CircuitMeter – Business Case Analyses

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Energy efficiency is widely recognized as a valuable and underutilized resource.[1] While the potential for energy efficiency to deliver cost savings and GHG emission reduction has been well known for years[2], these benefits have largely failed to materialize.[3] One of the main challenges is the difficulty in identifying and prioritizing energy efficiency opportunities in a cost effective way.[4]

CircuitMeter's monitoring technology enables building and facility managers to measure and monitor circuit level electricity usage in real time. By enabling detailed monitoring at a lower cost, CircuitMeter addresses one of the key barriers to energy efficiency deployment and demand management. The technology delivers granular real time and historical data that allows users to easily evaluate equipment energy performance, identify energy efficiency opportunities and track implementation. CircuitMeter's technology is applicable to commercial and high density residential buildings as well as industrial facilities. It meters all equipment using electricity including pumps, fans, motor, lighting, etc.

There are three main categories of energy efficiency opportunities that can be identified and captured with CircuitMeter:

CircuitMeter can identify actions to reduce energy costs in three categories

1. Turn off what you don't need

- turn off equipment when it is not necessary because of control or behavioral error(s)
- remove redundant equipment

2. Optimize what you have

- implement or improve predictive maintenance
- use waste/residual energy in other applications

3. Replace equipment with more efficient alternatives

- substitute alternative technologies that use less energy for the same tasks
- properly size equipment for the load

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[1] American Council for an Energy Efficient Economy, *Energy Efficiency as a Resource* (2016). http://aceee.org/topics/energy-efficiency-resource; David Crossley, *Energy Efficiency as a resource for the power sector in China* (2014), 3. www.raponline.org/document/download/id/7259.

[2] William Prindle, *Energy Efficiency as a Low-Cost Resource for Achieving Carbon Emissions Reductions* (2009), ES-1. https://www.epa.gov/sites/production/files/2015-08/documents/ee_and_carbon.pdf

[3] Natalie Mims, Mathias Bell, Stephen Doig, *Assessing the Electric Productivity Gap and the U.S. Efficiency Opportunity* (RMI, 2009). http://www.rmi.org/Knowledge-Center/Library/2009-08_AssessingElectricProductivityGap

[4] Alexandra B. Klass and Elizabeth J. Wilson, *Energy Consumption Data: The Key to Improved Energy Efficiency* (2015), Minnesota Legal Studies Research Paper No. 15-13. Available at SSRN: http://ssrn.com/abstract=2602974

1. Turn off what you don't need – Before getting to sophisticated optimization or retrofits, significant savings often can be made by simply ensuring that equipment is turned off when it is not in use, and by powering down equipment that is using energy for an unnecessary task, due to either errors in control system setup, or through a lack of attentive/conscientious personnel that have control over the on/off function.

> *Information from CircuitMeter can identify equipment loads and compare usage with workplace and equipment schedules to identify waste.*

2. Optimize what you have – Detailed information on the energy use of individual components can highlight equipment issues early, just as they begin to operate inefficiently due to undetected maintenance or repair requirements, or become equipment failures. Predictive maintenance can then be done to keep equipment operating at its highest efficiency, saving energy costs, extending equipment lifetime and avoiding operation downtime.

> *Information from CircuitMeter can be used to identify outliers in energy use within a group of similar equipment to enable precision maintenance, or to highlight areas where energy use is higher than benchmarks suggest.*

3. Replace equipment with more efficient alternatives – The most well-known savings from energy efficiency are achieved by replacing equipment with alternatives that perform the same function while using less energy. This includes substituting alternative technologies that use energy more efficiently to perform the same task, and properly sizing equipment for the intended load.

> *Information from CircuitMeter can be used to identify categories of large energy use to prioritize for substitution, baseline energy use in support of business case analyses, find low power factor equipment usage, and size the potential for substitution based on how often individual equipment is being used.*

The examples described here illustrate some of these energy efficiency opportunity categories. In each case, the data from CircuitMeter is used to identify and size the opportunity — something that would otherwise be too time intensive and/or impossible without real-time energy consumption information at the circuit level. CircuitMeter can also be used to evaluate various types of technology and verify energy efficiency/consumption claims by the manufacturer, giving the end user the ability to select the optimum equipment for their application.

The examples presented are intended to illustrate the nature of the energy savings that can be identified and to quantify the savings in terms of cost. Various measures of Return on Investment are generated through a comparison with CircuitMeter system costs.

It is important to note that the actual returns that can be expected to be generated from a CircuitMeter deployment are expected to be much higher than those associated with a single energy saving example, as the same CircuitMeter system can generate an ongoing series of cost savings of the types described without further cost i.e. the same base cost will generate multiple instances of energy cost savings.

It is also important to note that because the cost of an individual system is quite low compared to existing technologies, the magnitude of specific cost saving examples does not need to be particularly high in order to generate high returns, especially given the opportunity to string together different savings examples, as noted above.