ 0.092**	**$ 0.095**	**$ 0.098**	**$ 0.101**	**$ 0.104**	**$ 0.107**	**$ 0.111**	**$ 0.114**	**$ 0.118**	**$ 0.122**	**$ 0.126**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ (0.004)	$ 0.021	$ 0.016	$ 0.021	$ 0.026	$ 0.024	$ 0.029	$ 0.028	$ 0.034	$ 0.033	$ 0.034	$ 0.034	$ 0.035	$ 0.036	$ 0.037	$ 0.037	$ 0.038	$ 0.039	$ 0.040	$ 0.041
Economic Benefits	$/kWh	$ 0.087	$ 0.086	$ 0.083	$ 0.081	$ 0.079	$ 0.078	$ 0.077	$ 0.075	$ 0.075	$ 0.074	$ 0.073	$ 0.072	$ 0.072	$ 0.071	$ 0.070	$ 0.069	$ 0.069	$ 0.068	$ 0.067	$ 0.066
Health Benefits	$/kWh	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009
Subtotal Economic/Social Benefits/(	**$/kWh**	**$ 0.088**	**$ 0.112**	**$ 0.105**	**$ 0.108**	**$ 0.111**	**$ 0.108**	**$ 0.111**	**$ 0.110**	**$ 0.115**	**$ 0.114**	**$ 0.114**	**$ 0.114**	**$ 0.114**	**$ 0.114**	**$ 0.114**	**$ 0.115**	**$ 0.115**	**$ 0.115**	**$ 0.116**	**$ 0.116**
Total Quantified Benefits	**$/kWh**	**$ 0.164**	**$ 0.180**	**$ 0.172**	**$ 0.182**	**$ 0.187**	**$ 0.189**	**$ 0.194**	**$ 0.195**	**$ 0.203**	**$ 0.205**	**$ 0.209**	**$ 0.212**	**$ 0.215**	**$ 0.218**	**$ 0.222**	**$ 0.225**	**$ 0.229**	**$ 0.233**	**$ 0.237**	**$ 0.242**

2.2 Behind the Meter Scale

2.2.1 Reference Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.043	$ 0.048	$ 0.047	$ 0.047	$ 0.049	$ 0.051	$ 0.053	$ 0.056	$ 0.058	$ 0.061	$ 0.064	$ 0.067	$ 0.070	$ 0.073	$ 0.076	$ 0.079	$ 0.083	$ 0.087	$ 0.091	$ 0.095
Energy Market Price Effects	$/kWh	$ (0.008)	$ 0.013	$ 0.005	$ 0.002	$ 0.002	$ 0.001	$ 0.002	$ 0.002	$ 0.001	$ 0.003	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Capacity	$/kWh	$ 0.006	$ 0.006	$ 0.008	$ 0.008	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.009	$ 0.009	$ 0.009
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004
Avoided Transmission Charge	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.049**	**$ 0.075**	**$ 0.068**	**$ 0.065**	**$ 0.067**	**$ 0.069**	**$ 0.072**	**$ 0.075**	**$ 0.077**	**$ 0.082**	**$ 0.083**	**$ 0.086**	**$ 0.089**	**$ 0.092**	**$ 0.096**	**$ 0.099**	**$ 0.103**	**$ 0.106**	**$ 0.110**	**$ 0.114**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.019	$ 0.022	$ 0.018	$ 0.025	$ 0.023	$ 0.024	$ 0.024	$ 0.026	$ 0.026	$ 0.027	$ 0.027	$ 0.028	$ 0.029	$ 0.029	$ 0.030	$ 0.031	$ 0.031	$ 0.032
Economic Benefits	$/kWh	$ 0.295	$ 0.238	$ 0.223	$ 0.209	$ 0.196	$ 0.185	$ 0.174	$ 0.165	$ 0.156	$ 0.148	$ 0.141	$ 0.134	$ 0.127	$ 0.120	$ 0.114	$ 0.108	$ 0.102	$ 0.097	$ 0.092	$ 0.087
Health Benefits	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Subtotal Economic/Social Benefits/(	**$/kWh**	**$ 0.303**	**$ 0.256**	**$ 0.245**	**$ 0.235**	**$ 0.218**	**$ 0.214**	**$ 0.202**	**$ 0.193**	**$ 0.184**	**$ 0.179**	**$ 0.172**	**$ 0.165**	**$ 0.159**	**$ 0.153**	**$ 0.148**	**$ 0.143**	**$ 0.138**	**$ 0.133**	**$ 0.129**	**$ 0.125**
Total Quantified Benefits	**$/kWh**	**$ 0.352**	**$ 0.331**	**$ 0.314**	**$ 0.300**	**$ 0.284**	**$ 0.283**	**$ 0.274**	**$ 0.268**	**$ 0.261**	**$ 0.260**	**$ 0.255**	**$ 0.252**	**$ 0.248**	**$ 0.246**	**$ 0.243**	**$ 0.242**	**$ 0.240**	**$ 0.240**	**$ 0.239**	**$ 0.239**

2.2.2 High CO2 Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.043	$ 0.048	$ 0.053	$ 0.054	$ 0.055	$ 0.057	$ 0.060	$ 0.063	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.079	$ 0.082	$ 0.086	$ 0.090	$ 0.094	$ 0.099	$ 0.103	$ 0.108
Energy Market Price Effects	$/kWh	$ (0.008)	$ 0.013	$ 0.006	$ 0.003	$ 0.004	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.003	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.003	$ 0.003	$ 0.003
Avoided Capacity	$/kWh	$ 0.006	$ 0.006	$ 0.008	$ 0.008	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.009	$ 0.009	$ 0.009
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004
Avoided Transmission Charge	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.049**	**$ 0.075**	**$ 0.074**	**$ 0.072**	**$ 0.075**	**$ 0.076**	**$ 0.079**	**$ 0.082**	**$ 0.086**	**$ 0.089**	**$ 0.092**	**$ 0.095**	**$ 0.099**	**$ 0.102**	**$ 0.106**	**$ 0.110**	**$ 0.114**	**$ 0.119**	**$ 0.123**	**$ 0.128**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.018	$ 0.015	$ 0.009	$ 0.021	$ 0.018	$ 0.018	$ 0.020	$ 0.019	$ 0.020	$ 0.020	$ 0.021	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.023	$ 0.023	$ 0.024
Economic Benefits	$/kWh	$ 0.295	$ 0.238	$ 0.223	$ 0.209	$ 0.196	$ 0.185	$ 0.174	$ 0.165	$ 0.156	$ 0.148	$ 0.141	$ 0.134	$ 0.127	$ 0.120	$ 0.114	$ 0.108	$ 0.102	$ 0.097	$ 0.092	$ 0.087
Health Benefits	$/kWh	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.305**	**$ 0.258**	**$ 0.246**	**$ 0.230**	**$ 0.212**	**$ 0.212**	**$ 0.199**	**$ 0.189**	**$ 0.183**	**$ 0.175**	**$ 0.168**	**$ 0.161**	**$ 0.155**	**$ 0.149**	**$ 0.143**	**$ 0.138**	**$ 0.133**	**$ 0.129**	**$ 0.124**	**$ 0.120**
Total Quantified Benefits	**$/kWh**	**$ 0.354**	**$ 0.333**	**$ 0.321**	**$ 0.302**	**$ 0.287**	**$ 0.288**	**$ 0.278**	**$ 0.271**	**$ 0.269**	**$ 0.264**	**$ 0.260**	**$ 0.256**	**$ 0.254**	**$ 0.251**	**$ 0.249**	**$ 0.248**	**$ 0.247**	**$ 0.247**	**$ 0.248**	**$ 0.248**

2.2.3 Low Gas Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.040	$ 0.040	$ 0.039	$ 0.038	$ 0.040	$ 0.042	$ 0.044	$ 0.046	$ 0.048	$ 0.051	$ 0.054	$ 0.056	$ 0.059	$ 0.062	$ 0.065	$ 0.069	$ 0.072	$ 0.076	$ 0.080	$ 0.084
Energy Market Price Effects	$/kWh	$ 0.008	$ (0.000)	$ (0.003)	$ 0.002	$ 0.002	$ 0.004	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.003	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004
Avoided Capacity	$/kWh	$ 0.006	$ 0.006	$ 0.008	$ 0.008	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.009	$ 0.009	$ 0.009
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004
Avoided Transmission Charge	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.061**	**$ 0.054**	**$ 0.051**	**$ 0.057**	**$ 0.058**	**$ 0.063**	**$ 0.064**	**$ 0.066**	**$ 0.069**	**$ 0.072**	**$ 0.075**	**$ 0.078**	**$ 0.080**	**$ 0.083**	**$ 0.087**	**$ 0.090**	**$ 0.093**	**$ 0.097**	**$ 0.101**	**$ 0.105**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ (0.004)	$ 0.021	$ 0.016	$ 0.021	$ 0.026	$ 0.024	$ 0.029	$ 0.028	$ 0.034	$ 0.033	$ 0.034	$ 0.034	$ 0.035	$ 0.036	$ 0.037	$ 0.037	$ 0.038	$ 0.039	$ 0.040	$ 0.041
Economic Benefits	$/kWh	$ 0.295	$ 0.238	$ 0.223	$ 0.209	$ 0.196	$ 0.185	$ 0.174	$ 0.165	$ 0.156	$ 0.148	$ 0.141	$ 0.134	$ 0.127	$ 0.120	$ 0.114	$ 0.108	$ 0.102	$ 0.097	$ 0.092	$ 0.087
Health Benefits	$/kWh	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.297**	**$ 0.264**	**$ 0.244**	**$ 0.235**	**$ 0.228**	**$ 0.215**	**$ 0.209**	**$ 0.199**	**$ 0.196**	**$ 0.188**	**$ 0.181**	**$ 0.175**	**$ 0.169**	**$ 0.163**	**$ 0.158**	**$ 0.153**	**$ 0.149**	**$ 0.145**	**$ 0.141**	**$ 0.137**
Total Quantified Benefits	**$/kWh**	**$ 0.357**	**$ 0.318**	**$ 0.295**	**$ 0.292**	**$ 0.286**	**$ 0.278**	**$ 0.273**	**$ 0.265**	**$ 0.265**	**$ 0.260**	**$ 0.256**	**$ 0.253**	**$ 0.249**	**$ 0.247**	**$ 0.245**	**$ 0.243**	**$ 0.242**	**$ 0.242**	**$ 0.241**	**$ 0.242**

3. POTOMAC ELECTRIC POWER COMPANY

3.1 Utility Scale

3.1.1 Reference Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.046	$ 0.050	$ 0.050	$ 0.049	$ 0.051	$ 0.053	$ 0.055	$ 0.057	$ 0.060	$ 0.063	$ 0.065	$ 0.068	$ 0.071	$ 0.074	$ 0.078	$ 0.081	$ 0.085	$ 0.088	$ 0.092	$ 0.096
Energy Market Price Effects	$/kWh	$ 0.001	$ 0.007	$ 0.005	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.004	$ 0.005	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Avoided Capacity	$/kWh	$ 0.012	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.011	$ 0.012	$ 0.014	$ 0.015	$ 0.016	$ 0.018	$ 0.019	$ 0.021	$ 0.023	$ 0.023	$ 0.023	$ 0.022	$ 0.022	$ 0.022	$ 0.022
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.070**	**$ 0.077**	**$ 0.075**	**$ 0.075**	**$ 0.077**	**$ 0.082**	**$ 0.084**	**$ 0.088**	**$ 0.092**	**$ 0.098**	**$ 0.102**	**$ 0.106**	**$ 0.111**	**$ 0.116**	**$ 0.120**	**$ 0.124**	**$ 0.127**	**$ 0.131**	**$ 0.135**	**$ 0.139**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.019	$ 0.022	$ 0.018	$ 0.025	$ 0.023	$ 0.024	$ 0.024	$ 0.026	$ 0.026	$ 0.027	$ 0.027	$ 0.028	$ 0.029	$ 0.029	$ 0.030	$ 0.031	$ 0.031	$ 0.032
Economic Benefits	$/kWh	$ 0.079	$ 0.076	$ 0.074	$ 0.072	$ 0.070	$ 0.069	$ 0.068	$ 0.067	$ 0.066	$ 0.065	$ 0.065	$ 0.064	$ 0.064	$ 0.063	$ 0.062	$ 0.062	$ 0.061	$ 0.060	$ 0.060	$ 0.059
Health Benefits	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Subtotal Economic/Social Benefits/(	**$/kWh**	**$ 0.087**	**$ 0.094**	**$ 0.096**	**$ 0.098**	**$ 0.092**	**$ 0.099**	**$ 0.095**	**$ 0.095**	**$ 0.094**	**$ 0.096**	**$ 0.096**	**$ 0.096**	**$ 0.096**	**$ 0.096**	**$ 0.096**	**$ 0.096**	**$ 0.096**	**$ 0.097**	**$ 0.097**	**$ 0.097**
Total Quantified Benefits	**$/kWh**	**$ 0.157**	**$ 0.171**	**$ 0.171**	**$ 0.172**	**$ 0.169**	**$ 0.180**	**$ 0.180**	**$ 0.183**	**$ 0.187**	**$ 0.194**	**$ 0.197**	**$ 0.202**	**$ 0.208**	**$ 0.213**	**$ 0.217**	**$ 0.220**	**$ 0.224**	**$ 0.228**	**$ 0.232**	**$ 0.236**

