BEFORE THE

LOUISIANA PUBLIC SERVICE COMMISSION

***IN RE*: APPLICATION OF ENTERGY LOUISIANA, LLC FOR APPROVAL TO CONSTRUCT BAYOU POWER STATION, AND FOR COST RECOVERY**	**))))**	**DOCKET NO. U-_____**

DIRECT TESTIMONY

OF

SAMRAT DATTA

ON BEHALF OF

ENTERGY LOUISIANA, LLC

MARCH 2024

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EXHIBITS

I. INTRODUCTION AND PURPOSE

A. Qualifications

Q1. PLEASE STATE YOUR NAME AND CURRENT BUSINESS ADDRESS.

A. My name is Samrat Datta. My business address is 639 Loyola Avenue, New Orleans, LA 70130. I am the Director of Advanced Network Planning for the System Planning Organization at Entergy Services, LLC ("ESL"),[1] an organization that provides long-term planning support for Entergy Louisiana, LLC ("ELL" or the "Company"), among other EOCs.

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

A. I am testifying before the Louisiana Public Service Commission ("LPSC" or the "Commission") on behalf of ELL in support of its application seeking approval to construct and operate the Bayou Power Station ("BPS" or the "Project"), a proposed new power barge generating station consisting of six natural-gas fired reciprocating internal combustion engines ("RICE") with black-start capability in Leeville, Louisiana and an associated microgrid that would serve downstream of the Clovelly substation, including Port Fourchon, Golden Meadow, Leeville, and Grand Isle.

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[1] ESL is an affiliate of the Entergy Operating Companies ("EOCs") and provides engineering, planning, accounting, technical, and regulatory-support services to each of the EOCs. The five EOCs are Entergy Arkansas, LLC, ELL, Entergy Mississippi, LLC, Entergy New Orleans, LLC, and Entergy Texas, Inc.

Q3. PLEASE DESCRIBE YOUR EDUCATION AND BUSINESS EXPERIENCE.

A. I graduated from Nagpur University, India, in 2001 with a Bachelor of Science in Power Electronics Engineering. I received a Master of Engineering in Electrical Engineering from the University of Texas at Austin in 2002.

In 2003, I was hired by ESL to work in the Technical Studies Group in the Transmission Planning department. I was involved in performing voltage stability, transient stability, and electromagnetic transient analyses of the Entergy Transmission System. In 2010, I was appointed Supervisor of the Transmission Economic Studies group. In that role, my responsibilities included interfacing with the Independent Coordinator of Transmission, Network Service Customers, and the System Planning & Operations organization in order to perform activities required by Federal Energy Regulatory Commission ("FERC") Orders 717 and 890. In 2014, I became Manager, Commercial and Economic Planning, where I was responsible for the economic analyses and identification of economic transmission projects that benefit the EOCs' customers.

In 2019, I transitioned to a business role within ESL, focusing on innovation, and, in 2020, into the Enterprise Planning Group, and then, into my current role as Director of Advanced Network Planning for the System Planning Organization. In this role, I am responsible for the development of integrated resource plans that are designed to meet the company's planning objectives of sustainability, affordability and reliability, and to provide strategic direction and business support to the EOCs concerning the selection of supply-side resources. I am a registered Professional

Engineer in the State of Mississippi and a Senior Member of the Institute of Electrical and Electronics Engineers.

B. Purpose of Testimony

Q4. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. My testimony supports the Company's Application in this proceeding, which seeks, among other things, approval to construct and operate the Bayou Power Station, which is a proposed new 112 megawatt ("MW") power barge generating station consisting of six natural-gas fired RICE generators with black-start capability in Leeville, Louisiana and an associated microgrid that would serve downstream of the Clovelly substation, including Port Fourchon, Golden Meadow, Leeville, and Grand Isle. I first explain the reliability issues that are driving the need for the Project and the alternatives that were considered for addressing that need. Then I explain why the BPS is the more reasonable alternative considering all the relevant circumstances. I present the estimated transmission interconnection and substation upgrade costs necessary to interconnect the BPS to the existing transmission system and the Midcontinent Independent System Operator ("MISO"). Finally, I explain the development of the estimated costs of rebuilding the damaged Golden Meadow to Barataria 115 kilovolt ("kV") line, which was used in the economic analysis prepared by Company witness Phong Nguyen.

Q5. HAVE YOU PREVIOUSLY TESTIFIED BEFORE A REGULATORY COMMISSION?

A. Yes. Attached as Exhibit SD-1 is a list of my prior testimony.

II. RELIABILITY NEED FOR THE PROJECT

Q6. WHAT IS DRIVING THE NEED FOR THIS PROJECT?

A. The southern half of Lafourche Parish in southeast Louisiana, including the towns of Lockport, Cut Off, Galiano, Golden Meadow, and Port Fourchon, presents a unique setting from an electrical engineering and resource planning perspective. This region, abutting the Gulf of Mexico to the south, is home to pumping facilities that manage crude oil flow from the nation's only deep-water oil port, a very large storage facility with both floating roof tanks and sub-terranean storage caverns, other petrochemical and oil and gas infrastructure that plays a crucial role in the nation's oil and gas sector (supplying more than 18% of the nation's oil supply), and myriad other industrial facilities. The region's diverse customer base also includes residential customers, small businesses, and marine facilities that serve the southeast Louisiana region.

The challenging topography in the region includes wetlands and very narrow tracts of land that present considerable challenges for transmission and distribution construction. Because of its low-lying nature and proximity to the coast, the region is also exposed to risks associated with hurricanes and tropical storm events, such as Hurricanes Zeta and Ida that struck the region in recent years. Before Hurricane Zeta, the region was served by a 115 kV transmission system that included two transmission sources to the Golden Meadow substation and a single radial transmission line to the Fourchon substation (Exhibit SD-2, page 1). Hurricane Zeta caused extensive damage to the electrical infrastructure in Lafourche Parish, with nearly 60% of the transmission poles in the parish damaged from the storm. In particular, the Golden Meadow – Barataria 115 kV line sustained extensive damage with 25% of the poles destroyed and

10% of the poles damaged because of the storm. Exhibit SD-2, page 2 shows the configuration of the transmission system in the region following Hurricane Zeta. It was clear very early in the storm restoration process following Hurricane Zeta that any potential rebuilding of the Golden Meadow – Barataria line would involve a significant investment and engineering challenge.

