Filing Receipt

Filing Date - 2025-02-26 11:57:41 AM

Control Number - 56693

Item Number - 301

SOAH DOCKET NO. 473-24-21530

PUC DOCKET NO. 56693

APPLICATION OF ENTERGY TEXAS, INC. TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY TO CONSTRUCT A PORTFOLIO OF DISPATCHABLE GENERATION RESOURCES	§	**BEFORE THE STATE OFFICE**
	§	
	§	**OF**
	§	
	§	**ADMINISTRATIVE HEARINGS**

DIRECT TESTIMONY OF

SHERRYHAN GHANEM

INFRASTRUCTURE DIVISION

PUBLIC UTILITY COMMISSION OF TEXAS

February 26, 2025

TABLE OF CONTENTS

ATTACHMENTS

I. QUALIFICATIONS

Q. Please state your name, occupation, and business address.

A. My name is Sherryhan Ghanem. I am employed by the Public Utility Commission of Texas ("PUC" or "Commission") as an Engineering Specialist in the Engineering Section of the Infrastructure Division. My business address is 1701 North Congress Avenue, Austin, Texas 78701.

Q. Please outline your educational and professional background.

A. I have a Bachelor of Science degree in Electrical Engineering. My career to date has included technical work in the energy industry. I have been employed at the PUC since November 2021. Attachment SG-1 of my testimony contains a more detailed description of my educational and professional background.

Q. Are you a registered professional engineer?

A. No.

Q. Have you filed testimony at the Commission in previous proceedings?

A. Yes, I have included Attachment SG-3which lists my previously filed testimonies at the Commission.

II. SCOPE OF TESTIMONY

Q. What is the purpose of your testimony in this docket?

A. The purpose of my testimony is to present recommendations concerning the application (Application) of Entergy Texas Inc. (ETI) to amend its certificate of convenience and necessity (CCN) for the purposes of constructing, owning, and operating the Legend Power

Station (Legend) and the Lone Star Power Station (Lone Star), collectively, the Project. In particular, I address the need for the Project, the hydrogen capability proposed for the Project, the cost of the Project, and the recommendations of the Texas Parks and Wildlife Department (TPWD).

III. RECOMMENDATIONS

Q. What recommendations do you have regarding the Application?

A. If the Commission approves the Application, I recommend that the Commission also enact the following requirements:

- If the actual cost to construct the ETI Project inclusive of AFUDC, exceeds the estimated cost presented in ETI's CCN application by more than 10%, Commission Staff, in consultation with ETI, will develop an RFP and select a third-party consultant to conduct a prudence review. Commission Staff will have final approval on the selection of the consultant and will promptly notify ETI of the budgeted cost of the consultant before the consultant's work begins.
- Require ETI to promptly notify the Commission when it becomes aware that the cost to construct the ETI Project, inclusive of AFUDC, has exceeded or will likely exceed the estimated cost presented in ETI's CCN application by more than 10%. ETI will be required to bear the cost of the consultant. ETI must cooperate with the selected consultant's review process and provide the consultant with requested information as part of the consultant's prudence review.
- Commission Staff will present the third-party consultant as a witness in the applicable base rate proceeding. Commission Staff will file the third-party consultant's findings and conclusions and supporting testimony on the date of the

filing of the applicable base-rate application that includes the ETI Project construction costs. However, the Commission may grant an extension of the filing deadline, but in no event will the third-party consultant's findings and testimony be filed later than one month before the deadline for intervenor direct testimony. ETI must give Commission Staff reasonable notice as to when it plans on filing its applicable base-rate proceeding.

- Require ETI to implement the design and procedural modifications for the Project in order to operate during weather conditions outlined on pages 12-14 of my testimony.
- Require ETI to site Lone Star at the alternative San Jacinto County site.
- Order ETI to implement certain TPWD recommendations related to fish and wildlife, including measures to exclude wildlife from the project area, soil stabilization, minimization of electrocution hazards to perching birds, review of the threatened and endangered species at the Project site, and development of a beneficial management practices plan.

I am not making a recommendation on whether the Commission should approve the Application.

IV. PROJECT JUSTIFICATION

A. DESCRIPTION OF THE PROJECT

Q. Please describe the Project.

A. The Project would include two facilities, Legend and Lone Star. Legend would be a 754 megawatt (MW) combined-cycle combustion turbine (CCCT) resource, which will be enabled with carbon capture and storage (CCS) and hydrogen co-firing optionality, to be

located in Jefferson County, Texas. Lone Star would be a 453 MW simple-cycle combustion turbine (CT), which will be enabled with hydrogen co-firing optionality, to be located in Liberty County, Texas. The expected commercial operation date for Legend is on or before July 2028. The expected commercial operation date for Lone Star is May 2028.[1]

Legend will be located in ETI's Eastern Region, an area bordered by the Texas-Louisiana state border on the east, the Gulf of Mexico on the south, ETI's Western Region on the west, and the Southwest Power Pool (SPP) on the north. The Eastern Region is located within the West of the Atchafalaya Basin (WOTAB) load pocket, which is an area of heavy load concentration that, due to a limited ability to import power into the area, is dependent upon generation capability located within the region to serve the load in that area.[2]

Lone Star will be located in ETI's Western Region, which is a load pocket within the broader WOTAB load pocket, bordered on two sides (and partly on a third) by the Electric Reliability Council of Texas and sharing a small border with a less developed portion of the SPP system. The Western Region is almost entirely dependent on resources within the Western Region with a relatively limited amount of transmission import capability. [3]

ETI's total estimated cost of the Project is approximately $2.401 billion which includes the estimated costs of transmission upgrades and interconnection costs, contingency, an

[1] Application of Entergy Texas to Amend its CCN to Construct a Portfolio of Dispatchable Generation Resources at 1 (Jun. 5, 2024) ("Application").

