BEFORE THE

LOUISIANA PUBLIC SERVICE COMMISSION

APPLICATION OF ENTERGY LOUISIANA, LLC FOR APPROVAL OF GENERATION AND TRANSMISSION RESOURCES PROPOSED IN CONNECTION WITH SERVICE TO A SIGNIFICANT CUSTOMER PROJECT IN NORTH LOUISIANA, INCLUDING PROPOSED RIDER, AND REQUEST FOR TIMELY TREATMENT	)))))))))	**DOCKET NO. U-_____**

DIRECT TESTIMONY

OF

NICHOLAS W. OWENS

ON BEHALF OF

ENTERGY LOUISIANA, LLC

PUBLIC REDACTED VERSION

OCTOBER 2024

TABLE OF CONTENTS

Page

I. INTRODUCTION

Q1. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Nicholas Owens. I am a Partner at The NorthBridge Group ("NorthBridge"). My business address is 30 Monument Square, Suite 105, Concord, Massachusetts 01742.

Q2. ON WHOSE BEHALF ARE YOU FILING THIS DIRECT TESTIMONY?

A. I am filing this Direct Testimony on behalf of Entergy Louisiana, LLC ("ELL" or the "Company").

Q3. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I graduated from Colby College in 2004 with a B.A. in economics and government. I spent two years as an Analyst with FTI Consulting before joining NorthBridge in 2007. I joined NorthBridge as an Analyst and was promoted to Senior Analyst in 2009, Associate in 2010, and Partner in 2019. NorthBridge is an economic and strategic consulting firm serving the electricity and natural gas sectors. My practice includes wholesale electricity markets, generation and transmission planning, and regulatory strategy.

Q4. HAVE YOU PREVIOUSLY TESTIFIED BEFORE A REGULATORY COMMISSION?

A. Yes. I have provided testimony to the Louisiana Public Service Commission ("LPSC") (Docket Nos. U-32148 and U-33592), the Public Utility Commission of Texas (Docket Nos. 52487, 56693, and 56865), the Arkansas Public Service Commission (Docket No. 20-049-U), and the City Council of New Orleans (Docket No. UD-11-01).

Q5. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I am testifying on behalf of ELL in support of its application. Specifically, my testimony addresses: 1) ELL's proposal to build gas-fired generation to meet its capacity and energy needs arising from serving the Customer, 2) proposals to build gas-fired generation elsewhere in the country, and 3) the significance of the Customer's clean energy funding commitments.

Q6. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. *First,* the around-the-clock nature of the Customer's load addition requires ELL to add a significant amount of capacity and to significantly increase energy production throughout the day and night. To achieve that with renewables alone is not possible, and to achieve that with renewables plus storage is not viable at this point. A portfolio that includes renewables and gas-fired generation that can be co-fired with hydrogen or retrofitted with carbon capture is the best option available, as ELL has proposed.

Second, to address demand growth elsewhere in the country, vertically-integrated utilities and competitive power providers are also proposing to add gas-fired capacity. This fact supports the reasonableness of ELL's proposal to add gas-fired capacity at this time. It also supports an expectation that if ELL were unable to provide a competitive power supply solution to the customer, the likely result would be that the Customer would site its operation elsewhere, and gas-fired capacity would be built in that location to serve it.

Third, the Customer has made significant clean energy funding commitments. These include a commitment to fund 1,500 MW of new solar capacity and a retrofit of a ~900 MW combined-cycle combustion turbine ("CCCT") to apply carbon capture and storage technology ("CCS"). Together, these two sources will produce enough zero- or low-carbon energy to offset approximately 60% of the energy production from the new CCCTs that ELL is proposing in this docket.

This is a substantial clean energy funding commitment. But perhaps more important than its size is the fact that, unlike any other corporate clean energy procurement that has been announced to date, it involves a commitment to fund a large-scale application of CCS to a CCCT, a technology application that is absolutely essential to decarbonization, but which has not yet been demonstrated at scale. By funding the demonstration of CCS applied to a CCCT, the customer's commitment will advance this technology in a meaningful way and act as a force multiplier for decarbonization.

II. ADDITIONAL GAS-FIRED GENERATION

Q7. DESCRIBE THE CUSTOMER'S LOAD ADDITION.

A. The Customer is building a new [redacted] that will require firm power around the clock. The operation will ramp up over time to [redacted]. It is expected to operate at a load factor of [redacted] and use approximately [redacted] of electricity per year.