3.1.2 High CO_2 Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.046	$ 0.050	$ 0.060	$ 0.061	$ 0.062	$ 0.064	$ 0.067	$ 0.070	$ 0.073	$ 0.076	$ 0.079	$ 0.083	$ 0.086	$ 0.090	$ 0.094	$ 0.098	$ 0.102	$ 0.106	$ 0.111	$ 0.116
Energy Market Price Effects	$/kWh	$ 0.001	$ 0.007	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007
Avoided Capacity	$/kWh	$ 0.012	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.011	$ 0.012	$ 0.014	$ 0.015	$ 0.016	$ 0.018	$ 0.019	$ 0.021	$ 0.023	$ 0.023	$ 0.023	$ 0.022	$ 0.022	$ 0.022	$ 0.022
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.070**	**$ 0.077**	**$ 0.085**	**$ 0.086**	**$ 0.089**	**$ 0.093**	**$ 0.098**	**$ 0.101**	**$ 0.106**	**$ 0.110**	**$ 0.116**	**$ 0.121**	**$ 0.127**	**$ 0.132**	**$ 0.137**	**$ 0.141**	**$ 0.145**	**$ 0.150**	**$ 0.154**	**$ 0.159**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.018	$ 0.015	$ 0.009	$ 0.021	$ 0.018	$ 0.018	$ 0.020	$ 0.019	$ 0.020	$ 0.020	$ 0.021	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.023	$ 0.023	$ 0.024
Economic Benefits	$/kWh	$ 0.079	$ 0.076	$ 0.074	$ 0.072	$ 0.070	$ 0.069	$ 0.068	$ 0.067	$ 0.066	$ 0.065	$ 0.065	$ 0.064	$ 0.064	$ 0.063	$ 0.062	$ 0.062	$ 0.061	$ 0.060	$ 0.060	$ 0.059
Health Benefits	$/kWh	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009	$ 0.009
Subtotal Economic/Social Benefits/(	**$/kWh**	**$ 0.089**	**$ 0.096**	**$ 0.097**	**$ 0.093**	**$ 0.086**	**$ 0.096**	**$ 0.093**	**$ 0.091**	**$ 0.093**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**
Total Quantified Benefits	**$/kWh**	**$ 0.159**	**$ 0.173**	**$ 0.182**	**$ 0.179**	**$ 0.175**	**$ 0.189**	**$ 0.190**	**$ 0.193**	**$ 0.199**	**$ 0.202**	**$ 0.207**	**$ 0.213**	**$ 0.218**	**$ 0.224**	**$ 0.228**	**$ 0.233**	**$ 0.237**	**$ 0.242**	**$ 0.246**	**$ 0.251**

3.1.3 Low Gas Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.044	$ 0.044	$ 0.043	$ 0.043	$ 0.044	$ 0.046	$ 0.047	$ 0.049	$ 0.052	$ 0.054	$ 0.056	$ 0.059	$ 0.061	$ 0.064	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.078	$ 0.082
Energy Market Price Effects	$/kWh	$ 0.003	$ 0.003	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.004	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006
Avoided Capacity	$/kWh	$ 0.012	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.011	$ 0.012	$ 0.014	$ 0.015	$ 0.016	$ 0.018	$ 0.019	$ 0.021	$ 0.023	$ 0.023	$ 0.023	$ 0.022	$ 0.022	$ 0.022	$ 0.022
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.069**	**$ 0.067**	**$ 0.067**	**$ 0.069**	**$ 0.071**	**$ 0.074**	**$ 0.077**	**$ 0.080**	**$ 0.084**	**$ 0.089**	**$ 0.092**	**$ 0.096**	**$ 0.101**	**$ 0.105**	**$ 0.109**	**$ 0.112**	**$ 0.115**	**$ 0.118**	**$ 0.121**	**$ 0.124**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ (0.004)	$ 0.021	$ 0.016	$ 0.021	$ 0.026	$ 0.024	$ 0.029	$ 0.028	$ 0.034	$ 0.033	$ 0.034	$ 0.034	$ 0.035	$ 0.036	$ 0.037	$ 0.037	$ 0.038	$ 0.039	$ 0.040	$ 0.041
Economic Benefits	$/kWh	$ 0.079	$ 0.076	$ 0.074	$ 0.072	$ 0.070	$ 0.069	$ 0.068	$ 0.067	$ 0.066	$ 0.065	$ 0.065	$ 0.064	$ 0.064	$ 0.063	$ 0.062	$ 0.062	$ 0.061	$ 0.060	$ 0.060	$ 0.059
Health Benefits	$/kWh	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009
Subtotal Economic/Social Benefits/(	**$/kWh**	**$ 0.081**	**$ 0.102**	**$ 0.095**	**$ 0.099**	**$ 0.102**	**$ 0.099**	**$ 0.103**	**$ 0.101**	**$ 0.106**	**$ 0.105**	**$ 0.105**	**$ 0.106**	**$ 0.106**	**$ 0.106**	**$ 0.107**	**$ 0.107**	**$ 0.107**	**$ 0.108**	**$ 0.108**	**$ 0.109**
Total Quantified Benefits	**$/kWh**	**$ 0.150**	**$ 0.169**	**$ 0.162**	**$ 0.167**	**$ 0.173**	**$ 0.172**	**$ 0.180**	**$ 0.181**	**$ 0.190**	**$ 0.194**	**$ 0.198**	**$ 0.202**	**$ 0.207**	**$ 0.212**	**$ 0.215**	**$ 0.219**	**$ 0.222**	**$ 0.225**	**$ 0.229**	**$ 0.233**

3.2 Behind the Meter Scale

3.2.1 Reference Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.046	$ 0.050	$ 0.050	$ 0.049	$ 0.051	$ 0.053	$ 0.055	$ 0.057	$ 0.060	$ 0.063	$ 0.065	$ 0.068	$ 0.071	$ 0.074	$ 0.078	$ 0.081	$ 0.085	$ 0.088	$ 0.092	$ 0.096
Energy Market Price Effects	$/kWh	$ 0.001	$ 0.007	$ 0.005	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.004	$ 0.005	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Avoided Capacity	$/kWh	$ 0.005	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Transmission Charge	$/kWh	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.057**	**$ 0.066**	**$ 0.063**	**$ 0.063**	**$ 0.064**	**$ 0.068**	**$ 0.070**	**$ 0.073**	**$ 0.077**	**$ 0.081**	**$ 0.084**	**$ 0.088**	**$ 0.092**	**$ 0.095**	**$ 0.099**	**$ 0.102**	**$ 0.106**	**$ 0.110**	**$ 0.114**	**$ 0.118**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.019	$ 0.022	$ 0.018	$ 0.025	$ 0.023	$ 0.024	$ 0.024	$ 0.026	$ 0.026	$ 0.027	$ 0.027	$ 0.028	$ 0.029	$ 0.029	$ 0.030	$ 0.031	$ 0.031	$ 0.032
Economic Benefits	$/kWh	$ 0.244	$ 0.232	$ 0.217	$ 0.204	$ 0.192	$ 0.181	$ 0.171	$ 0.162	$ 0.154	$ 0.146	$ 0.139	$ 0.132	$ 0.126	$ 0.119	$ 0.113	$ 0.108	$ 0.102	$ 0.097	$ 0.092	$ 0.088
Health Benefits	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Subtotal Economic/Social Benefits/(	**$/kWh**	**$ 0.252**	**$ 0.250**	**$ 0.240**	**$ 0.230**	**$ 0.213**	**$ 0.210**	**$ 0.198**	**$ 0.190**	**$ 0.182**	**$ 0.177**	**$ 0.170**	**$ 0.164**	**$ 0.158**	**$ 0.153**	**$ 0.147**	**$ 0.142**	**$ 0.138**	**$ 0.134**	**$ 0.130**	**$ 0.126**
Total Quantified Benefits	**$/kWh**	**$ 0.309**	**$ 0.316**	**$ 0.303**	**$ 0.292**	**$ 0.278**	**$ 0.279**	**$ 0.269**	**$ 0.263**	**$ 0.259**	**$ 0.258**	**$ 0.254**	**$ 0.252**	**$ 0.250**	**$ 0.248**	**$ 0.246**	**$ 0.245**	**$ 0.244**	**$ 0.243**	**$ 0.243**	**$ 0.244**

3.2.2 High CO_2 Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.046	$ 0.050	$ 0.060	$ 0.061	$ 0.062	$ 0.064	$ 0.067	$ 0.070	$ 0.073	$ 0.076	$ 0.079	$ 0.083	$ 0.086	$ 0.090	$ 0.094	$ 0.098	$ 0.102	$ 0.106	$ 0.111	$ 0.116
Energy Market Price Effects	$/kWh	$ 0.001	$ 0.007	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007
Avoided Capacity	$/kWh	$ 0.005	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Transmission Charge	$/kWh	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.057**	**$ 0.066**	**$ 0.073**	**$ 0.074**	**$ 0.077**	**$ 0.080**	**$ 0.084**	**$ 0.086**	**$ 0.090**	**$ 0.094**	**$ 0.098**	**$ 0.102**	**$ 0.107**	**$ 0.111**	**$ 0.115**	**$ 0.120**	**$ 0.124**	**$ 0.128**	**$ 0.133**	**$ 0.138**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.018	$ 0.015	$ 0.009	$ 0.021	$ 0.018	$ 0.018	$ 0.020	$ 0.019	$ 0.020	$ 0.020	$ 0.021	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.023	$ 0.023	$ 0.024
Economic Benefits	$/kWh	$ 0.244	$ 0.232	$ 0.217	$ 0.204	$ 0.192	$ 0.181	$ 0.171	$ 0.162	$ 0.154	$ 0.146	$ 0.139	$ 0.132	$ 0.126	$ 0.119	$ 0.113	$ 0.108	$ 0.102	$ 0.097	$ 0.092	$ 0.088
Health Benefits	$/kWh	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.254**	**$ 0.252**	**$ 0.241**	**$ 0.225**	**$ 0.207**	**$ 0.208**	**$ 0.196**	**$ 0.186**	**$ 0.180**	**$ 0.173**	**$ 0.166**	**$ 0.160**	**$ 0.154**	**$ 0.148**	**$ 0.143**	**$ 0.138**	**$ 0.133**	**$ 0.129**	**$ 0.125**	**$ 0.121**
Total Quantified Benefits	**$/kWh**	**$ 0.311**	**$ 0.318**	**$ 0.314**	**$ 0.299**	**$ 0.284**	**$ 0.288**	**$ 0.279**	**$ 0.273**	**$ 0.271**	**$ 0.266**	**$ 0.264**	**$ 0.262**	**$ 0.261**	**$ 0.259**	**$ 0.258**	**$ 0.257**	**$ 0.257**	**$ 0.257**	**$ 0.257**	**$ 0.258**

