BPA Policy 484-1
Load and Resource Forecasting

Table of Contents

1. Purpose & Background

A broad range of BPA planning and operational activities requires the agency to develop official predictions of expected utility customer electricity consumption (load) and the availability of power generation resources. For efficiency and consistency, it is important for the agency to standardize these forecasts to the degree practicable. Accordingly, BPA has established a shared Load Forecasting & Analysis (KSL) organization. KSL manages the agency's standard forecast products. Other organizations use KSL products in support of their own functions, which may include development of activity-specific forecasts based on KSL products.

This policy sets requirements for the identification, development, production, use, and administration of KSL products. KSL works with internal client organizations and inputs from Utility Customers to produce Base Load Forecasts, Base Resource Forecasts, and Standard Scenarios, as these terms are defined in §4, below. Appendix A lists variants of these products in more detail.

The policy is supported by procedures implemented to ensure efficient and standardized production of accurate Base Forecasts and Standard Scenarios. (*See*, §8, Standards & Procedures.)

Together, this policy and its procedures also document the associated responsibilities and relationship structure between KSL, internal client organizations, and external parties. BPA recognizes there may be a need for client organizations to create or use ad hoc, alternative forecasts that depart from KSL forecasts and to integrate with regional forecast for regional planning. However, the policy requires BPA organizations with regular forecasting requirements to collaborate with KSL in identifying the need to adjust current KSL products, and develop new products and Standard Scenarios.

Under its forecasting process, KSL regularly reviews and updates its forecasts to maintain accuracy. Forecast updates allow for discussion on expected economic changes, changes to energy efficiency plans, annexations of service territories, the addition or reduction of load, changes to metering points, and the adoption of updated forecasting practices that increase accuracy of the existing forecast. BPA's consistent use of accurate and standard forecasts and scenarios ensures that the agency performs power, transmission, and financial analysis and planning under a uniform view of the future. Accurate forecasts are critical inputs for optimizing planning and operational activities that include grid operations, ratemaking, financial planning, and asset and resource planning.

2. Policy Owner

The Customer Support Services Director has overall responsibility for this policy, and is also responsible for determining the appropriate resolution of any conflicts that may arise during this policy's implementation.

The Load Forecasting & Analysis Manager is responsible for working in consultation with the *Marketing and Sales, Front, Middle, and Back Office Policy and Standards Implementing Group* (FOMOBO) to implement, review, and revise this policy.

Questions about this policy should be directed to the Load Forecasting & Analysis Manager.

3. Applicability

This policy applies to the identification, development, use, and administration of Base Load Forecasts, Base Resource Forecasts, and Standard Scenarios produced to support BPA's planning and operational activities requiring forecasts of load or the use of non-federal resources by Utility Customers to serve load.

4. Terms & Definitions

A. **Agency Load Forecasting System (ALF):** BPA's system for storing, developing, and consolidating Base Forecasts. ALF is the source of record for Forecast modeling techniques, Model Equation Inputs, and model outputs.

B. **Base:** For purposes of this policy and its procedures, "Base" is used to identify standard forecast products produced by KSL.

   1. Base Load Forecast

   2. Base Resource Forecast

   Base Forecast is used to refer to both, collectively. By comparison, *Resource Forecast* is used to reference a resource forecast generated by any BPA organization.

C. **Case Study:** An in-depth investigation by an internal BPA organization based on any combination of a Base Forecast, a regional Forecast, or a Forecast independently developed by that organization.

D. **Configuration:** The details (i.e. meters, points of delivery, busbars, customers, geographic locations, load concepts, etc.) that define an internal BPA organizations forecast requirements.

E. **Forecast:** Any formal prediction of energy consumption or production for use in an official capacity.

F. **Internal User:** A BPA consumer of the Base Forecast or Standard Scenario data (i.e. concepts or details) who is responsible for producing and supporting the planning and operational activities in their organization.

G. **Load Forecast:** A formal prediction of an electricity consumer's energy consumption. Appendix A lists the Base Load Forecast products produced by KSL.

H. **Model Equation Inputs:** A set of data variables used to model elements of a Forecast.

I. **Standard Scenario:** A standard Forecast produced by KSL using a Base Forecast to represent uniform assumptions and that is updated to include other considerations. These may include, but are not limited to, changes in weather, energy efficiency, economic, or demographic variables. Standard Scenarios are used to support operational and planning activities which require regular modifications to Base Forecasts.

