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Review and Assessment of the Proposed Acquisition by Entergy Mississippi of the Choctaw Generating Station

**Report to the
Mississippi Public Utilities Staff**

Prepared by Bates White, LLC

September 9, 2019

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I. Executive Summary

Bates White LLC (“Bates White”) was retained by the Mississippi Public Utilities Staff (“Staff”) to provide an independent assessment of the proposed acquisition by Entergy Mississippi, LLC (“EML” or “Entergy Mississippi” or the “Company”) of the Choctaw Generating Station (“Choctaw”, the “Facility” or the “Choctaw Facility”), based on the transaction as presented in the Company’s October 9, 2018 Petition (In Re: Proposed Modernization of the Generating Facilities of Entergy Mississippi, Inc. with the Acquisition of the Choctaw Generating Station in Choctaw County, Mississippi; Docket No. 2018-UA-204; the “Petition”).

Bates White reviewed the Petition, accompanying testimony, and responses to data requests to evaluate the proposed transaction.

Specifically, the analyses presented in this report examine:

- Background and origin of the transaction;
- The EML response to the Choctaw solicitation;
- EML’s economic evaluation of the transaction as proposed in the Petition; and,
- EML’s due diligence assessment regarding the physical condition of the Facility.

Based on the review presented in this report, our conclusions and recommendations are as follows:

1. Choctaw Acquisition Cost

We find that the **\$314 million** purchase price of the Choctaw unit is significantly below the cost of a new combined cycle gas turbine (“CCGT”), consistent with Choctaw’s age and performance characteristics. A comparison of the acquisition price to available data on recent comparable transactions also indicates that the Choctaw purchase price is consistent with other observed plant values in the market. We conclude that the acquisition cost of Choctaw is reasonable. Additional costs associated with planned capital investments, spare equipment, transaction costs and contingency bring the total asset acquisition cost to approximately **\$401 million**.

2. Estimated Net Benefits

The acquisition of Choctaw, and planned capital upgrades, will cause customer rates to increase, but likely by less than under reasonable alternative scenarios examined by Entergy Services, LLC (“ESL”) on behalf of EML. The economic evaluation of the transaction indicates an expected positive net benefit of \$ [REDACTED] on a Net Present Value (“NPV”) basis over a modeled period of 2020-2033 (in

ESL's reference case). This represents a reduction in EML's supply costs of approximately [REDACTED] compared to an alternative scenario in which a new CCGT is brought into service in 2023. We note that the modeled net benefit of acquiring Choctaw occurs largely as a result of net revenue from sales of excess energy into the Midcontinent Independent System Operator ("MISO") market in the early years post-transaction. If natural gas prices, and closely-linked energy market clearing prices, remain very low, margins on such excess energy sales may not be as large as expected. Nonetheless, we find that Entergy's analysis provides reasonable confidence that the Choctaw acquisition, as presented in the Petition, is likely to produce some amount of positive net benefit for EML's customers.

3. Plant Condition and Performance

Because of depressed conditions in the wholesale power markets, the Choctaw Facility was mothballed for most of the period from its commercial operation beginning in 2003 until 2010 when it was brought back into service. Coincident with the sustained drop in natural gas prices as well as the integration of the Entergy region into MISO, the Choctaw Facility has increased its output and efficiency significantly. The Combustion Turbine Unit 1 ("CT1"), which experienced a major compressor failure event shortly after the plant was brought back into service in 2010, was repaired and returned to service in 2017. While overall plant availability is not as high as that of other facilities of similar size and age, planned upgrades and integration within EML's operations are expected to improve Choctaw's performance further.

4. Due Diligence

Entergy performed extensive due diligence for the transaction. The Due Diligence Report was thorough and well developed. Independent technical review of maintenance schedules and inspection reports generally concluded that the Choctaw Facility is in good condition, with appropriate procedures in place to ensure proper operations and maintenance. Consolidated Asset Management Services ("CAMS") recommended that [REDACTED] identified in past inspections be examined more fully as soon as possible. Potential necessary repairs to [REDACTED] have not been included in EML's capital expenditure budget.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

5. Outstanding Transaction Requirements

There are several outstanding requirements for finalizing the acquisition of Choctaw and integrating it within the EML generation fleet. These include finalizing Choctaw's interconnection and transmission delivery status in MISO, assignment of natural gas transportation rights, receipt of TVA's report on affected transmission facilities, and conducting final performance tests when the Facility is fully moved into the MISO BA. We recommend that EML report to Staff on completion of these outstanding items as they are concluded, as well as any further inspections that are performed at the Facility prior to transaction close.

6. Expenditure Review

EML has presented budget estimates for the Company's significant planned capital investments at the Choctaw Facility. If the Commission approves the transaction, we recommend that Staff review actual expenditures against budgeted amounts, as well as capital expenditures on additional items not identified in the Petition.

The balance of this report is organized as follows:

Section II presents background to the proposed Choctaw transaction.

Section III addresses the transaction terms, associated agreements, and additional costs that EML expects to incur.

Section IV presents a summary and assessment of EML's economic evaluation of the transaction.

Section V presents an assessment of Entergy's due diligence and a summary of the independent assessment of CAMS, which was subcontracted to provide technical expertise for this assignment.

Section VI presents our conclusions and recommendations.

