JEA Integrated Resource Planning

IRP
INTEGRATED RESOURCE PLANNING

Mid-May 2022 Stakeholders Report

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Building Community

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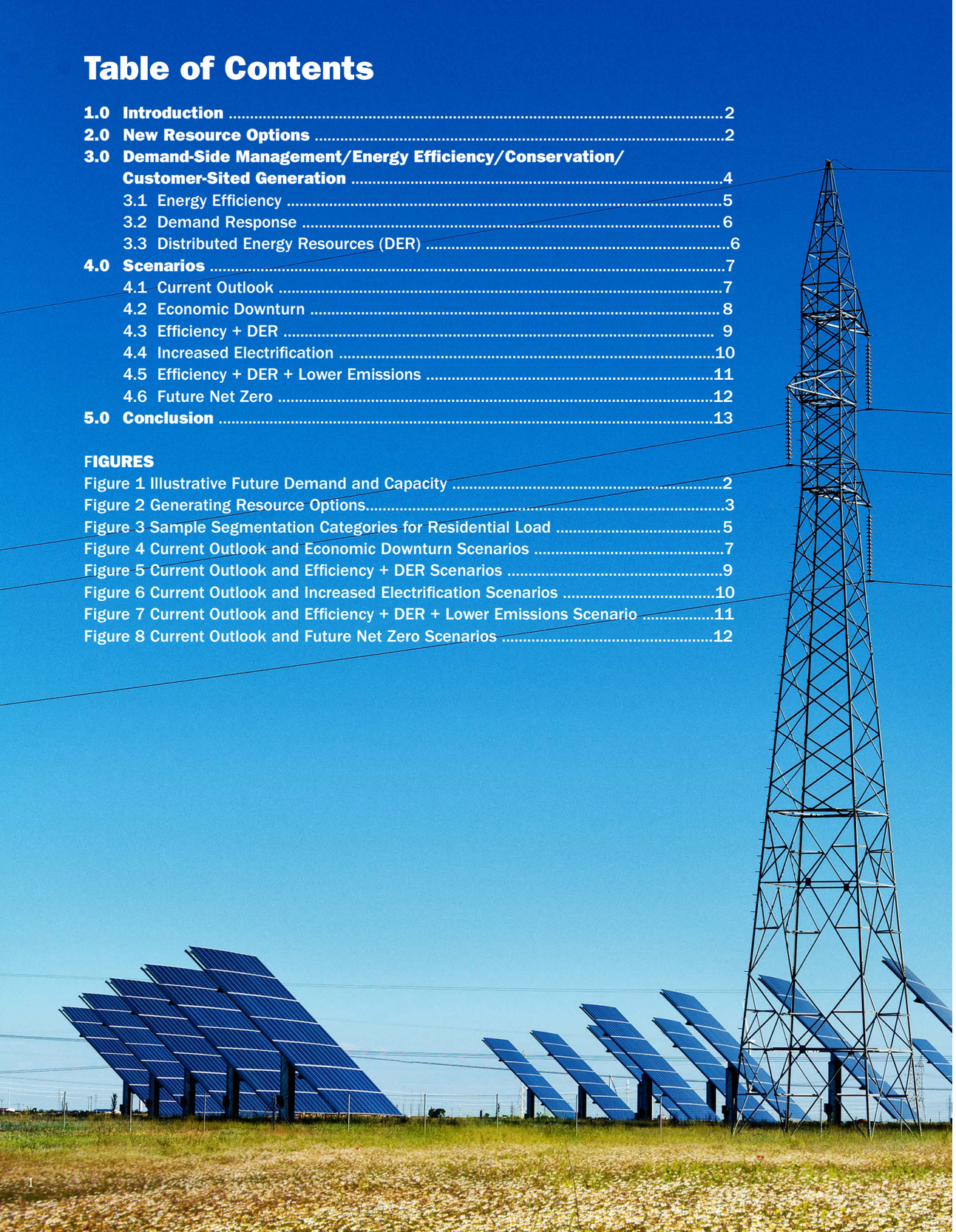