J. **Service Level Agreement (SLA):** An agreement that defines and documents services and associated performance levels that are provided by a BPA organization, as described in BPA Policy 236-300, *Enterprise Data Governance* (2018).

K. **Resource Forecasts:** A prediction of the energy that will be produced by a generation source. Appendix A lists the Base Resource Forecast products produced by KSL for customer owned or contracted for non-federal resources.

L. **Utility Customer:** A public body, cooperative, or investor owned utility, electricity marketing or production company, or federal agency that may purchase firm power or transmission services from BPA, or transmission service only, that delivers electricity to load.

5. Policy

A. **Load Forecasting & Analysis (KSL)**

1. KSL will provide Base Forecasts developed from Configurations provided by requesting Internal Users.

2. All Forecasts used in official BPA planning or operations, or made publicly available shall be those produced by or agreed to by KSL in accordance with the procedures listed in §8.1 of this policy.

3. All modeling techniques, Model Equation Inputs, and model outputs shall be established and managed by KSL and recorded in the Agency Load Forecasting system.

4. KSL shall provide, as needed, testimony and support to explain Base Forecasts.

5. KSL shall perform all analysis on Base Forecast accuracy. Upon request, it can provide additional analysis.

6. KSL is the responsible organization for official agency Load Forecasts and will coordinate with BPA organizations that utilize Load Forecasts to ensure processes are coordinated, data requests are clear, complete and require the minimal touchpoints for customers.

B. **Developing and Updating Base Forecasts:** KSL produces four categories of Base Load and Base Resource Forecasts: near-term, short-term, medium-term, and long-term. KSL also produces Standard Scenarios. For these, KSL collaborates with Internal Users to

Organization	Title	Unique ID	
Load Forecasting & Analysis (KSL)	Load and Resource Forecast	484-1	
Author	**Approved by**	**Date**	**Version**	
Erin Jensen, KSL-4	CSS Director, Jamie Sims	7 February 2020	1.0	Page 4

establish, maintain and adjust supporting requirements. Appendix A lists the modeling techniques, scope, unit, availability, and time horizon for each of these KSL products.

Base Forecasts diminish in accuracy over time and shall be updated at an appropriate cadence. KSL will establish the current version of Base Forecasts and manage the archiving of past versions.

1. **Near-term Base Forecasts:** To remain accurate, near-term Base Forecasts must be revised within a day. KSL shall monitor weather conditions, sub-regional load conditions, forecast performance, and other available data. KSL adjusts these Forecasts based on findings and publishes new versions for use.

2. **Short-term Base Forecasts:** Short-term Base Forecasts must be revised daily or as needed to remain accurate. KSL shall monitor weather conditions, sub-regional load conditions, and forecast performance. KSL adjusts these Forecasts based on findings and publishes new versions for use.

3. **Medium-term Base Forecasts:** Medium-term Base Forecasts must be revised quarterly or as needed to maintain accuracy. The region is dynamic and economic changes occur rapidly, which is reflected in changing load patterns. KSL monitors economic conditions and stays abreast of additions and reductions within industries. KSL adjusts these Forecasts based on findings and publishes new versions for use.

4. **Long-term Base Forecasts**

    a) Long-term Base Forecasts must be revised annually or as needed to ensure BPA has the optimal information for assumptions and forecast inputs.

    b) KSL forecasters engage with Utility Customers once a year to gather information to make informed decisions about Forecast inputs and assumptions in the Forecast. If a Utility Customer has a BPA account executive, these meetings shall be coordinated with that Utility Customer's account executive(s).

5. **Standard Scenarios:** Standard Scenarios are produced as established in SLAs or agreed to by the KSL manager on an ad-hoc basis with BPA organizations. They are based on Base Forecasts and updated as Base Forecasts change.

C. **Version Control**

1. KSL identifies the current versions of Base Forecasts and Standard Scenarios.

2. KSL archives Base Forecasts and Standard Scenarios following these retention standards:

    a) **Near-term Base Forecasts:** KSL archives near-term Base Forecasts it deems critical, daily. These are retained for 30 days.

    b) **Short-term Base Forecasts:** KSL archives short-term Base Forecasts it deems critical, daily. These are retained for six months.

c) **Medium-term Base Forecasts:** KSL archives published medium-term Base Forecasts quarterly or as necessary. These are retained for three years.

d) **Long-term Base Forecasts:** KSL archives published long-term Base Forecasts annually or as necessary. These are retained for five years.

e) **Standard Scenarios:** KSL archives published long-term Base Forecasts annually or as necessary. These are retained for five years.

