DUKE ENERGY FLORIDA

Dianne M. Triplett
DEPUTY GENERAL COUNSEL

April 2, 2024

VIA ELECTRONIC FILING

Mr. Adam J. Teitzman, Commission Clerk
Office of Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Docket 20240025-EI, Petition for Rate Increase by Duke Energy Florida, LLC

Dear Mr. Teitzman,

Attached for filing on behalf of Duke Energy Florida, LLC's ("DEF") in the above-referenced docket is the Direct Testimony of Benjamin Borsch and Exhibit Nos. BMHB-1 through BMHB-6

Thank you for your assistance in this matter. Please feel free to call me at (727) 820-4692 should you have any questions concerning this filing.

(Document 7 of 40)

Respectfully,

/s/ Dianne M. Triplett

Dianne M. Triplett

DMT/mw

Attachments

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CERTIFICATE OF SERVICE

Docket No. 20240025-EI

I HEREBY CERTIFY that a true and correct copy of the foregoing has been furnished by electronic mail this 2nd day of April, 2024, to the following:

/s/ Dianne M. Triplett
Dianne M. Triplett

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for increase in rates by Duke Energy Florida, LLC	**Docket No. 20240025-EI** **Submitted for filing: April 2, 2024**

DIRECT TESTIMONY

OF

BENJAMIN M. H. BORSCH

On behalf of Duke Energy Florida, LLC

I. <u>INTRODUCTION AND SUMMARY</u>

Q. Please state your name and business address.

A. My name is Benjamin M. H. Borsch. My business address is Duke Energy Florida, LLC, 299 First Avenue North, St. Petersburg, Florida 33701.

Q. By whom are you employed and in what capacity?

A. I am employed by Duke Energy Florida, LLC ("DEF" or "the Company") as Managing Director of Integrated Resource Planning and Analytics.

Q. What are the duties and responsibilities of your position with DEF?

A. I am responsible for directing the resource planning process for DEF in an integrated approach in order to find the most cost-effective alternatives to meet the Company's obligation to serve its customers in Florida. In this capacity, I oversee numerous studies to evaluate the system impact and cost effectiveness of various proposed and alternative generation projects. I oversee the completion of the Company's Ten-Year Site Plan ("TYSP") filed each April.

Q. Please describe your educational background and professional experience.

A. I received a Bachelor of Science and Engineering degree in Chemical Engineering from Princeton University. I joined Progress Energy in 2008 supporting the project management and construction department in the development of power plant projects. In 2009, I became Manager of Generation Resource Planning for Progress

Energy Florida, and following the 2012 merger with Duke Energy Corporation, I accepted my current position. Prior to joining Progress Energy, I was employed for more than five years by Calpine Corporation where I was Manager (later Director) of Environmental Health and Safety for Calpine's Southeastern Region. In this capacity, I supported development and operations and oversaw permitting and compliance for several gas-fired power plant projects in nine states. I was also employed for more than eight years as an environmental consultant with projects including development, permitting, and compliance of power plants and transmission facilities. I am a professional engineer licensed in Florida and North Carolina.

Q. Have you ever testified before the Florida Public Service Commission?

A. Yes. I provided testimony in several proceedings, including Docket No. 20200176-EI, Petition for a Limited Proceeding to Approve Clean Energy Connection Program and Tariff and Stipulation and Docket No. 20170260-EI, DEF's Petition for a Limited Proceeding to Approve First Solar Base Rate Adjustment.

Q. What is the purpose of your direct testimony?

A. The purpose of my testimony is to describe the Company's plan to add new and upgraded resources to the DEF portfolio, bringing clean energy and system benefits to DEF's customers. I will also discuss the load forecast used in the preparation of this rate case. As I use the term "load forecast" in my testimony, it means the

Company's individual projections of customers, energy sales, and coincident peak demand. I discuss the results of the resource planning analyses and how they support the cost effectiveness, prudence, and need for additional solar, energy storage, and combined cycle efficiency improvement projects that I discuss further in my testimony. Finally, I explain why the Levy County land is being included in Plant Held for Future Use in this case.

Q. Do you have any exhibits to your testimony?

A. Yes, I have prepared or supervised the preparation of several exhibits, as follows:

- Exhibit BMHB-l, a list of the Minimum Filing Requirements ("MFRs") schedules I sponsor or co-sponsor;
- Exhibit BMHB-2, Historic and Projected Customer, Energy Sales & Seasonal Demand Forecast;
- Exhibit BMHB-3, Solar Cost Analysis;
- Exhibit BMHB-4, CEC Expansion Cost Analysis;
- Exhibit BMHB-5, Combined Cycle Efficiency Improvements Project Cost Analysis; and
- Exhibit BMHB-6, Battery Storage Cost Analysis.

These exhibits are true and accurate, subject to being updated throughout the course of this proceeding.

Q. Do you sponsor any schedules of the Company's MFRs?

A. Yes, I sponsor in full or co-sponsor portions of the schedules listed in Exhibit BMHB-1. These MFR Schedules are true and correct, subject to being updated during the course of this proceeding.

Q. Please summarize your testimony.

A. My testimony presents the value of the DEF's planned investments in additional solar generation, efficiency improvements to its existing combined cycle fleet, and new battery energy storage. In support of the Company's evaluation of this value, I present the planning processes underpinning DEF's Integrated Resource Plan ("IRP"), discussing the design and selection of the Company's resource portfolio, proposed generation facilities and renewable energy programs, and the load forecast and methodology. The IRP is a critical component of our strategy, designed to identify the most cost-effective mix of resources to meet future demand and energy needs. It emphasizes fuel diversity, fuel supply risk management, and the cost-effectiveness of various projects.

The cost-effectiveness of these proposed solar projects, combined cycle efficiency improvement projects, and battery energy storage is a key focus of my testimony. The Company is proposing approximately 1,050 MW of solar photovoltaic ("PV") generation, 100 MW of battery energy storage, and efficiency improvements to existing natural gas-fired combined cycle facilities. These additions are strategic moves to replace retiring coal units and enhance our resource plan with cost-effective, supply-side resource alternatives. I highlight the expected savings for customers, the natural hedge against fuel price volatility provided by solar resources, and the anticipated rate impacts. These projects are not just about increasing DEF's generation capacity; they represent our commitment to providing reliable power while reducing fuel consumption.

Load forecasting is the backbone of our planning and budget processes. I outline the purpose, methodology, and major assumptions behind DEF's load forecast, which anticipates slower retail sales and peak demand growth as the increased customer base is offset by energy efficiency and rooftop solar penetration.

Additionally, I discuss the expansion of the Clean Energy Connection ("CEC") program, justified by additional demand from customers, with five of the proposed solar projects made available to subscribing customers under this program. Finally, I touch upon the inclusion of Levy County land in the rate base as Plant Held for Future Use. This strategic decision underscores the potential for future generation or transmission projects on this property.

In order to meet the future demand and energy needs of its customers, the Company proposes to further develop its resource portfolio by building renewable generation, expanding its community solar program, conducting efficiency improvements at existing combined cycle facilities, and adding additional battery storage projects. My testimony discusses the load forecast methodology used to determine those demand and energy needs, identifying key assumptions underlying the forecast and explaining the differences in processes between different classes of customers.

In conclusion, my testimony supports DEF's petition for a rate increase by detailing the planned resource additions and their benefits, demonstrating the cost-effectiveness of these projects, and explaining the underlying load forecast and economic assumptions. Our goal is to bring clean energy and system benefits to DEF's customers, and this petition represents a significant step towards achieving that objective.

