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The IID (Imperial Irrigation District) 2013 load forecast study and report was provided by Leidos Engineering, LLC (Leidos) and is used for all IID long term planning purposes. Now the report is used by IID as Form 4 Demand Forecast Methods and Models to meet the 2015 IEPR submittal requests. The 2013 Load Forecast study utilized an econometric approach to forecast IID's system net energy for load (NEL) and coincident peak (CP) demand beginning 2013 through 2032. The study based on an analysis of the influence of retail customer counts and sales by major customer classification as a function of certain explanatory factors generally from 2000 through 2012 (the Study Period). The forecast also incorporated the load impact resulting from energy efficiency programs and demand-side management programs. Historical and projected economic and demographic data were provided by Woods & Poole Economics, Inc. Weather data was provided by the National Oceanic and Atmospheric Administration (NOAA). Historical load data and other relative data were provided by IID.

Final Report

2013 Load Forecast

Imperial Irrigation District

July 2014

leidos

Final Report

2013 LOAD FORECAST

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EXECUTIVE SUMMARY

Leidos Engineering, LLC (Leidos) was retained by Imperial Irrigation District (IID) to prepare a forecast of peak load and net energy for load for the IID system. IID is a consumer-owned public service agency which provides both electric and water service to agricultural, municipal, and industrial consumers. The IID Energy division supplies capacity and energy to approximately 145,000 customers within a service territory (IID System) composed of two service areas in southeast California. The Coachella Valley service area is located to the north of the Salton Sea and the Imperial Valley service area is located to the south of the Salton Sea.

A load forecast is a critical input to many utility processes including, but not limited to, generation resource planning, fuel and purchased power budgeting, transmission planning, financial planning and budgeting, and staffing. Consequently, a rigorous and detailed process that relies on recognized standards of practice, as well as a thorough review of results by various parties, is essential to IID operations and long-term planning.

The 2013 Load Forecast (Forecast) has been prepared for a 20-year period, beginning 2013 through 2032. The forecast uses an econometric approach to forecast monthly retail customer counts and sales by major customer classification as a function of certain explanatory factors based on an analysis of the influence of these factors generally over 2000 through 2012 (the Study Period). Forecasts of system net energy for load (NEL) and coincident peak (CP) demand are derived from the total sales forecast based on recent averages of distribution loss factors and load and coincidence factors.

The forecast relies on utility and load data maintained and provided by IID, historical data regarding estimates of Demand-Side Management (DSM) activity, and historical installations data associated with the IID PV Solutions Program (PV), which represent all currently known solar installations within the IID footprint. Historical and projected economic and demographic data were provided by Woods & Poole Economics, Inc. (Woods & Poole), a nationally recognized provider of such data. Leidos has also relied on information, provided by IID staff, regarding local economic developments and other issues specific to each service area. Weather data provided by the National Oceanic and Atmospheric Administration (NOAA) for a variety of weather stations in close proximity to the IID service territory was evaluated to determine the most appropriate weather station for use in the study.

DSM activity over the historical period 2006 – 2012 was compiled and organized into a custom DSM model based on data maintained by IID and information contained in the most recently available SB 1037 report, which catalogues energy efficiency programs by utility in the State of California. Data was organized based on the specific measure in question, the sector to which that measure was historically applied, the nature and extent of seasonality associated with the impacts of that measure (if any), and the program sector (e.g., appliances, lighting, etc.) for a given measure. Historical DSM impacts were amalgamated and compiled in order to produce grossed-up estimates of historical IID system determinants (defined below). Additionally, DSM impacts were projected into the future based on a monthly analysis to decompose annual program impacts based on weather patterns, which were combined with projections of known future program activity and a series of discounting factors to account for longer-term degradation to generate an export range of monthly DSM program impacts for each retail sector that was individually projected, as applicable. The discounting factors used to degrade longer-term cumulative DSM impacts were as follows:

- End-use degradation – this factor accounts for the degradation in the performance of individual end-uses through time.
- Market saturation factor – this factor accounts for the increased difficulty in obtaining and maintaining new market participants as the saturation for a given DSM measure increases.
- End-of-life impact – this factor accounts for certain measures deployed in the early portion of the study period reaching the end of their useful life within the study period.
- Baseline shift impact – this factor accounts for the fact that equipment baselines gradually shift through time, and that certain measures may be phased out or no longer relevant due to such shifts.
- Contingency – this is a small discounting factor that relates to the uncertainty inherent in estimates of demand and energy savings associated with specific DSM measures.

These DSM discounting factors and all of the IID historical information regarding DSM measures and their impacts have been compiled into a customized DSM analytical model, which will be relayed to IID at the conclusion of the project. The assumptions delineated above can be altered in terms of their discounting impact on the IID system determinants in the future at the discretion of IID staff.

The IID PV Solutions program was also analyzed in significant detail in order to derive grossed-up estimates of historical IID determinants, and to generate a reasonable long-term projection of the impact of the PV Solutions Program on IID energy and peak demand over the forecast horizon.

In order to assist IID with determining the estimated impact of distributed solar capacity on the Load Forecast, Leidos developed a historical tracking and analysis model for installed capacity on a retail basis. Historical installations for each retail class were derived from spreadsheet data provided to Leidos by IID. These installations were combined with Leidos' estimates of the monthly energy produced by an individual installation and the availability of solar output during each monthly peak period to derive an estimated monthly energy and peak demand impact for a representative solar installation within the IID footprint. Each distributed solar installation was assumed to have an annual degradation factor of 0.75% and a useful life of 20 years. Finally, a combination of Bass Diffusion modeling and trend modeling was applied to the historical data in each retail class to develop a reasonable estimate of the future rate of PV penetration on the IID system, which was then combined with the monthly performance assumptions described above to generate detailed monthly estimates of historical and projected PV impacts for each retail class.

The analysis of DSM activity and PV installations was a critical input to the downstream forecast results, the results for which are first defined and then presented below.

The Forecast results[1] are presented in this report under the following two perspectives with regard to the load impacts as they relate to the DSM and PV programs:

- **Gross of the DSM and PV programs (Gross NEL and Gross CP)** – These results are representative of the load levels for energy and demand that are grossed-up to account for the estimated load impacts with regard to the DSM and PV programs, i.e., actual historical values and projected forecast values represent what the load levels would have been assuming the estimated impacts of DSM and PV were/are not present.
- **Net of the DSM and PV programs (Net NEL and Net CP)** – The results are representative of the load levels for energy and demand that are net of the estimated load impacts with regard to the DSM and PV programs, i.e., actual historical values represent the load levels as they have been actually recorded, and projected forecast values represent load level projections assuming the estimated impacts of DSM and PV continue to be present as based on the forecasting approach described above.

This report will present the forecast results on the Gross of DSM and PV programs basis first, followed by the Net of DSM and PV programs basis.

In conjunction with IID, both the Gross and Net results shown below reflect a specific assumption about weather in the short term that deviates from an assumed return to long-term average (or "normal") weather conditions in the first year of the forecast period. Given IID's discomfort with the "spring back" to normal weather in 2013, Leidos conducted research into weather expectations for the year 2013. In addition, it is no secret that recently, the region surrounding the IID service territory has been experiencing very high temperatures. Were we to have completed the base case earlier in the year, we would have had more limited intelligence on how similar 2013 weather would have been to 2012. According to the Platts product to which Leidos subscribes, the private forecaster WSI, which provides shorter term forecasts, anticipated above normal weather for a good chunk of the U.S. in 2013, particularly in the West. Given this evidence, Leidos constructed an alternative weather assumption that assumes the same weather variability for the short term (or 2013) in the commercial equation, and keeps residential class usage levels flat at 2012 levels into the forecast horizon. Long-term weather assumptions, wherever appropriate, still reflect a return to normal weather conditions, which is in alignment with industry standard forecasting practices and is described further in Section 1. This scenario was constructed based on feedback from IID and represents the most useful result to IID for downstream planning purposes.

[1] The forecast architecture constructed for IID is forward looking. Consequently, references to prior forecasts that are anticipated to be compared to future forecasts may be present in the results graphs.

The results of the Forecast reflect that the Gross NEL of the IID System, depicted in Figure ES-1 below, is expected to grow at an annual average growth rate of 1.7% over calendar years 2013-2022 and 1.6% over 2023-2032. This compares to historical growth over the most recent 10 years (2003-2012) of 2.2% per year. As discussed further below, the load of the IID System over 2008-2012 has been depressed as a result of a severe downturn in the U.S. and California economies from which both are only just recently beginning to recover. In addition, it is important to recognize that the growth rate over the first 10 years of the forecast horizon is impacted by the projected improvement in economic conditions over 2013-2017. The historical data provided by IID indicates that load levels, on a weather normalized basis, have remained flat since 2007, which is generally indicative of some extent of insulation from depressed loads relative to similar utility benchmarks with which Leidos is familiar.

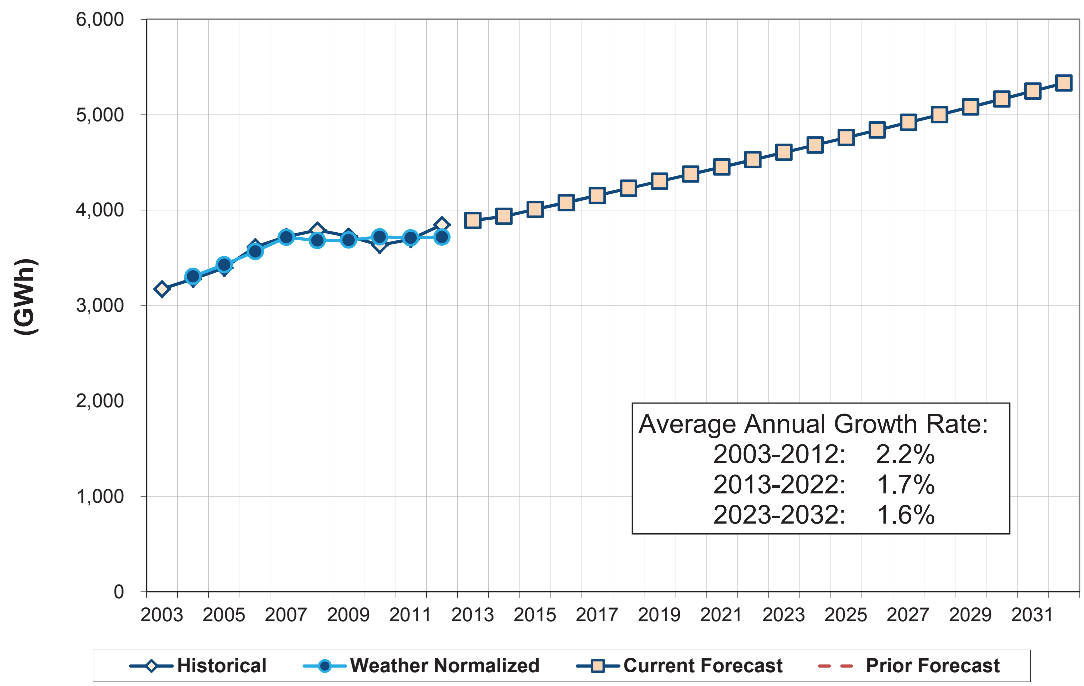

Figure ES-1: Total Gross NEL of the IID System

Figure ES-2 below summarizes the Gross CP demand forecast. The Forecast reflects that the Gross CP demand of the IID System is expected to grow at annual average growth rates of 1.7% over 2013-2022 and 1.6% over 2023-2032. This compares to historical growth over the most recent 10 years (2003-2012) of 2.9% per year. The Base Case projected calendar year 2013 Gross NEL and Gross CP of the IID System are 3,892 GWh and 1,053.1 MW, respectively. The IID System annual CP typically occurs in the summer, and more often in August than other summer months.

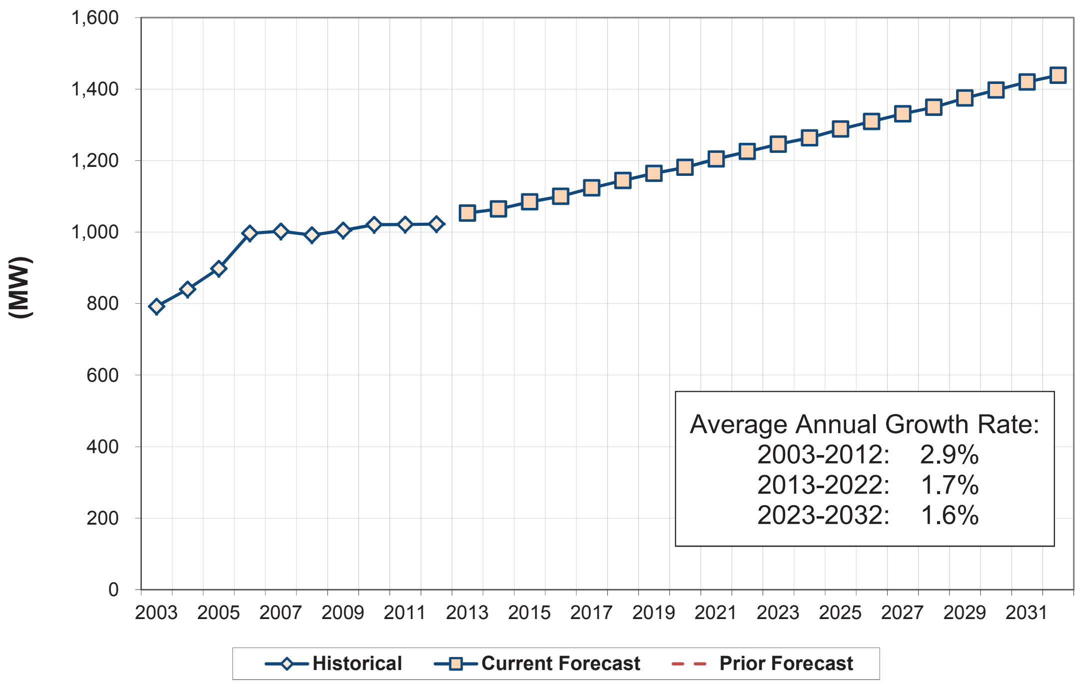

Figure ES-2: Total Gross CP Demand of the IID System

The results of the Forecast reflect that the Net NEL of the IID System, depicted in Figure ES-3 below, is expected to grow at an annual average growth rate of 1.7% over calendar years 2013-2022 and 1.8% over 2023-2032. This compares to historical growth over the most recent 10 years (2003-2012) of 1.8% per year.

Figure ES-4 below summarizes the Net CP demand forecast. The Forecast reflects that the Net CP demand of the IID System is expected to grow at annual average growth rates of 1.7% over 2013-2022 and 1.7% over 2023-2032. This compares to historical growth over the most recent 10 years (2003-2012) of 2.6% per year. The Base Case projected calendar year 2013 Net NEL and Net CP of the IID System are 3,753 GWh and 1,017.6 MW, respectively.