1.0 Introduction

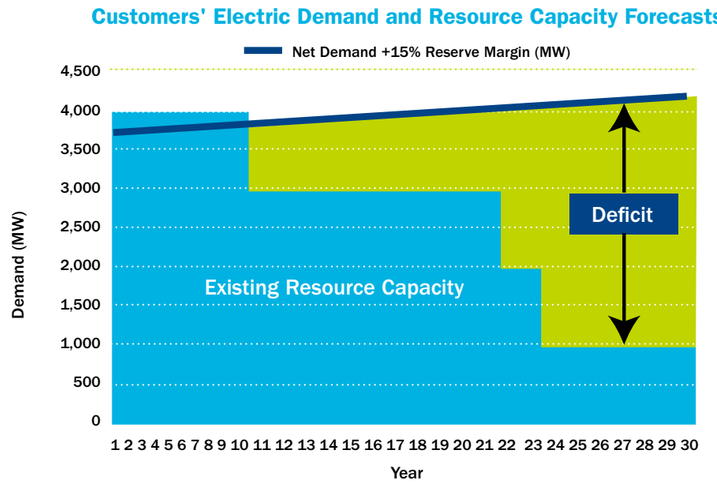
This Stakeholders Report provides information about new generating resource options (including renewable, natural gas firming, and nuclear alternatives), demand-side and customer-sited resources, and scenarios that will be evaluated in the pending JEA integrated resource plan (IRP). Additional scenario analysis and information will be shared throughout the Stakeholder engagement process.

2.0 New Resource Options

The IRP process continues to identify generating resource options that JEA may need to implement in the future to reliably meet customer load growth and compensate for the planned retirement of existing resources. New generating resources will work in tandem with non-generating resources such as demand-side management, customer-sited solar and demand response to help JEA meet future customer needs.

The fundamental challenge facing every utility that is obligated to serve all current and future customer energy needs is illustrated in Figure 1. ***This is illustrative only and does not represent the actual future demand and resource needs of JEA.*** The top line represents the future growth of electric demand by customers plus a required 15 percent reserve margin. A reserve margin ensures that the total capacity of future generating resources will always be 15 percent more than future customer demand. The demand line also includes potential load reduction from non-generating resources.

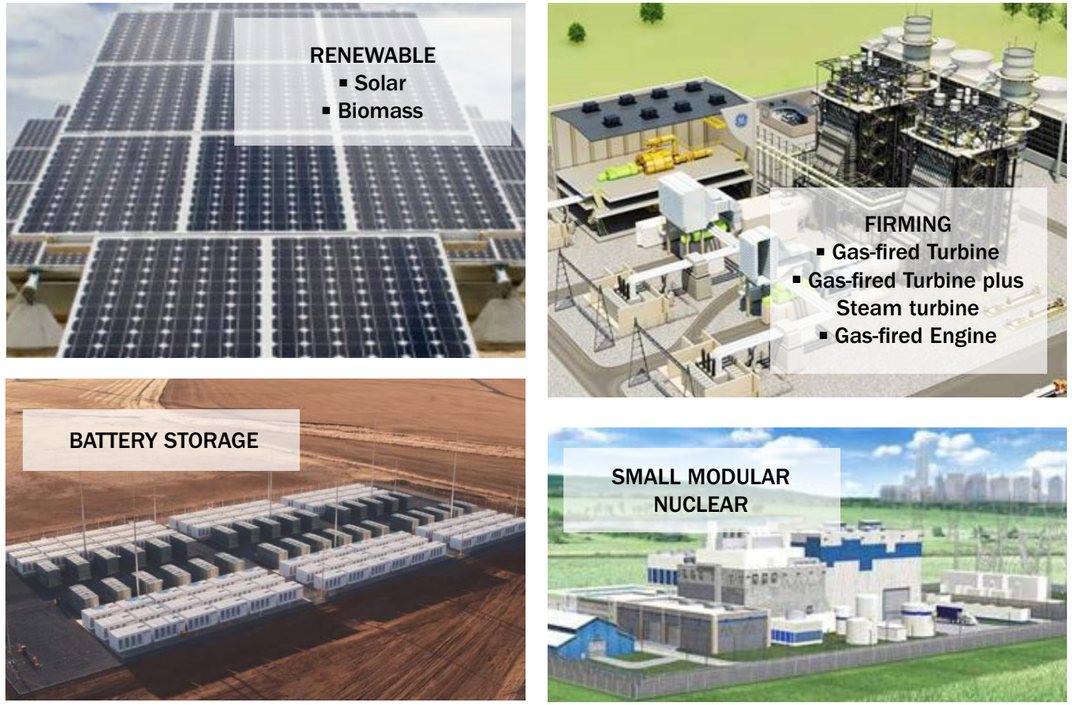
Figure 1 Illustrative Future Demand and Capacity



The areas below the demand line represent the capacity of the existing generating resources to meet the demand. As demand increases over time, the capability of the existing resources decreases due to age and eventual retirement. The deficit, represents the capacity needed from new resources and/or market purchases. Although market purchases can help fill the deficit, their availability and price vary and therefore they can only play a limited role. In addition, market purchases and resource options located outside our system will be subject to transmission losses and transmission service costs to deliver that energy to the JEA service territory. These losses and costs will limit the contribution these remote purchases and resources can make to close the gap.