3.2.3 Low Gas Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.044	$ 0.044	$ 0.043	$ 0.043	$ 0.044	$ 0.046	$ 0.047	$ 0.049	$ 0.052	$ 0.054	$ 0.056	$ 0.059	$ 0.061	$ 0.064	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.078	$ 0.082
Energy Market Price Effects	$/kWh	$ 0.003	$ 0.003	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.004	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006
Avoided Capacity	$/kWh	$ 0.005	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Transmission Charge	$/kWh	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.056**	**$ 0.056**	**$ 0.056**	**$ 0.057**	**$ 0.059**	**$ 0.060**	**$ 0.063**	**$ 0.065**	**$ 0.068**	**$ 0.072**	**$ 0.074**	**$ 0.078**	**$ 0.081**	**$ 0.084**	**$ 0.087**	**$ 0.090**	**$ 0.093**	**$ 0.096**	**$ 0.099**	**$ 0.103**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ (0.004)	$ 0.021	$ 0.016	$ 0.021	$ 0.026	$ 0.024	$ 0.029	$ 0.028	$ 0.034	$ 0.033	$ 0.034	$ 0.034	$ 0.035	$ 0.036	$ 0.037	$ 0.037	$ 0.038	$ 0.039	$ 0.040	$ 0.041
Economic Benefits	$/kWh	$ 0.244	$ 0.232	$ 0.217	$ 0.204	$ 0.192	$ 0.181	$ 0.171	$ 0.162	$ 0.154	$ 0.146	$ 0.139	$ 0.132	$ 0.126	$ 0.119	$ 0.113	$ 0.108	$ 0.102	$ 0.097	$ 0.092	$ 0.088
Health Benefits	$/kWh	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.246**	**$ 0.258**	**$ 0.239**	**$ 0.231**	**$ 0.223**	**$ 0.211**	**$ 0.206**	**$ 0.196**	**$ 0.194**	**$ 0.186**	**$ 0.180**	**$ 0.174**	**$ 0.168**	**$ 0.163**	**$ 0.158**	**$ 0.153**	**$ 0.149**	**$ 0.145**	**$ 0.141**	**$ 0.137**
Total Quantified Benefits	**$/kWh**	**$ 0.302**	**$ 0.314**	**$ 0.294**	**$ 0.287**	**$ 0.282**	**$ 0.271**	**$ 0.269**	**$ 0.261**	**$ 0.262**	**$ 0.258**	**$ 0.254**	**$ 0.251**	**$ 0.249**	**$ 0.247**	**$ 0.245**	**$ 0.243**	**$ 0.242**	**$ 0.241**	**$ 0.240**	**$ 0.240**

4. POTOMAC EDISON

4.1 Utility Scale

4.1.1 Reference Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.044	$ 0.047	$ 0.047	$ 0.046	$ 0.047	$ 0.050	$ 0.051	$ 0.054	$ 0.057	$ 0.059	$ 0.062	$ 0.065	$ 0.067	$ 0.071	$ 0.074	$ 0.077	$ 0.080	$ 0.084	$ 0.088	$ 0.092
Energy Market Price Effects	$/kWh	$ 0.001	$ 0.009	$ 0.004	$ 0.003	$ 0.003	$ 0.005	$ 0.003	$ 0.003	$ 0.002	$ 0.005	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005
Avoided Capacity	$/kWh	$ 0.013	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.011	$ 0.013	$ 0.014	$ 0.015	$ 0.017	$ 0.019	$ 0.020	$ 0.022	$ 0.024	$ 0.025	$ 0.025	$ 0.024	$ 0.024	$ 0.024	$ 0.024
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.067**	**$ 0.075**	**$ 0.069**	**$ 0.069**	**$ 0.071**	**$ 0.077**	**$ 0.078**	**$ 0.082**	**$ 0.086**	**$ 0.092**	**$ 0.096**	**$ 0.100**	**$ 0.106**	**$ 0.111**	**$ 0.115**	**$ 0.119**	**$ 0.122**	**$ 0.126**	**$ 0.130**	**$ 0.134**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.019	$ 0.022	$ 0.018	$ 0.025	$ 0.023	$ 0.024	$ 0.024	$ 0.026	$ 0.026	$ 0.027	$ 0.027	$ 0.028	$ 0.029	$ 0.029	$ 0.030	$ 0.031	$ 0.031	$ 0.032
Economic Benefits	$/kWh	$ 0.113	$ 0.110	$ 0.107	$ 0.104	$ 0.102	$ 0.099	$ 0.098	$ 0.097	$ 0.095	$ 0.095	$ 0.094	$ 0.093	$ 0.092	$ 0.091	$ 0.090	$ 0.089	$ 0.088	$ 0.087	$ 0.086	$ 0.085
Health Benefits	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.122**	**$ 0.128**	**$ 0.129**	**$ 0.130**	**$ 0.123**	**$ 0.129**	**$ 0.125**	**$ 0.125**	**$ 0.124**	**$ 0.125**	**$ 0.125**	**$ 0.125**	**$ 0.124**	**$ 0.124**	**$ 0.124**	**$ 0.124**	**$ 0.123**	**$ 0.123**	**$ 0.123**	**$ 0.123**
Total Quantified Benefits	**$/kWh**	**$ 0.189**	**$ 0.203**	**$ 0.198**	**$ 0.199**	**$ 0.194**	**$ 0.205**	**$ 0.203**	**$ 0.206**	**$ 0.209**	**$ 0.217**	**$ 0.220**	**$ 0.225**	**$ 0.230**	**$ 0.235**	**$ 0.239**	**$ 0.242**	**$ 0.246**	**$ 0.249**	**$ 0.253**	**$ 0.257**

4.1.2 High CO_2 Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.046	$ 0.050	$ 0.060	$ 0.061	$ 0.062	$ 0.064	$ 0.067	$ 0.070	$ 0.073	$ 0.076	$ 0.079	$ 0.083	$ 0.086	$ 0.090	$ 0.094	$ 0.098	$ 0.102	$ 0.106	$ 0.111	$ 0.116
Energy Market Price Effects	$/kWh	$ 0.001	$ 0.007	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007
Avoided Capacity	$/kWh	$ 0.012	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.011	$ 0.012	$ 0.014	$ 0.015	$ 0.016	$ 0.018	$ 0.019	$ 0.021	$ 0.023	$ 0.023	$ 0.023	$ 0.022	$ 0.022	$ 0.022	$ 0.022
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.070**	**$ 0.077**	**$ 0.085**	**$ 0.086**	**$ 0.089**	**$ 0.093**	**$ 0.098**	**$ 0.101**	**$ 0.106**	**$ 0.110**	**$ 0.116**	**$ 0.121**	**$ 0.127**	**$ 0.132**	**$ 0.137**	**$ 0.141**	**$ 0.145**	**$ 0.150**	**$ 0.154**	**$ 0.159**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.018	$ 0.015	$ 0.009	$ 0.021	$ 0.018	$ 0.018	$ 0.020	$ 0.019	$ 0.020	$ 0.020	$ 0.021	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.023	$ 0.023	$ 0.024
Economic Benefits	$/kWh	$ 0.079	$ 0.076	$ 0.074	$ 0.072	$ 0.070	$ 0.069	$ 0.068	$ 0.067	$ 0.066	$ 0.065	$ 0.065	$ 0.064	$ 0.064	$ 0.063	$ 0.062	$ 0.062	$ 0.061	$ 0.060	$ 0.060	$ 0.059
Health Benefits	$/kWh	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.089**	**$ 0.096**	**$ 0.097**	**$ 0.093**	**$ 0.086**	**$ 0.096**	**$ 0.093**	**$ 0.091**	**$ 0.093**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**	**$ 0.092**
Total Quantified Benefits	**$/kWh**	**$ 0.159**	**$ 0.173**	**$ 0.182**	**$ 0.179**	**$ 0.175**	**$ 0.189**	**$ 0.190**	**$ 0.193**	**$ 0.199**	**$ 0.202**	**$ 0.207**	**$ 0.213**	**$ 0.218**	**$ 0.224**	**$ 0.228**	**$ 0.233**	**$ 0.237**	**$ 0.242**	**$ 0.246**	**$ 0.251**

4.1.3 Low Gas Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.044	$ 0.044	$ 0.043	$ 0.043	$ 0.044	$ 0.046	$ 0.047	$ 0.049	$ 0.052	$ 0.054	$ 0.056	$ 0.059	$ 0.061	$ 0.064	$ 0.066	$ 0.069	$ 0.072	$ 0.075	$ 0.078	$ 0.082
Energy Market Price Effects	$/kWh	$ 0.003	$ 0.003	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.004	$ 0.006	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006
Avoided Capacity	$/kWh	$ 0.012	$ 0.008	$ 0.009	$ 0.010	$ 0.010	$ 0.011	$ 0.012	$ 0.014	$ 0.015	$ 0.016	$ 0.018	$ 0.019	$ 0.021	$ 0.023	$ 0.023	$ 0.023	$ 0.022	$ 0.022	$ 0.022	$ 0.022
Avoided RECs	$/kWh	$ 0.009	$ 0.009	$ 0.009	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.010	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.013	$ 0.013	$ 0.013
Avoided Tranmission Investment	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Transmission Charge	$/kWh	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.069**	**$ 0.067**	**$ 0.067**	**$ 0.069**	**$ 0.071**	**$ 0.074**	**$ 0.077**	**$ 0.080**	**$ 0.084**	**$ 0.089**	**$ 0.092**	**$ 0.096**	**$ 0.101**	**$ 0.105**	**$ 0.109**	**$ 0.112**	**$ 0.115**	**$ 0.118**	**$ 0.121**	**$ 0.124**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ (0.004)	$ 0.021	$ 0.016	$ 0.021	$ 0.026	$ 0.024	$ 0.029	$ 0.028	$ 0.034	$ 0.033	$ 0.034	$ 0.034	$ 0.035	$ 0.036	$ 0.037	$ 0.037	$ 0.038	$ 0.039	$ 0.040	$ 0.041
Economic Benefits	$/kWh	$ 0.079	$ 0.076	$ 0.074	$ 0.072	$ 0.070	$ 0.069	$ 0.068	$ 0.067	$ 0.066	$ 0.065	$ 0.065	$ 0.064	$ 0.064	$ 0.063	$ 0.062	$ 0.062	$ 0.061	$ 0.060	$ 0.060	$ 0.059
Health Benefits	$/kWh	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.081**	**$ 0.102**	**$ 0.095**	**$ 0.099**	**$ 0.102**	**$ 0.099**	**$ 0.103**	**$ 0.101**	**$ 0.106**	**$ 0.105**	**$ 0.105**	**$ 0.106**	**$ 0.106**	**$ 0.106**	**$ 0.107**	**$ 0.107**	**$ 0.107**	**$ 0.108**	**$ 0.108**	**$ 0.109**
Total Quantified Benefits	**$/kWh**	**$ 0.150**	**$ 0.169**	**$ 0.162**	**$ 0.167**	**$ 0.173**	**$ 0.172**	**$ 0.180**	**$ 0.181**	**$ 0.190**	**$ 0.194**	**$ 0.198**	**$ 0.202**	**$ 0.207**	**$ 0.212**	**$ 0.215**	**$ 0.219**	**$ 0.222**	**$ 0.225**	**$ 0.229**	**$ 0.233**

4.2 Behind the Meter Scale

4.2.1 Reference Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.044	$ 0.047	$ 0.047	$ 0.046	$ 0.047	$ 0.050	$ 0.051	$ 0.054	$ 0.057	$ 0.059	$ 0.062	$ 0.065	$ 0.067	$ 0.071	$ 0.074	$ 0.077	$ 0.080	$ 0.084	$ 0.088	$ 0.092
Energy Market Price Effects	$/kWh	$ 0.001	$ 0.009	$ 0.004	$ 0.003	$ 0.003	$ 0.005	$ 0.003	$ 0.003	$ 0.002	$ 0.005	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005
Avoided Capacity	$/kWh	$ 0.006	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.011
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001
Avoided Transmission Charge	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.055**	**$ 0.064**	**$ 0.058**	**$ 0.058**	**$ 0.060**	**$ 0.064**	**$ 0.065**	**$ 0.068**	**$ 0.071**	**$ 0.076**	**$ 0.079**	**$ 0.082**	**$ 0.086**	**$ 0.091**	**$ 0.094**	**$ 0.098**	**$ 0.101**	**$ 0.105**	**$ 0.108**	**$ 0.112**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.019	$ 0.022	$ 0.018	$ 0.025	$ 0.023	$ 0.024	$ 0.024	$ 0.026	$ 0.026	$ 0.027	$ 0.027	$ 0.028	$ 0.029	$ 0.029	$ 0.030	$ 0.031	$ 0.031	$ 0.032
Economic Benefits	$/kWh	$ 0.356	$ 0.320	$ 0.299	$ 0.281	$ 0.264	$ 0.249	$ 0.235	$ 0.223	$ 0.211	$ 0.201	$ 0.191	$ 0.182	$ 0.173	$ 0.164	$ 0.156	$ 0.148	$ 0.141	$ 0.134	$ 0.127	$ 0.120
Health Benefits	$/kWh	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.364**	**$ 0.338**	**$ 0.322**	**$ 0.307**	**$ 0.286**	**$ 0.279**	**$ 0.263**	**$ 0.251**	**$ 0.240**	**$ 0.232**	**$ 0.222**	**$ 0.214**	**$ 0.205**	**$ 0.197**	**$ 0.190**	**$ 0.183**	**$ 0.176**	**$ 0.170**	**$ 0.164**	**$ 0.158**
Total Quantified Benefits	**$/kWh**	**$ 0.419**	**$ 0.402**	**$ 0.380**	**$ 0.365**	**$ 0.345**	**$ 0.343**	**$ 0.327**	**$ 0.319**	**$ 0.310**	**$ 0.308**	**$ 0.301**	**$ 0.296**	**$ 0.292**	**$ 0.288**	**$ 0.284**	**$ 0.280**	**$ 0.277**	**$ 0.274**	**$ 0.272**	**$ 0.271**