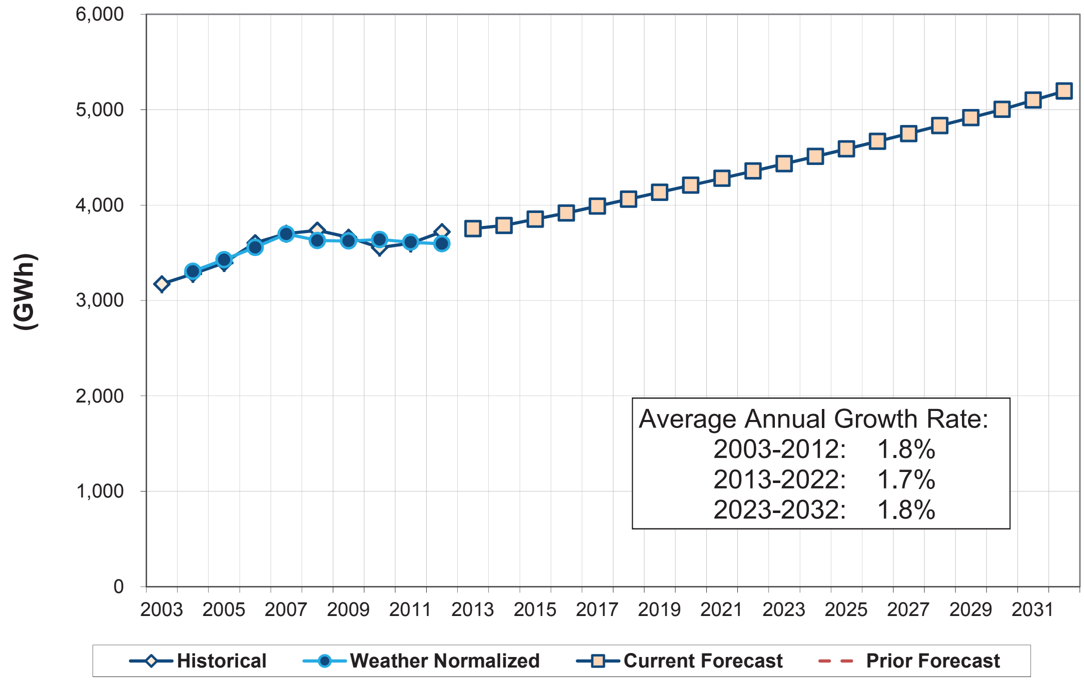

Figure ES-3: Total Net NEL of the IID System

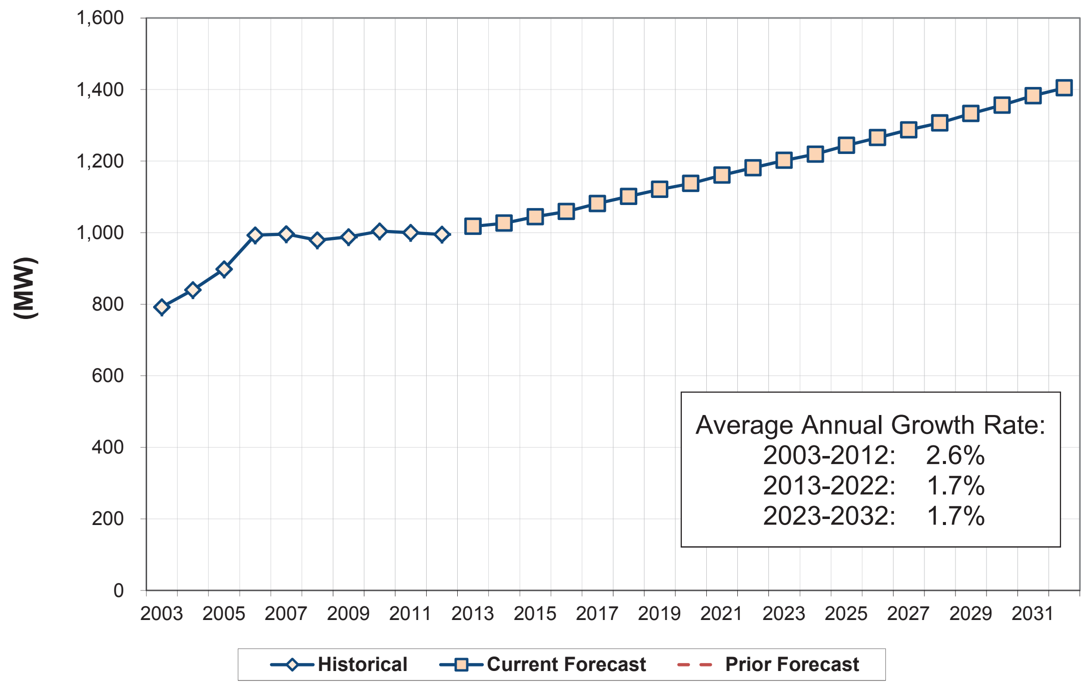

Figure ES-4: Total Net CP Demand of the IID System

Recent period historical growth rates are significantly impacted by the recession that began in late 2007 and from which the U.S. economy has only just begun to recover. In particular, the California economy has suffered a number of setbacks since 2007, including the following:

- persistently high unemployment, which as of the February 2014 Bureau of Labor Statistics estimates stood at 8.0 percent, which ranks 48th in the nation;
- A retrenchment in consumer expenditures due to low consumer confidence and uncertainty regarding longer-term employment prospects;
- The spillover effects of residential conservatism into the commercial sector, and
- Lingering housing equity issues associated with the dramatic downturn in home values and ongoing foreclosures in certain key states, which includes California.

These factors, as well as significant increases in the retail cost of electricity, the strengthening of efforts to promote DSM, and incentives associated with distributed generation, combine to alter expectations for future growth in the downward direction relative to historical benchmarks for growth. While electricity prices have fallen over the last few years, mostly due to the decline in natural gas prices, the economy has yet to recover in a significant and sustained way from these conditions. The exception is the unemployment rate, which has fallen steadily and much more quickly than previously expected, but much of the drop has been caused by declines in the available workforce (including departures of unemployed workers from the state) rather than significant increases in employment.

The current economic projections do reflect a recovery over 2013-2017 from these conditions, which should result in a similar recovery in the load served by the IID System. The forecasted growth rates in NEL and CP demand for the IID System over 2013-2022 shown above reflect the impact of this projected recovery. However, projected growth rates on a Gross basis are lower than historical rates of growth.

Figure ES-5 summarizes the components of the Base Case IID NEL forecast in terms of the elements involved in generating a “gross” historical forecast, as well as the details surrounding the difference between the projected gross NEL and net NEL in the form of specific, separated impacts of the IID PV Solutions program and the remainder of IID’s existing and project DSM activity. Figure ES-6 provides this same detail for the Base Case IID Summer CP demand.

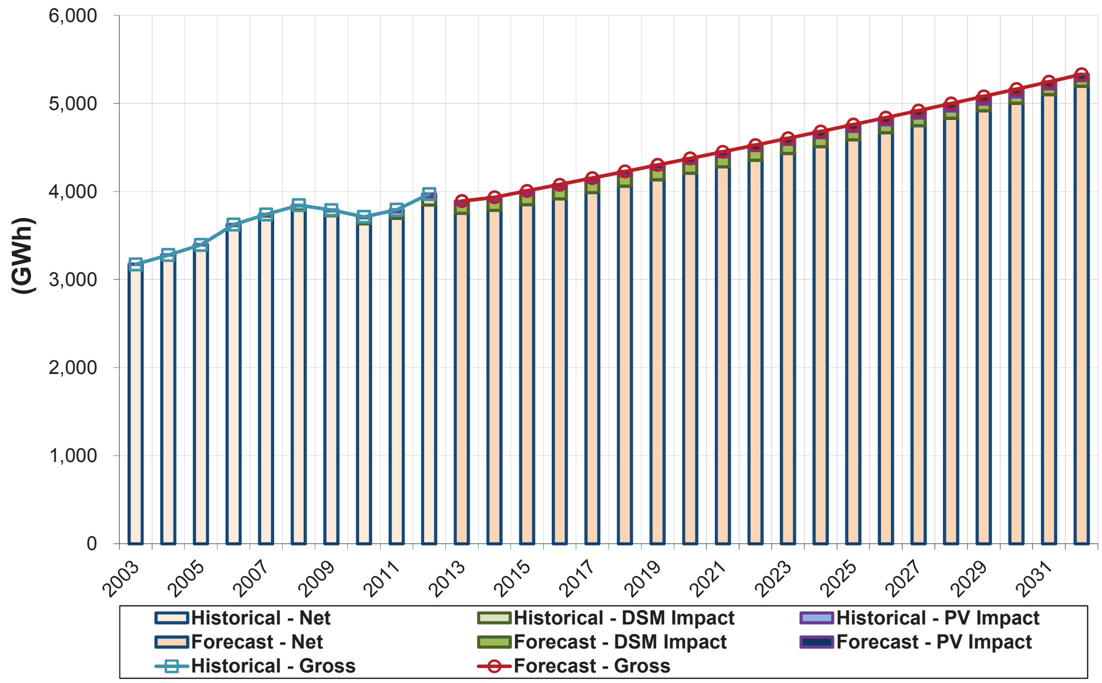

Figure ES-5: Total Net and Gross NEL of the IID System

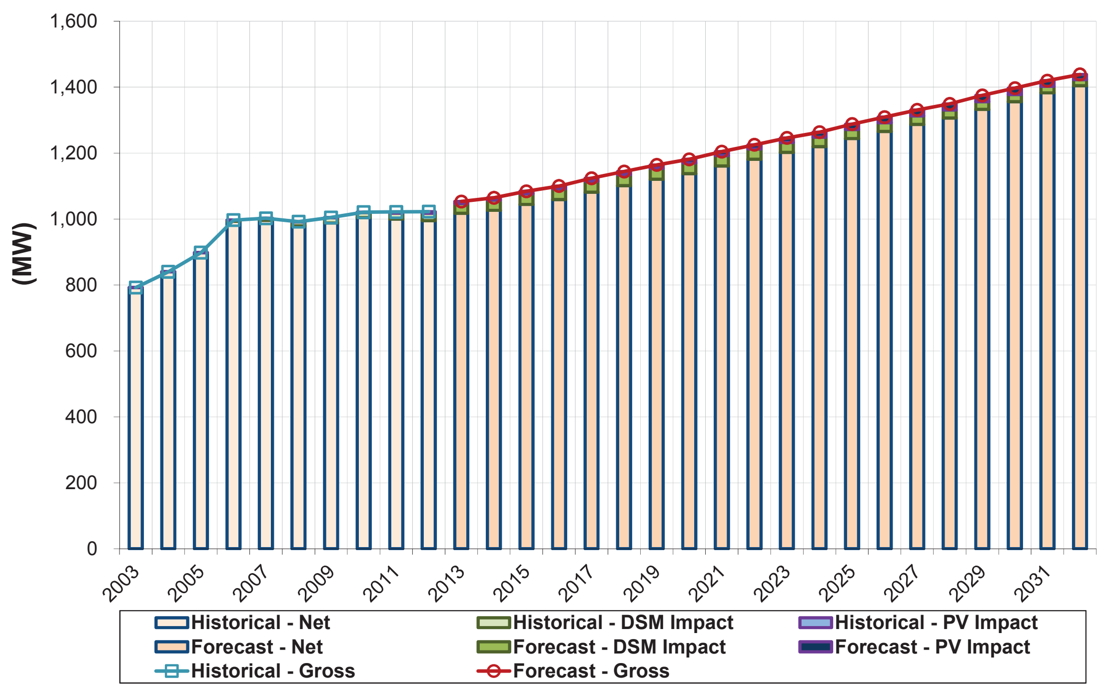

Figure ES-6: Total Net and Gross CP Demand of the IID System

As evidenced by Figures ES-5 and ES-6, the impact associated with the IID PV Solutions program and the IID DSM activities is not insignificant. To assist IID with future updates to account for changing dynamics for both programs, Leidos has created a series of Excel spreadsheet-based models to capture each program with the requisite detail needed to reflect estimated future impacts in the load forecast.

Consequently, while selected charts herein and within Appendices A, B. and C of this report capture compartmentalized impacts, the full extent of such impacts is also codified in the series of tools that Leidos will deliver to IID as part of the training element of this project.

The following report details the methodology, process, and results of the 2013 Load Forecast. The first section of the report provides an overview of the underlying methodology, including a general description of the econometric models and selected explanatory variables, as well as a discussion of the methodology involved in generating the Mild and Severe Weather scenarios (summarized in Appendices B and C, respectively) using the Base Case econometric equations. This overview is followed by a description of the data sources that have been relied on for the various types of data needed for the Forecast. Next, a list of principal considerations and assumptions, which have been relied upon, are included to provide context for the results. The Base Case results are then summarized and demand and energy requirements of the IID System are shown for selected years. Retail class-level detail on each individual forecast result is also provided. In addition to the Base Case results, the results of the Mild and Severe Weather scenarios generated for IID are summarized. Finally, some concluding recommendations are offered to place the 2013 Load Forecast results in context given the load forecasting process and underlying assumed economic projections. Appendix A contains detailed Base Case results for each IID retail class and in total, on both an annual and monthly basis through the end of the study period. Appendix B contains detailed Mild Weather results for each IID retail class[2] and in total. Appendix C contains detailed Severe Weather results. Additionally, Leidos will provide IID a series of models and analytical files at the conclusion of the project that will be buttressed with in-person training designed to help IID take ownership of the forecasting process.

[2] It is important to note that not all retail classes were found to be weather sensitive, and that consequently, the Mild and Severe Weather case results are identical to the Base Case for certain retail classes. Refer to Appendices B and C for complete annual and monthly detail for each retail class.

Section 1
OVERVIEW OF METHODOLOGY

The forecast of the IID system peak demand and net energy for load relies on an econometric forecast of retail sales, combined with various assumptions regarding loss, load, DSM, and PV generally based on the recent historical values for such factors. Econometric forecasting makes use of regression to establish historical relationships between energy consumption and various explanatory variables based on fundamental economic theory and experience.

In this approach, the significance of historical relationships is evaluated using commonly accepted statistical measures (e.g., standard error, adjusted R-squared, Schwarz Information Criterion, etc.). Models that, in the view of the analyst, best explain the historical variation of energy consumption are selected. These historical relationships are generally assumed to continue into the future, barring any specific information or assumptions to the contrary. The selected models are then populated with projections of explanatory variables, resulting in projections of energy requirements.

Econometric forecasting can be a more reliable technique for long-term forecasting than trend-based approaches and other techniques, because the approach results in an explanation of variations in load rather than simply an extrapolation of history. As a result of this approach, utilities are more likely to anticipate departures from historical trends in energy consumption, given accurate projections of the driving variables. In addition, understanding the underlying relationships that affect energy consumption allows utilities to perform scenario and risk analyses, thereby improving decisions. The ability to vary assumptions regarding short-term weather expectations in the content of an econometric model that is predicated upon quantification of the incremental impact of weather on load is an example of this capability, and indeed, the IID results presented herein benefited greatly from this model fidelity.

Forecasts of monthly sales were prepared by rate classification for the IID System. In some cases, rate classifications were combined to eliminate the effects of class migration or redefinition. In this way, greater stability is provided in the historical period upon which statistical relationships are based. The following is a list of the retail classes for which an econometric model was developed.

