



Load Forecast Development

Load Analysis Subcommittee
November 15, 2017



Key Work Activities

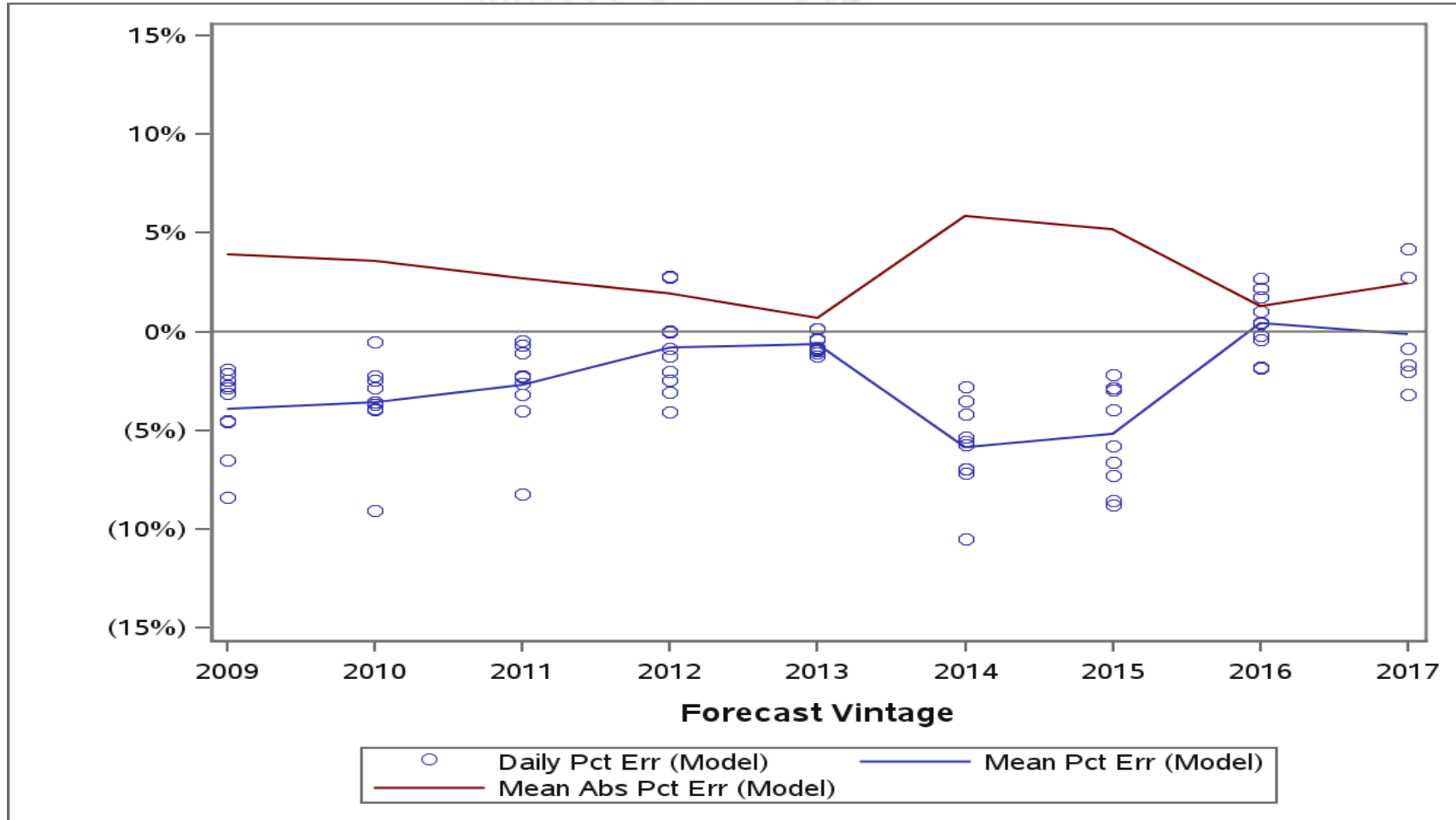
The key work activities are the following:

1. Winter Peak Load Forecasting.

- a. PJM staff to review PJM's load forecasting methodology to identify any potential issues with regard to the accuracy of PJM's RTO and zonal peak load forecasting for use in assessing resource adequacy during the winter season (defined as October through April). For example, the increasing penetration of certain end use technologies in recent years may have changed the relationship between extreme cold temperatures and electricity demand in some zones, and this may not be fully captured in the econometric modeling.
- b. If any issues are identified, PJM staff to craft potential solutions and to work with the LAS to evaluate and select recommended solutions.