[2] Application at 4-5

[3] Application at 5-6

allowance for funds used during construction, and expenses related to seeking Commission certification. The estimated cost for Legend is $1.602 billion, which includes $1.433 billion associated with the generation portion of the project as well as $22.5 million in estimated interconnection costs for connecting Legend to ETI's system at the switchyard and $147 million in estimated transmission network upgrades. The estimated cost of Lone Star is $799 million, which includes $750 million associated with the generation portion of the project as well as $7.8 million in estimated interconnection costs for connecting Lone Star to ETI's system at the switchyard and $41 million in estimated transmission network upgrades.[4]

Legend will consist of one Mitsubishi Power Americas (MPA) 501 JAC CT, one Nooter Eriksen heat recovery steam generator with duct firing and Selective Catalyst Reduction, and one MPA steam turbine generator in a 1x1 combined-cycle configuration, together with other balance of plant equipment, including the use of an air-cooled condenser for closed-cycle cooling operations. By design, the MPA 501 JAC CT is capable of approximately 30% hydrogen co-firing, with the capability of supporting 100% hydrogen firing in the future with additional upgrades. In addition, the layout of the Legend facility and site can accommodate CCS infrastructure and operations onsite.[5]

Lone Star will be a simple-cycle CT generation resource located near ETI's existing Jacinto Substation in one of two potential sites in Liberty County, Texas or San Jacinto County, Texas. Lone Star will consist of one MPA 501 JAC CT and one MPA generator in simple-cycle configuration, and other balance of plant equipment, including Selective Catalyst

[4] Affidavit of Abigail Weaver at 1-2 (Dec. 16, 2024) ("Weaver Affidavit").

[5] Application at 4.

Reduction and a Generator Step-Up transformer. The CT will be capable of approximately 30% hydrogen co-firing, with the capability of supporting 100% hydrogen firing in the future with additional upgrades.[6]

Q. Is the Project located within the incorporated boundaries of any municipality?

A. No. The San Jacinto County site for Lone Star is located within unincorporated lands of San Jacinto County and a small portion of Liberty County. The nearest residences are located approximately 0.5 mile north of the project site boundary. The nearest utility is the East Texas Electric Cooperative Peaking Facility located adjacent to the site.[7]

The Liberty County site for Lone Star is partially located in the city of Cleveland. The nearest Cleveland residences are located approximately 0.10 miles west of the Lone Star Project site boundary.[8]

The nearest city to Legend is Port Arthur, which is located approximately 2.8 miles east of the Project site. The Project site is within the extra-territorial jurisdiction of the city. The nearest Port Arthur residences are located approximately 0.35 miles north of the Legend site boundary.

Q. Does any part of the Project lie within the Texas Coastal Management Program (TCMP) boundary?

A. The Lone Star facility will not be sited within a TCMP boundary. However, the entirety of the Legend Project will be sited within the mapped CMP boundary. Specifically, Legend is seaward of the Coastal Facility Designation Line, as defined by 31 TAC § 19.2(a)(22),

[6] *Id.* at 5.

[7] Supplemental Direct Testimony of Jeremy Halland at 15 (Dec. 16, 2024).

[8] Direct Testimony of Jeremy Halland at 24 (Jun. 5, 2024) ("Halland").

and impacts a coastal wetland Coastal Natural Resource Area.[9] Applicable requirements include 16 Texas Administrative Code (TAC) § 25.102, which requires ETI to indicate the types of Coastal Natural Resources Areas (CNRAs) as defined in 31 § TAC 501.3(b) that are located in the Project area and ensure that they would not be directly or significantly impacted by the Project. The CNRAs specified and defined in 31 TAC § 26.3(b) are: coastal barrier, coastal historic area, coastal preserve, coastal shore area, coastal wetlands, critical dune area, critical erosion area, Gulf beach, hard substrate reef, oyster reef, special hazard area, submerged land, submerged aquatic vegetation, tidal sand or mud flat, water of the open Gulf of Mexico, and water under tidal influence. Of those CNRAs, the only CNRA present at the Legend site is coastal wetland. The Legend facility will not have a direct and significant impact on the coastal wetland CNRA because ETI will purchase mitigation offsets for any removal of wetlands at the Legend site.[10]

To comply with the CMP, ETI will coordinate with the U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), and potentially other members of the networked agencies of the CMP who will need to be consulted to assess and develop mitigation to offset impacts to coastal wetlands/critical areas within the Project area. Currently, ETI is consulting with the USACE to help evaluate and determine wetland permitting and mitigation requirements for the Legend Project. Regional and local mitigation banks are present that could support potential mitigation requirements and help to provide compliance with the CMP. It is expected that the USACE will have to consult

[9] *Id.* at 13-14.