II. Background

The Choctaw Generating Station (“Choctaw”, the “Facility”, or the “Choctaw Facility”) is a natural gas-fired combined cycle power plant consisting of three combustion turbine generators (General Electric Frame 7FB.04), three heat recovery steam generators (“HRSGs”) and one condensing steam turbine, with a summer-rating generating capacity of approximately 810 megawatts (“MW”). The Facility, located near the town of French Camp, in Choctaw County, Mississippi, was developed by a unit of Reliant Energy, Inc., which became GenOn Energy, Inc. (“GenOn”) in 2010, following a merger with Mirant Corporation. The plant is currently owned by NRG Wholesale, a subsidiary of GenOn. The Facility entered commercial operation in 2003 and is currently 16 years old with an estimated remaining asset life of approximately 14 years, based on an assumed total asset life of 30 years.

The Choctaw Facility is located at the boundary between the electric systems of the Midcontinent Independent System Operator (“MISO”) and the Tennessee Valley Authority (“TVA”), which is also the boundary between EML and TVA. The Choctaw Facility is interconnected with both the MISO and TVA systems via 500kV transmission lines, and it currently has an Interconnection Agreement with EML that provides 810MW of Network Resource Interconnection Service (“NRIS”), making output from the facility deliverable to the MISO markets. The Facility has been operated to deliver energy to TVA and is currently considered part of the TVA Balancing Authority (“BA”). Following completion of the acquisition, EML intends to operate the plant to serve EML customers.

Natural gas for the Facility is served from a single pipeline interconnection with Texas Eastern Transmission Company (“TETCO”). While flows on the TETCO pipeline have historically been from producing basins in the Gulf Coast region toward the northeast, the substantial growth of shale production from the Utica and Marcellus Shale formations have caused TETCO to become a predominantly north-to-south flowing pipeline.

II.1. Notable Facility Attributes

There are several notable attributes of the Choctaw Facility. One is that the switchyard of the Facility serves as the physical connection between 500kV transmission lines of MISO and TVA. This unusual feature is related to the initial selection of the site for plant development. The location provided the ability to interconnect with the bulk transmission systems of Entergy and TVA and was considered strategically valuable because it expanded opportunities for selling output from the plant into different markets without additional wheeling costs. As discussed further, below, the [REDACTED]
[REDACTED]
[REDACTED] now and looking forward.

As events transpired, the apparently strategic location of the Choctaw Facility did not guarantee the plant's economic viability. A second notable attribute of the Facility is that less than a year after it entered commercial operation, the plant was mothballed by Reliant Energy, which cited depressed wholesale market conditions.¹ The plant was brought back into service in 2010. Shortly after resuming operations, one of the combustion turbine units, CT1, experienced a major compressor failure event, and the unit was returned to mothball status. CT1 was subsequently repaired and placed back into service in December 2017. As a consequence of its abbreviated operating history, the plant has fewer operating hours than other CCGTs of similar vintage, and CT1 in particular has much lower total service hours than the other units. The somewhat limited operational history of the plant does not necessarily translate to a benefit – for example, being out of service for six years does not necessarily add six years of asset life onto the expected 30 year life – but the plant's history bears upon the due diligence evaluation.

Finally, a third notable feature of the Facility is that it is air-cooled rather than water-cooled. At the time of construction, the air-cooled condenser ("ACC") and three evaporative coolers represented one of the largest applications of air-cooling at a CCGT in the U.S. While the plant site had advantages in terms of transmission access and natural gas supply, there was no viable supply of surface water for a more typical water-cooled system. The air-cooled system substantially reduced the volume of groundwater use and discharge at the plant, and simplified environmental permitting.

II.2. Entergy Mississippi's Capacity Need and IRP

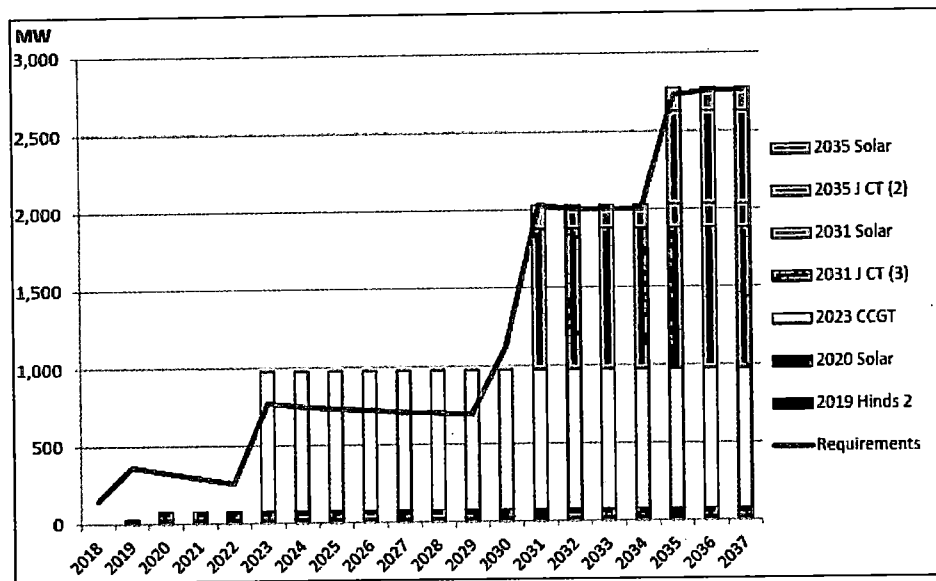
Entergy Mississippi plans its energy and capacity supply portfolio to meet its projected peak load plus a planning reserve margin based on MISO Resource Adequacy requirements. EML's 2018 Integrated Resource Plan ("2018 IRP"), filed with the Commission in June 2018, describes the supply, demand, and market context faced by the Company and sets out a resource plan through 2037.² As described in the Direct Testimony of EML witness Mary M. Decuir, the acquisition of Choctaw, which is not reflected in the 2018 IRP, would effectively advance the anticipated addition of CCGT capacity that is shown in the IRP in 2023.³ Capacity requirements and resource additions presented in the 2018 IRP are shown in Figure 1 below.

