**BEFORE THE**

**GEORGIA PUBLIC SERVICE COMMISSION**

**In the Matter of:**

**GEORGIA POWER COMPANY’S ) DOCKET NO. 55378**

**2023 INTEGRATED RESOURCE PLAN )**

**UPDATE )**

|  |
| --- |
| **PUBLIC DISCLOSURE****DIRECT TESTIMONY AND EXHIBITS****OF****ROBERT L. TROKEY****KATHLEEN A. KELLY****AND****KARAN A. POL** |

**ON BEHALF OF THE**

**GEORGIA PUBLIC SERVICE COMMISSION**

**PUBLIC INTEREST ADVOCACY STAFF**

**February 15, 2024**

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**Staff Exhibit # Description**

RLT-1 Resume of Robert L. Trokey

KAK-1 Resume of Kathleen A. Kelly

KAP-1 Resume of Karan A. Pol

TKP-1 Winter Peak Demand Forecast Sensitivities

TKP-2 Proposed Large Load Tracking System

# Qualifications

Q. STAFF, please state your name, TITLE, and business address.

A. My name is Robert L. Trokey. I am the Unit Director of the Electric Section at the Georgia Public Service Commission (Commission or GPSC). My business address is 244 Washington St. SW, Atlanta, GA 30334.

Q. Please state your educational background and work experience.

A. My background and experience are provided in Exhibit RLT-1.

Q. HAVE YOU EVER TESTIFIED BEFORE THIS COMMISSION?

A. Yes. I have testified in prior Integrated Resource Planning dockets and Rate Cases, including Docket Nos. 44160 and 44280 in 2022.

Q. Ms. Kelly, please state your name, TITLE, and business address.

A. My name is Kathleen A. Kelly. I am a Vice President and Principal Consultant with Daymark Energy Advisors, Inc. My business address is 370 Main Street, Suite 325, Worcester, Massachusetts, 01608.

Q. Please state your educational background and work experience.

A. My background and experience are provided in Exhibit KAK-1.

Q. HAVE YOU EVER TESTIFIED BEFORE THIS COMMISSION?

A. No. I have testified in other jurisdictions. A list of my testimony is provided in Exhibit KAK-1.

Q. Mr. Pol, Please state your name, TITLE, and business address.

A. My name is Karan A. Pol. I am a Senior Energy Analyst with Daymark Energy Advisors, Inc. My business address is 370 Main Street, Suite 325, Worcester, Massachusetts, 01608.

Q. Please state your educational background and work experience.

A. My education and experience are provided in Exhibit KAP-1.

Q. HAVE YOU EVER TESTIFIED BEFORE THIS COMMISSION or other Commissions?

A. No.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. We are testifying on behalf of the GPSC Public Interest Advocacy Staff (Staff).

# II. Summary of Conclusions, Observations, and Recommendations

Q. please summarize your conclusions.

A. Our conclusions are as follows:

* Georgia Power Company (GPC or Company) filed a new load forecast in this docket, which is significantly higher than the forecast provided in the 2022 IRP. The new load forecast includes organic growth[[1]](#footnote-2), but is driven primarily by GPC being selected, in 2022, to serve new large load customers. The Company identified a significant amount of future large load customer additions because of activities in 2023.
* The Company’s tools and methods for the organic load forecast appear consistent with typical utility practice. Based on our review of the Company’s analysis, we conclude that it has developed a reasonable organic load forecast. However, the Company should provide model results, variables, model documentation describing model structure(s), variable relationships and key formulae, and interactions between models, and regression statistics[[2]](#footnote-3) in each future load forecast filing to ensure that Staff and its consultants can perform a timely review of model results without purchasing software to do so.
* The largest portion of the change in the load forecast is from the large customer choice loads. The growth in customer choice loads increased noticeably in 2021. This trend continued with dramatic increases in 2022 and additional significant increases in 2023. Georgia Power developed a new tool to forecast the probability and timing of realization of this load. The Company’s tool (Load Realization Model) for developing this forecast is highly sensitive to certain input assumptions, and the Company has not conducted sufficient analysis to justify those assumptions.
* The Company only tested one scenario, with one set of assumptions, in its large customer load forecast, indicating that it has not thoroughly and comprehensively examined the possible outcomes throughout the forecast time frame.
* The Company’s overall methodology of forecasting new, large, customer choice loads is a reasonable approach, but based on our review, we believe the resulting forecast is skewed to show load realization sooner and in greater quantity than it is likely to materialize. The Company has not performed sensitivity analyses nor alternative forecasts that should inform capacity expansion planning or rate impact analysis.
* The Company estimated the incremental net cost to customers based on the load and capacity situation filed in October 2023. The Company’s assertion that the new loads will result in “downward pressure” on rates, lacks context and may not apply to all customers. The testimony of Newsome, Hayet and Wellborn discusses this issue of rate impact. The Company’s economic analysis is not sufficient because the impact on rates and bills for each customer class was not provided.
* We prepared an alternative forecast using uniform probabilities in the load realization assumption[[3]](#footnote-4) and by extending the assumed length of potential project delays for Datacenters from a \*\*\*\*\*\*\*\*\*\* approach to a \*\*\*\*\*\*\*\*\*\*\*\* distribution. These changes are reasonable and lower the forecasted peak demand in the winter of 2028/2029 and throughout the forecast period by nearly 1,500 MW.

Q. PLEASE PROVIDE STAFF’S RECOMMENDATIONS TO THE COMMISSION.

A. Based on the conclusions of our review, Staff is making the following recommendations:

1. Multiple modifications to the Load Realization Model (“LRM”).[[4]](#footnote-5) The Company’s current LRM is skewed to materialize load earlier and in greater quantity due to its assumptions. We recommend that the Commission require the Company to modify its assumptions in the LRM and use the results as inputs to the Peak model to produce a new forecast, as Staff did, in developing its forecast in the following manner:
	* For the current LRM analysis, the Company should utilize uniform probabilities for all customer types in its Load Realization assumptions. The Company indicated that it relied on the “informed judgement” of its management as their rationale for the ranges and values utilized in the Model as well as for the higher datacenter values. However, the Company has not provided support for this differentiation. Due to a lack of empirical evidence, the Company should not make any assumptions regarding how one industry may materialize differently from another. If empirical evidence is available to support its assumptions, the Company should provide it.
	* Modify the assumptions for “Ramp-Up Delays” associated with datacenters from a most likely \*\*\*\*\*\* delay and maximum \*\*\*\*\*\*\* delay to a most likely \*\*\*\*\*\*\*\* delay and maximum \*\*\*\*\*\*\* delay. We base this recommendation on the public information available in the market related to delays and the time it takes to complete such projects, such as each facility owner working through the potential incentives offered to the facility, potential implications of supply chain interruptions, political uncertainty impacts, and construction delays.
	* Increase the range of alternative futures considered by varying the key assumptions to produce a range of potential load additions along with a range of timing of those additions to assess risks for the Company and customers.
2. Staff recommends that the Company focus on the next ten-year period in its load realization model analysis to demonstrate the peak demand needs of the facilities and use the same time frame for the RIM analysis and the Estimated Net Impact to Customers analysis to inform an enhanced analysis of the potential short term rate impacts of the required investment in generation and transmission assets.
3. Given the uncertainty regarding the materialization of large load customers, Staff recommends that the Company update the Commission quarterly during this period of extraordinary load growth by documenting its interactions with potential new large loads, implications of changes since the previous update, and actions taken or actions requiring modification to address changes in need. This will provide the Commission, Staff, and stakeholders with key information relevant to the investments proposed in this IRP Update.
4. To facilitate the recommendation in the preceding paragraph, and to support future load forecasts of new load, Staff recommends the Company be required to adopt a tracking system to monitor the market’s activities and track the status and outcomes of potential projects. This tracking system will benefit the Company’s modeling of new potential loads by providing trends, insights into decision making processes utilized by the new large loads relative to the planned project in Georgia, and support reporting both internally and to the Commission on activities in the market and those taken by the Company to address the new loads. The data collected in this tracking system will provide the foundation for the assumptions the Company may use in the LRM in future analyses. We offer a template for the Company to build from to address this recommendation in our testimony.
5. Staff recommends that the Company enhance the information provided in its load forecast filings submitted to the Commission as part of the regular and updated IRP submittals to include more detailed underlying assumptions and interactions that can facilitate Staff and Commission understanding of, and insights into, the drivers of energy and peak demand needs.
	* The information provided in the 2023 IRP Update requires Staff and its Consultants to acquire the software used by the Company to effectively analyze the Company’s plan. The Company provided modeling information in technical sessions but without the actual tools, Staff and Consultants cannot adequately see behind the “curtain” of sophisticated and intertwined modeling assumptions and equations to understand how technology enhancements, economic changes, and efficiency improvements impact energy consumption to produce a transparent review with which to advise the Commission. We offer specific modifications in this testimony regarding how the Company should modify its standard filing procedures. We request the Commission require Georgia Power to provide additional transparency enhancements for the next IRP filing. This recommendation is for both the “organic” forecast and the new “load realization model” developed to address the recent growth in large customer facilities.