[10] *Id.* at 15.

with the USFWS to assess habitat loss for migratory wildlife and integrate mitigation requirements into mitigation for wetlands loss.[11]

B. NEED FOR THE PROJECT

Q. As described by ETI, what need would be met by the Project?

A. The Dispatchable Portfolio will help meet the urgent capacity and energy needs of ETI's customers, is consistent with ETI's Strategic Resource Plan (SRP) to deliver affordable, reliable, and sustainable service centered on positive customer outcomes, and will allow ETI and the State of Texas to serve the once-in-a-generation growth ETI's service area is experiencing. The Dispatchable Portfolio will also help meet the sustainability demands of ETI's new and expanding industrial customers, which are increasingly considering access to clean energy in determining where to locate major new investments. Finally, the sustainable qualities of the Dispatchable Portfolio – specifically, enabling the future use of CCS technology at Legend and utilizing turbines capable of hydrogen co-firing at both resources – will protect all ETI customers by ensuring these major investments are positioned to provide reliable and economic power over their full useful lives notwithstanding current and future federal environmental regulations, including the recently finalized rule under Section 111 of the federal Clean Air Act that will impose significant carbon emission reductions starting in January 2032.[12]

ETI's Application states that the Project would add capacity to the electric system that will be necessary to meet ETI's projected load growth. The Company's summer coincident peak load is projected to grow 19.7% (or 746 MW) by 2028 and 29.5% (or 1,115 MW) by

[11] *Id.* at 13.

[12] Application at 2

2034. ETI's winter coincident peak load is projected to grow 17.0% (or 590 MW) by 2028 and 25.0% (or 866 MW) by 2034. With ETI's already short capacity position, the Company will need approximately 1.5 gigawatts (GW) and 1.6 GW of summer and winter capacity, respectively, by 2028. This need grows to approximately 2.4 GW of capacity in both the summer and winter by 2034.[13]

C. WEATHERIZATION

Q. What measures has ETI taken to weatherize Legend and Lone star to withstand hurricanes and extreme cold weather?

A. Both facilities will be designed with two approaches to extreme cold protection. All pipe and equipment will be designed considering an average temperature below freezing specific to the regional location of each facility and a duration below freezing of a minimum of 72 hours. This approach will identify the insulation requirements for piping. Piping systems 2.5 inches in diameter, or those which require an extreme amount of insulation thickness relative to pipe diameter, will be electrically heat traced to prevent freezing. The heat trace system will utilize smart electrical panels and thermal transmitters to provide the control room with online monitoring of critical systems susceptible to freezing. This design approach is based on lessons learned from recent hurricanes and winter storms in ETI' s service territory.[14]

Legend's current design allows the facility to continue conducting normal operations in temperatures as low as approximately 10 degrees Fahrenheit. As was done with OCAPS, several enhanced weatherization measures relative to ETI's previous CCCT design are

[13] *Id.* at 2-3.

[14] ETI's Responses to Commission Staff's Fifth RFI, STAFF 5-12 at 14 (Sep. 19, 2024).

being implemented in the Legend design to incorporate lessons learned from previous extreme weather events. The Legend design exceeds the latest winterization standards for generators set by NERC and ERCOT.[15]

Lone Star's current design allows the facility to continue conducting normal operations in temperatures as low as approximately 0 degrees Fahrenheit. If temperatures fell below 0 degrees Fahrenheit, combined with 20-mph or higher wind speeds, some additional measures could be required to sustain or resume normal operations. Several enhanced weatherization measures relative to ETI's previous CCCT design are applicable to CT design and are being implemented in the Lone Star design to incorporate lessons learned from prior extreme weather events. Like Legend, the Lone Star design exceeds the latest winterization standards set by NERC and ERCOT.[16]

Q. What measures has ETI taken to mitigate flood risk at the Legend site?

A. Recent geotechnical analyses completed as part of ETI's due diligence investigation of the project site involved the analysis of subsoil samples taken from borings dug deep beneath the surface of the Legend project site before starting the process of raising the elevation of the site for construction of the power plant's foundation. ETI's analysis of the subsoil samples revealed that the soils in the subsurface of the project site are more compressible than originally estimated in determining the scope of work for raising the site elevation in order to protect Legend from major flooding events.[17] The low base elevation of the Legend site makes it susceptible to potential flooding from significant rainfall events.[18]

[15] Direct Testimony of Carlos Ruiz at 8-9 (Jun. 5, 2024) ("Ruiz").

[16] *Id.* at 15-16.

[17] Supplemental Direct Testimony of Carlos Ruiz at 3 (Dec. 16, 2024) ("Ruiz Supplemental").

[18] *Id.* at 5.

Therefore, part of the construction plan for the facility is to raise the elevation of the site to protect against a 500-year flood event, and based on the results of the more recent soil borings, an alternative design will be required to safely and effectively mitigate this flood risk. ETI selected the sheet pile method to address the soil conditions at the Legend site. Accordingly, ETI will build a wall at or above the floodplain in order to keep floodwaters out of the power plant site in the event of a generational flooding event.[19]

Q. What recommendation do you have for weatherization of the Project?

A. I recommend that, if it approves the Application, the Commission require the design of, and procedures for, the Project to enable the plant to operate during weather conditions at least as severe as the weather conditions in February 2021. During the February 2021 severe freeze, some parts of Texas saw temperatures at or below freezing for up to eight consecutive days and winds up to 80 miles per hour. Many generation plants experienced failures due to those conditions, causing power outages to millions of Texans. Therefore, the Project should be designed and have procedures in place that would enable it to operate under the severe weather conditions of February 2021.