4.2.2 High CO_2 Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.044	$ 0.047	$ 0.057	$ 0.058	$ 0.060	$ 0.062	$ 0.065	$ 0.067	$ 0.071	$ 0.073	$ 0.076	$ 0.080	$ 0.083	$ 0.087	$ 0.090	$ 0.094	$ 0.098	$ 0.103	$ 0.107	$ 0.112
Energy Market Price Effects	$/kWh	$ 0.001	$ 0.009	$ 0.005	$ 0.003	$ 0.004	$ 0.005	$ 0.005	$ 0.004	$ 0.005	$ 0.005	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.006
Avoided Capacity	$/kWh	$ 0.006	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.011
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001
Avoided Transmission Charge	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.055**	**$ 0.064**	**$ 0.070**	**$ 0.070**	**$ 0.073**	**$ 0.076**	**$ 0.079**	**$ 0.082**	**$ 0.087**	**$ 0.090**	**$ 0.094**	**$ 0.098**	**$ 0.103**	**$ 0.108**	**$ 0.112**	**$ 0.116**	**$ 0.120**	**$ 0.124**	**$ 0.129**	**$ 0.133**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ 0.005	$ 0.015	$ 0.018	$ 0.015	$ 0.009	$ 0.021	$ 0.018	$ 0.018	$ 0.020	$ 0.019	$ 0.020	$ 0.020	$ 0.021	$ 0.021	$ 0.022	$ 0.022	$ 0.022	$ 0.023	$ 0.023	$ 0.024
Economic Benefits	$/kWh	$ 0.356	$ 0.320	$ 0.299	$ 0.281	$ 0.264	$ 0.249	$ 0.235	$ 0.223	$ 0.211	$ 0.201	$ 0.191	$ 0.182	$ 0.173	$ 0.164	$ 0.156	$ 0.148	$ 0.141	$ 0.134	$ 0.127	$ 0.120
Health Benefits	$/kWh	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.366**	**$ 0.340**	**$ 0.323**	**$ 0.302**	**$ 0.280**	**$ 0.276**	**$ 0.260**	**$ 0.247**	**$ 0.238**	**$ 0.227**	**$ 0.218**	**$ 0.209**	**$ 0.201**	**$ 0.193**	**$ 0.185**	**$ 0.178**	**$ 0.171**	**$ 0.165**	**$ 0.159**	**$ 0.153**
Total Quantified Benefits	**$/kWh**	**$ 0.421**	**$ 0.404**	**$ 0.393**	**$ 0.372**	**$ 0.353**	**$ 0.352**	**$ 0.339**	**$ 0.329**	**$ 0.325**	**$ 0.318**	**$ 0.312**	**$ 0.308**	**$ 0.304**	**$ 0.300**	**$ 0.297**	**$ 0.294**	**$ 0.291**	**$ 0.289**	**$ 0.288**	**$ 0.287**

4.2.3 Low Gas Case

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Avoided Energy	$/kWh	$ 0.042	$ 0.042	$ 0.041	$ 0.040	$ 0.041	$ 0.043	$ 0.044	$ 0.046	$ 0.048	$ 0.051	$ 0.053	$ 0.055	$ 0.057	$ 0.060	$ 0.062	$ 0.065	$ 0.067	$ 0.070	$ 0.073	$ 0.076
Energy Market Price Effects	$/kWh	$ 0.004	$ 0.003	$ 0.003	$ 0.003	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.004	$ 0.005	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005	$ 0.005
Avoided Capacity	$/kWh	$ 0.006	$ 0.004	$ 0.004	$ 0.005	$ 0.005	$ 0.005	$ 0.006	$ 0.007	$ 0.007	$ 0.008	$ 0.009	$ 0.010	$ 0.011	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.012	$ 0.011
Avoided RECs	$/kWh	$ 0.001	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Avoided Tranmission Investment	$/kWh	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001	$ 0.001
Avoided Transmission Charge	$/kWh	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002	$ 0.002
Subtotal Bulk Power System Benefits	$/kWh	**$ 0.055**	**$ 0.053**	**$ 0.052**	**$ 0.052**	**$ 0.054**	**$ 0.057**	**$ 0.059**	**$ 0.061**	**$ 0.064**	**$ 0.068**	**$ 0.070**	**$ 0.073**	**$ 0.077**	**$ 0.080**	**$ 0.083**	**$ 0.086**	**$ 0.089**	**$ 0.091**	**$ 0.094**	**$ 0.097**
Economic/Social Benefits																					
Non-Monetized CO2 Social Benefit	$/kWh	$ (0.004)	$ 0.021	$ 0.016	$ 0.021	$ 0.026	$ 0.024	$ 0.029	$ 0.028	$ 0.034	$ 0.033	$ 0.034	$ 0.034	$ 0.035	$ 0.036	$ 0.037	$ 0.037	$ 0.038	$ 0.039	$ 0.040	$ 0.041
Economic Benefits	$/kWh	$ 0.356	$ 0.320	$ 0.299	$ 0.281	$ 0.264	$ 0.249	$ 0.235	$ 0.223	$ 0.211	$ 0.201	$ 0.191	$ 0.182	$ 0.173	$ 0.164	$ 0.156	$ 0.148	$ 0.141	$ 0.134	$ 0.127	$ 0.120
Health Benefits	$/kWh	$ 0.005	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.006	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.007	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.008	$ 0.009
Subtotal Economic/Social Benefits/(C	**$/kWh**	**$ 0.357**	**$ 0.346**	**$ 0.321**	**$ 0.308**	**$ 0.296**	**$ 0.279**	**$ 0.270**	**$ 0.257**	**$ 0.252**	**$ 0.241**	**$ 0.232**	**$ 0.223**	**$ 0.215**	**$ 0.207**	**$ 0.200**	**$ 0.193**	**$ 0.187**	**$ 0.181**	**$ 0.175**	**$ 0.170**
Total Quantified Benefits	**$/kWh**	**$ 0.413**	**$ 0.399**	**$ 0.372**	**$ 0.359**	**$ 0.350**	**$ 0.336**	**$ 0.329**	**$ 0.318**	**$ 0.316**	**$ 0.309**	**$ 0.302**	**$ 0.297**	**$ 0.292**	**$ 0.288**	**$ 0.283**	**$ 0.279**	**$ 0.275**	**$ 0.272**	**$ 0.270**	**$ 0.267**

APPENDIX D – ENERGY MODELING ANALYSIS

1. AURORA INPUTS

1.1 Load

Table 1. PJM annual gross load before distributed generation (GWh), by select transmission zone[1].

	APS	BGE	DPL	PEPCO	PJM RTO
2019	51,204	33,846	19,487	32,435	829,766
2020	51,517	33,898	19,503	32,479	829,811
2021	51,662	33,826	19,458	32,411	828,612
2022	51,948	33,856	19,490	32,450	830,735
2023	52,120	33,897	19,539	32,506	833,345
2024	52,488	34,047	19,650	32,684	838,893
2025	52,529	33,995	19,641	32,681	839,543
2026	52,790	34,056	19,701	32,792	843,539
2027	53,063	34,118	19,768	32,924	847,894
2028	53,512	34,297	19,913	33,137	854,838

Key source: PJM 2017 Load Forecast Report[2]

Table 2. Maryland annual gross load before distributed generation (GWh).

	APS	BGE	DPL	PEPCO	Maryland Total
2019	8,667	33,846	5,911	18,752	67,177
2020	8,721	33,898	5,916	18,777	67,312
2021	8,746	33,826	5,902	18,737	67,210
2022	8,794	33,856	5,911	18,760	67,321
2023	8,823	33,897	5,926	18,792	67,437
2024	8,885	34,047	5,960	18,894	67,786
2025	8,892	33,995	5,957	18,892	67,735
2026	8,936	34,056	5,975	18,956	67,924
2027	8,983	34,118	5,996	19,032	68,127
2028	9,058	34,297	6,040	19,154	68,549

Key sources: PJM 2017 Load Forecast Report; Ten-Year Plan (2016-2025) of Electric Companies in Maryland[3]; PJM Market Monitor.

1 Four of twenty PJM transmission zones include territory in Maryland: Baltimore Gas and Electric Company (BGE), Allegheny Power Systems (APS), Delmarva Power and Light Company (DPL), and Potomac Electric Power Company (PEPCO). All but BGE are multistate zones including non-Maryland territory as well.

2 https://www.pjm.com/~/media/library/reports-notices/load-forecast/2017-load-forecast-report.ashx

3 Public Service Commission of Maryland. (November 2016) Ten-Year Plan (2016-2025) of Electric Companies in Maryland. http://www.psc.state.md.us/wp-content/uploads/Final-2016_2025_TYP-12_8_16.pdf

Table 3. PJM gross summer peak demand before distributed generation (MW) by select transmission zone.

	APS	BGE	DPL	PEPCO	PJM Total
2019	8,975	7,004	4,104	6,706	155,557
2020	9,027	7,058	4,099	6,685	155,217
2021	9,065	7,017	4,085	6,666	155,210
2022	9,110	6,986	4,089	6,668	155,540
2023	9,119	6,994	4,096	6,671	156,157
2024	9,151	7,024	4,105	6,687	156,733
2025	9,194	7,097	4,129	6,704	157,227
2026	9,229	7,115	4,143	6,722	157,909
2027	9,257	7,120	4,146	6,734	158,707
2028	9,295	7,096	4,167	6,760	159,585

Key source: PJM 2017 Load Forecast Report.

Table 4. Maryland share of gross summer peak demand (MW) by transmission zone.

	APS	BGE	DPL	PEPCO
2019	1,519	7,004	1,245	3,877
2020	1,528	7,058	1,243	3,865
2021	1,535	7,017	1,239	3,854
2022	1,542	6,986	1,240	3,855
2023	1,544	6,994	1,242	3,857
2024	1,549	7,024	1,245	3,866
2025	1,556	7,097	1,252	3,876
2026	1,562	7,115	1,257	3,886
2027	1,567	7,120	1,257	3,893
2028	1,573	7,096	1,264	3,908

Key source: PJM 2017 Load Forecast Report.

1.2 Fuel Prices

Table 5. Henry Hub natural gas prices (2016$/MMBtu).

	Reference	Low Gas
2019	$3.96	$3.53
2020	$4.51	$3.56
2021	$4.39	$3.27
2022	$4.26	$3.15
2023	$4.28	$3.22
2024	$4.41	$3.35
2025	$4.51	$3.44
2026	$4.64	$3.56
2027	$4.75	$3.68
2028	$4.86	$3.86

Key source: EIA 2017 Annual Energy Outlook (AEO)[4].

Table 6. Delivered natural gas price basis to Henry Hub, select hubs (2016$/MMBtu).

	Dominion South Point	Transco Zone 6 Non-NY	TETCO M3
2019	$(0.46)	$0.30	$0.13
2020	$(0.47)	$0.25	$0.12
2021	$(0.48)	$0.24	$0.11
2022	$(0.49)	$0.23	$0.10
2023	$(0.47)	$0.23	$0.10
2024	$(0.45)	$0.23	$0.10
2025	$(0.44)	$0.23	$0.09
2026	$(0.41)	$0.23	$0.10
2027	$(0.39)	$0.24	$0.12
2028	$(0.44)	$0.28	$0.13

Key source: S&P global Market Intelligence

[4] Reference price outlook based on AEO Reference Case. Low gas scenario price outlook based on AEO High Oil and Gas Resource and Technology Case.