Q. How does your testimony relate to the testimony of other DEF witnesses?

A. DEF witness Vanessa Goff explains the details of the portfolio of 14 solar projects that are underway as a part of the plan to build future solar and bring clean energy and fuel and operational benefits to DEF's customers. She will describe the specifics of the selection, construction, and costs of these projects being added to the existing DEF solar generation portfolio.

DEF witness Reginald Anderson describes the details of the combined cycle efficiency projects currently underway across DEF's existing fleet of natural gas fired combined cycle generating units. As the name suggests, these projects will bring greater efficiency to the upgraded units and fuel savings to DEF's customers.

DEF witness Hans Jacob describes the details of DEF's Powerline battery project.

DEF witness Marcia Olivier explains how the load forecast is used to develop the Company's revenue forecast. She also explains the financial aspects of DEF's proposed expansion of the Clean Energy Connection program.

II. INTEGRATED RESOURCE PLAN PORTFOLIO

Q. How does DEF determine its future demand and energy needs and how best to meet those needs?

A. DEF employs an IRP process to determine the most cost-effective mix of supply- and demand-side alternatives that will reliably satisfy our customers' future demand and energy needs. DEF's IRP process incorporates state-of-the-art computer models used to evaluate a wide range of future generation alternatives and cost-effective conservation and dispatchable demand-side management programs on a consistent and integrated basis.

The IRP provides DEF with substantial guidance in assessing and optimizing the Company's overall resource mix on both the supply side and the demand side. When a decision supporting a significant resource commitment is being developed (e.g., plant construction, power purchase, DSM program implementation), the Company moves forward with directional guidance from the IRP and delves much further into the specific levels of examination required. This more detailed assessment addresses specific technical requirements and cost estimates, as well as detailed system benefits including fuel use, system operations, corporate financial considerations, and the most current dynamics of the business and regulatory environments.

Q. What are the reliability standards the Company used to design its resource portfolio and determine the need for additional resources?

A. DEF plans its resources in a manner consistent with utility industry planning practices and employs both deterministic and probabilistic reliability criteria in the resource planning process. The Company plans its resources to satisfy a minimum Reserve Margin criterion and a maximum Loss of Load Probability ("LOLP") criterion. DEF plans its resources to satisfy a minimum 20% Reserve Margin criterion and a maximum of one day in ten years loss of load probability. DEF has used this dual reliability criteria in its IRP process since the early 1990s. DEF's resource plans, based on these dual-reliability criteria, have been reviewed by the Commission each year since the early 1990s in the annual TYSP.

DEF's resource portfolio is designed to satisfy the 20% Reserve Margin requirement and probabilistic analyses are periodically conducted to ensure that the one day in ten years LOLP criterion is also satisfied. By using both the Reserve Margin and LOLP planning criteria, DEF's resource portfolio is designed to have sufficient capacity available to meet customer peak demand, and to provide reliable generation service under expected load conditions. DEF has found that resource additions are typically triggered to meet the 20% Reserve Margin thresholds before LOLP becomes a factor.

Q. Are there other criteria for selecting new resources?

A. DEF considers a variety of criteria in selecting the final plan. One key factor is fuel diversity and the attendant risk of fuel volatility. Over 75% of energy on the DEF system currently comes from natural gas. As DEF projects forward to the eventual retirement of the remaining coal units, this value would rise absent other options. That would present increasing risk around natural gas cost volatility to DEF's customers. DEF places a qualitative value on energy from other fuel sources, such as solar, that provide a natural hedge against gas prices. A second factor is fuel supply risk. DEF recognizes that there is significant pressure on the coal mining industry as well as the associated transportation channels. As a result, DEF recognizes that in the longer term, reliance on coal as a firm fuel source may be increasingly risky. In the case of solar, the proposed projects are selected in the IRP optimization process. DEF does, however, adjust the dates of these projects to smooth the rate of build and allow for a more efficient and effective development process. Some projects have been brought forward in time to create a continuity in project development, to allow DEF to build a portfolio of project options that will have the best available land options and interconnection positions. DEF seeks to optimize the timing of these projects considering issues such as equipment procurement, labor availability, and interconnection timing.

Q. How has the Company's emissions profile changed over time, given its process for considering and adding generation resources?

A. DEF has been moving to a cleaner generating fleet by investing in modernizing its existing fleet, as well as planning new resources for system efficiency. This has allowed DEF to reduce SO_2 and NO_X pollutants by over 97% and 81%, respectively, since 2005. Since 2005, DEF has reduced CO_2 emissions by about 25%.

Q. How was the Company's base case fuel price forecast developed?

A. The base case fuel price forecast was developed using short-term and long-term spot market price projections from industry-recognized sources. The base cost for coal is based on the existing contracts and spot market coal prices and transportation arrangements between DEF and its various suppliers. For the longer term, the prices are based on spot market forecasts reflective of expected market conditions. Oil and natural gas prices are estimated based on current and expected contracts and spot purchase arrangements as well as near-term and long-term market forecasts. Oil and natural gas commodity prices are driven primarily by open market forces of supply and demand. Natural gas firm transportation cost is determined primarily by pipeline tariff rates.

Q. What resource additions is DEF proposing that impact the test year periods for this rate case?

A. DEF's planned supply resource additions and changes relevant to this rate case include solar energy plants, a battery energy storage project, and heat rate improvements to several existing natural gas fired combined cycle facilities.

DEF's primary resource addition proposed for the period 2025-2027 is the addition of approximately 1,050 MW of solar PV generation with an expected equivalent summer firm capacity contribution of approximately 262 MW. The details of these solar additions are discussed in more detail in witness Vanessa Goff's testimony, as well as in a later section of my testimony.

DEF will complement the solar portfolio with 100 MW of battery storage available in 2027. This battery storage will provide valuable capacity in peak generation periods, will allow storage for energy generated during lower cost times of day that can be released during higher cost periods, and will provide a nearly instant response resource that can operate to smooth the impact of sub-hourly solar generation variability. Additional details regarding the battery storage project are provided in Mr. Hans Jacob's testimony.

Finally, between 2022 and 2027, DEF will add close to 400 MW of combined cycle capacity that results from projects focusing on increasing the fuel efficiency of the combined cycle generating units. These projects are discussed in greater detail in Mr. Reginald Anderson's testimony.

In DEF's most recent approved rate settlement (FPSC Docket No. 20210016-EI), DEF anticipated the retirement of the two remaining coal units at Crystal River (Crystal River units 4 and 5) in 2034. Solar PV, complemented by a mix of combustion turbines and batteries for capacity, will be the cost-effective generation to replace most of that energy in the 2034 timeframe. DEF's plan to construct 450 MW of solar PV generation in 2025, and 300 MW in each year from 2026 through 2027, with additional annual amounts from 2028 through 2034, provides a path to meeting this goal through a measured and paced approach to bringing the solar onto the system which recognizes the challenges of building and interconnecting solar projects, helps maintain reliability as solar penetration increases, and considers the impact on customer rates. DEF also continues to consider cost effective market supply-side resource alternatives to enhance DEF's resource plan.

III. PROPOSED SOLAR INSTALLATIONS

Q. Please describe the Company's existing solar generating facilities.

A. DEF currently owns and operates a fleet of 23 PV solar generating facilities ranging in size from 0.25 MW to 74.9 MW. Most of these are state of the art single axis tracking facilities. Collectively, these units have a nameplate capacity of 1,186 MW and generated over 2.1 million MWh of electricity in 2023, more than 5% of DEF's total energy for load.