D. PROJECT ALTERNATIVES

Q. Did ETI consider investing in existing generation facilities to extend their service lives?

A. No. Approximately half of the capacity in ETI's current resource portfolio is from older gas-steam generation units. These units have been in-service for 45 years or more, with the oldest being in operation for 62 years. Several of ETI's generators are expected to reach

[19] *Id.* at 8.

the end of their economic useful lives and deactivate starting in 2025. These planned deactivations contribute to ETI's projected need for additional capacity.[20]

Q. Did ETI consider building additional transmission to enable it to purchase more power?

A. ETI is developing multiple new transmission projects in combination with the Dispatchable Portfolio to most cost-effectively meet the resource needs of its customers, which include both locational reliability needs and market risk mitigation.[21]

Siting generation within a load pocket is preferable if one exists. A load pocket generally refers to an area of heavy load concentration that, due to a limited ability to import power into the area, is dependent upon generation capability located within the area to serve the load in that area. Often, simply expanding the transmission system to import more power into a load pocket is not the most cost-effective method to increase a utility's load-serving capability in the load pocket due to geographical constraints that hinder the expansion of the transmission system.[22]

Q. What technology alternatives to the Project did ETI evaluate?

A. ETI did not have sufficient time to develop and conduct the type of RFP for dispatchable generation previously conducted for units like the Montgomery County Power Station and the Orange County Advanced Power Station. Therefore, as discussed below, ETI requested that Sargent & Lundy develop and conduct a Power Island Equipment (PIE) RFP for the major plant components that would constitute the bulk of the investment in

[20] Direct Testimony of Abigail B. Weaver at 10 (Jun. 5, 2024) ("Weaver").

[21] ETI's Responses to Staff's Third RFI, STAFF 3-18 at 20 (Sep. 13, 2024).

[22] Direct Testimony of Daniel Kline at 5-6 (Jun. 5, 2024).

the Dispatchable Portfolio. At the same time, ETI used the new SRP process to test whether an optimized portfolio would include dispatchable generation, and to what extent. The SRP preliminary results supported the conclusion that two dispatchable generation resources should be deployed in the near term. Based on those preliminary results, ETI made the decision to proceed with the PIE RFP pending the final SRP results.[23]

Q. Do you have an opinion on whether ETI adequately considered alternatives to the Project before filing its Application?

A. No.

D. HYDROGEN CO-FIRING CAPABILITY

Q. What does ETI propose with respect to hydrogen use?

A. By design and without any modifications, the PIE that ETI plans to install at the Lone Star Power Station and Legend Power Station can mix up to 30% by volume hydrogen together with natural gas as fuel to theoretically help reduce stack carbon emissions. Although the PIE has the ability to operate with this mixture of natural gas and hydrogen fuel, the design of this plant, as requested for approval in this application, only considers operation on 100% natural gas. Additional equipment necessary to get hydrogen to the plants (i.e., pipeline infrastructure) and equipment that may be needed to blend the natural gas and hydrogen fuels prior to introduction into the combustion turbines was not

[23] Weaver at 19-20.

included in the design or cost estimates for the Project presented in ETI's Application in this docket.[24]

Q. Why is ETI proposing to use hydrogen?

A. ETI states that it is proposing to use hydrogen. The vast majority of the new and expanding industrial loads in the ETI service territory have sustainability goals. Further, new, expanding, and existing industrial customers are increasingly considering access to clean energy as a key component in locating new loads. In addition, federal environmental regulations could dramatically impact the manner in which long-lived generation resources can be operated and the associated economics benefits received by customers. For example, on April 25, 2024, the United States Environmental Protection Agency (EPA) adopted a final rule under Section 111 of the Clean Air Act (Rule 111) that establishes new requirements for the control of greenhouse gas emissions from new and certain existing fossil fuel-fired generating units.[25]

This rule could be withdrawn by a new administration or overturned by the courts, but there is a non-trivial possibility – indeed, some would say a likelihood – that this rule or similar regulations could be implemented at some 1 point during the planned 30-year life of a new natural gas unit, which would extend into the 2060s and perhaps beyond.[26]

Q. How does ETI plan to supply hydrogen?

[24] ETI's Responses to Staff's First RFI, STAFF 1-20 at 27 (Aug. 12, 2024).

[25] Direct Testimony of Eliecer Viamontes at 9-10 (Jun. 5, 2024) ("Viamontes").

[26] Weaver at 25-26.

A. Entergy Texas, Inc.'s (ETI) has not performed an evaluation to understand the existing supply chain and availability of hydrogen fuel for the Legend Power Station and Lone Star Power Station.[27]

Q. What does ETI propose with respect to a Carbon Capture System (CCS) use?

ETI is planning to accommodate future green initiatives at the Legend site by including enough acreage to accommodate a CCS facility. In addition, ETI has oriented the CCCT on the property such that installation of necessary duct work to convey exhaust gases from the CCCT to a CCS facility could be installed with little to no obstruction. Any CCS facility installed at Legend is also expected to require additional utilities such as natural gas and electricity, as well as the ability to transport captured CO2 off-property, and corridors have been accounted for to ensure these needs can be met. As of this time, Legend will not be required to utilize CCS technology in order to operate at its full capacity and generate electricity at the maximum output. However, pursuant to Section 111 of the federal Clean Air Act, the EPA has recently published a new emission reduction rule that would apply to fossil fuel-fired electric generating units, including CCCTs such as Legend. This rule would impose a Phase 2 CO2 emission standard based on the application of CCS for new baseload CCCTs such as Legend beginning on January 1, 2032. When this Phase 2 CO2 emission standard becomes effective, the ability of Legend to generate electricity at its full capacity will be limited to a significant degree if CCS technology has not been integrated into the unit's operation. ETI states that implementation of CCS technology is effectively the only means of compliance with the

[27] ETI's Responses to Staff's First RFI, STAFF 1-22 at 29.

rule that will allow Legend to operate at its full capacity after January 2032 and avoid becoming a stranded asset.[28]

Q. What infrastructure does ETI propose for the capability to co-fire hydrogen and what would be the incremental cost?

A. In order to enable hydrogen co-firing capability, the turbines utilized in both the Legend and Lone Star facilities will have off-the-shelf hydrogen co-firing capability.[29] Incremental costs to enable hydrogen use have not been considered in this application.