# III. Rules and Regulations of the State of Georgia

Q. what is the role of the load forecast in the context of aN irp?

A. Load forecasts are intended to project the energy (MWhs) and peak demand (MW) of customers over time so that the utility can assess its ability to serve those needs during the forecast period. It is standard practice in the industry to look at a range of potential futures, or forecasts, informed by different economic, technological, and policy assumptions. This allows the utility, Staff and the Commission, to assess the potential implications on need, risks, and costs and to monitor the market after the forecast is complete to identify changes that affect its planning. The Company identified a significant change from 2021-2022 resulting in the 2023 IRP Update with the acceleration of the expected large load projects.[[5]](#footnote-6)

Q. Are there any regulations regarding Energy and demand forecasting?

A. Yes. Under Rule 515-3-4-.03 of the Rules and Regulations of the State of Georgia, there are specific requirements for energy and demand forecasting.

Q. Has the company met the requirements established in rule 515-3-4-.03?[[6]](#footnote-7)

A. No. Specifically relating to the new Large Load Forecast, the Load Realization Model fails to meet several requirements established under these rules. While this model cannot rely on historical data, and due to the unprecedented scale of this growth, some of the requirements do not apply to the model,[[7]](#footnote-8) the model can and should incorporate the following requirements:

* 515-3-4-.03(4)(a & b): “The energy forecast shall include an analysis of the sensitivity of results to the major assumptions…[and] must include three levels of expected growth based on alternative assumptions…” The Company has only provided a single case of the Load Realization Model in its filing, which is assumed to be its “base case.” Under this rule, the base case should “incorporate all assumptions that are likely to occur…” The Company has not demonstrated that its assumptions are “likely to occur” nor has it provided the requisite “high growth scenario” and “low growth scenario” that are required under this rule. Given the sensitivity of the LRM to individual model assumptions, and the fact that these loads have no historical precedent for their nature and size, the Company should have provided at least three plausible scenarios for evaluation. These alternate future scenarios should be developed to:
	+ 1) comply with the Rules and Regulations of the state of Georgia,
	+ 2) provide the Company, Staff, and the Commission with a set of alternative futures to understand the risks of faster or slower realization of these new large loads and support its capacity planning, and
	+ 3) provide the Commission with appropriate context for the potential variability of load forecasts.
* 515-3-4-.03(3)(b & c): “Each utility…forecast shall include detailed descriptions of the source of all determinants…Where reliable data are not available, estimates should be used and justified.” According to the Company, the source of several of the key assumptions in the Load Realization Model is the “informed judgement” of the Company.[[8]](#footnote-9) The Company has not provided research or empirical evidence regarding the development delays associated with any industry segment nor any evidence that their materialization assumptions are representative of similar projects in the past. As such, the Company has not included detailed descriptions of the source of the determinants (assumptions) of this model, nor has it provided sufficient justification for its estimates.
* 515-3-4-.03(2)(c)-5: “[The Forecast shall include the impact of…] Self generation and cogeneration by existing and future customers.” Many of these customers have the capability to invest in collocated battery storage or other capacity resources that may mitigate their contribution to peak loads. The Company did not consider how these customers might address their total requested load needs in this manner.

 We offer a more detailed analysis of the LRM and make recommendations for modifications to the projections and future analysis through the course of this testimony.

Q. ARE THERE OTher ways in which the 2023 IRP Update has not met the CURRENT COMMISSION rules and regulations?

A. Though the Company has been relying on the same tools for some time in its organic forecast methodology and the Commission is likely quite familiar with the approach, Commission rules require the following:[[9]](#footnote-10)

* 515-3-4-.03(3)(c) Data Requirements: Utility energy and demand forecasts shall be based on the best available data. Where reliable data are not available, estimates should be used and justified. Each utility shall develop a database of electricity consumption patterns by customer class and by end-use where applicable (e.g., classes for which end-use data have been collected within the most recent five years). When using end-use forecasting methodologies, each utility shall submit the most current data available on end-use appliance penetration and saturation rates and end-use electricity consumption patterns. Each forecast shall include a detailed description of data used in making the forecast, an identification of the sources of such data, and a detailed explanation of specific techniques employed for gathering, organizing, adjusting, or interpreting the data, and
* 515-3-4-.03(3)(d) Econometric Forecasting Methods: Where statistical or econometric methods are used in developing forecast inputs or in the forecasting process, analyses of the reasonableness of such methods and models shall be presented, including computer outputs with parameter estimates…

 The tools used to produce each portion of the Company’s load forecast, except for the long-term load model, are proprietary[[10]](#footnote-11). Without access to these tools, it is difficult to understand the drivers of load growth without additional information and analyses provided by the Company. As required in the rules above, we would expect additional transparency regarding key forecast drivers and model results to facilitate the Commission and Staff review and understanding of the projections. Detailed recommendations are provided through the course of this testimony.

Q. What are your recommendations for addressing the concerns highlighted here?

A. The Company should provide further documentation that provides the results of any analyses or models to increase transparency of the results and underlying forecast drivers as well as to enable Commission review and understanding as changes occur in the market. We make specific recommendations in Section VI of this testimony regarding the implementation of further scenarios. With respect to the issue of greater transparency to facilitate review of forecast drivers and changes from year to year we make recommendations in Section VII of this testimony.

# IV. Company’s Load Forecast Update

Q. Please describe the overall load forecast Methodology employed by georgia power company.

A. The Company’s load forecast consists of two core pieces: the baseline, or “organic,” load forecast and the large load forecast. The organic load forecast is a deterministic model used to estimate the growth of the residential, commercial, industrial sectors, and MARTA. It is notable that Georgia Power recorded large load customer growth wins as early as 2021 that, in MW terms, were three times the magnitude of wins in 2017-2020. In calendar year 2022, the Company recorded even more dramatic growth of large loads seeking to locate their projects in Georgia[[11]](#footnote-12). As a result of this large-load growth, the Company separated its large-load forecast from its organic growth forecast. The Company indicates that the organic growth model employs historical data in deterministic models to forecast future energy and peak demand. The large load forecast is a probabilistic model which specifically estimates the growth of large commercial and industrial loads based on individual project data.

 The organic load forecast uses a set of linear regression models to estimate usage per customer and the total number of customers in each customer class on a short-term basis using a regression software called eViews.[[12]](#footnote-13) Using these variables, the Company estimates total load in each year on an energy basis for each class. These model results are inputs into a long-term model called LoadMAP[[13]](#footnote-14) which accounts for technology lifespans and replacement rates, costs associated with technology replacement, market saturation rates for given load sources, technology costs, and many more variables that are expected to impact long-term energy consumption.[[14]](#footnote-15)

 The large load forecast is produced by the Load Realization Model (LRM) and compiles every known potential large load customer considering development in the state of Georgia.[[15]](#footnote-16) Unlike the organic load forecast, which is a fundamentals-based forecast relying on macroeconomic indicators and customer trends, the large load forecast is based on individual, known customers and project details. Each entry in the LRM is a specific potential customer that has expressed interest in initiating electric service with Georgia Power for a specific project or facility.