Q. Please explain DEF's proposed solar project build in the years 2025 through 2027.

A. DEF proposes a total of 14 solar projects to be installed and come into service during the period of 2025-2027, five of which are part of the proposed expansion of the existing CEC program. Each project is expected to have a nameplate output of 74.9 MW for a total nameplate output of 1,048.6 MW. When DEF completes these proposed solar installations, nearly 15% of DEF's generation will come from solar energy, which will be enough to power over 500,000 residential customers with clean, cost-effective energy. Specific details regarding the development and siting of these units can be found in the testimony of Ms. Vanessa Goff.

Q. Will these units contribute to firm reliable power?

A. Yes, although not at the full nameplate value. DEF recognizes that as solar penetration increases, including both DEF and customer-owned PV, the total dependable solar resource capability is influencing or shifting DEF's reserve planning focus later in the evening, beyond the on-peak period. DEF is accounting for this planning shift by deriving reduced summer capacity values of planned PV installations starting in 2025. The units to be installed in this period are projected to contribute 25% of their nameplate value during the net-peak hour (i.e., the hour of the summer in which the maximum amount of fuel fired generation is required). Collectively, these units will contribute approximately 262 MW of firm summer capacity to DEF's peak summer resources. This contribution will offset DEF's need to build or acquire other resources in the future.

Q. Is the primary value of these solar resources their contribution to firm capacity?

A. The solar resources contribute value in several ways. The contribution to firm capacity contributes value in that it reduces the need for other resources in the future. Solar energy is also an important low-cost resource that serves to offset the use of fuel fired resources, providing significant fuel cost reductions. This also serves as a physical hedge against future variability in the price of fuel, especially natural gas. Finally, a new value stream comes in the form of tax credits associated with the 2022 Inflation Reduction Act. These tax credits create a savings for each megawatt hour of solar energy produced which serves to reduce costs to customers and are discussed further in the testimony of Mr. John Panizza. While DEF is not currently ascribing additional value to these facilities for future GHG emissions regulations (e.g., a carbon price), the clean generation from these units and the resulting reduction in emissions from fossil fired generation also insulates DEF customers from the impact of potential future GHG regulation.

Q. Will the proposed solar units reduce fossil fuel consumption?

A. Yes. DEF calculates that with our current fuel mix, each 74.9 MW solar facility displaces approximately 1.2 billion cubic feet of natural gas, 8,500 tons of coal and 7,500 barrels of fuel oil per year. Once all 14 of the proposed solar projects are in service, they will displace approximately 17 billion cubic feet of natural gas, 120 thousand tons of coal, and 100,000 barrels of oil per year compared with equivalent generation from our fossil fuel fleet.

Q. How does this translate into savings for the customer?

A. At 2023 market prices, each 74.9 MW solar unit reduced the DEF fuel expenditure by over $5 million. Relatively speaking, 2023 was a low fuel cost year. Fuel prices in 2022 were roughly double what they were in 2023; therefore, in addition to direct near-term savings, the solar units provide a natural hedge against future volatility in the price of fuel. Further, generation from the solar facilities will generate tax credits for DEF, the value of which will flow back to customers in the form of rate reductions. For each solar facility, these are expected to be approximately $4.8 million per year for the first 10 years of operation.

Q. Can all this be translated into an approximate rate impact?

A. Yes. Taking into account what DEF pays to own, maintain, and operate the facilities offset by the savings in fuel and tax credits, each solar facility adds a little less than 6 cents to a 1,000 kwh monthly bill during its initial years of operation. Due to depreciation and expected fuel price inflation, this amount is expected to decrease over time becoming a monthly benefit to customers in the sixth or seventh year of operation, out of a 30-year projected life, for each unit. If fuel prices increase more rapidly than overall inflation, this benefit will occur sooner. For instance, in 2022, when fuel prices were unusually high, the operating solar projects provided a net cost savings to customers.

Q. Why is 1048.6 MW nameplate capacity the right amount of solar to add to DEF's generating resource portfolio over the 2025 to 2027 timeframe?

A. As discussed previously, DEF's model has identified a larger amount of new solar generation, more than 5,000 MW, which is selected through 2034 to provide for load growth and to offset the generation from the retiring Crystal River units. DEF selected the 1048.6 MW of solar for construction in the 2025-2027 timeframe based on several factors, including site availability, opportunity for transmission interconnection, equipment availability, DEF's ability to integrate the solar into the system, and expected impact on customer bills.

Q. What will these proposed solar projects cost?

A. The projected project costs used in the cost effectiveness evaluation are detailed in MFR B-13. The development of the costs is described in more detail in Ms. Goff's testimony.

Q. How did DEF evaluate the cost effectiveness of the solar projects?

A. DEF calculated the cost effectiveness in the same manner that it performs cost effectiveness evaluations of numerous projects including the development of the Ten-Year Site Plan and the 2020 CEC filing and every Solar Base Rate Adjustment ("SoBRA") filing it has made pursuant to its 2017 Revised and Restated Stipulation and Settlement Agreement ("2017 Settlement"). DEF calculates the total system cost projected over the life of the solar projects for a scenario with the solar projects and compares it to the total system cost calculated for a scenario without the solar projects. Lower total system costs for the scenario with the solar projects represents savings to DEF's customers. As with our Ten-Year Site Plan, this analysis is performed using EnCompass Expansion Planning and Production Cost modeling tools to evaluate the production cost results. Project-specific capital costs come from the Renewables Development Team and revenue requirements are then developed. Finally, project-specific solar performance projections are developed using the PVSyst model and provided to the production cost model. These data become inputs to derive the system costs for the two cases developed with and without the solar projects in service.

The results of these differential cumulative present value of revenue requirement ("CPVRR") analyses, the difference between with and without the solar projects, are shown in Exhibit BMBH-3.

Q. Please describe the major assumptions used in developing the CPVRR analyses.

A. Two major assumptions used in developing the CPVRR analyses are the forecast of DEF system energy and demand ("Load Forecast") and the forecast of future prices for natural gas, coal, and oil ("Fuel Forecast"):

- Load Forecast – The analysis uses the load forecast presented as the base case load forecast in the DEF 2023 Ten-Year Site Plan ("TYSP") and filed with the commission April 1, 2023, which was developed in the fall of 2022. The process of developing the load forecast is explained in detail in Section VIII of this testimony.
- Fuel Price Forecast – This analysis uses the published fuel price forecast also utilized in DEF's 2023 TYSP.

Q. Are the proposed solar resources cost effective?

A. Yes. DEF analyzed the total system cost of the DEF system with and without the 14 solar projects which DEF proposes to build during the period 2025- 2027. The solar resources produce a savings of approximately $550 million compared to the alternate resource plan without these units. Details of DEF's analysis can be found in Exhibit BMHB-3.

IV. <u>CLEAN ENERGY CONNECTION ("CEC") PROGRAM EXPANSION</u>

Q. Please describe the CEC program.

A. The CEC program is a community solar program through which participating customers can voluntarily subscribe to a share of new solar energy centers. DEF introduced the CEC Program in 2021 and it was quickly subscribed to by many customers. The CEC program provides a path for customers who wish to have the environmental and sustainability benefits of participating in solar generation but cannot, or do not, wish to install it on their own premises to participate directly in DEF's solar generation expansion. As explained in Company witness Marcia Olivier's testimony, DEF is proposing to expand its existing CEC program.