Winter 10CP Model Error by Forecast Vintage

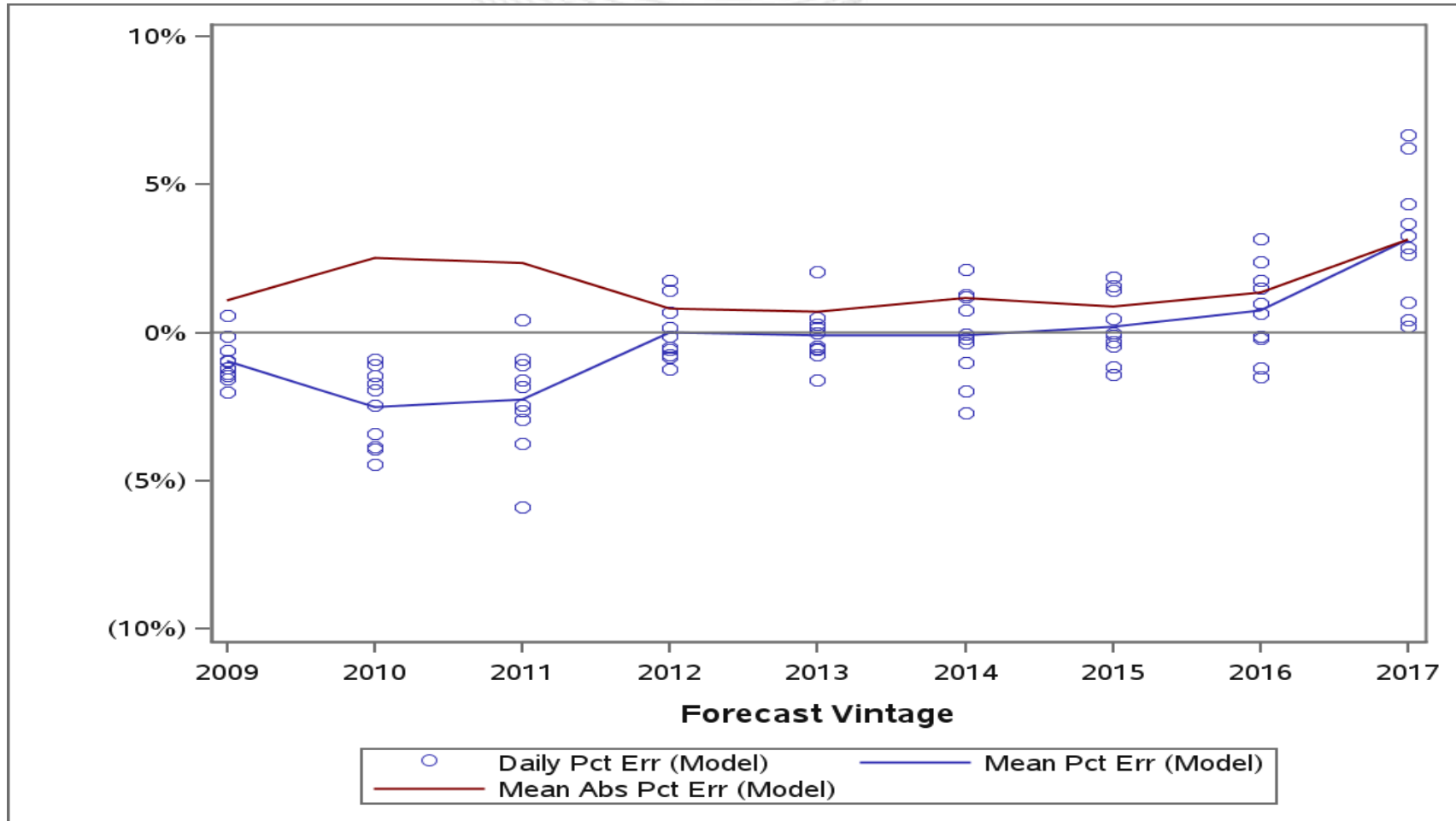
