Entergy Arkansas, LLC

2021 Integrated Resource Plan

Stakeholder Kickoff Meeting

AUGUST 25, 2020

Entergy | WE POWER LIFE℠

Creating sustainable value for all

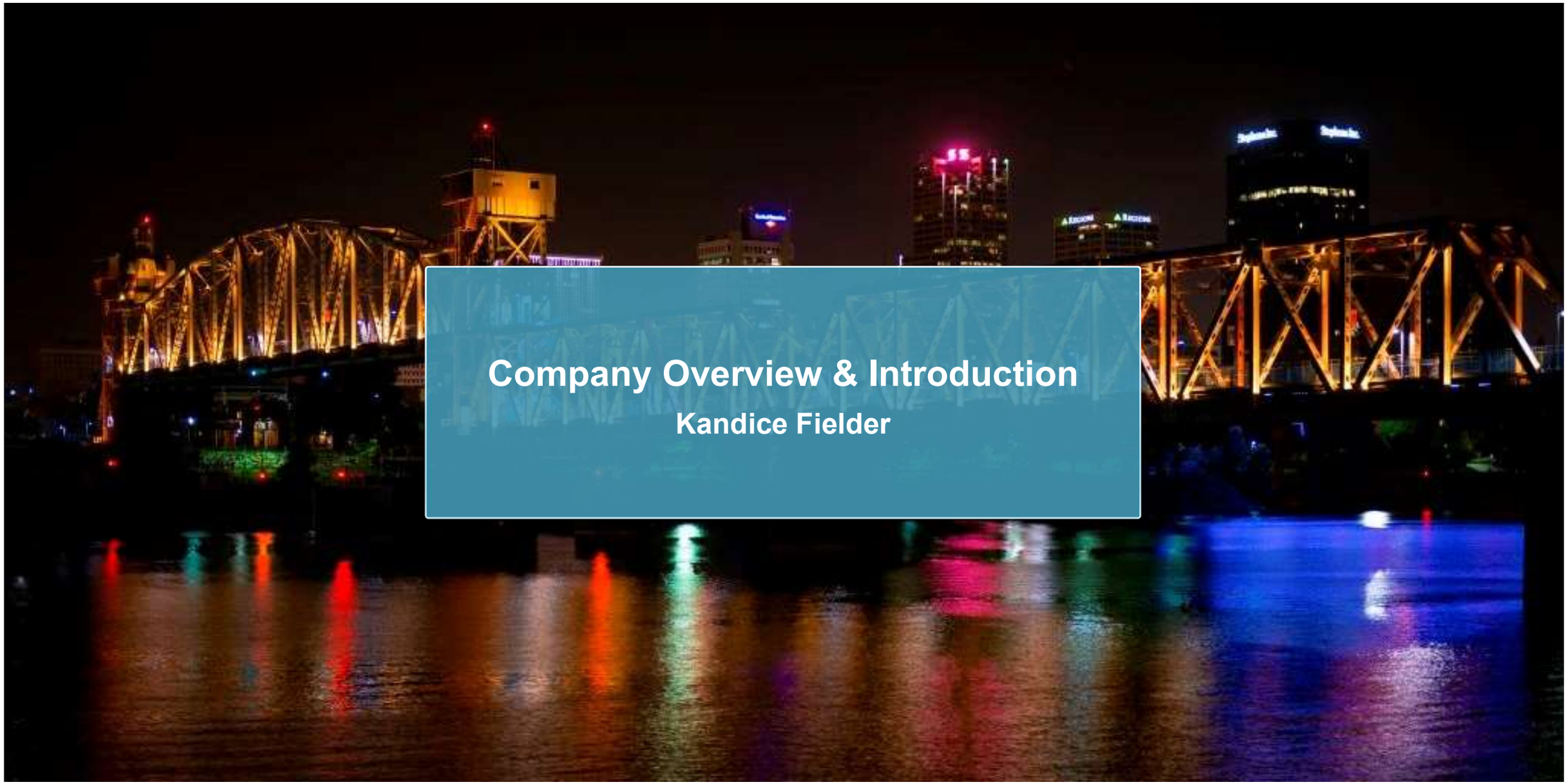
Welcome & Meeting Guidelines

- EAL is pleased to welcome the IRP Stakeholder Group to kick off the 2021 Integrated Resource Plan (“IRP”) process
- Please mute your line to reduce background noise and prevent interruptions

- Q&A Process
  - Questions can be submitted during today’s meeting via the WebEx Chat Window or to the EAL IRP inbox at EALIRP@ENTERGY.COM
  - Questions will be gathered during the meeting for a Q&A Session following the presentations
  - Time constraints may limit the number of questions answered during today’s meeting; EAL will post written responses to all questions to its IRP website within two weeks
  - https://www.entergy-arkansas.com/integrated_resource_planning/

Meeting Agenda

Topic	Presenter
Introduction	Kandice Fielder
Company Overview	Kandice Fielder
EAL Planning Overview: Transmission, Energy Efficiency and Operations	Brad Cullipher, Denice Jeter, John Schwegler
Environmental Update	Rick Johnson
2018 IRP Action Plan & Other Recent Activities	Caleb Bales
Overview of EAL's Planning Process	Caleb Bales
IRP Objectives & Deliverables	Heather Naeher
Technology Assessment	Heather Naeher
Load Forecast Process	Charles John
Aurora Modeling Overview	Charles DeGeorge
2021 IRP Schedule and Next Steps	Caleb Bales
Stakeholder Feedback / Q&A	All



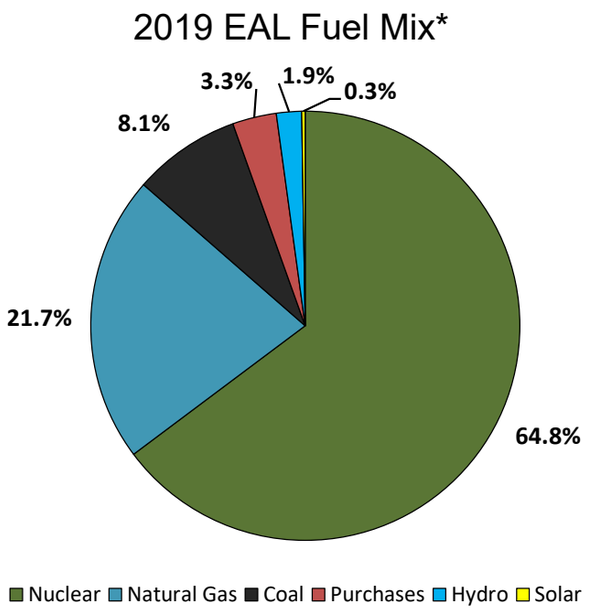
Company Overview & Introduction

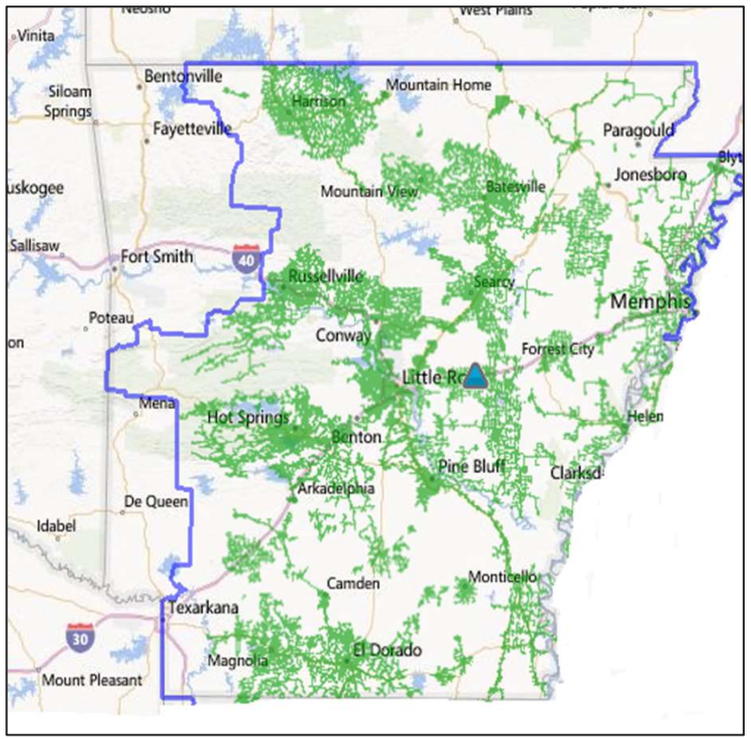
Kandice Fielder

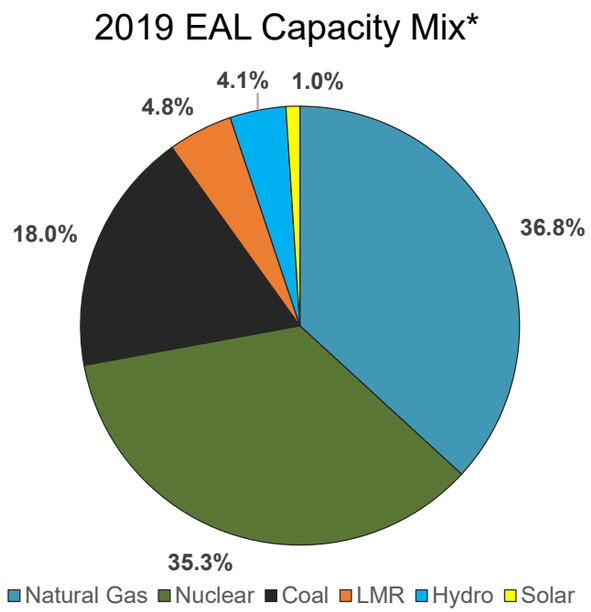
Entergy | WE POWER LIFE℠

Company Overview

- Entergy Arkansas, LLC serves more than 715,000 electric customers across 63 counties in Arkansas







- 2019 Peak Load: 4,510 MW
- 2019 WN Sales: 21,859 GWh
- Transmission Mileage: 4,967 mi
- Distribution Mileage: 39,116 mi

Entergy WE POWER LIFE℠

**Energy and capacity that serve EAL's Native Load customers*

Meeting Objectives

- Discuss EAL's Integrated Resource Plan process, assumptions, preliminary plans, and schedule
- Begin the Stakeholder Engagement process, to include facilitating the formation of a Stakeholder Group

