At Pacific Gas & Electric
2012

Prior to selecting Integral Analytics, PG&E completed a two year review of its existing processes and methods, and chose LoadSEER as the preferred tool to improve its capabilities in several areas including circuit load forecasting, identifying capacity shortfalls, incorporating micro-grid impacts, insuring consistency with corporate planning, streamlining regulatory data requirements, creating more defensible long term load forecasting methods, and automating and streamlining various aspects of the decision and approval process.

The economic downturn has made it tougher to accurately forecast circuit and bank peak loads. In fact, PG&E is finding that economic risk is now a larger threat to circuit planning than weather. Basing regression forecasts on temperature alone is inadequate. When the economy returns, will you be prepared, or get caught short of capacity? Will commercial and industrial loads ramp up quickly as the economy improves or will they remain flat? Which economic drivers are the key ones for each of your circuits? LoadSEER automatically models up to 100 economic drivers, along with weather, to provide you with the best combination of influences, circuit by circuit.

In addition to economic risks, the added risks emerging from the advance of micro grids, solar, DG, EV, the Smart Grid push, is making the job of the distribution planner increasingly complex. LoadSEER's acre-level granularity, comprehensive statistical forecasting algorithms, and powerful GIS engines can tackle this complexity, and let you actually do planning, instead of data modeling.

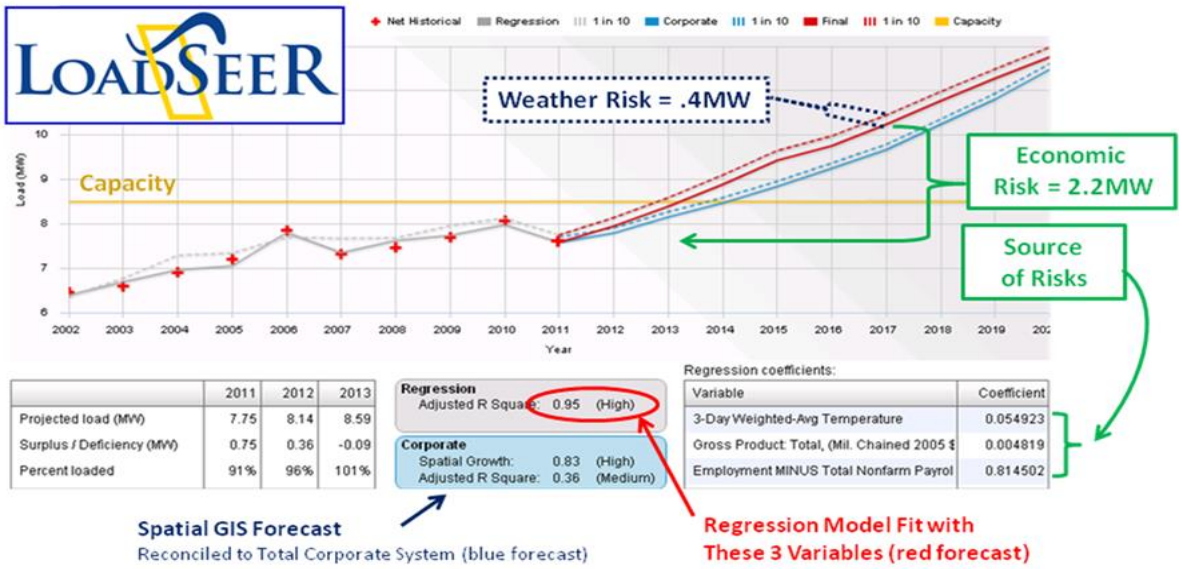
This new system reconciles and approves 3,500 circuit forecast models, and monitors more than 70 distribution engineers during the forecasting process. Prior to PG&E's implementation of LoadSEER, the large Northern California utility was using a typical spreadsheet solution for its electric load forecasting needs at the distribution and transmission levels. That solution was more or less manual for approximately 250 distribution planning areas.

The manpower being expended in data gathering, processing and reporting is now be better utilized to review the forecasts for accuracy and focus more time on planning the distribution system to accommodate the forecasted load.

What Are the Key Improvements to PG&E Distribution Forecasting?

- **Ability to forecast up to 100 economic influences, by circuit, in addition to weather. Powerful automated regression model fitting, with recommended forecasts to choose from, so the engineer simply has to pick the best one.**
- **A GIS spatial forecast, at the acre level, based on 20 years of NASA satellite histories, yielding key insights into how your loads grow within your specific regions. Comprehensive quality checking, process review, and log history, for use in data requests and defensibility, as well as oversight of who is doing what.**
- **Ability to directly integrate solar forecasts, EV forecasts or other micro grid impacts, down to the acre or customer level. We then export it to your power flow tool.**

In the example below, note some key insights. Economic risk over the next 6 years is 2.2 MW versus the weather risk at .4 MW. LoadSEER automatically scours up to 100 factors for you. Here we find the best 3 that lie at the heart of the risk for this circuit. We actually provide 2 different forecasts via very different methods. One is traditional regression (red line forecast, 3 influences). The second one uses 20 years of historical NASA satellite data, but is aligned to your overall corporate system projected growth, decomposed to customer classes down to the one acre level (blue line forecast). We even calculate the optimal blending of these forecasts, to take advantage of both approaches. Or you can pick one or the other, or overwrite your own, based on local knowledge.



LoadSEER provides in-depth model diagnostics for you, to determine your level of confidence in the forecasts. Below are the best 1 variable, 2 variable and 3 variable model fits, selected from among 100 possible key drivers. Note that weather does not enter the modeling as significant, until at least 2 economic variables are chosen. When we do add in weather in the 3 variable model, we see a nice improvement in Model Reliability and Adjusted R squared. All of this work is done for you, automatically, in LoadSEER. You can review, approve, or modify based upon your own local knowledge.

Number of Variables	Variables	Adjusted R Square	Model Reliability
0	n/a	0.00	24.19
1	Income: Total Personal, (Mil. $)	0.76	11.79
2	Gross Product: Total, (Mil. Chained 2005 $) Employment MINUS Total Nonfarm Payroll, (Ths.)	0.87	10.65
3	Gross Product: Total, (Mil. Chained 2005 $) Employment MINUS Total Nonfarm Payroll, (Ths.) 3-Day Weighted-Avg Temperature	0.95	6.40