0 Year Out Forecast





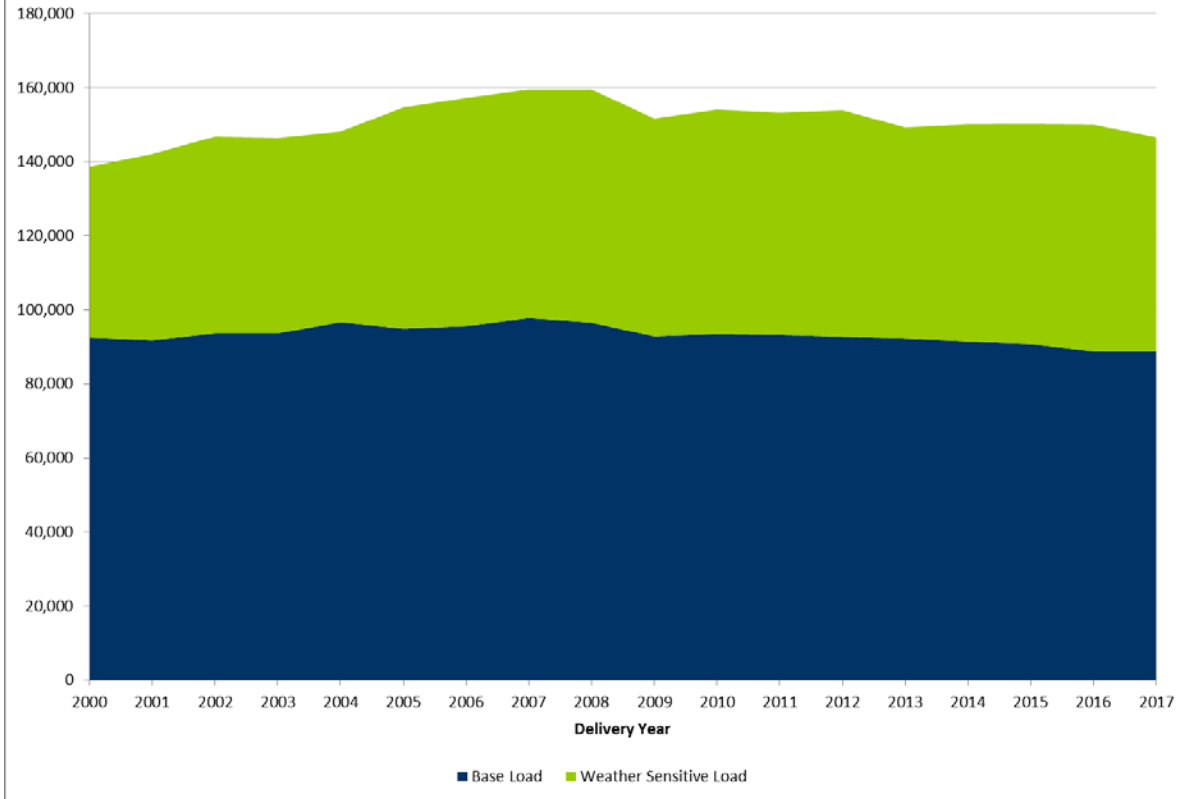
Summer 10CP Model Error by Forecast Vintage