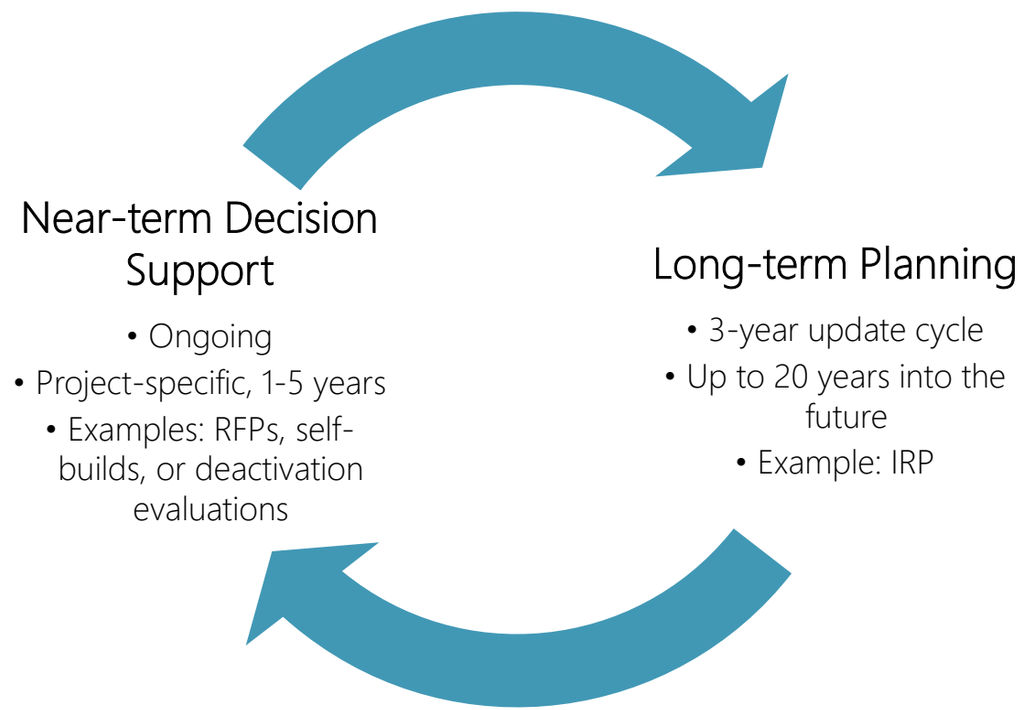
What is Integrated Resource Planning?

"…..a utility planning process which requires consideration of all reasonable resources for meeting the demand for a utility's product, including those which focus on traditional supply sources and those which focus on conservation and the management of demand."

Source: APSC's Resource Planning Guidelines

IRP Kickoff

- Consistent with Section 6.1 of Attachment 1 to the APSC Order No. 6 in Docket No. 06-028-R Resource Planning Guidelines for Electric Utilities, EAI has begun development of its next Integrated Resource Plan to be filed at the Commission no later than three years from the prior IRP submission, which is October 31, 2021.



IRP Objective

- An Integrated Resource Plan is a planning process and framework in which the costs and benefits of supply-side and demand-side alternatives are evaluated to develop resource portfolio options that help meet EAL's planning objectives. Results of the IRP are not intended as static plans or pre-determined schedules for resource additions and deactivations.

- Through the IRP process, EAL will:
  - Conduct an extensive study of customers' needs over the next 20 years based on current available data
  - Customer-centric planning focused on meeting what today's customers want from their utility
  - Design resource portfolios that meet a projected peak load plus planning reserve margin while taking into consideration MISO's Resource Adequacy requirements
  - Evaluate the impact of different fuels and technologies
  - Analyze resource portfolios under a variety of economic scenarios ("futures")

Transmission Planning Overview

Brad Cullipher

Transmission Planning Update

- What has changed since the 2018 IRP:
  - EAL continues to develop plans to improve the Reliability of the Bulk Electric System through traditional Transmission investments with collaboration from MISO.
  - EAL is seeing a downward trend in Transmission baseline reliability projects as we continue to remain compliant with the NERC reliability planning standards.

Transmission Planning Update

- What hasn't changed in Transmission Planning:
  - EAL is still responsible for planning transmission projects that will meet NERC reliability planning standards and EAL's local transmission planning criteria.
  - Our focus remains on providing cost effective, economic, and reliable transmission service to our customers.
  - We use an open and transparent stakeholder process when planning transmission projects which involves stakeholder meetings held by MISO's Planning Subcommittee.

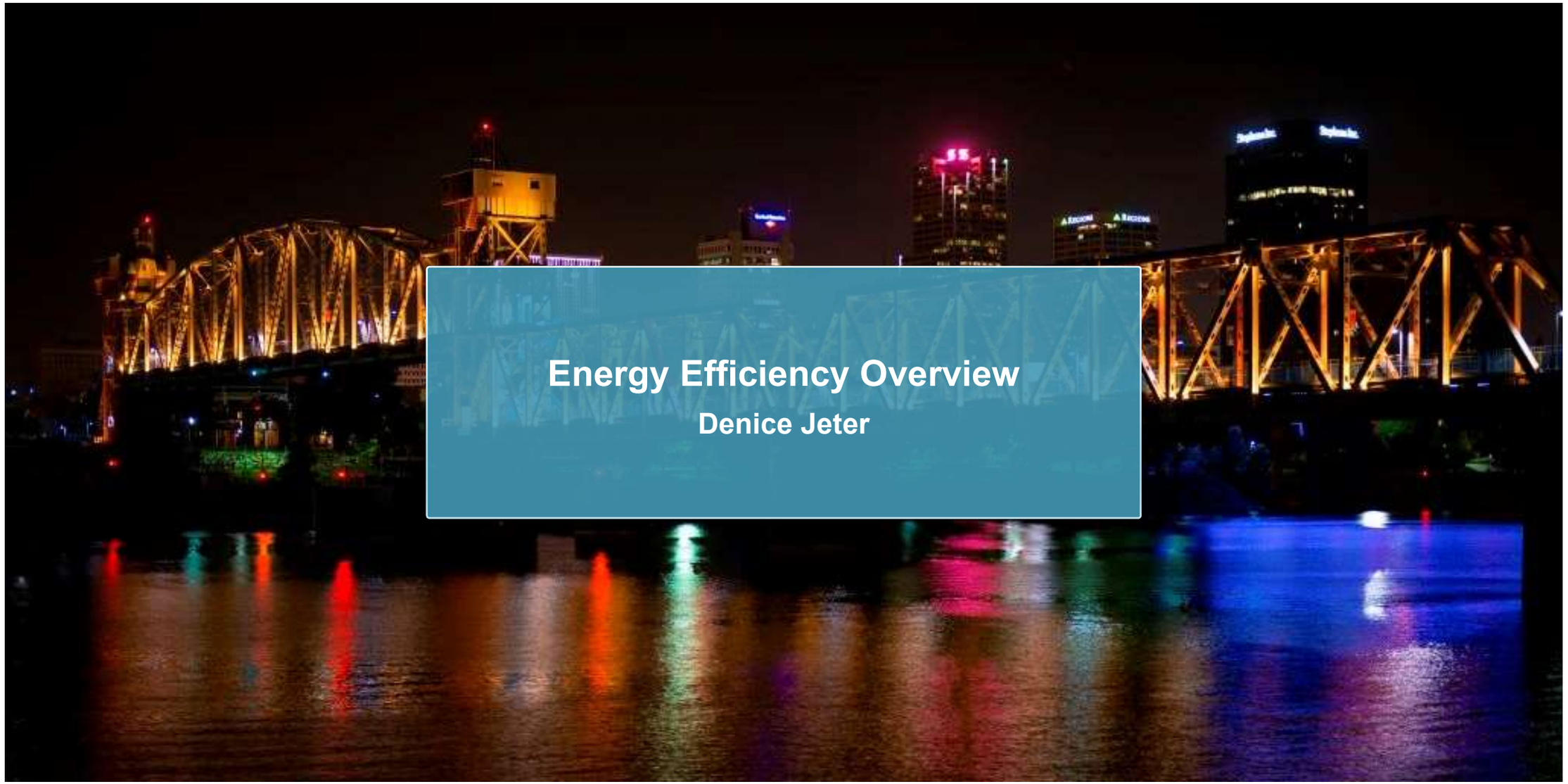
Transmission Projects at a Glance

	APPENDIX A		APPENDIX B	
MISO Cycle	Future/in-progress	Est. Cost	Studied for Future Years	Est. Cost
MTEP 18	12	~$138 M	7	~$92 M
MTEP 19	10	~$87 M	0	
MTEP 20*	12	~$99 M	0	
MTEP 21**	4	~$48 M	2	~$43 M

*MTEP 20 process is still in progress; MISO approval of projects to occur in December 2020.
**MTEP 21 planning is currently on-going by the Transmission Owner's.
MTEP 19 – 20 will include Generator Interconnection Projects approved by MISO

Transmission Planning and the IRP

- Should the 2021 IRP Action Plan guide EAL to pursue and evaluate options for additional generating resources (for example, through an RFP), transmission analysis of resource options will be conducted to model the impact on the Bulk Electric System.
- This reliability analysis will include the current and future planned transmission topology, updated rating information, and future planned Transmission projects submitted and approved in MISO's MTEP Transmission plan.



Energy Efficiency Overview

Denice Jeter

Entergy | WE POWER LIFE℠

Entergy Arkansas EE Staff

Gabe Munoz
BSEE, PMP, BEP
EAL EE Manager

Denice Jeter
B.S.B.A. Accounting
EE Program Manager
Auditing , Finance, EECR
Point of Purchase Solutions Manager
Arkansas Energy Office LEAD

Beau Blankenship
BSEE, BEP
EE Program Manager
Design , PWC Lead, Technical Lead
Cost-Effective Testing –
Business Solutions Program Manager

Heather Hendrickson
MBA, BEP
EE Program Manager
EM&V , Regulatory Reporting
Residential Programs Manager

Santiago Asimbaya
BSME, CEA, CEM, BEPIT
EE Engineer III
Demand Response – LEAD
Technical Analysis,
QA/QC , Safety, New Measures, R&D

Entergy | WE POWER LIFE℠

EAL 2020 Program Plan: 285,557 MWh

Home Energy Solutions

Multi-Family Homes

Manufactured Homes

Low Income Solutions

Retail / Wholesale

Public Institutions

Small Business Solutions

Large Commercial & Industrial

Agricultural Solutions

Irrigation Load Control

Smart Direct Load Control

HVAC Load Control

Entergy | WE POWER LIFE℠

2020 Program Plan

2020 EAL Programs	2020 Goal MWH
Residential Programs	53,015
Point of Purchase Program	56,884
Non-Residential Programs	175,658
TOTAL PORTFOLIO	285,557

EE Program Changes Implemented in 2020

- Residential Benchmarking transitioned to Customer Engagement Portal
- CoolSaver Program ended
- Lighting & Appliances and Commercial Midstream merged into Point of Purchase Solutions
- Low Income Program started
- Smart Thermostat Direct Load Control Pilot started
- De-commissioning of Residential Direct Load Control AC Switches has started