- Residential
- Residential Energy Assistance
- Mobile Home / Recreational Vehicle
- Agricultural Power
- Commercial (General Service and Large General Service)
- Special Contract
- Industrial (A-2)

- Lighting (Roadway and Outdoor)
- Municipal

The following classes have at one time or another in the historical period contributed to energy sales on the IID System. However, given that load levels associated with these classes have been zero for many years and the class itself has been phased out, no load has been assumed to be present in the forecast period for such classes.

- Time of Use (Agricultural)
- Interim (Retail)
- Economic Development

Model Specification

The following bullet-list discussion summarizes the development of econometric models used to forecast load, energy sales and customer accounts on a monthly basis by retail class, as applicable. The discussion of customer models and retail sales models are grouped by major retail class in order to reinforce certain key interrelationships that are a part of the forecasting process, most notably for the residential class.

- For the residential classes (Residential and Residential energy Assistance), residential usage was modeled as a function of (i) weather terms that capture monthly weather variability, (ii) lagged weather variables to account for the typical billing cycle offset from calendar data, (iii) seasonality terms that capture additional variations not due to weather in certain key months, and (iv) a limited number of terms intended to address level shifts in the usage data. The residential model was not used in the ultimate forecast, as it was determined that usage levels would be kept flat at 2012 levels into the forecast horizon based on feedback and interaction with IID. However, the model is part of the forecasting architecture developed for IID and can be updated in later periods if desired. The residential modeling framework typically projects residential usage and combines it with projections of residential customer counts to get to total residential sales. This is done due to the relative homogeneity of the residential space as compared to other retail classes, where retail sales are forecast directly given the disparities in function and usage patterns across customers in a particular retail class. Residential customers were modeled as a function of (i) blended population/households data comprising the IID service territory, (ii) several terms to capture level shifts and otherwise unexplained deviations in customer counts, and (iii) an autoregressive term. Projections of customers were combined with the aforementioned usage assumption to derive projected sales. For the Residential Energy Assistance class, a separate projection of lower-income households was developed to drive the future trajectory of the number of customers in that class, which was then combined with assumed usage.

- For the mobile home/recreational vehicle class, sales were modeled as a function of (i) blended personal income in the IID service territory, which is negatively correlated to this particular retail sector, and (ii) monthly weather variables. Customer counts were projected based on a trending model, which indicated a slow and steady declining trend in this sector.
- For the agricultural class, sales were modeled as a function of (i) the number of agricultural customers, (ii) weather variability terms on a monthly basis, and (iii) some limited terms intended to address anomalous data. The agricultural customer model was specified as a function of (i) blended farm employment within the IID service territory, and (ii) limited trend and autoregressive terms.
- For the combined commercial model, sales were a function of (i) blended personal income within the IID service territory, (ii) monthly weather terms, (iii) lagged monthly weather terms, and (iv) autoregressive terms. Customers were projected based on (i) blended retail employment within the IID service territory and (ii) certain trend terms to capture anomalous observations within the historical data set.
- Special contract sales and customer counts were kept flat into the forecast horizon given that IID currently has only one customer in this class and does not anticipate adding any additional special contract customers.
- For the Industrial class, sales were projected based on a time-series model that reverted to a flat long-term sales rate based on the expectation that IID would not add any additional industrial customers over the forecast horizon.
- For the lighting class, sales were projected as a function of (i) blended total employment in the IID service territory, and (ii) certain limited trend and autoregressive terms. Lighting customers were projected based on blended personal income in the IID service territory.
- Municipal sales were projected based on (i) blended personal income in the IID service territory, (ii) monthly weather terms, and (iii) certain limited trend terms intended to capture otherwise unexplained level shifts in the data. Customer counts were projected based on (i) blended personal income in the IID service territory, and (ii) certain limited trend/autoregressive terms.

Weather variables of a monthly nature referenced in the above discussion include heating and cooling degree-days for the current month and for the prior month. Lagged degree-day variables are included to account for the typical billing cycle offset from calendar data. In other words, sales that are billed in any particular month are typically made up of electricity that was used during some portion of the current month and of the prior month.

In certain instances, as noted above, specific modifications of the general theoretical model and additional variables were used to account for behavior that occurred during the study period or is expected to occur in the future but is unexplained by available data. Some of these additional variables address specific, known events, as guided by information provided by IID. Others account for observations of the dependent variable that are believed to be anomalous. While these adjustments artificially increase the “fit” of regression equations and are typically discouraged, large deviations from expected behavior tend to have a significant impact on resulting parameters and sometimes undeservedly so. In consultation with IID, we have treated certain anomalies as errors or otherwise removed certain observations from the regression process.

PV Solutions Program Impacts

Leidos worked with IID to prepare an analysis of the impacts of their PV Solutions program on the IID system retail loads using annual historical retail class data provided by IID along with a projection of adoption using a Bass Diffusion Model approach. In certain instances, the Bass Diffusion Model approach was explored but deemed inappropriate due to limited installations and poor parametric fit relative to the Bass Diffusion curve concept. In those cases, where it was deemed inappropriate, a reasonable adoption rate assumption was developed in cooperation with IID. Based on prior Leidos experience with distributed solar installations, Leidos assumed a useful life of 20 years, an annual degradation factor of 0.75 percent, and a capacity factor of 20.25 percent for a given installation. Using the assumptions described, an annual capacity and energy impact have been estimated.

Additionally, based on prior experience, Leidos generated a monthly profile of dependable capacity and energy available from such a resource. These profiles were then applied to the annual impacts estimated to generate a monthly estimation of the PV Solution Program Impacts.

The historical monthly impact estimates were then used to gross up the historical load data for purposes of forecasting the loads gross of the impacts for the PV Solutions Program. In addition, the projected monthly impact estimates were used to discretely adjust the forecast results to reflect a forecast that was net of PV Solutions Program impacts.

Demand Side Management Portfolio Impacts

The IID System includes a Demand Side Management Portfolio which provides incentives for consumers to join. Table 1-1 below describes the DSM programs included in the analysis for the Forecast.

Table 1-1
Demand Side Management Programs

No.	Program Sector	Category	Seasonality
1	Appliances	Res Clothes Washers	No Seasonality
2	HVAC	Res Cooling	CDD
3	Appliances	Res Dishwashers	No Seasonality
4	Consumer Electronics	Res Electronics	No Seasonality
5	HVAC	Res Heating	HDD
6	Lighting	Res Lighting	No Seasonality

No.	Program Sector	Category	Seasonality
7	Pool Pump	Res Pool Pump	No Seasonality
8	Refrigeration	Res Refrigeration	No Seasonality
9	HVAC	Res Shell	Total DD (HDD+CDD)
10	Water Heating	Res Water Heating	No Seasonality
11	Comprehensive	Res Comprehensive	No Seasonality
12	Process	Non-Res Cooking	No Seasonality
13	HVAC	Non-Res Cooling	CDD
14	HVAC	Non-Res Heating	HDD
15	Lighting	Non-Res Lighting	No Seasonality
16	Process	Non-Res Motors	No Seasonality
17	Process	Non-Res Pumps	No Seasonality
18	Refrigeration	Non-Res Refrigeration	No Seasonality
19	HVAC	Non-Res Shell	Total DD (HDD+CDD)
20	Process	Non-Res Process	No Seasonality
21	Comprehensive	Non-Res Comprehensive	No Seasonality
22	Other	Non-Res Other	No Seasonality

DSM activity over the historical period 2006 – 2012 was compiled and organized into a custom DSM model based on data maintained by IID and information contained in the most recently available SB 1037 report, which catalogues energy efficiency programs by utility in the State of California. Data was organized based on the specific measure in question, the sector to which that measure was historically applied, the nature and extent of seasonality associated with the impacts of that measure (if any), and the program sector (e.g., appliances, lighting, etc.) for a given measure. Historical DSM impacts were amalgamated and compiled in order to produce grossed-up estimates of historical IID system energy and peak demand. Additionally, DSM impacts were projected into the future based on a monthly analysis to decompose annual program impacts based on weather patterns, which were combined with projections of known future program activity and a series of discounting factors to account for longer-term degradation to generate an export range of monthly DSM program impacts for each retail sector that was individually projected, as applicable. The discounting factors used to degrade longer-term cumulative DSM impacts were as follows:

- End-use degradation – this factor accounts for the degradation in the performance of individual end-uses through time.
- Market saturation factor – this factor accounts for the increased difficulty in obtaining and maintaining new market participants as the saturation for a given DSM measure increases.
- End-of-life impact – this factor accounts for certain measures deployed in the early portion of the study period reaching the end of their useful life within the study period.

- Baseline shift impact – this factor accounts for the fact that equipment baselines gradually shift through time, and that certain measures may be phased out or no longer relevant due to such shifts.
- Contingency – this is a small discounting factor that relates to the uncertainty inherent in estimates of demand and energy savings associated with specific DSM measures.

These DSM discounting factors and all of the IID historical information regarding DSM measures and their impacts have been compiled into a customized DSM analytical model, which will be relayed to IID at the conclusion of the project. The assumptions delineated above can be altered in terms of their discounting impact on the IID system determinants in the future at the discretion of IID staff.

The DSM program impacts were then aggregated to the IID System level on a capacity and energy basis. These impacts were used in conjunction with the PV Solutions Program impacts to estimate the total impact of the DSM and PV Solutions programs both historically and into the projected period.

Projection of NEL and Peak Demand

The forecast of sales for each rate classification described above are summed to equal the total sales. An assumed loss factor, based on a rolling 5-year average of historical loss factors, is then applied to the total sales to derive monthly NEL.

Projections of peak demands were developed by applying projected load factors, generally based on an analysis of historical load factors, to the forecasted net energy for load on the IID System basis. However, prior to computing the necessary historical load factors from which to develop projections, Leidos worked with IID staff to perform an analysis of the historical impacts of DSM and PV. These impacts have been added back to the metered demands of the IID System to produce historical gross determinants for use in the forecast. As a result, the forecasted gross peak demands reflect the peak demands that the IID System should be prepared to serve irrespective of reductions in load that might be realized as a result of these resources, as they are not entirely controlled by IID and cannot be counted on to be active during peak periods.

Projections of summer and winter CP demand were developed by applying projected seasonal load factors to the forecasted NEL. The projected load factors are based on the average relationship between historical annual NEL and the seasonal peak demand over the period 2005-2013.

Monthly peak demand is based on the average relationship between each monthly peak and the appropriate seasonal peak. This average relationship was computed after ranking the historical demand data within the summer and winter seasons and reassigning peak demands to each month based on the typical ranking of that month compared to the seasonal peak. This process avoids distortion of the averages due to randomness as to the months in which peak weather conditions occur within each season. For example, a summer peak period can occur during July or August of any year. It is important that the shape of the peak demands reflect that only one of those two months is the peak month and that the other is typically some percentage less.

Weather Uncertainty and Mild & Severe Weather Scenarios

In addition to the Base Case forecast, which relies on normal weather conditions, we have developed high and low forecasts, referred to herein as the Severe and Mild Weather cases, intended to capture the volatility resulting from weather variations equivalent to 90% of potential occurrences. Accordingly, load variations due to weather should be outside the resulting "band" between the Mild and Severe weather cases less than 1 out of 10 years.

The potential weather variability was developed using weather data selected to represent the IID service territory, as detailed in Section 2 of this report. These weather volatility statistics are only updated periodically, as they tend to be fairly stable over sufficiently long periods of time. It is anticipated that these weather volatility statistics will be updated as deemed appropriate for future iterations of the Forecast.

The scenarios are intended to represent the range of potential weather experienced in the summer and winter seasons. These weather scenarios simultaneously reflect more and less severe weather conditions in both seasons, although this is less likely to happen than severe conditions in one season or the other.

In order to derive the Mild and Severe Weather Scenarios, the following specific steps were undertaken:

- The historical data was subjected to an analysis to determine the standard deviation of degree days[3] (both heating and cooling, as appropriate) over the available historical period. This measure of variation was used to construct a mild degree day data set and a severe degree day data set for all future degree day values in the non-shoulder periods (i.e., summer and winter months) by taking the critical value associated with a 90% confidence interval and adding (severe) or subtracting (mild) that many standard deviations to/from the mean of each relevant degree day measure.
- The core econometric equations for the Base Case for all retail classes that were found to be weather sensitive (i.e., contained degree day measures as variables) were re-simulated using both the Mild assumed future weather conditions as well as the Severe future weather conditions. Importantly, the weather simulations of alternative conditions did not intersect the period where specific alternative weather assumptions were assumed (i.e., the weather simulations began subsequent to 2013).
- Utilizing the resultant sales forecasts for each retail class from the simulations above, the remaining forecast steps were replicated to produce total IID level NEL and Peak demand determinants on both a gross and net basis (note: the weather scenarios as output represent the "gross" projections, and are then

[3] Refer to Section 2 of this report for further details on the degree day measures utilized in the forecast.

ratcheted downward to reflect the impacts of the IID PV Solutions program and IID DSM activity, as appropriate).

Historical Participant Retail Sales, Demand Side Management, and PV Solutions Program Data

Data for numbers of customer accounts, electric sales, revenues, demand side management activity, and PV Solutions Program distributed solar impacts collected and maintained by IID were furnished to Leidos. Retail data were generally available and analyzed over January 2000 through December 2013 (Study Period). Demand side management activity as reported by IID was provided for the period 2006 through 2013 program years. PV Solutions Program data was provided by IID for the 2003-2013 program years, and reflects all known distributed solar installations within the IID footprint.

Weather Data

Historical weather data has been provided by the National Climatic Data Center (a subsidiary of the NOAA). Weather stations, for which historical weather was obtained, were reviewed and analyzed for completeness and reasonableness. The weather station used in the study was selected based on the quality and proximity to the IID service areas and correlation to other weather stations with geographical advantages.

The influence on electricity sales of weather has been represented through the use of two data series—heating and cooling degree-days (HDD and CDD, respectively.) Degree-days are derived by comparing the average daily temperature and a base temperature, typically 65 degrees Fahrenheit, the base relied on herein. To the extent the average daily temperature exceeds the base, the difference between that average temperature and the base is the number of CDD for the day in question. Conversely, HDD result from average daily temperatures that are below the base. Heating and cooling degree-days are then summed over the period of interest, in this case, months.

Weather conditions assumed over the forecast horizon are based on the average of monthly HDD and CDD, as reported by the NOAA, from the period 1950 through 2012 for all complete monthly data sets, with the exception of the first forecast year, which has been assumed to experience the same weather variability in the commercial sector as was experienced in 2012. Figure 2-1 below depicts historical data regarding HDD and CDD for the Desert Resorts Regional airport weather station. The figure includes both actual historical values and long-term normal values. The figure shows that HDD have been above normal for winter 2011/2012, while 2012 summer conditions were also above normal.