0 Year Out Forecast

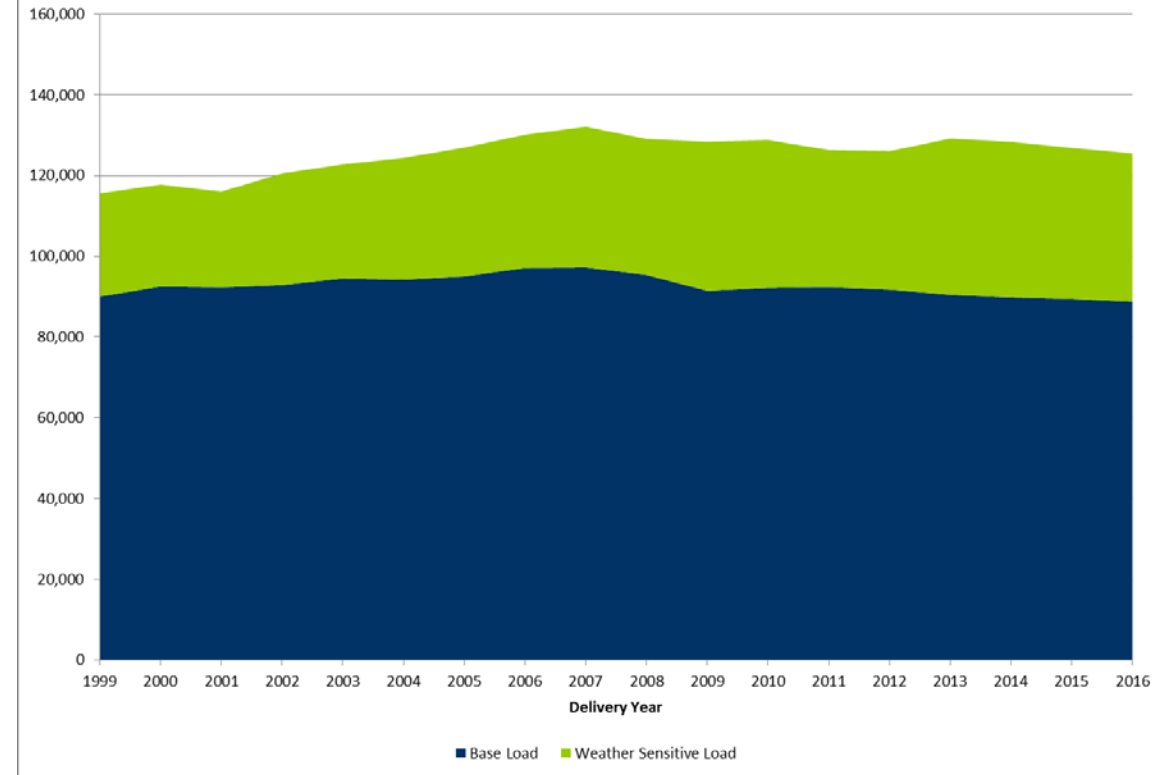


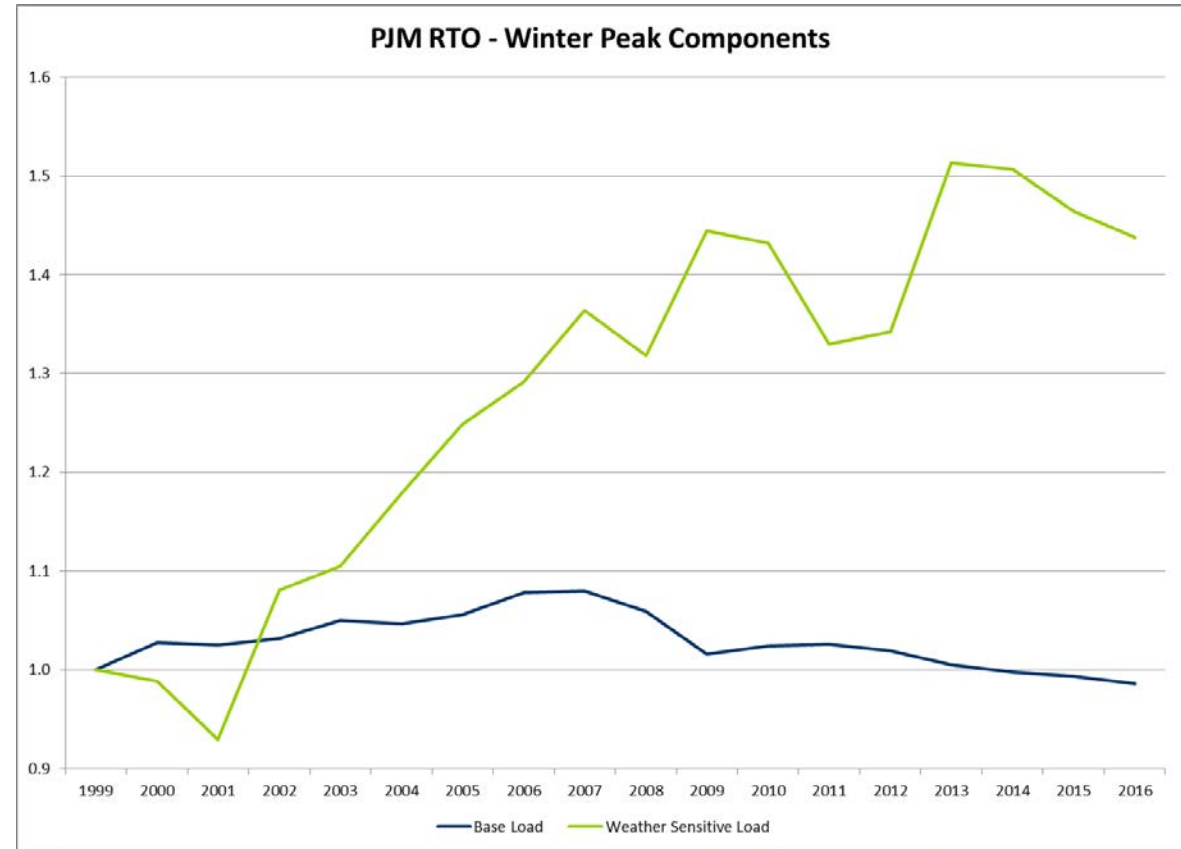
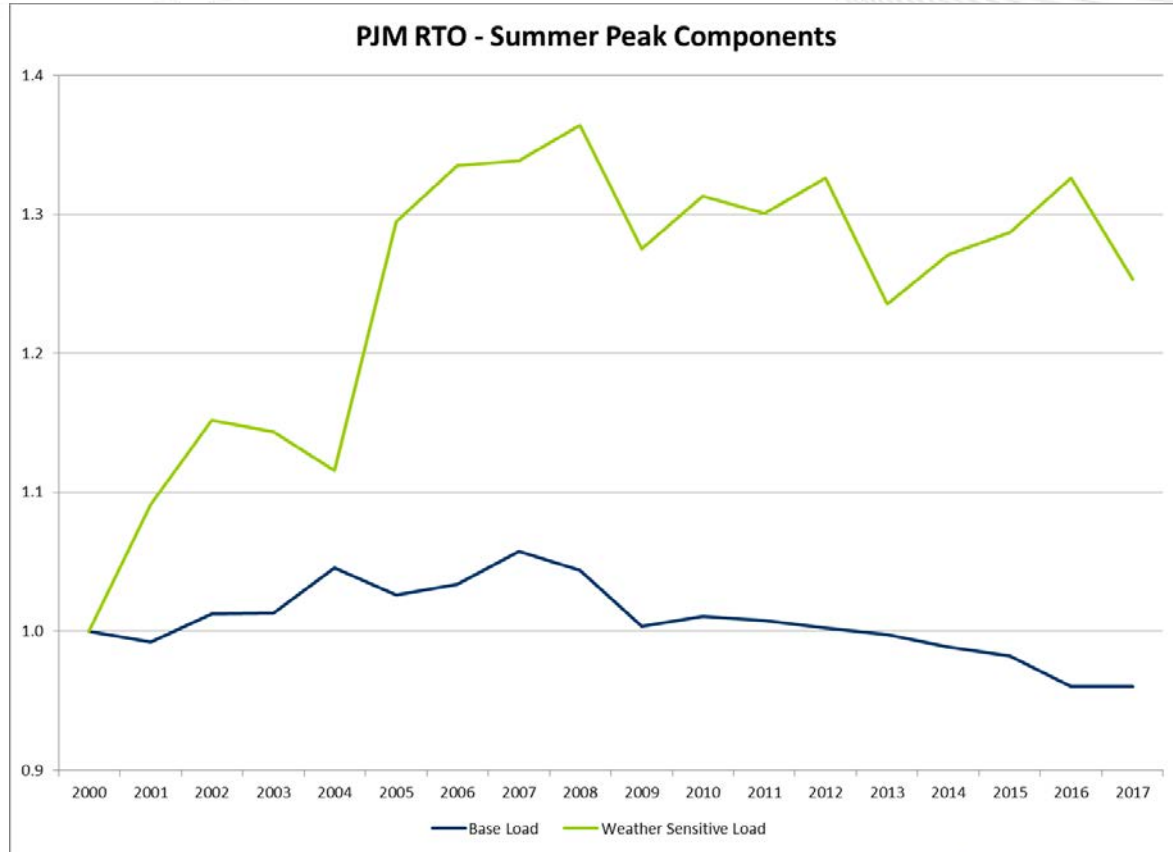
- PJM investigated whether there were ways to improve just the winter season, through experimenting with the weather parameters that were inputs to the model.
 - This path seemed to yield only marginal improvement at best
- PJM opted instead to take this opportunity for more comprehensive model redevelopment
 - Still use concepts that we brought in a few years ago (equipment indexes and distributed solar)

