

# OptiMagic: How OptiMiser uses utility bills to improve speed and accuracy throughout the audit process

The OptiMiser audit tool streamlines the audit process and delivers accurate results through careful and thorough use of utility bill analysis. OptiMiser has developed these three steps for fully leveraging utility bills in the audit process:

1. **Analysis:** A careful utility analysis determines energy characteristics of the home (BLC/Eff, Base Temperature, and Base Load).
2. **Diagnostics:** Comparison of utility analysis results to a default modeled with the same basic dimensions and location yields detailed pre-audit diagnostics.
3. **Calibration:** Utility BLC/Eff, Base Temperature, and Base Load are used to intelligently calibrate the model and significantly reduce needed audit inputs.

## ANALYSIS

OptiMiser uses PRISM regression analysis and follows the BPI-2400 Standard to ensure that bills are of sufficient quality and quantity to provide accurate information about the home. Success of the PRISM regression is optimized through application of the following refinements:

- Use of a weighted regression
- Identification of “best-fit” dates, when exact read dates are not available
- Constraint of regression intercept to ensure a reasonable base load
- Removal of statistical outlier bills (e.g. summer vacations).
- Proper handling of estimated bill periods

A successful PRISM regression yields all three of the energy characteristics necessary to calculate normalized annual utility usage using a degree day method.

1. BLC/Eff (Building Loss Coefficient to System Efficiency ratio)
2. Base Temperature
3. Base Load

| The utilities indicate ►<br>Possible causes below ▼ | HEATING                      | COOLING        | ELECTRIC                    |
|-----------------------------------------------------|------------------------------|----------------|-----------------------------|
|                                                     | HIGH Gains<br>LOW Thermostat | HIGH Cool Load | HIGH Hot Water & Appliances |
| Unusually low heating thermostat setting            | ✓                            |                |                             |
| Unusually high cooling thermostat setting           |                              | ✓              |                             |
| Highly inefficient AC                               |                              | ✓              |                             |
| Extreme infiltration                                |                              | ✓              |                             |
| Large glazing area                                  | ✓                            | ✓              |                             |
| Hot water leak                                      |                              |                | ✓                           |
| High water heater temperature                       |                              |                | ✓                           |
| Hot tub                                             |                              |                | ✓                           |
| Pool heater                                         |                              |                | ✓                           |
| Extra fridge/freezer                                |                              |                | ✓                           |

## DIAGNOSTICS

The BLC/Eff, Base Temperature and Base Load are also calculated by OptiMiser's degree-day model and represent quantifications of the envelope and system efficiency, thermostat setpoint and gains, and appliance use, respectively. Starting with the basic location and dimension information available prior to the audit, OptiMiser constructs a "typical" home for comparison. By analyzing the relationship between the utility BLC/Eff, Base Temperature, and Base Load and those of the "typical" home, OptiMiser is able to predict specific conditions that are likely be encountered during the audit.

## CALIBRATION

**Detailed calibration.** The synergy between the utility analysis results (BLC/Eff, Base Temp, Base Load) and OptiMiser's own internal degree-day energy model allow for a simple and powerful calibration system. Utility analysis results that pass the BPI-2400 standard for "detailed calibration" are capable of producing an accurate model of future usage for the base home. With the addition of specification for only the heating and cooling systems (including delivery) and the thermostat setpoints, OptiMiser can create a self-calibrating model capable of handling component interactions and generating savings estimates. The auditor is then only required to fully specify building components that will be considered for improvement.

**Automated true-up.** Even with utility bills that do not pass the BPI-2400 standard for "detailed calibration," OptiMiser can provide an accurate model through more conventional "true up" techniques. OptiMiser's new Wizard interface expertly guides the auditor through model specification seamlessly collecting measured data and allowing the auditor set more general parameters or limits for features that were not measured or observed directly. These latter inputs are the ones that are typically used during a manual "true-up" (e.g. window area). OptiMiser places all this information into a matrix of possibilities that is used to automatically select a configuration that brings the model projections closer to the utility bills.