¹ See, e.g., <https://www.mrt.com/news/article/Reliant-Energy-stops-production-at-Choctaw-County-7836998.php>.

² Attachment A, Exhibit MMD-1 of the Petition for Certificate of Public Convenience and Necessity ("2018 IRP").

³ Attachment A to the Petition, Direct Testimony of Mary M. Decuir ("Decuir"), page 14, line 16 to page 15, line 2.

Figure 1: Capacity Expansion Portfolio⁴



Note that the stepwise increase in capacity requirements indicated in Figure 1 does not reflect load growth but the expected retirement of other resources. EML anticipates its future load to remain “relatively flat” and also to reflect approximately 250MW of peak load reductions from demand side management.⁵

Witness Decuir describes the fact that EML is currently in a short capacity position (consistent with the left-most portion of Figure 1, which indicates requirements in excess of capacity additions) and that the Company relies on purchases in the MISO Planning Resource Auction (“PRA”) to cover a portion of its Resource Adequacy requirement.⁶ This short capacity position has been caused by the “unexpected” loss of approximately 680MW of capacity from the retirement of Baxter Wilson Unit 2 in June 2018.⁷ Over the IRP planning period of 2018 to 2037, anticipated deactivation of legacy gas and coal units may total as much as 3,000MW.⁸

The acquisition of Choctaw would put EML in a long capacity position through at least 2022, by upwards of 600MW in 2022 based on the 2018 IRP. As discussed further in Section IV, EML modeling indicates

⁴ 2018 IRP, page 47, Figure 15.

⁵ Decuir, page 15, lines 10-13.

⁶ Decuir, page 16, lines 17-19.

⁷ Decuir, page 14, lines 11-14.

⁸ Attachment B, Exhibit MMD-1, page 24.

that the plant will likely operate at relatively high levels and produce significant net economic benefits for EML customers through its assumed life.

III. The Proposed Choctaw Transaction

Entergy Mississippi's Petition for a Certificate of Public Convenience and Necessity seeks authorization from the Commission for the Company "to acquire, own, operate, improve and maintain the Choctaw Generating Station".⁹

The acquisition of Choctaw was not initiated by EML, but stemmed from an approach to Entergy Services, LLC ("ESL") by Credit Suisse Securities LLC ("Credit Suisse") on behalf of GenOn.¹⁰ ESL was invited to participate in a solicitation of offers to buy the Choctaw Facility and related assets. In November 2017, during the first phase of the solicitation, ESL submitted a preliminary offer on behalf of EML. EML was subsequently invited to participate in the second phase of the solicitation process and submitted a second preliminary offer in March 2018. Due diligence efforts and negotiations continued, and an asset purchase agreement ("APA") was signed on August 21, 2018.

III.1. Asset Purchase Agreement ("APA") and Related Agreements

Under the terms of the APA, EML will purchase the Choctaw Facility and related assets from NRG Wholesale for a price of \$314 million (with potential adjustments), with closing required by August 21, 2020, subject to certain exceptions and termination rights of the parties. As discussed further, below, the total cost of the acquisition plus additional planned facility investments and other costs totals an estimated \$401.4 million.

EML characterizes the terms and conditions of the APA as "very similar" to those in the asset purchase agreement for EML's purchase of the Hinds Electric Generating Facility.¹¹ Based on our review of the agreement, we find that the terms and conditions are consistent with those of other asset purchase agreements we have reviewed and that it appropriately addresses the specific issues associated with the transfer of the Choctaw Facility. The APA includes terms addressing performance testing of the Facility, transfer of gas transportation rights, assignment of MISO transmission service to the Mississippi Zone 10, assumption by EML of the Long Term Service Agreement ("LTSA") with General Electric International, Inc. ("GEI"), and required regulatory approvals. The APA also includes a MISO Transition Agreement

⁹ Petition, page 1.

¹⁰ At the time of the initial contact, through the filing of the Petition, ESL was known as Entergy Services, Inc., also referred to as ESI in the Petition and related documents, while EML was known as Entergy Mississippi, Inc., and referred to as EML. In this report, we have attempted to refer consistently to the entities using their new names.

¹¹ Attachment B – Direct Testimony of Rene L. Broussard ("Broussard"), page 12, lines 14-16.

that governs market participation of the Choctaw Facility within MISO during a period prior to transaction close until EML can assume the role of Market Participant for the Facility under MISO rules (expected to occur within 14 days of transaction close).