Several generating resource options have been identified to help support JEA. These span a wide variety and size of technologies including renewable, firming, battery storage and small nuclear. The general categories and types of resources are summarized in Figure 2.

Figure 2 Generating Resource Options



These generating resource options have been identified based on the technologies that are considered proven in large scale electric utility operation such as solar, biomass and gas-fired turbines and engines as well as the technologies expected to be further proven within the next twenty years including larger-scale battery storage and small modular nuclear.

It is important to note that some proven technologies are not being considered for generating options. These include coal-fired, wind, geothermal and hydro pumped storage technologies. Coal is excluded because of its relatively high rate of carbon and pollutant emissions such as nitrogen and sulfur oxides which would slow achievement of carbon reduction goals and clean air standards. Wind is excluded because the southeastern US including Florida is relatively poor in wind quality (speed, duration) and therefore wind turbine-based options would be relatively expensive and not reliable. Geothermal and hydro pumped storage are excluded because the southeastern US has no significant geothermal resource or elevation changes, respectively.

Identifying options also depends on the type and availability of land on which to site the resources, including the existing JEA plant sites at Northside and Greenland Energy Center (GEC) and the former St. Johns River Power Park site (SJRPP). GEC and SJRPP currently have available site space and Northside will have available space if the current generating units are retired. Deployment of gas-fired options at these sites would allow re-use of the existing fuel supply, water supply and electric transmission infrastructure resulting in lower costs and less environmental impact than building a new plant at a new location. However, these sites also present some challenges which may limit the size and type of new options.

Approximately 6 to 8 acres of land are required for one megawatt of solar capacity which on average in Florida will serve about 135 homes. Conversely, 6 to 8 acres can host about 200 megawatts of gas fired capacity which will serve about 47,000 homes. These details will be discussed in the upcoming June 9 stakeholder meeting.

Constraints at existing sites may point JEA toward entering into additional long-term purchase power agreement (PPA) contracts. Fundamentally, PPAs mean that JEA enters into contracts for generating options to be built and owned by third-party developers on land controlled by the developers with the resulting energy sold to JEA. Utilities typically enter these arrangements for large scale solar resources that require large amounts of land and infrastructure to achieve economies of scale and lower prices.

The IRP process will continue to identify and analyze new generating options for JEA based on the aforementioned technologies and siting constraints. The resulting options will be shared during the June 9 stakeholder meeting.

3.0 Demand-Side Management/Energy Efficiency/Conservation/ Customer Sited Generation

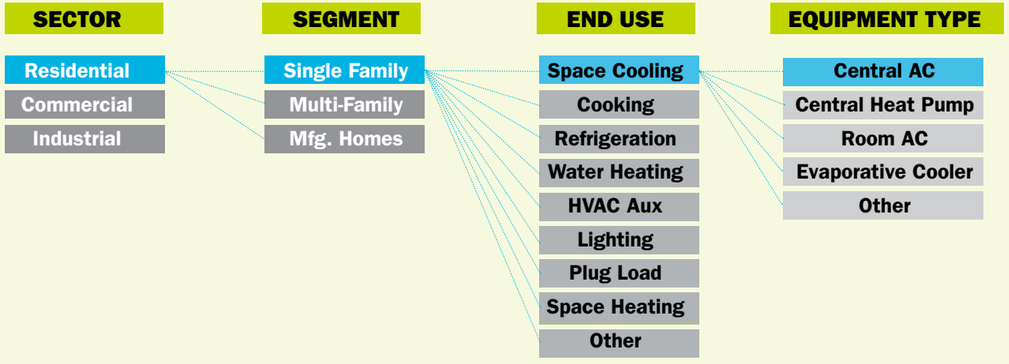
As presented in the March 9 stakeholder meeting, Black & Veatch is collaborating with JEA's Customer Solutions group to develop a comprehensive analysis of demand-side management/energy efficiency/conservation (collectively referred to as "DSM") options as a reliable, cost-effective resource contributing to mitigating JEA customers' peak demand energy requirements. DSM presents an opportunity to reduce total consumption as well as peak demands and thereby reduce system costs.

