Joint Transportation Research Program

Principal Investigator: Jim Handy, Purdue University, jhandy@purdue.edu, 317.275.6813
Program Office: jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp
Sponsor: Indiana Department of Transportation, 765.463.1521

SPR-3946 2016

Improving Energy Efficiency of Facilities

Introduction

The Indiana Department of Transportation (INDOT) has entered into an agreement with the Purdue University Manufacturing Extension Partnership (MEP) to perform energy assessments on six sites. These sites—the Research and Development building in West Lafayette, the Crawfordsville administration building, the Falls City Sub-District building, the Greensburg Unit building, the Frankfort Sub-District building, and Central Materials and Testing building in Indianapolis—were selected to represent the variety of building types typical for INDOT's portfolio.

This energy assessment report identifies, evaluates, and prioritizes energy-saving projects. Purdue MEP provided a comprehensive energy assessment of each site, and many energy efficiency measures (EEMs) were identified that could reduce annual energy costs. We also researched available incentives from local utilities and calculated the payback period for each EEM.

As a result of the assessments, six reports have been generated to:

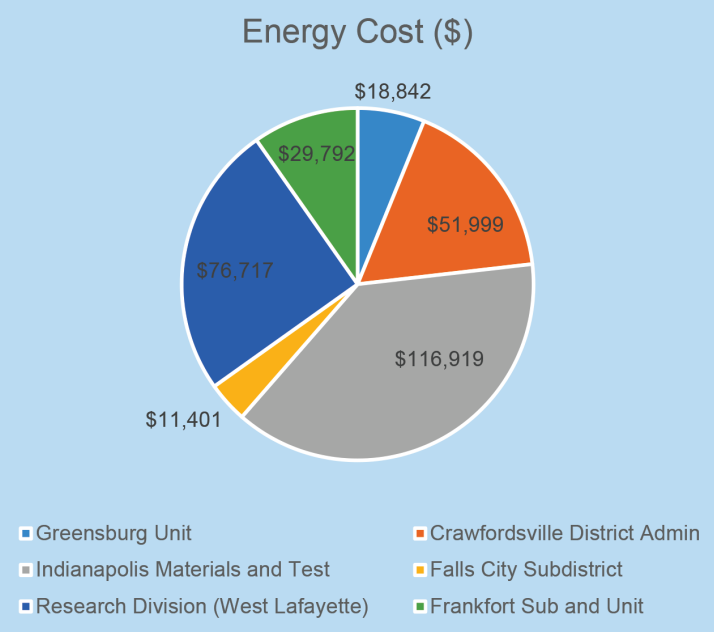
- Provide a benchmarking analysis to show energy performance relative to similar buildings
- Provide insight into the historical energy usage patterns of the facility
- Present recommended EEMs for consideration
- Provide analysis to determine first order approximate costs and savings for each EEM
- Discover opportunities for incentives that may be available to help fund energy improvements

Findings

If all recommended EEMs for all six locations are implemented, this would yield an *average annual cost* savings of over 30% off the current utility costs. Of the six selected sites, Central Materials and Testing is the largest portion of the cost.

Each of the six sites has unique EEM recommendations detailed in the individual reports. Some common themes that are consistent throughout the sites include:

- Switching lighting from T12 or higher wattage T8 to lower wattage T8 or LED
- Replacing exterior HID lights with LED
- Installing automatic sensors for lighting in certain areas with low occupancy
- Updating older mechanical equipment with high-efficiency replacements
- Installing better controls to manage HVAC equipment, which may include setbacks, programmable thermostats, BAS, or outside air resets



Total Energy Cost Breakdown by Site

Energy Assessment Process

See Appendix A to this report for lighting options spec sheets for all sites. See Appendix B to this report for specific HVAC equipment options spec sheets for sites.

Implementation

Prior to the on-site assessment, INDOT provided 12–24 months of utility data to the assessment team. The consumption data was analyzed and compared to cooling degree days (CDD) and heating degree days (HDD) for weather normalization. Any observed anomalies were flagged for further questioning and a preliminary utility analysis was generated for discussion purposes.

On the day of the on-site assessment, the facility personnel at each site provided background information on the facility's primary energy systems as well as previous and planned renovations and projects. The assessment team then did a walk-through of the various types of spaces, including meeting rooms, lab spaces, offices, break areas, common areas, and so forth. The assessment team investigated the mechanical rooms to observe the HVAC equipment.

Data collected on site was used to perform detailed energy calculations. Potential alternatives were investigated and a cost analysis performed to determine which solutions were feasible and cost-effective. Recommendations were made, including proposed energy reduction, cost savings, applicable incentives, and simple payback periods. This information was presented to INDOT in the form of an energy assessment report for each of the six individual sites.

Next steps for implementation and verification include:

- Evaluating all recommended measures collectively
- Identifying EEMs to pursue first
- Obtaining cost estimates from outside contractors
- Performing energy efficiency updates at selected sites
- Tracking energy costs and comparing to weather normalized historical data
- Determining best practices for implementing across the state

Recommended Citation for Report

Weger, K., & Handy, J. (2016). *Improving energy efficiency of facilities* (Joint Transportation Research Program Publication No. FHWA/IN/JTRP-2016/29). West Lafayette, IN: Purdue University. http://dx.doi.org/10.5703/1288284316356

View the full text of this publication here: http://dx.doi.org/10.5703/1288284316356

Published reports of the Joint Transportation Research Program are available at http://docs.lib.purdue.edu/jtrp/.