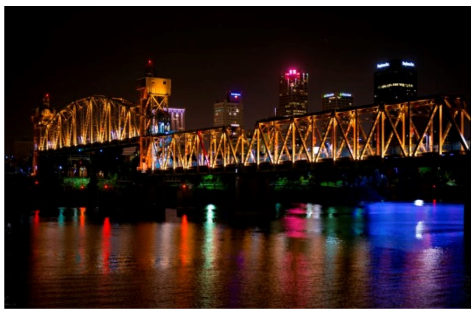
Entergy Arkansas, Inc.
2018 Integrated Resource Plan




Entergy

Follow-Up Materials
June 18, 2018
entergy-arkansas.com/IRP

Follow-up Materials to the 2018 IRP Stakeholder Meeting

The following information is provided as a supplement to the information presented during the June 6th Stakeholder Meeting and in response to stakeholder questions and feedback received.

Responses are grouped by category as presented and discussed during the Stakeholder Meeting.

Any additional requests for information may be sent to EAI at EAIIRP@entergy.com.

2018 Integrated Resource Plan

FOLLOW-UP MATERIALS - RESPONSE SET 2

Resource Planning

- Please provide a breakdown of the types of gas units displayed on Slide 89.

Units Built	Total Capacity (MW)
Internal Combustion	640
Aeroderivative CT	204
1x1 501J CCGT	3,570
2x1 501J CCGT	0
M501J CT	300

- What is EAI's owned share of coal as a percentage of overall capacity? What percent of capacity is coal compared to percent of energy?
  - EAI's owned share of coal constitutes 19% of overall capacity and 10% of energy serving EAI's native load.

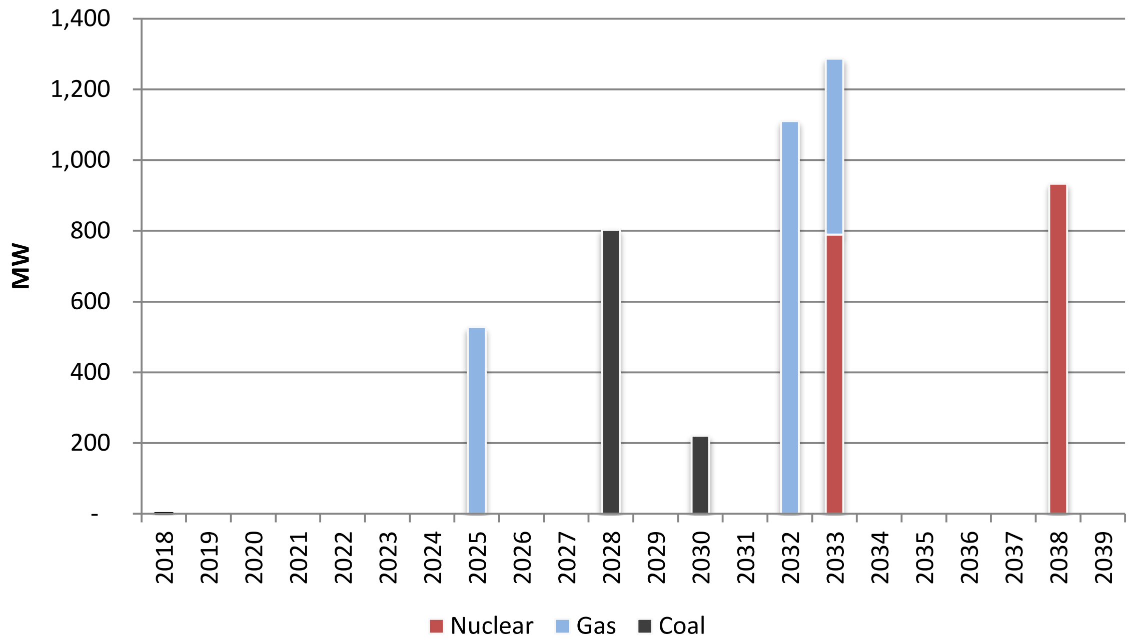
Resource Planning

- Has EAI compared the percentage of utility-scale solar penetration in California versus percentage in EAI's footprint? What about in North Carolina?
  - Not at this time. Note, however, that as of March 2018 there are currently 4,957 MW of solar generation located on EAI's transmission system being studied in the MISO DPP queue.

