The Everything Store Case

You are the National Energy Manager at The Everything Store, Inc., a Fortune 500 company with retail stores across the continental United States. One of your main responsibilities in this role is to develop and implement a strategy to achieve your company's energy efficiency goals cost-effectively, while sustaining energy and cost savings long-term.

As part of a recent push to increase energy savings, senior management has tasked you with determining decision criteria for investing in rooftop unit (RTU) technology across The Everything Store's entire building portfolio. Your primary objective is to explore the company's options to increase energy efficiency by replacing or retrofitting existing RTUs. Your recommendations may incorporate related ideas for improving the efficiency of cooling equipment, such as individual component upgrades, right sizing, RTU controls, innovative data management systems, etc.

You will present a business case to the Vice President of Operations outlining your proposed strategy and decision criteria for managing RTU assets. Solutions should include recommendations for prioritizing buildings/RTU systems in order to maximize energy efficiency and cost savings, supporting technical details, a cost-benefit analysis of the replacement options including financial and tax implications and suggestions on how and whether to make use of incentives or other sources of external funding, and a plan for project implementation and performance evaluation.

You have been asked to start by examining a sample of 100 buildings that is representative of the national portfolio, and select a subset of these buildings for a pilot effort. The activities undertaken in the pilot stores will be used as a means to test your recommended investment decision criteria, check the underlying assumptions, and demonstrate the resulting savings. You must therefore both come up with a replicable strategy, and identify what data will need to be collected to be able to evaluate the pilot effort and justify roll out across the portfolio. You may make reasonable assumptions for data not provided in the case, or propose adjustments to pricing assumptions or corporate policies given in the case, but these assumptions should be clearly stated in your proposal.

Overview

The Everything Store, Inc. is a large American retailer with 3,000 stores located across the continental United States, which sells both hardlines (housewares, electronics, hardware, sporting goods, health and beauty products, toys, etc.) and softlines (clothing), as well as perishable and non-perishable groceries in some of its stores. Your position – National Energy Manager – has existed for over a decade, and is well-supported by upper management. You supervise The Everything Store's energy management department, and report to the Vice President of Operations. The department is responsible for developing and executing a company-wide energy management plan, and handles energy procurement, maintenance and monitoring of energy-related equipment and systems, energy consumption tracking and benchmarking, increasing energy efficiency and cost savings, and implementation of cost-effective alternative and renewable energy systems, among other tasks.

In 2008, the company adopted a Corporate Social Responsibility (CSR) plan, which addresses environmental stewardship throughout the supply chain and includes a section on strategic energy management, setting greenhouse gas (GHG) reduction goals and energy savings targets. The plan specifies that The Everything Store aims to decrease GHG emissions 50 percent by 2025. The Everything Store also joined the Department of Energy's Better Buildings Challenge (BBC) in 2011, committing to reduce portfolio-wide energy use by 20 percent or more by 2020. You work closely with the CSR office as they implement efforts related to water use reduction, green building initiatives for new construction (LEED Gold rating level), environmental compliance, waste management and reduction, and environmental communications. You are also partly responsible for implementing The Everything Store's carbon management protocols and ensuring that the company meets its carbon emissions reduction goals, and for coordinating participation in voluntary programs (like the Better Buildings Challenge).

As a result of the economic downturn and The Everything Store's environmental and sustainability commitments, the Executive Committee has expressed a desire to see significant cost savings and energy reductions across the company's portfolio over the next several years. Specifically, they are interested in energy efficiency options pertaining to early retirement and replacement of rooftop unit (RTU) technology in store buildings, and have asked the Energy Manager to prepare decision criteria and a business case for investing in the replacement of rooftop unit (RTU) technology across The Everything Store's entire building portfolio. The Everything Store wishes to establish a standard set of information and decision criteria to use in deciding when to replace an RTU, and what new technology to install.