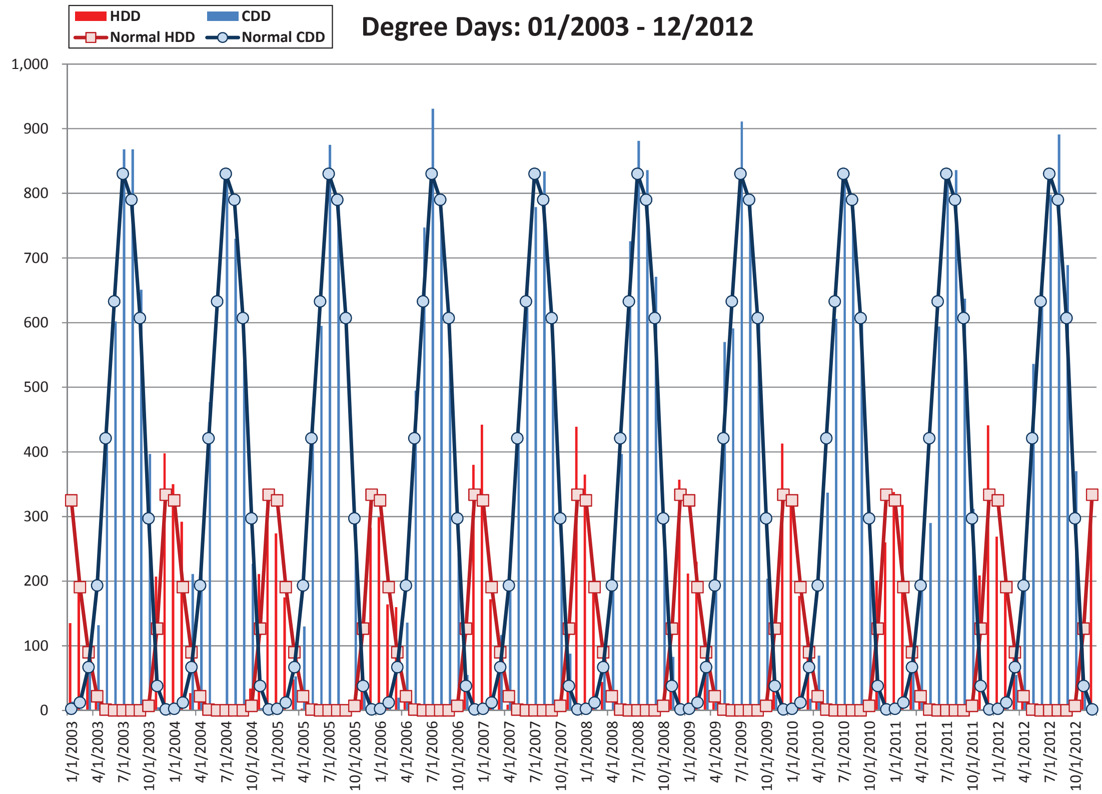

Figure 2-1: Historical v. Normal Heating and Cooling Degree Days

Economic Data

Historical and projected economic and demographic data were obtained from Woods & Poole Economics, a nationally recognized provider of economic data. The data relied on include economic and demographic data for 2 counties in which the IID service territory predominantly resides. The data for each county was blended using a weighted average derived from 2012 energy sales data. This data includes county population, households, employment, personal income, and gross domestic product. Although all data was not necessarily utilized in each of the forecast equations, each was examined for its potential to explain changes in the IID System historical electric sales.

Two of the most influential variables in the 2013 Forecast, household counts and average real personal income, are shown in the Figures 2-2 and 2-3 below. As the forecast architecture developed for IID is forward-looking, the figures below contain spacing for future economic forecasts to be compared in future iterations. Consequently, growth rates for future forecast vintages are “not applicable”, as a placeholder in anticipation of future forecast updates.

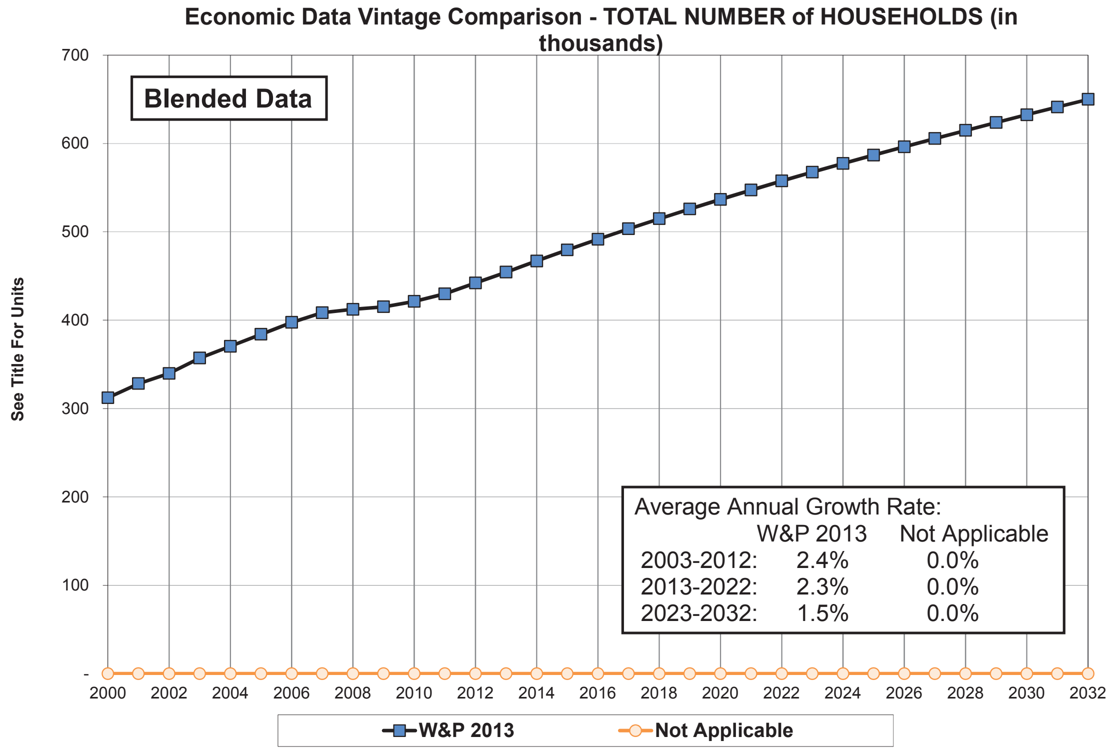

Figure 2-2: Household Counts - Blended

As evidenced by Figure 2-2, household counts in the blended IID service territory are projected to continue to grow at a steady pace, and the core catalyst for future load growth in the residential sector, given the assumption of flat usage levels, is anticipated to be customer counts. Note that the customer count projections are based on the derivation of an elasticity relative to historical IID data, and consequently, the growth rates associated with Figure 2-2 above are not directly indicative of projected growth rates over the study period.

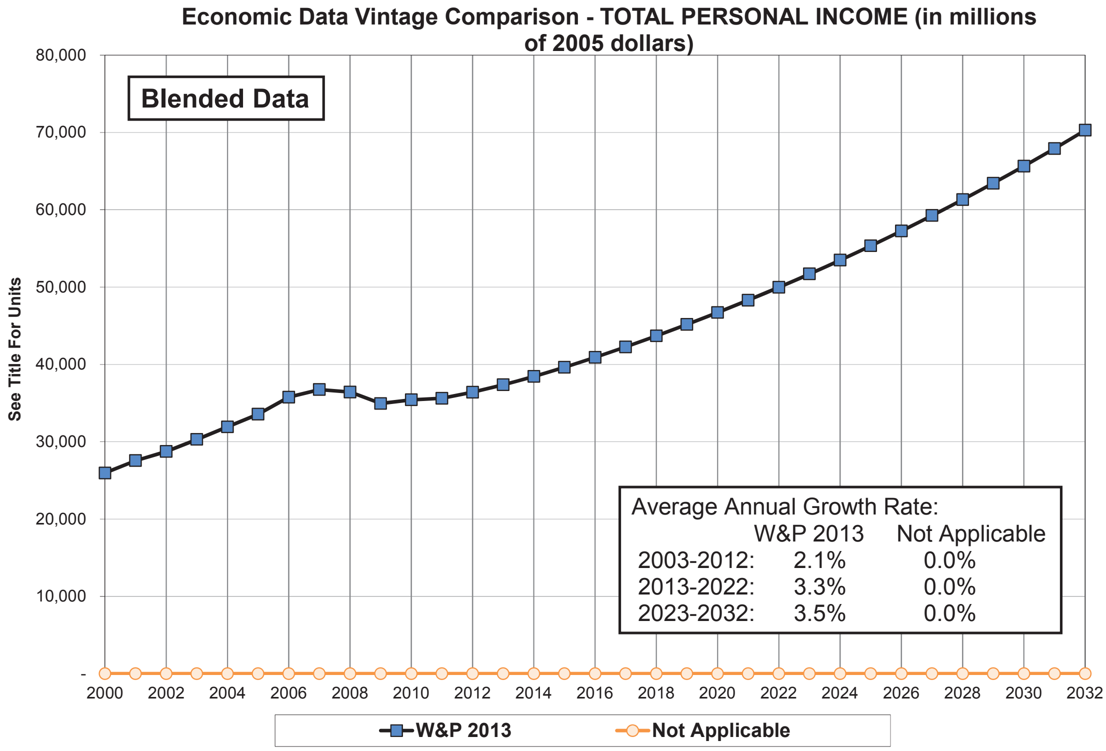

Figure 2-3: Total Personal Income ($M2005) - Blended

Note that personal income refers to the total income earned by the population in a county rather than average personal income per capita, thereby combining population and income per capita concepts. Additionally, it is of note that the long-term growth rates in personal income growth in total far outpace projected IID load growth. This is in alignment with expectations, as it is again the estimated elasticity with respect to income as predicated upon the econometric models that drives long-term growth in a given retail class, as described in Section 1.

Real Electricity Price and Natural Gas Price Data

The real price of electricity is generally represented as a multi-month moving average of real average revenue, based on state level data obtained from the U.S. Energy Information Administration (EIA). The moving average period varies from 12 to 60 months (i.e., one to five years) but is in multiples of twelve months to avoid the seasonality that is typical of average electricity revenues, which would be correlated with weather-related influences. It is expected that changes in electricity prices will yield greater variations in load after a longer period of time has elapsed. However, the strong negative correlation between electricity prices and economic data precluded a lengthier lag treatment for the price variable in many cases. Additionally, while the price of both electricity and natural gas was experimented with as a candidate explanatory variable in each of the retail models (given the significant empirical work performed in the industry that suggests that price response can be a key driver of load variation), none of the individual retail models suggest that price response in various lag structures has been a significant determinant of load growth or contraction. Leidos will work with IID as part of the in-person training to ensure that future experimentation with price terms is retained as part of the forecasting process.

Section 3
PRINCIPAL CONSIDERATIONS AND ASSUMPTIONS

In preparing the 2013 Load Forecast, as summarized in this report, we have made certain assumptions with respect to conditions that may occur in the future. These assumptions primarily relate to economic, demographic, and weather conditions. With regard to certain of these factors, we have used and relied upon information provided to us, or prepared by others. While we believe the assumptions made by us in preparing the 2013 Load Forecast are reasonable for the purposes of the forecast, they are dependent on future events, and actual conditions may differ from those assumed. While we believe the sources of the information provided to us, or prepared by others, to be reliable and the use of such information to be reasonable for the purposes of the forecast, we offer no other assurances with respect thereto.

To the extent that economic, demographic, weather, or other conditions occur that are different from those assumed by us or from the information provided to us or prepared by others, the actual load on the IID system can be expected to vary from the forecast. It should be emphasized that the confidence associated with any forecast varies inversely with the length of the forecast horizon. The probability of other factors affecting forecasted values increases with uncertainty about future developments; this uncertainty increases with the length of the forecast horizon. With this in mind, the 2013 Load Forecast should be seen as providing reasonable estimates of future demand and energy requirements of the IID System for the purposes for which the forecast is intended; however, these estimates are subject to the future effects of factors that cannot be reasonably foreseen at this time.

The development of the 2013 Load Forecast was based upon the following principal considerations and assumptions:

- The future influence on energy sales of the economic, demographic, and weather factors, on which the econometric models are based, was assumed to be similar to the estimated influence of such factors generally over the period 2000 through 2013.
- Although the econometric models implicitly account for the historical relationships between energy usage and the following factors to the extent they have occurred in the past, the 2013 Load Forecast does not explicitly reflect extraordinary potential future effects of: (a) increases in appliance design efficiency or building insulation standards; (b) significant conservation efforts, including those funded by IID, the state of California, and the federal government, that are <u>not</u> a function of changes in electricity or natural gas prices; (c) development of substitute energy sources, or demand-side generation outside of the PV Solutions Program; (d) consumers switching to traditional or new types of electrical appliances from other alternatives (e.g., electric vehicles); (e) consumers switching from electrical appliances to other alternatives; or (f) variations in load that might result from legal, legislative, regulatory, or policy actions.

- The recent average historical relationships between annual summer and winter coincident demands and annual NEL and between monthly CP demands and annual winter and summer CP demands were assumed to represent reasonable approximations of future load relationships between demands and energy requirements.
- The demand impact of the DSM programs and PV Solutions Program, as projected in the custom tracking and analysis tool, differs from the demand impact imputed using the average system load factor methodology described above. This methodology is reflective of the historically embedded impacts to both energy and demand of the DSM programs and PV Solutions Program on the IID system. The use of the average system load factor methodology is an industry-accepted method and was assumed to be a reasonable representation of the impact of such programs on the IID system.
- The data regarding the historical impacts of DSM programs reported by IID are assumed to be accurate. As discussed previously, Leidos has prepared, with IID's assistance, a custom tracking and analysis tool to capture the impacts of DSM program activity and load impacts, the levers for which can be adjusted in future forecast iterations as the DSM portfolio matures or contracts, as appropriate.
- The data regarding the PV Solutions Program, including historical participation and marginal impacts, are assumed to be accurate. As discussed previously, Leidos has prepared, with IID's assistance, a customized tracking and analysis model for the PV Solutions Program activity and load impacts. While Leidos has taken care to apply industry-accepted methods to the forecast of future PV penetration within the IID service territory, the onset of such adoption is still in its infancy, and a considerable amount of uncertainty regarding future incentives, cost structures, and legislation regarding distributed solar installations persists. Consequently, it is possible that the market cap imposed upon installations as a function of diffusion modeling or other trend-based approaches may differ from actual conditions. These models should be updated in tandem with the core econometric models as the forecast process moves forward, in order to continually track the momentum of PV installations across the IID footprint.

Section 4
OVERVIEW OF RESULTS

Results of the load forecast[4] included herein for the IID System are presented in the following two ways:

- **Gross of the DSM and PV programs (Gross NEL and Gross CP)** – These results are representative of the load levels for energy and demand that are grossed up to account for the estimated load impacts with regard to the DSM and PV programs, i.e., actual historical values and projected forecast values represent what the load levels would have been assuming the estimated impacts of DSM and PV were/are not present.
- **Net of the DSM and PV programs (Net NEL and Net CP)** – The results are representative of the load levels for energy and demand that are net of the estimated load impacts with regard to the DSM and PV programs, i.e., actual historical values represent the load levels as they have been and projected forecast values represent load level projections assuming the estimated impacts of DSM and PV continue to be present as based on the forecasting approach described herein.