E. PROJECT COSTS

Q. How much would the Project cost?

A. ETI provided initial project costs at the time of filing its application. Since then, supplemental testimony has been filed describing increased costs. ETI's total estimated cost of the Project is approximately $2.401 billion[30] which includes the estimated costs of transmission upgrades and interconnection costs, contingency, an allowance for funds used during construction, and expenses related to seeking Commission certification. The estimated cost for Legend is $1.602 billion, which includes $1.433 billion associated with the generation portion the project as well as $22.5 million in estimated interconnection costs for connecting Legend to ETI's system at the switchyard and $147 million in estimated transmission network upgrades. The estimated cost of Lone Star is $799 million, which includes $750 million associated with the generation portion of the project as well as $7.8 million in estimated interconnection costs for connecting Lone Star to

[28] Ruiz at 11-12.

[29] Viamontes at 10.

[30] Weaver Affidavit at 1.

ETI's system at the switchyard and $41 million in estimated transmission network upgrades.[31]

Q. What are the additional costs for Legend?

A. As described in my testimony on pages 13-14 there was a design change to mitigate the flood risk at the Legend site. As a result of the implementation of the sheet piling plan and the estimated increases in the other cost categories discussed above, the net project cost increase for Legend is approximately $139 million, for a total project cost of $1.602 billion compared to the original estimate of $1.463 billion.[32] Below is the breakdown of additional costs related to the sheet piling:[33]

Impact of Sheet Piling Plan on Legend Cost Estimate:

Cost category	Total cost - original civil design	Total cost - sheet pile design	Difference
Civil scope	$ 32,800,000	$ 73,400,000	$ 40,600,000
Mechanical equipment	$ -	$ 840,000	$ 840,000
Pipe	$ -	$ 319,000	$ 319,000
Structural	$ -	$ 109,300	$ 109,300
Electrical	$ -	$ 779,000	$ 779,000
Engineering	$ -	$ 8,400	$ 8,400
Indirects	$ 7,500,000	$ 20,600,000	$ 13,100,000
Equipment warranty extension	$ -	$ 494,400	$ 494,400
TOTAL			**$ 56,250,100**

[31] Weaver Affidavit at 23.

[32] Ruiz Supplemental at 12-13.

[33] Ruiz Supplemental at 11.

In addition to the increased cost for the design change I just discussed, there have been changes in the engineering, procurement, and construction (EPC) cost estimates, which primarily resulted from cost adjustments for changes in scope based on project development activity that has advanced since the application was filed. These items include additional required equipment, additional cost for area craft attraction, equipment design modifications, and site drainage rerouting required to avoid further wetland impacts. The EPC cost estimate has also increased due to general escalation in market prices for many of the cost components for Legend that have occurred since the original estimate was made, and to account for EPC indirect cost adjustments.

The total additional costs breakdown is below:[34]

Legend Total Additional Cost:

Driver	Increase/(Decrease) ($M)
Civil scope design change	56
EPC cost adjustments since open book	70
Entergy Direct Costs	(11)
Entergy Indirect Costs	7
Removal of Mitsubishi Financing Costs	(42)
Financing costs	59
Total Additional Estimated Project Costs	**139**

Legend Capital Cost Estimate (Millions)[35]:

[34] Ruiz Supplemental at 13.

[35] *Id.* at 14.

	Original Estimate	Current Estimate
EPC Contract	$925.70	$1,010.00
Other Vendors	$102.50	$88.00
Entergy Labor	$16.00	$16.40
Other Expenses	$6.50	$8.70
Total Direct Cost	**$1,050.70**	**$1,123.10**
Allowance for Funds Used During Construction ("AFUDC")	$140.50	$199.70
Other Indirect Costs	$15.00	$22.90
Total Indirect Cost	**$155.50**	**$222.60**
Contingency	$87.20	$87.20
Generation Project Cost	**$1,293.40**	**$1,432.90**
Transmission Interconnection Project Cost	**$22.50**	**$22.50**
Transmission Upgrades Project Cost	**$147.00**	**$147.00**
Total Project Cost	**$1,462.90**	**$1,602.40**

Q. What are the additional costs for Lone Star?

A. ETI has pursued an alternate location to site Lone Star which was previously unavailable at the time of application filing. As filed, ETI planned to site Lone Star at a location in Liberty County just adjacent to the existing ETI Jacinto Substation, where the facility would be interconnected to ETI's transmission system. The alternative property for siting Lone Star, is in San Jacinto County, approximately five miles farther away from the transmission interconnection point at the Jacinto Substation, but in close proximity to the transmission line right of way. This property is a suitable plot of land to install a power plant with the characteristics of the proposed Lone Star project.