Table 7. As-burned coal prices by generator location (2016$/MMBtu).

	All PJM	Maryland
2019	$2.43	$3.54
2020	$2.48	$3.58
2021	$2.48	$3.59
2022	$2.48	$3.60
2023	$2.48	$ 3.60
2024	$2.49	$3.60
2025	$2.49	$3.60
2026	$2.50	$3.60
2027	$2.49	$3.59
2028	$2.49	$3.58

Key sources: EIA 2017 Annual Energy Outlook (AEO); EIA Form 923; EPIS, LLC.

1.3 Resource Retirements and Additions

Table 8. PJM post-2018 retirements.

Unit	Fuel Type	State	Summer Capacity (MW)	Retire Date
Oyster Creek	Nuclear	NJ	637	12/31/2019
Subtotal	*Nuclear*		*637*	
Dickerson ST1-3	Coal	MD	537	5/1/2020
W.H. Sammis 1-4	Coal	OH	640	5/31/2020
CP Crane Power 1-2	Coal	MD	385	6/1/2020
Herbert A Wagner 2	Coal	MD	135	6/1/2020
Bay Shore	Coal	OH	136	9/30/2020
Subtotal	*Coal*		*1,833*	
Bay Shore	Oil	OH	17	9/30/2020
Marcus Hook Refinery	NG	PA	51	4/30/2019
Doswell Energy Center	NG	VA	199	5/31/2020
Subtotal	*Oil/NG*		*267*	
TOTAL			**2,737**	

Key sources: PJM; EPIS, LLC.

Table 9. PJM Specific Thermal Unit Additions (completed feasibility and impact studies).

Project Name	Type	State	Capacity (MW)	COD
Trumbull Energy Center	CCGT	OH	940	2021
Lucas Energy Station	CCGT	OH	962	2021
Niles Energy Center	CCGT	MI	1,000	2021
Beech Hollow	CCGT	PA	1,048	2020
Allegheny Energy Center	CCGT	PA	550	2021
Renaissance (Greene Co)	CCGT	PA	1,140	2022
Moundsville Power Project	CCGT	WV	673	2020
CPV Fairview Energy Center	CCGT	PA	1,050	2021
Charles City	CCGT	VA	1,060	2020
South Field Energy	CCGT	OH	1,132	2020
TOTAL			**9,555**	

Key source: PJM Interconnection Queue.

Table 10. PJM Renewable resource additions, base case (cumulative nameplate MW)

	Onshore Wind	Offshore Wind	Distributed Solar	Utility Solar
2019	13,065	-	4,129	1,487
2020	15,317	-	5,043	1,739
2021	17,570	-	6,076	1,992
2022	19,823	800	7,090	2,244
2023	22,076	1,600	8,212	2,497
2024	24,328	2,400	8,760	2,749
2025	26,581	3,200	8,985	3,002
2026	28,834	4,000	9,354	3,254
2027	31,087	4,000	9,964	3,506
2028	33,340	4,000	10,779	3,759

Key sources: PJM 2017 Load Forecast; PJM Renewable Integration Study (14% RPS Scenario)[5].

[5] GE Energy Consulting (March 2014). PJM Renewable Integration Study. http://www.pjm.com/committees-and-groups/subcommittees/irs/pris.aspx.

Table 11. Maryland-based solar resource additions by case (cumulative nameplate MW)

	Distributed (Base)	Distributed (Solar)	Distributed (Delta)	Utility (Base)	Utility (Solar)	Utility (Delta)
2019	725	735	**10**	40	470	**430**
2020	1,005	1,020	**15**	40	684	**644**
2021	1,123	1,304	**181**	40	899	**859**
2022	1,185	1,588	**403**	40	1,114	**1,074**
2023	1,265	1,872	**607**	40	1,329	**1,289**
2024	1,288	2,157	**869**	40	1,543	**1,503**
2025	1,281	2,442	**1,161**	40	1,758	**1,718**
2026	1,274	2,726	**1,452**	40	1,973	**1,933**
2027	1,270	3,011	**1,741**	40	2,188	**2,148**
2028	1,267	3,295	**2,028**	40	2,402	**2,362**

Key sources: PJM 2017 Load Forecast Report; PJM Renewable Integration Study (30% HSBO Scenario).

2. AURORA OUTPUTS

Table 12. Reference scenario zonal prices by case (2019$/MWh)

	Base				Solar			
	APS	BGE	DPL	PEPCO	APS	BGE	DPL	PEPCO
2019	$41.7	$42.7	$42.3	$44.0	$41.7	$42.7	$42.3	$44.0
2020	$44.1	$45.6	$46.0	$46.8	$44.0	$45.5	$45.9	$46.7
2021	$42.7	$44.6	$44.8	$45.8	$42.6	$44.4	$44.7	$45.7
2022	$41.1	$43.4	$43.7	$44.6	$41.0	$43.2	$43.6	$44.4
2023	$41.2	$43.5	$43.8	$44.8	$41.1	$43.3	$43.7	$44.5
2024	$42.3	$44.6	$44.8	$45.9	$42.0	$44.3	$44.8	$45.5
2025	$42.8	$45.2	$45.6	$46.4	$42.6	$44.8	$45.5	$46.1
2026	$43.9	$46.3	$46.6	$47.5	$43.7	$45.9	$46.5	$47.1
2027	$44.9	$47.4	$47.6	$48.7	$44.8	$46.9	$47.6	$48.2
2028	$45.8	$48.3	$48.7	$49.6	$45.4	$47.7	$48.5	$48.9

Table 13. High CO_2 scenario zonal prices by case (2019$/MWh)

	Base				Solar			
	APS	BGE	DPL	PEPCO	APS	BGE	DPL	PEPCO
2019	$41.7	$42.7	$42.3	$44.0	$41.7	$42.7	$42.3	$44.0
2020	$44.1	$45.6	$46.0	$46.8	$44.0	$45.5	$45.9	$46.7
2021	$52.3	$53.2	$50.4	$54.8	$52.2	$53.0	$50.3	$54.7
2022	$51.7	$52.9	$49.9	$54.5	$51.6	$52.7	$49.8	$54.4
2023	$51.8	$52.9	$49.9	$54.6	$51.6	$52.7	$49.8	$54.3
2024	$52.6	$53.8	$50.8	$55.5	$52.3	$53.5	$50.7	$55.1
2025	$53.8	$55.0	$52.1	$56.7	$53.5	$54.6	$52.0	$56.2
2026	$54.5	$55.7	$53.0	$57.4	$54.2	$55.3	$52.9	$56.9
2027	$56.2	$57.5	$54.6	$59.2	$55.8	$57.0	$54.4	$58.7
2028	$56.7	$58.2	$55.6	$59.8	$56.3	$57.7	$55.4	$59.2

Table 14. Low Gas scenario zonal prices by case (2019$/MWh)

	Base				Solar			
	APS	BGE	DPL	PEPCO	APS	BGE	DPL	PEPCO
2019	$39.6	$40.4	$39.1	$41.8	$39.5	$40.3	$39.1	$41.8
2020	$38.8	$39.9	$38.9	$41.3	$38.8	$39.8	$38.9	$41.2
2021	$36.8	$38.0	$36.5	$39.4	$36.7	$37.9	$36.5	$39.3
2022	$35.5	$37.0	$35.6	$38.5	$35.4	$36.8	$35.6	$38.3
2023	$35.7	$37.3	$36.0	$38.7	$35.6	$37.1	$36.0	$38.4
2024	$36.5	$38.2	$37.1	$39.6	$36.3	$37.9	$37.0	$39.3
2025	$36.9	$38.6	$37.8	$40.0	$36.7	$38.3	$37.6	$39.6
2026	$37.5	$39.3	$38.5	$40.7	$37.2	$38.9	$38.4	$40.3
2027	$38.4	$40.4	$39.7	$41.7	$38.1	$39.9	$39.5	$41.3
2028	$39.3	$41.6	$41.2	$43.0	$38.9	$41.0	$41.0	$42.3

APPENDIX E – ADDITIONAL DETAILS ON CAPACITY AND TRANSMISSION ANALYSIS

1. CAPACITY

1.1 Benchmarking Daymark's Forecast Against Other Sources

Daymark's model benchmarks well against other sources. In this section we use two sources: an escalation of historical capacity prices, and forecasts of capacity estimation provided by PJM in recent reports to justify this.

Escalation of historical prices. The average nominal value of capacity prices from the 2010/11 delivery year through the 2019/20 delivery year is used to represent the value of capacity in 2020 for each zone. The use of an average price over the period removes the volatility experienced in the PJM capacity prices. This value is then escalated annually at a rate of 1.8 percent to provide nominal capacity prices through 2040. The 1.8 percent escalator is based on the latest United States Bureau of Labor Statistics (BLS) Composite Index to reflect changes in generating plant construction costs.[1] This index is used by PJM to escalate the Cost of New Entry (CONE) [2]when developing the Variable Resource Requirement (VRR) [3]curve for each BRA.

This escalation is a simplified approach, since it is not based on any historic trends with respect to solar installation nor does it include any assumptions with regard to technological advancements represented in the CONE. However, it does provide a reasonable benchmark on the capacity prices formulated in Daymark's capacity model.

Published Source for Capacity Prices. As explained in the avoided energy section, Daymark previously relied on the capacity price forecast produced by PJM for the Clean Power Plan Impact Report to the PJM energy and capacity markets. Daymark utilized the results of PJM's EPA's Final Clean Power Plan Compliance Pathways Economic and Reliability Analysis report to estimate the avoided cost of energy in the Value of Solar for Maryland's Electric Cooperatives report. The report provided capacity market prices

[1] 2020-2021 BRA Planning Period Parameters

[2] Net CONE is an estimate of the Cost of New Entry, net of the first-year non-capacity market revenues, for a reference technology resource type and is intended to equal the amount of capacity revenue the reference technology resource would require, in its first year of operation, to be economically viable given reasonable expectations of the first year energy and ancillary services revenues, and projected revenue for subsequent years.

[3] VRR is also referred to as Demand Curve. Defines a relationship between level of reserve and capacity price based on the net annual cost of a new combustion turbine. It also recognizes the value of additional capacity above the reserve required to meet the reliability criterion.

for PJM under different scenarios. The PJM report produced the price impact under different Clean Power Plan implementation scenarios.[4]

- ***Reference scenario***: The reference scenario represents a future without the Clean Power Plan. This means the Clean Power Plan does not influence any resource's entry and exit, dispatch or operating status decisions under this pathway. The Regional Greenhouse Gas Initiative, which affects new and existing resources in Maryland and Delaware, is the only CO_2 emissions limitation modeled within the PJM footprint.

- ***Low Gas Price scenario***: A continuous low gas price forecast was utilized for this scenario (gas prices remaining in the $3-$4/MMbtu range, in constant 2018 dollars over the 20-year study period). The prolonged low gas price environment prompted accelerated retirements in the region and resulted in lower wholesale energy prices but higher capacity prices than the reference case.

- ***Reference RPS scenario***: This scenario denoted an outcome independent of the Clean Power Plan, ensuring that all currently established state renewable portfolio standards are satisfied.

This report was published at the end of 2016, but due to the minimal changes in the PJM capacity market design and regional market conditions, it can be used as a reasonable benchmarking tool to assess the reasonableness of Daymark's capacity prices.

The graph below compares Daymark's capacity model prices with the two price methods above.

