

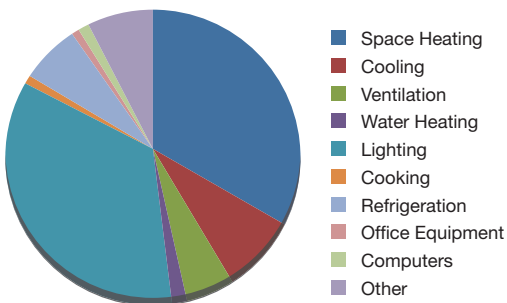
# Small Box Retail Energy Savings in 5 Easy Pieces



## Practical Actions for Retail Store Chains

In this white paper, we offer a 5 step approach to lowering energy costs in the small box retail environment.

### Retail Equipment Energy Use (Non-Mall)



Source: Energy Trust of Oregon

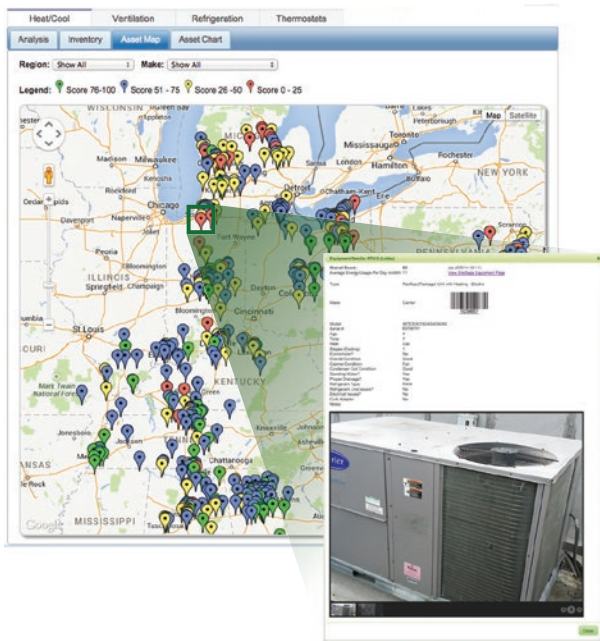
**According to EnergyStar, retailers represent the largest component of energy use of commercial facilities in the US, spending \$20B annually on energy.** Moreover, the Energy Information Agency (EIA) reports that smaller commercial facilities use, on average, 30% more energy per square foot than their larger counterparts. Retail facilities under 10,000 square feet, typically referred to as “small box” retail, use less energy per square foot than similarly sized facilities in food service and food sales, but more than many other commercial building types.

Heating, cooling, and lighting are the dominant energy uses in small box retail, although the split varies widely based on climate. The chart at left is taken from the Energy Trust of Oregon, where cooling loads are not a major issue. This chart would look quite different in Texas or Florida.

Many retailers across the country have taken steps to try to reduce energy costs. With the tight margins that are typical of retail operations, the extra profits that result from an energy reduction program are quite welcome. But, for most retailers, there is much more that can be done to reduce energy costs.

Following is a 5 step approach to lowering energy costs in a small retail environment.

## 1. Inventory what you have



If you do not know exactly what HVAC equipment you have at each of your locations- and what shape the equipment is in- you are in the majority. (For the purposes of this paper we will focus on HVAC because that is generally the most critical and energy intensive type of equipment in a retail facility.) Every company has some form of financial asset system that itemizes all equipment assets and applies the correct depreciation. Based on our experience, however, few seem to have an asset management system that tracks where that equipment is located – much less the condition of each piece of equipment at every location.

Why is this important? There are several reasons. First of all, that information is critical not only for prioritizing maintenance activities, but also for effective replacement and upgrade planning. Both the general information about the equipment and information on its condition are important. For example, age is a critical factor in prioritizing equipment replacement, since older units generally are more expensive to maintain and use more energy.

If you are tracking overall maintenance costs but not detailed costs for specific equipment, the cost growth of aging equipment may not be readily apparent. The impact on energy cost for most companies is even harder to see. Moreover, new HVAC equipment has become more energy efficient, so replacing older equipment is one way to lower energy costs. We'll discuss replacement as an energy reduction strategy later in this document.