Q7. PLEASE CONTINUE.

A. ELL was subsequently faced with a decision soon after the storm regarding the manner in which the electric system in this region should be reconstructed so that the electric system is not only more resilient in the face of storms in the future but can also meet the current and future electrical demand in this region. As mentioned above, the significant oil and gas infrastructure and other critical load in this region necessitates an electrical system that is dependable. Moreover, additional load growth is also expected in this region, particularly at Port Fourchon, associated with the offshore oil and gas industry and potential offshore wind installations. This collective electrical demand impacts this region in two ways: first, the electrical demand, and the associated planning reserve margin, will add to ELL's overall capacity need; second, any potential additional load in this region will result in the need for greater load serving capability for the electric system, which may require additional infrastructure improvements or upgrades (i.e., additional transmission lines or lines with greater capacity, and/or generators on the electric system).

Accordingly, in addition to the overall capacity need for the ELL system, which is explained by Company witness Laura Beauchamp, the critical nature of the electrical demand in this region, the need for increased resilience of the electric system (in the face of increasingly more violent and devastating hurricanes), along with the potential additional electric demand that may materialize in the future, has driven the need for additional infrastructural improvements to the electric system in this region. Various options were considered and analyzed by ESL, on behalf of ELL, taking into account the aforementioned factors, in addition to constructability and the needs of an ever-evolving and decarbonizing electric grid.

Q8. WHAT OPTIONS WERE ANALYZED AND CONSIDERED FOR ADDRESSING THE UNIQUE ELECTRICAL NEEDS IN THIS REGION?

A. As mentioned above, various factors, including the need for resilience of the electrical system, potential demand growth in the region, especially at Port Fourchon, the constructability of various infrastructure options, and the need for additional capacity for the ELL system were all taken into account in developing options for upgrading the electric system in the region. The two principal options considered were: (1) rebuilding the Golden Meadow – Barataria line that was damaged by the Hurricane Zeta and eventually upgrading the 115 kV transmission system in the region to 230 kV as additional growth in electric demand materializes; and (2) adding a local power plant in the form of a floating generator on a barge interconnected to the 115 kV transmission system in the region coupled with the development of a microgrid anchored by the local power plant. See Exhibit SD-3, page 3 for an illustration of the two options.

The first option, also referred to as the "wires option," involves the restoration of the power grid topologically back to the state it was prior to Hurricane Zeta.

However, under this option, the Golden Meadow – Barataria line would be constructed to the Company's current and updated wind loading standard (which would render the rebuilt Golden Meadow – Barataria line much more resistant to storm damage) and to 230 kV insulation (though it would be operated at 115 kV, such that it could be upgraded to 230 kV operation in the future). See Exhibit SD-3, page 3. Any additional 230 kV upgrades would have been deferred to the future when sufficient load growth is forecasted to warrant upgrades to the transmission system. Although under this option the electrical system would be more resilient than the one that was damaged by Hurricane Zeta, it would still rely upon power generated remotely to transmit to electric load in the region. I will address the challenges associated with constructing and maintaining the infrastructure necessary to execute this option in more detail later in my testimony.

The second option, also referred to as the "microgrid option" or "non-wires alternative," involves leveraging a RICE technology power plant to generate power locally within the region, when economic to do so, while also incorporating decentralized controls to assist in system restoration within a microgrid island downstream of the Clovelly substation. While this option does not restore the transmission topology back to the state it was in prior to Hurricane Zeta, a power plant interconnected locally adds a source of power to the transmission system and enables restoration of power locally in case of a wide-spread interruption in electric service following a significant event, like a hurricane. See Exhibit SD-3, page 3.

Q9. DID ELL PERFORM AN ECONOMIC EVALUATION OF THE ALTERNATIVES?

A. Yes. An economic evaluation was performed for both of the options where the present value associated with the net benefits of both options, in terms of the capital costs, the annual capacity, fixed, and variable costs and benefits to all ELL customers was calculated. Company witness Nguyen describes and sponsors the economic analysis. Additionally, given the challenging terrain in the region, the feasibility of construction of both options was also taken into account during the process to arrive at the optimal electrical solution to meet the reliability need in this region. Furthermore, the impact of the electrical system upgrades necessary to meet the reliability needs of the region on the ELL system was also evaluated holistically, taking into account the evolving needs of the electric grid of the future.

Q10. DID ELL CONSIDER ANY ALTERNATIVE GENERATION TECHNOLOGIES?

A. Yes. Several different types of generator technologies were considered for the region, with an eye toward ensuring that the generation solution was able to restore power to the critical customers in the region following an outage of the transmission source resulting from a significant weather event. The generation solution, therefore, has to be capable of restoring power to the region without any assistance from the grid by way of power for auxiliary systems of the generator that are necessary to start the generator (i.e., black-start capability), and has to be capable of sustaining the electrical load in the region without the benefit of being connected to the rest of the ELL electrical system while the line and substation repairs are being carried out (i.e., islanding capability).

ELL considered combined-cycle gas turbines ("CCGT"), solar, and simple-cycle combustion turbines ("CT") as alternatives to the selected RICE-generator technology. The CCGT technology was determined to be technically challenging. BPS was designed to be able to black-start and restore power with no support from the grid. The combustion turbine-generators that are part of CCGTs require natural gas supply at high pressure, which necessitates the addition of compressors to increase the pressure of the gas available from the gas pipeline. Black-starting a CCGT would require the ability to not only start the turbine and generator control systems without any support from the grid, but also drive the compressor to increase the pressure of the gas supply for the power plant under those challenging conditions.