The Gross NEL and Gross CP basis results are presented first, which reflects the load that IID could actually serve if the programs were suddenly unsuccessful. Subsequently, results are shown on a Net NEL and Net CP basis.

In conjunction with IID, both the Gross and Net results shown below reflect a specific assumption about weather in the short term that deviates from an assumed return to long-term average (or "normal") weather conditions in the first year of the forecast period. Given IID's discomfort with the "spring back" to normal weather in 2013, Leidos conducted research into weather expectations for the year 2013. In addition, it is no secret that recently, the region surrounding the IID service territory has been experiencing very high temperatures. Were we to have completed the base case earlier in the year, we would have had more limited intelligence on how similar 2013 weather would have been to 2012. According to the Platts product to which Leidos subscribes, the private forecaster WSI, which provides shorter term forecasts, anticipated above normal weather for a good chunk of the U.S. in 2013, particularly in the West. Given this evidence, Leidos constructed an alternative weather assumption that assumes the same CDD and HDD for the short term (or 2013) in the commercial equation, and keeps residential class usage levels flat at 2012 levels into the forecast horizon. Long-term weather assumptions, wherever appropriate, still reflect a return to normal weather conditions, which is in alignment with industry standard forecasting practices. This scenario was constructed based on feedback from IID and represents the most useful result to IID for downstream planning purposes.

[4] The forecast architecture constructed for IID is forward looking. Consequently, references to prior forecasts that are anticipated to be compared to future forecasts may be present in the results graphs.

The results of the Forecast reflect that the Gross NEL of the IID System, depicted in Figure 4-1 below, is expected to grow at an annual average growth rate of 1.7% over calendar years 2013-2022 and 1.6% over 2023-2032. This compares to historical growth over the most recent 10 years (2003-2012) of 2.2% per year. As discussed further below, the load of the IID System over 2008-2012 has been depressed as a result of a severe downturn in the U.S. and California economies from which both are only just recently beginning to recover. In addition, it is important to recognize that the growth rate over the first 10 years of the forecast horizon is impacted by the projected improvement in economic conditions over 2013-2017. The historical data provided by IID indicates that load levels, on a weather normalized basis, have remained flat since 2007, which is generally indicative of some extent of insulation from depressed loads relative to similar utility benchmarks with which Leidos is familiar.

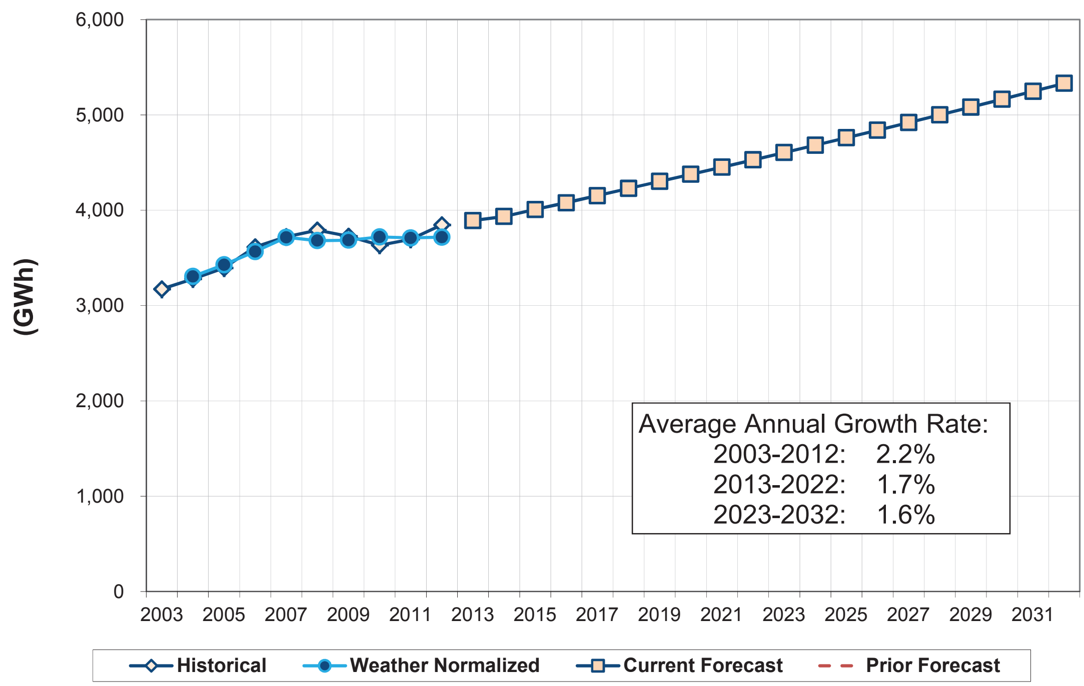

Figure 4-1: Total Gross NEL of the IID System

Figure 4-2 below summarizes the Gross CP demand forecast. The Forecast reflects that the Gross CP demand of the IID System is expected to grow at annual average growth rates of 1.7% over 2013-2022 and 1.6% over 2023-2032. This compares to historical growth over the most recent 10 years (2003-2012) of 2.9% per year. The Base Case projected calendar year 2013 Gross NEL and Gross CP of the IID System are 3,892 GWh and 1,053.1 MW, respectively. The IID System annual CP typically occurs in the summer, and more often in August than other summer months.

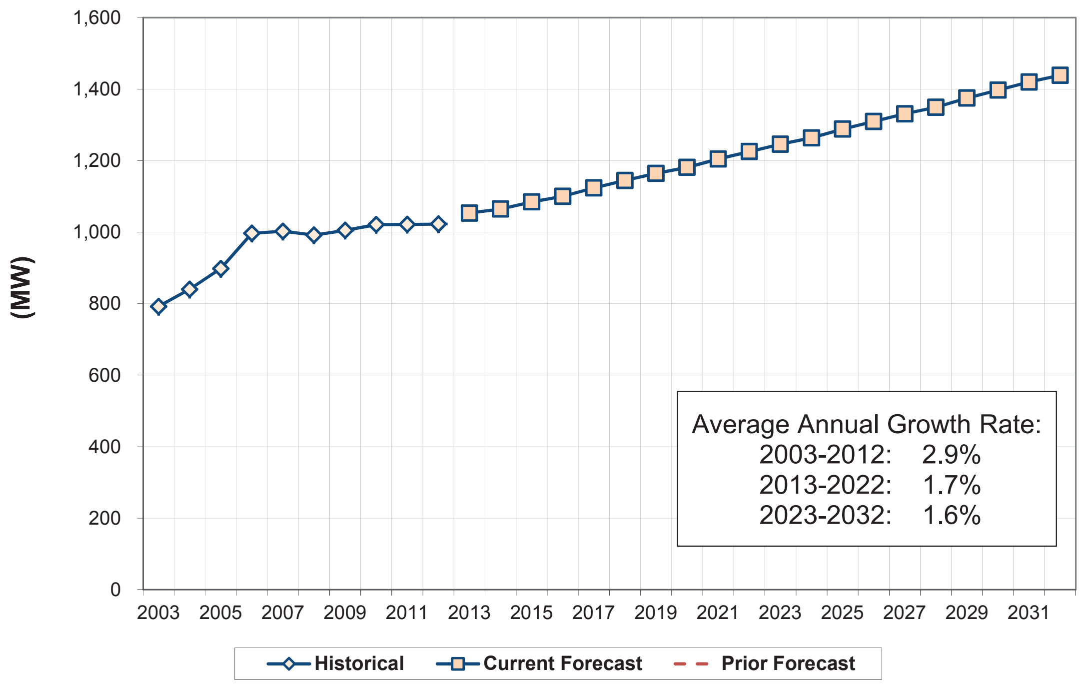

Figure 4-2: Total Gross CP Demand of the IID System

The results of the Forecast reflect that the Net NEL of the IID System, depicted in Figure 4-3 below, is expected to grow at an annual average growth rate of 1.7% over calendar years 2013-2022 and 1.8% over 2023-2032. This compares to historical growth over the most recent 10 years (2003-2012) of 1.8% per year.

Figure 4-4 below summarizes the Net CP demand forecast. The Forecast reflects that the Net CP demand of the IID System is expected to grow at annual average growth rates of 1.7% over 2013-2022 and 1.7% over 2023-2032. This compares to historical growth over the most recent 10 years (2003-2012) of 2.6% per year. The Base Case projected calendar year 2013 Net NEL and Net CP of the IID System are 3,753 GWh and 1,017.6 MW, respectively.

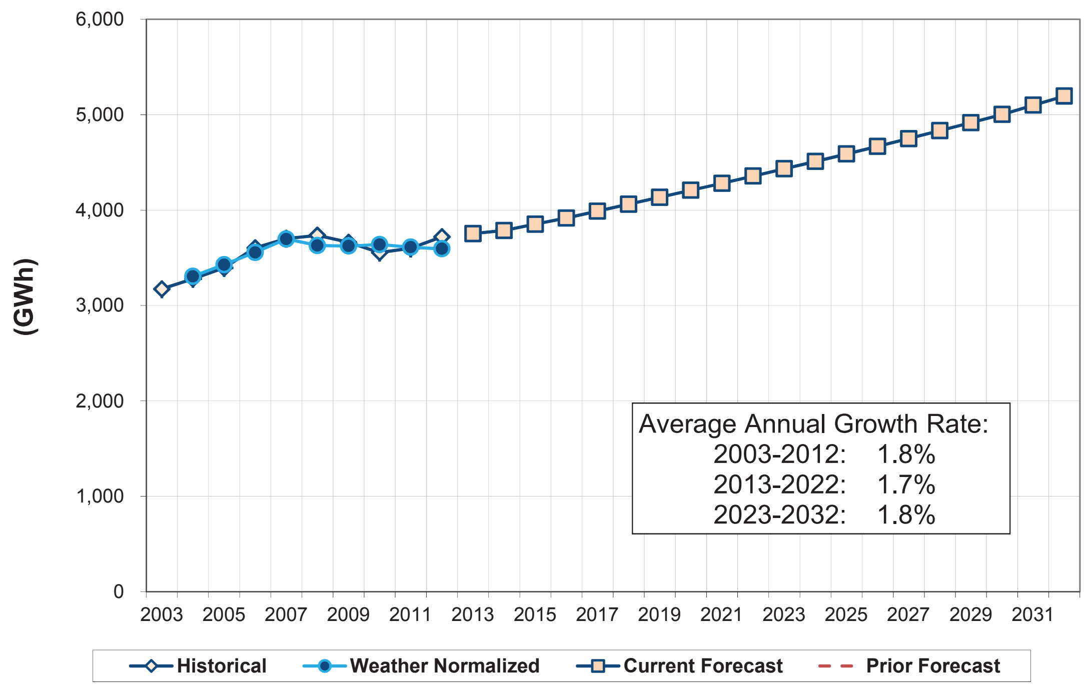

Figure 4-3: Total Net NEL of the IID System

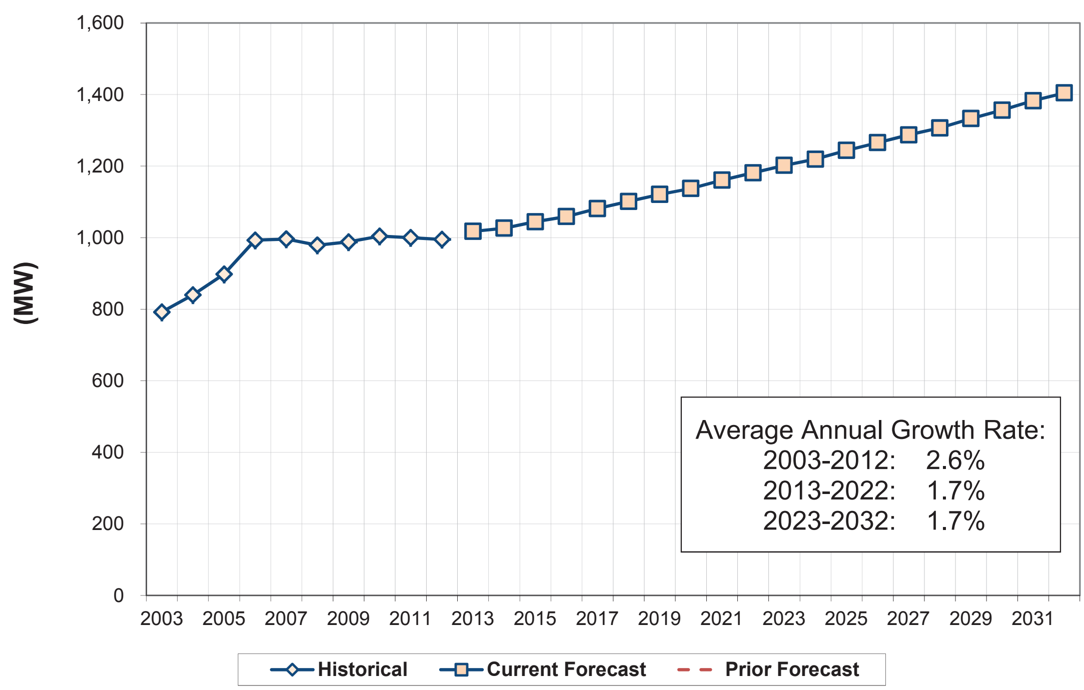

Figure 4-4: Total Net CP Demand of the IID System

Recent period historical growth rates are significantly impacted by the recession that began in late 2007 and from which the U.S. economy has only just begun to recover. In particular, the California economy has suffered a number of setbacks since 2007, including the following:

- persistently high unemployment, which as of the February 2014 Bureau of Labor Statistics estimates stood at 8.0 percent, which ranks 48th in the nation;
- A retrenchment in consumer expenditures due to low consumer confidence and uncertainty regarding longer-term employment prospects;
- The spillover effects of residential conservatism into the commercial sector, and
- Lingering housing equity issues associated with the dramatic downturn in home values and ongoing foreclosures in certain key states, which includes California.

These factors, as well as significant increases in the retail cost of electricity, the strengthening of efforts to promote DSM, and incentives associated with distributed generation, combine to alter expectations for future growth in the downward direction relative to historical benchmarks for growth. While electricity prices have fallen over the last few years, mostly due to the decline in natural gas prices, the economy has yet to recover in a significant and sustained way from these conditions. The exception is the unemployment rate, which has fallen steadily and much more quickly than previously expected, but much of the drop has been caused by declines in the available workforce (including departures of unemployed workers from the state) rather than significant increases in employment.

The current economic projections do reflect a recovery over 2013-2017 from these conditions, which should result in a similar recovery in the load served by the IID System. The forecasted growth rates in NEL and CP demand for the IID System over 2013-2022 shown above reflect the impact of this projected recovery. However, projected growth rates on a Gross basis are lower than historical rates of growth.

The results of the Forecast, <u>on a Gross and Net basis</u>, are summarized in Appendix A that accompanies this report. Appendices B and C provide similar annual and monthly detail for the Mild and Severe Weather scenarios, respectively.