The forecast of achievable DSM is being developed for modeling in the IRP in the following categories: energy efficiency ("EE"), demand response ("DR"), and distributed energy resources ("DER"), which will focus on customer-sited rooftop solar and battery storage.

Key elements of forecasting DSM for JEA's IRP include the following:

- **Alignment with JEA Load Forecast:** DSM modeling begins with analyzing JEA's load forecast by customer characteristics to describe the potential benefits of and opportunities for energy savings. Assessing DSM savings potential also requires an understanding of how EE, DR, and DER technologies apply to electricity customers. Since electricity consumption patterns vary by customer type, it is useful to segment customers into similar groups to reflect the applicability of specific DSM technologies. As an example, Figure 3 illustrates how the residential load forecast is broken out into specific customer segments, then into end-use categories within each segment, and finally to specific equipment within each end use, with DSM technologies applied to the individual equipment types as appropriate.

Figure 3 Sample Segmentation Categories for Residential Load



- **DSM Measure Development and Screening:** A comprehensive list of DSM technologies that are applicable in JEA's service territory will be developed for the IRP. The energy and demand savings, as well as the costs to purchase and install these technologies, will be developed and then compared to JEA's avoided energy and capacity costs from the energy and demand reductions. The results of this economic comparison of technology costs and benefits are used to screen measures for inclusion in the forecast of achievable DSM.

- **Achievable Market Potential:** The forecast of achievable DSM will incorporate market adoption rates, which are applied to each DSM technology to estimate annual and cumulative energy and demand savings, and participation rates. The market adoption rates include the influence of program designs, incentive levels, and marketing approaches, which will be adjusted to forecast varying levels of achievable DSM for the range of IRP scenarios.

Additional detail on the analysis of each DSM category is provided below:

3.1 ENERGY EFFICIENCY

The energy efficiency analysis includes a comprehensive set of over 250 energy efficiency (EE) measures and technologies applicable to residential, commercial, and industrial customers in JEA's service territory. EE market adoption rates will incorporate, to the extent possible, JEA's historic program participation data to derive estimates of baseline program participation rates. While informed by past program performance, the specific program methods and accomplishments to date do not limit the forecast of future market opportunities but serve as a calibration step followed by development of forward-looking adoption rates based on the scenario parameters. The resulting forecast of energy efficiency potential will be described in terms of estimated costs, energy savings, and peak demand capacity savings.

3.2 DEMAND RESPONSE

For the demand response analysis, a baseline forecast of what loads or operational requirements exist during peak periods in the absence of existing dispatchable DR resources will be established. Once peaking conditions have been identified, interval data from a representative sample from each customer segment is examined to determine the magnitude of loads that can be managed during those peaking conditions.

- For residential and small commercial accounts where DR generally takes the form of direct utility control, DR opportunities are limited by the loads that can be controlled remotely at scale. For residential customers, curtailable end uses are typically considered to be central cooling, central heating (electric), water heaters, electric vehicle charging, and pool pumps. For small commercial customers, curtailable end uses include central heating and cooling.

- Large commercial and industrial accounts generally do not provide the utility with direct control over end uses, and typically have a broader range of building and process loads that may be available for curtailment. Therefore, the forecast of achievable DR is based on the utility program offering, incentives, technology costs, and other considerations, assuming the majority of peak coincident load to be temporarily curtailable.

3.3 DISTRIBUTED ENERGY RESOURCES

Black & Veatch will forecast market adoption of customer-sited solar photovoltaic ("PV") systems, accounting for available roof space (including pitched vs. flat roofs, other roof equipment, etc.), PV power density, hourly generation shapes, and AC/DC ratios, among other factors. The DER model's rigorous hourly economic analysis will enable calculating the point at which it is cost-effective for customers to install a system as a function of cost per unit of demand (i.e., dollars per kilowatt, or $/kW), discount rates, and other costs.

With respect to storage, systems paired with solar and stand-alone battery storage systems will be analyzed. To account for the complex economics of storage technologies, which can shift load to reduce energy charges (e.g., through on/off peak period arbitration) or reduce peak demand charges, hourly battery storage dispatch optimization modeling will be utilized to simulate the hourly dispatch of stand-alone or solar-paired storage systems. This model enables calculation of all components of electric bill savings (for the customer) or avoided costs (for the utility) required to fully understand the economics of battery storage.