Solar technology was considered but deemed to be technically unfeasible because of the lack of space in the region necessary to be able to accommodate a solar resource that can support the load in the area. The solar resource would also then have to be coupled with an energy storage device in order to "firm" the solar energy production around the clock when the region needs to operate as an electrical island following the loss of the transmission source into the region. In addition, it is very difficult to support the significant short circuit strength required for starting the induction motors that customers in this region employ using an inverter-based resource such as solar photovoltaic resources or batteries. Induction motor starts result in a large current draw and high reactive power consumption, which then has to be supported by the electric system in order for the induction motor to be able to start successfully. Synchronous generators, such as the BPS, are able to accommodate this incremental current draw and reactive power requirement needed for motor starts much better than inverter-based resources, which may require the inverter to be oversized or for the motor to be augmented at potentially significant additional cost in order for the induction motors to start successfully and avoid stalling. For these various reasons, solar technology was deemed unfeasible and ill-suited to meeting the needs of the Bayou region in which BPS would sit.

CT technology was deemed technically feasible but less preferable to RICE technology due to its higher gas pressure requirements (similar to the CCGT gas requirements), water requirements for cooling, and the physical footprint of the power plant. On the other hand, the Power Generation group is familiar with the RICE generator technology that was selected for the BPS because it is the same technology from the same manufacturer utilized in Entergy New Orleans, LLC's New Orleans Power Station ("NOPS"), which has been in service since 2020. The experience gained in the four years since the commencement of NOPS's commercial operations has given confidence in the Power Generation group's ability to operate and maintain RICE-generator technology.

In summary, a combination of factors made alternative technologies like CT and CCGT generators challenging to implement considering the specific resource needs and constraints of the region as compared to the advantages afforded by the RICE-generator technology, including familiarity with the technology, which were instrumental in the decision to utilize the RICE generator technology for BPS.

Q11. DID ELL CONSIDER ALTERNATIVE LOCATIONS FOR A GENERATING RESOURCE?

A. Yes, and the microgrid option for addressing the power needs of the region influenced that analysis. To limit interconnection costs, the team endeavored to site the generator close to the transmission lines in the region. Second, the team tried to reduce the gas pipeline interconnection costs for the generator by siting the generator close to the available gas pipelines in the area.

Without those considerations in mind, ELL considered siting a generating resource at or near ELL's Golden Meadow substation or ELL's Fourchon substation. At Golden Meadow, the substation is approximately one mile from the nearest pipeline, and the Fourchon substation is approximately three miles from the nearest pipeline. In fact, in order to provide a fuel source for a power barge from those substations, ELL would have to incur significant costs to extend gas pipelines that would cross wetlands and disrupt residential neighborhoods and/or Port Fourchon operations centers. In light of the cost considerations, environmental impact, and business/residential interruptions, ELL did not pursue siting the resource at these alternative locations. On the other hand, the BPS is expected to be moored next to the Leeville substation and, as explained in Company witness Gary Dickens's Direct Testimony, the Tennessee and Kinetica gas pipelines are adjacent to the mooring location.

Q12. WHY WAS THE POWER BARGE SELECTED AS THE BEST OPTION FOR ADDRESSING THE UNIQUE ELECTRICAL NEEDS OF THE REGION?

A. Both of the options described above in my Direct Testimony – the wires option and the microgrid option – were compared to each other on a quantitative and qualitative basis. The quantitative comparison between the two options for meeting the reliability needs of the region involved the calculation of the net benefits associated with the two options in the MISO wholesale market. The microgrid, anchored by BPS, is designed to restore power to the region after a catastrophic weather event. BPS can also participate in the wholesale energy market and provide capacity benefits to ELL's customers. The wires option, on the other hand, does not provide those sorts of economic benefits to the region or to ELL's customers.

Mr. Nguyen describes the economic analysis where the present value of the net benefits estimated for BPS was computed by netting the capacity value associated with the generator and the energy margin that is estimated to be realized by the generator in the MISO energy market from the capital and annual O&M costs of BPS and the associated microgrid and the transmission interconnection cost of BPS to the transmission system. This net benefit associated with the microgrid option was then compared to the present value of the capital cost associated with the wires option. This economic comparative analysis is quantified in Mr. Nguyen's Direct Testimony, and it shows that, on a net present basis in 2028 Dollars, the microgrid is on par with the wires-only option.

Moreover, while the results of the economic analysis show net benefits for the BPS that exceed those of the wires option by approximately $3 million, the economic analysis is likely conservative as to the BPS because the analysis includes a conservatively high estimate for marine insurance for the BPS while insurance is not available, and thus was not included, for the most of the assets included in the wires option. Moreover, as I describe later, the estimated costs for the wires alternative are likely understated.

Q13. ARE THERE ADDITIONAL QUALITATIVE BENEFITS THAT WERE CONSIDERED?

A. Yes. In addition to those quantified benefits, there are several categories of qualitative benefits that BPS provides over the wires option that were also considered by ESL for meeting and enhancing the reliability and resiliency needs of the region. First, the BPS will add a black-start resource to the ELL system. The black-start capability associated with the BPS resource also enables various options for storm restoration for customers in the region for whom restoration of power following storm damage may otherwise involve lengthy line and substation repair work as well as reliance upon power from afar to reestablish electric service in the region. For example, the damage on the Golden Meadow – Clovelly and the Golden Meadow – Leeville line sections was so extensive after Hurricane Ida that it took a month to return these two line sections to service. The microgrid will be able to improve the resilience of the electric system in the region by levering the controls and the monitoring capabilities of the microgrid controller and the black-start capability of the BPS to enable the electric system to restore electric service to customers.

The BPS, on account of being a collection of six RICE generators, will also be capable of flexible operations. That is, the BPS is designed to be able to start at very short notice and to be able to ramp up and down rapidly. Such operational flexibility will enable the BPS to participate in the wholesale ancillary services market, a benefit that was not included in Mr. Nguyen's quantitative economic analysis but that would generate revenues, which would be an additional quantitative benefit of the BPS. In addition, the operational flexibility enabled by the BPS will also allow the ELL system to compensate for variations in power supply from intermittent renewable resources in the future. This benefit will be in addition to the capacity benefit that the BPS would provide, as explained by Ms. Beauchamp and Mr. Nguyen in their Direct Testimonies, and it will enable the grid to accommodate greater amounts of intermittent renewable resources, which I address in more detail later in my Direct Testimony.