- How do MISO Capacity Market vs avoided cost for DR program cost-effectiveness compare?
  - The avoided capacity cost for evaluating DR program cost-effectiveness is based on the MISO auction clearing price for capacity in MISO South in the near-term and transitions to the cost of a new-build peaking resource in the long-term.

Resource Planning

- EAI received several questions on Slide 12 of the IRP Stakeholder Meeting materials about the modeled deactivations and timing for ceasing coal operations. The assumptions are shown below by unit:



- 2025: Lake Catherine 4
- 2028: White Bluff 1
  White Bluff 2
- 2030: Independence 1
- 2032: Ouachita 1
  Ouachita 2
  Hot Spring
- 2033: ANO 1
  Union 2
- 2038: ANO 2

Resource Planning

- Please list the units that are anticipated for retirement, including their age, current capacity factors, heat rates, fuel type and operational costs in $/MWh.
  - See the table below for age, capacity factor, and fuel type by unit. Heat rates and operational costs constitute market sensitive data.

Unit	**Age**	**Fuel Type**	**Capacity Factor (2017)**
Lake Catherine Unit 4	48	Gas	2.0%
White Bluff 1, 2	38, 37	Coal	68.0%, 43.7%
Independence 1	35	Coal	43.2%
Ouachita 1, 2	16, 16	Gas	70.7%, 55.0%
Hot Spring	16	Gas	64.6%
Union PB2	15	Gas	35.6%
ANO 1	44	Nuclear	93.2%
ANO 2	38	Nuclear	66.8%

Resource Planning

- **Please explain how high/low natural gas prices affect demand.**
  - The futures referenced on Slide 79 are intended to frame broad, plausible sets of macroeconomic conditions. Assuming the request refers to natural gas demand, its use as an industrial feedstock, as a seasonal heating source, and as an energy source for electricity generation drives demand to a greater extent than its price.

- **If the MISO market hourly LMP prices are lower than EAI's existing fleet, would that highlight possible deactivation opportunities?**
  - The market price of energy is one of several factors that may influence a particular deactivation opportunity. Such an evaluation is part of a separate planning process, and the result of that process is an input to the IRP model.

Resource Planning

- **If new generation resources for EAI are higher price than the MISO market, would the AURORA model recommend market purchases? Will EAI's model select available MISO resources if prices are lower?**
  - To serve EAI's energy needs, the model will select the lowest cost option on an hourly basis, including market purchases.
  - For capacity needs, the model will select incremental resources to meet EAI's projected load plus reserve margin based on the cost and performance assumptions presented in Slides 66 through 70. As discussed during the Stakeholder Meeting, modeling assumptions and corresponding analytics are used to support EAI's long-term planning objectives and any resource investment decisions would be made through a separate process. For example, the 2015 IRP followed the same modeling construct and its results indicated renewables may offer an attractive economic option to EAI. As a result, EAI issued its 2016 Renewable RFP and the Chicot Solar PPA was selected.

Resource Planning

- Were environmental costs for coal included in the IRP? If so, what are the costs?
  - At this point in the IRP modeling, only long-term capacity optimization modeling has been completed and the production cost calculations of the resulting portfolios has not yet been completed. The capacity optimization modeling takes into account variable costs, such as CO_2 and Seasonal NOx allowance prices.

- Were CCR costs included in the IRP modeling?
  - No, costs for coal combustion residuals are not included in the capacity optimization modeling.

Resource Planning

- Has there been a study of DSM potential in advance of this IRP? If so, when and where can the study results be viewed? What is the potential that has been identified for future DSM growth, and are these assumptions captured within the model?
    - EAI engaged a third-party vendor, ICF, to conduct a study to assess the potential for demand-side management opportunities that could produce capacity and energy savings. The results of the study were presented at the IRP Stakeholder Meeting (June 6, 2018) on slides 83 through 86.

Resource Planning

- How are DSM goals being set in the short term? What do these goals look like when modeled at higher levels? If existing modeling runs are accounting for a 1% decrease in net sales, what would the model outputs look like if modeled utilizing targets that would correspond with a 1.5% decrease in retail sales?
  - DSM goals are set by the Arkansas Public Service Commission. Any energy savings above the current assumption would reduce the incremental energy, and potentially the capacity, needs for EAI.

Resource Planning

- Are there any traditional generators being planned for retirement within the Modeling? If so, DSM/DG should be competing directly with these resources to ensure that the cost-effective solution is selected.
    - There are assumptions around the length of viability of existing generation over the evaluation period of the IRP; refer to Slide 6 of this deck for detailed information. As discussed in the IRP Stakeholder Meeting, demand-side management resources are included in the model inputs for incremental resource options.

