

Greening Grocery: Strategies for Sustainable Food Retailing - A Project of The Food Trust

Site Design: Strategies focus on methods for increasing user access and decreasing a store's environmental footprint. Additional consideration is paid to reducing initial land and construction costs and lowering long-term operating costs.									
	Category	Strategy	Relevant Store Size/Type	Initial Cost	** Return on Investment	Operator Benefits	Technical Considerations	Product + Manufacturer Suggestions/Resources/Examples	
*	1	Site Selection	Choose an urban building site and/or smaller building sites.	S,M,L/New & Adapted	0 - \$\$	Immediate	Ability to work with existing infrastructure (utilities); lease, construction, and utility costs are less for smaller sizes; denser location brings people in from surrounding neighborhoods.	This may involve multi-level structures including parking above or below grade, both of which have significant cost implications. Consider the following strategies: retail frontage with parking at rear; designs that minimize loading dock area and back of house storage (note: this requires additional coordination for loading demands); design compactly with narrower aisles.	ShopRite, Acme, Romanos Grocery, Weaver's Way, Fresh Grocer, Trader Joe's, Whole Foods, Mariposa Coop
*	2	Alternative Transportation	Select a site near public transportation and develop project site to encourage additional access beyond a single passenger car.	S,M,L/ New & Adapted	0-\$	Immediate	Brings in more customers; reduces the first-cost and on-going cost of parking areas.	Consider the following strategies: locate store in Transit Oriented Development; site selection near public transportation; provide bike parking; covered bus shelter integrated with site design for buses and shuttles; parking spaces for car share programs.	Bike Share / Philly Car Share / FlexCar / ZipCar
	3	Adaptive Re-use / Renovation	Locate the market in existing buildings.	S,M,L/ Adapted	0 - \$\$	Immediate	Potential time and cost savings to work with existing infrastructure (utilities and structure).	This may involve unusual shaped footprints and multi-level structures; more limitations on type of mechanical systems that may be applicable.	Romanos Grocery, Weaver's Way, Trader Joe's, Mariposa Coop, FreshGrocer, Supremo (Philadelphia stores)
	4	Parking	Reduce number of parking spaces; parking at rear to maintain urban street fabric.	S,M,L/New & Adapted	0 - \$	Immediate	Savings in land cost, construction cost, taxes, and maintenance costs.	Urban locations can support less parking and narrower spaces - 5/1000 occupants and 8'w spaces. Upper and lower deck parking is not yet generally financially viable in the Philadelphia area due to relatively low land costs. Consider validated parking with nearby lots and provide drop off spaces for taxis, etc.	Philadelphia Parking Policies (see Appendix: Additional Resources)
	5	Loading Area Design	Minimize area of loading docks; Successful mid-size stores developed with only one dock.	M-L/New + Adapted	0	Immediate	Reduces construction costs and building size, allows more area for floor sales.	Seal loading docks from other areas to minimize infiltration; look at strategies around delivery and storage to minimize loading (for example, stacked storage and staggered deliveries).	Wild by Nature (Long Island, NY)

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* Additional information provided in cut sheets

Return on Investment: This information is meant to show at what point the initial cost investment has paid for itself and will accrue savings that go directly to the bottom line. This information is broad as it will be different for different size stores and impacted by location. Energy modeling will give the best sense of return on investment during the design process for each particular project. For non-energy based systems, it's the point at which the costs for the strategy will have paid for themselves through the benefits listed. In some cases, the initial investment is negligible so the return on investment is shown as immediate.

Initial Cost Notes

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- \$\$\$ 50%-75% additional cost to equivalent conventional building method/technology

Store Size Notes

- S - Small store; Bodega style; 1000-5000sf
- M - Medium sized store; Grocery store; 5000 -25,0000 sf
- L - Large store; Supermarket; > 25,000sf, typ. 45,000sf - 60,000sf

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- New - Ground-up new buildings
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Energy Efficiency: Strategies for system design, upgrades and operations focus on reducing energy consumption as related to mechanical and electrical usage. Typical supermarkets use an average of 52.5 kWh/sf/yr which accounts for 80% - 90% of its energy load. The benefits of this are realized in cost savings on utility bills to the store operator as well as reducing global environmental impacts from the use of non-renewable fossil fuels.