Finally, the wires-only option presents unique construction challenges given the challenging terrain of the region, including wetlands and other topographic features, that make construction and ongoing maintenance difficult. The microgrid option is able to obviate the need for this challenging line construction project, while also enabling the injection of real and reactive power locally in the proximity of the crucial industrial load in this region that requires such power, when the BPS is producing power.

All of the myriad quantitative and qualitative factors listed above were taken into account to evaluate the wires and microgrid option to meet the reliability needs of the region. Given the critical nature of the industrial load in this region and the resilience benefits that would be enabled by the microgrid, ELL concluded that these crucial benefits outweigh the wires solution and selected the BPS-anchored microgrid option as the preferred alternative to meet the reliability needs of this region. In particular, there are several categories of qualified benefits that Bayou Power Station provides over a wires-only alternative, including support for renewable generation, adding a black-start resource that provides additional grid support, potentially providing ancillary services in the MISO market, and providing resiliency benefits through its microgrid functionality during outages. Finally, the wires-only alternatives present unique challenges given the terrain and location of the industrial load in the Fourchon – Valentine corridor area, which favors the BPS.

Q14. PLEASE ELABORATE HOW THE PROJECT SUPPORTS RENEWABLE GENERATION AND THE COMPANY'S SUSTAINABILITY GOALS.

A. The design specifications of RICE generators allow the power plant to operate in a flexible manner. The BPS will be capable of very short start-up times and will be able to ramp its power output up and down rapidly, which will allow the BPS to respond to rapid changes in grid conditions. As the degree of renewable penetration in the grid (and in MISO) increases, the intermittent nature of such renewable resources will result in variable supply of power into the grid.

As the amount of such intermittent renewable resources in the grid increases, especially as the Company and other load serving entities progress towards meeting their sustainability goals and meeting customer demand for carbon-efficient electric energy, these variations in the supply of power will result in power imbalances in the commitment pool (in this case, in the MISO load balancing area) that will have to be compensated by other power sources. In order to explain this phenomenon using a simplified example, assume that for a given operating hour, the amount of load in the system does not vary at all throughout the 60 minutes of operations. Further assume that this electrical demand was met almost exactly by generation (from both renewable intermittent resources and other resources) at the beginning of the operating hour. Now assume that 10 minutes into the operating hour, the environmental conditions (either sunshine or wind velocity) are no longer sufficient to sustain the amount of renewable generation that was prevalent at the beginning of the hour and the renewable power generation reduces by 20%. This shortfall would have to be made up by other generating resources in the commitment pool in order to maintain the reliability of the grid. However, some generators (for instance, nuclear, coal and even some natural gas fired generators) are not capable of changing their power output rapidly in the face of changing grid conditions due to the physics or limitations of their respective technologies.

If this shortfall in power supply into the commitment pool (resulting from the reduction in renewable generation) is not compensated for by other generators, and if no other source of power can be found (from adjoining load balancing areas, for instance), then the grid operator would have no choice but to eventually order a curtailment of a corresponding amount of electric load in order to bring the amount of electrical load and the amount of electric supply available back into balance to prevent any compromise to the reliability of the grid.

This example scenario can be even more disadvantageous if the electric demand were not actually constant throughout the relevant operating time-period (an assumption I had made for the sake of simplifying the example), but instead were rising. This would mean that the amount of power that would be required 10 minutes into the operating hour would not just be the amount associated with the renewable energy shortfall, but also the additional amount by which the electric load has grown in those 10 minutes.

Any such compromise to the reliability of the grid (which, in an extreme case, might also result in load shed) resulting from the addition of intermittent renewable resources might naturally result in a limit to the amount of renewable resources that might be interconnected to the grid. Conversely, the presence of flexible resources, such as the BPS, that are able to vary the output of their power output quickly in response to varying grid conditions enable the integration of greater amounts of renewable resources anywhere on the grid. Thus, flexible resources, such as the BPS, will indirectly assist in the addition of renewable resources to the grid.

Q15. PLEASE ELABORATE ON THE BENEFITS OF A BLACK-START RESOURCE.

A. A black-start generating resource is capable of starting the engine that drives the alternator in a generator that generates electricity and the electronics that govern the generator, and of producing power from the generator with no assistance in the form of start-up power from the utility grid. Thus, such a power plant is deigned to self-start and reinitiate power in an electric system that was heretofore without any electricity (i.e., the electric grid was in a blackout). A black-start power plant (such as the BPS) must include some means of starting the engine or turbine that drives the alternator (in case of the BPS, compressed air bottles will be used to drive the engine during start-up) and, in some cases, a smaller generator to power the electronics of the generator during black-start conditions (in case of the BPS, a small generator is expected to be on board the barge to help energize the electronics of the BPS).

When the grid is being restored after a catastrophic event, such as a hurricane or a large thunderstorm, the storm restoration process will seek to prioritize the restoration of the infrastructure (such as distribution or/and transmission poles, wires and substation) that will enable the quickest time to reestablish electric service to a particular load from a secure source of power (such as a transmission substation that is energized or a generator). For electric loads that are at the end of long radial transmission or distribution systems (such as the load in the southeast Louisiana region at issue here), restoration will typically involve the line, pole, and conductor repairs and reconstruction and substation repairs until a path for power to flow from a secure source (like a generator or an energized substation) can be found to the customers representing the electric load. If a local source of power (such as the BPS power plant) were present, the distance from a secure source of power to the load can be greatly shortened, and the number of distribution and transmission (pole, conductor, substation, etc.) repairs that need to be completed before power can be restored to customers can be significantly reduced, thus reducing the time needed for restoration of electric service and outage time for customers in the region, including the critical customers I noted above. Accordingly, the BPS-anchored microgrid will be able to bolster the resilience of the electric system in the Fourchon – Valentine corridor and shorten restoration times in this economically-significant part of the state, providing additional societal benefits that may not be directly realized by ELL.