Achievements

- Gross Energy Saved:
  - 2018: 270,655 MWh of energy savings achieved
  - 2019: 267,395 MWh of energy savings achieved

- National Awards:
  - 2019 ACEEE Exemplary Program - Agricultural Energy Solutions
  - 2019 ACEEE Exemplary Program - Manufactured Homes
  - 2019 EPA Energy Star Partner of the Year - Lighting & Appliances
  - 2020 EPA Energy Star Partner of the Year - Lighting & Appliances and Midstream Programs

Operations Planning Overview

John Schwegler

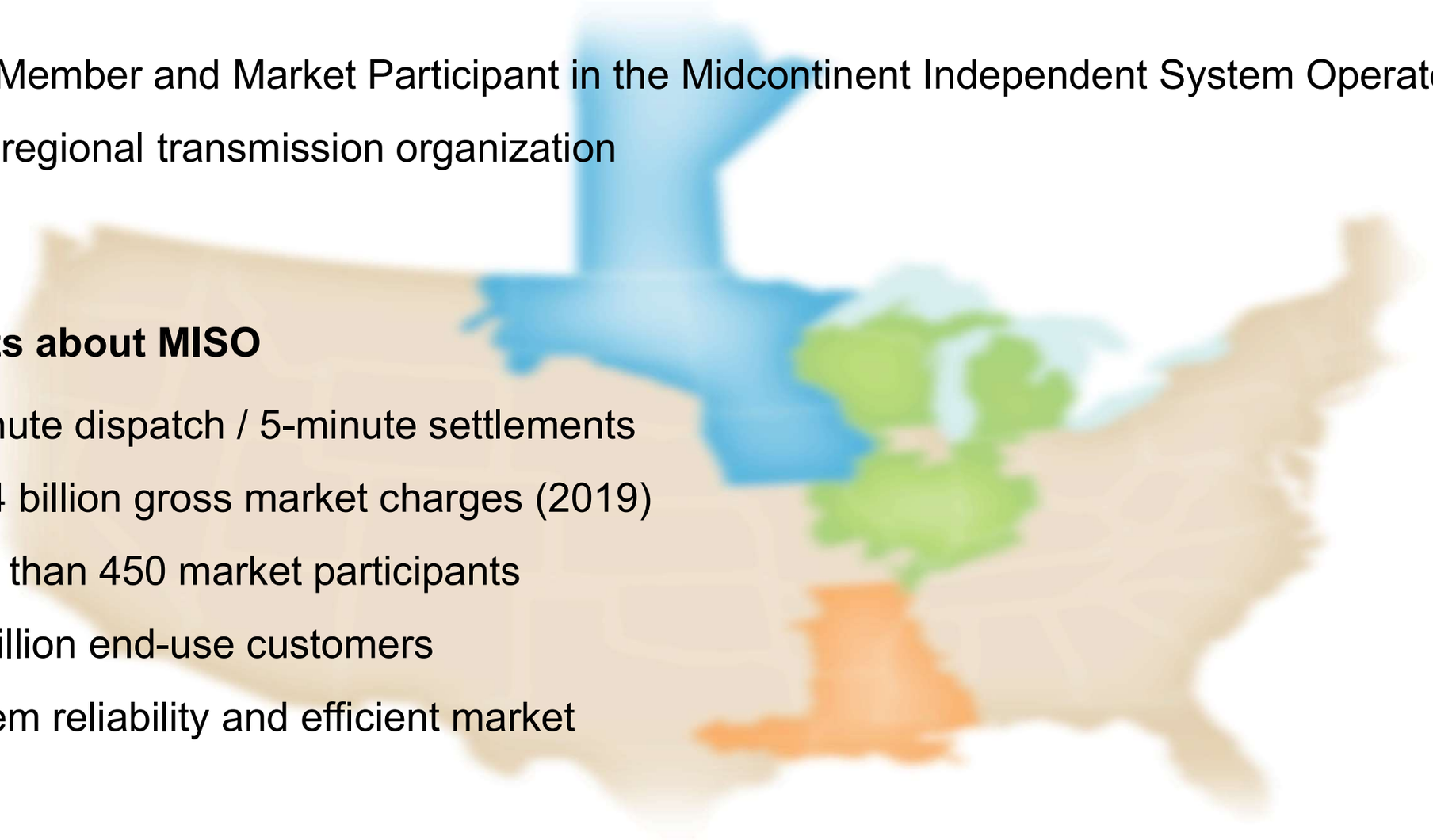
Entergy | WE POWER LIFE℠

EAL Operations Planning Update

- **Summary:**
  - MISO Membership
  - Market Participation
  - Resource Additions
  - Renewable Energy Credits (“RECs”)

MISO Membership

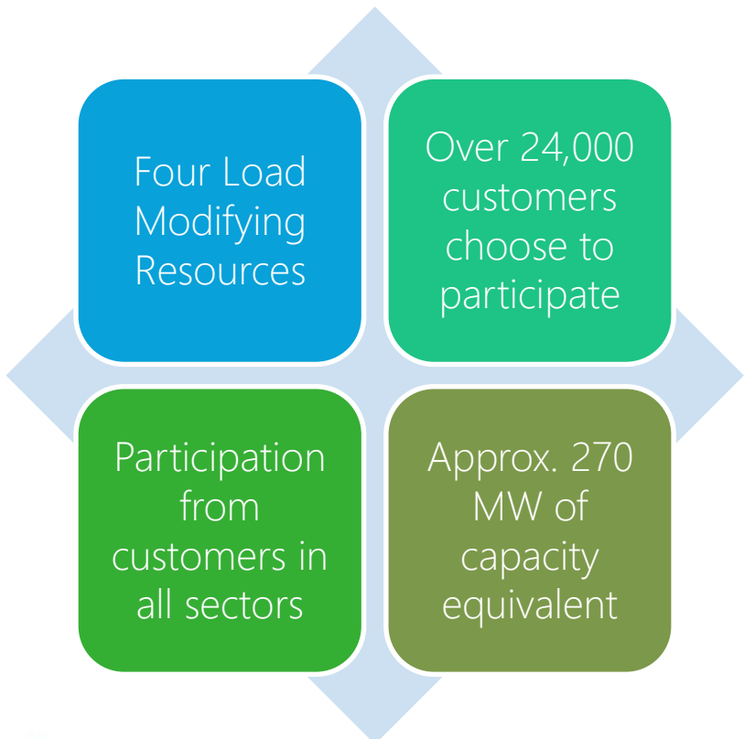
- EAL is a Member and Market Participant in the Midcontinent Independent System Operator, Inc. (“MISO”) regional transmission organization

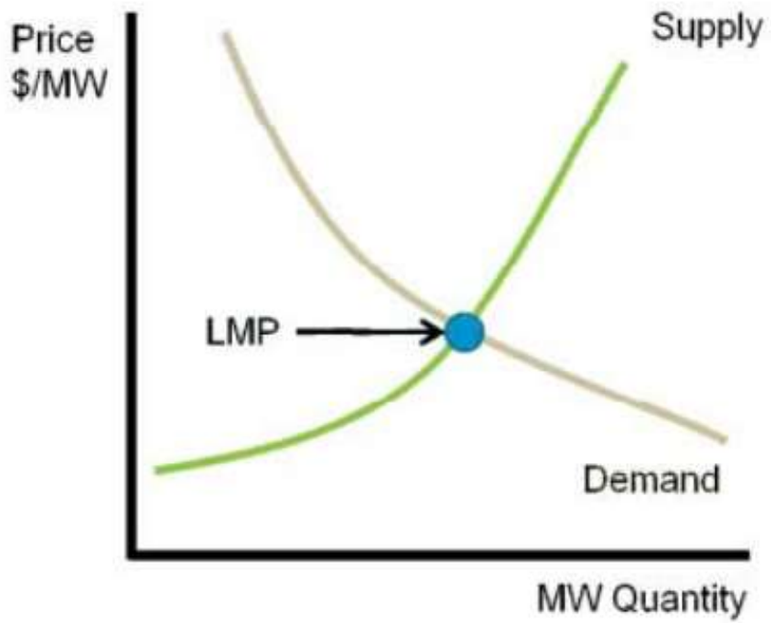


- **Key Facts about MISO**
  - 5-minute dispatch / 5-minute settlements
  - $24.4 billion gross market charges (2019)
  - More than 450 market participants
  - 42 million end-use customers
  - System reliability and efficient market

MISO Market Participation

- All EAL generation and load-modifying resources (“LMRs”) are offered into MISO daily
- EAL’s customers’ load bid submitted daily to MISO
- Outage coordination/planning