Q. Why is DEF proposing to expand the CEC program?

A. DEF is proposing to expand the CEC program because of substantial additional demand from customers above the amount incorporated into the original CEC program starting in 2021.

Q. How many solar projects will be incorporated into the expanded CEC program?

A. Of the 14 proposed solar projects, DEF proposes to make five of those solar projects, totaling approximately 375 MW, available to subscribing customers under the expanded CEC program to support those customers' interests in meeting their environmental and sustainability goals.

Q. Was the cost effectiveness of the five CEC projects evaluated in the same

manner as the 14 solar projects over all?

A. Yes. The evaluation of the subset of the five CEC projects was conducted by the same process using the same base assumptions as those used for the evaluation of the whole group of 14 proposed solar projects.

Q. Are the proposed solar projects designated for the CEC program cost effective?

A. Yes. As discussed previously in this testimony, DEF analyzed the total system cost of the DEF system with and without the 14 solar projects which DEF proposes to build during the period 2025- 2027. DEF also conducted an additional analysis of the subset of the five CEC projects alone. These projects were shown to be cost effective for DEF customers. The solar resources produce a savings of approximately $312 million compared to the alternate resource plan without these units. Details of DEF's analysis can be found in Exhibit BMHB-4.

V. COMBINED CYCLE EFFICIENCY IMPROVEMENT PROJECTS

Q. Does DEF plan to implement efficiency improvement projects at its existing natural gas fired combined cycle units?

A. Yes. DEF has begun work on projects at each of the combined cycle sites. Specific details on the projects can be found in the testimony of Mr. Reginald Anderson. Increasing the efficiency of these crucial baseload generating units will allow DEF to reduce the fleet-wide fuel consumption in both natural gas and coal. The projects are planned to come into service over a multi-year period beginning with the Osprey Energy Center, where the improvements were implemented in 2023, and extending through 2027 in coordination with scheduled major outages at the rest of the units.

Q. Will these projects increase the capacity of the combined cycle units?

A. Yes. Collectively, the projects at seven existing combined cycle units will raise the capacity of the combined cycle fleet by almost 400 MW. This increase in capacity will offset the need to construct future generation. In addition, because the capacity is being added at operationally flexible baseload units, this will enable additional future solar development as it will provide energy in periods of low solar generation and will add load following capacity to match intermittent solar generation.

Q. Was the cost effectiveness analysis of these projects done in a similar manner to the process previously described above for the solar analysis?

A. Yes. As described above, the analysis was conducted by creating two cases for evaluation, one with the upgrade projects and one without.

Q. Will these projects produce savings for customers?

A. Yes. These projects are expected to produce almost $400 million in savings to customers primarily through fuel savings. Because fuel costs are trued up annually, these savings will be passed to customers in the short term. These savings do not include any potential benefit due to future carbon regulation, which would further increase the value of these projects. Details of DEF's cost effectiveness evaluation for these projects are shown in Exhibit BMHB-5.

VI. <u>BATTERY ENERGY STORAGE</u>

Q. Please provide an overview of DEF's current battery energy storage portfolio.

A. All of the energy storage systems from DEF's 50 MW battery storage pilot program (Battery Storage Pilot) were placed in-service by late 2023. These projects may serve a variety of purposes including, but not limited to substation upgrade deferral, distribution line reconducting deferral, power reliability improvement, frequency regulation, Volt/VAR support, backup power, energy capture, and peak load shaving. Going forward, DEF is gathering data on the performance of these units and will use the data gathered from the operation of these Pilot Program sites to evaluate the opportunities and uses of future DEF battery development. The increase of solar energy generation on the system provides a unique opportunity for energy storage assets to assist in integration of these intermittent resources and shift energy from lower system value periods to times with higher system value.

Q. Is DEF proposing to add additional Battery Energy Storage projects in the 2025-2027 period?

A. Yes. DEF is proposing to build and commission a 100 MW / 200 MWH battery energy storage system with an in-service date in 2027. The project will utilize lithium-ion energy storage and be located to maximize the Standalone Storage

Investment Tax Credit ("ITC") passed into law as a part of the Inflation Reduction Act of 2022. The increase of solar energy generation on the system provides a unique opportunity for energy storage assets to assist in integration of these intermittent resources and shift energy from lower system value periods to times with higher system value. Further details about this battery energy storage project are included in witness Hans Jacob's testimony.

Q. Is the proposed Battery Storage project cost effective?

A. Valuation of battery cost effectiveness is still evolving. DEF performed a cost effectiveness analysis of the battery project using the EnCompass tool, which is the standard tool used in the evaluation of DEF generating assets. The results of this analysis are shown in Exhibit BMHB-6. The results of this analysis showed a range of results from a lifetime cost of $3.2 million (over the 15-year life of the battery) to a lifetime savings of $5.7 million. DEF believes that both of these values understate the actual value of the battery because these values are based solely on the ability of the battery to store energy in low-cost hours and discharge it in higher cost hours (energy arbitrage). While this provides a significant value, essentially equal to the installation and operating cost of the battery, it does not capture other values streams such as the battery's use in sub-hourly periods to offset rapid changes in solar output or shortcomings in system ramp capability that might otherwise lead to additional peaker starts. Similarly, the battery may be used to prevent solar curtailment which will allow the increased generation of production tax credits in some hours, another system condition that is not well represented in the modeling. Avoiding or reducing solar curtailment in approximately 30 hours per year over the life of the battery would offset the estimated $3 million shortfall in the battery value in the worst projected case.

The range of values shown in Exhibit BMHB-6 demonstrates another area of uncertainty as it is tied to differing assumptions regarding treatment of the Investment Tax Credit allowed under the 2022 Inflation Reduction Act. The precise conditions for monetization of the tax credits in 2027 are not known and will depend on Duke Energy's tax position as well as on the market for tax credits if Duke Energy cannot fully utilize them. In these projections, DEF shows a range from $5.7 million (Duke fully utilizes the credit) to $-3.2 million (the credits are sold at a 10% discount) and assumes that Duke chooses to normalize the resulting tax benefit over the project life.

Taken in aggregate, this project is expected to provide value to DEF customers through energy arbitrage, system balancing and solar smoothing, peaker start reduction, and capture of otherwise curtailed solar generation. The values in Exhibit BMHB-6 show that the project essentially breaks even when counting only the energy arbitrage value.

VII. <u>IMPACT ON COST ALLOCATION</u>

Q. Do these changes to the generating portfolio influence the way that DEF values

its new generating units?

A. Yes. As can be seen in the Exhibits BMHB-3 and BMHB-5, showing the cost effectiveness of the proposed solar projects and the combined cycle efficiency improvement projects, these projects derive a large portion of their value from fuel savings and low-cost energy generation. In the example of the combined cycle efficiency projects, DEF found that while the projects add capacity, which has a real value, the primary driver for pursuing these projects is the fuel savings opportunity, which will have immediate benefit to customers. DEF expects the focus on energy efficiency and cost as a complement to traditional capacity and reliability interests to increase in future years in projects that may be proposed beyond the period covered by this proceeding.