HVAC refrigerant type is another important variable to consider when prioritizing equipment for replacement. If you have units that still use R22 – or Freon – you are spending more money to maintain them since replacement parts are no longer being made, requiring extra conversion equipment. Additionally, you will have to replace units using R22 by 2020, when regulations require that R22 be phased out.

In addition to equipment age, other data can also be helpful in diagnosing why some locations are more expensive to operate than others. For example, if some facilities have a much higher ratio of tonnage to square feet than others in the same region, those units could be oversized, which provides guidance when choosing the optimal size of replacement units. Of course, undersized equipment could be the source of customer comfort complaints.

Equipment condition is important to track as well. Do the condenser coils look old and worn? Is standing water visible? These are signs that, at a minimum, the equipment needs to be serviced, but may also indicate that replacement will be necessary sooner rather than later.



*Visual inspection may make it obvious that a unit needs to be serviced - at a minimum*

Capturing asset property and condition data need not cost an arm and leg. Done as part of regularly scheduled equipment maintenance, the marginal cost of capturing the data can be fairly small. Alternatively, you can capture the data when you replace a piece of equipment or install a new thermostat. There are apps available to make it painless to capture the data – including photos of the

equipment. An equipment inventory is also a great opportunity to affix a bar code or QR code, which will make it very easy to track and retrieve relevant information on the equipment as it's serviced in the future.

Having this information can also be helpful to your service teams in planning any future service calls, making sure they know exactly what to bring with them to avoid multiple truck rolls. Also, capturing warranty information, at least on new equipment, will help prevent avoidable maintenance costs for equipment still under warranty.

## 2. Maintain what you have

This sounds obvious- and indeed most retailers do a pretty good job of maintaining equipment. But not everyone is aware that regular maintenance generally pays for itself not only in reduced maintenance costs (since studies have shown preventive maintenance calls cost about 1/3 that of reactive emergency repairs) but also in reduced energy costs.

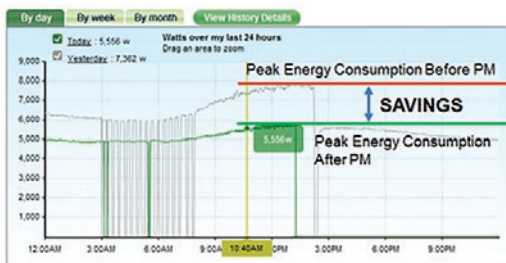
Preventive maintenance should be scheduled multiple times a year for critical equipment such as HVAC. Maintenance should include a thorough review and test of the equipment and should also cover basics such as replacing filters and cleaning coils; that process alone can have a significant impact on energy use. In some cases maintenance checks will reveal that a component, such as the coils, needs to be replaced. While coil replacement could cost in the thousands of dollars, according to the Professional Retail Store Maintenance Association (PRSM), it can significantly increase the life of the asset – to the tune of 5 to 10 years.

If you capture information on the condition of all equipment, you have a basis for deciding how to prioritize your maintenance activities. You can then use regularly scheduled maintenance to keep the condition information up-to-date.

For outdoor lighting, one minor maintenance activity that is often overlooked is regularly checking to see that photo-sensors are clean (and free of snow and ice). When photo-sensors are dirty or covered, your lights will be on continuously.



*Dirty HVAC Coils*



*Source: Powerhouse Dynamics*

## 3. Monitor what you have

Monitoring your locations is a key to controlling energy expenditures.

Monitoring utility bills (including water) is the bare minimum required to start to get a handle on energy usage – and water usage for those locations that have meaningful water bills. There are numerous options for capturing and tracking utility bills, including both stand-alone software and managed services. The savings from identifying billing errors alone generally pays for these services. Tracking bills will enable you to benchmark facilities in order to identify and target those whose

energy spend (normalizing for such factors as operating hours, square footage, utility rates, and weather) is outside the range of their peers. Higher energy spend could signify issues such as underperforming equipment needing repair or replacement, oversized equipment, or poor adherence to equipment schedules. The good news is that the majority of retailers appear to be tracking their utility bills at some level.