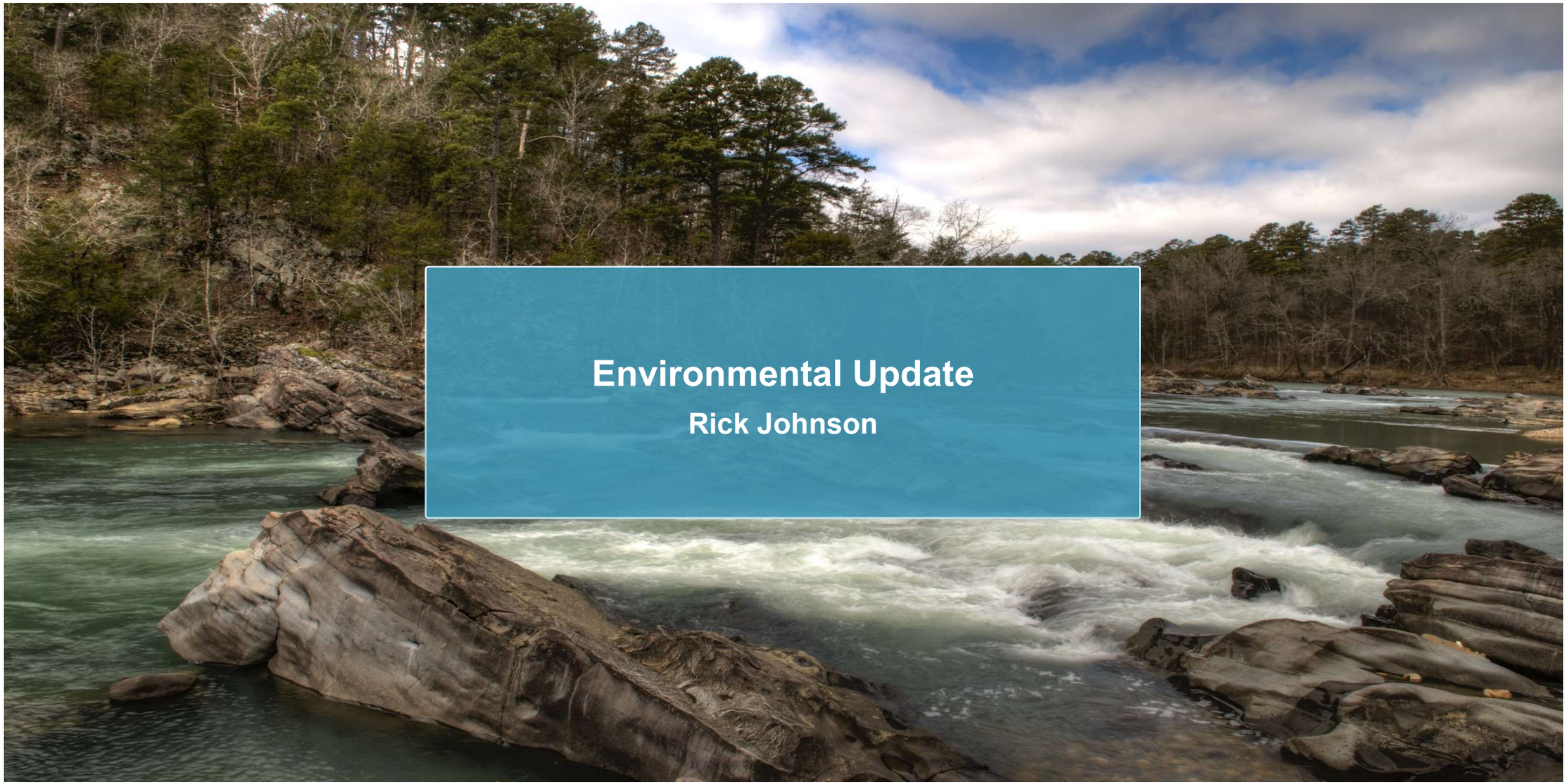


EAL Resource Additions

- **Chicot Solar Power Purchase Agreement (PPA)**
  - 100MW Solar Facility
  - Expected commercial operation date (“COD”): Mid-October 2020
  - Continue project management with NextEra until COD
  - Transition into contract management of the PPA with NextEra

EAL Renewable Energy Credits (“RECs”)

- **Management of RECs for EAL’s renewable resources**
  - Stuttgart Solar facility
  - Chicot Solar facility COD mid-October
  - Solar Energy Purchase Option (SEPO) tariff



Environmental Update

Rick Johnson

Entergy | WE POWER LIFE℠

Entergy Arkansas' Clean Generation Portfolio

Rick Johnson – Director, Sustainability

Entergy | WE POWER LIFE℠

Creating sustainable value for all

We exist to grow a world-class energy business that creates ***sustainable*** value for our four stakeholders

13 CLIMATE ACTION

Consistent Leadership and Two Decades of Action

Entergy | WE POWER LIFE™

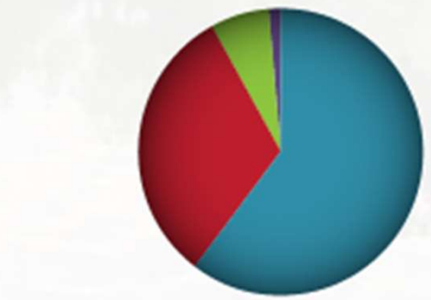
ENTERGY'S 2030 CLIMATE GOAL

- Intensifying efforts to reduce our carbon footprint and that of other sectors
- 50 percent reduction in emission rate from 2000 levels by 2030
- Resulting 2030 emission rate…

  …is in line with IEA Sustainable Development Scenario.

  …results in a projected absolute emissions decrease in line with US INDC.

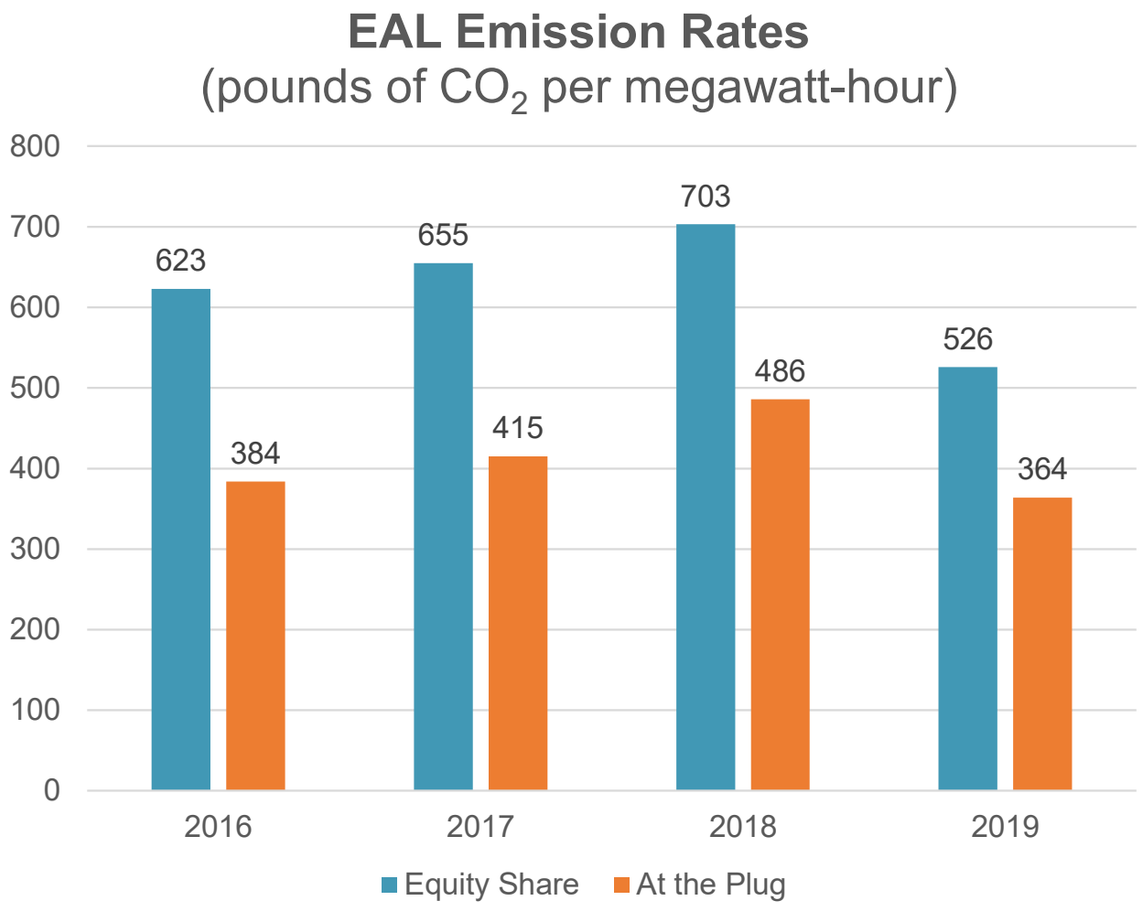
  …allows for decarbonization of other sectors.

Metric	Entergy's Climate Goal: 50% Emission Rate Reduction by 2030
	Solar Replaces Most Coal Case
CO_2 Emissions (million short tons)	35.6
Compared to Base Year	-28%
CO_2 Emission Rate (lbs. per MWh)	532
Compared to Base Year	-50%
Projected 2030 Generation Mix	~134 TWh 
Compared to Base Year	45%

Entergy WE POWER LIFE℠

Entergy Arkansas' Emission Performance

- EAL has low emission rates today
- National Average ~ 1,000 pounds per MWh
- Diverse, clean fuel mix
- Definitive plans to retire coal by the end of 2030
- Modernizing the gas generation fleet
- Integrating renewables



Managing emissions

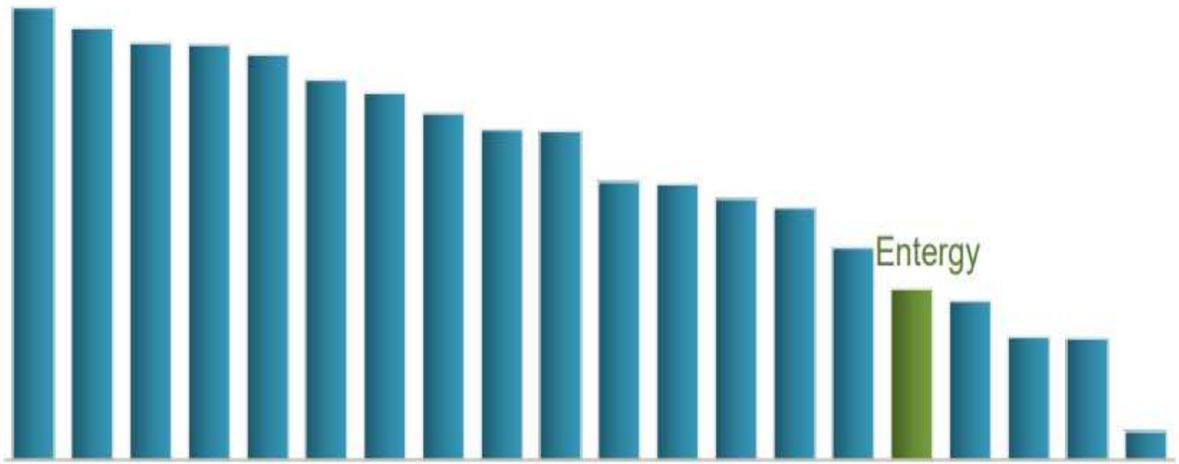
One of the cleanest large-scale generating fleets in U.S

First U.S. utility to commit voluntarily to stabilizing greenhouse gas emissions

~3,500 to 4,000 MW of owned renewables potential by 2030

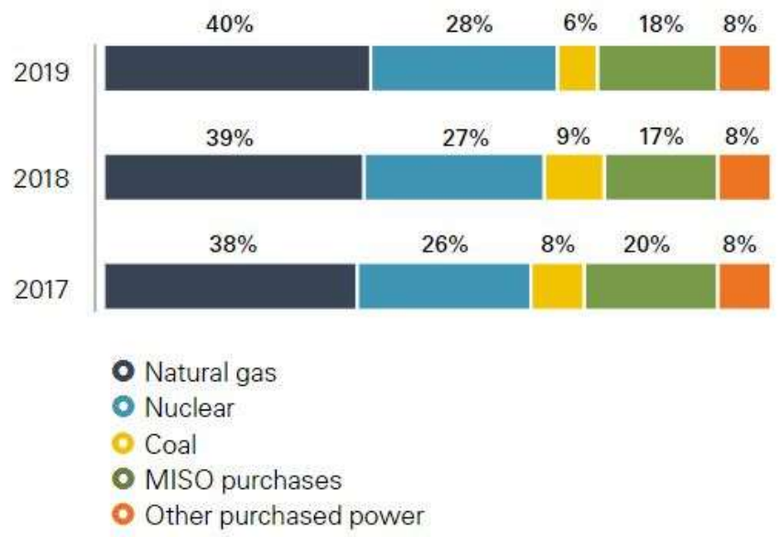
13 CLIMATE ACTION

CO_2 emission rates of top 20 privately / investor-owned power producers (lbs/MWh)