[4] Page 4 of PJM's EPA's Final Clean Power Plan Compliance Pathways Economic and Reliability Analysis

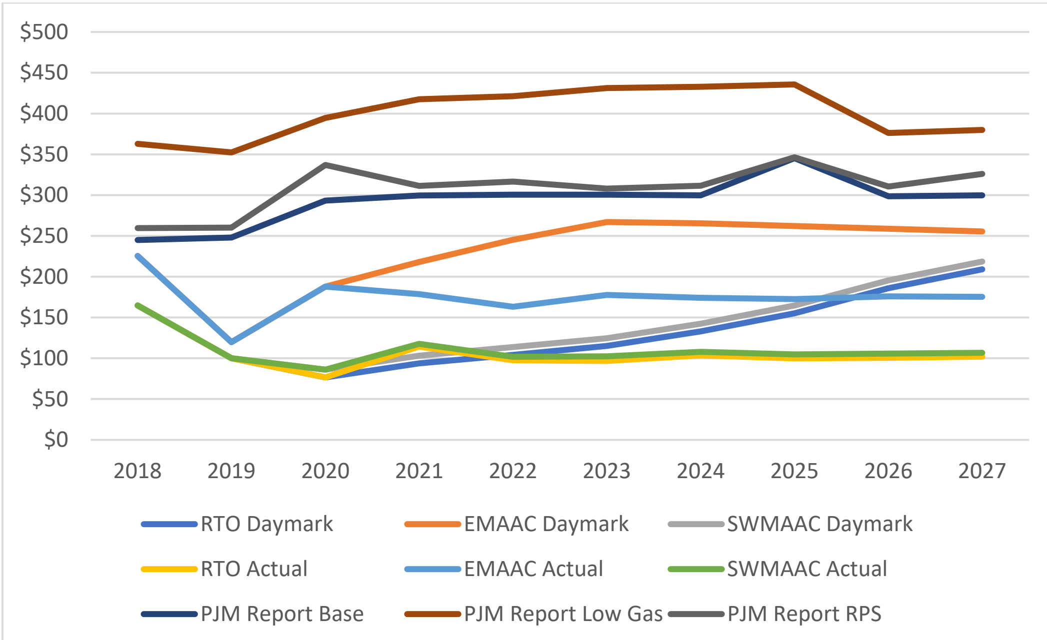


Figure: Daymark's Capacity Forecast verses Benchmark Forecasts

1.2 Assessment of Capacity Prices

The capacity prices in Maryland are estimated to remain elevated as compared to the rest of the RTO over the study period for couple of reasons. First, the transmission limitations that require the formation of separate capacity zones will most probably remain. PJM has determined that the capacity zones in Maryland will remain modeled even though they meet the CETL/CETO test. PJM has performed internal analysis to make this determination which differs from the established LDA deliverability test and has not been well explained to the market participants and it has affected market outcomes in the most recent and prior auctions.

Second, the recent elimination of the PSEG Wheel has affected the flow of capacity into the EMAAC zone. Based on the information provided by PJM, the elimination of the contract imposed constraints within the PJM transmission system, which further limits access to economic capacity that could be used to meet the capacity requirement in EMAAC.[5] Based on our review of documentation provided in various stakeholder

[5]Monitoring Analytics, Analysis of the 2020/2021 RPM Base Residual Auction Page 57

meetings, there is currently no certain path on mitigating this issue, so we assume the limitations created by the elimination of the contract will remain.

Besides the modeling reasons that enforce the notion of continuous price separation between the Maryland capacity zones and the rest of the RTO, we assess publicly available information regarding he supply stack and bidding of PJM's capacity resources. As mentioned in the main part of the report, PJM does not provide detailed information on the capacity market supply stack. However, after the end of every BRA, PJM publishes a scenario analysis document that describes how the market prices would react under different supply conditions. The scenarios related to Maryland are summarized below:[6]

Table: Scenario Analysis; Maryland

NO.	SCENARIO DESCRIPTION	RTO	MAAC	EMAAC	SWMAAC
BASE	Actual 2020/21 results	$76.53	$86.04	$187.87	$86.04
1	Unconstrained Simulation - Remove LDA import limits	$104.46	$104.46	$104.46	$104.46
2	Remove 3000 MW of CP supply from bottom of supply curve in MAAC (302.4 MW in rest of MAAC, 991.6 MW in rest of EMAAC, 259.3 MW in rest of PS, 258 MW in PS-North, 120.1 MW in DPL-South, 336.9 MW in PEPCO, 352.3 MW in BGE, 379.4 MW in PL)	$75.00	$102.04	$291.24	$102.04
3	Add 3000 MW of CP supply to bottom of supply curve in MAAC (302.4 MW in rest of MAAC, 991.6 MW in rest of EMAAC, 259.3 MW in rest of PS, 258 MW in PS-North, 120.1 MW in DPL-South, 336.9 MW in PEPCO, 352.3 MW in BGE, 379.4 MW in PL)	$74.50	$85.00	$149.92	$85.00
4	Remove 6000 MW of CP supply from bottom of supply curve in MAAC (604.9 MW in rest of MAAC, 1983.2 MW in rest of EMAAC, 518.7 MW in rest of PS, 516 MW in PS-North, 240.1 MW	$82.00	$155.79	$424.65	$155.79

[6] http://www.pjm.com/markets-and-operations/rpm.aspx, Delivery year 2020/2021 Scenario Analysis for Base Residual Auction.

NO.	SCENARIO DESCRIPTION	RTO	MAAC	EMAAC	SWMAAC
	in DPL-South, 673.7 MW in PEPCO, 704.6 MW in BGE, 758.8 MW in PL)				
5	Add 6000 MW of CP supply to bottom of supply curve in MAAC (604.9 MW in rest of MAAC, 1983.2 MW in rest of EMAAC, 518.7 MW in rest of PS, 516 MW in PS-North, 240.1 MW in DPL-South, 673.7 MW in PEPCO, 704.6 MW in BGE, 758.8 MW in PL)	$75.00	$75.00	$124.70	$75.00

At first, the unconstrained scenario results confirm the view that price separation exists due to transmission limitations. In an unconstrained capacity market, the prices are uniform throughout the RTO at about $104.46 MW-Day. Scenarios 2 through 5 provide an indication on how significant additions or retirements of supply resources at the bottom of the supply curve will affect the capacity prices throughout the RTO. Scenario 2 assesses the addition of 3000 MW and shows that capacity prices at MAAC and SWMAAC are not affected at all (due to transmission limitations).

Scenario 5 indicates that the addition of 6000 MW at the bottom of the supply curve will in effect eliminate any price separation between SWMAAC, MAAC and the unconstrained RTO. EMAAC will still be transmission limited even after close to 3000 MW of economic generation is added within the zone (1983.2 MW in rest of EMAAC, 518.7 MW in rest of PS, 516 MW is PS-North and 240.1 MW in DPL-South).

2. TRANSMISSION

2.1 PJM Transmission Cost Allocation and Cost Recovery

The costs of the transmission upgrades included in the RTEP plan are allocated and recovered by an established PJM methodology.[7] The transmission costs are allocated in terms of physical characteristics and purpose of the proposed transmission element. The solution-based Distribution Factor Analysis (or DFAX) method determines the share of cost responsibility based on the benefit produced by the new transmission element. The Load Ration Share distributes the transmission project cost across multiple zones

[7] Cost allocation is how costs responsibility for transmission projects is assigned to load zones and/or merchant Transmission Owners. Cost recovery is how transmission owners and other payors recover assigned costs from end-use customers through rates

based on each zone's respective non-coincident peak. The table below provides an overview of how the cost of different transmission elements is allocated.

Table: Transmission Cost Allocators

BASELINE PROJECTS	**Reliability**	345 kV or Lower	100% of Project Costs Allocated on Solution-based DFAX
		345 kV or Higher	50% of Projects costs allocated on a DFAX basis
	Market Efficiency Projects	High Voltage	50% of Project costs allocated on a Load Ratio Share Basis
		Low Voltage	50% allocated on load ratio share
SUPPLEMENTAL PROJECTS			50% allocated to zones that show a decrease in the next present value of Load Energy Payments

Cost recovery for new transmission projects in PJM can be calculated by two different mechanisms. The first is used by most of the Transmission Owners in PJM and it produces transmission rates called Network Integration Transmission Service (NITS), based on a formula that permits the recovery of the costs for the provision of transmission service. NITS rates are set so that network customers within each transmission zone collectively pay the annual transmission revenue requirement according to each customer's share of zonal network transmission service peak loads. These rates are updated annually to reflect changes, such as addition of new transmission investments. The second mechanism, which is used by fewer Transmission Owners, sets the transmission rate at a fixed rate that remains the same until it is updated through a cost-based rate filing at the FERC.

APPENDIX F: INTERCONNECTION PROCESS METHODOLOGIES

The typical interconnection process for distribution solar projects is to assess system impacts and determine mitigation costs for a proposed project using a sequential queue process. In many states, the interconnection approval process is based on the typical flow chart shown in Figure 1.[1]

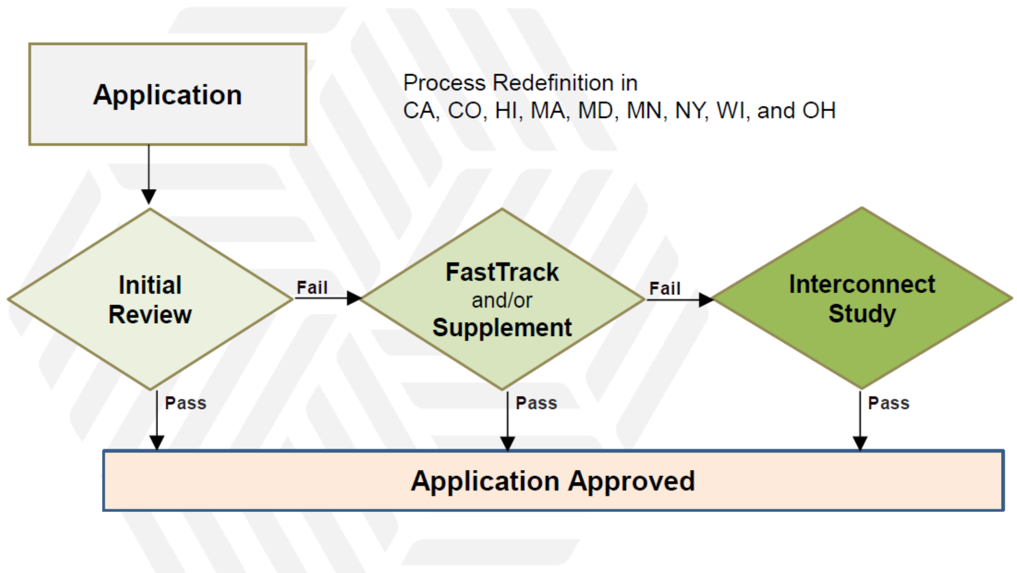


Figure 1: Typical Interconnection Approval Process

The process is designed to accommodate the large amount of proposed solar in an expedited manor. In California, however, it has been determined that the fast-track test has resulted in both false positive and false negative outcomes.

This type of sequential queue process may be adequate for low levels of solar penetration; however, as solar penetration levels increase, a higher percentage of projects will not qualify for approval under the initial review or fast-track tests. Consequently, more interconnection studies

[1] Emerging distribution planning analysis, Lew, Distribution Systems and Planning for Midwest PUCs, Jan 2018

will become necessary which could potentially result in a queue back-log.

Furthermore, under the sequential queue process a proposed project is solely responsible for the mitigation costs that are determined to be necessary to support the reliable interconnection. This can often result in withdrawal of the project, which in turn, can halt requests for interconnection of additional projects in the same general location. Ultimately, this may not be the most efficient process to encourage the optimal amount of distributed solar generation as penetration levels increase.

As solar penetration levels increase, the interconnection approval process should consider “grouping” or “clustering” of proposed projects in the same general location so that they could share in the associated upgrade costs and/or locational benefits. Furthermore, the future interconnection approval process should encourage the pairing of complimentary projects and advanced technologies as described in Section 4.4.4 of the main report.

As solar penetration levels increase, the interconnection approval process should continue to evolve to enable the safe and reliable interconnection of the maximum, or near maximum amount of solar projects.

APPENDIX G – LINE LOSSES

General Theory of Line Losses

For distribution and transmission alike, line losses are undesirable and are a function of the square of the current (I) times the inherent live resistance (R), or $I^2 \times R$. The current (I) is directly proportional to the power (P):

$$P = V * I$$

Where P is power and V is the voltage

Due to this, higher voltages are preferable in power transmission because they equate to smaller currents for the same amount of power transmitted. However, distribution systems are limited to lower voltages (typically 23-kV and below). Lower voltages mean smaller structure sizes needed for placement in urban, suburban, and rural locations. Reduction in line losses ($I^2 \times R$) can be achieved by either reducing the resistance (R), or by reducing the current (I). Reduction of the resistance can only be significantly decreased by an increase in distribution line or cable size; therefore, reducing high line currents can be a more viable solution. Offsetting of power flow by siting solar units close to the system loads can be an effective measure to reduce current and therefore reduce overall transmission and distribution system losses.