 Each large load project is assigned a set of probabilities determining their likelihood of contracting with Georgia Power (Project Success assumptions), a set of probabilities to determine how much of their load might materialize (Load Realization Assumptions), and a set of assumptions regarding the extent to which that load might be delayed from the initial intended in-service date (Ramp-up Delay Assumptions). The assumptions are applied to a quarterly load ramping schedule provided by each project to produce a final peak load forecast using a Monte Carlo simulation. For this simulation, the Company has executed 100,000 iterations of the LRM, with each iteration representing a unique draw of project-specific probabilities for each potential large load customer.

 For the large load forecast, the Company decided to use the P95 forecast level, meaning that of the 100,000 iterations, 95,000 of them produced a peak load forecast at or below the final forecast selected by Georgia Power.

 This large load forecast is converted to an energy basis based on industry specific load factors and added to the organic load forecast as an “external adjustment.” This total energy forecast is an input to a “Peak” model that accounts for industry specific load factors, coincident loads, and many other variables.[[16]](#footnote-17)

Q. have there been any changes in the company’s load forecasting methodology in the 2023 IRP Update load forecast since the 2022 IRP Forecast?

A. Partially. The organic model methodology, which estimates energy and peak demand growth from non-large loads in the residential, commercial, industrial sectors and MARTA, has not changed from the methodology explained above. The Company has updated the economic drivers in the organic forecast to more recent projections which has resulted in some increase in load more in line with historic growth in the residential sector and somewhat higher in the commercial and industrial sectors[[17]](#footnote-18). The LRM is a new method of calculating the impact of specific large loads on the Company’s system.

 In the past, the Company has performed “external adjustments” to its load forecasts to account for energy or peak demand not sufficiently captured in historical data or models.[[18]](#footnote-19) However, the probabilistic framework used in the LRM is a novel approach, with the first iteration performed in January of 2023.

 From January through the October 2023 filing, the assumptions underlying the LRM changed significantly in both structure as well as the specific values for a given industry segment.[[19]](#footnote-20) The changes in the Load Realization assumptions have been described in Table 1. In total, 9 new industry segments were introduced with assumed values and distributions changing for every segment.

Table 1: LRM Change in Load Realization Assumptions[[20]](#footnote-21)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   |   | **January 2023 Assumptions** | **October 2023 Filed Assumptions** | **Change** |
| **Class** | **Segment** | **Low** | **Mid** | **High** | **Low** | **Mid** | **High** | **Low** | **Mid** | **High** |
| Commercial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 30% | 35% | 10% |
| Commercial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 30% | 15% | 0% |
| Commercial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 10% | 0% | -5% |
| Commercial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 10% | 0% | -5% |
| Commercial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 0% | 0% | -10% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |
| Industrial | \*\*\*\*\*\*\* | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | \*\*% | 40% | 50% | 75% |

Q. how does the peak demand forecast presented in the 2023 irp update compare to prior load forecasts?

A. The peak demand forecast has changed significantly, adding nearly 7 GW of peak load by the winter of 2042/2043 when compared to the 2022 load forecast. Based on filed workpapers by the Company, the specific value is 6,865 MW by the end of the forecast period, with interim differences in 2028/29 and 2032/33 shown in Table 2.

Table 2: Filed GPC Winter Peak Demand Forecasts (MW)[[21]](#footnote-22)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Filed Forecast** |   | **2028/2029** | **2032/2033** | **2042/2043** |
| 2022 IRP |  |  | 15,760 | 16,250 | 18,169 |
| Budget 2023  |  |  | 16,864 | 17,459 | 19,019 |
| 2023 IRP Update | 20,551 | 22,353 | 25,033 |
|   |  |  |  |  |  |
| **Forecast Change** |   |  |  |  |
| 2022 to Budget 2023  |  | 1,104 | 1,210 | 851 |
| 2022 to 2023 IRP Update | 4,791 | 6,103 | 6,865 |

 Figure 1 shows the peak demand forecasts filed for the 2022 IRP, the Budget 2023 forecast, and the 2023 IRP Update, within which the large load forecast is evaluated at the P95 level (2023 IRP Update, LRM P95).[[22]](#footnote-23) The most significant projected increases occur between the winter 2024/2025 and the winter 2032/2033 – this excerpt is shown in Figure 2.

Figure 1: Selected GPC Peak Demand Forecasts and Adjustment for Large Loads[[23]](#footnote-24)

# V. Large Load Forecast – Load Realization Model Detailed Review

q. please summarize the structure of the load realization model. [[24]](#footnote-25)

A. The Load Realization Model filed in October of 2023 evaluates a portfolio of 51 projects, which represented the known potential projects at the time of the analysis. The Company has indicated that since filing this IRP Update additional projects have expressed interest in using Georgia Power as their electricity provider.[[25]](#footnote-26)

 Based on the initial information received by the Company from the potential customer, the LRM forecasts the amount and timing of the load that will ultimately materialize. For each project, the company estimates three sets of assumptions through a series of Monte Carlo simulations:

1. “Project Success” assumptions associated with the likelihood that a project will select Georgia Power as its service provider (0 or 1),
2. “Load Realization” assumptions associated with the extent to which said project’s load will materialize (\*\*\*\*\*\*\*\*, dependent upon the industry), and
3. “Project Delay” assumptions associated with the extent to which quarterly peak demand might materialize in later quarters (ranging from \*\*\*\*\*\*\*\*\*\* \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*).

 These assumptions are applied to a quarterly load schedule from Q1 2023 through Q4 2042. The annual load/ramp-up data are provided by customer/project. If the customer also provides an expected Commercial Operation Date (“COD”), the COD is rounded up to the nearest quarter end, and the initial load is assumed to materialize at the rounded-up COD. If an expected COD is not specified, the initial load is assumed to materialize at the end of the second quarter of the year in which it was reported, with load ramp up to full load occurring thereafter.[[26]](#footnote-27) Linear interpolation is then used to create the quarterly load. The company provides an in-depth demonstration in the “Example” tab of “TS-STF-DEA-1-15 Attachment.”[[27]](#footnote-28)

 Using an Excel plug-in software called “@RISK,” the Company then applies the Project Success, Load Realization, and Project Delay assumptions to these quarterly loads across 100,000 iterations of Monte Carlo simulations. As a result, a new quarterly load schedule is developed for each project 100,000 times. The company then selects the 95th percentile (P95) results from these simulations producing the resultant peak demand level. The P95 represents the forecast below which 95% of the simulations would fall and at which only 5% of the cases would exceed that value. This peak demand level is applied as an external adjustment to the organic peak load forecast.

 While final values may fluctuate due to the probabilistic nature of the model, the total P95 level for end-of-year peak demand generally fluctuates around the values reported in Table 3, which demonstrates both LRM results rendered for this testimony as well as the results filed directly by the Company.

Table 3: Load Realization Model Results, P95[[28]](#footnote-29)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model** |  |  | **2023/2024** | **2024/2025** | **2025/2026** | **2026/2027** | **2027/2028** | **2028/2029** | **2029/2030** | **2030/2031** | **2031/2032** | **2042/2043** |
| LRM Model Results, P95 |  \*\*\* |  \*\*\* |  \*\*\* |  \*\*\* |  \*\*\* |  \*\*\* |  \*\*\* |  \*\*\* |  \*\*\* |  \*\*\* |
| LRM Results, GPC Filed | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* |

 The forecasted results for each project calculated by the LRM should not be interpreted as the expected demand levels for each project in each year.[[29]](#footnote-30) The LRM is a “portfolio-level” model which provides an understanding of the total level of peak demand that arises from this set of projects. In each iteration and each simulation, the distribution of that peak load might vary between projects.