Figure 4-5 summarizes the components of the Base Case IID NEL forecast in terms of the elements involved in generating a “gross” historical forecast, as well as the details surrounding the difference between the projected gross NEL and net NEL in the form of specific, separated impacts of the IID PV Solutions program and the remainder of IID’s existing and project DSM activity. Figure 4-6 provides this same detail for the Base Case IID Summer CP demand.

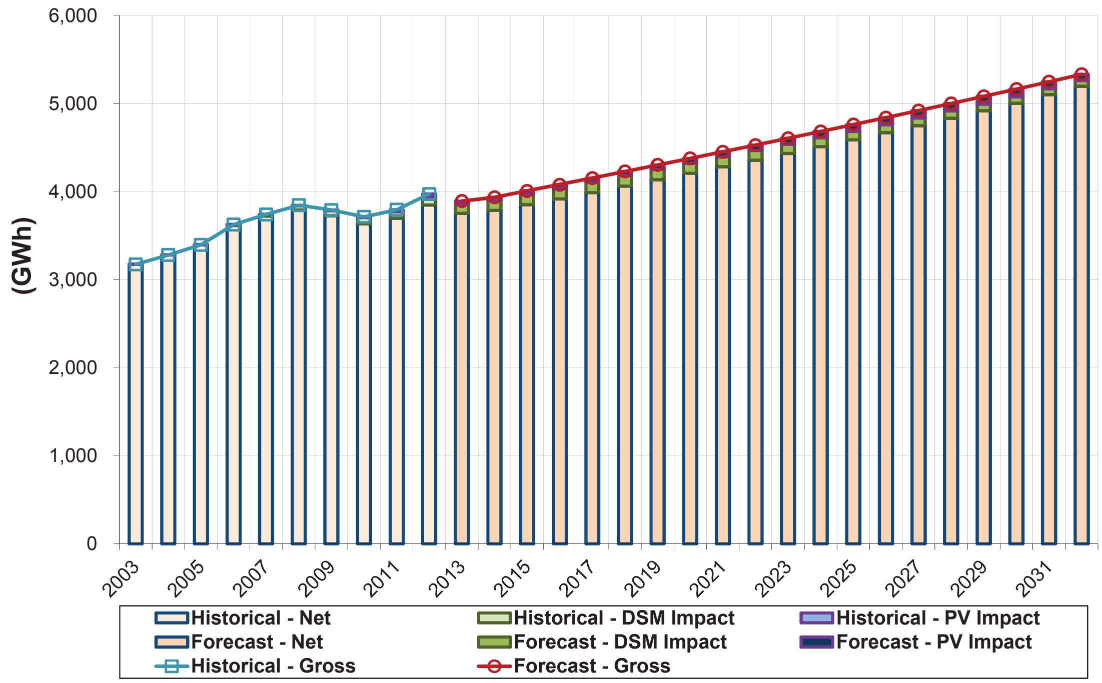

Figure 4-5: Total Net and Gross NEL of the IID System

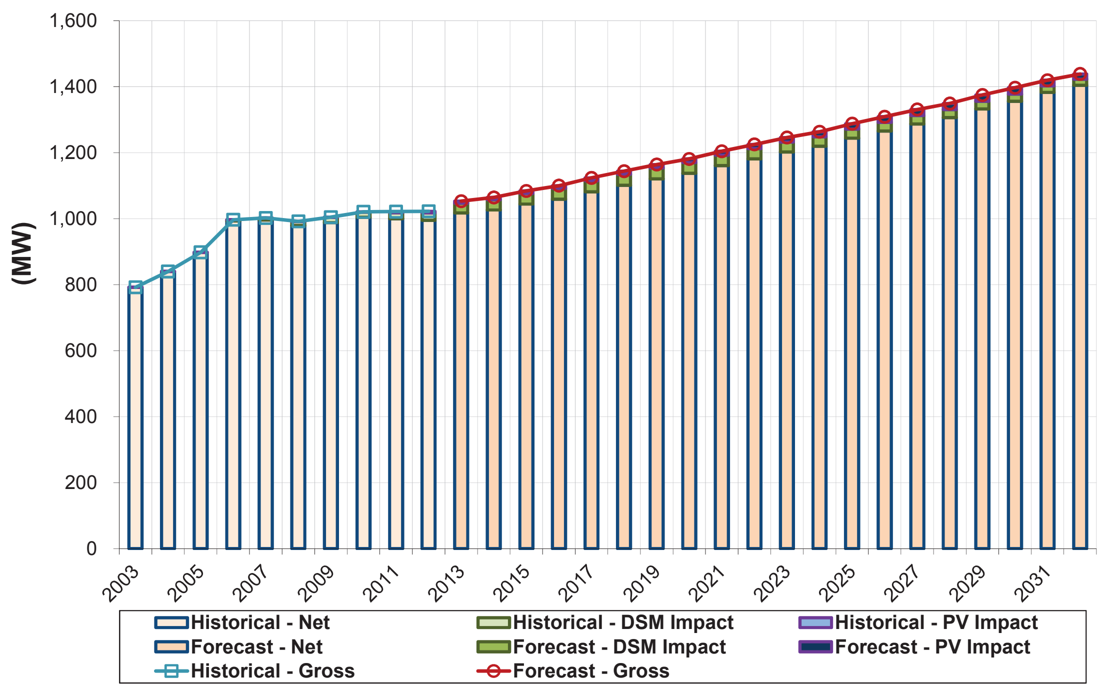

Figure 4-6: Total Net and Gross CP Demand of the IID System

As evidenced by Figures 4-5 and 4-6, the impact associated with the IID PV Solutions program and the IID DSM activities is not insignificant. To assist IID with future updates to account for changing dynamics for both programs, Leidos has created a series of Excel spreadsheet-based models to capture each program with the requisite detail needed to reflect estimated future impacts in the load forecast. Consequently, while selected charts herein and within Appendices A, B. and C of this report capture compartmentalized impacts, the full extent of such impacts is also codified in the series of tools that Leidos will deliver to IID as part of the training element of this project. As discussed in Section 3 of this Report, the projected demand impacts of the DSM programs and PV Solutions Program, as estimated using the average system load factor methodology, differ from the impacts estimated in the tools described above.

Customer Class Forecasts

The IID NEL and system peak demand summarized above is predicated on a “roll-up” of sales projections for each of the individual customer classes. These sales projections are summarized herein in graphical form, with discussion regarding the driving factors underpinning each forecast. In order to provide a concise summary, the individual class forecast results are shown herein on a “gross” basis for the Base Case only (as certain classes were not found to be weather sensitive, and other classes have been projected on the basis of a consensus assumption and not a direct sales model, as detailed in Section 1 of this report). The Leidos load forecasting engine prepared for IID has the capability to easily switch between the gross and net determinants for each retail class, and to move between the Base Case, Mild Weather Case, and Severe Weather case, as appropriate. Detailed annual and monthly customer count results for each case can also be found in Appendices A, B, and C.

As noted in Section 1, forecasts of monthly sales were prepared by rate classification for the IID System. In some cases, rate classifications were combined to eliminate the effects of class migration or redefinition. In this way, greater stability is provided in the historical period upon which statistical relationships are based. The following is a list of the retail classes for which an econometric model was developed.

- Residential
- Residential Energy Assistance
- Mobile Home / Recreational Vehicle
- Agricultural Power
- Commercial (General Service and Large General Service)
- Special Contract
- Industrial (A-2)
- Lighting (Roadway and Outdoor)
- Municipal

The following classes have at one time or another in the historical period contributed to energy sales on the IID System. However, given that load levels associated with these classes have been zero for many years and the class itself has been phased out, no load has been assumed to be present in the forecast period for such classes.

- Time of Use (Agricultural)
- Interim (Retail)
- Economic Development

The figures below summarize resultant sales equations to the extent appropriate based on the modeling performed, and exclude the three classes for which no load has been assumed to be present in the forecast period. Special contract sales and customer counts were kept flat into the forecast horizon given that IID currently has only one customer in this class and does not anticipate adding any additional special contract customers. Consequently, no graph is shown for that class.

Figure 4-7 summarizes the gross energy sales forecast for the Residential class.

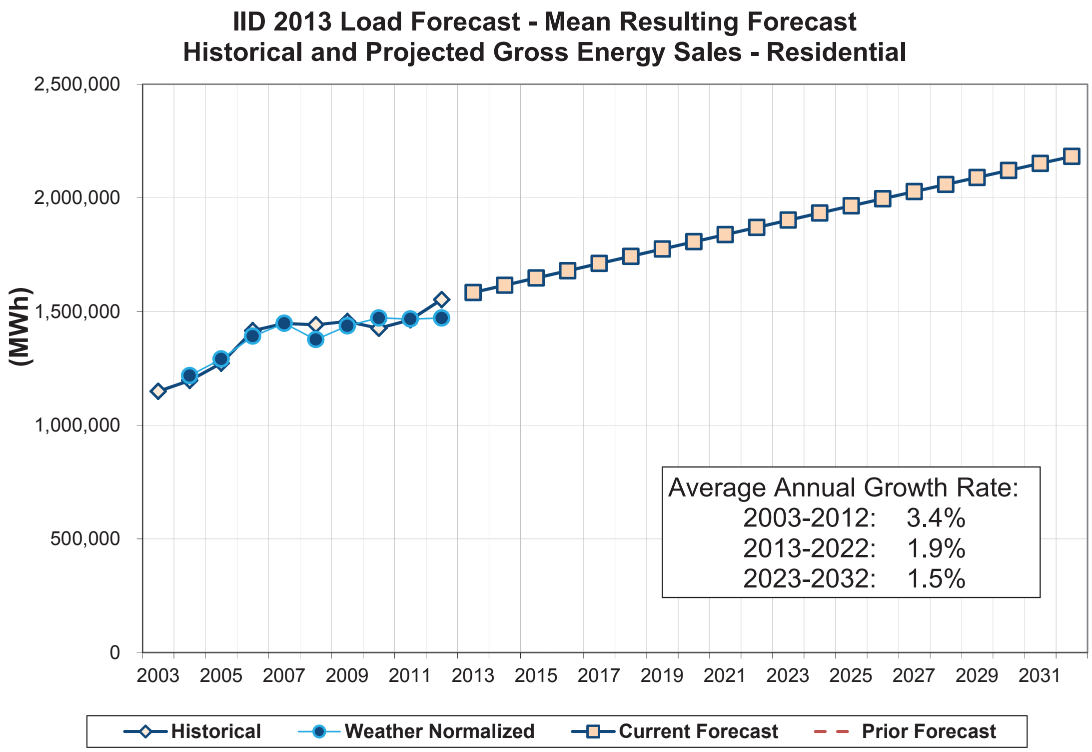

Figure 4-7 – Gross Sales – Residential Class

The Residential class forecast is driven entirely by the projection of residential customer counts, which is derived from the blend of households comprising the IID service territory. As usage was assumed to be flat in the base case, and consequently in the Mild and Severe weather cases, the residential trajectory is based on the anticipated customer growth within the service territory. Given that IID residential usage is essentially flat over the period of available historical data, and that it is not correlated to any economic driver of significance, it is reasonable for customer growth to drive longer term growth at a slower rate than what has been experienced in recent period history. Figure 4-8 depicts IID residential usage. As evidenced by Figure 4-8, usage is essentially flat over the period 2004-2012.

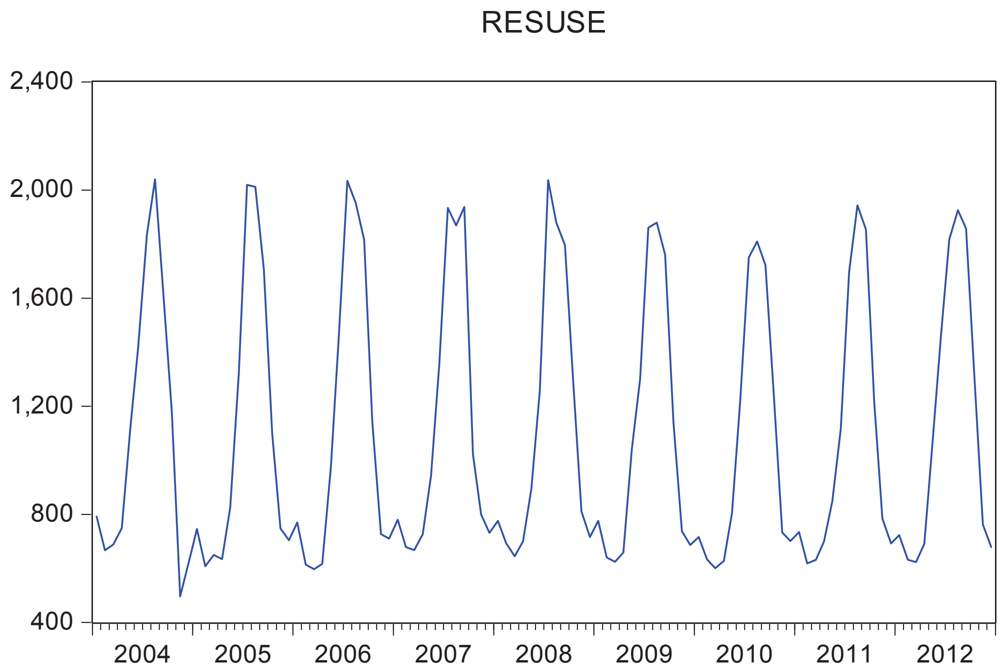

Figure 4-8 – IID Residential Usage

Figure 4-9 summarizes the gross energy sales forecast for the Residential Energy Assistance class.

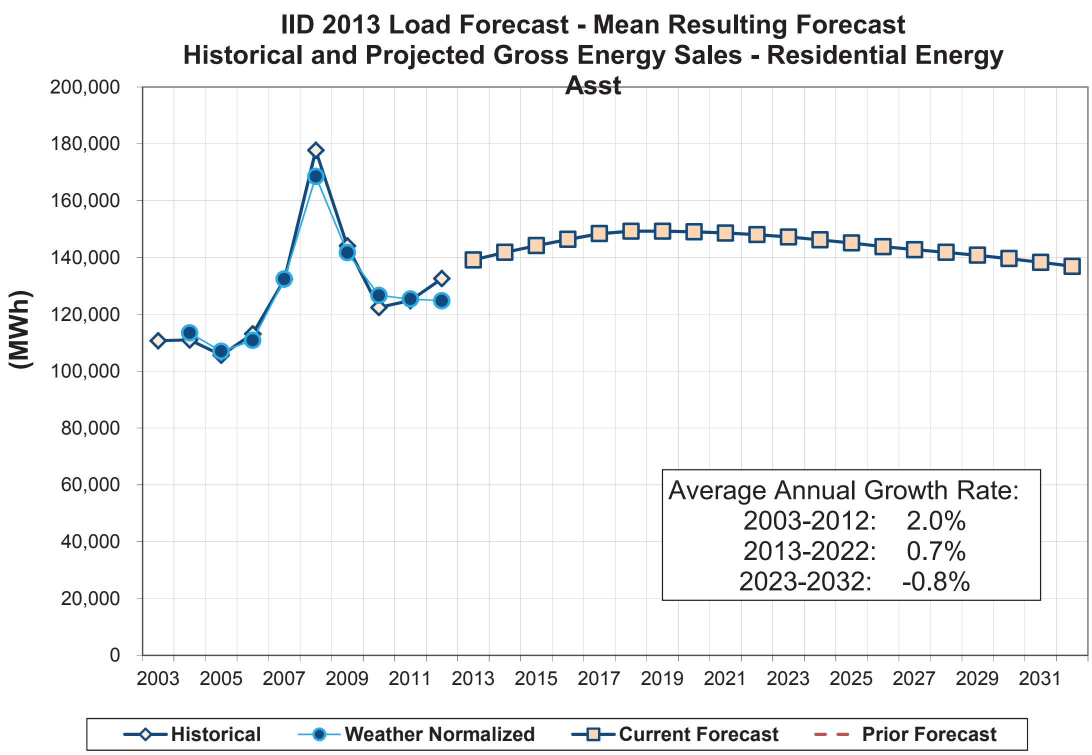

Figure 4-9 – Gross Sales – Residential Energy Assistance Class

The Residential Energy Assistance class is driven by the expectation that as challenging economic conditions persist over a protracted recovery, the number of customers in this class will remain steady to increasing, but will then decline and stabilize to a more long-term average. As usage in this class was also kept flat, the customer trajectory drives the long term growth rate.