4.0 Scenarios

As discussed throughout the IRP Stakeholders Meetings, the IRP will utilize a scenario evaluation approach. This allows for simultaneous evaluation of a number of variables that are reflected in the inputs used throughout the IRP and is intended to address uncertainties related to:

- Projected load growth (both peak demand and annual energy requirements)
- Penetration of plug-in electric vehicles and electrification in general
- Demand-side management, energy efficiency, conservation, and customer-sited generation (distributed energy resources, or DER)
- Future environmental regulation and clean energy standards
- Projected natural gas and solid fuel prices

Several key considerations will be critical to holistic evaluation of scenario results. These include affordability, reliability, environmental justice, economic development and CO2 emission reductions, as discussed during our February meeting. Affordability will be considered by examining the potential cost and rate increases under each scenario to ensure they are moderate and would not cause undue hardship on customers. Reliability will be considered by examining the amount of generating capacity at the time of peak customer demand to ensure it exceeds the peak by the required reserve margin. Environmental justice and economic development will be considered by examining the location of new resources to help ensure that disadvantaged communities will not bear the brunt of potential increased noise and visual impact and that land use would be consistent with future economic development. CO2 emission reduction will be considered by examining the potential reduction of these emissions relative to the other scenarios.

The following provides a conceptual-level summary of the six scenarios that have been developed for evaluation in the IRP with figures that illustrate the changes to the variables within each scenario as compared to the Current Outlook scenario. Within each figure, the magnitude of variables within the Current Outlook scenario are indicated as “Base” or “None” while “High” and “Low” represent the magnitude of the variable as compared to the corresponding variable within the Current Outlook scenario.

4.1 CURRENT OUTLOOK

The following reflects JEA’s current outlook on the IRP variables:

- Inflation and escalation rates increase as compared to recent rates
- Load forecast based on:
  - Historical customer usage trends and population projections
  - Historical customer participation in demand-side management/energy efficiency/conservation/DER
  - Projections of increased plug-in electric vehicle adoption and electrification based on recent historical observations and projected population growth
- Natural gas and solid fuel prices in-line with recent historical prices following a period of volatility given current international disruptions to fuel markets
- No cost for emissions of carbon dioxide (CO2)
- No specific target for renewable energy/clean energy generation
- Costs for construction of new generating resource options in-line with current costs
- JEA’s existing generating units continue to operate until their retirement due to age and condition

4.2 ECONOMIC DOWNTURN

The following reflects a future with a sustained economic slowdown, driven in part by higher inflation and fuel and commodity costs:

- Inflation and escalation rates increase as compared to Current Outlook
- Load forecast lower than in Current Outlook, influenced by combination of:
  - Lower customer usage and population projections than Current Outlook
  - No changes to demand-side management, energy efficiency, conservation, DER, or electrification as compared to Current Outlook
  - Lower plug-in electric vehicle adoption than Current Outlook
- Natural gas and solid fuel prices increase as compared to Current Outlook
- No cost for emissions of CO2
- No specific target for renewable energy/clean energy generation
- Costs for construction of new generating resource options increase as compared to Current Outlook
- JEA’s existing generating units continue to operate until their retirement due to age and condition

Figure 4 Current Outlook and Economic Downturn Scenarios

Area	Variable	Current Outlook	Economic Downtown
Financial	Interest During Construction & Discount Rate	Base	High
	General Inflation Rate	Base	High
	Capital Cost Escalation Rate	Base	High
Demand	Total Net Energy Requirements Forecast	Base	Low
	Net Firm Peak Demand Forecast	Base	Low
	DSM/EE/Conservation	Base	Base
	Plug-in Electric Vehicles (PEV)	Base	Low
	Electrification	Base	Base
	Customer-Sited Renewables (Distributed Energy Resources	Base	Base
Environmental Regulations	Carbon Regulations/Cost	None	None
	Clean Energy Standards (CES)	None	None
Fuel Prices	Natural Gas	Base	High
	Solid Fuel	Base	High
Other	Construction Cost	Base	High
	Unit Retirements	Base	Base

Notes:
“Base” represents variables in Current Outlook Scenario
“High” or “Low” represents assumptions relative to “Base” or “None”

