



## REVIEW OF NON-RESIDENTIAL PROGRAM APPLICATION FORMS

Prepared for:

City of Riverside Public Utilities



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## Introduction

The City of Riverside Public Utilities (RPU) has a number of energy efficiency and renewable energy programs offered through its utility department. As part of an effort to review RPU tracking systems and program application forms, Navigant Consulting reviewed actual application forms for several RPU non-residential programs. This paper summarizes these reviews.

## Non-Residential Program Review

### *Non-Residential Programs*

The City of Riverside Public Utilities' incentive programs for electric reduction in the non-residential sector include:

- New construction
- Custom projects including:
  - Lighting retrofits
  - Thermal energy storage systems
  - Compressed air systems
  - Variable frequency drives
  - Hydraulic power units
- Prescriptive incentives for:
  - HVAC systems
  - Energy Star® products
  - Premium motors
  - Pool pumps
  - Computer power management software
- Direct install programs
  - Thermostats
  - Lighting
  - Vending Misers and Cooling Misers

### *Non-Residential Incentive Applications*

The City of Riverside Public Utilities use a standard application for all incentive types except the direct install programs. The standard application consists of a cover page to which supporting documentation is attached. Only customer details and basic product information are required.

#### **New Construction Applications**

Navigant reviewed two new construction applications. These files each consisted of the standard incentive application cover page and a savings model, created using EnergyPro. Overall these applications included details of inputs used for the model and outputs showing estimated energy use compared to the Title 24 base case. This is a reasonable way to approach new construction incentives, and is in line with approaches commonly accepted elsewhere. Verification of such projects generally requires comparison of electrical billing once the building is occupied to usage estimated by the EnergyPro or similar model. Ideally at least a year of billing data would be used for this work.

During Navigant's review of the New Commercial applications, it was noted that one of the applications was claiming negative building energy use in January. Since EnergyPro does permit the modeling of onsite energy generation a result like this is possible, however no onsite generation was present and the results were out of line with usage in the rest of the year. Based on this, the utility contacted the

company who produced the model for further information. They indicated that they had accounted for the entire year of thermal mass precooling outside the EnergyPro model and manually included it in January's total. While this should produce the same overall annual energy use, it is not recommended that savings be bundled in this manner. The savings should be allocated separately in each month so as not to skew the model produced by EnergyPro. No major issues were found with the second application.

### *EnergyPro*

EnergyPro is a software package<sup>1</sup> produced by EnergySoft, LLC and designed for use with California's Title 24 standards. It is based on the commercial version of DOE-2. This software, like other similar energy modeling packages, is used to produce detailed energy use models of new buildings based on their design specifications. It can be used to model energy use in a building throughout a typical year based on weather and design information. California specific packages allow comparison of a building design to Title 24 standards to determine the difference in energy use. Based on this, incentives can be calculated for the savings. EnergyPro can provide a simple summary page of energy savings for a building as well as detailed information on building equipment and variations in use throughout a typical meteorological year (TMY).

The DOE-2 model is accepted as an industry standard for energy use estimates of new commercial buildings, and EnergyPro is a package which compares that information to California standards. However, it should be emphasized that the accuracy of the energy use estimate is highly dependent upon the details entered into the model. Although use of EnergyPro, or any equivalent DOE-2 based software package, is the appropriate choice for modeling energy savings in a new building, the results derived through such a package are only as good as their inputs. It is necessary to thoroughly review the inputs and outputs. The applications provided for review under the New Commercial program included detailed information on equipment and savings. This is in line with what should be required by the program.

### **Custom Project Applications**

Custom application files for four of Riverside's customers were provided to Navigant for review. These included two lighting retrofits and a compressed air system upgrade. The fourth file included three applications for a single customer who retrofitted lighting, replaced an air compressor, and applied variable speed controls to hydraulics.

One lighting application was a simple replacement of 249 high intensity discharge (HID) lights with 254 six-lamp T5 high output fluorescent fixtures with integrated motion sensors. The application claimed 25% savings for the inclusion of motion sensors. The description of the old lighting fixtures was not detailed beyond being described as HID, and the claimed wattage for each unit was 456 watts. This could imply that the old lamps were 400 watt metal halide, although 458 watts is the more standard power used by IOUs in California for those lamps. High pressure sodium (HPS) fixtures are typically 465 watts, so it is unlikely that these were being replaced. Mercury vapor HID fixtures use 455 watts, but

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<sup>1</sup> [http://www.energysoft.com/main/page\\_energypro\\_ep\\_information.html](http://www.energysoft.com/main/page_energypro_ep_information.html)

they are relatively uncommon as the technology is quite old. If the old fixture type were actually called out, it would be simpler for a reviewer to determine if the correct wattage is being used in calculations instead of assuming they were 400 watt metal halide units rather than some other type of HID fixture. The motion sensor savings estimate of 25% is highly conservative. The NRR-DR manual allows 45% savings for motion sensors in warehouses without requiring monitoring to verify usage.