Q. What are the differences between the Liberty County and San Jacinto County sites?

A. The Liberty County site is very close to the transmission interconnection point at the Jacinto Substation, but it is also located within the Houston-Galveston-Brazoria ozone nonattainment area. Siting Lone Star at this location requires the purchase of emission reduction credits to offset the projected nitrogen oxide and volatile organic compound emissions from Lone Star to allow the plant to be constructed and operated at this location. In addition, the Liberty County site would entail additional costs associated with wetland mitigation. The wetland delineation and waterbody survey for the Liberty County property identified approximately 160 acres of wetlands on the 240-acre tract of land surveyed, including on the area adjacent to Jacinto Substation. Although the extent of wetlands at the Liberty County property was known at the time ETI filed its initial application in this proceeding, ETI had not yet determined an exact location for Lone Star within the limits of the property. Since then, a revised location for Lone Star on the Liberty County property has been identified that minimizes wetlands impacts. ETI anticipates that siting Lone Star at the Liberty County property will have permanent wetlands impacts that requires the purchase of wetland mitigation credits to allow project construction and operation.

The potential alternative project site in San Jacinto County is not located in a nonattainment area and diligence reveals no material amount of wetlands within its boundaries. As a result, the costs associated with emissions reduction and wetlands mitigation credits required at the Liberty County site would be avoided if Lone Star is constructed at the San Jacinto County site. However, the San Jacinto County site is roughly five miles farther away from the Jacinto Substation interconnection point.

Therefore, it will require the construction and authorization, in a separate certification proceeding, of a transmission line between the project and the substation.[36]

Q. What are the costs associated with the environmental impact at the Liberty County Site?

A. ETI estimates that the project costs for the emission reduction credits that will be necessary for construction and operation of Lone Star at the Liberty County site will be approximately $38.7 million. As for the wetlands at the Liberty County site, ETI estimates that the cost of the mitigation credits necessary to allow construction of the project will be approximately $2.5 million. Thus, in total, ETI estimates there would be approximately $41.2 million of environmental compliance costs associated with the Liberty County site that could be avoided if Lone Star is constructed on the San Jacinto County site.[37]

Q. What is the estimated cost of the transmission line to interconnect Lone Star at the San Jacinto County Site?

A. ETI currently estimates that the costs associated with the transmission line would be approximately $21 million, which is approximately $13 million more than assumed for transmission interconnection costs in the original project cost estimate at the Liberty County site.

Q. Have there been further cost escalations for Lone Star as seen with Legend?

[36] Ruiz Supplemental at 16-17.

[37] *Id.* at 18.

A. Yes. The same categories of cost increases associated with the EPC that resulted in increased pricing for Legend have also impacted the cost estimates for Lone Star that I presented in my direct testimony, except for the increase associated with the civil design change at Legend. The incremental project cost increase for Lone Star (at the original Liberty County site) is approximately $63.7 million, for a total updated project cost of $799 million as compared to the original estimate of $735 million. The breakdown associated with the cost increase is below[38]:

Lone Star Total Additional Cost:

Driver	Increase/ (Decrease) ($M)
Environmental Costs	41.2
EPC cost adjustments since open book	26.3
Entergy Direct Costs	6.5
Entergy Indirect Costs	3.2
Removal of Mitsubishi Financing Costs	(34.7)
Financing Costs	21.2
Total Additional Estimated Project Costs	**63.7**

ETI is preserving optionality to pursue either site (Liberty or San Jacinto County) as determined, through final due diligence, to be in customers' best interest based on cost and risk. The site-specific costs vary depending on the location where Lone Star will be built. The current cost estimates below reflect the higher cost site at Liberty County.

[38] *Id.* at 20.

Lone Star Capital Cost Estimate (Millions)[39]:

	Original Estimate	Current Estimate
EPC Contract	$467.30	$459.90
Other Vendors	$69.60	$110.80
Entergy Labor	$15.50	$15.00
Other Expenses	$19.40	$25.00
Total Direct Cost	**$571.80**	**$610.70**
AFUDC	$61.50	$82.70
Other Indirect Costs	$9.40	$13.00
Total Indirect Cost	**$70.90**	**$95.70**
Contingency	$43.80	$43.80
Generation Project Cost	**$686.50**	**$750.20**
Transmission Interconnection Project Cost	**$7.80**	**$7.80**
Transmission Upgrades Project Cost	**$41**	**$41**
Total Project Cost	**$735.30**	**$799.00**

Q. What is your recommendation with respect to the cost of the Project?

A. If the Commission approves the Application, I recommend that the Commission limit the costs for the Project recoverable through rates up to a maximum of $2.401 billion, including AFUDC-the estimate in ETI' s supplemental application. A cost cap will protect ratepayers from potential increases for the selected Project. If the actual cost to construct the ETI Project, inclusive of AFUDC, exceeds the estimated cost presented in ETI's CCN application by more than 10%, Commission Staff, in consultation with ETI, will develop an RFP and select a third-party consultant to conduct a prudence review. Commission Staff

[39] *Id.* at 22.

will have final approval on the selection of the consultant and will promptly notify ETI of the budgeted cost of the consultant before the consultant's work begins.

F. OTHER FACTORS

Q. Did ETI address community values, recreational and park areas, historical and aesthetic value, and environmental integrity?

A. Existing land uses within the Legend Project area are primarily composed of pastureland, remnant saline prairie, forest habitat, manmade canals and ditches, and coastal wetlands. For Lone Star, existing land uses include forested land with minimal industrial land located in the southern portion of the Lone Star Project area.[40] The Project will convert the current land use in both Project areas to industrial development as power station facilities. Site conversion will require clearing, grading and construction activities. Local residences will experience temporary construction impacts, such as noise and traffic, but will not be disrupted during the Project's operations. Construction and operation of the Project will not affect local utility services in the Project areas.