Resource Planning

- **How is peak shaving by customers captured within the capacity optimization models? How would model outputs change if meaningful peak demand reductions are observed through Entergy pursuing aggressive multi-technology rate design packages of low-cost peak shaving strategies?**
  - The programs assumed within the DR portfolios include the effects of peak shaving by customers at three different levels. If the costs were outweighed by the benefits of these types of programs, the AURORA model would select those resources to fill EAI's capacity needs.

Resource Planning

- Why assume 50% effective capacity for solar on the L&C?
  - Please refer to MISO Resource Adequacy BPM-011-r18, section 4.2.3.4.1 - Solar Capacity Credit.

- What is the purchase power slice on 2017 energy chart?
  - The Purchased Power component of the chart on Slide 25 consists of day-ahead and real-time energy purchases from the MISO market.

Resource Planning

- Which general use cases for energy storage will EAI model (Slide 30)?
  - The long-term capacity optimization modeling included a utility-scale battery energy storage application to be used for energy arbitrage and capacity. There are many different use cases available to battery storage technology and those are included in transmission studies as well as other case-by-case applications.

Resource Planning

- Can EAI provide more support for the NGCC capital cost on Slide 68?
  - Please refer to Follow-Up Materials - Set 1, Slide 22.

- What is EAI's assumed capital cost on Slide 69?
  - The capital costs assumptions are based on an IHS Markit forecast and the exact values are confidential information. However, the costs are assumed to be in the $1/W-DC range for the duration of the study.

- Is a transmission constraint between MISO North/South modeled (Slide 80)?
  - Yes.

Resource Planning

- Please provide details on all solar modeling assumptions shown on Slide 69.
  - The Fixed O&M figure is based on an IHS Markit forecast and includes labor, tax, and insurance. The useful life assumption is based on industry trends and available historical data. The MACRS depreciation assumption is based on IRS guidelines for depreciation of solar assets. The capacity factor is a generic assumption for solar tracking performance in the MISO South region. Hourly profiles were modeled in AURORA based on output from PlantPredict, a solar energy modeling tool. The DC:AC ratio used in the tool was 1.35.

Resource Planning

- **Why is Distributed Solar (DG) not included as an option in the AURORA model?**
  - Distributed Solar (DG) is not included as an option within the AURORA model for purposes of the capacity expansion analysis due to AURORA's limitations in quantifying particular value streams (e.g. avoided distribution capital expenditures or avoided distribution losses associated with electricity delivery) associated with distributed energy resources. Because AURORA is not a distribution level model, distributed solar would be modeled similar to utility-scale solar but with a lower assumed capacity factor and higher cost. Though not included in the scope of this IRP, the limitation does not prohibit EAI from exploring DG as a resource alternative in meeting its customers' supply needs.

Resource Planning

- **When considering all available technologies in the IRP process, how are DSM/EE/DG technologies being evaluated (load side or supply side)?**
    - For DG, please refer to the prior response on Slide 19 of this deck. DSM (DR and EE) technologies are a demand-side resource alternative evaluated in the AURORA model. The model directly evaluates these technologies against supply-side resources (gas, solar, storage, etc.) when making resource selections. Their capacity contribution to meeting EAI's long term requirements is calculated as their respective peak load reduction grossed up for transmission losses and avoided reserves.

Resource Planning

- If there is a projected capacity deficit in 2025, wouldn't DR help with that? Why would EAI consider discontinuing a program that is working/exceeding expectations/winning awards?
  - Yes, DR could be one of several options to address a potential capacity need in 2025. With respect to the existing portfolio of programs, EAI evaluates the cost-effectiveness on a regular basis and the continued low capacity prices in MISO South are negatively impacting the cost-effectiveness of the DR programs.

Resource Planning

- Will EAI model better transmission connection with SPP or MISO North as possible resource access?
  - For the IRP capacity expansion modeling, the import and export limits between MISO regions is an input assumption and is not varied to accommodate future resource additions. The resource additions are based on generic assumptions for EAI-sited resources but do not represent or imply a selection of any specific resource or location. Outside of the scope of the IRP, any evaluation of potential resources located in SPP would be resource-specific and handled individually. Such an evaluation would require inclusion of all the costs required to deliver the energy to MISO South.