Q16. PLEASE EXPLAIN THE DESIGN OF THE MICROGRID AND HOW IT OPERATES TO PROVIDE ADDITIONAL RELIABILITY AND RESILIENCY BENEFITS.

A. Under normal transmission system conditions, a microgrid controller will allow the BPS to operate in the MISO energy and ancillary services markets. The BPS will also be offered into the MISO Planning Resource Auction and will support MISO resource adequacy for ELL customers. When a transmission outage occurs, the microgrid controller will automatically carry out switching actions necessary to set up a microgrid island that is capable of serving the area downstream of the Clovelly substation.

The microgrid controller is a microprocessor that is designed to mimic the actions of an operator, including the monitoring of load level in the microgrid during normal system conditions, monitoring system conditions, detecting abnormal conditions such as a transmission outage, issuing control instructions to switching devices to form an island, sending start and stop commands to the BPS when in microgrid islanded mode, detecting the return of normal conditions in the transmission system outside the microgrid, and finally enabling reintegration of the microgrid island with the rest of the ELL transmission system when normal electric service has been restored. In this manner, this microgrid controller will enable expedient recognition of an interruption of power to the region, a quick transition to the microgrid island, and rapid restoration of power inside the region, thus providing a resilient power source, as discussed by Company witness Sean Meredith.

The microgrid controller is on a closed-loop system that will be connected to the BPS and the control houses at the Leeville, Fourchon, Golden Meadow, Clovelly, and Valentine substations via the existing fiber optic communication system. The microgrid control system will be included in the same cybersecure system that protects the rest of the Company's operations technology network. The primary microgrid controller will be installed at the Leeville substation along with redundant microgrid controllers, auto synchronization relays, and networking equipment at the other substations. Finally, the microgrid controller will have operator override capability.

Q17. WHAT IS THE ESTIMATED COST OF THE MICROGRID PORTION OF THE PROJECT, AND HOW WAS THAT ESTIMATE DEVELOPED?

A. The project team determined a planning level cost estimate associated with the microgrid controller, the human-machine interface equipment, the remote input/output equipment, and the auto synchronizing relays needed for the microgrid operation. In addition, the installation, commissioning support, and training associated with the microgrid controller was also estimated. The total cost associated with the microgrid portion of the BPS project is estimated to be $2.9 million.

Q18. PLEASE EXPLAIN THE POTENTIAL MISO-RELATED BENEFITS.

A. The Project would be a quick-start and fast ramping resource that could be a valuable asset in any future enhancements to the MISO ancillary service market that may be necessitated by increased penetration of renewable resources. The resource would also add synchronous inertia and short circuit capability to the system, both of which will be increasingly valuable ancillary services in sustainable futures; this attribute could be consequential since a significant proportion of future resources are expected to be inverter-based resources.

Additionally, flexible, and modular resources, such as a power barge, will likely play an important role in Entergy resource fleets in the future and will allow the resource fleet to respond to sudden changes in demand forecast and in wholesale market capacity market accreditation and resource adequacy rules. For example, MISO's recent transition to the seasonal resource adequacy construct has added a further consideration for resource portfolios that include renewable resources. MISO has replaced its single annual resource adequacy requirement with four seasonal resource adequacy requirements, where resources have unique accreditation values for each season. MISO stated that the proposed seasonal resource adequacy construct more accurately represents resource capabilities at different times during the year, improves certainty of resource availability outside the Summer Season, provides better incentives for resources to be available when needed, establishes seasonal reserve requirements that better align with risks, and delivers additional visibility into risks throughout the Planning Year. The end result of these changes and the transition to the seasonal accredited capacity methodology is that renewable resources will be accredited with very little capacity for the Winter Season. This change in MISO's resource adequacy construct makes dispatchable, quick-start and flexible resources like BPS extremely valuable in meeting ELL's planning reserve margin requirement.

Q19. ONCE THE DETERMINATION TO USE RICE-GENERATION TECHNOLOGY WAS MADE, HOW DID ELL EVALUATE POTENTIAL MANUFACTURERS?

A. Two RICE manufactures were evaluated, but only Wartsila produces RICE units greater than 10 MW, with Wartsila's 18 MW 18V50SG models (used for the Project) being the largest on the market today. 18 MW units are the ideal size to achieve the optimal 112 MW of aggregated generating capacity. A single (or fewer number of) larger generator would reduce the amount of redundancy in the region, especially when the region must operate as a microgrid island in the event of the loss of transmission source. A very large number of smaller generators increases maintenance cost, while also limiting the step change in load that can be served when in islanded mode without impacting frequency and voltage; i.e., smaller RICE generators can correspondingly only accommodate smaller increments in load that can be served in an island without a deterioration in the frequency or voltage within the island. Furthermore, a comparison of recent Wartsila power barge builds shows that the proposed Project has the lowest price of all other recent Wartsila power barge builds (including the addition of emissions protections and transformers on the barge). The Power Generation group's history with operating RICE generators of the same technology and generator model at the New Orleans Power Station also instilled confidence in ELL's ability to operate and maintain the BPS.

Q20. WHAT ARE THE UNIQUE CHALLENGES ASSOCIATED WITH CONSTRUCTING THE WIRES-ONLY ALTERNATIVE THAT YOU MENTIONED?

A. Rebuilding the Golden Meadow – Barataria line is expected to be extremely challenging and involve complex construction work. There are multiple considerations that must be taken into account because of the challenging environment in which the rebuilt line would be situated. First, because of the difficult terrain and the presence of wetlands, helicopters will most likely have to be utilized for construction. In turn, transmission line poles and caisson structures must be designed in such a way that they can be transported and installed using helicopters. For instance, lifting vangs and pole strap attachments must be included with the poles and caissons to enable these structures to be flown safely. Similarly, the caissons must be designed to include larger reveals so that base-plated connections are maintained above normal tidal water levels and additional coatings may be required to be applied to the caisson to prevent corrosion resulting from exposure as a result of the larger reveals. Moreover, because the transmission poles and foundations must be flown by helicopter, the constraints to weight and size imposed by this requirement may result in requirements for shorter than normal span lengths along the line. These additional considerations with respect to the structures and caissons will likely add to the uncertainty in the schedule and cost of the construction work.