Source: MJ Bradley, Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States, published July 2020 (2018 data)

Generation Sources Used to Meet Utility Demand



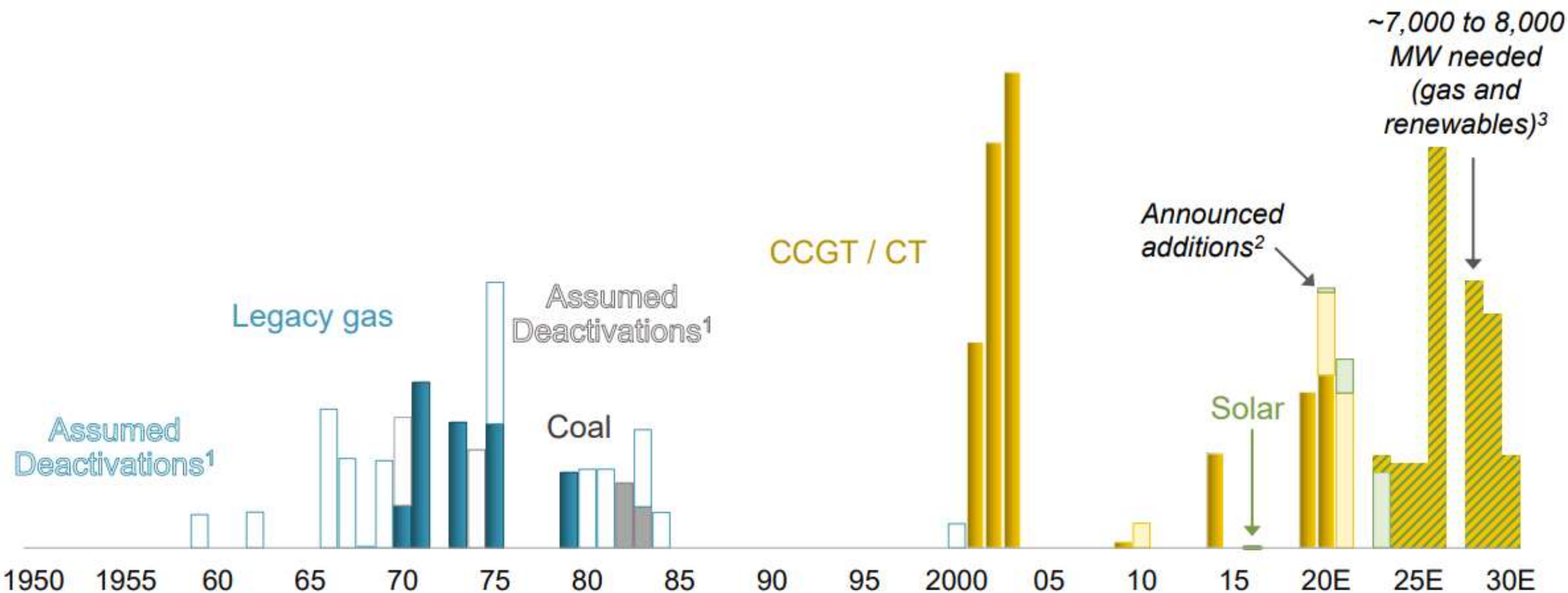
Entergy | WE POWER LIFE℠

Generation resources

Modernization provides cost-effective, reliable, and efficient generation

Owned Utility non-nuclear plant capability; MW by year of commercial operation

Illustrative



As of 6/30/20; excludes hydro

Reflects E-TX acquiring Hardin County Peaking Power Facility, an approximately150 MW 2010 CT, from ETEC, and E-TX selling 75 MW of MCPS to ETEC

[1] Assumed deactivations through 2030, planning assumptions only, subject to change

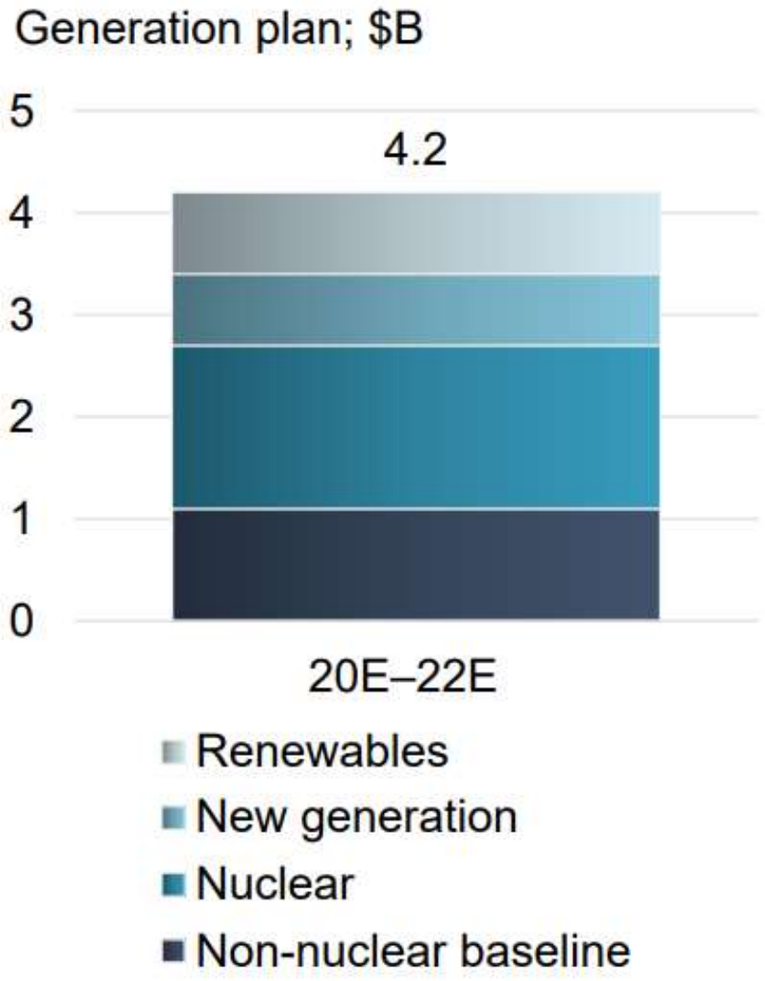
[2] Projects under construction, approved, or in the regulatory review processes; see slides 28 and 29 in 4Q19 webcast presentation for project details

[3] 2022E-2030E; subject to integrated resource planning processes and regulatory approvals

Entergy | WE POWER LIFE™

Generation investment

Includes new, cleaner, more efficient generation projects



Renewables

- E-NO rooftop solar (2020)
- New Orleans Solar Station (2020)
- Sunflower Solar (2021)
- Searcy Solar (2021)

New generation

- ✓ LCPS (completed)
- ✓ NOPS (completed)
- WPEC (2020)
- MCPS (2021)

Entergy | WE POWER LIFE™

2020E–2022E capital plan as of February 2020; does not reflect potential developments and/or updates since February 2020

Committed to renewables

Project	MW	Owned / PPA	In service
In service			
Agrilectric (bio-mass)	~9	PPA	1984
City of Vidalia-Murray Hydro	~114	PPA	1990
Rain CII (waste heat)	~27	PPA	2013
Montauk (bio-mass)	~3	PPA	2014
DeSoto Solar	0.5	Owned	2015
Brookhaven Solar	0.5	Owned	2016
Hinds Solar	0.5	Owned	2016
New Orleans Solar	1.5	Owned	2016
Stuttgart Solar	81	PPA	2017

Project	MW	Owned / PPA	Est. in service
Installation in process			
Rooftop solar	5	Owned	2020
Solar	~30	PPA	2020
Chicot Solar	100	PPA	2020
Capital Region Solar	50	PPA	2020
New Orleans Solar Station	20	Owned	2020
St. James Solar	20	PPA	2021
Iris Solar	50	PPA	2021
Sunflower Solar	100	Owned	2021
Searcy Solar	100	Owned	2021
RFPs			
Solar	200	Owned	2022/2023
Solar	200	Owned and PPA	2023
Solar	300	Owned and/or PPA	2023

Anticipate ~7,000 to 8,000 MW of new owned capacity between 2022 and 2030, up to half of which could be renewables

Investments in Arkansas Solar Power

Entergy Arkansas Plans Fourth Solar-generation Resource, Walnut Bend, Near Brinkley

08/17/2020

CONTACT David Lewis | | dlewis1@entergy.com

Walnut Bend will be the fourth utility-scale solar generation asset for Entergy Arkansas customers. The first, pictured here, was Stuttgart Solar, which went into service in 2017.

Arkansas Public Service Commission Approves Searcy Solar Project

04/28/2020

CONTACT David Lewis | | dlewis1@entergy.com

This is the solar facility near Stuttgart.

Stuttgart Solar Flips Switch to Entergy Arkansas

BY: DAVID LEWIS • SENIOR COMMUNICATIONS SPECIALIST

06/19/2018

Flipping the symbolic switch are Armando Pimentel of NextEra, Riley, Gov. Asa Hutchinson, Bethany Helldebrand, CEO and executive director of the Stuttgart Chamber of Commerce, and Arkansas County Judge Thomas Best.

Entergy Arkansas, NextEra Energy Resources announce groundbreaking of Arkansas' largest solar energy

12/02/2019

2018 IRP Action Plan & Recent Activities

Caleb Bales

2018 IRP Action Plan ✓

- The IRP Action Plan guides EAL's resource planning activities for the three-year period until the next IRP:

- ✓ Complete Solar BOTs (2017 RFP)
- ✓ Supply-side Resource Additions
- ✓ Potential 2025 Capacity Need
- ✓ Demand-side Resource Opportunities & Continue EE
- ✓ Coal Environmental Compliance
- ✓ Stakeholder Engagement Process

2018 IRP Action Plan ✓

- EAL received APSC approval for the Searcy Solar project in June 2019
- The 2019 Solar RFP has thus far led to the selection and announcement of the Walnut Bend Solar project

✓ Complete Solar BOTs (2017 RFP)

Searcy Solar

✓ Supply-side Resource Additions

Walnut Bend Solar


Arkansas Public Service Commission Approves Searcy Solar Project

04/28/2020

CONTACT David Lewis | | dlewis1@entergy.com

This is the solar facility near Stuttgart.


Entergy Arkansas Plans Fourth Solar-generation Resource, Walnut Bend, Near Brinkley

08/17/2020

CONTACT David Lewis | | dlewis1@entergy.com

Walnut Bend will be the fourth utility-scale solar generation asset for Entergy Arkansas customers. The first, pictured here, was Stuttgart Solar, which went into service in 2017.