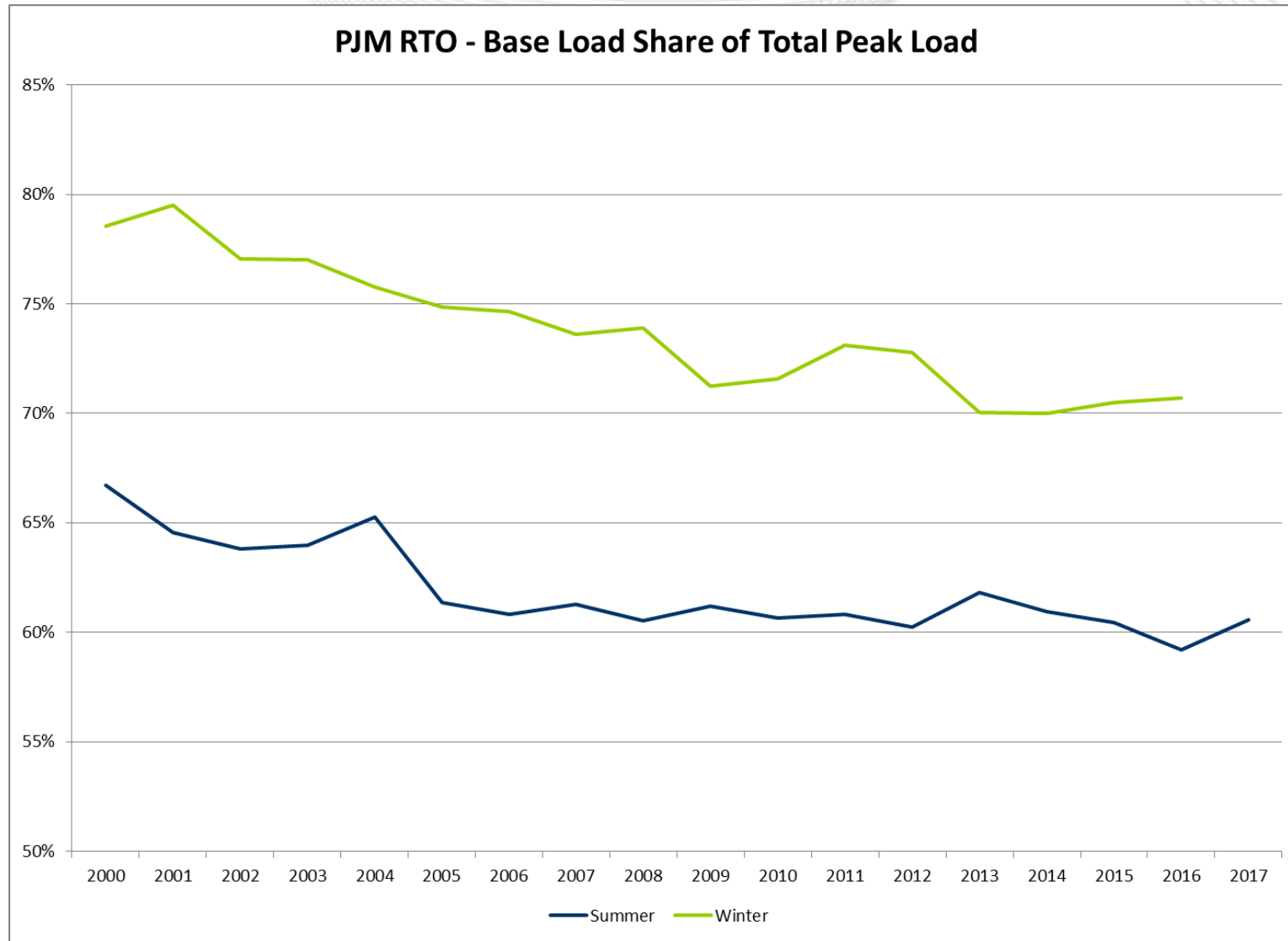
PJM RTO - Summer Peak



PJM RTO - Winter Peak







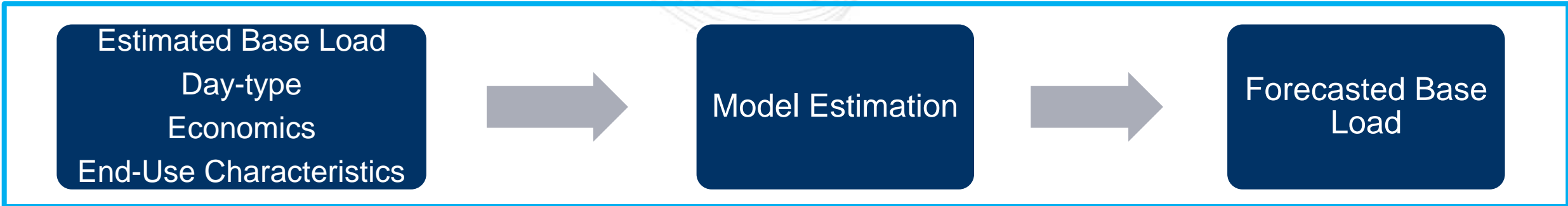
- Current Forecast Framework
 - Single econometric model (considers weather, economics, end-use characteristics and day-type variables)
 - Model coefficients are computed
 - Combined with historical weather to formulate peak distributions



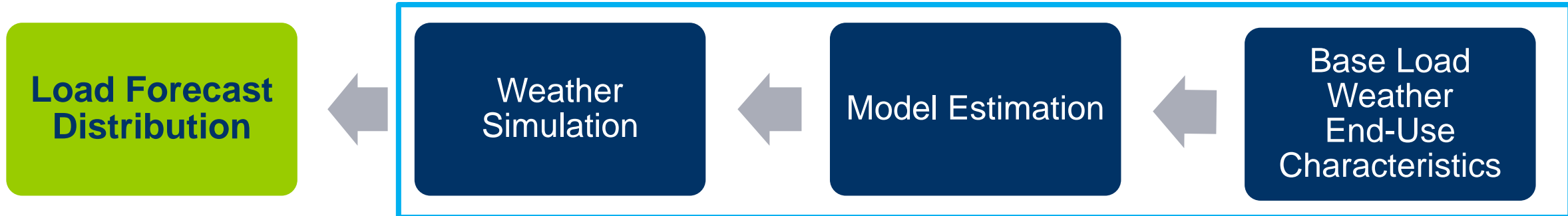
- Current framework relies on model to differentiate between base and weather sensitive load using the variables it has on hand.
- Estimate base load and then use this as a variable in the model
 - Current base load process produces a single value for each of the Summer and Winter seasons. Need daily frequency series to use in forecast framework.
 - Use a simple regression model with controls for weather (CDD/HDD), months, years, day of week (Monday-Thursday, Friday) and holidays. Then set weather parameter to zero to get base load values.