The current LTSA between GenOn and GEII for the Choctaw Facility will terminate at transaction closing, and EML has entered into an LTSA with GEII conditional on regulatory approvals and transaction closing. Under the LTSA, addressed further in Section V, GEII would provide major maintenance, parts and service for the combustion and steam turbines at the Choctaw Facility. EML characterizes the LTSA for Choctaw as “generally patterned after the LTSAs that are in place for the Hinds and Attala CCGT facilities and approved by the Commission.”¹² [REDACTED]

The transaction requires NRG Wholesale to assign firm natural gas transportation rights on the TETCO pipeline to EML to meet Choctaw’s fuel requirements. This requires the permanent release to EML of a specified volume of firm transportation from TETCO and an additional volume of legacy firm transportation from TETCO on the TETCO mainline as well as a matching volume of firm transportation on the TETCO lateral line serving the Facility.¹³

III.2. Additional Costs

In addition to the direct acquisition cost of \$314.0 million, EML has estimated that the transaction will entail a further \$87.4 million in costs to integrate the Facility into the EML fleet. The total Facility cost is estimated to be \$401.4 million, which is summarized by category in Table 1.

¹² Broussard, page 13, lines 8-9.

¹³ Broussard, page 15, lines 1-8.

Table 1: Estimated Total Facility Cost to EML¹⁴

	\$Millions
Purchase cost	\$314.0
Capital investments	\$56.6
Capital spares [REDACTED]	\$21.0
Transaction costs	\$4.0
Contingency	\$5.8
Total Facility Cost	\$401.4

The \$56.6 million in capital investments address upgrades identified in EML's due diligence efforts as being required to improve the overall performance and reliability of the Choctaw Facility and make it consistent with the Company's other CCGT facilities.¹⁵ The investments address upgrades to transformers, water chemistry analyzers and controls, replacement of catalyst in the Selective Catalytic Reduction ("SCR") units, replacement of high-energy process valves, capital safety improvements, and a range of other capital improvements associated with integrating the Facility into the EML resource portfolio. These upgrades are expected to be implemented over a number of years following closing.¹⁶

Section V of this report addresses EML's due diligence process and includes observations on some of EML's cost estimates.

¹⁴ Attachment C – Exhibit PDN-2, slide number 3.

¹⁵ Broussard, page 15, lines 14-16.

¹⁶ Broussard, page 15, line 17 to page 16, line 15.

IV. Economic Evaluation of the Acquisition

IV.1. Acquisition Price

EML translates the Choctaw transaction price of \$314 million into a value of \$388/kW using Choctaw's summer rating of 810MW.¹⁷ This \$388/kW is substantially below the cost of a new CCGT assumed in ESL's economic assessment as the alternative for meeting EML's capacity needs from 2023. The new CCGT alternative is assumed to cost \$[REDACTED], based on estimates developed by ESL's Capital Projects organization.¹⁸ This value is consistent with costs for new CCGTs applied in modeling by the U.S. Energy Information Administration ("EIA").¹⁹ The significantly lower cost per kW for Choctaw does not imply that the transaction represents an exceptional deal, however. After all, it is to be expected that an asset more than half way through its expected life will cost much less than if it were new. A new CCGT would also offer better performance efficiency.

To provide additional context for the Choctaw acquisition price, we looked at other comparable transactions. We identified these based on purchases of CCGTs of a similar vintage (entering service between 2000 and 2006), located in MISO, and announced from 2014 through 2018. Besides Choctaw, there were only three comparable transactions of separate CCGT assets conforming to these comparability criteria. The data, drawn from the S&P Global Market Intelligence database, are summarized in Table 2. To maintain an appropriate comparison, we have presented statistics as provided in the database. We note that the table presents transaction value in \$/kW based on nameplate capacity, which produces a lower value than the summer rating EML used in deriving its reported value of \$388/kW for Choctaw.

¹⁷ Attachment C – Direct Testimony of Phong D. Nguyen ("Nguyen"), page 4, line 13.

¹⁸ Nguyen, page 7, figure 2, and page 8, line 14.

¹⁹ See: EIA, "Cost and Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2019," accessed at https://www.eia.gov/outlooks/aeo/assumptions/pdf/table_8.2.pdf. Total overnight cost (including contingency, but excluding interest during construction) for a conventional CCGT is reported as \$999/kW in 2018 dollars.

Table 2: Comparable Transactions

Plant	Transaction Announced	Initial Operation Year	Deal Nameplate Capacity, MW	Announced Transaction Value (\$000)	Value, \$/kW
Choctaw County	Aug 2018	2003	899	\$314,000	\$349
Jackson Michigan (Triton)	Jan 2014	2002	570	\$155,000	\$272
Union Power Facility	Dec 2014	2003	2,428	\$948,000	\$390
Sabine Cogeneration	Oct 2014	2000	51	\$35,000	\$690
Weighted cost of comparable transactions					\$373

Though the sample is small and the range of transaction MW sizes is large, the data provides a useful reference. The weighted average transaction price of \$373/kW for the comparables is very close to the \$349/kW price for Choctaw. There are other roughly contemporaneous transactions for comparable CCGTs, but they included other plants as part of a larger portfolio. It is difficult to isolate the transaction cost of the CCGT alone without speculative assumptions. Two transactions announced in 2017 and 2018 for portions of the Cottonwood CCGT in Missouri (in the Southwest Power Pool), which entered service in 2001, had transaction prices averaging \$512/kW. Of course, each plant has distinct characteristics that affect its value. We nonetheless conclude that the Choctaw transaction price is consistent with other comparable transactions.

IV.2. Net Value Assessment

EML estimates that the Choctaw acquisition will increase the billed cost to an average residential customer by \$6.03 per month through rate schedule FRP-7, but that accounting for energy and capacity benefits (and ad valorem taxes) the net effect on an average residential customer would be a rate increase of approximately \$2.42 per month, or approximately 2.3%.²⁰ However, the estimated rate increase would represent a savings relative to the alternative resource scenario evaluated by Entergy.