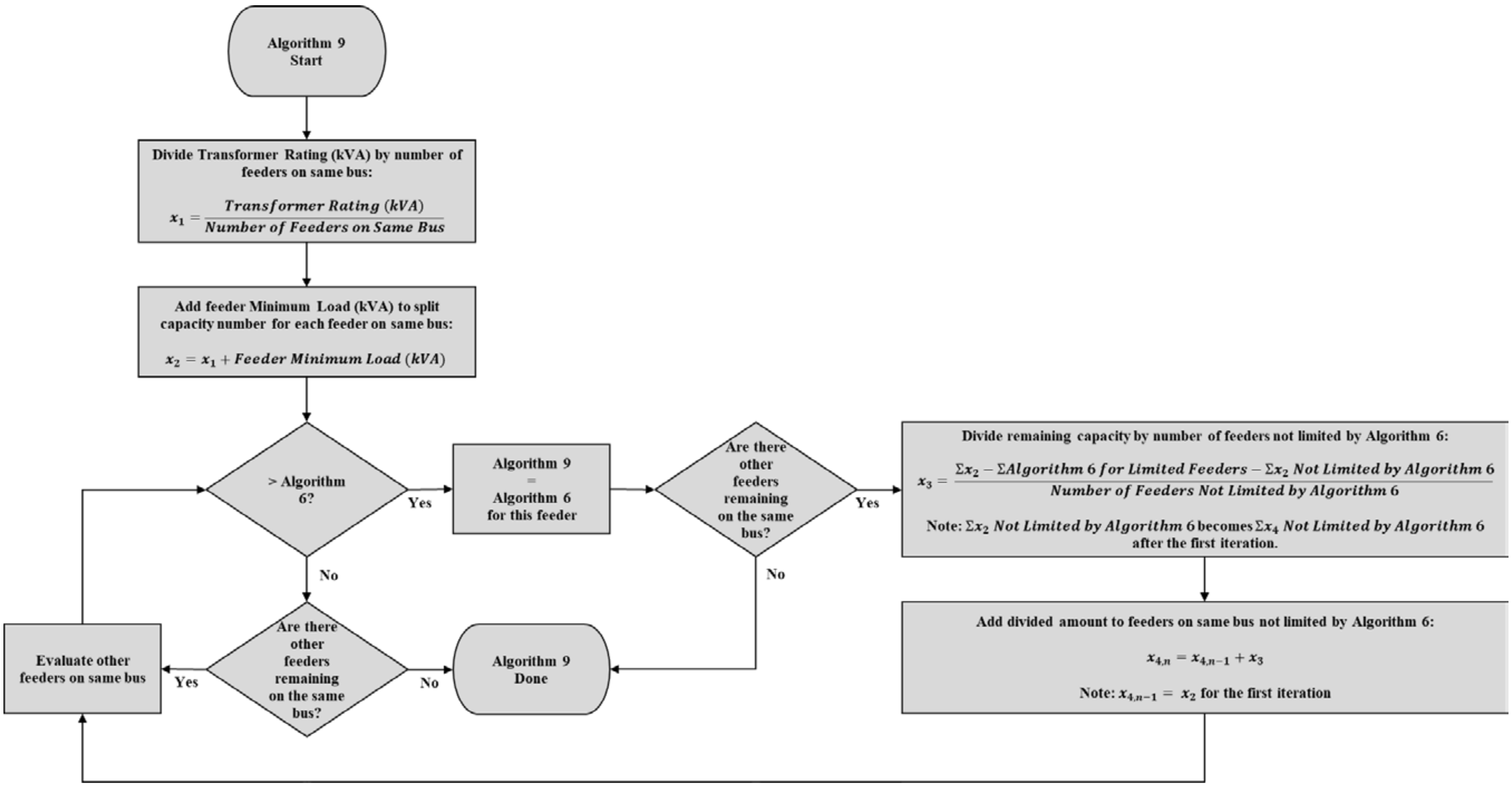
From a *transmission* standpoint, power flows travel from substation to substation across transmission lines. These flows are heavily dependent on the load demand at each substation and as demand goes up, so does the potential for losses on the transmission lines. Distribution-level solar installations can translate to lower net loading levels at substations, thus reducing transmission-level losses. If permitted by interconnection standards, power factor control at solar sites can also aid in loss reduction by improving substation level voltages and power factors.

From a *distribution* standpoint, the same losses occur, though the systems are typically configured radially under normal operation, whereas loop schemes are more common in transmission-level systems. Distribution-level solar installations can be very effective at reducing local losses.

APPENDIX H – ALGORITHMS

Name	Key Factors	Summary	Notes/Disclaimers	Formulas and Assumptions
Algorithm 1	Minimum Daytime Loading	Assumes that net export on feeders is not allowed. Aggregate generation can only export up to minimum loading values.	Not allowing feeder export may not be realistic with high solar penetration.	X = Min Loading
Algorithm 2	Loading Based on Real Time Dispatch	Assumes that net export on feeders is not allowed. Aggregate generation can only export up to loading values based on real time dispatch estimates.	Not allowing feeder export may not be realistic with high solar penetration.	X = Peak Loading * 0.6 Assume 60% of peak load is realistic real time dispatch capacity to be filled.
Algorithm 3	Transformer Ratings Minimum Daytime Loading	Allows generation to be added up to the substation transformer rating. Uses minimum loading values as negative generation values.	Applied on a feeder-by-feeder bases. DOES NOT consider generation on adjacent feeders. May result in exceeded backbone conductor ratings.	X = Transformer Rating + Min Loading
Algorithm 4	Transformer Ratings Loading Based on Real Time Dispatch	Allows generation to be added up to the substation transformer rating. Uses loading values based on real time dispatch estimates as negative generation values.	Applied on a feeder-by-feeder bases. DOES NOT consider generation on adjacent feeders. May result in exceeded backbone conductor ratings.	X = Transformer Rating + Peak Loading * 0.6 Assume 60% of peak load is realistic real time dispatch capacity to be filled.
Algorithm 5	Transformer Ratings	Allows generation to be added up to 95% of the substation transformer rating. Does not consider loading.	Applied on a feeder-by-feeder bases. DOES NOT consider generation on adjacent feeders. May not be realistic, but this standard has existed for some utilities historically.	X = Transformer Rating * 0.95
Algorithm 6	Backbone Conductor Ratings Minimum Daytime Loading	Allows generation to be added up to the feeder backbone conductor rating. Uses minimum	Applied on a feeder-by-feeder bases. DOES NOT consider generation on adjacent feeders. May result in exceeded transformer ratings.	X = Conductor Ampacity + Min Loading

Name	Key Factors	Summary	Notes/Disclaimers	Formulas and Assumptions
		loading values as negative generation values.		
Algorithm 7	Fault Currents Feeder Nominal Voltages	Allows generation to be added up to the number that would likely cause voltage and/or flicker issues.	Based on interconnections within a mile of the substation. Results may vary depending on location along feeder.	X = (Transformer 3LG Current * Feeder Voltage * sqrt(3) * 0.5) / 29 The 0.5 factor assumes half of the 3LG fault current is lost within a mile (based on testing). The 29 factor corresponds with a stiffness ratio of 30, which is a strong ratio for most interconnections.
Algorithm 8	Fault Currents Feeder Nominal Voltages	Determines feeder suitability based on system strength. The result is a non-numerical value indicative of whether a feeder is "Very Weak" or "Very Strong" with multiple steps in between.	Should be used strictly as a rule of thumb to get a general feel for feeder suitability.	X = (Transformer 3LG Current * Feeder Voltage * sqrt(3) * 0.5 The 0.5 factor assumes half of the 3LG fault current is lost within a mile (based on testing). If X < 10, "Very Weak" If 10 <= X < 15, "Weak" If 15 <= X < 25, "Moderate" If 25 <= X < 40, "Strong" If X > 40, "Very Strong" Note that stiffness ratios were translated to short circuit kVA so that feeder voltage is taken into account. Also note that the project size used for this calculation is 3 MW.
Algorithm 9 Thermal Max	**Transformer Ratings** **Minimum Daytime Loading** **Backbone Conductor Ratings**	**Allows generation to be added up to the substation transformer rating OR the backbone conductor rating. Uses minimum loading values as negative generation values.**	**DOES consider generation on adjacent feeders. This algorithm presents the most realistic scenarios.**	X = MIN(Algorithm 3, Algorithm 6)


Algorithm 9
Start
Divide Transformer Rating (kVA) by number of feeders on same bus:
$x_1 = \frac{Transformer\ Rating\ (kVA)}{Number\ of\ Feeders\ on\ Same\ Bus}$
Add feeder Minimum Load (kVA) to split capacity number for each feeder on same bus:
$x_2 = x_1 + Feeder\ Minimum\ Load\ (kVA)$
> Algorithm 6?
Yes
No
Algorithm 9 = Algorithm 6 for this feeder
Are there other feeders remaining on the same bus?
Yes
No
Divide remaining capacity by number of feeders not limited by Algorithm 6:
$x_3 = \frac{\Sigma x_2 - \Sigma Algorithm\ 6\ for\ Limited\ Feeders - \Sigma x_2\ Not\ Limited\ by\ Algorithm\ 6}{Number\ of\ Feeders\ Not\ Limited\ by\ Algorithm\ 6}$
Note: Σx_2 Not Limited by Algorithm 6 becomes Σx_4 Not Limited by Algorithm 6 after the first iteration.
Add divided amount to feeders on same bus not limited by Algorithm 6:
$x_{4,n} = x_{4,n-1} + x_3$
Note: $x_{4,n-1} = x_2$ for the first iteration
Are there other feeders remaining on the same bus?
Yes
No
Evaluate other feeders on same bus
Algorithm 9
Done

APPENDIX I – LAND USE BY COUNTY

Solar Suitability Analysis for the State of Maryland - With Constraints

ESS Group, Inc., 2018

This report summarizes a geospatial analysis of land use data from the National Land Cover Database for the State of Maryland. This NLCD data is current as of 2014 and has a spatial resolution of 30-meters. The report provides acreage information derived from NLCD land use types within the State that have been generalized through the analysis as Agriculture, Forest, and Vegetated types. The resulting acreage calculations reflect the removal of the following geospatial constraints:

Constraint	Source
Water bodies (Lakes & Ponds)	Maryland GIS Data Catalog, 2005
Land use classified as 'Open Water'	National Land Cover Database, 2014
Wetlands	National Wetlands Inventory, 2017
Wetlands of Special State Concern	Maryland GIS Data Catalog, 1998
Rivers and streams	Maryland GIS Data Catalog, 2017
Protected areas	USGS Protected Areas Database of the United States, 2017
Airport buffer (10,000 ft)*	Airport point locations (MD GIS Data Catalog, 2017) with 10,000 foot buffer (ESS)
Road buffer (500 meter)	State-wide road centerlines (MD GIS Data Catalog, 2017) with 500 m buffer (ESS)
Developed, High Intensity	NLCD land cover type
Developed, Medium Intensity	NLCD land cover type
Developed, Low Intensity	NLCD land cover type
Developed, Open Space	NLCD land cover type
Terrain Slope > 10%	LiDAR from Maryland GIS Data Catalog (years vary by county)
Natural Heritage Areas	Maryland GIS Data Catalog, 2010
Area < 25 Acres	

**Because of its size, Baltimore-Washington International Airport (BWI) has a 20,000' buffer.*

The following NLCD land use types have been consolidated into a single classification:
Cultivated Crops, Pasture/Hay - Consolidated into classification "Agriculture"
Deciduous Forest, Evergreen Forest, Mixed Forest - Consolidated into classification "Forest"
Grassland/Herbaceous, Shrub/Scrub - Consolidated into classification "Vegetated"

Agriculture land for the following counties was removed due to zoning restrictions: Carroll, Harford, Kent, Montgomery
Forested land for the following counties was removed due to zoning restrictions: Frederick, Harford

State-Wide Acreage Totals for Constrained Land Use

State-wide totals for each NLCD land use type after removal of any associated constraint acreage.

Land Use	Acres	% Total
Agriculture	757,030.69	56.97%
Vegetated	53,229.15	4.01%
Forest	518,532.39	39.02%
TOTAL ALL ACRES	**1,328,792.22**	**100.00%**

County-Wide Acreage Totals for Constrained Land Use

County-wide totals for generalized land use type within the State of Maryland after removal of any associated constraint acreage.