D. **Distribution**

1. To avoid use of an incorrect version of a Forecast, all Base Forecasts and Standard Scenarios, supporting data, and KSL produced information shall be distributed to Internal Users by KSL.

2. **Internal User Requests for Base Forecasts or Standard Scenario Data**

a) KSL Base Forecast or Standard Scenario products described in Appendix A may be requested via email to kslf@bpa.gov, or acquired through arrangements recorded in SLAs as described in BPA Internal Policy 236-300, *Enterprise Data Governance* (2018).

b) The KSL Manager approves requests. Reoccurring requests may require a SLA.

c) After a request is approved the KSL Manager will determine the appropriate delivery timeframe in coordination with the requesting Internal User.

E. **Citing Base Forecast and Standard Scenario Data**

Any Internal User that develops departmental information using Base Forecasts or Standard Scenarios or associated data as an input shall cite KSL as the source of any displayed Base Forecasts or Standard Scenario data distributed to Utility Customers. If load or resource amounts, or other KSL associated data is not shown, citing the Load Forecasting & Analysis organization is not required.

6.   Policy Exceptions

This policy does not affect or apply to end-user processes that create or use other possible ad hoc outcomes of a Forecast in departmental Case Studies, regional planning studies, or analytical and scenario analyses for potential future load or resource values.

7.   Responsibilities

A. **Load Forecasting & Analysis (KSL)**

1. Provides accurate Base Forecasts for Internal Users.

2. Develops documentation to substantiate Base Forecast results.

3. On an annual basis, gathers information from customers to inform development and management of long-term Base Forecasts and assure compliance with assigned standards, tariff requirements, and contractual requirements.

B. **Load Forecasting & Analysis Manager**

1. Responds to and approves data request inquiries by Internal Users.

2. Approves revisions to Appendix A to this policy.

C. **Customer Support Services Director**

1. Maintains overall responsibility for this policy.

2. Interprets this policy and resolves disagreements.

D. **Internal Users**

1. Identify the Configurations that define the loads or resources to be forecasted.

2. Submit data requests for Base Forecasts and Standard Scenario data to KSL.

3. Identify KSL as the source of Base Forecast or Standard Scenario data used in Internal User's analysis products, when applicable.

4. Collaborate with KSL to develop any necessary Service Level Agreements and review them every three years

5. Communicate additional needs for Base Forecasts or Standard Scenario analysis for KSL to incorporate into regular workload.

8. Standards & Procedures

8.1 Procedures

A. BPA Procedure 484-1-1, *Final Forecast Decision Authority* (2019)

B. BPA Procedure 484-1-2, *Rate Period High Water Mark Forecast Change* (2019)

C. BPA Procedure 484-1-3, *Forecast Project Probability Threshold* (2019)

8.2 Standards

A. **Base Forecast Probability:** A 50% probability Forecast, also known as a *one-in-two forecast*, where it is a 50% chance the metered actual value will exceed the Forecast value in any given year.

B. **MOD-31-2:** The North American Electric Reliability Corporation (NERC) has established reliability standards to reduce risk to the reliability of the electricity grid. Modeling, Data, and Analysis Standard 31 (MOD-31-2) deals with the sharing of forecasted load data to make possible forecasted loads and resources transparent to all parties. KSL is responsible for ensuring that BPA is compliant with this standard by working with BPA compliance organizations.

Organization		Title		Unique ID	
Load Forecasting & Analysis (KSL)		Load and Resource Forecast		484-1	
Author		Approved by	Date	Version	
Erin Jensen, KSL-4		CSS Director, Jamie Sims	7 February 2020	1.0	Page 7

9. Performance & Monitoring

KSL monitors compliance with this policy and regularly reports on compliance and related audit findings to the *Marketing and Sales, Front, Middle, and Back Office Policy and Standards Implementing Group* (FOMOBO).

KSL monitors the accuracy of near- and short- term Base Forecasts at the appropriate intervals and provides quarterly reports to stakeholders. KSL annually reviews the accuracy of medium- and long- term Base Forecasts it deems critical, consulting with internal stakeholders as necessary.