Q. Does this shift have implications for cost allocation?

A. This topic is discussed in greater detail in the testimony of Ms. Marcia Olivier, but from a resource planning standpoint, there is greater emphasis on units that are designed around the need to control fuel costs. Over the last two decades, DEF has invested in the construction of combined cycle units, which over the long term have created savings for customers, but which are subject to greater short term fuel cost variability. In this way, they emphasize the importance of energy as a component of the overall customer cost. Looking forward, the industry expects a greater emphasis on energy adequacy as more intermittent resources become part of the generating portfolio. These factors support a shift in the cost allocation so that the customer's energy use is a more significant factor in contribution to cost of service.

VIII. LOAD FORECASTING

Q. What is the purpose of a load forecast?

A. The load forecast is used in both the Company's planning and budget processes. The load forecast enables the Company to estimate the likely number of customers it will serve in the future, the amount of electric energy it will sell to those customers, the peak demand for power, and the time at which the customer demand will be greatest. DEF must estimate or project how much energy its customers (old and new) will consume in the future and when that consumption is likely to take place to serve customers in a cost-effective and reliable manner.

Q. When did the Company perform its load forecast?

A. The Company prepared the load forecast upon which this base rate filing is based in late February and early March 2023 (the "Spring 2023 Load Forecast"). The Spring 2023 Load Forecast accounts for the impact of then current economic conditions on the Company's anticipated future customer, energy, and peak demand by including the most recent economic and demographic inputs available. The Spring 2023 Load Forecast was used to develop the revenue forecast and resulting 2025, 2026, and 2027 Company budgets. It serves as the basis for the development of the Company's MFRs. The Company's Spring 2023 Load Forecast (customers, energy sales, and demand) for 2024 and the test years (2025-2027) is reflected in Exhibit BMHB-2.

IX. FORECAST METHODOLOGY

Q. Please provide us with an overview of the forecasting methodology used to develop the load forecast.

A. The DEF forecast of customers, energy sales, and peak demand applies both an econometric and end-use methodology. The residential and commercial energy projections incorporate Itron's statistically adjusted end use ("SAE") approach while other classes use customer-class specific econometric models. These models are expressly designed to capture class-specific variation over time. Peak demand models are projected on a disaggregated basis as well. This allows for appropriate handling of individual assumptions in the areas of wholesale contracts, demand response, interruptible service, and changes in self-service generation capacity.

Q. Please explain how DEF develops the Energy and Customer Forecast.

A. In the retail jurisdiction, customer class models have been specified showing a historical relationship to weather and economic/demographic indicators using monthly data for sales models and customer models. Sales are regressed against "driver" variables that best explain monthly fluctuations over the historical sample period. Forecasts of these input variables are either derived internally or come from a review of the latest projections made by several independent forecasting concerns. Internal company forecasts are used for projections of electricity price, weather conditions, the length of the billing month and rates of customer owned renewable and electric vehicle adoption. The external sources of data include Moody's Analytics forecasts of changes in population, demographics, and economic conditions. The incorporation of residential and commercial "end-use" energy has been modeled as well. Surveys of residential appliance saturation and average efficiency performed by the Company's Market Research department and the EIA, along with trended projections of both by Itron capture a significant piece of the changing future environment for electric energy consumption.

Q. What process does DEF use to forecast the residential sector?

A. Residential kWh usage per customer is modeled using the SAE framework. This approach utilizes the forecast weather expressed as cooling and heating degree days along with the economic outlook and explicitly introduces trends in appliance saturation and efficiency, dwelling size, and thermal efficiency. It allows for an explanation of usage levels and changes in weather-sensitivity over time. The "bundling" of 19 residential appliances into "heating," "cooling," and "other" end uses form the basis of equipment-oriented drivers that interact with typical exogenous factors such as real median household income, average household size, the real price of electricity to the residential class and the average number of billing days in each sales month. This structure captures significant variation in residential usage caused by changing appliance efficiency and saturation levels, economic cycles, weather fluctuations, electric price, and sales month duration. Projections of kWh usage per customer combined with the customer forecast provide the forecast of total residential energy sales. The residential customer forecast is developed by correlating monthly residential customers with county level population projections, provided by Moody's, for counties in which DEF serves residential customers.

Q. What process does DEF use to forecast the commercial sector?

A. Commercial MWh energy sales are forecast based on commercial sector (non-agricultural, non-manufacturing and non-governmental) employment, the real price of electricity to the commercial class, the average number of billing days in each sales month, and the heating and cooling degree-day values. As in the residential sector, these variables interact with the commercial end-use equipment (listed below) after trends in equipment efficiency and saturation rates have been projected.

- Heating
- Cooling
- Ventilation
- Water heating
- Cooking
- Refrigeration
- Outdoor Lighting
- Indoor Lighting

- Office Equipment (PCs)
- Miscellaneous

The SAE model contains indices that are based on end-use energy intensity projections developed from EIA's commercial end-use forecast database. Commercial energy intensity is measured in terms of end-use energy use per square foot. End-use energy intensity projections are based on end-use efficiency and saturation estimates that are in turn driven by assumptions in available technology and costs, energy prices, and economic conditions. Energy intensities are calculated from the EIA's Annual Energy Outlook ("AEO") commercial database. End-use intensity projections are derived for eleven building types. The energy intensity ("EI") is derived by dividing end-use electricity consumption projections by square footage. Commercial customers are modeled using the projected level of residential customers.

Q. What process does DEF use to forecast the industrial sector?

A. Energy sales to this sector are separated into two sub-sectors. A large portion of industrial energy use by DEF industrial customers is consumed by the phosphate mining industry. Because this one industry is such a large share of the total industrial class, it is separated and modeled apart from the rest of the class. The term "non-phosphate industrial" is used to refer to those customers who comprise the remaining portion of total industrial class sales. Both groups are impacted by changes in economic activity. However, adequately explaining sales levels requires separate explanatory variables. Non-phosphate industrial energy sales are modeled using Florida manufacturing employment and the average number of sales month billing days.

The industrial phosphate mining industry is modeled using customer-specific information with respect to anticipated market conditions. Since this sub-sector is comprised of only three customers, the forecast is dependent upon information received from direct customer contact. DEF Large Account Management employees provide specific phosphate customer information regarding customer production schedules, inventory levels, area mine-out and start-up predictions, and changes in self-service generation or energy supply situations over the forecast horizon. These Florida mining companies compete globally into a global market where farming conditions dictate the need for "crop nutrients."

The projection of industrial accounts is expected to continue declining with manufacturing employment as a primary driver.

Q. What process does DEF use to forecast the street lighting sector?

A. Electricity sales to the street and highway lighting class are projected to decrease over the forecast period, primarily due to improvements in lighting efficiency. The number of accounts has increased due to rate changes from the Public Authority class; however they are still exhibiting a negative growth rate. A simple time-trend was used to project energy consumption and customer growth in this class.

Q. What process does DEF use to forecast the Public Authorities sector?

A. Energy sales to public authorities ("SPA"), comprised of federal, state, and local government operated services, are projected to decline within the DEF's service area. This is a result of lower projected customer growth/customers moving to the Street Lighting class. The level of government services, and thus energy, can be tied to the population base, as well as the amount of tax revenue collected to pay for these services. Factors affecting population growth will affect the need for additional governmental services (i.e., public schools, city services, etc.) thereby increasing SPA energy consumption. Government employment has been determined to be the best indicator of the level of government services provided along with state government GDP. These variables, along with cooling degree-days and the sales month billing days, explains most of the variation over the historical sample period. Adjustments are also included in this model to account for the large change in school-related energy use throughout the year. The SPA customer forecast is projected linearly as a function of a time trend.