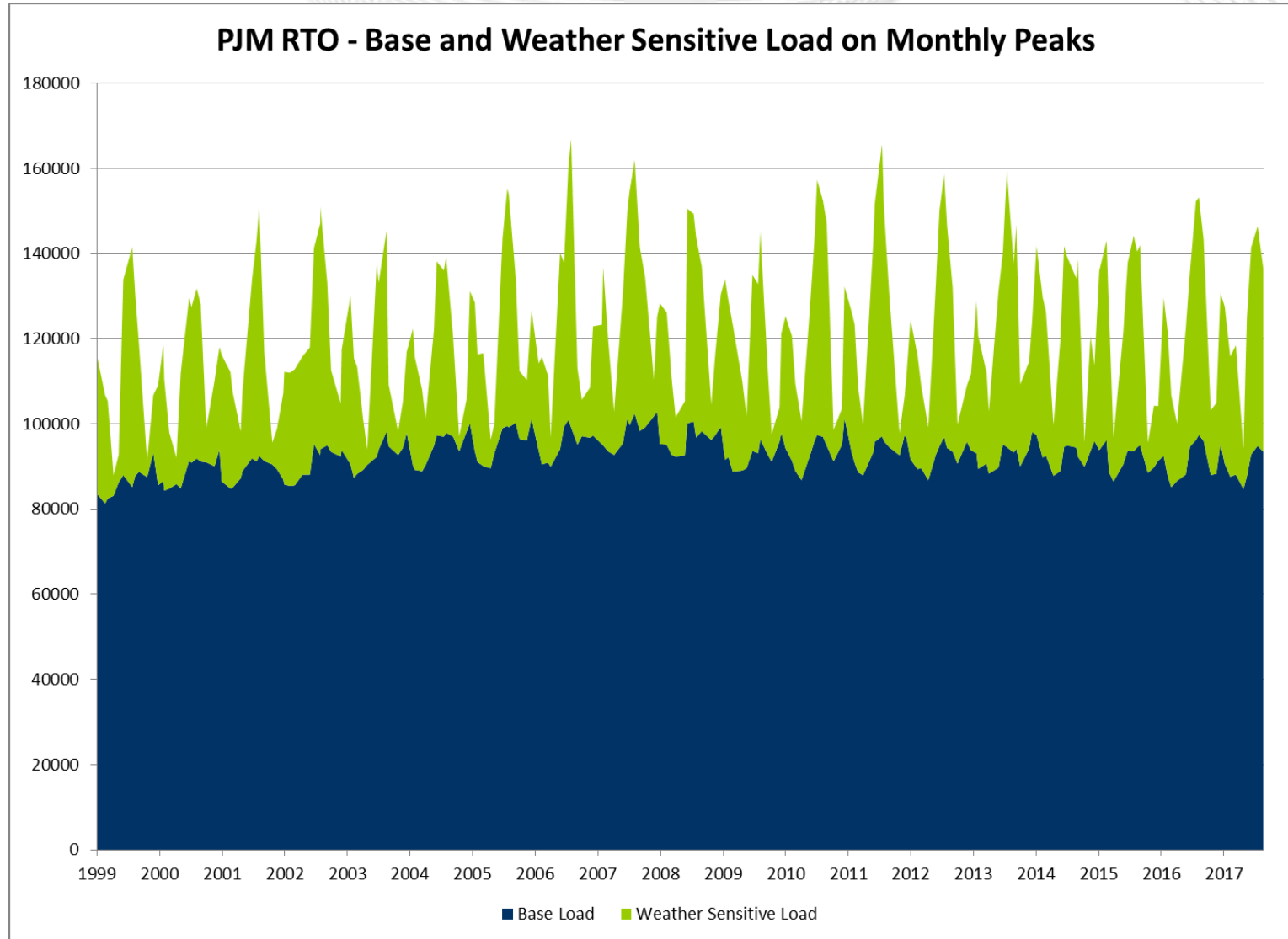
- Potential Forecast Framework
 - Two econometric models
 - First model estimates and forecasts base (non weather-sensitive) load (considers economics, end-use characteristics and day-type variables)
 - Second model estimates and forecasts total load (considers base load, economics, end-use characteristics)
 - Combined with historical weather to formulate peak distributions