There are no recreational or park areas within the Project areas. No parks or other public open spaces are located in the immediate vicinity of the Project sites, nor are there other commercial or institutional uses in the immediate area that could be disrupted.

The Project areas are not located within one mile of any cultural and historical resources. No known high-quality aesthetic resources, designated views, or designated scenic roads or highways were identified within the Project areas. There will be minimal effect on aesthetics in the Project areas.

[40] Halland at 20.

Q. As a result of the TPWD comments, what modifications, if any, should be made to the Project?

A. I recommend following TPWD's recommendations outlined in "TPWD's Comments regarding the Application of Entergy Texas, Inc. to Amend its Certificate of Convenience and Necessity to Construct a Portfolio of Dispatchable Generation Resources; Jefferson and Liberty Counties, Texas" filed on August 6, 2024 as well as supplemental information provided by TPWD regarding the alternative San Jacinto County site.

Q. What other comments do you have about TPWD's recommendations?

A. Under Texas Parks and Wildlife Code § 12.0011(a), TPWD is the state agency with primary responsibility for protecting the state's fish and wildlife resources. In addition, under subsection (b)(2) and (3), it provides recommendations that will protect fish and wildlife resources to local, state, and federal agencies that approve, permit, license, or construct developmental projects; and provides information on fish and wildlife resources to any local, state, and federal agencies or private organizations that make decisions affecting those resources. As a result, I recommend that ETI be ordered to collaborate with TPWD to implement actions corresponding to the TPWD recommendations.

V. CONCLUSION

Q. What conclusions have you reached?

A. If the Commission approves the Application, I recommend that the Commission also enact the following requirements:

- If the actual cost to construct the ETI Project, inclusive of AFUDC, exceeds the estimated cost presented in ETI's CCN application by more than 10%, Commission

Staff, in consultation with ETI, will develop an RFP and select a third-party consultant to conduct a prudence review. Commission Staff will have final approval on the selection of the consultant and will promptly notify ETI of the budgeted cost of the consultant before the consultant's work begins.

- Require ETI to promptly notify the Commission when it becomes aware that the cost to construct the ETI Project, inclusive of AFUDC, has exceeded or will likely exceed the estimated cost presented in ETI's CCN application by more than 10%. ETI will be required to bear the cost of the consultant. ETI must cooperate with the selected consultant's review process and provide the consultant with requested information as part of the consultant's prudence review.
- Commission Staff will present the third-party consultant as a witness in the applicable base rate proceeding. Commission Staff will file the third-party consultant's findings and conclusions and supporting testimony on the date of the filing of the applicable base-rate application that includes the ETI Project construction costs. However, the Commission may grant an extension of the filing deadline, but in no event will the third-party consultant's findings and testimony be filed later than one month before the deadline for intervenor direct testimony. ETI must give Commission Staff reasonable notice as to when it plans on filing its applicable base-rate proceeding.
- Require ETI to implement the design and procedural modifications for the Project in order to operate during weather conditions outlined on pages 12-14 of my testimony.
- Require ETI to site Lone Star at the alternative San Jacinto County site

- Order ETI to implement certain TPWD recommendations related to fish and wildlife, including measures to exclude wildlife from the project area, soil stabilization, minimization of electrocution hazards to perching birds, review of the threatened and endangered species at the Project site, and development of a beneficial management practices plan.

I am not making a recommendation on whether the Commission should approve the Application.

Q. Do you have any other comments?

A. Yes. My silence on a particular issue should not be interpreted as my agreement with ETI's position on that issue.

Q. Does this conclude your testimony?

A. Yes.

Attachment SG-1

Qualifications of Sherryhan Ghanem

SHERRYHAN GHANEM

SUMMARY

Experienced Electrical Engineer with a demonstrated history of working in the oil & energy industry. Skilled in analytical skills, project management, communication, and teamwork.

EDUCATION

Bachelor of Science in Electrical Engineering (2018), New Jersey Institute of Technology,
Applied Mathematics Minor Newark College of Engineering, Newark, NJ
GPA: 3.5

Master of Science in Engineering Management (In Progress), New Jersey Institute of Technology,
Newark College of Engineering, Newark, NJ

WORK EXPERIENCE

PUBLIC UTILITY COMMISSION OF TEXAS, Austin, TX 2021 - Present

Engineering Specialist
Infrastructure Division

- Apply engineering principles to evaluate and audit engineering and technical issues to provide recommendations regarding facility planning, construction, and operations and maintenance in the electric and water industries
- Participate in the winter weatherization rulemaking for electric utilities in conjunction with the Electric and Reliability Council of Texas as a response to the February 2021 winter storm that impacted electrical infrastructure in Texas
- Prepare written testimony for filing in contested proceedings, such as certificate of convenience and necessity, fuel reconciliation, and rate proceedings
- Demonstrate a spirit of teamwork and collaboration across several divisions including Market Analysis, Rate Regulation, and Legal, offering positive and constructive ideas and support to the team

EXXONMOBIL PIPELINE COMPANY, Houston, TX 2019 - 2020

Field Electrical Engineer
Fuels and Lubes

- Led, managed, and created technical designs for electrical and multidisciplinary projects at various pipeline stations and fuels terminals including PLC upgrades and power management solutions
- Troubleshot and provided technical support for field operations in the event of power or control systems failure
- Communicated, scheduled, and coordinated with a team of engineers, operators, technicians, and contractors to execute projects from design to construction
- Programmed Allen Bradley PLCs in various RSLogix models to automate processes at pipeline stations and terminals