Q8. CAN THE TYPES OF RENEWABLE POWER CURRENTLY AVAILABLE TO ELL PROVIDE FIRM RENEWABLE POWER AROUND THE CLOCK?

A. No, not by themselves. Currently, the only cost-effective source of renewable power that is available to ELL at scale is solar power. Solar is an attractive source of power generation, and ELL is actively procuring large amounts of it, but it is only available during the daytime, and even then, its availability is affected by weather conditions. Like solar power, wind power is intermittent. Due to their intermittency, solar and wind cannot – by themselves – provide firm power around the clock.

Q9. COULD THE TYPES OF RENEWABLE POWER CURRENTLY AVAILABLE TO ELL BE COMBINED WITH STORAGE TO PROVIDE FIRM RENEWABLE POWER AROUND THE CLOCK?

A. In theory, yes. But as a practical matter, not in this situation. To illustrate, consider a scenario where solar operates predictably at a 25% capacity factor every day throughout the year. In this hypothetical scenario, it would take approximately [redacted] of solar to serve [redacted] of load per year and approximately [redacted] of 18-

hour batteries to store energy during periods of solar surpluses and to discharge energy during periods with solar shortfalls. At $1,900/kW for solar and $7,000/kW for 18-hour batteries, the capital cost of this solution would be approximately [redacted], which is prohibitively costly,[1] and that's before incorporating the cost of transmission that would be necessary to reliably deliver at least [redacted] of power to the customer's site around the clock.[2]

The reality is that much more infrastructure would be required and that it would cost much more than [redacted] (a cost that is already prohibitive) because solar does not operate at a 25% capacity factor every day. In fact, there are long periods when solar operates at less than a 25% capacity factor. For example, solar produces less than the average level during a rainy week or during the winter season. To provide firm renewable power around the clock during these periods would require much more solar and/or much more storage than described in the illustrative example above.

Q10. COULD ELL USE STORAGE RATHER THAN GAS-FIRED GENERATION TO ADDRESS ITS CAPACITY NEEDS?

A. Practically, no. A storage-only solution for ELL's capacity needs would be more expensive, would not address ELL's needs for substantial additional energy

---

[1] The availability of tax credits would offset the cost but would not alter the fact that it would be prohibitively costly at this time to provide firm renewable power around the clock, given the types of renewable power available to ELL.

[2] If the storage was co-located with the customer, it would be necessary to plan transmission to reliably deliver more than [redacted] in order to serve the customer and charge the storage.

throughout the day, and would require more transmission infrastructure, which would add cost and could jeopardize ELL's ability to meet the Customer's ramp schedule.

It is my understanding that, in its normal course of business, ELL has received and evaluated offers for storage and, thus far, found that gas-fired capacity is cost-advantaged relative to storage as a source of incremental capacity. In the instant case, the two gas-fired generators that ELL has proposed to build next to the Customer site reduce the amount of transmission that would be needed to reliably serve the Customer around the clock, which is a further cost advantage for gas-fired generation relative to storage as a source of incremental capacity.

In addition to its cost advantage, the new and efficient gas-fired units that ELL has proposed to build will produce energy (in contrast to storage, which does not produce energy) that will displace energy that would otherwise be produced by relatively inefficient existing gas- and coal-fired units if ELL were to build storage instead of gas. The displacement of relatively inefficient generation from existing units with relatively efficient generation from new units has the effect of reducing CO2 emissions.

It is important to note that ELL's proposal to add new gas-fired capacity does not preclude it from adding renewables. Whether ELL addresses its capacity needs with efficient new gas units or with storage, it can reduce emissions by adding renewables. Thus, with respect to emissions, the difference between the efficient gas-fired capacity that ELL has proposed, and the hypothetical storage alternative is that the efficient gas-fired capacity reduces emissions through displacement of relatively inefficient existing generation, whereas storage does not.

Q11. IS ELL EXPANDING ITS RENEWABLES PORTFOLIO?

A. Yes, ELL is aggressively expanding its solar portfolio, including through the accelerated 3 GW procurement process that the Commission recently approved and by proposing in this docket to use that process to further expand its portfolio of solar resources by an additional 1.5 GW.

Q12. TO SERVE THE CUSTOMER LOAD ADDITION, DOES ELL NEED ADDITIONAL GAS-FIRED CAPACITY?