The other lighting application involved the replacement 438 outdoor metal halide lights of varying types with T5 and T8 fluorescent fixtures. A few fixtures were also removed as part of the upgrade. In cold climates outdoor lights are rarely replaced with standard fluorescent fixtures because of performance problems, but in Riverside this should not be an issue. The individual fixtures and locations to be replaced were detailed in the file, along with their operational hours and the new fixture details. Operational hours were listed as 4,368 annually, which indicates that the calculations used a 52 week year, rather than 365 days, this is not a significant issue. For the most part, this application appeared complete, although some of the new fixtures were simply called out as “exterior street light - forward throw” and did not provide enough detail for a reviewer to confirm their claimed wattages. An onsite audit could determine the new fixture details, but it should be included in the application as well.

The compressed air system underwent a complete upgrade, including: installation of a new controller; new programming; installation of two new air surge tanks; a new 75 HP compressor; and commissioning of the entire system. Compressed air is a major electric load in many industrial situations, and energy savings projects of this type are common. However, although the application included a rough description of expected savings, and the intent to validate savings based on post-installation monitoring, the details were not included with the file provided to Navigant. The City of Riverside may have more details on this project filed separately, but it is not possible to verify savings based on the data provided.

The three applications for a single customer also included a lighting retrofit. This application was primarily for the addition of occupancy sensors and photocells to existing T8 fluorescent fixtures, although a few metal halide fixtures were also replaced with new T8 units. Details of the retrofit were provided as an attachment to the application, and included a description of the operation, hours, and individual fixtures. The wattages used for the fixtures were standard, but no details were provided for the expected reduction in hours from the addition of sensors. Omissions such as this one result in the need to recreate the calculations used to estimate savings. It is recommended that the assumptions used for calculations be included with all applications.

A new variable speed air compressor was also installed at this site. The application indicated that savings estimates were based on logged data, but the details were not included with the application file. The logged data may have been provided separately to the City of Riverside, but they were not in the hardcopy file. This may be because they were provided electronically, but it is recommended that a standardized system be implemented for storing this sort of information so that it can easily be located and associated with individual application files if it is to be reviewed. It did appear that the savings estimates had been calculated using logged data, and that this had been repeated after the installation of the new unit, so it is likely that the savings are accurate.

The third application from this customer was for the replacement of a 20 horsepower hydraulic power unit with a more efficient model. This uses a variable speed drive (VSD) controller and premium efficiency motors to reduce energy consumption relative to the previously installed system. Hydraulics are a relatively new application VSDs, although controllers like this have the potential for significant savings. For projects like this it is very important to base savings estimates on measured data, since there are no established savings values, and operation is highly installation dependent. The application included plots of logged power consumption for the system, both before and after the retrofit. The calculations provided were minimal, but appeared to be correct based upon the plots of logged data. For applications like this, it is highly recommended that the City of Riverside request raw logged data and more detailed calculations, as it is difficult to verify calculations using only plots.

### Prescriptive Incentives

Prescriptive incentives are based on expected savings for well established technologies. The City of Riverside Public Utilities use standard applications and savings values for these. In particular the incentives for HVAC systems, Energy Star® products, premium efficiency motors, and pool pumps use savings established for those technologies and used by other utilities in California. Computer power management software has been more controversial in its savings. It is straightforward to calculate post-installation usage since most software of this type logs system activity, but it can be very difficult to estimate the baseline usage for computers as this is highly variable. Despite this, prescriptive incentive programs for such software are becoming more common, and the savings estimated by the City of Riverside are in line with other similar programs.

### Direct Install Records

The City of Riverside Public Utilities receives summary reports from each of the three vendors administering direct install programs for them. The three programs are small business lighting, programmable thermostat, and VendingMiser installations. Each of the vendors administers one program and each provides a summary in a different format.

The Small Business Lighting program's summary includes customer details, installation date, estimated savings (energy and demand), and price, but not details of fixtures installed. The programmable thermostat program provided the least information, including only a summary of number of units installed and statistics on follow up verification work. No details of individual customers were included in this file, although it is likely that the vendor does have these details and that they could be obtained by the City of Riverside upon request. The VendingMiser summary is provided as an Excel spreadsheet and includes a detailed list of locations and numbers of units installed. CoolerMiser® are also installed by the same vendor under the VendingMiser program and included in the same summary file. The invoice date is provided, but the install date is not specified in the file.

Overall the records provided for this program are not unusual for direct install programs. However, it is highly recommended that the Utility request specific details from all three vendors in order to allow for simple verification of the program. In particular, the programmable thermostat vendor should be required to provide a detailed customer list rather than an overall summary of installs and the lighting program vendor should be required to provide a detailed list of fixtures installed under the program. Individual installation dates should be included for all three programs.

### *Overall Observations*

Overall the City of Riverside Electric Utility Non-Residential Programs are in line with programs offered by other California utilities. As the Utility is aware, the primary issue that needs to be addressed is to centralize the records for applications and incentives. Issues with individual applications could be lessened with a few guidelines for required information:

- Assumptions used in savings calculations, both for the New Construction and Custom Programs, should be clearly stated in the application.
- If savings are manually included in EnergyPro models, the calculations for those additions should be included in the file, and the reason for their treatment outside the model should be clearly explained.
- Logged data used in savings calculations should be supplied with the application, preferably in a spreadsheet format.