ESL conducted an economic evaluation of the proposed Choctaw acquisition on behalf of EML. This analysis examined the purchase by EML of Choctaw compared to an alternative scenario in which Choctaw is not owned by EML, but operates within MISO. We find that the assumption that Choctaw would remain operational within MISO is an appropriate method for evaluating the transaction. It considers an alternative

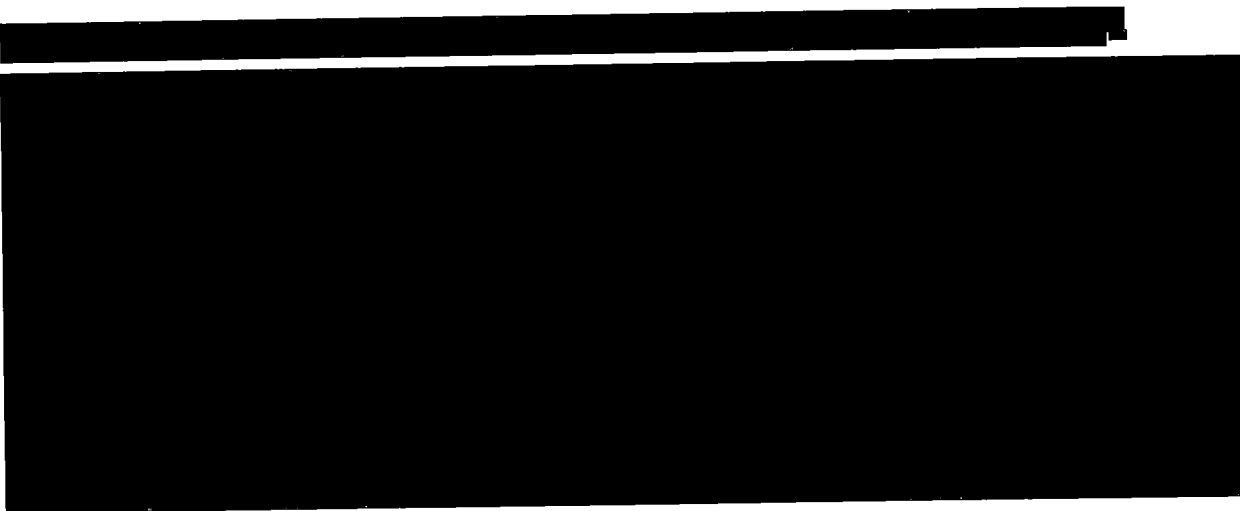
²⁰ Attachment D – Direct Testimony of Allen A. Heard (“Heard”), page 6, lines 6-9.

scenario in which EML could benefit from energy (and capacity) being sold from the plant into the MISO wholesale markets without assuming the purchase and upgrade costs associated with taking ownership of the plant. Under this alternative no-purchase scenario, EML is assumed to build a new CCGT for operation beginning in 2023, consistent with the 2018 IRP. The implications of these cases for EML's resource plan, fixed and variable costs are summarized in Table 3.

Table 3: Choctaw Acquisition and Alternative Scenario Effects

	Acquire Choctaw	No Acquisition
Resource plan impact	<ul style="list-style-type: none"> EML is significantly long capacity through at least 2022 New CCGT is deferred beyond 2030 	<ul style="list-style-type: none"> EML remains modestly short capacity, and relies on potentially higher-cost capacity purchases from MISO PRA New CCGT in 2023
Fixed cost effects	<ul style="list-style-type: none"> Choctaw acquisition and upgrade costs cause EML's fixed costs to be significantly higher than in the absence of the transaction 	<ul style="list-style-type: none"> New CCGT cost is high but is deferred several years Required market capacity purchases in the near-term are not at full cost of new entry
Variable cost/revenue effects	<ul style="list-style-type: none"> Choctaw's efficiency is significantly lower than a new CCGT, but the plant is still projected to operate at a relatively high capacity factor, and to produce net revenue for EML in the energy market 	<ul style="list-style-type: none"> EML benefits indirectly from Choctaw operating and selling energy into the MISO market, but loses net revenue from opportunity sales.
Net cost effects	<ul style="list-style-type: none"> Higher fixed cost (NPV) Lower variable cost (NPV) Low value case [REDACTED] benefit Reference case net benefit \$ [REDACTED] (NPV) 	<ul style="list-style-type: none"> Lower fixed cost (NPV) Higher variable cost (NPV) Expected higher net cost.

In its economic analysis, ESL examined the effect of a range of market capacity price assumptions, including the then-current reference price curve produced by Entergy System Planning & Operations ("SPO"), and various price levels based on a percentage of the cost of a new CT. Because the Choctaw acquisition would make EML significantly long in capacity for at least three years, higher market capacity prices produce higher value for the Choctaw acquisition. ESL estimated net benefits [REDACTED] in the lowest capacity price case (25% of the cost of a new CT), net benefits of \$ [REDACTED] based on the SPO forward price curve and net benefits of more than \$ [REDACTED] in a high capacity price case (100% of the cost of a new CT). These cases are summarized in Figure 2.