Q. What process does DEF use to forecast the sales for resale sector?

A. The Sales for Resale sector encompasses all firm sales to other electric power entities. This includes sales to other utilities (municipal or investor-owned) and power agencies (rural electric authority or municipal).

The municipal sales for resale or wholesale class includes a number of customers, divergent not only in scope of service (i.e., full, or partial requirement), but also in composition of ultimate consumers. Each customer is modeled separately in order to accurately reflect its individual profile. In each case, these customers contract with DEF for a specific level and type of stratified capacity (MW) needed to provide their particular electrical system with an appropriate level of reliability. The energy forecast for each contract is derived using information provided by the purchaser who better understands their needs. Electric energy growth and competitive market prices will dictate the amount of wholesale demand and energy throughout the forecast horizon. In the period 2025 - 2027 Seminole Electric Cooperative is the only wholesale, or sales for resale, customer of DEF in the current forecast.

Q. Please explain how DEF develops the Peak Forecast.

A. The forecast of peak demand also employs a disaggregated econometric methodology. For seasonal (winter and summer) peak demands, as well as each month of the year, DEF's coincident system peak is separated into five major components. These components consist of total retail load, interruptible and curtailable tariff non-firm load, conservation and demand response program capability, wholesale demand, and company use demand.

Total retail load refers to projections of DEF retail monthly net peak demand before any activation of DEF's General Load Reduction Plan. The historical values of this series are constructed to show the size of DEF's retail net peak demand assuming no utility activated load control had ever taken place. The value of constructing such a "clean" series enables the forecaster to observe and correlate the underlying trend in retail peak demand to retail customer levels and coincident weather conditions at the time of the peak and the amounts of Base-Heating-Cooling load estimated by the monthly Itron models without the impacts of year-to-year variation in utility-sponsored DR programs. Monthly peaks are projected using the Itron SAE generated use patterns for both weather sensitive (cooling & heating) appliances and base load appliances calculated by class in the energy models. Daily and hourly models of applying DEF class-of-business load research survey data lead to class and total retail hourly load profiles when a 30-year normal weather template replaces actual weather. The projections of retail peak are the result of a monthly model driven by the summation of class base, heating and cooling energy interpolated 30-year normal weather pattern-driven load profile. The projection for the months of January (winter) and August (summer) are typically when the seasonal peaks occur. Energy conservation and direct load control estimates consistent with DEF's DSM goals that have been established by the FPSC are applied to the MW forecast. Projections of dispatchable and cumulative non-dispatchable DSM impacts are subtracted from the projection of potential firm retail demand resulting in a projected series of firm retail monthly peak demand figures. The Interruptible and Curtailable service (IS and CS) tariff load projection is developed from historic monthly trends, as well as the incorporation of specific projected information obtained from DEF's large industrial accounts on these tariffs by account executives. Developing this piece of the demand forecast allows for appropriate firm retail demand results in the total retail coincident peak demand projection.

Sales for Resale demand projections represent load supplied by DEF to other electric suppliers such as SECI. For Partial Requirement demand projections, contracted MW levels dictate the level of seasonal demands.

DEF "company use" at the time of system peak is estimated using load research metering studies similar to potential firm retail. It is assumed to remain stable over the forecast horizon as it has historically.

Each of the peak demand components described above is a positive value except for the DSM program MW impacts and IS and CS load. These impacts represent a reduction in peak demand and are assigned a negative value. Total system firm peak demand is then calculated as the arithmetic sum of the five components.

Q. What major assumptions are used throughout DEF forecasts as a part of this methodology?

A. A number of key assumptions have generally been used in DEF forecasts for several years. These key assumptions for the current load forecast are as follows:

1. Weather conditions for energy sales are based on a 30-year average of conditions at specific weather stations in Florida.

2. The customer forecast relies on Moody's population estimates for the 29 counties served by the utility, along with economic projections from Moody's Analytics and Energy Information Administration ("EIA") surveys.

3. The phosphate mining industry heavily influences industrial sales within the service area, with global factors such as foreign competition, agricultural industry conditions, exchange rates, international trade pacts, and environmental regulations affecting energy consumption.

4. The utility has contractual obligations with wholesale customers, and the forecast considers these agreements and the potential for customers to self-generate.

5. Assumption of successful renewal of all future franchise agreements.

6. The forecast incorporates demand and energy reductions as per Florida Public Service Commission ("FPSC") approved Demand-Side Management ("DSM") goals.

7. Impacts from Plug-in Hybrid Electric Vehicles ("PHEV") and customer-owned renewable generation (primarily solar PV installations) are considered for both energy and peak demand.

8. Expected energy and demand reductions from customer-owned self-service cogeneration facilities are included.

9. Economic assumptions are based on the most recent semiannual economic outlook report from Moody's Analytics.

These assumptions are made with the expectation that the regulatory environment and the utility's obligation to serve retail customers will remain consistent throughout the forecast horizon. For wholesale customers, the forecast only includes generation resources if there is a long-term contract in place.

Q. Please describe the economic assumptions used in the Spring 2023 Load Forecast.

A. The economic outlook for this forecast was developed in the winter of 2022-2023. In January 2023, the U.S. economy faced a challenging economic landscape characterized by aggressive tightening of monetary policy by the Federal Reserve. The central bank, underlining a hawkish stance, signaled further rate increases into 2023 and 2024, with plans to shrink its balance sheet through quantitative tightening. The funds rate target was projected to reach 4.5% to 4.75%, well above the estimated long-run equilibrium of 2%. This monetary policy approach was driven by concerns about persistently high inflation resulting from pandemic-related disruptions to global supply chains, labor markets, and geopolitical events such as Russia's invasion of Ukraine. Taking resilient job growth and low unemployment into account, the Federal Reserve aimed to address inflationary pressures. Ten-year Treasury yields reflected these actions, reaching close to 4% at the time of Moody's January 2023 outlook. Simultaneously, fiscal policy shifted from expansionary measures during the pandemic to a more restrictive approach. The recently passed Inflation Reduction Act aimed to raise substantial funds over the next decade through increased taxes and reduced spending. This legislation targeted climate change, healthcare costs, and future budget deficits. While previous fiscal support during the pandemic totaled over $5 trillion, the focus shifted to deficit reduction, with the federal government expecting a narrower deficit of $850 billion in fiscal 2023. The U.S. dollar, buoyed by the Federal Reserve's tight monetary policy and global uncertainties, remained strong, with expectations of its resilience even as threats such as the pandemic and geopolitical tensions receded. At the state level, Florida's economy outpaced the nation's but faced challenges from higher prices and rising interest rates, impacting job creation, income gains, and the housing market. Additionally, the vital tourism industry in Florida felt the effects of a weakened U.S. economy.

It is with this background that the DEF Customer, Energy and Peak Demand forecast was developed and the environment in which the Moody's Analytics January 2023 U.S. forecast and Florida forecast was applied.

Major assumptions were as follows:

- Preparation for the European Union sanctions, weakening global economies, demand destruction from high oil prices had all pushed oil prices below expectations. Moody's expected lower Russian exports, the end of Strategic Petroleum Reserve releases, and the reopening of the Chinese economy to lift oil prices, but not as high as previously thought. However, lower forecast prices in 2023 implied a projection of less drilling and higher prices in 2024.
- In January 2023, the economy was considered to be at a full employment level. A full-employment economy is one with an unemployment rate around 3.5%, a 62.5% labor force participation rate, and a prime-age employment-to-population ratio a little north of 80%.
- The Fed raised the fed funds rate 50 basis points in December 2022, and the forecast was for two additional increases of 25 basis points in early 2023. The Fed forecast to pause, despite hawkish rhetoric from Chairman Jerome

Powell, but cuts were not expected to begin until 2024. The assumption was that the reduction in the Fed's balance sheet would remain on autopilot.