2018 IRP Action Plan ✓

- EAL's potential 2025 capacity need and EE Programs have been actively managed since the 2018 IRP:

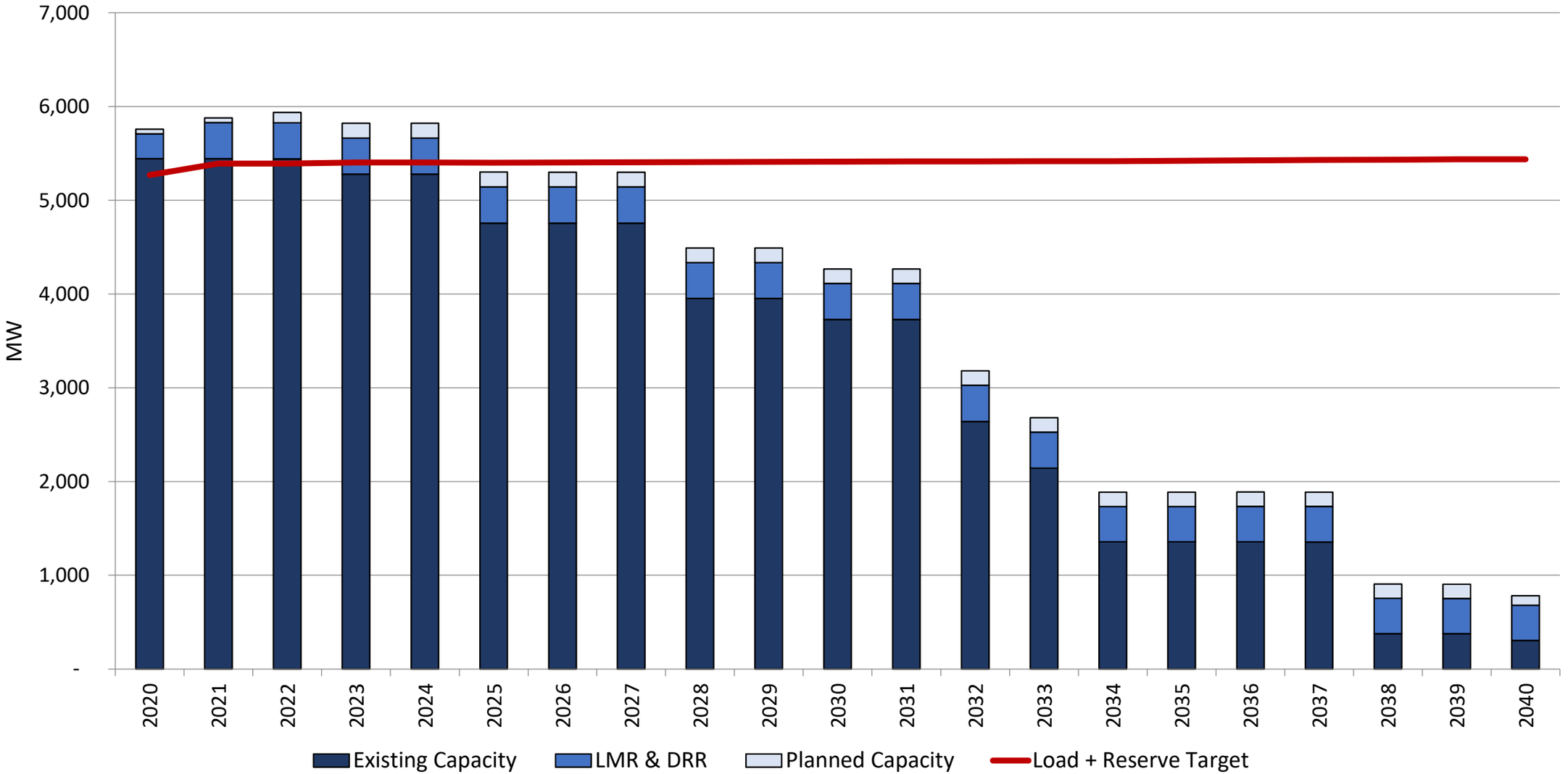
Potential 2025 Capacity Need

- EAL continues to monitor its projected load and capability position for 2025 based on the assumed deactivation of Lake Catherine 4
- EAL's ongoing supply-side solar resource additions are contributing to meeting this forecasted need

Demand-side Resource Opportunities & Continue EE

- EAL's EE programs have continued at APSC-mandated savings targets
- Since the prior IRP, EAL's EE programs have achieved 160% and 140% of APSC-mandated savings targets in 2018 and 2019, respectively
- EAL's EE programs also achieved 40 MW and 29 MW of DR savings in 2018 and 2019, respectively

EAL Supply Portfolio and Customer Demand



EAL's Planning Process Overview

Caleb Bales

Entergy | WE POWER LIFE℠

Key Elements of Integrated Resource Planning

- Each component of the IRP process is critical to an informative and effective IRP:

Planning & Design
Building future scenarios, assumptions, and ranges of risk factors

Stakeholder Engagement
Sharing information, receiving feedback, and facilitating Stakeholder Group

Modeling & Analysis
Portfolio optimization, production cost projections

Conclusions & Action Plan
Identifying themes and opportunities, establishing a mid-term, actionable plan

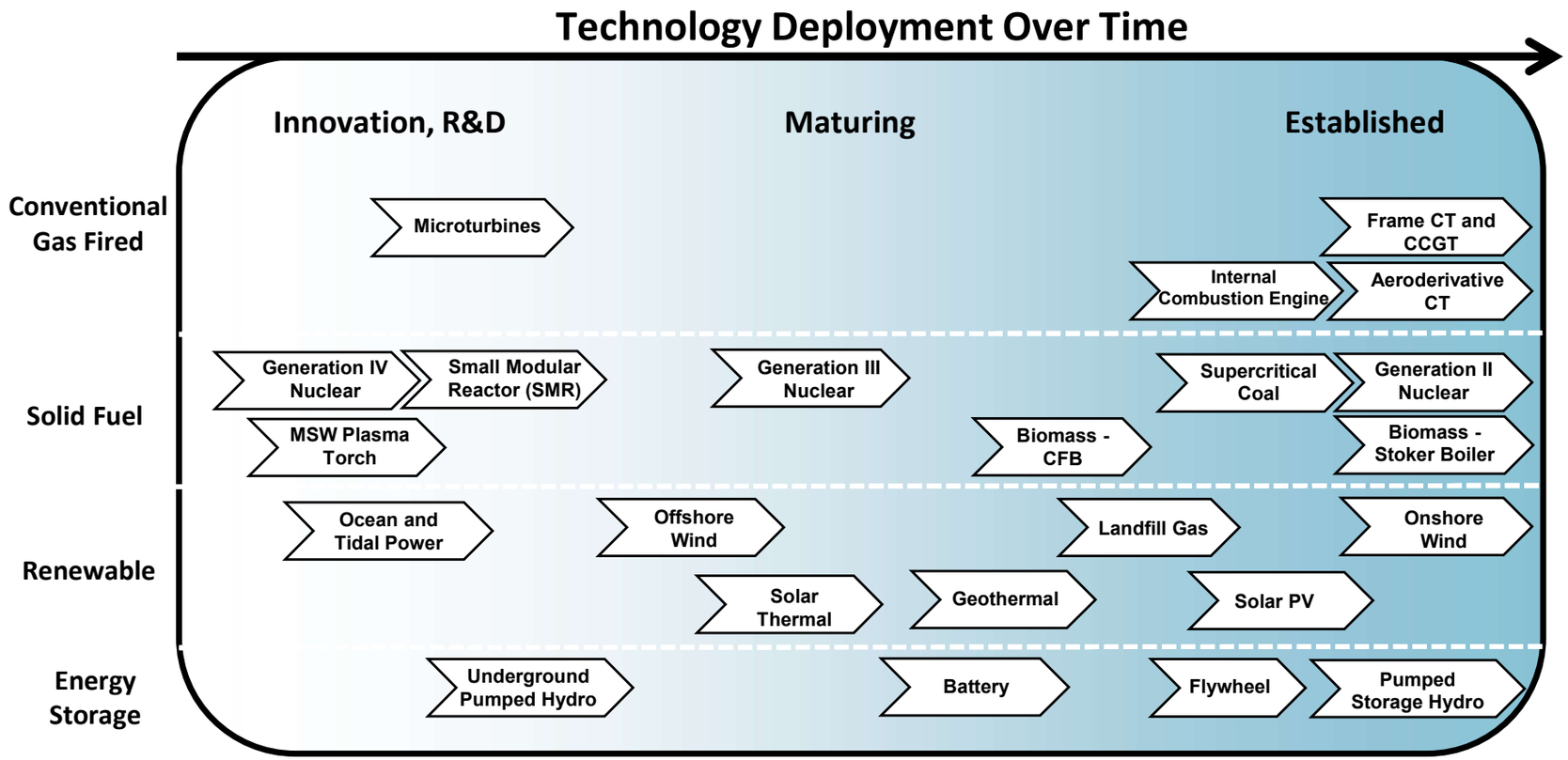
Publishing and Filing the Report
Organizing information, displaying results, and communicating EAL's narrative

IRP Objectives, Deliverables & Technology Assessment

Heather Naeher & Charles DeGeorge

Identified Supply-Side Resource Alternatives

- The technology evaluation includes surveying supply-side resource alternatives to meet supply needs. A subset of alternatives are retained to further understand costs and operational characteristics to be considered for meeting planning objectives. Alternatives evaluated are technologically mature and could reasonably be expected to operate economically and reliably in or around the EAL service territory.



ILLUSTRATIVE

Supply-Side Resource Alternative Trends

Market economics, public policy, and technological innovation have shifted research and focus to four main areas for developmental, utility-scale power generation in or around the EAL service territory:

- Gas-fired combustion turbine and combined cycle plants are the lowest cost dispatchable supply-side alternatives based on current projections and recent experience.
- 
  Solar is competitive today with gas-fired resources with capital costs continuing to decline.
- 
  Utility-scale battery storage is an emerging technology. The cost of certain battery storage technologies is expected to decrease significantly over the next 10 years.
- Solutions that cater to customer preferences while maintaining reliable, cost effective service.