Figure 4-10 summarizes the gross energy sales forecast for the Mobile Home/RV class.

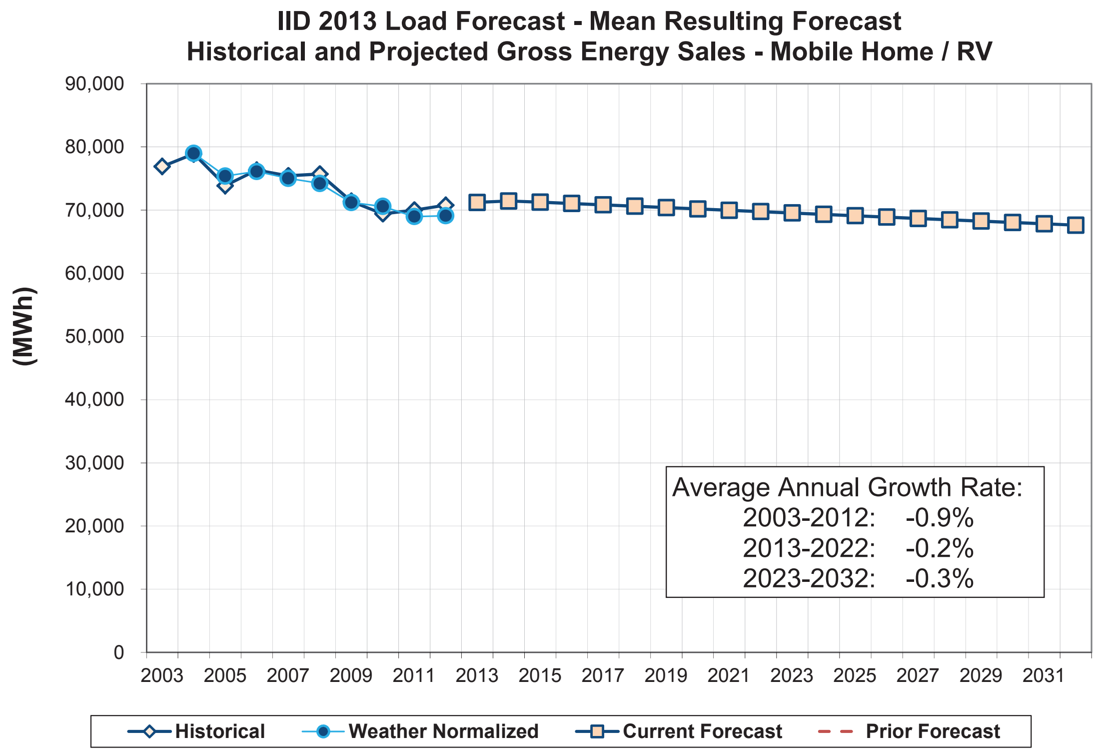

Figure 4-10 – Gross Sales – Mobile Home/RV Class

Mobile Home/RV class sales have been declining at a slow pace in the available historical data, and customer counts have also been decreasing. Given that increases in personal income are negatively correlated with sales in this class, the forecast reflects a protracted economic recovery that will have a small contraction effect on long term mobile home/RV energy sales.

Figure 4-11 summarizes the gross energy sales forecast for the Agricultural Power class.

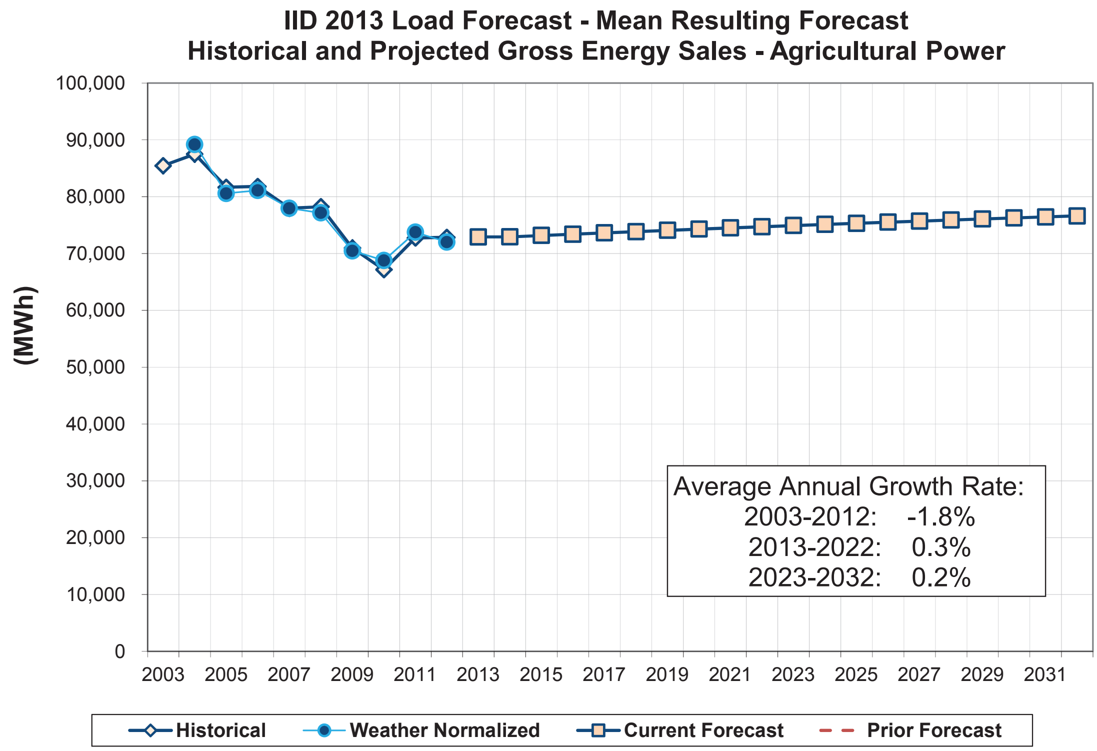

Figure 4-11 – Gross Sales – Agricultural Power Class

The agricultural sales forecast was modeled as a function of customer growth and weather variability. Agricultural customer counts were based on projected farm employment within the IID service territory. Farm sales have been declining steadily over the historical period, and the very modest long term gains are predicated upon some small improvement in farm employment and customer counts.

Figure 4-12 summarizes the gross energy sales forecast for the combined Commercial class.

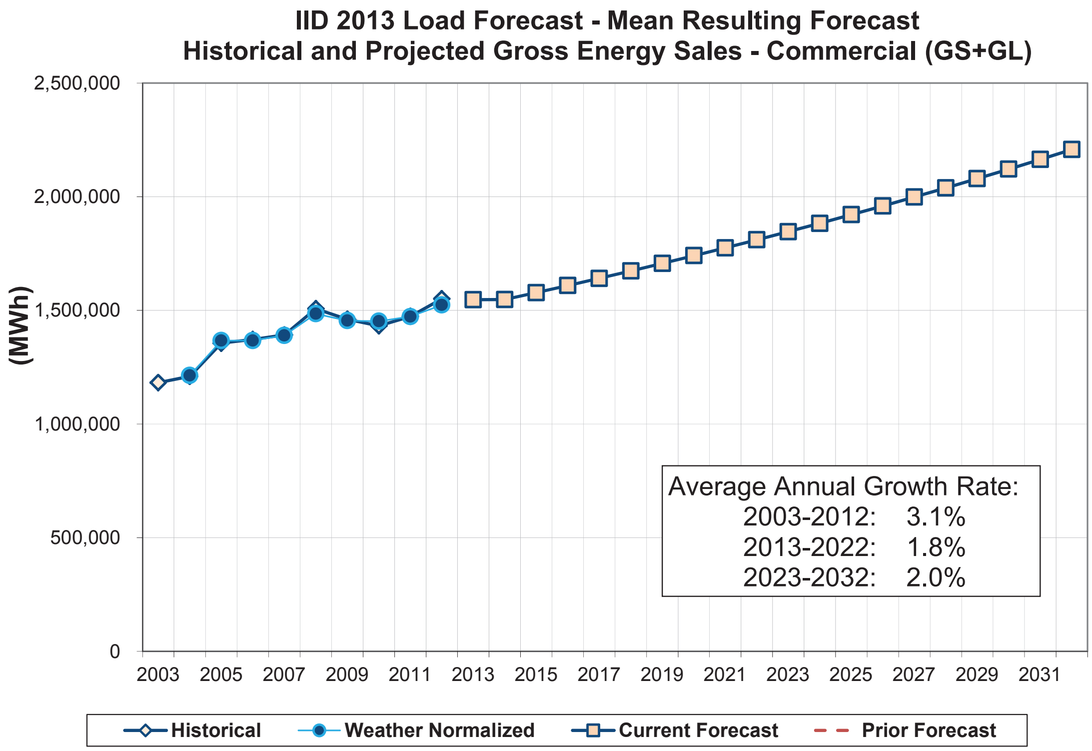

Figure 4-12 – Gross Sales – Combined Commercial Class

The combined commercial class is reflective of a continued growth trajectory at a more modest pace relative to the available historical data. The model for the combined commercial class is a function of (i) blended personal income within the IID service territory, (ii) monthly weather terms, (iii) lagged monthly weather terms, and (iv) autoregressive terms. The relationship between historical personal income and commercial sales is the primary determinant of the long term growth rate projected for this class.

Figure 4-13 summarizes the gross energy sales forecast for the Industrial class.

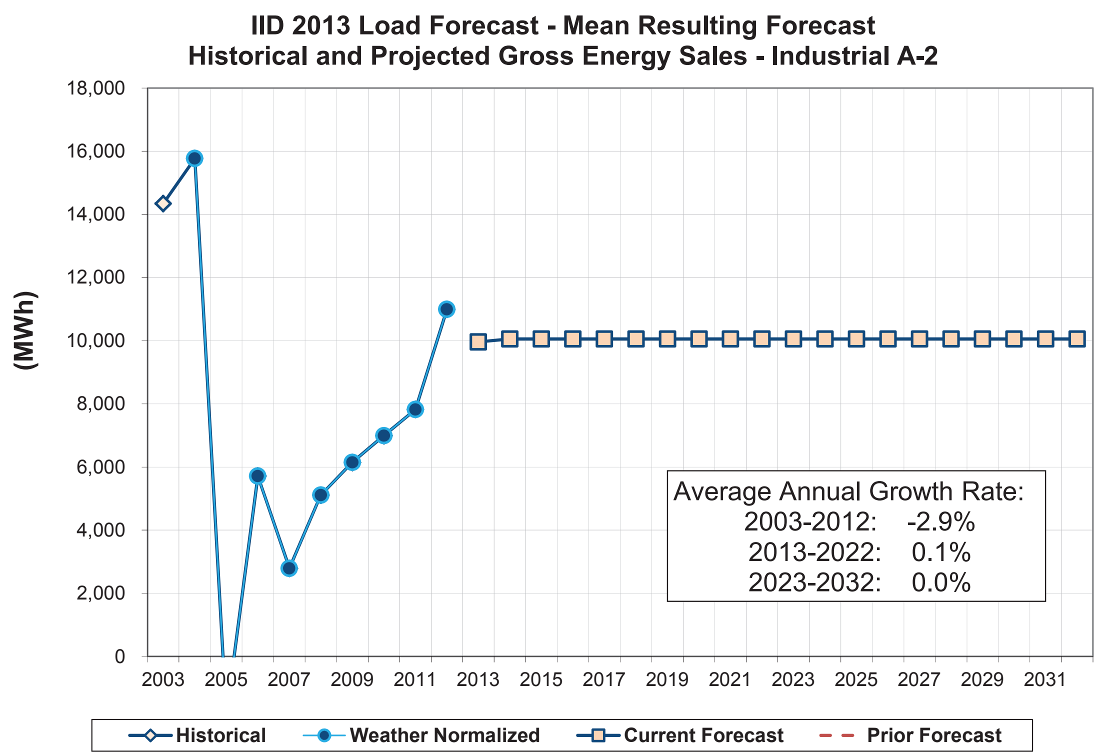

Figure 4-13 – Gross Sales – Industrial Class

Industrial sales have been kept essentially flat based on feedback from IID regarding the anticipation of limited to no customer or sales growth in this class.

Figure 4-14 summarizes the gross energy sales forecast for the combined Lighting class.

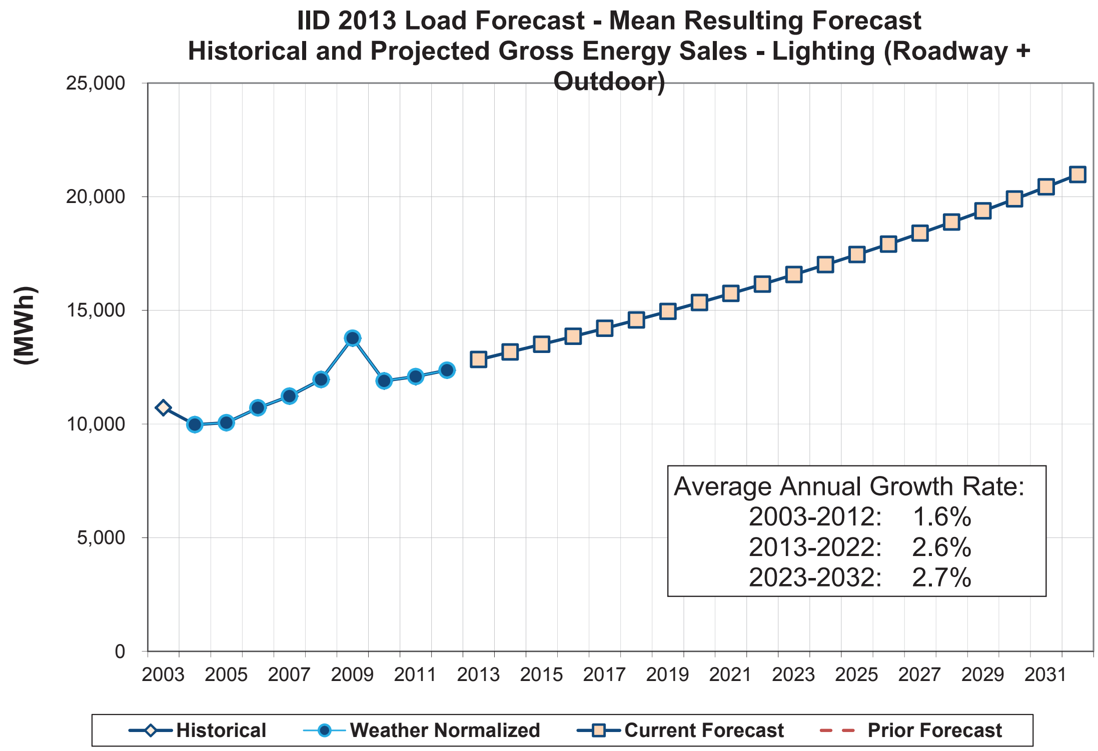

Figure 4-14 – Gross Sales – Combined Lighting Class

Lighting is generally a very small portion of the total utility energy. The lighting class growth in the early part of the historical period was significantly higher than the growth inclusive of the post-recession time period. Consequently, the longer term growth rate is projected to be somewhat higher than as suggested by the 2003-2012 time period. In the long term, growth in this class is not a major contributor to overall IID energy.