4.3 EFFICIENCY + (DER)

The following reflects a future with increasing levels of interest and participation in demand-side management, conservation, energy efficiency, and DER, driven in part by higher fuel costs:

- No changes to inflation and escalation rates as compared to Current Outlook
- Load forecast lower than in Current Outlook, influenced by combination of:
  - Lower customer usage than Current Outlook
  - Increased customer participation in demand-side management, energy efficiency, conservation, and DER as compared to Current Outlook
  - Increased plug-in electric vehicle adoption and electrification as compared to Current Outlook
- Natural gas and solid fuel prices increase as compared to Current Outlook
- No cost for emissions of carbon dioxide (CO2)
- No specific target for renewable energy/clean energy generation
- Lower costs for construction of new generating resource options as compared to Current Outlook
- JEA's existing generating units continue to operate until their retirement due to age and condition

Figure 5 Current Outlook and Efficiency + DER Scenarios

Area	Variable	Current Outlook	Efficiency + DER
Financial	Interest During Construction & Discount Rate	Base	Base
	General Inflation Rate	Base	Base
	Capital Cost Escalation Rate	Base	Base
Demand	Total Net Energy Requirements Forecast	Base	Low
	Net Firm Peak Demand Forecast	Base	Low
	DSM/EE/Conservation	Base	High
	Plug-in Electric Vehicles (PEV)	Base	High
	Electrification	Base	High
	Customer-Sited Renewables (Distributed Energy Resources	Base	High
Environmental Regulations	Carbon Regulations/Cost	None	None
	Clean Energy Standards (CES)	None	None
Fuel Prices	Natural Gas	Base	High
	Solid Fuel	Base	High
Other	Construction Cost	Base	Low
	Unit Retirements	Base	Base

Notes:
"Base" represents variables in Current Outlook Scenario
"High" or "Low" represents assumptions relative to "Base" or "None"

4.4 INCREASED ELECTRIFICATION

The following reflects a future with increased levels of interest and adoption of DER and electrification, driven in part by higher fuel costs:

- No changes to inflation and escalation rates as compared to Current Outlook
- Load forecast higher than in Current Outlook, influenced by combination of:
  - Higher customer usage than Current Outlook
  - Increased customer adoption of plug-in electric vehicles, electrification, and DER as compared t Current Outlook
  - No changes to demand-side management, energy efficiency, or conservation as compared to Current Outlook
- Natural gas and solid fuel prices increase as compared to Current Outlook
- No cost for emissions of carbon dioxide (CO2)
- No specific target for renewable energy/clean energy generation
- Increased costs for construction of new generating resource options as compared to Current Outlook
- JEA's existing generating units continue to operate until their retirement due to age and condition

Figure 6 Current Outlook and Increased Electrification Scenarios

Area	Variable	Current Outlook	Increased Electrification
Financial	Interest During Construction & Discount Rate	Base	Base
	General Inflation Rate	Base	Base
	Capital Cost Escalation Rate	Base	Base
Demand	Total Net Energy Requirements Forecast	Base	High
	Net Firm Peak Demand Forecast	Base	High
	DSM/EE/Conservation	Base	Base
	Plug-in Electric Vehicles (PEV)	Base	High
	Electrification	Base	High
	Customer-Sited Renewables (Distributed Energy Resources	Base	High
Environmental Regulations	Carbon Regulations/Cost	None	None
	Clean Energy Standards (CES)	None	None
Fuel Prices	Natural Gas	Base	High
	Solid Fuel	Base	High
Other	Construction Cost	Base	High
	Unit Retirements	Base	Base

Notes:
"Base" represents variables in Current Outlook Scenario
"High" or "Low" represents assumptions relative to "Base" or "None"

4.5 EFFICIENCY + DER + LOWER EMISSIONS

The following reflects a future with increased levels of interest and participation in demand-side management, conservation, energy efficiency, DER, and electrification, driven in part by higher fuel costs and costs for CO2 emissions:

- No changes to inflation and escalation rates as compared to Current Outlook
- Load forecast lower than in Current Outlook, influenced by combination of:
  - Lower customer usage than Current Outlook
  - Increased customer participation in demand-side management, energy efficiency, conservation, and DER as compared to Current Outlook
  - Increased plug-in electric vehicle adoption and electrification as compared to Current Outlook
- Natural gas prices increase as compared to Current Outlook
- No change to solid fuel prices as compared to Current Outlook
- Costs for emissions of carbon dioxide (CO2)
- Targets for renewable energy/clean energy generation
- Higher costs for construction of new generating resource options as compared to Current Outlook
- JEA's existing generating units continue to operate until their retirement either due to age and condition or for economics due to high environmental costs