Demand-Side Management (DSM) Potential Study

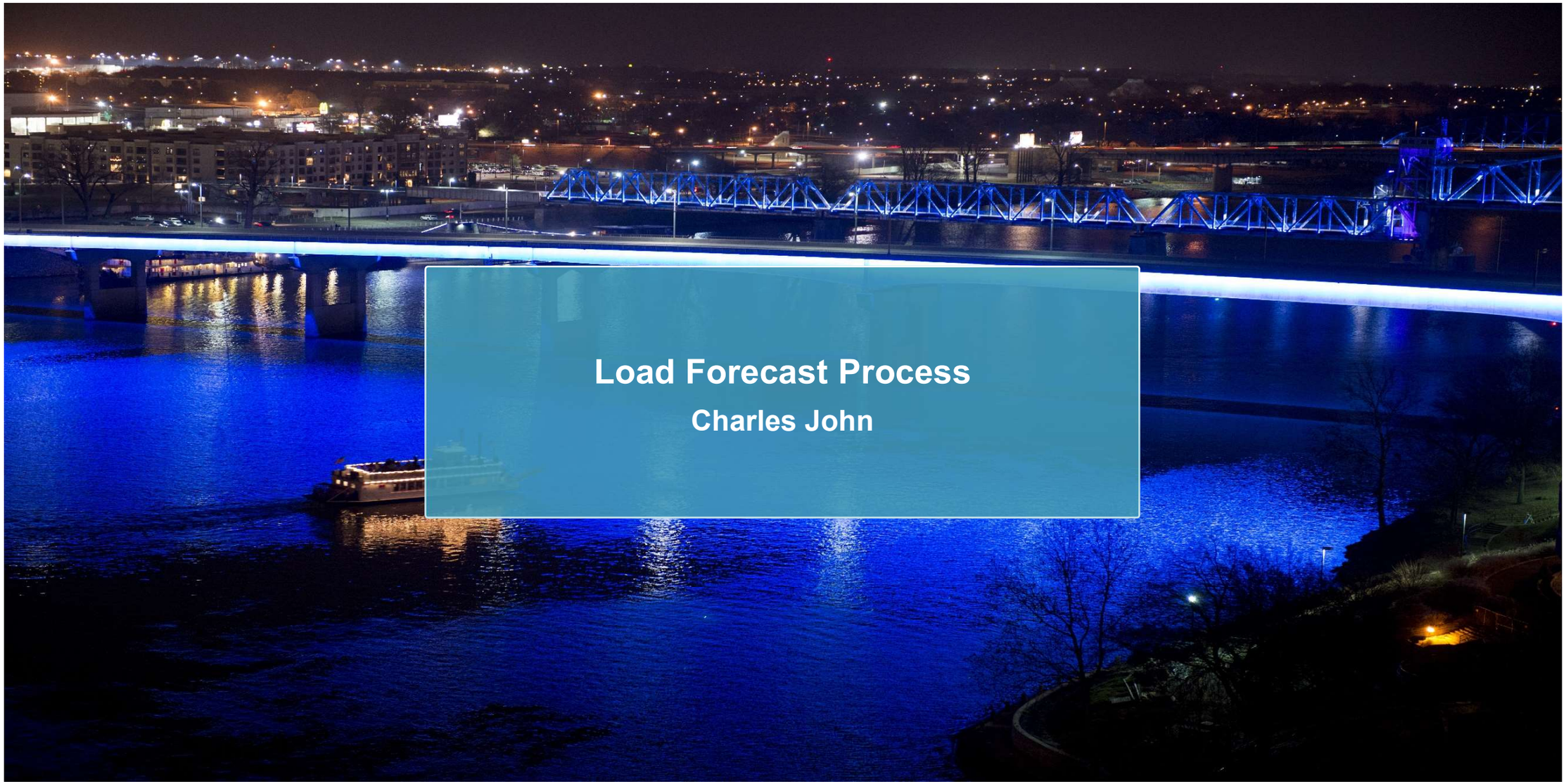
- EAL will retain ICF to perform a robust DSM potential study with the following components:
  - Demand Response Potential Study (“DR”)
  - Distributed Energy Resource Potential Study (“DER”)
- DR programs developed from the ICF Potential Study will be evaluated in EAL’s portfolio as future resource alternatives to meet supply needs alongside the supply-side options.
- Future load scenarios will also include increased levels of kWh reductions from EE and DER programs.
- Hourly load shapes and program costs associated with energy or demand savings from the selected programs will serve as inputs to the IRP production cost modeling in AURORA.
- The result will allow Entergy to describe how the market penetration of cost-effective energy efficiency, demand response, and distributed energy resource technologies will impact load shapes over the 20-year evaluation period.

Development of Futures

- In order to reasonably account for a broad range of uncertainty, the EAL IRP takes a futures-based approach. In this approach, futures are developed that represent different combinations of outcomes of many variables and reasonably bookend the range of potential outcomes.

- Major areas of uncertainty that are considered:
  - Sales and load growth
  - Customer usage trends
  - Natural gas price trends
  - Unit life assumptions
  - CO_2 tax trends

- For each future, the AURORA Capacity Expansion Model selects (i.e., outputs) a 20-year resource portfolio that is economically optimal for EAL under that set of circumstances.

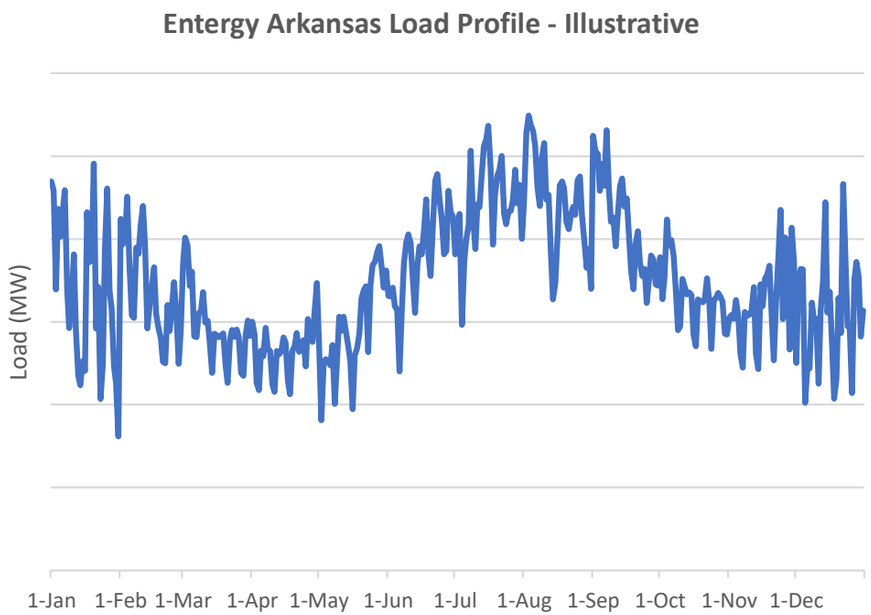


Load Forecast Process

Charles John

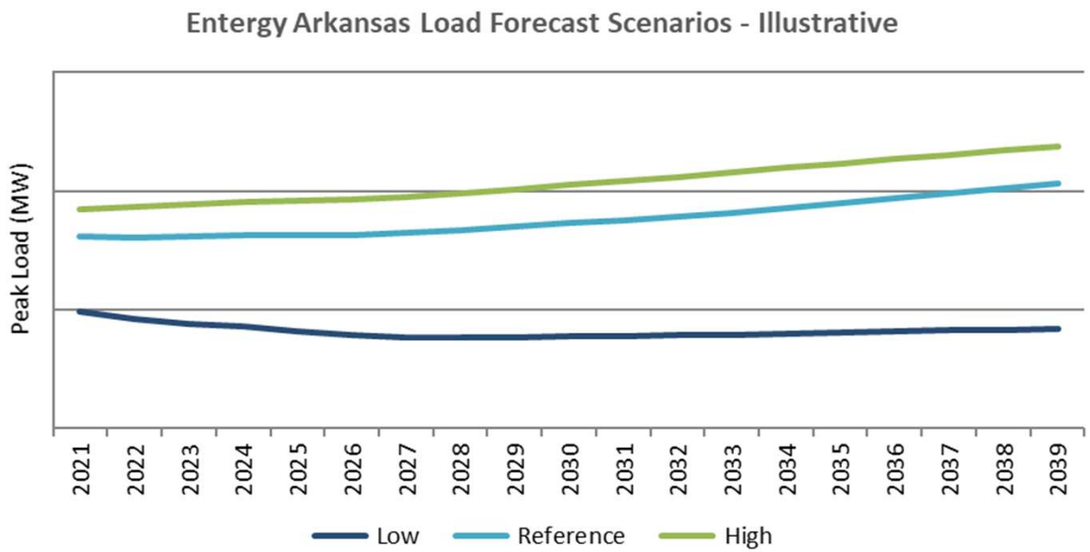
Load Forecasts - Process

- Entergy Arkansas develops electricity consumption forecasts for a 20 year forward period.
- The forecasts are developed using statistical models and a bottom-up approach by class – Residential, Commercial, Industrial, and Governmental – to estimate the total electricity consumption volumes. The volumes are developed considering a number of elements including:
  - Historical consumption levels, numbers of customers, and temperatures
  - Energy efficiency – organic and company-sponsored
  - Future changes in population/households, employment, and segment-level output
  - Individual customer information for identified large industrial customers
- Consumption volumes are merged and allocated across hourly profiles to estimate annual peaks and hourly energy.



Load Forecasts - Elements and Scenarios

- Entergy Arkansas has a Reference Case forecast (BP21) that is the basis for current resource plans as well as financial budgets. That forecast includes perspectives on consumption due to a number of elements including:
  - Energy efficiency: organic and company-sponsored
  - Load growth: changes in numbers of customers; increases/declines with specific customers
  - Technological and economic changes: increases in numbers of electric vehicles, installation of behind-the-meter resources, other electrification
  - Effects of weather/temperatures
- Alternative scenarios are planned to be developed to help in the assessment of other potential future outcomes.
- Those scenarios – high and low – will be based on increasing/decreasing or adding/removing volumetric levers to the Reference Case forecast.