10. Authorities & References

A. BPA Policy 130-6, *Functional Statement for Office of the Chief Operating Officer* (2016)

B. BPA Policy 236-300, *Enterprise Data Governance* (2018)

11. Review

A. KSL annually reviews the continuing effectiveness of this policy and associated procedures in meeting the policy's objectives.

B. The KSL Manager may approve revisions to Appendix A from this policy after consulting with the FOMOBO when appropriate.

12. Revision History

Version Number	Issue Date	Brief Description of Change or Review
1.0	7 February 2020	Initial publication of policy.

Appendix A: Available Forecasts

The following table provides the Base Forecasts electricity concepts currently available from KSL. Internal Users may gain access to this data by establishing a SLA with KSL or by submitting an email request to the KSL Manager. These concepts are available for many Configurations.

For further information, contact the KSL Manager.

Table 1: Current Base Forecast Electricity Concepts Available from the Load Forecasting & Analysis Organization

	Forecast Type	Modeling Technique	Scope	Unit	Availability	Time Horizon
1	Near-Term	Neural network, regression, and persistence models	5 minute load	MW	Updated hourly or as necessary based on Forecast performance	8 hours
2	Short-Term	Neural network, regression, and persistence models	Hourly load	MW	Updated hourly or as necessary based on Forecast performance	14 days
3	Short-Term	Neural network, regression, and persistence models	15 minute load	MW	Updated hourly or as necessary based on Forecast performance	14 days
4	Medium-Term	Regression models	Monthly energy	MWh	Updated quarterly or as necessary based on Forecast performance	36 months
5	Medium-Term	Regression models	Hourly energy	MW	Updated quarterly or as necessary based on Forecast performance	36 months
6	Long-Term	Regression or Statistically Adjusted End-Use (SAE) models	Monthly energy by resource, Utility Customer, associated Points of Delivery (POD) and Busbar (BUS)	MWh	Updated annually or as necessary based on Forecast performance	Minimum 20 years
7	Long-Term	Regression or SAE models	Monthly heavy load hour energy by resource, Utility Customer, associated POD and BUS	MWh	Updated annually or as necessary based on Forecast performance	Minimum 20 years
8	Long-Term	Regression or SAE models	Monthly light load hour energy by resource, Utility Customer, associated POD and BUS	MWh	Updated annually or as necessary based on Forecast performance	Minimum 20 years
9	Long-Term	Regression or SAE models	Monthly customer peak by resource, Utility Customer, associated POD	MW	Updated annually or as necessary based on Forecast	Minimum 20 years

			and BUS		performance	
10	Long-Term	Regression or SAE models	Monthly light load hour energy by resource, Utility Customer, associated POD and BUS	MW	Updated annually or as necessary based on Forecast performance	Minimum 20 years
11	Long-Term	Regression or SAE models	Monthly total transmission system load by resource, Utility Customer, associated POD and BUS	MW	Updated annually or as necessary based on Forecast performance	Minimum 20 years
12	Long-Term	Regression or SAE models	Monthly generation system peak by resource, Utility Customer, associated POD and BUS	MW	Updated annually or as necessary based on Forecast performance	Minimum 20 years
13	Long-Term	Regression or SAE models	Monthly control area peak by resource, Utility Customer, associated POD and BUS	MW	Updated annually or as necessary based on Forecast performance	Minimum 20 years
14	Long-Term	Regression or SAE models	Monthly minimum load by resource, Utility Customer, associated POD and BUS	MW	Updated annually or as necessary based on Forecast performance	Minimum 20 years
15	Long-Term	Regression or SAE models	Monthly reactive power by resource, Utility Customer, associated POD and BUS	MVAR	Updated annually or as necessary based on Forecast performance	Minimum 20 years
16	Long-Term	Regression model	Hourly energy by resource and Utility Customer	MW	Updated annually or as necessary based on Forecast performance	20 years
17	Long-Term	Regression model	Hourly energy by POD and BUS	MW	Updated annually or as necessary based on Forecast performance	3 years

Table 2: Standard Scenarios

Standard Scenario	Description
Frozen Efficiency	Forecast without effects of conservation
Climate Change	Forecast based on weather predictions provide by climate change experts
Extreme Weather	Forecast based on 1 in 20 year weather events for summer and winter periods
High Economic Growth	Forecast based on robust economic conditions with a 10% chance of being exceeded provided by authorized economic forecasting vendor.
Low Economic Growth	Forecast based on weak economic conditions with a 10% chance of being exceeded provided by authorized economic forecasting vendor.