The figure provides a visual reference for the fact that Entergy expects the Choctaw acquisition to increase EML's fixed costs and decrease its variable costs on an NPV basis.²² The first no-acquisition case on the left, based on the SPO capacity price curve, has an estimated total supply cost of a little over \$ [REDACTED], NPV, approximately \$ [REDACTED] than for the acquisition case (the labeled values reflect rounding). This case indicates that the Choctaw acquisition would lower EML supply costs by approximately [REDACTED], on an NPV basis [REDACTED]. ESL also ran sensitivities on this case for several natural gas / CO₂ price futures, as summarized in Figure 3.

²¹ Attachment C – Exhibit PDN-1, slide 17.

²² NPV was calculated using EML's year-end 2017 cost of capital of 6.67%.

[REDACTED]

ESL did not report a matrix of cases that would show the interaction of these futures with different capacity price assumptions: [REDACTED]

[REDACTED] However, we find that Entergy's analysis provides confidence that the Choctaw acquisition as presented in the Petition is likely to produce net benefits for EML's customers.

We address several additional points related to the economic evaluation immediately below.

IV.3. Historical and Expected Operation of Choctaw Post-Acquisition

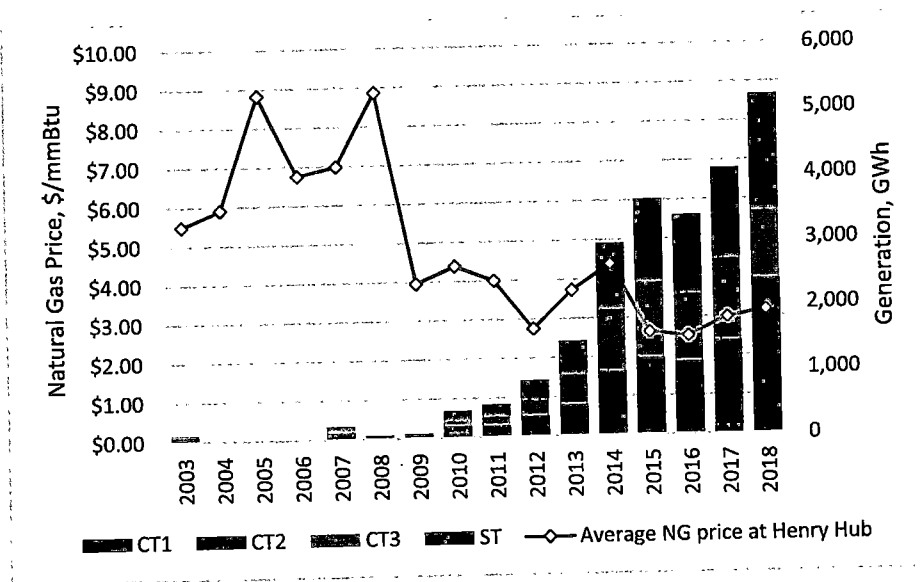
EML witness Phong D. Nguyen describes in his Direct Testimony regarding the economic evaluation of the Choctaw acquisition that ESL's production cost modeling projected the Choctaw Facility to operate at a capacity factor of [REDACTED] across the natural gas and CO2 price combinations evaluated.²⁴ We find these results to be plausible, based on historical generation data for the facility. Figure 4 charts the output of each of the Choctaw units on an annual basis from 2003 through 2018. Several notable points are evident in the figure. It confirms that the plant effectively generated nothing until it came out of mothball status in 2010 (small gross generation values reported in the data set during mothball status presumably reflect activities at the plant intended to preserve the operational capability of the plant – i.e., the ability to be reactivated effectively). The figure also clearly indicates the return to operation of CT1 at the end of 2017. It is also notable that Choctaw was brought back into service as natural gas prices fell and remained relatively low.

²³ Attachment C – Exhibit PDN-1, slide 18.

²⁴ Nguyen, page 10, lines 15-17.

While the fall in natural gas prices does not necessarily entail an improvement in the depressed wholesale market conditions that led to the plant's mothballing, it is an important driver of improved competitiveness of Choctaw. Finally, it is apparent that the major increase in Choctaw output occurred at the same time that the Entergy region joined MISO, at the very end of 2013. EML's Petition states that "NRG Wholesale has operated the Choctaw Facility to deliver energy to TVA...."²⁵ It is not clear that sales from the plant were exclusively into TVA, and there are no available data to indicate the extent of possible sales into MISO following integration. We note the timing of increased plant output because it suggests that the plant may already be operating consistent with being part of the MISO BA. This lends credence to ESL's modeling showing high future output levels, and the result that EML's customers should benefit from revenue margins from sales of excess energy into the MISO market.

Figure 4: Choctaw Historical Generation and Natural Gas Prices²⁶



A final caveat is warranted regarding the potential for Choctaw to produce significant net energy market revenues. While low natural gas prices tend to increase the competitiveness of natural gas-fired plants such as Choctaw, the persistence of low natural gas prices has accelerated the development of and reliance upon CCGTs to serve load. As a consequence, energy clearing prices are increasingly set by efficient CCGTs,

²⁵ Petition, page 10.

²⁶ Choctaw generation from S&P Global Market Intelligence; natural gas prices from the U.S. Energy Information Administration.

which reduces the margins such plants can achieve. Choctaw's operation may indeed be high going forward, but its energy revenue margins may be slim.