Q. Which potential Large load projects known to the Company are included in the LRM?

A. The Company’s base case LRM is developed based on 51 known projects. Of these, datacenters constitute the majority of realized load, followed by Cryptocurrency and Battery Manufacturing. The total pipeline of 51 projects, referring to the total announced load data provided by customers, amounts to \*\*\*\*\*\*\*\* by 2042. Table 4 illustrates how this announced load is spread across different industry segments.

Table 4: Load Realization Model Base Case, Industry Segment Analysis (% Total Announced Load)[[30]](#footnote-31)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Row Labels** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | **…** | **2042** |
| **Commercial** |   |   |   |   |   |   |   |   |   |   |   |   |
| Cryptocurrency | 0% | 24% | 10% | 4% | 4% | 3% | 3% | 2% | 2% | 2% |  | 2% |
| Datacenter | 0% | 38% | 61% | 68% | 73% | 74% | 75% | 74% | 75% | 76% |  | 77% |
| Placeholder | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |  | 0% |
| **Industrial** |   |   |   |   |   |   |   |   |   |   |   |   |
| Battery Manufacturing | 40% | 15% | 9% | 5% | 6% | 5% | 5% | 4% | 4% | 4% |  | 4% |
| Chemicals | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |  | 0% |
| Other Industrial | 0% | 10% | 3% | 1% | 1% | 1% | 1% | 1% | 1% | 1% |  | 1% |
| Rubber & Plastics | 0% | 0% | 2% | 1% | 1% | 1% | 1% | 1% | 1% | 1% |  | 1% |
| Solar | 60% | 15% | 9% | 6% | 5% | 5% | 4% | 4% | 3% | 3% |  | 3% |
| Steel Manufacturing | 0% | 0% | 0% | 9% | 7% | 7% | 8% | 11% | 10% | 10% |  | 9% |
| Transportation | 0% | 0% | 6% | 4% | 3% | 4% | 3% | 3% | 3% | 3% |  | 3% |
| **Grand Total** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |  | **100%** |

 The Company has testified that there are “14 of the 51…that we have won.”[[31]](#footnote-32) This value corresponds with the 14 projects in the LRM that have complete certainty of having selected both the state of Georgia as a site and Georgia Power Company as the service provider. Assuming these 14 projects in the LRM are the same projects the Company has “won,” they have been consolidated in Table 5 below with industry data included as well.

Table 5: LRM Won Projects[[32]](#footnote-33)

|  |  |  |  |
| --- | --- | --- | --- |
| **Project** | **Class** | **Segment** | **Announced Load** |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\*\*\*\*\*\*\*\*\*\* | \*\*\*\* |
| **Total** |  |  | \*\*\*\* **[[33]](#footnote-34)** |

Q. what are the key assumptions of the load realization model regarding project Success?

A. The Project Success assumptions are constructed of two core components:

1. A simple product of customer choice assumptions and
2. A Bernoulli distribution.

 The customer choice assumptions are constructed of three probabilities:[[34]](#footnote-35)

1. Probability 1: The probability that the customer has chosen Georgia as the site of the project (\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*),
2. Probability 2: The probability that the customer will choose GPC as the power provider (\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*), and
3. Probability 3: The probability that a project will materialize after the customer signs a contract with GPC, which is always set at \*\*\* as signed contracts do fail to materialize sometimes.

 A simple product of these three percentages is used to produce the likelihood that a given project would materialize. A Bernoulli distribution is then applied to this customer choice assumption through the @RISK software with independent correlation assumptions between projects to produce a value of either 0 or 1 across each iteration.[[35]](#footnote-36) If a project receives a value of 0, then the project has “failed” and none of its load will materialize in each iteration. If a project receives a value of 1, then the project load will materialize according to the remaining assumptions in the model.

Q. Are the project success assumptions appropriate?

A. The specific values are arbitrary as would be any alternate proposed values. For Probabilities 1 and 2, the Company seems to have based its confidence levels upon Requests for Electric Service, Contracts for Electric Service, Customer Baseline Load Agreements, Meter Totalization T&C Agreements, or Engineering Letter Agreements to Proceed, which are shown in Table 6. Evidence of any such agreement has only been provided for 16 projects of the total 51, largely consisting of Requests for Electric Service (RFS), as opposed to any firm contracts.

Table 6: Contracts and Agreements for External Load[[36]](#footnote-37)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | Customer | Meter | Engineering |
|  | Request for | Contract for | Baseline | Totalization | Letter |
|  | Electric | Electric | Load | Term &  | Agreement |
| Customer | Service | Service | Agreement | Conditions | to Proceed |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | Y | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | Y | Y | Y | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | Y | Y | Y | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | N | N | N | N | Y |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |
| \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* | Y | N | N | N | N |

 Only three projects have anything firmer than a request for electric service as evidence of the Company’s confidence level, as shown in Table 6. A request for service by a customer represents the customer’s decision to take electric service at a certain location from Georgia Power rather than another load serving entity (MEAG or EMCs). It does not require the customers to start service at a certain date or require the customer to maintain a given load. Beyond the data in Table 6, the company has used what it refers to as “informed judgement” to set the levels at \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* for Probability 2 and at \*\*\* \*\*\* \*\*\* for Probability 1.[[37]](#footnote-38)

 Ultimately, the Company must make some reasonable assumptions to develop this model, and for the purpose of reviewing this model, we would not be able to produce reasonable alternate assumptions without greater details on each of the project terms in the LRM. While these assumptions have been treated as reasonable, the Company should instead evaluate how different assumption values and different probability distributions (implementing fewer or more probability categories in each of Probabilities 1, 2, and 3) would impact the model results.

Q. what are the assumptions associated with Load realization, the second parameter used in the @Risk based LRM model?

A. The Load Realization assumptions are constructed of a distribution of materialization likelihoods for each industry segment. A triangular distribution is assumed for each project’s load realization, with a correlation matrix that is independent across segments and perfect within.[[38]](#footnote-39) As a result, the load that is announced for each project by the potential customer accounts for some diversity factor, producing the values in column CR of the LRM: “Actual Max Load.”

 Most industry segments share the same Load Realization distributions, except for Datacenters and Cryptocurrency, as demonstrated in Table 7. These two industry segments have a \*\*\* \*\*\*\*\*\*\* \*\* \*\*\* \*\*\*\*\*\*\*, a \*\*\* \*\*\*\*\*\*\* \*\* \*\*\* \*\*\*, and \* \*\*\* \*\*\*\*\*\*\* \*\* \*\*\* \*\*\*\*\*\*\*\* when compared to the other industries. As a result, the amount discounted from the max load of these two industries is typically less than that of the other industry segments in each iteration.

Table 7: LRM Load Realization Assumptions, Base Case[[39]](#footnote-40)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Class** | **Segment** | **Low** | **Mid** | **High** |
| Commercial | Cryptocurrency | \*\*% | \*\*% | \*\*% |
| Commercial | Datacenter | \*\*% | \*\*% | \*\*% |
| Commercial | Miscellaneous | \*\*% | \*\*% | \*\*% |
| Commercial | Warehouse | \*\*% | \*\*% | \*\*% |
| Commercial | Distribution | \*\*% | \*\*% | \*\*% |
| Industrial | Steel Manufacturing | \*\*% | \*\*% | \*\*% |
| Industrial | Battery Manufacturing | \*\*% | \*\*% | \*\*% |
| Industrial | Chemicals | \*\*% | \*\*% | \*\*% |
| Industrial | Food Production | \*\*% | \*\*% | \*\*% |
| Industrial | Metals | \*\*% | \*\*% | \*\*% |
| Industrial | Other Industrial | \*\*% | \*\*% | \*\*% |
| Industrial | Pipeline | \*\*% | \*\*% | \*\*% |
| Industrial | Rubber & Plastics | \*\*% | \*\*% | \*\*% |
| Industrial | Stone Clay and Glass | \*\*% | \*\*% | \*\*% |
| Industrial | Textiles | \*\*% | \*\*% | \*\*% |
| Industrial | Transportation | \*\*% | \*\*% | \*\*% |
| Industrial | Beverage | \*\*% | \*\*% | \*\*% |
| Industrial | Brake Manufacturing | \*\*% | \*\*% | \*\*% |
| Industrial | Medical Microb Manufacturer | \*\*% | \*\*% | \*\*% |
| Industrial | Solar Manufacturer | \*\*% | \*\*% | \*\*% |
| Industrial | Housing | \*\*% | \*\*% | \*\*% |
| Industrial | HS Manufacturer | \*\*% | \*\*% | \*\*% |
| Industrial | Solar | \*\*% | \*\*% | \*\*% |

Q. Are the load realization assumptions appropriate?

A. No. Specifically, the assumptions associated with Datacenters and Cryptocurrency are not appropriate. The remaining industries’ assumptions are appropriate.