Second, rebuilding of the Golden Meadow – Barataria line would likely require that each potential transmission structure location be surveyed to determine whether the water depth is suitable for construction, thereby increasing the time, uncertainty, and cost associated with construction.

Third, the rebuilt line would require special consideration for animal mitigation owing to the delicate ecosystem in which it would be located. Custom solutions for bird diverter installations on all structure arms have to be designed, and these installations also must be transportable by helicopter. FAA lighting, which requires periodic maintenance, especially after storms, would be required on three structures.

Fourth, some portions of the line's right-of-way are expected to be over open water, which may result in delays in construction if windspeeds and tides cause the water to be too rough to work for construction activities. Any inadvertent impact to the wetlands may also require remediation to the marsh land, thereby adding to the cost and schedule uncertainty of the construction work. There are also multiple major waterway crossings that are located within the anticipated right-of-way, which require specialized PyraMAX towers that will require barges for transportation. The construction and installation of these towers would be challenging and likely require a combination of pontoon cranes, airboats, helicopters, and barges.

Sixth, because of the presence of saltwater in the marsh land where the construction of the line would be expected to occur, galvanized steel will likely be required for the transmission poles, with anodes installed on each structure to prevent corrosion. Even with protections, because of the corrosive environment in which the rebuilt line would be situated, the equipment may have shorter life expectancy.

Finally, access needed for the construction of the line might be through tracts owned by private landowners as well as state parks, raising the possibility of further delays and schedule complications.

Q21. ASSUMING THE TRANSMISSION LINE WERE TO BE REBUILT, ARE THERE UNIQUE CHALLENGES ASSOCIATED WITH MAINTAINING A TRANSMISSION LINE IN THAT AREA AS WELL?

A. Yes. Although the structures themselves would be hardened to withstand hurricane-force winds, wind-blown debris may contact the conductor or structures, causing damage that will have to be repaired in challenging circumstances. In addition to many of the same challenges present with constructing the line described above, there are additional challenges associated with maintaining and repairing the line, including the specialized and amphibious equipment necessary to work on the line, which significantly increases the cost of maintenance compared to traditional structure repairs that may be done with rubber tire equipment. Compared to typical overland transmission lines, a rebuilt Golden Meadow – Barataria line would require specialized spare parts and equipment necessary to work on PyraMax towers described above. Maintenance work may also result in the need for marshland remediation, thereby increasing the time needed for and the cost associated with maintenance work.

Q22. ARE THERE ANY OTHER CONSIDERATIONS YOU WOULD LIKE TO NOTE ASSOCIATED WITH THE WIRES-ONLY ALTERNATIVE?

A. Yes. Additional load growth, if it were to materialize, would require converting the transmission system in this area to 230 kV. The scheduling of outages and the construction needed to implement the conversion of the substations and the transmission system to 230 kV would be extremely challenging, as described above. Converting the portion of the electric system south of Golden Meadow would be particularly challenging given the radial nature of the transmission system and the significant induction motor customer load in that area.

III. <u>TRANSMISSION INTERCONNECTION AND UPGRADES</u>

A. MISO Interconnection

Q23. PLEASE DISCUSS THE MISO INTERCONNECTION REQUIREMENTS THAT ARE RELEVANT TO THE BAYOU POWER STATION PROJECT.

A. The BPS has secured Energy Resource Interconnection Service ("ERIS") in the MISO market, which gives the resource the ability to inject power to the grid. ELL has already signed a Generator Interconnection Agreement ("GIA") for the BPS with MISO. In addition, ELL also secured a 30-year Network Integration Transmission Service ("NITS") to the ELL load commencing in 2026, thereby making the BPS a network resource for ELL. I note, however, that the GIA will expire if BPS does not achieve commercial operations by December 1, 2028 unless granted a waiver by the Federal Electric Regulatory Commission, and if it expires a new interconnection request would be required to be made for the BPS in the MISO DPP process.

B. Transmission Upgrades Required for the Project

Q24. PLEASE DESCRIBE THE TRANSMISSION UPGRADES THAT WILL BE REQUIRED FOR THE PROJECT.

A. There are expected to be two transmission lines that will connect the BPS to the Leeville 115 kV substation. The Leeville substation must be expanded to include circuit breakers and additional substation bays into which the two generator tie-lines from BPS will interconnect. The total cost associated with this interconnection is expected to be $37 million.

IV. TRANSMISSION ALTERNATIVE COSTS

Q25. HOW WERE THE TRANSMISSION ALTERNATIVE COSTS USED IN THE ECONOMIC ANALYSIS PREPARED?

A. The cost estimate for the "wires option" was developed in several stages. First, a project to rebuild the Golden Meadow-Barataria 115kV line that was severely damaged in Hurricane Zeta was developed. Because the demolition of that 31-mile long line was recently completed, the rebuild would only involve construction of a new storm-hardened line within ELL's existing ROW. Completion of the rebuild would restore a second transmission source to the Golden Meadow Substation, and it would bring load-serving capacity back up to approximately where it was prior to the line being removed from service.

Second, a portfolio of projects was developed, which would upgrade existing facilities to provide additional load-serving capacity within lower Lafourche Parish once the golden Meadow - Barataria line rebuild has been completed. These upgrades would be performed in the following order, as needed to provide incremental load-serving capability to the area: (1) install Capacitor Bank at Clovelly 115 kV; (2) convert the Golden Meadow - Barataria line from 115 kV to 230 kV operation; (3) convert the Valentine-Clovelly-Golden Meadow Lines from 115 kV to 230 kV operation; and (4) convert the Golden Meadow-Leeville-Fourchon Lines from 115 kV to 230 kV operation.