- The 10-year U.S. Treasury yield was expected to steadily increase until late Fall 2023.
- With all these factors, the forecast called for a decrease in Real GDP's year over year growth rate from 3.99% in 2022 to 1.33% in 2023. The growth rate would then gradually increase to 2.74% by 2027, still falling short of 2022s level of growth.
- A decrease in total employment's year over year growth rate from 5.29% in 2022 to 2.23% was also forecast for 2023. The growth rate would remain relatively flat at 0.88% by 2027, signifying a stagnating labor market during the forecast period.

Throughout the forecast horizon, risks and uncertainties are always recognized and handled on a "highest probability of outcome" basis. General rules of economic theory, namely, supply and demand equilibrium are maintained in the long run. This notion is applied to energy/commodity prices, currency levels, the housing market, wage rates, birth rates, inflation, and interest rates. Uncertainty surrounding specific weather anomalies (hurricanes or earthquakes), international crises, such as wars or terrorist acts, or future pandemic events, are not explicitly designed into this projection. Thus, any situations of this variety will result in a deviation from this forecast.

Q. Is the forecasting methodology used to develop the load forecast consistent with DEF's load forecasting policy and practice?

A. Yes, it is. DEF followed its standard forecasting methodology in developing its load forecast. This forecasting methodology has been used for years at DEF to forecast load with substantially accurate past results when actual load is compared to prior forecasts, excluding anomalous, unpredictable events such as the post-9/11, global financial crises, and the COVID-19 pandemic. DEF's load forecasting methodology is also consistent with generally accepted, utility industry standard methodologies for load forecasts. As a result, DEF is confident that its load forecast was a reasonably accurate projection of future load in 2025, 2026, and 2027 based on the information available in early 2023.

X. <u>LOAD FORECAST SUMMARY</u>

Q. What conclusions can be drawn from DEF's load forecast?

A. The total number of retail customers continues to grow during the forecast period, with the rate of change being effectively unchanged. The historical 10-year compound annual growth rate ("CAGR") from 2014-2023 was 1.65% vs 1.68% projected from 2024-2027. At the same time, total retail sales over the period from 2024-2027 are expected to grow at a lower rate than the previous 10-year period. The historical 10-year CAGR for total retail sales from 2014-2023 was 1.03% vs only 0.15% projected for 2024-2027. The lower growth rate during this period is attributed to a decrease in residential sales. The historical 10-year CAGR for residential sales from 2014-2023 was 1.5% vs –0.2% projected. While customer growth is projected to continue the growth trend of the previous 10 years, there are several drivers causing a decrease in residential sales in the forecast period. Total employment is an economic driver for residential sales. At the time of the forecast, total employment was expected to remain flat from 2023-2024 and grow at a lower rate from 2025-2027. Furthermore, energy efficiency programs and solar adoption continue to grow causing residential sales to decrease. Flat employment, increasing energy efficiency, and increasing rooftop solar adoption all contribute to the negative residential sales growth rate from 2024-2027.

General Service sales are expected to remain consistent with the previous 10 years. The historical 10-year CAGR for General Service Sales was 0.5% and a 0.5% growth rate was projected. General Service customer growth also remained strong with a historical CAGR from 2014-2023 of 1.2% and 1.3% projected. Electric vehicle adoption is expected to contribute to increased sales. Energy efficiency and rooftop solar adoption for this class are much lower than the residential class and therefore are not causing the same negative impact to sales.

Industrial sales are expected to increase over the forecast period. The historical 10-year CAGR for Industrial Sales was 0.4% vs 0.8% projected. This is primarily due to the projected expansion of one large customer.

Overall, residential sales experience a slight decrease due to flat employment, and growing energy efficiency and rooftop solar adoption while General Service and Industrial sales outpace the growth of the previous 10 years. As residential sales are the largest component of DEF sales, the overall impact projected for the 2025-2027 period is one of lower growth than over the previous period.

XI. <u>LEVY COUNTY LAND</u>

Q. Has the Company included Levy County Land in rate base in this case?

A. Yes. Approximately $94 million for Levy County land is included in rate base in this case as Plant Held for Future Use.

Q. Is it probable that the Company will use the Levy County Land for future generation or transmission projects?

A. Yes. It is probable that the land in Levy County will be used for a regulated project in the future. DEF recognizes that this property has multiple potential uses. The DEF property has access to a water source but is not at risk for storm surge, and it provides access to connect to DEF's power grid, which makes it an attractive site for future conventional generation. DEF also anticipates that scheduled upgrades to the transmission system will increase transmission access in this area in the 2025-2030 timeframe. Because of the large area of this property, and the above features, DEF envisions that this property could have multiple potential uses. Given the above, this site may be utilized for new generation needed in response to the retirement of the coal units at Crystal River North in 2034. Beyond that period, in the 2038-2048 timeframe, this will be an attractive site for addition of a new Zero-Emitting Load Following Resource. DEF is exploring different technologies including the potential development of next generation nuclear (Small Modular Reactor) technology. The site remains especially valuable given its access to water, transportation, and transmission.

Q. Does this conclude your direct testimony?

A. Yes, it does.

List of MFRs Sponsored or Co-Sponsored

B-15	Property Held for Future Use – 13 Mo. Average
C-33	Performance Indices
C-34	Statistical Information
C-40	O&M Compound Multiplier Calculation
E-6a	Cost of Service Study – Unit Costs, Present Rates
E-6b	Cost of Service Study – Unit Costs, Proposed Rates
E-9	Cost of Service – Load Data
E-10	Cost of Service Study – Development of Allocation Factors
E-11	Development of Coincident and Non-Coincident Demand for Cost Study
E-12	Adjustment to Test Year Unbilled Revenue
E-15	Projected Billing Determinants - Derivation
E-16	Customers by Voltage Level
E-18	Monthly Peaks
E-19a - c	Demand and Energy Losses
F-5	Forecasting Models
F-6	Forecasting Models – Sensitivity of Output to Changes in Input Data
F-7	Forecasting Models – Historical Data
F-8	Forecasting Assumptions

Historic and Projected Customer, Energy Sales & Seasonal Demand Forecast

Historic and Forecast Retail Sales, GWHr/Yr

Year	Residential	Commercial	Industrial	Street & Highway Lighting	Other Sales to Public Authorities	Total Retail Sales
2013	18,508	11,718	3,206	25	3,159	36,616
2014	19,003	11,789	3,267	25	3,157	37,240
2015	19,932	12,070	3,293	24	3,234	38,553
2016	20,265	12,094	3,197	24	3,194	38,774
2017	19,791	11,918	3,120	24	3,171	38,023
2018	20,636	12,172	3,107	24	3,206	39,144
2019	20,775	12,198	2,963	24	3,227	39,187
2020	21,459	11,522	3,147	23	3,079	39,230
2021	21,192	11,785	3,292	24	3,158	39,451
2022	21,508	12,220	3,508	33	3,244	40,512
2023	21,750	12,450	3,396	31	3,205	40,832
10-Year CAGR	1.51%	0.61%	0.43%	2.49%	0.17%	1.03%
2024	21,111	12,047	3,419	33	3,167	39,779
2025	21,044	12,090	3,441	33	3,191	39,799
2026	21,056	12,138	3,495	33	3,205	39,927
2027	21,002	12,194	3,497	32	3,232	39,957
2024-2027 CAGR	-0.17%	0.40%	0.76%	-1.09%	0.67%	0.15%