 The Company has demonstrated that it has considered multiple iterations of values for these assumptions. In the “Assumptions” tab of the response attachments to Data Request DEA-1-4, the Company demonstrates a testing of different industry segments and different corresponding Low, Mid, and High realization rates. Specifically, the Company has moderated the modal probability distribution from \*\*\*\*\*\*\*\*\*\*\* in its initial LRM version[[40]](#footnote-41) to a modal distribution of \*\*\*\*\*\*\*\*\*\*\* in the final filed version as demonstrated in Table 1.[[41]](#footnote-42) This tighter distribution eliminates high rates of realization in the industry segment to which it is applied while eliminating lower rates of realization. This change is reasonable but should continue to be monitored and tested as loads are realized, suggesting that within an industry, load would not materialize at a level less than \*\*\* of the total announced load, but it also would not materialize at a level greater than \*\*\*. As a result, there is a minimum discount to each industry segment in each iteration of at least \*\*\*, for each project that receives a Project Success value of \* denoting that the project has succeeded in materializing at all.[[42]](#footnote-43)

 This distribution of confidence is not the same, however, for the Datacenter and Cryptocurrency segments. The Company argues that these industry segments have a unique operational model:[[43]](#footnote-44)

“Due to the continuous operation of their equipment, Cryptocurrency and Datacenters are expected to use most of their connected load. Consequently, their percentage is higher than that of other segments included in the model. In contrast, industrial segments, which do not operate their connected load simultaneously, are assigned a lower percentage.”

 The Company mentions this again in hearing:[[44]](#footnote-45)

 “…when you ask for electric service, first you list all of the equipments that are behind the meter. Think about an industry that has motors, that has heaters, it has lighting; right? When they operate, they don't use every single device at the same time. They use something lower. That diversity in the usage is what we need to consider…for serving the load. And that number is coming as a portfolio and it's not something we can break down.”

 However, the Company has not demonstrated this claim empirically in its testimony, responses to data requests, or otherwise.

 Since empirical evidence of the relationship between announced loads and materialized loads has not been provided for each industry, it would be more appropriate to assume uniform Load Realization assumptions for each industry segment and interpret these as the Company’s level of confidence that announced load materializes. A uniform set of assumptions demonstrates that the Company does not expect varying levels of accuracy regarding peak load projection over time between different industry segments. Generally, it should be assumed that a customer’s ability to provide an accurate demand projection for each quarter is similar and any set of assumptions suggesting otherwise should be defended more rigorously.

 The company may find in the future that the materialization distribution is greater or lower than the levels assumed in this model. However, as an initial model for a novel growth situation, the \*\*\*\*\*\*\*\*\*\*\* triangular distribution is reasonable, subject to future monitoring, testing, and revision. The Company should have evaluated alternative distributions to assess the sensitivity of model results and resource need to these assumptions.

Q. What are the assumptions associated with Ramp-Up Delays?

A. Similar to the Load Realization assumptions, the Company applies a Low, Mid, and High level of delay to each project. It then applies a triangular distribution to these values to produce an expected level of delay to the load schedule provided by each project. Table 8 illustrates the Ramp-up Delays applied to each industry segment.

Table 8: LRM Ramp-Up Delay Assumptions, Base Case[[45]](#footnote-46)

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Ramp-up Delay (Months) |  |
| *Class* | *Segment* | *Low* | *Mid* | *High* |
| Commercial | Cryptocurrency | \* | \* | \*\* |
| Commercial | Datacenter | \* | \* | \*\* |
| Commercial | Miscellaneous | \* | \* | \*\* |
| Commercial | Warehouse | \* | \* | \*\* |
| Commercial | Distribution | \* | \* | \*\* |
| Industrial | Steel Manufacturing | \* | \* | \*\* |
| Industrial | Battery Manufacturing | \* | \* | \*\* |
| Industrial | Chemicals | \* | \* | \*\* |
| Industrial | Food Production | \* | \* | \*\* |
| Industrial | Metals | \* | \* | \*\* |
| Industrial | Other Industrial | \* | \* | \*\* |
| Industrial | Pipeline | \* | \* | \*\* |
| Industrial | Rubber & Plastics | \* | \* | \*\* |
| Industrial | Stone Clay and Glass | \* | \* | \*\* |
| Industrial | Textiles | \* | \* | \*\* |
| Industrial | Transportation | \* | \* | \*\* |
| Industrial | Beverage | \* | \* | \*\* |
| Industrial | Brake Manufacturing | \* | \* | \*\* |
| Industrial | Medical Microb Manufacturer | \* | \* | \*\* |
| Industrial | Solar Manufacturer | \* | \* | \*\* |
| Industrial | Housing | \* | \* | \*\* |
| Industrial | HS Manufacturer | \* | \* | \*\* |
| Industrial | Solar | \* | \* | \*\* |

Q. Are the Ramp-Up Delay assumptions reasonable?

A. Partially. These assumptions can be considered reasonable for most industries, except Datacenters. Since Datacenters comprise most of the load in the LRM, as demonstrated in Table 4, particular focus was given to analyzing this set of delay assumptions. A \*\*\*\*\*\*\* \*\*\*\*\* distribution of delay is not appropriate for this industry given recent industry trends. The Company should provide further evidence to support its Ramp-up Delay assumptions.

 Datacenters have faced development delays due to supply chain issues, tight labor markets, and rising prices in 2022.[[46]](#footnote-47) Supply chain issues continued through 2023, with semiconductor and server shortages impacting the datacenter industry.[[47]](#footnote-48) A CBRE report suggests that construction timelines for datacenters range anywhere from two to six years, compared to an average range of one to three years for the 2015 to 2020 period, largely due to power availability.[[48]](#footnote-49) This average timeline change represents a delay of 12 months on the low end up to a delay of 36 months on the high end. Specific project demands such as a new electricity substation or an upgraded transmission line could delay delivery by one to four years, per the report.[[49]](#footnote-50)

 While the Company could address many power availability issues, it could not address supply chain and procurement delays on the customer side. It is unclear how recent geopolitical developments may impact these supply chains. Local political uncertainty regarding favorable tax incentives for this industry segment may further impact the actual materialization of these loads.[[50]](#footnote-51)

 Furthermore, the Company has not tested different assumptions for the Ramp-up delay, as it did for the Load Realization assumptions. Since the initial LRM version in January of 2023, the company has consistently used a \*\*\*\*\*\*\*\*\*\*\*\* distribution.[[51]](#footnote-52) This lack of testing suggests that the Company has not revisited these assumptions since January 2023 and has not considered modifying them.

 Given the supply chain challenges and the lack of testing, it is possible that the datacenter industry, which is a key driver of the new large load demands, could face delays much greater than currently assumed. It is possible that other industries will also face different delays than assumed, but the \*\*\*\*\*\*\*\*\*\*\*\* assumptions for non-Datacenter industry segments are reasonable estimates in the place of further research. Each of these delay assumptions should be monitored, tested, and reviewed over time to ensure accuracy and the Company should make an effort to research current trends for each industry. The Company should have evaluated alternative distributions in its analysis for this filing to understand the resource need of such alternatives.