For the Golden meadow – Barataria rebuild, the estimated costs were developed at a Class 3 level in mid-2022. The Class 3 estimate was based on completion of all preliminary engineering by internal resources, a detailed internal estimate of all material costs with input from all material vendors, and a competitive, negotiated firm fixed-price bid for a turnkey construction contract, with the construction scheduled for November 2022 through June 2024. The estimate also included an allocation of contingency funds based on a detailed quantitative risk assessment. Subsequently, the Class 3 estimate has been updated to account for material/labor cost escalations that were anticipated if the rebuild procurement/construction were to be executed at successively later dates.

For the Capacitor Bank and 230 kV Upgrades, the estimated costs were developed at a Class 4 level in mid-2021, based on preliminary scopes, utilizing internal resources and estimating tools, and cross-checked against actual costs from other completed projects where practical. The estimates for each of the four upgrades included allocation of scope/estimate uncertainty funds based on a qualitative risk assessment. Subsequently, these Class 4 estimates have been updated several times to account for anticipated material/labor costs escalations if the upgrades were to be executed at a later date.

Q26. WHAT WAS THE TOTAL ESTIMATED COST FOR THE WIRES ALTERNATIVE?

A. The costs associated with the projects comprising the wires alternative sum to the total project cost of $307 million:

- GM-Barataria Line Rebuild: $210 million
- Clovelly Capacitor Bank: $4 million
- GM-Barataria Conversion to 230 kV Operation: $54 million
- Valentine-Clovelly-GM Conversion to 230 kV Operation: $39 million

Q27. ARE THERE REASONS TO BELIEVE THE ESTIMATED WIRES ALTERNATIVE COSTS ARE LIKELY UNDERSTATED?

A. Yes. As explained above, the line rebuild portion of the estimate was initially developed at the Class 3 level in 2022 based on a construction timeline ending in June 2024. The capacitor bank and 230 kV upgrade estimates were initially developed at the Class 4 level in 2021. While those estimates have been updated several times, primarily to account for inflation, as noted above, they are still at the Class 3 and Class 4 levels, respectively, and the estimates would have to be refined with updated vendor quotes, route and site analysis, and further adjusted for inflation in materials and services at the time when, and if, the decision were ultimately made to execute the wires alternative. Given the additional passage of time and scope and cost refinement that would need to occur should the wires alternative move forward, the $307 million estimate described here is likely understated.

V. CONCLUSION

Q28. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY AT THIS TIME?

A. Yes.

AFFIDAVIT

STATE OF LOUISIANA

PARISH OF ORLEANS

NOW BEFORE ME, the undersigned authority, personally came and appeared, **SAMRAT DATTA**, 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.

Samrat Datta

Samrat Datta

SWORN TO AND SUBSCRIBED BEFORE ME
THIS 23d DAY OF FEBRUARY, 2024

Sean D. Moore

NOTARY PUBLIC

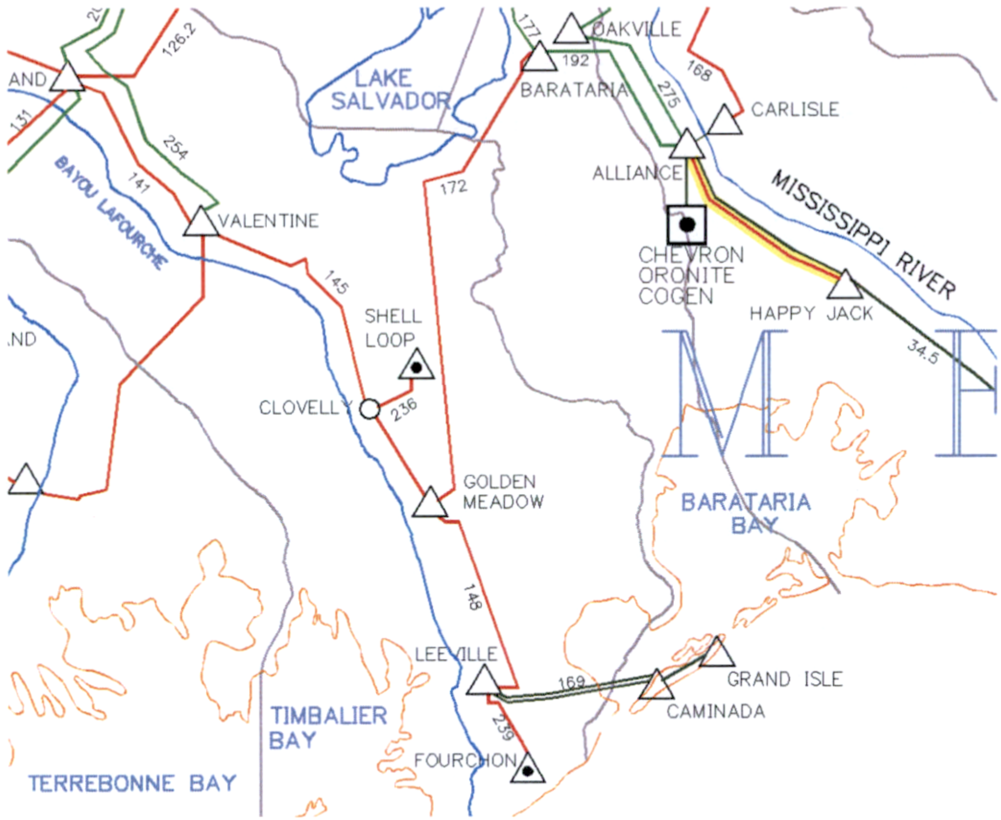
My commission expires: upon death

Sean D. Moore-La. Bar No. 20303
Notary Public for the State of Louisiana
My commission expires upon death