Figure 7 Current Outlook and Efficiency + DER + Lower Emissions Scenario

Area	Variable	Current Outlook	Efficiency + DER + Lower Emissions
Financial	Interest During Construction & Discount Rate	Base	Base
	General Inflation Rate	Base	Base
	Capital Cost Escalation Rate	Base	Base
Demand	Total Net Energy Requirements Forecast	Base	Low
	Net Firm Peak Demand Forecast	Base	Low
	DSM/EE/Conservation	Base	High
	Plug-in Electric Vehicles (PEV)	Base	High
	Electrification	Base	High
	Customer-Sited Renewables (Distributed Energy Resources	Base	High
Environmental Regulations	Carbon Regulations/Cost	None	High
	Clean Energy Standards (CES)	None	High
Fuel Prices	Natural Gas	Base	High
	Solid Fuel	Base	Base
Other	Construction Cost	Base	High
	Unit Retirements	Base	Base

Notes:
"Base" represents variables in Current Outlook Scenario
"High" or "Low" represents assumptions relative to "Base" or "None"

4.6 FUTURE NET ZERO

The following reflects a future in which JEA achieves net zero carbon emissions from its generating portfolio by the end of the IRP planning period, with no changes to the load forecast as compared to the Current Outlook:

- No changes to inflation and escalation rates as compared to Current Outlook
- No changes to load forecast as compared to Current Outlook
- DSM/energy efficiency/conservation, DER, plug-in electric vehicles, electrification all unchanged as compared to Current Outlook
- Natural gas prices increase as compared to Current Outlook
- No change to solid fuel prices as compared to Current Outlook
- Costs for emissions of carbon dioxide (CO2)
- Net-zero CO2 emissions from JEA generating portfolio
- No change to costs for construction of new generating resource options as compared to Current Outlook
- Gradual removal of higher carbon emitting units, such as Northside Generating Station units, from service during IRP planning period

Figure 8 Current Outlook and Future Net Zero Scenarios

Area	Variable	Current Outlook	Future Net Zero
Financial	Interest During Construction & Discount Rate	Base	Base
	General Inflation Rate	Base	Base
	Capital Cost Escalation Rate	Base	Base
Demand	Total Net Energy Requirements Forecast	Base	High
	Net Firm Peak Demand Forecast	Base	High
	DSM/EE/Conservation	Base	Base
	Plug-in Electric Vehicles (PEV)	Base	High
	Electrification	Base	High
	Customer-Sited Renewables (Distributed Energy Resources	Base	High
Environmental Regulations	Carbon Regulations/Cost	None	High
	Clean Energy Standards (CES)	None	High
Fuel Prices	Natural Gas	Base	High
	Solid Fuel	Base	Base
Other	Construction Cost	Base	Base
	Unit Retirements	Base	High

Notes:
"Base" represents variables in Current Outlook Scenario
"High" or "Low" represents assumptions relative to "Base" or "None"

5.0 CONCLUSION

Thank you for your valuable input and insight on this very important effort. Your respective input has been extremely helpful in guiding us through the first set of stakeholder meetings and we look forward to your continued engagement into the remaining stakeholder meetings.

As we progress, we want you to continue to provide input, insight, and direction. Our team will be available to openly discuss the ideas, scenarios, and your suggestions.

As a reminder, the 4th stakeholder hybrid meeting will be held on June 9th. The draft agenda includes:

- JEA Facility Site Tour
- (Illustrative) Model Run
- New Resource Options
- Open Discussion

Below is the schedule of the remaining stakeholder meetings.

Meeting #5: August 18, 12:00–2:00 PM–Present Initial Modeling Results
Meeting #6: October 20, 12:00–2:00 PM–Present Revised Modeling and Studies Results
Meeting #7: November 17, 12:00–2:000 PM–Present Preferred Plan
Meeting #8: December 15, 12:00–2:00 PM–Present 90% Draft IRP Report

We are excited about our progress and look forward to continued engagement with you and the diverse community voices you represent!

We have provided a variety of information on the JEA website for your convenience. Please visit **jea.com/irp/** to find updates and information about the IRP process. This page provides information regarding the process, industry trends, the project timeline and more.

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