EDF ENVIRONMENTAL DEFENSE FUND
Finding the ways that work

GREEN FREIGHT

Best Practices in Warehouse Efficiency

A large percentage of the total cost to operate a modern distribution center is attributed to energy. EDF has identified effective strategies to increase efficiency and cut costs in your facility.

EDF worked with shippers to develop a list of realistic, cost-effective, opportunities to reduce energy use in distribution centers. Nearly all of our recommendations have a payback of two years or less and will dramatically improve the efficiency of your operation. Implementing energy-saving measures can be a true win-win for the bottom line and the planet.

Both company-owned and leased facilities can take advantage of these cost-saving opportunities.

In short-term leases, landlords may be receptive to funding or partially funding certain upgrades, such as lighting retrofits and HVAC improvements. The landlords could benefit from tax credits and rebates as well as the capital improvement on the building.

Getting oriented

The first step toward a greener warehouse is learning where your facility can benefit most from efficiency upgrades. During an audit, a trained professional will evaluate your operation and provide recommendations and rebate opportunities. Free or reduced-cost energy audits are available to many facilities with over $200,000 in annual energy spend or spending more than $0.10/kWh. Once an energy audit is conducted, you can better determine the cost/benefit of implementing each best practice.

Below, you will find a comprehensive list of proven measures to improve efficiency in distribution centers. For more information on greening your supply chain logistics operation, click here.

Don't have time or resources to start an efficiency project?
EDF Climate Corps is a cost-effective solution for organizations looking to improve both environmental and business performance. Climate Corps has worked with more than **300** leading organizations to uncover opportunities that could:

Save nearly **$1.4 billion** in energy costs

Avoid the annual carbon emissions from more than **250,000** homes' electricity use

Avoid yearly carbon emissions from nearly **400,000** cars

Save an average of **$1 million** for each organization involved

Learn more at edfclimatecorps.org, or by contacting Scott Wentzell, Project Manager at **swentzell@edf.org** or **(617-406-1811)**

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Top Priority Opportunities		
Category	**Recommendation**	**Payback**
Participate in demand response programs	In a demand response program, a facility agrees to reduce non-essential energy use during peak demand periods, and the utility pays the company for its participation. The utility is typically required to give advanced notice of peak periods. Contact your local facility to determine availability of a demand response program and whether your facility's energy footprint is covered.	immediate
Shut off exhaust fans in unoccupied spaces	Exhaust fans can be shut off when warehouse spaces are unoccupied for extended periods of time. Incorporate fan shut off as a part of warehouse closing procedures wherever appropriate.	immediate
Implement regular HVAC maintenance	Regular maintenance of heating, ventilation, cooling and refrigeration systems - including changing filters regularly - improves air quality and avoids wasted energy.	< 1 year
Seal air leaks	One of the greatest sources of energy loss for heated or refrigerated warehouse spaces is air infiltration through gaps. Regularly checking and repairing gaps in seals is a quick energy saver.	< 1 year
Switch to Exit Sign LEDs	Exit sign lights should be upgraded to LEDs in facilities with lease terms of greater than one year. Incandescent and fluorescent exit sign lights use significantly more energy than LEDs and need to be replaced on a more frequent basis. Many utilities offer rebates for upgrades to LED exit signs.	0.5-2 years
Adjust temperature programming and zone controls	Do an assessment of temperatures and ventilation settings for occupied/unoccupied zones and periods, including office space. Schedule regular periodic checks of settings and controls.	1-1.5 years
Docking door insulation	Dock doors should be regularly inspected to ensure gaps are sealed, especially during loading/unloading operations. Doors should be closed and adequately insulated and sealed when outdoor air temperatures conflict with desired indoor temperatures.	1-2 years
Install occupancy sensors	Spaces such as aisles that are illuminated but infrequently used can waste energy and money. Occupancy sensors turn off or dim lighting when spaces are unoccupied, significantly reducing energy costs. Occupancy sensors are best used with fluorescent or LED lighting rather than metal halides as metal halides require a several minute delay when starting up. If you are considering use of occupancy sensors, consider upgrading your lighting at the same time.	< 2 years