Proposals for capital improvements are typically drafted by the National Energy Manager and then approved by the Vice President of Operations. The energy efficiency capital budget process for asset improvement or replacement begins a year before the improvement is to take place. The proposal must be drafted by the National Energy Manager, in coordination with the rest of energy team, the sustainability team, finance team, and engineering consultants, and include an argument justifying the incremental cost difference. If your proposed strategy is approved by the Vice President of Operations, a pilot project will be conducted on the recommended subset of the 100 stores, and performance will be monitored to verify the savings and ROI. Given satisfactory results, your team will go on to present the strategy for roll out the project across the entire portfolio to the Executive Committee, which includes all the Vice Presidents of different divisions.

Crafting a successful strategy will require careful consideration of economic (e.g. cost-effectiveness, amount of up-front cost), social (e.g. environmental impact, improved corporate reputation, opportunities for peer exchange), and operational factors (e.g. improved operating conditions). This is a nuanced technical problem, requiring exploration of the efficiencies of current RTU stock and replacement options; the costs associated with early retirement, purchasing new technology, and switching from one

manufacturer to another; issues associated with choosing and installing equipment; and the best ways to prioritize buildings and RTUs for updating (among other concerns).

Typically, for a project to be approved, the payback period on incremental costs must be within five (5) years. However, detailed analysis must be performed to understand this incremental cost-benefit as compared to the standard practice of replacing RTUs at end-of-life with minimum code compliant equipment. Financial analyses typically include a Net Present Value calculation using a 9% discount rate. Tax impacts are calculated using straight line depreciation. Because HVAC is considered part of the building, the assumed asset life is 39 years for tax depreciation purposes. However, the actual service life of an RTU is usually closer to 20 years. Energy costs are assumed to escalate at the rate of inflation. Proposed projects will not be considered if they are not economically viable or if they will negatively impact retail floor operations, worsen indoor air quality, or significantly reduce comfort for shoppers or store employees.

Building Portfolio

The company's portfolio consists of 3,000 store buildings in the 48 continental states. Appendix A contains building-specific data for a representative sample of 100 stores, including a building identifier (unique number from 1-100), store type (standard store and superstore), building age (range from 0-30, in age range classes), RTU age, climate zone, city/state, and RTU manufacturer. The two main store types, the standard store and the superstore, are constructed using a prototype and described in Appendix B. The major difference between the two store types is that the superstores are larger and contain grocery sections, which carry both dry goods and perishable items that require supermarket-like refrigeration systems.

All stores adhere to a standard temperature set point and schedule, which varies according to season (winter, summer) and store occupancy.

Temperature Set Points	Occupied	Unoccupied
Cooling Season	73°	78°
Heating Season	69°	64°

Existing Assets – Rooftop Units

The Everything Store's heating, ventilating, and air-conditioning (HVAC) systems employ RTUs – air handlers designed for outdoor use, and situated on the roof – to circulate and condition air in each store. RTUs are enclosed (sometimes called "packaged units") and attached to the building's HVAC system through ducting. Several major manufacturers sell RTUs that are appropriate for use in big box stores, and The Everything Store has purchased and installed standard units from Lennox, Trane, Carrier, and Aaon (see Appendix A). Appendix D contains details on the RTUs that are currently installed in The Everything Store's portfolio, including the cooling efficiencies, relevant codes, physical footprints, and existing controls for each RTU age range (0-5 years, 5-10 years, 10-15 years, and 15-20 years). The rated efficiency of each RTU reflects the minimum code-compliant technology at the time that the RTU was installed. Note that the refrigerant R22 is used in many of these units, the sale of which is being phased out in accordance with the Clean Air Act. This will result in a cost escalation for continuing to operate these units.

Because superstores with food sales contain refrigeration (open and closed refrigerated display cases), the RTUs installed in these buildings are often larger and equipped to dehumidify the air as well as condition and circulate it[1]. The Everything Store's superstores have RTUs with dehumidification capabilities from two manufacturers, Seasons*4 and Munters (see Appendix A, RTU Manufacturers).