Finally, figure 4-15 summarizes the gross energy sales forecast for the Municipal class.

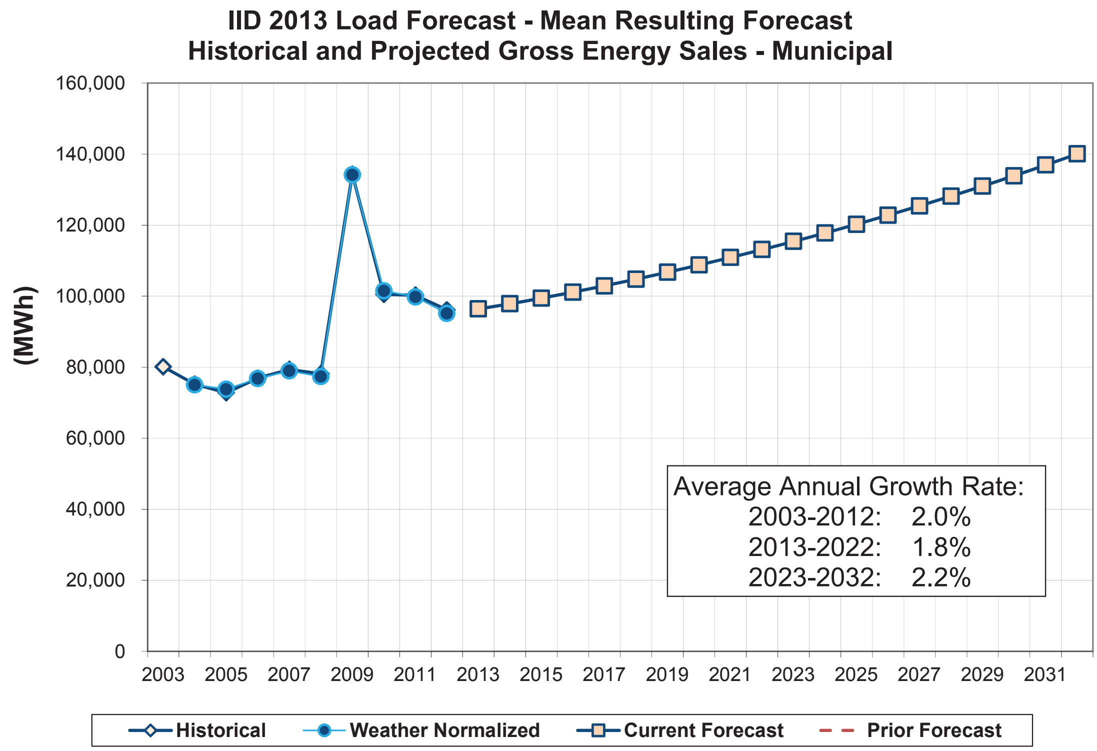

Figure 4-15 – Gross Sales – Municipal Class

The municipal class was subject to some significant volatility in the most recent period, including a large spike during the most recent recession. Based on the econometric model developed for this class, it is anticipated that municipal sales will grow more steadily into the future, and will follow a long-term growth path that will not reach the recession-period spike level over the remainder of the study period.

As mentioned above, detailed monthly tables for the Base Case and each of the two weather scenarios are provided in Appendices A, B, and C. Additionally, the set of files created by Leidos to capture the load forecast inputs and results also contains detailed by-class results and graphics that can be manipulated in spreadsheet form by IID in the future.

Energy Sales Correlation Among Classes

Per IID's request, Leidos has analyzed historical correlation among classes in terms of usage. The correlation matrix in Figure 4-16 below represents the simple correlation in residential usage (with RESUSE and RESUSE_A representing the core and economic assistance classes, respectively) and sales in each of the major retail classes in a grid. A correlation of 0.5 or higher in absolute value represents a strong correlation, and any value below that represents weak to no correlation. A correlation matrix is symmetric about the diagonal line in the middle of the grid, as the cross-tabulations amongst groupings are identical to the left and right of that diagonal line.

	RESUSE	RESUSE_A	AG	COMM	IND	LIGHTS	MOBILE	MUNI
RESUSE	1	0.995	0.72	0.873	0.00415	-0.117	0.881	0.275
RESUSE_A	0.995	1	0.703	0.877	0.00589	-0.0972	0.879	0.3
AG	0.72	0.703	1	0.613	0.101	-0.191	0.558	0.0513
COMM	0.873	0.877	0.613	1	-0.013	0.131	0.709	0.227
IND	0.00415	0.00589	0.101	-0.013	1	-0.000282	-0.0737	-0.0144
LIGHTS	-0.117	-0.0972	-0.191	0.131	-0.000282	1	-0.139	0.123
MOBILE	0.881	0.879	0.558	0.709	-0.0737	-0.139	1	0.195
MUNI	0.275	0.3	0.0513	0.227	-0.0144	0.123	0.195	1

Figure 4-16 – Correlation of Residential Usage and Sales by Retail Class

As evidenced by Figure 4-16, usage in the residential classes is very strongly correlated, which is due in large part to the similarity of the weather response parameters in that class, and the fact that usage has been fairly flat over the period of history available. Commercial, agricultural, and municipal classes have varying degrees of correlation to one another and to residential usage. The lighting class is the one of the least correlated segments across all classes, which is in alignment with the recent period perturbation in that data set that occurred during the most recent recessionary period. Given the uniqueness of the industrial class, it is not surprising that correlations relative to other classes therein is also very weak.

It is important to note that this correlation analysis does not imply that classes should be projected on the basis of one another, nor that they were necessarily projected on the basis of one another for purposes of this forecast. The individual econometric models and assumptions underpinning each class are provided in Sections 1 and 4 (above) in this report, and should be reviewed carefully.

Mild and Severe Weather Scenario Results

Figures 4-17 and 4-18 below depict the forecast of IID gross NEL and gross CP demand resulting from the Severe and Mild Weather Cases as compared to historical and weather-normalized data and the Base Case. The weather scenarios result in bands of uncertainty around the Base Case that are essentially constant through time. The differential between the Severe Case and Base Case is somewhat larger than between the Mild Case and Base Case as a result of a somewhat non-linear response of load to weather.

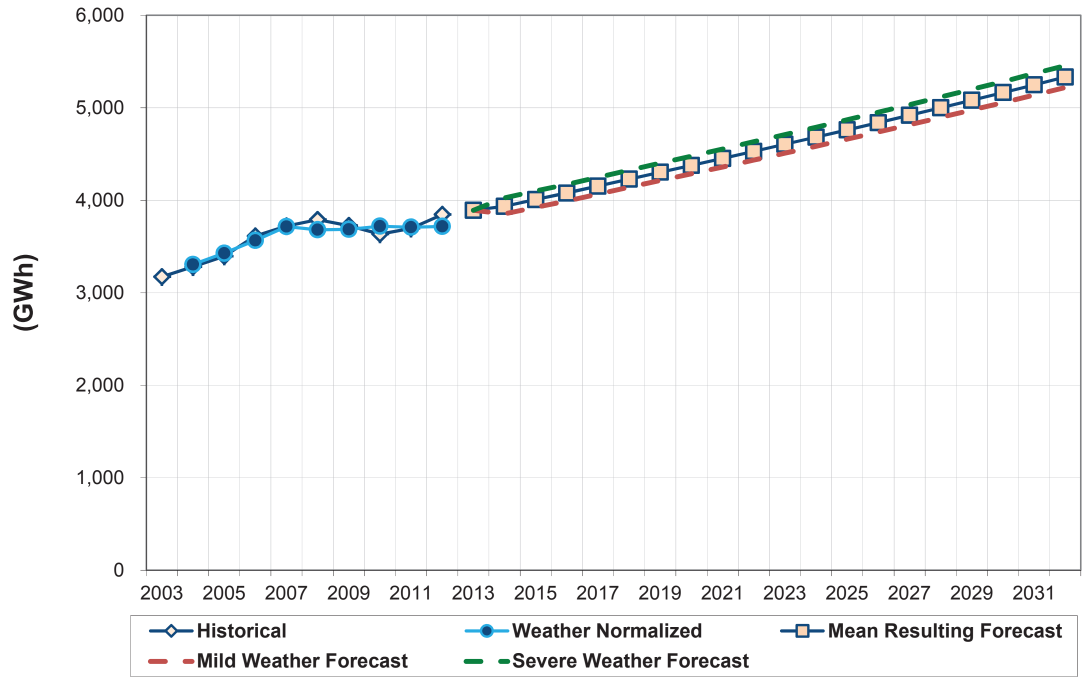

Figure 4-17: Weather-related Uncertainty in Gross NEL of the IID System

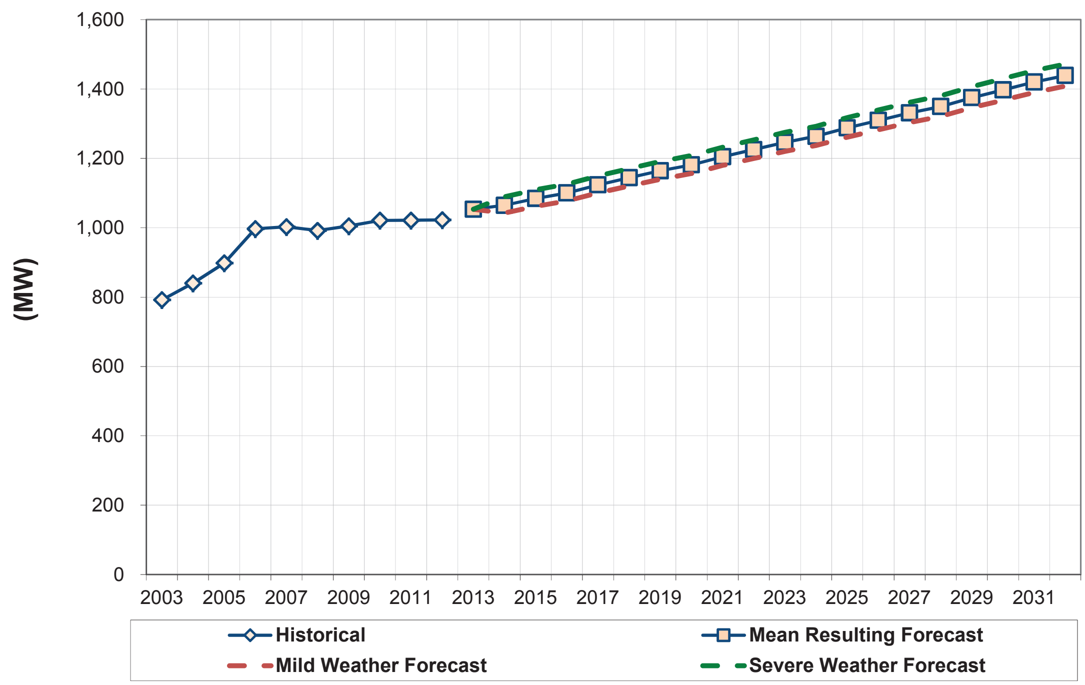

Figure 4-18: Weather-related Uncertainty in Gross CP Demand of the IID System

Net energy for load in the Severe Case is projected to be higher than the Base Case by 2.3% by the end of the study period and lower in the Mild Case by 2.1% by the end of the study period. CP demand in the Severe Case is projected to be higher than the Base Case by 2.3% by the end of the study period and lower in the Mild Case by 2.1% by the end of the study period.

It should be noted that these weather scenarios are focused on specific seasons, in total, rather than individual months. NEL in any *particular* month may be more volatile than shown herein, and the off-peak months, which sometimes exhibit weather conditions more like peak months, may also be more volatile than the winter or summer seasons. In addition, because of the methodology that derives peak demand from NEL via constant load factor assumptions, annual summer and winter peak demand may be somewhat more volatile with respect to weather than shown herein.

Detailed forecast results for the Base case and each of the two weather scenarios can be found in Appendices A, B, and C.

Section 5
CONCLUSIONS AND RECOMMENDATIONS

Forecasting the direction of the nation's economy is no easy task. Population growth is fairly predictable, but migration rates are highly uncertain and subject to volatile geopolitical pressures. The pace of economic activity is also highly uncertain. At a regional level, the uncertainty of future population and economic growth increases dramatically, both due to increased migration volatility and the focus on a smaller number of economic agents (residents, businesses, industries, etc.). It is in this environment that forecasts of the power requirements of a utility must be developed.

It is important to recognize that no forecast will prove to be perfectly accurate once projected periods become history. The 2013 Load Forecast is no exception. It can only be as accurate as the numerous assumptions and data sources it relies on are, or later prove to be. The econometric equations on which the Forecast is based demonstrate that energy consumption is driven by population, economic forces, and weather in fairly predictable ways. However, these drivers are anything but predictable. Many of these will deviate from the projections shown herein only briefly or in volatile ways but will maintain the trend over the long term; certain others may deviate in a way that suggests a somewhat different trend altogether.

Accordingly, a forecast must be viewed as a guide only, and plans for large capital expenditures, which are based on such forecasts, made with care and with an allowance for flexibility.

The national economy is only just recovering from a historically deep and long recession. California, in particular, has been one of the epicenters of the housing crisis, resulting in a significant downturn in the local economies that drive the load growth of IID. IID must stay abreast of economic developments and projections for the region and be even more flexible and proactive in its planning efforts. Accordingly, IID has initiated a process (which began in 2013 with this forecast) to periodically review updated economic projections, system loads, and retail customer data, and perform periodic analyses during the year to provide an updated view on forecasted loads as an input to on-going planning activities. Given current circumstances, this forecast should be re-visited at least annually until conditions warrant otherwise. In order to facilitate such updates, Leidos will be providing in-person training to IID staff on how to update the forecast architecture generated as part of the 2013 Load Forecast.