Q. how did the company determine the values used for these assumptions?

A. The company refers to “informed judgement” when explaining its methodology of selecting the values for each assumption. The values assumed in Project Success Probability 1 are based on information gathered by the Company’s Customer Choice department and communicated to the Load Forecasting team.[[52]](#footnote-53) The Project Success Probability 2 used “informed judgement based on the state of the negotiations with prospective customers.”[[53]](#footnote-54) Regarding the Load Realization assumptions, the Company “relied…on informed judgement.”[[54]](#footnote-55) Regarding the Ramp-up Delay assumptions, the Company also “relied…on informed judgement.”[[55]](#footnote-56)

Q. Was the company’s approach to selecting and justifying the assumption values appropriate?

A. No. The Company has not provided sufficient justification for the approach used to select values for the Project Success assumptions, the Load Realization assumptions, and the Ramp-up Delay assumptions. Furthermore, the approaches used to produce \*\*\*\*\* Load Realization assumptions for \*\*\*\*\*\*\*\*\*\* \*\*\* \*\*\*\*\*\*\*\*\*\*\*\*\* customers as well as the \*\*\*\*\*\*\*\*\*\*\*\* delay assumptions for Datacenters are not appropriate.

 The company makes the point that the scope of growth in Georgia is “unprecedented,” and as a result, it “cannot rely upon any historical data to serve as a guide for the forecast”.[[56]](#footnote-57) While it is true that the Company did not have historical data to inform every piece of this model, it did have the opportunity to research both publicly available and private industry data regarding construction/supply chain delays that might impact this model. The Company could improve its approach to specifying this model in the many ways outlined above.

# VI. Incorporating Scenarios in the LRM forecast

Q. DId the Company provide any sensitivity analyses associated with this model or any potential large load scenarios as part of the updated IRP?

**A.** No. The Load Realization Model was provided with a single set of assumptions. While the Company has modified the model over time with changes to assumptions in each version, the Company did not file multiple scenarios in its October 2023 filing. The Company’s 2023 IRP Update provided only the P95 projection for the large load although the @RISK tool allows the user to select alternative probabilities. The Company selected the P95 level in response to “the unprecedented pace of economic development in the state of Georgia and because the Company has seen more increases in large projects interested in the state over the last several months than decreases.”[[57]](#footnote-58) Furthermore, the Company references “uncertainty surrounding future growth,” as a reason to plan toward an “upper limit.”[[58]](#footnote-59)

Q. Please characterize how sensitive the model results are to the assumptions.

A. The model is highly sensitive to its assumptions, particularly those that impact the Load Realization or Ramp-up Delay of datacenters. The Company’s failure to provide the Commission with alternative scenarios with which to evaluate the implications of LRM on the forecast is limiting. While numerous simulations have been rendered by Daymark Energy Advisors in the process of reviewing the Company’s filing, this testimony utilizes three core cases to demonstrate the sensitivity of this model to underlying assumptions:

1. 2023 IRP Update, LRM P95: This is the base case LRM filed by the Company,
2. Uniform w/Delays, P95: This scenario modifies the assumptions in two ways:
	1. The Load Realization assumptions are standardized such that every industry segment, including Datacenters and Cryptocurrency, have a \*\*\*\*\*\*\*\*\*\*\* Load Realization distribution,
	2. The Ramp-up Delays for Datacenters are expanded from the original \*\*\*\*\*\* \*\*\*\*\* distribution to a \*\*\*\*\*\*\*\*\*\*\*\*\* distribution, to account for potentially longer delay times due to supply chain challenges, and
3. Uniform w/Delays, P80: This scenario uses the same assumptions as Uniform w/Delays, P95, but it evaluates the model at a P80 level, based on a suggestion from J. Kennedy & Associates regarding the Company’s reserve margin planning methodology.

 The results of these three scenarios are shown graphically for the period Winter 2022/2023 through Winter 2029/2030 and compared to the Budget 2023 forecast in Figure 2.

Figure 2: Peak Demand (MW), Selected LRM Sensitivities Winter 2022/23 – 2029/30[[59]](#footnote-60)

 The changes made in these two scenarios result in lower peak demand levels in each year as shown in Table 9. The total peak demand in the lowest case is more than 2,000 MW less by the end of the forecast period, with similar differences throughout, as demonstrated in Table 10. For the mid case, this difference is closer to 1,500 MW throughout the forecast period.

Table 9: Peak Demand (MW), Selected Sensitivities in Selected Years[[60]](#footnote-61)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Author** | **Forecast** |   |   | **2028/2029** | **2032/2033** | **2042/2043** |
| Company | 2023 IRP Update, LRM P95 |  20,551  |  22,353  |  25,033  |
| Staff | Uniform w/Delays P95 |  |  19,084  |  20,888  |  23,560  |
| Uniform w/Delays P80 |   |  18,504  |  20,109  |  22,765  |

Table 10: Peak Demand (MW) Change From Base Case, Selected Sensitivities, Winter 2028/29 to 2031/32[[61]](#footnote-62)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Forecast** |  |  | **2024/ 2025** | **2025/ 2026** | **2026/ 2027** | **2027/ 2028** | **2028/ 2029** | **2029/ 2030** | **2030/ 2031** | **2031/ 2032** |
| Uniform w/Delays P95 |  (204) |  (571) |  (840) |  (1,019) |  (1,203) |  (1,349) |  (1,417) |  (1,440) |
| Uniform w/Delays P80 |  (527) |  (1,464) |  (1,613) |  (1,760) |  (2,047) |  (2,231) |  (2,253) |  (2,244) |

Q. Please summarize why the two staff forecasts presented in Figure 2 are reasonable alternate futures.

A. The core issues identified in the Company’s LRM are those of non-uniform Load Realization assumptions and likely inaccurate Ramp-up Delays for datacenters.[[62]](#footnote-63) The Uniform w/Delays P95 case offers a reasonable alternative to the Base Case by standardizing the load realization assumptions and modifying the Ramp-Up Delays based on public research. The Uniform w/Delays P80 case replicates the assumptions above and plans to a P80 level, based on recommendations by J. Kennedy & Associates.

 Beyond the modelling assumptions, we believe the Company has not provided sufficient evidence supporting the likelihood of these large load projects materializing in any firm manner. Of the various paperwork provided by the Company as proof of load materialization, most documentation simply demonstrates a request for service with no clear commitments from load itself.[[63]](#footnote-64)

 Due to these factors, we believe that the Company is likely over-stating the extent to which load will materialize in each year. Given the assumption that load will materialize at a lower rate, the two alternate forecasts proposed above are reasonable modifications.

Q.        DESCRIBE THE BENEFITS OF USING alternate future SCENARIOS.

A.        Developing alternate future scenarios aids planning by demonstrating the sensitivity of the forecast to changes in underlying assumptions. This allows planners to look at the costs and risks associated with meeting various capacity need levels produced under different forecasts.

 The use of multiple scenarios establishes “reference points” for higher and lower growth. These alternative projections of need can serve as valuable information or trigger points at which the planners should begin to evaluate the need to modify its plans – either higher or lower. Should actual load differ from the forecast, but look similar to one of the alternate futures, then planners should investigate modifications to the original plan.  Fundamentally, scenario analysis allows decision makers to weigh the risks and benefits of their decisions, and in this case should have been done to demonstrate the benefits and risks of planning to different P-levels and assumptions in the LRM.  Furthermore, the Company could use these scenarios to assess implications for customer rates and rate allocations.

Q. Is the company’s decision to plan at a p95 level in the load realization model reasonable?

A. The Company explains generally that there is significant uncertainty in this model and their goal is to ensure sufficient capacity to meet anticipated loads and ensure reliability.[[64]](#footnote-65) By planning to a higher P-level, the Company is 1) preparing for the risk that loads may materialize at a greater level than the most likely outcome of P50 and 2) ensuring that the system is robust to those higher levels. However, the use of a P-level only considers serving new customers reliably and does not consider the economic impact on all other customers. Using P95 level results in higher peak load than P50 or P80 levels and supports more capacity additions but it also increases the risk of constructing too much new generation capacity too quickly and increasing ratepayer cost unnecessarily. As the level of large-load growth changes or the Company’s LRM becomes more accurate, the Company should monitor, test, and review this planning level to evaluate its accuracy.