IV.4. Excluded Transmission Upgrade Costs

In the Direct Testimony of Rene L. Broussard, it is stated that "ESL's Transmission organization has identified approximately \$40 million in transmission upgrades on Entergy Louisiana, LLC's transmission system that are likely to be needed in connection with Entergy Mississippi's acquisition of the Choctaw Facility. However, because those upgrades would not be required on Entergy Mississippi's transmission system, they are not included in EMI's total cost of the acquisition."²⁷ Bates White requested further information regarding these transmission impacts. While the effects are not expected on EML's system, impacts of this sort – i.e., costs impositions on neighboring systems – should generally be addressed more thoroughly in an economic analysis. However, EML personnel clarified that the referenced transmission upgrade costs were not a function of EML's acquisition of Choctaw, or of making Choctaw deliverable to the Mississippi Zone, but reflected a variety of updates to ESL's modeling assumptions. Our understanding is that ESL identified the transmission upgrades as an impact from the updated model run, including Choctaw, but did not conclude that the transmission upgrades were caused by the Choctaw acquisition. We find this explanation persuasive, as we would not expect significant electric system impacts from shifting ownership of Choctaw, which is already electrically interconnected with the EML system, with existing MISO transmission service into Zone 9, which includes Entergy Louisiana. We therefore agree that the \$40 million in transmission upgrades are properly excluded from the assessment of the Choctaw acquisition.

IV.5. TVA Affected Facilities

EML communicated to Bates White that TVA has not yet provided a report on affected transmission facilities on its system associated with the transaction and moving the Choctaw Facility from the TVA BA to the MISO BA. While this is a necessary element of finalizing Choctaw's interconnection and transmission delivery status in MISO, it is not expected that there should be any material impacts or cost implications, and we agree with EML's assessment.

²⁷ Broussard, page 14, lines 15-19.

IV.6. Portfolio Flexibility and Potential for a Future Capacity Cliff

As noted above, it is to be expected that a generating asset such as Choctaw, which is more than half way through its expected life, should cost significantly less than a new CCGT. Yet there are potential advantages to a lower-cost, shorter-lived asset. In the context of rapidly changing resource technologies, including renewable generation and battery storage, and declining capital costs, as well as flat and potentially declining load, acquiring a short-lived resource may provide EML with valuable flexibility in comparison to a new CCGT. Buying a cheaper, shorter-lived asset now may allow EML to exploit opportunities for accessing new, lower cost, and non-emitting resources in the future. We believe there is significant value in such flexibility in the current power market environment.

As noted above, the fact that the Choctaw Facility was mothballed for a significant portion of its life to date does not necessarily mean that its asset life will be extended beyond the expected 30 years from commercial operation. The life of some plant components, such as turbines and high-energy piping, depends significantly on hours of operation, while the life of other components, such as instrumentation and electrical systems, is more closely tied to calendar age. Mothballing itself requires ongoing efforts to prevent adverse effects from the plant *not* operating, which may not be fully effective. As noted above, EML's economic analysis assumed a 30 year asset life for Choctaw, with no adjustment for the period of mothballing, which we find appropriate.

One potential risk associated with the transaction is that, with the addition of Choctaw to its generation fleet, EML will have three CCGTs – Choctaw, Attala, and Hinds – totaling approximately 1,300MW of capacity, that are very nearly the same age. If Entergy's assumed 30 year asset life applies to all three facilities, it indicates a potential 'capacity cliff' that could expose ratepayers to urgent and possible high expenditures for new resources in a narrow period just beyond 2033. Because ESL's economic evaluation extends only to 2033, it does not encompass the potential consequences of such a circumstance. While we do not believe that an extended analysis is likely to demonstrate that Choctaw is significantly less valuable simply because its asset life is coincident with those of Attala and Hinds, this issue does highlight that the Choctaw acquisition may entail risks that are not captured in ESL's economic analysis.

V. Due Diligence Assessment

Bates White contracted with Consolidated Asset Management Services, LLC (“CAMS”) to provide an independent technical assessment of the Choctaw Facility and Entergy’s due diligence efforts. Bates White and CAMS personnel attended a site visit at the Choctaw Facility on July 11, 2019, and coordinated on the review of the Petition and testimonies, submitting discovery requests, and evaluating EML’s responses. CAMS has prepared a separate report for Bates White, filed as a separate Exhibit attached to Bates White testimony. The following discussion draws from the observations and recommendations in that report.

V.1. Choctaw Performance Metrics

Choctaw’s availability and output have increased significantly since 2016. Table 4 summarizes recent plant performance data provided by EML in response to data requests. The availability and capacity factor data exclude CT1 for the period in which it was mothballed (i.e., up to November 2017).

Table 4: Choctaw Performance Statistics, 2016-2019²⁸

Availability Factor	
Net Capacity Factor	
EFORd	
Net Heat Rate (BTU/kWh)	
Forced Outage Hours	

Availability for the Facility has improved since 2016 as a function of plant improvements and upgrades that have been implemented. While forced outage hours have generally been low, long scheduled outages have caused availability to be relatively low for a generation facility of this size and type.

The Net Heat Rate has improved by [REDACTED] from 2016 to 2019, a significant improvement driven by plant improvements and upgrades made to the combustion turbines and control systems.

²⁸ Data provided in response to MPUS 1-9.

V.2. Entergy Due Diligence and Inspection Reports

The Due Diligence Report produced and provided by Entergy was very thorough and well developed. Most of the projects identified in the Petition are described in detail, with specific cost information. A small number of proposed enhancements have limited detail, which will need to be addressed by EML prior to implementation.