PSEG NUCLEAR, Salem, NJ 2018

Technical Intern

Corporate/Design Engineering

- Revised Performance Centered Maintenance templates to adhere to industry standards set by the Electric Power Research Institute and updated procedures
- Reviewed and analyzed electrical drawings for various tasks in the plant including risk analyses and conducted walk downs into the plant to inspect different systems

SCHINDLER ELEVATOR CORPORATION, Morristown, NJ 2018

Electrical Engineering Intern

Field Support Group

- Led the preparation and maintenance of lab equipment for testing
- Read schematics to build, wire, and test elevator simulators using proprietary company software

KEARFOTT CORPORATION GUIDANCE AND NAVIGATION DIVISION, Little Falls, NJ 2017

Engineering Summer Intern

Guidance and Navigation Division

- Collaborated with a team of interns to produce all documentation, software, 3D CAD models required to create an automated version of substrate inspection
- Tested and evaluated quartz and MEMS accelerometers using a tilt table, thermal chamber, and vertical shaker

MATH TUTORING CENTER, Newark, NJ 2016 - 2018

Math Tutor

New Jersey Institute of Technology

- Tutored students in Pre-calculus, Trigonometry, Calculus I, II, III, and Differential Equations
- Led math recitation classes with the Teacher's Assistant

LEADERSHIP

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, Newark, NJ 2017 - 2018

Event Coordinator

- Planned and organize educational workshops and coordinate with companies to hold information sessions
- Met weekly with board members and advisor to discuss club goals and progress

SOCIETY OF WOMEN ENGINEERS, Newark, NJ 2015 - 2017

Event Coordinator (2016), Membership Chair (2015)

- Planned educational and social events to keep current members engaged and to expand membership
- Effectively communicated with fellow board members on a weekly basis to discuss progress

STUDENT SENATE, New Jersey, Newark, NJ 2016 - 2017

Electrical Engineering Representative

- Held feedback sessions for ECE students and meet with the chair of the ECE Department to implement changes reflective of constituents' requests
- Served on a standing committee and attended weekly meetings to share progress and plan events for the students

PROFESSIONAL ASSOCIATIONS

- Eta Kappa Nu IEEE Honor Society
- Tau Beta Pi Engineering Honor Society NJ Gamma Chapter
- Society of Women Engineers (SWE)
- Institute for Electrical and Electronics Engineers (IEEE)

SKILLS

- Microsoft Office Suite, MultiSim, Java, Matlab, RSLogix, SKM Power Tools

Attachment SG-2

Table of Abbreviations

Name	Description
AFUDC	Allowance for Funds Used During Construction
CCCT	Combined-Cycle Combustion Turbine
CCN	Certificate of Convenience and Necessity
CCS	Carbon Capture and Storage
CNRA	Coastal Natural Resource Area
CT	Combustion Turbine
EPA	Environmental Protection Agency
EPC	Engineering, Procurement, and Construction
ETI	Entergy Texas Inc.
MPA	Mitsubishi Power Americas
MW	Megawatt
OCAPS	Orange County Power Station
PIE	Power Island Equipment
RFP	Request for Proposal
SPP	Southwest Power Pool
SRP	Strategic Resource Plan
TAC	Texas Administrative Code

TCMP	Texas Coastal Management Program
TPWD	Texas Parks and Wildlife Department
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WOTAB	West of the Atchafalaya Basin

Attachment SG-3

List of Dockets Containing Testimony of Sherryhan Ghanem

Application of Entergy Texas, Inc. to Amend its Certificate of Convenience and Necessity to Construct Orange County Advanced Power Station, SOAH Docket No. 473-22-1074, PUC Docket No. 52487

Joint Application of AEP Texas Inc. and Sharyland Utilities LLC to Amend Certificates of Convenience and Necessity for the La Palma-to-Kingfisher Double-Circuit 345-kV Transmission Line in Cameron County, SOAD Docket No. 473-22-05831, PUC Docket No. 53727

Application of Southwestern Electric Power Company for Certificate of Convenience and Necessity Authorization and Related Relief for the Acquisition of Generation Facilities, SOAH Docket No. 473-22-00991, PUC Docket No. 53625

Application of South Texas Electric Cooperative, Inc. to amend its Certificate of Convenience and Necessity for the San Miguel-to-Cruce Double Circuit 345-kV Transmission Line in Atascosa, McMullen, Duval, and Jim Hogg Counties, SOAH Docket No. 473-23-18893, PUC Docket No. 54936

Application of AEP Texas Inc., Electric Transmission Texas, LLC, and South Texas Electric Cooperative, Inc. to amend their Certificates of Convenience and Necessity for the Cruce-to-Del Sol Double Circuit 345-kV Transmission Line in Brooks, Duval, Jim Hogg, and Starr Counties, SOAH Docket No. 473-23-22772, PUC Docket No. 55151

Application of Oncor Electric Delivery Company LLC to Amend its Certificate of Convenience and Necessity for the Redland Switch-to-Lufkin Switch 345-KV Transmission Line in Angelina County, SOAH Docket No. 473-23-23817, PUC Docket No. 55172

Application of El Paso Electric Company to Amend its Certificate of Convenience and Necessity for a 150 MW Solar Facility, SOAH Docket No. 473-23-24883, PUC Docket No. 54929

Application of Entergy Texas, Inc. to Amend its Certificate of Convenience and Necessity to Construct a Portfolio of Renewable Generation Resources, SOAH Docket No. 473-25-00481, PUC Docket No. 56865