Q. Do you have any recommendations regarding an alternative lrm case that the company should use in its forecast?

A. Yes. The most reasonable alternative LRM case is the Uniform w/Delays, P95. This scenario incorporates industry research on Ramp-up delays and standardizes Load Realization assumptions while acknowledging the high level of uncertainty surrounding this recent growth by relying on the Company’s preferred P95 planning level. The Company should plan according to the load levels assumed in this scenario. We recommend the Company further evaluate alternative P levels and the impact of such planning on customer costs and company risks.

Q. Do you have any further recommendations regarding the load realization model?

A. Yes. The Company should monitor, track, and review all assumptions made in the LRM. By tracking this data, the Company will be prepared to implement historical data if a similar model or similar data are ever needed in the future. These recommendations are included in Section VII.

# VII. Forecast Transparency, Tracking and Documentation

Q. How do you recommend the Company monitor activities in the large load market to enhance its next LRM forecast?

A. The Company indicated during hearings that they plan to track activities which they had not needed to track prior to 2019.[[65]](#footnote-66) In response to several questions during the hearing, witnesses indicated that the Company is tracking activity starting from initial contact and monitoring actions taken by potential large loads as they work through the process. Especially if this new large load activity occurs over a multi-year period beyond 2022 through 2024, it is important for the Company to implement a database with which to improve the key parameters of the LRM modeling or to modify the variables used should new information come to light. We propose that the Company database on new large loads incorporate at a minimum the information shown in Exhibit TKP-2.[[66]](#footnote-67) This data intends to track each interaction or notification that occurs whether between the large load and the Company or within the Company or in the news. Monitoring the time it takes from initial notification, including the stage of the project at which the Company is notified, will enable the Company to fine tune the potential project timing, including potential for delays.

 We also propose in this exhibit that the Company institute tracking and verification of the actual loads during ramp up and beyond that time to enable the Company to have more data on which to develop its modeling tools capability. While this appears to require time to fulfill, the benefits to the accuracy of the forecast for such large load additions will be extensive – allowing better scenario considerations and hopefully accuracy of projections. Ideally the tracking system will enable the Company to report quarterly to the Commission on new large load activities ensuring that the next load forecast will have fewer surprises and also acting as an early warning system for both the Company and the Commission of changes in this market that might require an action on the part of the Company such as a delay in resource acquisition or a faster need for resource acquisition.

Q. how could the company make its Forecast filings more transparent to the commission and staff?

A. We recommend that the Company and Commission Staff work together to develop a model output reporting standard, in addition to the filing of all models, that allows reviewers to examine the outputs of models and the key drivers to load growth without purchasing access to any software. Understanding the key drivers of growth in each sector of the forecast is key to understanding what to investigate more deeply as one reviews a sophisticated forecast model like those used by the Company. For example, a tornado chart can help a reviewer understand the largest risks inherent in a PPA for example. As the Company and Staff develop this reporting standard, we recommend including the following items:

* **Overarching Model Structure Documentation**
	+ In its Technical Appendix, the Company should clearly explain how each model functions and interacts with the other. Based on the Company’s filing, it is not clear a) how the short-term (ST) Model, long-term (LT) Model, and LRM are ultimately input to the Peak model. Documentation should make clear what transformations are taking place as the results from one model are fed into another. For example, the Company has not filed sufficient explanation of how the LoadMAP model produces long-term forecasts based on the results of the short-term models. Similarly, the current documentation does not explain key assumptions in the Peak model used to convert energy demand into peak demand.
* **Regression Statistics for All Regression Models and Associated Documentation[[67]](#footnote-68)**
	+ For each regression model used in the short-term models, the Company should provide regression statistics that show the variables used in the model and their coefficients, significance levels, definitions, and any associated error statistics.
	+ Similar reporting should be provided for any other regression models.
* **Key Drivers Impacting Load Growth**
	+ The Company should, in both the organic and large load forecasts, identify the key factors impacting load growth. For example, the Company could prepare data showing the contribution of each key variable to the total forecast of energy for that sector. In the residential class that could be a pie chart showing how customer numbers grow between select years of the forecast period and how use per customer changes between those same years. This data enables the reviewer to identify key areas of investigation as the forecast review takes place. Another example is to show the breakdown of load growth for each section associated with economic factors as opposed to efficiency in usage and by increased electrification, again using a pie chart showing each factor’s contribution to total growth.

 Providing this level of analysis with the forecast documentation increases forecast transparency and enhances the understanding of drivers of load growth which may lead to identifying new policies to modify load growth to meet state objectives.