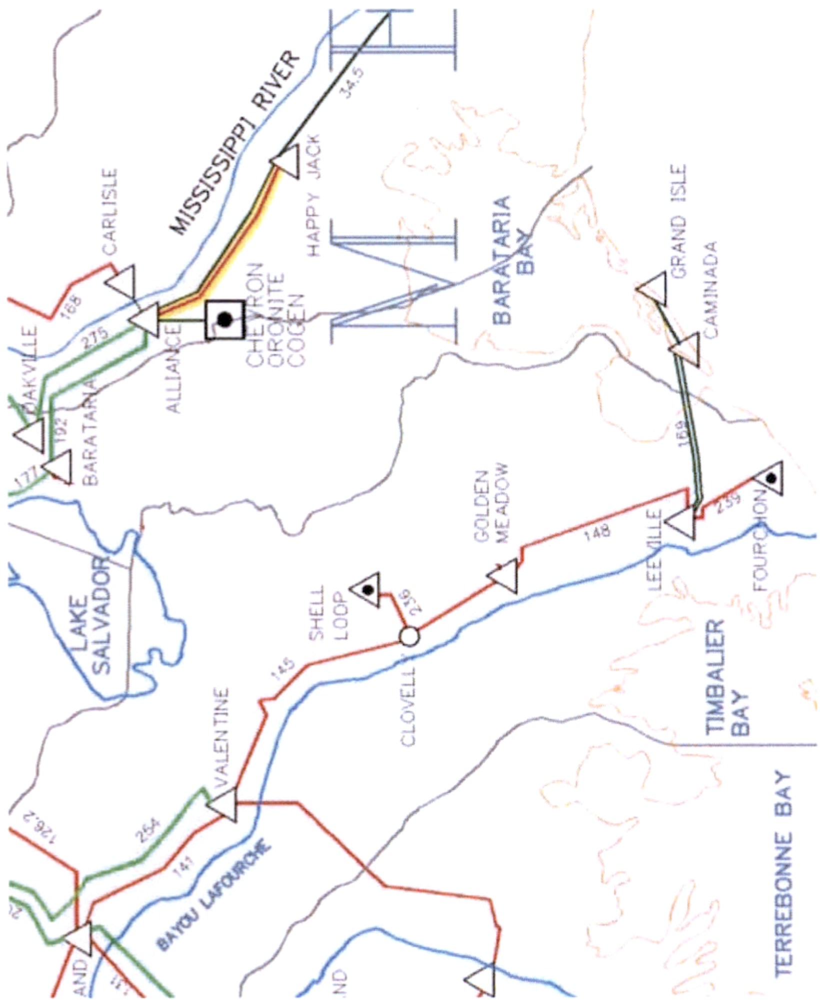
Listing of Previous Testimony Filed by Samrat Datta

DATE	TYPE	JURISDICTION	DOCKET NO.
04/21/2015	Direct	LPSC	U-33605
08/11/2017	Direct	PUCT	47462
12/11/2017	Rebuttal	LPSC	U-34447
09/08/2021	Direct	LPSC	U-35927
01/31/2022	Direct	LPSC	U-36135
02/14/2022	Direct	LPSC	U-36133
03/04/2022	Cross-Answering	LPSC	U-36135
3/18/2022	Cross-Answering	LPSC	U-36133
1/20/2023	Direct	LPSC	U-36514
01/26/2023	Direct	LPSC	U-36515

Configuration of the region prior to Hurricane Zeta

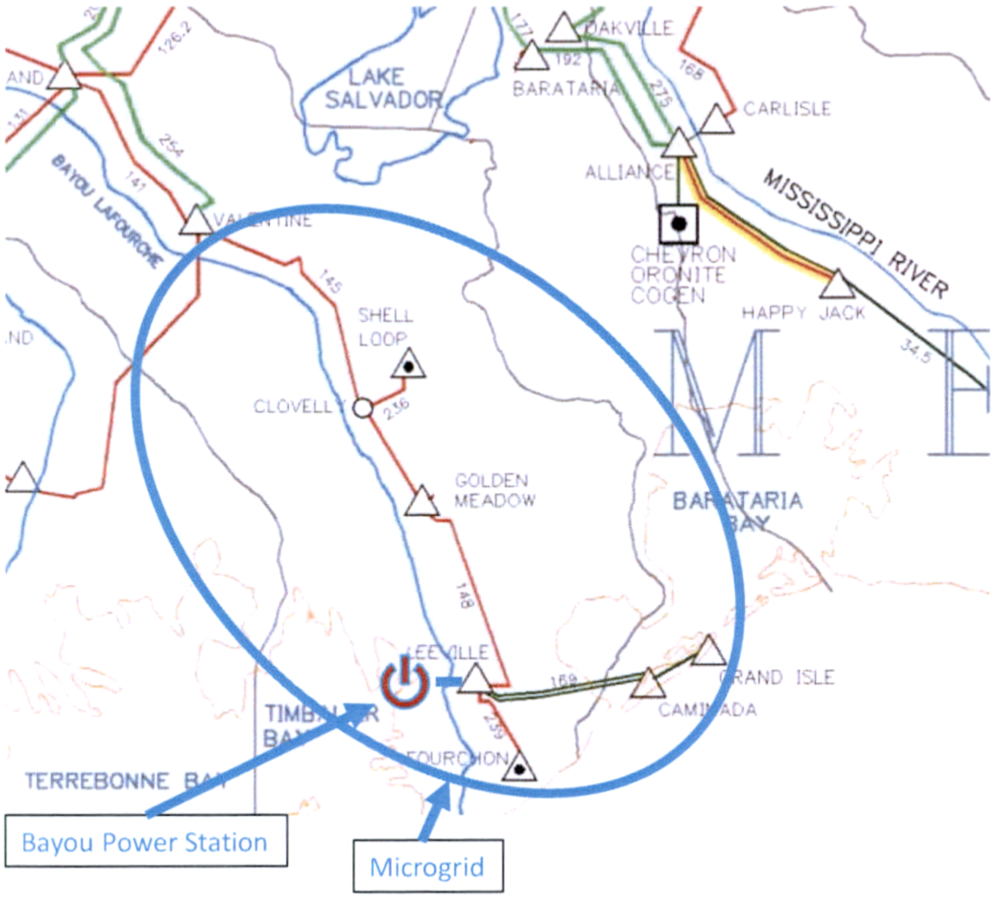


Current configuration of the region after Hurricane Zeta



Two options for increasing load serving capability in the future

Microgrid option with Bayou Power Station



Wires option