A. Yes. To serve the load addition, the only practical option is for ELL to build gas-fired capacity.

Q13. DOES ELL'S DECISION TO BUILD CCCTs MAKE SENSE?

A. Yes. The two most common types of gas-fired generation are combined-cycle combustion turbines (*i.e.*, "CCCTs") and simple-cycle combustion turbines ("CTs"). CCCTs are much more efficient than CTs because they recover heat from combustion turbine flue gas, use that heat to make steam, and use that steam to make additional power. CCCTs are suitable for around-the-clock operations, whereas CTs are not, which is important because ELL needs to provide significantly more energy around the clock. Finally, CCCTs are suitable for retrofit with CCS, whereas CTs are not, which is important because there is a non-trivial likelihood over their long operating lives that customers will demand and/or governments will enact policies that require and/or incentivize CO_2 emission reductions.

Q14. WHAT IF ELL WERE NOT WILLING TO BUILD ADDITIONAL GAS-FIRED GENERATION?

A. If ELL were not willing to build additional gas-fired generation, that would jeopardize its ability to provide electric service to the Customer at rates and on a schedule that is sufficiently attractive for the Customer to site its facility in Louisiana. In that case, it would be reasonable to expect the Customer to site its facility elsewhere and for gas-fired generation to be built in that location.

Q15. WHY IS IT REASONABLE TO EXPECT THAT THE CUSTOMER WOULD SITE ITS FACILITY ELSEWHERE?

A. [redacted]

[redacted]

---

3 [redacted]

[redacted]

Q16. IF THE CUSTOMER SITES ITS FACILITY ELSEWHERE, WHY WOULD IT BE REASONABLE TO EXPECT GAS-FIRED GENERATION TO BE BUILT IN THAT LOCATION?

A. Because vertically-integrated utilities and competitive power providers across the country are planning to build additional gas-fired generation, [redacted]

[redacted]

To be clear, there are some who are critical of the development of additional gas-fired capacity and who maintain that there are better ways to serve [redacted]

---

4 [redacted]

5 [redacted]

[redacted] The fact that gas plants are being planned by utilities across the country supports an expectation that if ELL does not serve the customer, the Customer will site its facility elsewhere and gas-fired generation will be built in that location

III. CUSTOMER CLEAN ENERGY FUNDING COMMITMENTS

Q17. HAS THE CUSTOMER MADE CLEAN ENERGY FUNDING COMMITMENTS?

A. Yes, the Customer has made significant clean energy funding commitments. These include a commitment to fund 1,500 MW of new solar and/or hybrid capacity and a CCS retrofit of an existing ~900 MW CCCT. Together, these two sources will produce enough zero- or low-carbon energy to offset 60% of the energy production from the new CCCTs that ELL is proposing in this docket.

Q18. WHY RETROFIT AN EXISTING CCCT RATHER THAN APPLY CCS TO ONE OF THE NEW CCCTs THAT ELL IS PROPOSING IN THIS DOCKET?

---

[6] Fisher et al., *Demanding Better: How growing demand for electricity can drive a cleaner grid*, Sept. 2024, at 5.

A. Because it can be accomplished faster. The CCS retrofit that would be applied to the Lake Charles Power Station ("LCPS") is in a more advanced stage of development such that the Company anticipates it becoming operational by 2031, if approved by the LPSC. The development activities that have already taken place are meaningful and time consuming, and, as Mr. Bulpitt explains in more detail, include: an engineering feasibility study that is specific to LCPS, the development of a commercial structure in collaboration with prospective suppliers of a comprehensive CCS Wrap Services Agreement for LCPS,[7] a request for information ("RFI") process to identify the most qualified suppliers for LCPS, a request for proposals ("RFP") process to formally select from among the most qualified suppliers for LCPS, the negotiation and execution of a letter of intent including potential pricing parameters for CCS at LCPS, and an ongoing Front End Engineering and Design ("FEED") study for LCPS, which is now underway.[8] Because of the work that's already been done to develop the CCS retrofit opportunity at LCPS, the Company is positioned to bring it online faster than would be the case for CCS applied to the new CCCTs that ELL is proposing in this docket.

Q19. WHY IS A SHORTER DEVELOPMENT TIME FRAME FOR THE CCS RETROFIT IMPORTANT?