Allegany

	Acres	% Total
Agriculture	8,722.52	38.09%
Forest	14,080.62	61.48%
Vegetated	97.78	0.43%
TOTAL	22,900.92	100.00%

Anne Arundel

	Acres	% Total
Agriculture	15,033.05	42.39%
Forest	19,052.55	53.72%
Vegetated	1,380.56	3.89%

Anne Arundel

		Acres	% Total
	TOTAL	35,466.16	100.00%

Baltimore

		Acres	% Total
Agriculture		41,377.02	49.15%
Forest		39,910.60	47.41%
Vegetated		2,900.45	3.45%
	TOTAL	84,188.07	100.00%

Baltimore City

		Acres	% Total
Forest		6.01	100.00%
	TOTAL	6.01	100.00%

Calvert

		Acres	% Total
Agriculture		12,583.01	24.65%
Forest		36,750.86	72.00%
Vegetated		1,707.38	3.35%
	TOTAL	51,041.24	100.00%

Caroline

		Acres	% Total
Agriculture		57,952.15	82.98%
Forest		10,389.28	14.88%
Vegetated		1,494.98	2.14%
	TOTAL	69,836.41	100.00%

Carroll

		Acres	% Total
Forest		24,758.75	92.75%
Vegetated		1,935.75	7.25%
	TOTAL	26,694.51	100.00%

Cecil

		Acres	% Total
Agriculture		44,700.56	54.71%
Forest		32,797.49	40.14%
Vegetated		4,211.27	5.15%
	TOTAL	81,709.33	100.00%

Charles

		Acres	% Total
Agriculture		26,095.68	28.17%
Forest		62,080.94	67.02%
Vegetated		4,447.06	4.80%
	TOTAL	92,623.67	100.00%

Dorchester

		Acres	% Total
Agriculture		53,085.69	84.14%
Forest		7,271.48	11.52%
Vegetated		2,738.22	4.34%
	TOTAL	63,095.39	100.00%

Frederick

		Acres	% Total

Frederick

		Acres	% Total
Agriculture		107,453.69	98.09%
Vegetated		2,095.79	1.91%
	TOTAL	109,549.48	100.00%

Garrett

		Acres	% Total
Agriculture		30,760.95	34.47%
Forest		58,028.83	65.03%
Vegetated		444.83	0.50%
	TOTAL	89,234.60	100.00%

Harford

		Acres	% Total
Vegetated		3,652.17	100.00%
	TOTAL	3,652.17	100.00%

Howard

		Acres	% Total
Agriculture		25,358.48	56.04%
Forest		18,687.47	41.30%
Vegetated		1,201.13	2.65%
	TOTAL	45,247.08	100.00%

Kent

		Acres	% Total
Forest		4,615.97	95.29%
Vegetated		228.02	4.71%
	TOTAL	4,843.99	100.00%

Montgomery

		Acres	% Total
Forest		20,859.32	90.64%
Vegetated		2,154.56	9.36%
	TOTAL	23,013.88	100.00%

Prince George'

		Acres	% Total
Agriculture		19,354.97	30.17%
Forest		41,805.53	65.17%
Vegetated		2,983.89	4.65%
	TOTAL	64,144.39	100.00%

Queen Anne's

		Acres	% Total
Agriculture		51,396.98	83.46%
Forest		9,601.62	15.59%
Vegetated		587.50	0.95%
	TOTAL	61,586.10	100.00%

Somerset

		Acres	% Total
Agriculture		24,125.09	69.80%
Forest		7,264.36	21.02%
Vegetated		3,173.41	9.18%
	TOTAL	34,562.85	100.00%

St. Mary's

		Acres	*% Total*
Agriculture		26,129.26	33.08%
Forest		49,403.05	62.55%
Vegetated		3,455.11	4.37%
	TOTAL	**78,987.41**	**100.00%**

Talbot

		Acres	*% Total*
Agriculture		45,689.72	81.76%
Forest		8,706.44	15.58%
Vegetated		1,484.71	2.66%
	TOTAL	**55,880.88**	**100.00%**

Washington

		Acres	*% Total*
Agriculture		74,137.67	73.84%
Forest		26,192.70	26.09%
Vegetated		78.64	0.08%
	TOTAL	**100,409.00**	**100.00%**

Wicomico

		Acres	*% Total*
Agriculture		46,579.84	67.04%
Forest		16,434.88	23.65%
Vegetated		6,467.69	9.31%
	TOTAL	**69,482.41**	**100.00%**

Worcester

		Acres	*% Total*
Agriculture		46,494.36	76.68%
Forest		9,833.64	16.22%
Vegetated		4,308.27	7.11%
	TOTAL	**60,636.28**	**100.00%**

APPENDIX K – COUNTY ZONING INFORMATION

Table 1 - Summary of Maryland County Zoning Requirements for Utility Scale Solar Development

County	System Definition	Agricultural	Forested	Conservation	Industrial	Commercial	Residential	Other	Minimum Lot Size	Maximum Lot Size	Maximum Lot Coverage	Minimum Setback	Glare Mitigation	Screening Buffer	Height	Lighting	Fencing	Power Lines and Interconnections	Decommission and Land Reclamation	Stormwater	Vegetation Removal	Other
Allegany	Solar Energy Systems as Primary Use	Special Exception Required	Special Exception Required	Special Exception Required	Special Exception Required	Prohibited	Prohibited	Brownfields - Permitted Reclaimed Surface Mines - Permitted Mixed Use - Prohibited Mining - Special Exception Required	NA	NA	NA	Greater of 30', fire separation distance, industrial setback	Yes	Yes	NA	NA	Yes	Underground	Plan required	NA	NA	NA
Anne Arundel	Solar Energy System - Principal	Conditional Use (Prohibited on preserved land)	NA	Prohibited	Conditional Use	Prohibited	Prohibited	Waterfront - Prohibited Mixed Use - Prohibited Village Center - Prohibited Small Business - Prohibited	NA	NA	80%	NA	Yes	Yes	Per zoning district	As required for safety	NA	NA	Grade and reseed	Low maintenance, low growing vegetative surfaces encouraged	NA	Moratorium in effect until 7/18
Baltimore	Solar Facility - Commercial Use	Special Exception Required, Not allowed if preservation easement	NA	Special Exception Required, Not allowed if preservation easement	Special Exception Required	Special Exception Required	Prohibited	Waterfront - Prohibited Research - Prohibited	NA	Acres needed for 2 MW (no more than 10 per district)	NA	50' (Agricultural, Conservation)	Yes	Yes	20' (Agricultural, Conservation)	NA	Yes	NA	Security Bond	NA	NA	NA
Baltimore City	NA																					
Calvert	Power Generating Facility, Commercial	Special Exception	Special Exception	Special Exception	Special Exception	Special Exception (Employment Center District)	Prohibited	Rural Commerical - Prohibited Marine Commercial - Prohibited Town Center - Prohibited	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caroline	Solar Energy System, Commercial, Large Scale (> 2MW)	Special Use Exception	Special Use Exception	Special Use Exception	Special Use Exception	Special Use Exception (General)	Prohibited	Mining - Special Use Exception Village Center - Prohibited Mobile Home - Prohibited	NA	2,000 aggregate county-wide	NA	Minimum zoning setback or at least 25', 200' from residential	Yes	As needed	15'	Minimum necessary, activated by motion sensors, fully shielded and downcast	6' high	Underground	Yes	NA	Tree removal minimized, >2% removal requires approval	Emergency and Warning Signs
Carroll	Solar Energy Conversion Facility	Prohibited	NA	Prohibited	Conditional Use	Conditional Use	Prohibited		NA	NA	NA	200' nonresidential, 400' residential (Commercial); 100 nonresidential, 200' residential (Industrial)	Yes	Can reduce setback if used	25'	NA	NA	NA	NA	NA	NA	NA
Cecil	Power Generating Facilities	Special Exception	NA	Prohibited	Permitted	Prohibited	Prohibited	Mining - Prohibited Mixed Use - Prohibited	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Charles	Solar Energy System, Large	Special Exception	NA	Special Exception	Special Exception	Special Exception	Special Exception	Waterfront - Special Exception Mixed Use - Special Exception Village Center - Special Exception	NA	NA	NA	50'	Yes	Yes	25'	NA	NA	Underground	Yes	NA	NA	NA
Dorchester	Solar Energy System, Utility Scale	Special Exception	NA	Special Exception	Special Exception	Special Exception	Special Exception	Village Center - Special Exception	25 acres	NA	NA	Per zoning district	Yes	Yes	45' (50' industrial)	NA	NA	Underground	Yes	NA	As authorized and must be mitigated one -to-one	NA
Frederick	Solar Facility, Commercial	Permitted with approval (prohibited for prime and preserved farmland)	Prohibited	Prohibited	Permitted with site plan approval	Prohibited	Prohibited	Mining - Prohibited Mixed Use - Prohibited Village Center - Prohibited Research - Prohibited	20,000 sq ft (Light Industry), 1 acre (General Industry), 10 acres (Agricultural)	750 acres (Ag)	10% of tillable acreage	50'	Yes	Yes (25 foot deep for Agricultural)	30'	NA	NA	NA	Yes	NA	NA	Lot Width - at least 200 ft Register with Fire Department
Garrett	NA																					
Harford	NA	Prohibited	Prohibited	Prohibited	Permitted	Prohibited	Prohibited															
Howard	Solar Facility, Commercial	Conditional Use	NA	NA	Prohibited	Prohibited	Rural - Conditional Use, All others - Prohibited		10 Acres	75 acres	NA	50'	Yes	Yes	20'	NA	NA	NA	Yes	NA	Tree removal minimized and reforestation required	Register with Fire Department
Kent	Solar System, Utility Scale	Special Exception	NA	Special Exception	Conditional Use (Prohibited in Light Industrial)	Special Exception	Prohibited	Village Center - Prohibited	NA	5 acres (Agricultural, Conservation only)	NA	NA	Yes	Yes	45' (38' Agricultural, Conservation)	NA	NA	NA	NA	NA	Tree removal minimized and mitigated (Agricultural, Conservation)	Register with Fire Department
Montgomery	Solar Collection System	Prohibited	NA	NA	Limited Use	Limited Use	Prohibited		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Yes	NA	NA	NA
Prince George's	NA																					
Queen Anne's	Solar Array	Conditional Use	NA	Conditional Use	Prohibited	Prohibited	Prohibited	Waterfront - Prohibited Village Center - Prohibited Estate - Prohibited	NA	NA	NA	NA	NA	Yes	NA	Per code	NA	Underground	Yes	Yes	Forested areas removed must be mitigated	Operations and Maintenance Plan Noise < 60 dBA
Saint Mary's	Utility Major	Conditional Use	Conditional Use	Conditional Use	Conditional Use	Prohibited	Conditional Use - Low Density, Prohibited - all other residential	Village Center - Prohibited Office Park - Conditional Use Waterfront - Prohibited	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Somerset	NA																					
Talbot	Solar Energy System, Large Scale (> 2MW)	Special Exception	NA	Prohibited	Special Exception	Special Exception	Special Exception	Village Center - Special Exception	NA	NA	NA	150'	NA	Yes	16'	Motion sensors, shielded and downcast	Yes	NA	Yes	Yes	Minimize impacts	Operations and Maintenance Plan Publice Notice Emergency and Warning Signs
Washington	Solar Energy Generating Systems	Special Exception	NA	Special Exception	Special Exception	Prohibited	Prohibited	Mining - Special Exception Village Center - Prohibited	20 acres	NA	Per district requirements	Per district requirements	NA	Yes	Per district requirements	Diffused toward the ground	Yes	Underground	Yes	NA	NA	Noise < 55 dBA Emergency and Warning Signs
Wicomico	Privately Owned and Operated Utility	Special Exception	NA	Special Exception	Permitted	Permitted	Special Exception		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Worcester	Solar Energy System, Utility Scale (> 2.5 MW)	Yes (Major Site Plan Approval Process Required)	NA	Prohibited	Yes (Major Site Plan Approval Process Required)	Yes (Major Site Plan Approval Process Required)	Prohibited	Waterfront - Prohibited Village Center - Approval Required Estate - Approval Required	20 acres (< 2.5 MW, Agricultural, Conservation) 30 acres (<2.5 MW, Commercial, Estate, Village) 50 acres (> 2.5 MW)	NA	NA	50 ' (< 2.5MW, Agricultural, Conservation) 100' (<2.5MW, Commercial, Estate, Village)	NA	6' (< 2.5MW within 500' of residential)	NA	NA	NA	NA	Yes	Yes	NA	Operations and Maintenance Plan Public Notice