First Model

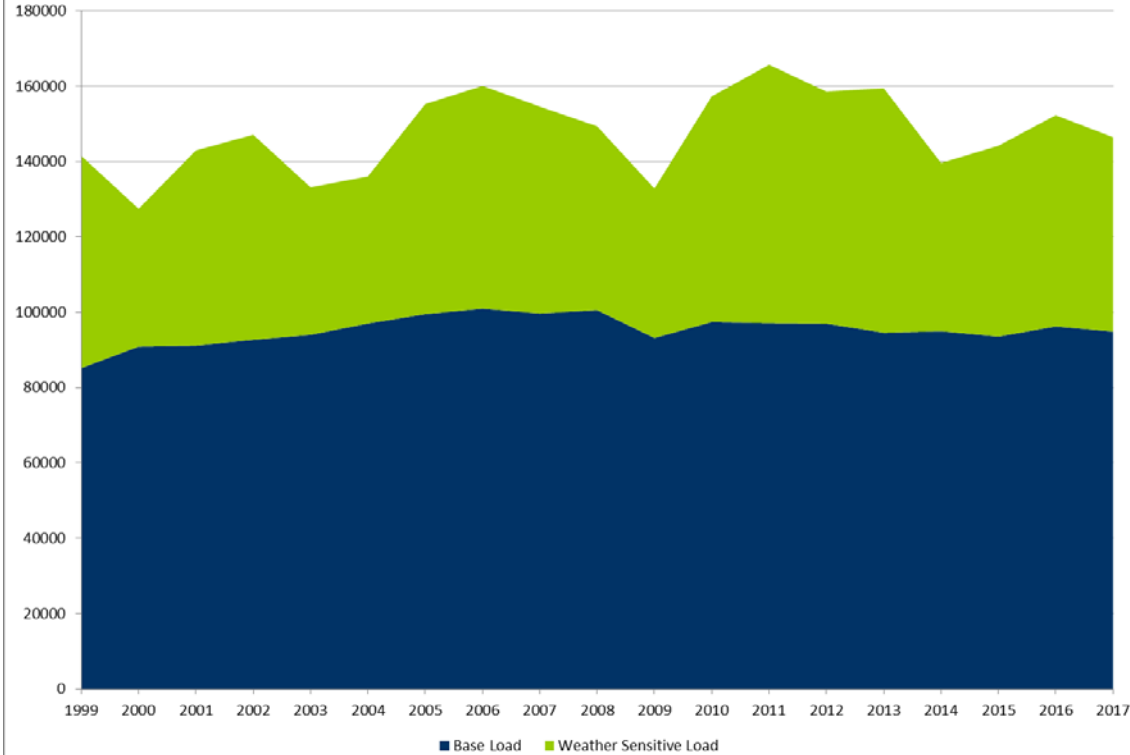


Second Model

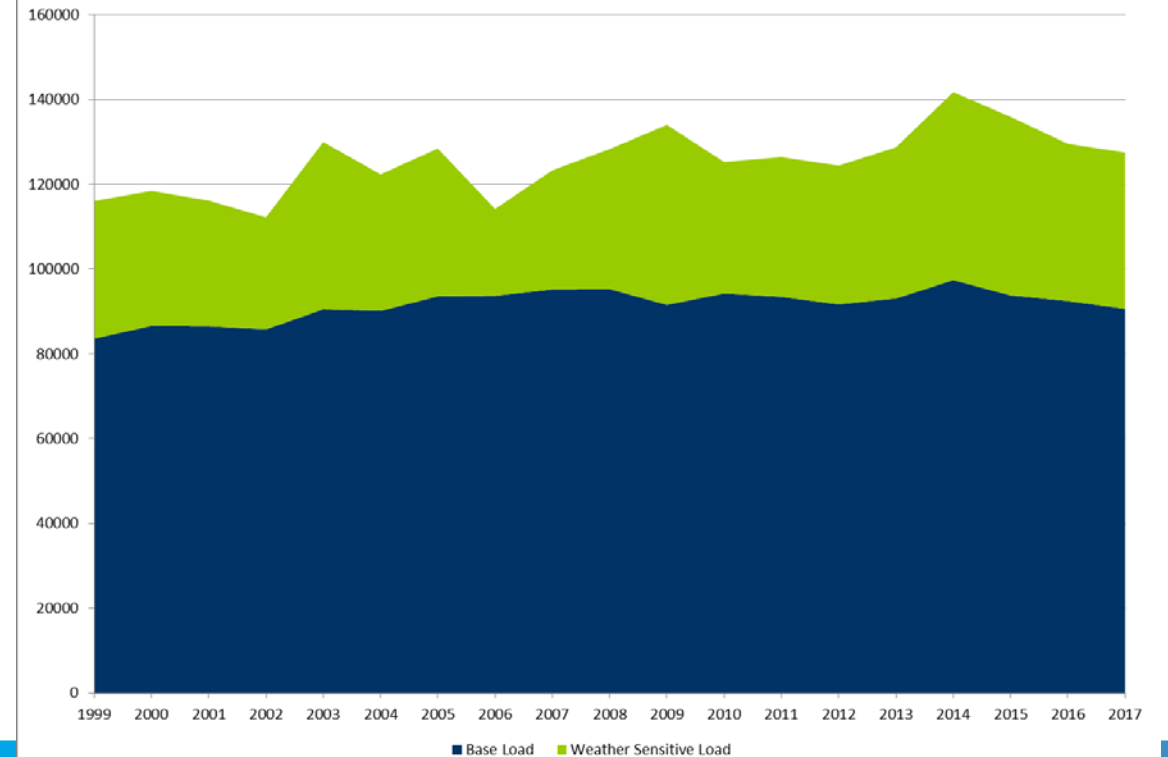




PJM RTO - Base and Weather Sensitive Load on July Peaks



PJM RTO - Base and Weather Sensitive Load on January Peaks



- Some options
 - Regression model?
 - Dependent variable
 - Load or transformed load
 - Independent variables
 - Economics, other equipment index, calendar variables
 - ARIMA model?
 - Dependent variable
 - Load or transformed load
 - Independent variables
 - Load, economics, other equipment index

- Similar to current structure only that some drivers (calendar variables, economics, other equipment index) are collapsed into a base load variable
 - Base load variable should have a coefficient close to 1.0 (i.e. with a good estimate of base load, total load should move in lock step with base load).
 - Variables that drive weather sensitive load including THI, wind-adjusted temperature, economics and heating/cooling equipment indexes would be included.
- Weather simulation to produce 50/50, 90/10 would remain unchanged

- Further investigate base load for use in step 1
 - Means to establish historical values and establishing base load forecast
- Additional investigation into step 2
 - Look for improvements to combination of weather variables
- Seasonal accuracy testing
 - Compare accuracy of existing model with test models and evaluate improvement