---

7 [redacted]

8 In addition to the FEED study for CCS applied to LCPS that is being conducted by the consortium, an additional FEED study for CCS applied to LCPS is underway with funding support from the U.S. Department of Energy. https://www.energy.gov/oced/carbon-capture-demonstration-projects-program-front-end-engineering-design-feed-studies.

A. The most important benefit of the shorter development timeframe is that it will provide a faster demonstration of an at-scale application of CCS to a CCCT, a technology application which is absolutely essential to decarbonization, but which has not yet been demonstrated at scale.

Q20. PLEASE ELABORATE ON THE IMPORTANCE OF DEMONSTRATING CCS APPLIED TO A CCCT AT SCALE.

A. Each "segment" of the CCS value chain, by which I mean capture, transportation, and storage, has been demonstrated, in part through normal industrial operations. For example, as of September 2023, there are 15 facilities capturing CO_2 in the United States, mostly at plants that process natural gas or produce ethanol or ammonia;[9] the United States currently has about 5,200 miles of pipelines that carry CO_2,[10] including one pipeline network that traverses the state of Louisiana; and "[t]here are many projects within the United States and around the world where geologic storage of CO_2 is being successfully performed."[11]

While each segment of the CCS value chain has been demonstrated at scale, there has not yet been an at-scale demonstration of CO_2 capture applied to flue gas streams produced from the combustion of natural gas in a CCCT.[12] The issue is not the technical feasibility of capturing a high percentage of CO_2 – the technology to do

---

9 Congressional Budget Office, *Carbon Capture and Storage in the United States*, at 1 (Dec. 2023).

10 *Id.*, at 8.

11 https://netl.doe.gov/carbon-management/carbon-storage/faqs/carbon-storage-faqs.

12 Depending on what one considers to be an "at scale" demonstration, a potential exception is the Bellingham CCCT in Massachusetts, which captured 85-95% of CO_2 from a 40 MW slipstream for use in the food industry between 1991 and 2005.

that is mature and has been demonstrated. The issue is that the flue gas from natural gas combustion has a relatively low concentration of CO_2 (approximately 4% CO_2 concentration), and this increases the cost of capture beyond the levels that companies have thus far been willing to pay for it. In other words, it is a commercial issue.

It is critically important to demonstrate the commercial viability of CCS applied to flue gas from natural gas combustion because a large fraction of CO_2 emissions comes from the combustion of natural gas. In particular, the combustion of natural gas in CCCTs is growing and on track to overtake coal plants (many of which are being retired) as the largest source of CO_2 emissions within the U.S. power sector. In addition, a large fraction of emissions from heavy industry within the United States, including the refining and chemical industries in Louisiana, comes from the combustion of natural gas in boilers and furnaces.

The application of CCS is considered by many experts to be the best way to address emissions from the combustion of natural gas in power and heavy industry. For example, the United States Environmental Protection Agency ("EPA") recently finalized regulations for new CCCTs that are based on a determination that the application of CCS is the "best system of emission reductions." Frankly, there are few good alternatives to CCS in some industries. Certainly, in Louisiana today, renewables, whether alone or in combination with storage, are not a viable option to provide round-the-clock power – which most, if not all, industrial customers demand.

Simply put, to address climate change, there is an urgent need to demonstrate the commercial viability of CCS applied to a CCCT. The customer has agreed to fund such a demonstration at a large, advanced stage, project in Louisiana. By doing so, the customer could help ELL pave the way for broader deployment of a technology application that is absolutely essential to decarbonization, especially in Louisiana. It would be hard to conceive of a more impactful clean energy funding commitment than this.

Q21. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, at this time.

AFFIDAVIT

STATE OF MASSACHUSETTS

COUNTY OF SUFFOLK

NOW BEFORE ME, the undersigned authority, personally came and appeared, **Nicholas W. Owens**, who after being duly sworn by me, did depose and say:

That the above and foregoing is his sworn testimony in this proceeding and that he knows the contents thereof, that the same are true as stated, except as to matters and things, if any, stated on information and belief, and that as to those matters and things, he verily believes them to be true.

Nicholas W. Owens

SWORN TO AND SUBSCRIBED BEFORE ME
THIS 15th DAY OF Oct. 2024

PEGGY I. MARTIN
NOTARY PUBLIC
Commonwealth of Massachusetts
My Commission Expires
September 19, 2025

Peggy I. Martin
NOTARY PUBLIC

My commission expires: Sept. 19, 2025