Historic and Forecast, Number of Retail Customers

Year	Residential	Commercial	Industrial	Street & Highway Lighting	Other Sales to Public Authorities	Total Retail Customers
2013	1,488,159	165,936	2,343	21,907	3,852	1,682,197
2014	1,503,758	167,253	2,280	21,963	3,837	1,699,091
2015	1,524,605	169,147	2,243	22,043	3,823	1,721,861
2016	1,543,967	170,999	2,178	22,330	3,675	1,743,149
2017	1,573,260	173,695	2,137	22,440	3,808	1,775,340
2018	1,597,132	175,848	2,080	22,710	3,794	1,801,564
2019	1,626,117	178,036	2,025	22,928	3,779	1,832,885
2020	1,655,304	179,666	1,999	23,169	3,676	1,863,814
2021	1,687,471	182,195	1,978	23,317	3,765	1,898,726
2022	1,719,905	184,453	1,868	23,084	3,750	1,933,060
2023	1,753,583	186,524	1,773	22,606	3,736	1,968,221
10-Year CAGR	1.72%	1.22%	-2.76%	0.32%	-0.30%	1.65%
2024	1,783,098	189,270	1,782	23,003	3,721	2,000,874
2025	1,815,032	191,786	1,748	23,052	3,707	2,035,324
2026	1,846,937	194,324	1,727	23,094	3,692	2,069,775
2027	1,878,277	196,852	1,722	23,129	3,678	2,103,660
2024-2027 CAGR	1.75%	1.32%	-1.14%	0.18%	-0.39%	1.68%

Historic and Projected
Retail Peak Demand (MW)

Year	Winter	Summer
2013	7,220	8,205
2014	7,684	8,412
2015	8,439	8,447
2016	7,661	8,780
2017	6,874	8,522
2018	9,286	8,493
2019	6,708	8,986
2020	7,795	8,747
2021	7,629	8,671
2022	8,202	8,932
2023	8,110	9,492
	0.60%	1.35%
2024	9,151	9,072
2025	9,169	9,035
2026	9,206	9,020
2027	9,235	8,975
2024-2027 CAGR	0.31%	-0.36%

New Solar 2025-2027 Cost Analysis

CPVRR $M (2023$)	Base Case	Solar Case	Base Case - Solar Case
Fuel Cost	$ 22,375	$ 21,186	$ 1,189
Environmental Costs	$ 34	$ 33	$ 1
Variable Costs	$ 2,661	$ 2,495	$ 166
PTC	$ (6,647)	$ (6,647)	$ 0
Inc Transm and FOM Cost	$ 583	$ 475	$ 108
Inc Gen Capital	$ 1,852	$ 1,463	$ 390
	$ 20,859	$ 19,004	$ 1,855
Transm and FOM Add Solar	$ -	$ 265	$ (265)
Gen Capital Add Solar	$ -	$ 1,660	$ (1,660)
	$ -	$ 1,925	$ (1,925)
PTC Add Solar	$ -	$ (621)	$ 621
Add Solar Savings	$ 20,859	$ 20,309	$ 550

Discount Rate **6.83%**

Clean Energy Connection Expansion Cost Analysis

CPVRR $M (2023$)	Base Case	Solar Case	Base Case - Solar Case
Fuel Cost	$ 22,207	$ 21,751	$ 456
Environmental Costs	$ 34	$ 33	$ 1
Variable Costs	$ 2,631	$ 2,572	$ 59
PTC	$ (6,512)	$ (6,511)	$ (1)
Inc Transm and FOM Cost	$ 579	$ 519	$ 60
Inc Gen Capital	$ 1,840	$ 1,613	$ 227
	$ 20,780	$ 19,976	$ 803
Transm and FOM Add Solar	$ -	$ 97	$ (97)
Gen Capital Add Solar	$ -	$ 619	$ (619)
	$ -	$ 716	$ (716)
PTC Add Solar	$ -	$ (225)	$ 225
Add Solar Savings	$ 20,780	$ 20,467	$ 312

Discount Rate **6.83%**

CPVRR Results: Analysis of Combined Cycle Efficiency Improvement Project
Change in System Cost (Savings) with projects vs. Base Case (no projects)

CPVRR $k (to 2041)	CC 400MW Upgrade - Base Case
Avoided Generation Capital and Fixed Cost/Savings	($293,122)
Fuel and Purchase Cost/Savings	($150,267)
VOM Cost/Savings	($43,619)
Environmental Cost/Savings	($1,337)
Unit Start Cost/Savings	($17,226)
Variable Production Costs (Savings / Costs)	($212,449)
CC Heat Rate Upgrade Cost (Savings / Costs)	$112,743
Project Cost/Savings Fuel Only	($37,523)
Project Cost/Savings Production Cost	($99,705)
Total Project Costs/Savings Before CO2	($392,827)
Negative Values represent Savings	

Duke Energy Florida
Witness: Benjamin Borsch
Exhibit BMHB-6

CPVRR Results: Analysis of 2027 Battery Energy Storage Project
Change in System Cost (Savings) with project vs. Base Case (no project)

40% ITC with 10% Haircut

CPVRR $M	Base Case	Powerline	Base Case - Powerline
Generation Capital	$ 109.10	$ 120.80	$ (11.70)
Transmission Capital	$ 15.11	$ 4.14	$ 10.98
Incremental FOM	$ 15.26	$ 22.66	$ (7.40)
Gas Reservation Charges	$ 3,885.07	$ 3,885.07	$ -
Fixed Costs (Savings / Costs)	$ 4,024.54	$ 4,032.66	$ (8.12)
PTC	$ (3,394.22)	$ (3,393.78)	$ (0.44)
Fuel Costs	$ 16,076.58	$ 16,077.55	$ (0.97)
Variable Costs	$ 1,845.93	$ 1,839.87	$ 6.06
Environmental Costs	$ 24.94	$ 24.67	$ 0.27
Variable Production Costs (Savings / Costs)	$ 17,947.45	$ 17,942.10	$ 5.36
Fixed and Variable Costs (Savings / Costs)	$ 18,577.77	$ 18,580.98	$ (3.21)
	Positive Values represent Savings		

40% ITC with no Haircut

CPVRR $M	Base Case	Powerline	Base Case - Powerline
Generation Capital	$ 109.10	$ 111.88	$ (2.78)
Transmission Capital	$ 15.11	$ 4.14	$ 10.98
Incremental FOM	$ 15.26	$ 22.66	$ (7.40)
Gas Reservation Charges	$ 3,885.07	$ 3,885.07	$ -
Fixed Costs (Savings / Costs)	$ 4,024.54	$ 4,023.75	$ 0.79
PTC	$ (3,394.22)	$ (3,393.78)	$ (0.44)
Fuel Costs	$ 16,076.58	$ 16,077.55	$ (0.97)
Variable Costs	$ 1,845.93	$ 1,839.87	$ 6.06
Environmental Costs	$ 24.94	$ 24.67	$ 0.27
Variable Production Costs (Savings / Costs)	$ 17,947.45	$ 17,942.10	$ 5.36
Fixed and Variable Costs (Savings / Costs)	$ 18,577.77	$ 18,572.06	$ 5.71
	Positive Values represent Savings		