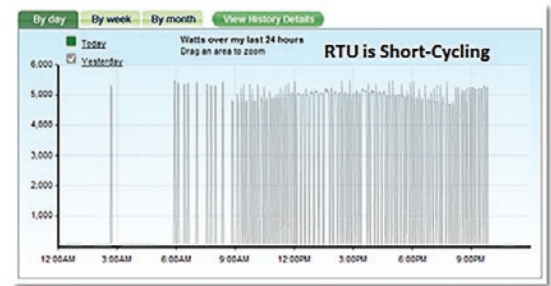


However, truly understanding the reasons for high energy spend requires monitoring at a much more granular level. Fortunately, low cost wireless sensors and the “Internet of Things” have made it affordable to track just about any key piece of equipment in a facility.

For example, sensors placed inside electric panels enable you to monitor the energy use of all equipment centrally, including HVAC, lighting, and just about anything else, without having to attach sensors to each individual piece of equipment. With electricity monitoring (and perhaps the addition of temperature sensors in supply and return ducts for HVAC monitoring), along with the right level of analytics, you can determine if HVAC equipment is operating properly, observe if lighting is being left on when it shouldn't be, identify equipment that is suddenly – or gradually – using more energy, and discover what everything costs to operate to guide decision making. This level of information will allow you to understand why some facilities are using more energy than others so that issues can be addressed. It also allows you to benchmark the equipment itself, not just the facilities, which can also be valuable in replacement planning.

In addition, granular monitoring will let you evaluate the impact of maintenance activities on energy usage, and to confirm that maintenance was actually performed. If equipment performance does not change after a maintenance call, it is a sign that the maintenance was not performed correctly – or was not performed at all.

Finally, with this level of data it is often possible to diagnose a potential problem before it becomes disruptive; for example, monitoring can identify a short cycling HVAC compressor, which may signal a refrigerant leak or iced coils. Though temperature may be unaffected in the short term, short cycling left unattended can lead to system failure, and can also reduce equipment life. Since reactive maintenance calls cost 3 times as much as proactive ones, granular monitoring may result in a significant reduction in maintenance expenses as issues can be addressed before they lead to catastrophic failures.



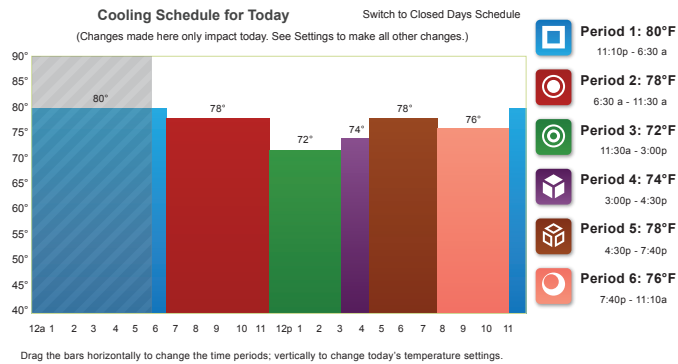
#### 4. Control what you have

There are 2 areas where controls make sense in small retail environments: lighting and HVAC.

Many retailers have installed mechanical lighting controls that allow lighting schedules to be automated. Sometimes these systems are effective. Too frequently, however, they are only effective until the first temporary schedule change – a change which never gets corrected. Or, too often we have seen facilities where the outdoor lights have been scheduled to turn off at noon rather than midnight, a problem which may not be identified for months if at all.

Introducing remote automated lighting controls ensures that the correct schedules are implemented and maintained. Even if local managers are allowed to override them, these systems let you monitor each location and restore the approved schedules where appropriate. Some systems even provide alerts when schedule changes are made.

HVAC controls follow a similar scenario. Many companies have installed programmable thermostats with the expectation that they would be able to maintain set points in support of energy saving goals. As with lighting, the correct automated schedules can only be maintained if local changes are not made – which is generally not practical. The recognition that programmable thermostats only work if they are programmed properly and maintained at those set points caused EPA to drop the EnergyStar designation for programmable



thermostats, and resulted in many utilities dropping rebates for them as well.