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High Priority Opportunities		
Category	**Recommendation**	**Payback**
Delamp in conjunction with biannual lamp cleaning	Light fixtures often use more lamps than are required for recommended lighting levels. When lights are upgraded from T12 to T8, delamping can be implemented to save energy (fixtures with bulbs removed do not consume energy). At the same time, lighting performance can be improved by cleaning the bulbs on a biannual basis. Lighting improvements can in some cases lead to improved work production and quality as well. Prior to delamping, consider storage of lamps removed and reinstallation costs when the lease term ends. Cleaning, removal and installation generally can be done by on-hand warehouse staff if lifts are available.	< 1 year
Install HVAC control technology/energy information systems	HVAC control technology coordinates HVAC units to reduce spikes in energy demand and consequently reduce demand fees from utilities. Additional HVAC control can reduce maintenance costs on HVAC units. In climatized warehouses, HVAC control technology can manage peak demand fees and reduce demand on individual HVAC units.	0.5-2 years
Upgrade to cold-storage door upgrades and insulation	Refrigerated areas lose energy when doors open to allow forklifts to come and go. Insulated cold-storage doors that open and close quickly and better sealing around loading dock doors will improve efficiency. Air curtains or strip curtains that activate when doors are opened can be used in tandem with refrigerated area doors or to further increase efficiency.	1.5+ years
Install ceiling "destratification" fans	For air conditioned space, ceiling fans save energy by improving air circulation, allowing the temperature setting to be lowered by as much as 4.5^0F and reducing cooling costs by 15-35%. Large fans can also reduce heating costs in the winter by recirculating hot air.	1-2 years
Slow evaporator fans	Full-speed operation of evaporator fans isn't always necessary. Controllers to slow evaporator fans can reduce energy use significantly.	1-2 years
Install fluorescent lighting	Fluorescent lighting generally has the lowest payback for most warehouse lighting upgrades. High-bay warehouses (higher than 20-25 feet) should be upgraded to T5s and low-bay to T8s. A combination of lighting upgrades and occupancy sensors can lead to significant savings.	1-2 years
Install task lighting	Installing task lighting in narrow aisles or where workers are located reduces the need for ceiling lighting, proving more delamping opportunities.	1-2 years
Install LED lighting	While LEDs are generally more expensive than fluorescents, their energy savings are much greater and their heat output is much lower. The ROI for LEDs can be improved in climatized warehouses	2 years
Section warehouse space into temperature zones	Over cooling or heating warehouse space that is not partitioned according to temperature zone can significantly increase energy use. Warehouse interior construction can be altered to allow for targeted different temperature zones. Sectioning should be considered when temperature requirements are significantly different for warehouse stock or when warehouse reconfiguration is already being considered.	> 2 years

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Install demand-defrost systems	Timer-based defrosters (used to defrost the ice that accumulates on the evaporator coils during operation) account for about 20% of the total energy consumption of walk-in freezers. Demand-defrost systems, which initiate defrosts only when they are needed, can save significant amounts of energy by reducing the number of defrost cycles. Independent tests show that the more advanced demand-defrost controllers can reduce defrost cycles by as much as 40% compared to defrosters with timers—saving from $150 to $3,000 annually depending on the size of the freezer. Controllers can also help increase product quality because fewer defrost cycles translates into a more constant temperature in the freezer.	2-4 years
Upgrade to energy efficient vending machines	Vending machines use a significant amount of energy (approximately 3,000kWh/yr per machine) because they are left on all of the time. Upgrading to a vendor who supplies Energy Star-certified vending machines or installing energy saving devices such as Vending Misers can reduce energy use by more than 50%. Include Energy-Star requirements in your next vending machine RFP or ask your current vendor if they can upgrade the equipment. Vending Misers can be installed easily by facility staff.	2-3 years (or immediate when initiating new vending contract)

Long-term Opportunities		
Category	**Recommendation**	**Payback**
Utilize beam radiant heaters	Reflector-focused gas or electric radiant heaters (in circumstances where only small employee areas require heat), can dramatically reduce energy costs by allowing the ambient facility temperature to be reduced without loss in employee comfort.	2 years
Install economizer controls/free cooling	For climatized warehouses, air-side economizers use a damper to control intake of outside air. When outside air is cooler than return air, the damper adjusts to maximize air intake. When outside air is warmer than return air, the damper reduces outside air intake to the minimum required by building codes, reducing the need for mechanical heating or cooling. Airside economizers are best used in cool climates to take advantage of regional temperatures.	> 2 years
Install CO2 cascade refrigeration system	Traditional refrigeration systems emit HFC gas which is a climate warming gas many thousand times more impactful than CO2. Cascade refrigeration systems that use CO2 for cooling purposes and can reduce energy use and climate impact.	> 2 years
Install cool roofing	Cool roofs are made from material that reflect the sun's energy and consequently reduces the heat transferred to the building below. This reduces cooling costs. Cool roofs should be considered on climatized warehouses if roofs are scheduled for replacement/repair and in long-term leased warehouses with high cooling costs.	> 2 years (when roof upgrades are due.)