LTSA

The new LTSA with GEII is a standard LSTA for the equipment and services required for a facility of this type and size. Pricing and services being offered in the LTSA are typical and are included in the filing along with the purchase of capital spares, which are necessary to support facility performance.

Maintenance Schedules

The CT maintenance schedule presented by EML is consistent with the expected operations of the facility and the maintenance requirements outline in the LTSA. Steam turbine inspections will align with the maintenance inspections for CT2 and CT3 to lower the number of long duration planned outages. This is consistent with the requirements of the LTSA and typical for this model and type of steam turbine. The Electric Generators associated with each CT and the Steam Turbine will be inspected at the same time as the maintenance inspection is conducted on each of the units. This is consistent with industry standards for this type of equipment and is included in the scope of work in the LTSA.

Maintenance schedules are not defined for other plant equipment. Typically, other plant equipment is maintained in accordance with manufacturer's recommendations and equipment history through the facilities maintenance management system.

V.2.1. 2018 HRST Report

HRST, Inc. ("HRST") (a third party technical services company) conducted inspections in early 2017 and identified [REDACTED]. Sampling of various [REDACTED] was conducted late in 2018 by HRST, which indicated that the [REDACTED]. HRST's recommendations were to continue with proper operations of the [REDACTED] and ensure that proper [REDACTED] and operating conditions were being maintained.

[REDACTED] for the [REDACTED] were identified and repaired. These types of [REDACTED] are not uncommon for a facility of this type and age. It appears the [REDACTED] are in good operating condition and this equipment should not pose any issues for EML in the near future.

V.2.2. Major Equipment Inspections

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

V.4. Categorization of Facility Under NERC Regulations

As described above, the Choctaw switchyard serves as the interconnection between 500kV transmission facilities on the MISO and TVA systems. This may have implications for compliance with NERC security requirements. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

VI. Conclusions and Recommendations

Based on the review presented in this report, our conclusions and recommendations are as follows:

Choctaw Acquisition Cost

We find that the \$314 million purchase price of the Choctaw unit is significantly below the cost of a new combined cycle gas turbine (“CCGT”), consistent with Choctaw’s age and performance characteristics. A comparison of the acquisition price to available data on recent comparable transactions also indicates that the Choctaw purchase price is consistent with other observed plant values in the market. We conclude that the acquisition cost of Choctaw is reasonable. Additional costs associated with planned capital investments, spare equipment, transaction costs and contingency bring the total asset acquisition cost to approximately \$401 million.

Estimated Net Benefits

The acquisition of Choctaw, and planned capital upgrades, will cause customer rates to increase, but likely by less than under reasonable alternative scenarios examined by Entergy Services, LLC (“ESL”) on behalf of EML. The economic evaluation of the transaction indicates an expected positive net benefit of \$[REDACTED] on a Net Present Value (“NPV”) basis over a modeled period of 2020-2033 (in ESL’s reference case). This represents a reduction in EML’s supply costs of approximately [REDACTED] compared to an alternative scenario in which a new CCGT is brought into service in 2023. We note that the modeled net benefit of acquiring Choctaw occurs largely as a result of net revenue from sales of excess energy into the Midcontinent Independent System Operator (“MISO”) market in the early years post-transaction. If natural gas prices, and closely-linked energy market clearing prices, remain very low, margins on such excess energy sales may not be as large as expected. Nonetheless, we find that Entergy’s analysis provides reasonable confidence that the Choctaw acquisition, as presented in the Petition, is likely to produce some amount of positive net benefit for EML’s customers.

Plant Condition and Performance

Because of depressed conditions in the wholesale power markets, the Choctaw Facility was mothballed for most of the period from its commercial operation beginning in 2003 until 2010 when it was brought back into service. Coincident with the sustained drop in natural gas prices as well as the integration of the Entergy region into MISO, the Choctaw Facility has increased its output and efficiency significantly. The Combustion Turbine Unit 1 (“CT1”), which experienced a major compressor failure event shortly after the plant was brought back into service in 2010, was repaired and returned to service in 2017. While overall

plant availability is not as high as that of other facilities of similar size and age, planned upgrades and integration within EML's operations are expected to improve Choctaw's performance further.

Due Diligence

Entergy performed extensive due diligence for the transaction. The Due Diligence Report was thorough and well developed. Independent technical review of maintenance schedules and inspection reports generally concluded that the Choctaw Facility is in good condition, with appropriate procedures in place to ensure proper operations and maintenance. Consolidated Asset Management Services ("CAMS") recommended that [REDACTED] identified in past inspections be examined more fully as soon as possible. Potential necessary repairs to [REDACTED] have not been included in EML's capital expenditure budget.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Outstanding Transaction Requirements

There are several outstanding requirements for finalizing the acquisition of Choctaw and integrating it within the EML generation fleet. These include finalizing Choctaw's interconnection and transmission delivery status in MISO, assignment of natural gas transportation rights, receipt of TVA's report on affected transmission facilities, and conducting final performance tests when the Facility is fully moved into the MISO BA. We recommend that EML report to Staff on completion of these outstanding items as they are concluded, as well as any further inspections that are performed at the Facility prior to transaction close.

Expenditure Review

EML has presented budget estimates for the Company's significant planned capital investments at the Choctaw Facility. If the Commission approves the transaction, we recommend that Staff review actual expenditures against budgeted amounts, as well as capital expenditures on additional items not identified in the Petition.