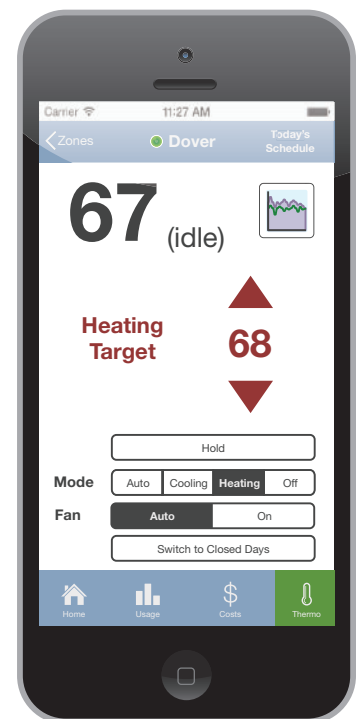
A few years ago, the only options for HVAC control were the energy management systems (EMSs) designed for larger facilities. Aside from the issue of cost, these systems are overly complex for a small facility, whose HVAC infrastructure is more similar to that of a house than to that of a large building. The introduction of Internet-enabled wireless thermostats has shifted the picture and created a number of much less expensive solutions that are better suited to smaller retail facilities.

Remote, centralized HVAC control ensures that settings that strike the optimal balance between customer (and staff) comfort and energy efficiency can be maintained. These systems can set back temperatures overnight to achieve maximum energy savings, and reset them in time to hit the proper set points when staff members arrive in the morning. Don't be afraid to set the thermostats back as much as 8 degrees, as long as you leave sufficient time for the store to get comfortable by opening. Depending upon the HVAC system in place, this could be as much as 2 hours in advance, but could be much less.

The savings for nightly setbacks can be significant. For example, a typical small retail facility might have annual HVAC energy costs of approximately \$7,500. Increasing the set point from 74 to 82 degrees overnight during cooling season and setting back from 68 to 60 degrees during the heating season should save on the order of \$900 per year. You may also be able to further optimize settings by keeping the stores a bit warmer in summer and cooler in winter for those periods after staff are on site but before guests arrive in the morning, and after guests leave but during close-down and cleaning times in the evening.

Many modern HVAC control systems offer mobile apps to control systems remotely. More sophisticated systems allow for enterprise level scheduling so that you do not need to program each individual thermostat. Some also allow for mass overrides for special events; e.g. holiday hours.

In fact, there are systems available that do all of what we have been discussing, from asset data capture and tracking, to utility bill tracking to granular monitoring to lighting and HVAC controls. We refer to these types of systems as EMS 2.0. One advantage of EMS 2.0 is that with these systems, you can manage all of these activities from a single point, rather than having to deal with multiple systems and interfaces.



## 5. Replace what makes sense

There are companies whose equipment replacement philosophy can be summed up as: only replace equipment when it finally fails for good, or “run to fail”.

While this approach sounds like it could benefit cash flow, in our experience it generally ends up being more expensive than a strategy of planned equipment replacement. This is particularly true when all costs are taken into account, including energy as well as maintenance.

As noted earlier, as HVAC systems age, they cost more and more to maintain and generally start to use more and more energy. The cost savings often offset the costs of more regular equipment replacement. Moreover, if there is a catastrophic failure, such as an HVAC unit failing during a busy summer shopping day, relying on older equipment can be a direct hit to revenue as well.

Companies that track assets along with the attendant maintenance and energy costs using some of the techniques described in this paper are able to perform rational equipment replacement planning that looks at the Total Cost of Ownership (TCO), including both capital and operating costs. In this way they are able to determine the most cost-effective time to replace equipment, which will reduce both maintenance and energy costs.

USDOE Better Buildings Alliance is a good source of information on the benefits of early replacement.



When replacing HVAC equipment, look to see if your utilities offer rebates for new, more efficient equipment. Many utilities will also offer rebates for energy management systems.

If you have not recently looked at the benefits of replacing halogen or fluorescent lighting with LEDs, you may be in for a pleasant surprise. Not only do LEDs use only 1/6 the energy of conventional lighting, and last as much as 10 times longer, but LED prices have been dropping rapidly, and LED replacements are eligible for rebates from the majority of utilities in the US. The resulting return on investment makes LED lighting replacement a true “no brainer” in many parts of the country.

## In Summary

This paper has covered 5 steps that “small box” retailers can take to get control of energy expenses and drive savings right to the bottom line: inventory, maintain, monitor, control, and replace. The steps range in cost, but all five offer a positive return on investment. Using the newest EMS 2.0 tools, which enable the first four steps, intelligent decisions can be made on the fifth. We leave it to retailers to decide the mix that best makes sense for them.