AURORA Modeling Overview

Charles DeGeorge

Total Relevant Supply Cost Analysis – Portfolio Design

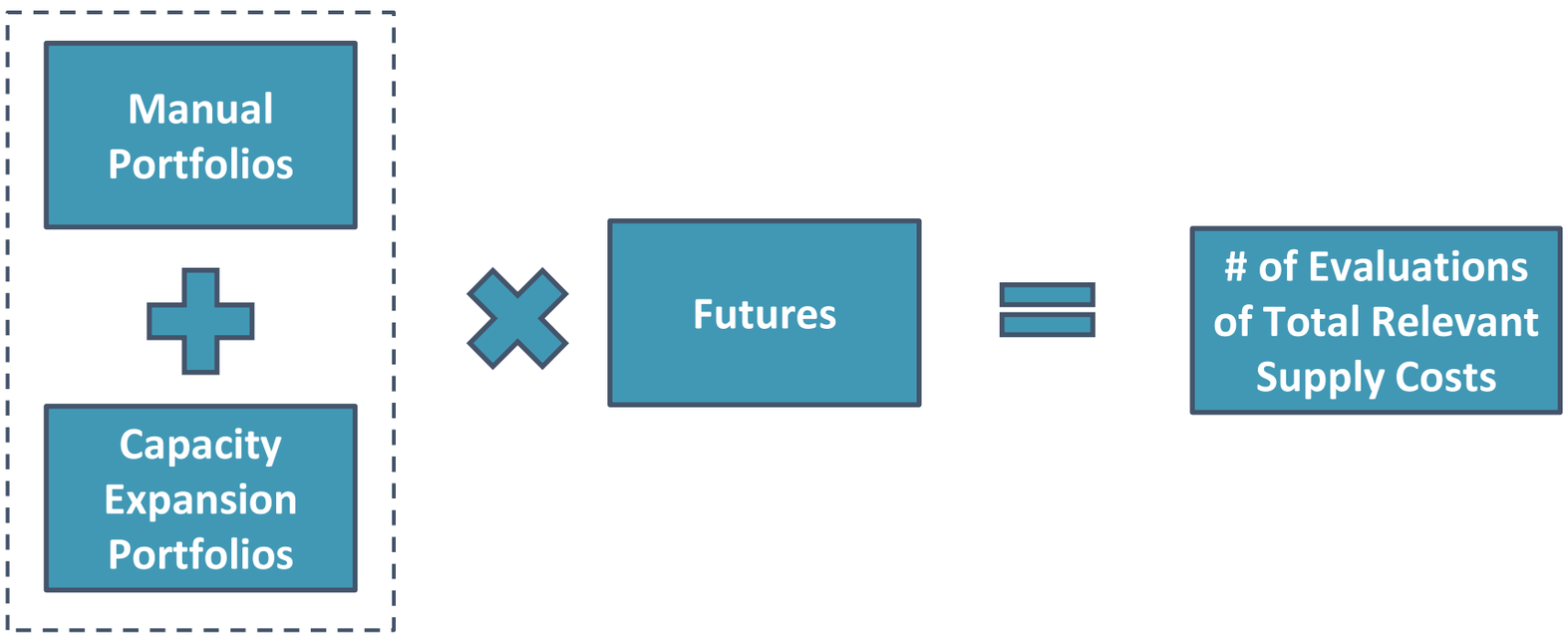
- EAL currently uses the AURORA Capacity Expansion modeling software to develop resource portfolios given defined constraints (e.g. magnitude of capacity needed, minimization of total supply costs as a participant in the MISO market)

- Based on defined assumptions, AURORA Capacity Expansion is used to identify the optimal portfolio additions of supply and demand-side resources to most economically serve customer needs over the 20-year planning horizon

- Some planning objectives or strategies may contemplate constraints that cannot be modeled in the AURORA Capacity Expansion Model. The optimal portfolio in that case would need to be developed based on defined constraints and professional judgment (“manual portfolios”)

Total Relevant Supply Cost Analysis – Portfolio Design

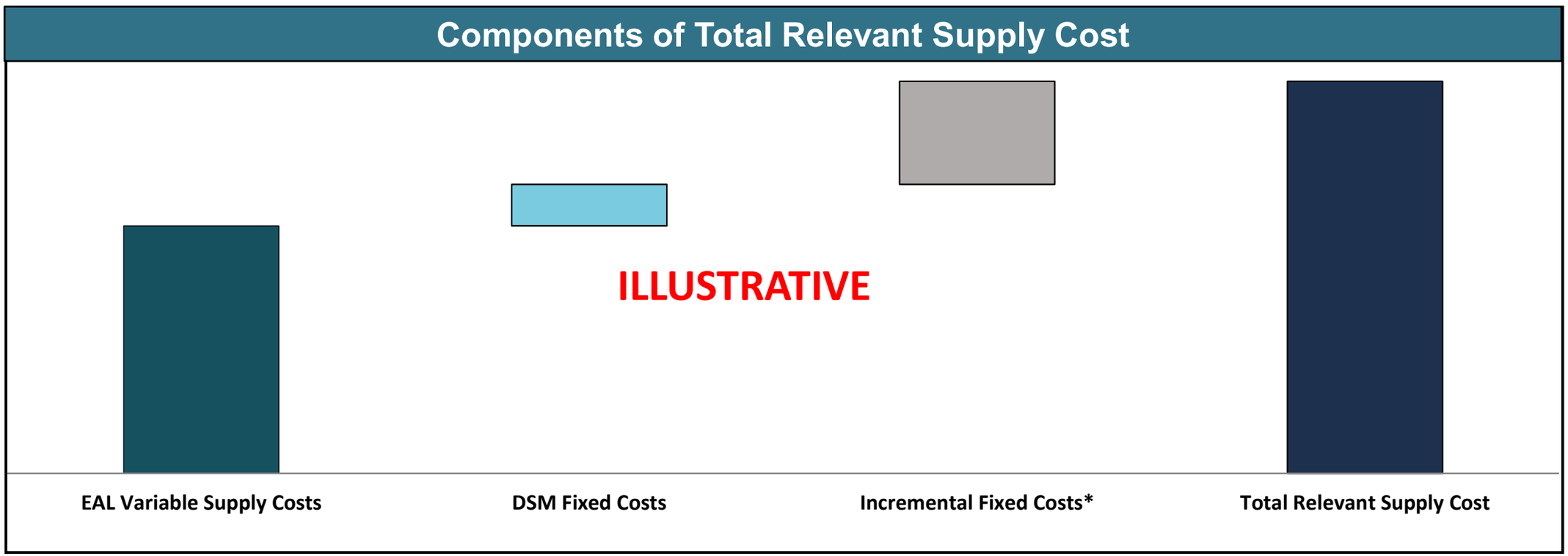
- Designed portfolios are assessed based on the economic impact to customers under each of the defined futures
- Each resource portfolio is tested in each future using AURORA production cost modeling software
- For each resource portfolio, a present value forward revenue requirement (i.e., a Total Relevant Supply Cost, that includes both relevant fixed and variable costs) will be calculated for the 20 year planning period



Total Relevant Supply Cost Components

- **Total Relevant Supply Cost results consist of 3 major components:**

EAL Variable Supply Costs
+ Demand Side Management (DSM) Costs
+ Incremental Fixed Costs*
Total Relevant Supply Cost ("TRSC")



*Incremental Fixed Costs include an adjustment for capacity purchases/sales

2021 IRP Schedule & Next Steps

Caleb Bales

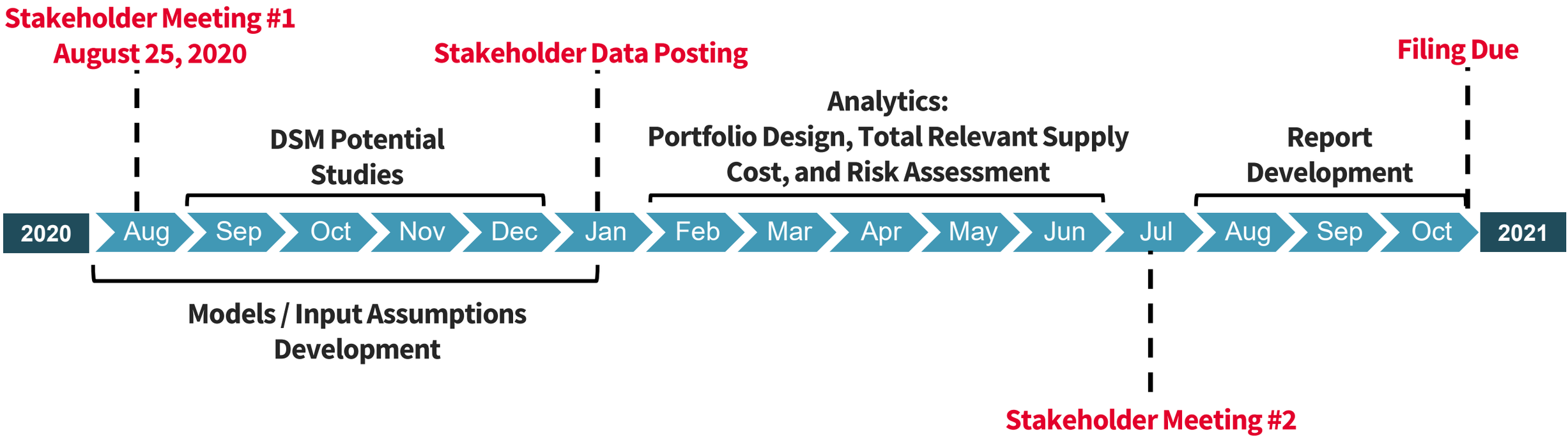
Entergy | WE POWER LIFE℠

2021 IRP Stakeholder Timeline

- Stakeholder engagement will be a cornerstone of the 2021 EAL IRP process
- Future Stakeholder meetings and data postings will be communicated via email
- In-person meetings remain TBD due to COVID-19

Activity/Milestone	Date
Stakeholder Engagement: Information Posting	June 26
Stakeholder Engagement: Meeting 1	August 25
Stakeholder Engagement: Data Posting	January 2021
Stakeholder Engagement: Meeting 2	July – August 2021
Filing	October 29, 2021

Timeline of Major Milestones



Dates shown are preliminary and subject to change.

Entergy | WE POWER LIFE℠

2021 IRP Website

- EAL's IRP website will serve as a central point of communication and will continue to be updated with IRP materials and responses to Q&As.

Entergy Arkansas, LLC Integrated Resource Planning

INTEGRATED RESOURCE PLAN

About Entergy Arkansas

- Entergy Arkansas, LLC Integrated Resource Planning
- President's Biography
- Request for Energy and Capacity Proposals

For more than a century, Entergy Arkansas, LLC ("EAL") has provided safe, reliable, and affordable electricity to its customers in Arkansas. EAL continues to serve its diverse, growing customer base by proactively planning for future resource needs by the most reliable and economic means possible.

Per APSC Resource Planning Guidelines EAL is beginning the necessary preparations for its 2021 Integrated Resource Plan, which will include a comprehensive Stakeholder Engagement process. Due to the uncertainty around COVID-19, EAL is planning for a remote Stakeholder meeting in August 2020 via WebEx. A preliminary Stakeholder Engagement timeline is detailed below. Dates shown are tentative and subject to change.

Preliminary Information Posting	June 25, 2020
Kickoff Meeting (WebEx)	August 25, 2020
Data Posting	January 28, 2021
Follow-Up Meeting	July 1, 2021
EAL's 2021 IRP Filing	October 29, 2021

WebEx meeting information will be posted on this site and distributed via email when available.

2021 IRP DOCUMENTS

CONTACT INFORMATION

Please contact the IRP Inbox at EALIRP@entergy.com with comments or questions.

https://www.entergy-arkansas.com/integrated_resource_planning/

Stakeholder Feedback
Q&A Session