Q. Does this conclude Staff’s testimony?

A. Yes.

1. “Organic Load Growth” refers to growth based on historical trends in the traditional classes of service and not including any new large load customers. [↑](#footnote-ref-2)
2. Each regression equation used should be provided with coefficients, significance, measures of error, and any other relevant summary statistics that are typically generated when running a linear regression. Documentation should enable reviewers to understand how each model interacts as well as the underlying equations driving the forecasts. [↑](#footnote-ref-3)
3. Probabilities were assigned regarding when customers’ load would come on the system and to what extent announced load would materialize. Staff used the same materialization probability assumptions (“uniform”) across all customer types. [↑](#footnote-ref-4)
4. The LRM is used to forecast large load growth for the Company. A more detailed description is provided later in Section IV and V of this testimony. In short, the LRM is added to a regression model based on historical growth (organic model) and eventually converted to peak load. [↑](#footnote-ref-5)
5. The Company shows 2021 wins of 336 MW compared to an average of around 100 MW for the years 2017-2020. Based on information provided in Technical Appendix 7, “TS Load and Energy Forecast.docx” [↑](#footnote-ref-6)
6. Office of the Secretary of State (2024), Rules and Regulations of the State of Georgia Subject 515-3-4 Integrated Resource Planning, <https://rules.sos.state.ga.us/gac/515-3-4> [↑](#footnote-ref-7)
7. Commercial and industrial loads such as datacenters have no relevant demographic information, are relatively inelastic to the price of electricity once developed, cannot substitute electricity with alternate fuels, and typically operate 24/7. For this reason, many of the methodological requirements within Subject 515-3-4 may not apply to the Load Realization Model. [↑](#footnote-ref-8)
8. Responses to PD STF-DEA-2-1, PD STF-PIA-6-12, STF-DEA-1-8, and STF-DEA-1-9. [↑](#footnote-ref-9)
9. Office of the Secretary of State (2024), Rules and Regulations of the State of Georgia Subject 515-3-4 Integrated Resource Planning, <https://rules.sos.state.ga.us/gac/515-3-4> [↑](#footnote-ref-10)
10. The Long-term load model uses an Excel Plug-in called “LoadMAP.” An external consultant for the Company developed this plug-in. [↑](#footnote-ref-11)
11. “..large load projects that Georgia Power was selected to serve in 2022 represented almost 2,200 MW. This is more than six times greater than in 2021 and nearly 22 times greater than the approximately 100 MW of large load the Company was selected to serve per year from 2017 to 2020. This growth has sustained in 2023. From January through August 2023, the Company was selected to serve more than 1,700 MW of new customer load and total Company selections in 2023 are estimated to be more than 2,500 MW.” Based on 2023 IRP Update Load and Energy Forecast, page 1. [↑](#footnote-ref-12)
12. Short-term in this context refers to the period from 2023 to 2027. Based on the Company’s October 2023 Filing, PD Technical Appendix 7, Load and Energy Forecast Documentation. [↑](#footnote-ref-13)
13. LoadMAP files are provided in TS Technical Appendix 7, LT Models. [↑](#footnote-ref-14)
14. Long-term, in this context, refers to the period from 2028 to 2042. Based on the Company’s October 2023 Filing, PD Technical Appendix 7, Load and Energy Forecast Documentation. [↑](#footnote-ref-15)
15. A “large load” customer is any customer with a load greater than 45 MW for the Industrial class or 115 MW for the commercial class. Based on the response to STF-DEA-6-1. [↑](#footnote-ref-16)
16. Due to issues procuring the relevant software and time constraints, the Peak model could not be accessed and was not reviewed. The assumptions used in the Peak model are likely reasonable, assuming they replicated similar assumptions as those used in the 2022 IRP and prior IRPs. [↑](#footnote-ref-17)
17. TS Technical Appendix Figures and Data fil, CAGRs & Controls Tab [↑](#footnote-ref-18)
18. 2023 IRP Update Direct Testimony of Georgia Power Company, p. 15 of 56, lines 4-7. [↑](#footnote-ref-19)
19. Responses to TS STF-DEA-1-4, Attachments A through D. [↑](#footnote-ref-20)
20. Based on responses to TS STF-DEA-1-4 Attachment A and IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Load Realization Model.” [↑](#footnote-ref-21)
21. Based on peak demand forecast data provided in the Main Document of the Company’s 2023 IRP Update Filing. File: [Figures 4, 5, 6, & 9 - Capacity Needs Data for B22, B23, and 2023 IRP Update.] [↑](#footnote-ref-22)
22. This testimony evaluates three filed forecasts: 1) the forecast filed with the 2022 IRP, 2) the annual forecast that is produced by the Company outside of the IRP (Budget 2023), and 3) the 2023 IRP Update forecast which the company filed in October 2023. The 2022 IRP forecast was developed in the second half of 2021. The Budget 2023 forecast was developed in fall 2022. The 2023 IRP Update forecast was developed in Q3 2023. [↑](#footnote-ref-23)
23. Based on peak demand forecast data provided in the Main Document of the Company’s 2023 IRP Update Filing. File: [Figures 4, 5, 6, & 9 - Capacity Needs Data for B22, B23, and 2023 IRP Update.] [↑](#footnote-ref-24)
24. IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Load Realization Model.” [↑](#footnote-ref-25)
25. Georgia Power Company, January 16 Hearing Transcript, p. 0165, lines 10-11 & p. 0381, lines 7-8. [↑](#footnote-ref-26)
26. If a project reports that it will achieve peak demand of 60 MW in year 2030 and 70 MW in year 2031, the LRM will assume that the project reaches 60 MW at the end of Q2 2030. [↑](#footnote-ref-27)
27. Response to Data Request STF-DEA-1-15 [↑](#footnote-ref-28)
28. Based on a 100,000 iterations @RISK simulation of the file from IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Load Realization Model.” [↑](#footnote-ref-29)
29. Georgia Power would typically convert the values in Table 3 to an energy basis using established load factors and input these values into its Peak model. We were not able to perform this portion of the analysis due to software limitations and time constraints, but do not expect that this transformation will materially impact the conclusions of our analysis. [↑](#footnote-ref-30)
30. Based on a 100,000 iterations @RISK simulation of the file from IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Load Realization Model.” [↑](#footnote-ref-31)
31. Georgia Power Company, January 16 Hearing Transcript, p. 0153, lines 12-13. [↑](#footnote-ref-32)
32. Based on data from IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Load Realization Model.” [↑](#footnote-ref-33)
33. We assume that this value corresponds with the Company’s reference to a “won” 4,000 MW mentioned on Georgia Power Company, January 17 Hearing Transcript, p. 0472, lines 11-13. [↑](#footnote-ref-34)
34. Based on explanations provided IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Model Sheet Description” and PD Technical Appendix 7 Load & Energy Forecast Documentation. [↑](#footnote-ref-35)
35. Independent correlation in this context assumes that the success of Project A should not be correlated with the Success of Project B. This is a reasonable assumption. [↑](#footnote-ref-36)
36. Based on responses to Data Requests JKA-4-7 (Attachments A & B) and DEA-4-7 (Attachments A though N). [↑](#footnote-ref-37)
37. Response to Data Requests PIA-6-12 [↑](#footnote-ref-38)
38. This correlation assumes that the materialization of load in each segment (Datacenters for example) would not impact the materialization of load in another segment (Chemicals). However, the materialization of load for a single Datacenter *might* be correlated with the materialization of load for another Datacenter. This is a reasonable assumption. [↑](#footnote-ref-39)
39. Based on a simulation with 100,000 iterations in @RISK of the file from IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Load Realization Model.” [↑](#footnote-ref-40)
40. Response to TS STF-DEA-1-4, Attachment A [↑](#footnote-ref-41)
41. IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Load Realization Model.” [↑](#footnote-ref-42)
42. The product of each set of Project Success probabilities is input into a Bernoulli distribution to produce a value of either 0 or 1. If a project receives a value of 0 in a given iteration, the load will not materialize (it will be 0 MW for each year in the forecast and not contribute to the total portfolio load). [↑](#footnote-ref-43)
43. Response to STF-DEA-5-3 [↑](#footnote-ref-44)
44. Georgia Power Company, January 16 Hearing Transcript, p. 0153, lines 12-13. [↑](#footnote-ref-45)
45. IRP Models & Workpapers, TS Technical Appendix 7 – Load & Energy Forecast, “TS 2023.10.11 Load Realization Model.” [↑](#footnote-ref-46)
46. Sebastian Obando (2022), Supply chain issues threaten data center construction boom. Supply Chain Dive - https://www.supplychaindive.com/news/supply-chain-issues-threaten-data-center-construction-boom/625116/ [↑](#footnote-ref-47)
47. Blair Felter (2023), Navigating Data Center Market Challenges: A Business Guide. EVOQUE - https://www.evoquedcs.com/blog/navigating-data-center-challenges. [↑](#footnote-ref-48)
48. Sebastian Obando (20230), Data center building boom shows cracks. Construction Dive - https://www.constructiondive.com/news/psmj-survey-data-center-construction/699469/. [↑](#footnote-ref-49)
49. Sebastian Obando (20230), Data center building boom shows cracks. Construction Dive - https://www.constructiondive.com/news/psmj-survey-data-center-construction/699469/. [↑](#footnote-ref-50)
50. Rob DiRienzo (2024), $10M tax break for X data center in Fulton Country face backlash. Fox5 Atlanta - https://www.fox5atlanta.com/news/tax-break-x-twitter-data-center-fulton-county-backlash-elon-musk. [↑](#footnote-ref-51)
51. Response to DEA-1-4, Attachments A through D. [↑](#footnote-ref-52)
52. Response to PD STF-DEA-2-1. [↑](#footnote-ref-53)
53. Response to PD STF-PIA-6-12. [↑](#footnote-ref-54)
54. Response to STF-DEA-1-8. [↑](#footnote-ref-55)
55. Response to STF-DEA-1-9. [↑](#footnote-ref-56)
56. Response to STF -DEA-1-7. [↑](#footnote-ref-57)
57. Response to STF-DEA-1-5. [↑](#footnote-ref-58)
58. Response to STF-DEA-1-5. [↑](#footnote-ref-59)
59. Based on values in Dir. Ex. TKP-1 [↑](#footnote-ref-60)
60. Based on values in Dir. Ex. TKP-1 [↑](#footnote-ref-61)
61. Based on values in Dir. Ex. TKP-1 [↑](#footnote-ref-62)
62. The inaccuracy of these Ramp-Up Delay assumptions is based on public research provided on page 34 of 46. [↑](#footnote-ref-63)
63. This is demonstrated in Table 6. [↑](#footnote-ref-64)
64. Response to STF-DEA-1-5. [↑](#footnote-ref-65)
65. Georgia Power Company, January 16th Hearing, p. 0157, lines 16-20 [↑](#footnote-ref-66)
66. Dir. Ex. TKP-2 [↑](#footnote-ref-67)
67. Typically, regression software will produce summary tables to report these values to the user. This information should be readily available to the Company & provided to the Commission Staff and any supporting Consultants. [↑](#footnote-ref-68)