RTU Pricing and Purchasing Considerations

There are a number of cost-related issues to consider when deciding when and how to replace older RTUs or retire equipment early in favor of more efficient models. The Everything Store can take advantage of bulk purchasing agreements if it is willing to commit to purchasing at least 300 units from the same manufacturer (See Appendix E). But in selecting units, there is a tradeoff between newer, more efficient technologies and those with proven performance. RTUs may also have extra installation costs depending on whether the new RTU is heavier or made by a different manufacturer than the one currently in place. In reality, the cost of RTU units is highly variable. Therefore, if specific options are not currently cost-effective given the assumptions in the case, you can consider at what price they could become a viable option, and recommend using this in negotiations with the manufacturer.

Cutting-edge, high-efficiency RTUs are introduced onto the market regularly. While these new technologies may have the potential to reduce energy consumption significantly, building owners and managers don't always want to be the first adopter, and sometimes perceive new technologies as "risky," in part because the lab performance of equipment can differ significantly from the actual installed performance and there may be a lack of maintenance technicians who are adept to fix these new technologies. The most cutting edge (IEER 18) units are very new to the market and therefore start at a higher price, but are also expected to become cheaper in the near future, as manufacturing of these units achieve economies of scale and there is increased competition offering similar products.

The installation costs associated with replacing RTU units (general installation costs, changes in maintenance requirements/protocols, etcetera), is based on days of labor rather than the number of units being installed. Contractors can typically install up to six units on one store in one day. Additional costs may also be incurred when building owners decide to switch from one manufacturer to another, due to the fact that the footprints of RTUs from different manufacturers are not always the same, and parts or other associated pieces of equipment might not be interchangeable updates to ducting, curbing, etc. These costs can range from $1,500 - $5,000 per unit depending on the type of adjustments needed, but for the purposes of this case, you can assume a 25 percent cost increase for extra installation effort if you decide to switch from an existing brand of RTU to a new brand (no cost increase if you choose to stay with the same manufacturer).

In addition, high-efficiency RTU models (even from the same manufacturer) are heavier than older, less efficient models. Often times higher efficiency RTUs gain efficiency through larger heat exchange surfaces or reduced air flow resistance which typically add weight and physical size to the equipment. The physical differences in the equipment can add to installation cost through structural reinforcement. When considering a switch to a newer, more efficient RTU, you must consider the structural load capacity of the existing roof, and any modifications that will be needed to support the replacement RTU. For this case, if you decide to switch to a heavier unit, and cannot avoid modification costs, assume a structural modification cost equivalent to 100% of the equipment costs if a new unit's weight exceeds 33% increase

1 Similarly, in more humid climates, The Everything Store often employs these specialized RTUs that also perform dehumidification. However, the sample portfolio does not include this level of complexity.

over the installed unit's weight. Note also that building structural modification may cause disruptions to the occupied space of the building which will cause concern for the Store Manager.

You may also consider complementary strategies in addition to RTU replacement, such as improving existing RTUs through retrofits, component replacement, updating control systems, or re-writing maintenance protocols. Also consider building changes that can be made that might change the cooling or heating load of the building and the required capacity of the HVAC equipment.

Financing

The Everything Store typically uses internal funds to pay for capital improvements, and applies industry standard financial assumptions to evaluate their investments. But for this project, the Everything Store is willing to explore using different financing levers, such as equipment leasing, third party financing and emerging funding resources such as Property Assessed Clean Energy (PACE) bonds or Energy Savings Performance Contracts (ESPCs) with Energy Service Companies (ESCOs). Also, in some areas of the country, tax breaks, utility rebates, or other financial incentives might be available for the purchase and installation of energy-efficient technologies such as high-efficiency RTUs. The administrative and time burden of pursuing new funding sources should be considered when evaluating these opportunities.