Building Design Strategies

	Category	Strategy	Relevant Store Size/Type	Initial Cost	** Return on Investment	Operator Benefits	Technical Considerations	Product + Manufacturer Suggestions/Resources/Examples
	1	Building Orientation	S,M,L/ New	0	Immediate	Can provide high quality daylighting; reduces cooling loads.	Limit east and west facing window exposure.	
*	2	Building Envelope Design	S,M,L/New, Adapted & Exist	\$-\$\$	1-3 years	Reduces cooling and heating loads for interior of building.	Reduce exterior envelope (for example, party walls or multiple stories). Consider high performance glazing, reflective roof coverings, high R-value insulation with low infiltration rates, products with high SRI (solar reflectance index >29 for sloped roofs), spray foam insulation over batts.	Carlisle's white TPO roofing; Solarban Glazing; Kingspan Metal SIPs, BioBased Spray Foam Insulation
*	3	Energy Modeling	S,M,L/ New & Adapted	\$	Immediate	Modeling will inform decisions about which selection or combination of selections perform the best. General energy analysis data can be applied to multiple stores in a chain, increasing the return on investment.	Energy modeling is the best way to project energy use and savings while designing the building. Modeling is typically necessary for energy rebates. While uncommon for grocery stores, it is ideal to integrate refrigeration modeling together with space conditioning to realize full efficiencies, like heat recovery.	See attached sheet
*	4	Comprehensive Daylighting Strategy	S,M,L/New & Adapted	0-\$	Immediate	30%-50% light energy savings. Enhances the stores appearance and attracts customers. Numerous studies have shown that daylight increases sales. Enhances staff satisfaction and productivity.	Produce areas should not receive any direct day light; special care should be given to designing skylights and windows so as not to increase cooling loads. Preferred natural light is from the south and north. Use high performance and diffuse glazing for skylights.	Solatube Skylights; See attached sheets for more information.
	5	Zoned Design	M,L/New, Adapted	0	Immediate	Energy savings by reducing loads and controlling humidity; reduces electric loads to minimum requirements	Design areas that can be closed off and conditioned separately from each other particularly separating open refrigerated cases from rest of area	
	6	Mixed Use Configurations	S-M/ New & Adapted	0	Immediate	When walls or ceilings are shared it helps reduce heating and cooling loads, as well as saves in first-cost. Locating store near adjacent retail brings in more customers.	In general, multi-level grocery stores are less desirable as they impact worker productivity.	See Appendix for Transit Oriented Development
	7	Tree Planting	S,M,L/New, Adapted & Exist	\$	1-3 years	Reduces cooling loads for interior of building. Keeps site cooler around the building for users and provides visual amenity. Inexpensive way to deal with stormwater.	Locate trees in parking to cast shade over site paving and glazing. Consider intermediate planting strips to get more tree coverage in parking. Native and adapted trees preferred. Locate deciduous trees to shade south, east and west of building.	TreeVitalize - a partnership to restore tree cover in Philadelphia www.treevitalize.net

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General Mechanical/Electrical System Design Strategies								
	Category	Strategy	Relevant Store Size/Type	Initial Cost	** Return on Investment	Operator Benefits	Technical Considerations	Product + Manufacturer Suggestions/Resources/Examples
1	Digital Building-wide Automatic System Controls	Use micro-processor based controls integrated with a well-defined energy management program to monitor mechanical, electrical and refrigeration systems.	M-L/New, Adapted & Exist	\$\$-\$\$\$	4-7 years	Reduces building energy and maintenance costs; Savings in the range 10%-50%.	While savings can be high, initial costs for controls is also high; therefore it is best implemented in large grocery stores and supermarkets; most supermarkets typically use refrigeration controls, however even more efficiencies recognized if used building/system wide.	Emerson E2 Controller
2	Zone Control	Design controls to allow systems within the store to operate independently from each other, particularly in off hours, and to shut off when not in use.	S,M,L/New, Adapted & Exist	\$	1-3 years	Energy savings by reducing loads and controlling humidity.	For stores that are not 24/7: use night set-backs and on-demand settings; provide case covers on open cases; locate units in areas that can be separated from other areas for varying setbacks/shut-off.	
3	Integrated Approach	Design and maintain mechanical systems integrally.	S,M,L/New & Adapted	0 - \$	Immediate	Energy savings realized through higher efficiencies.	Requires more upfront coordination. Systems are most frequently handled separately, not taking advantage of efficiencies that can be realized. Facilitate communication between refrigeration and HVAC operators and designers.	
4	Rebates	Before purchasing equipment, research utility company and government rebates; select high efficiency equipment based on rebates.	S,M,L/New, Adapted & Exist	0	Immediate	Reduces initial outlay for fixtures and equipment that can have long term savings benefits.	Applicable to new facilities and upgrades.	PECO / PGW

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Refrigeration								
	Category	Strategy	Relevant Store Size/Type	Initial Cost	** Return on Investment	Operator Benefits	Technical Considerations	Product + Manufacturer Suggestions/Resources/Examples
*	1	Low Charge Multiplex with Evaporative Condenser	Design for condensers with control systems that limit the amount of refrigerant recharge for the multiplex operation.	S, M, L / New, Adapted, Existing	\$	1-3 years	Lowest first cost premium giving the best payback; Energy savings in the range of 4-6%/year; Reduction in the amount of refrigerant by 1/3.	Liquid controls save additional energy by lowering condensing temperatures. See attached sheet
*	2	Distributed Refrigeration	Design for small condensers located closer to the refrigerated cases, typically on the roof, reducing the amount of refrigerant and refrigerant lines.	M-L/New & Adapted	\$	4-7 years	Reduces piping length which reduces refrigerant leakage. Energy savings in the range of 11%/year.	Requires additional condensing units, although smaller. Water cooled systems require glycol and pumps which have implications maintenance and energy; energy use can be offset if an evaporative fluid cooler is employed. Hussman Corp
*	3	Secondary Loop, Water/Glycol Cooled Refrigeration Cases	Design for water chilled lines to refrigerator cases with refrigeration contained within the central cooling unit.	M-L/New & Adapted	\$\$	4-7 years	Energy savings in the range of 10%/year; refrigerant savings in the range of 80%; even better benefits if tied to HVAC system, see Integrated HVAC below.	Not meant for packaged refrigeration units; requires additional maintenance of glycol; use a good installer and have a good maintenance contract. See attached sheet
	4	High Efficiency Self Contained Refrigeration	Install/upgrade to high efficiency refrigerators. Select equipment with Energy Star ratings where applicable. Consider units with water cooled condensers and glycol loops to the exterior of the building for heat rejection.	S/New, Adapted & Exist	\$	1-3 years	Energy Savings; depends on unit selection.	Best for smaller stores where more efficient distributed systems are not a viable option. Glass door reach ins not necessarily best first approach for energy savings. Consider distribution systems. See Energy Star Recommendations for Commercial Refrigeration www.energystar.gov
	5	Evaporative Condensers	Alternative to air-cooled condenser using wetted filter media to cool ambient air as it enters the condenser increasing its ability to reject heat.	M & L/New	\$	4-7 years	Savings in the range 2%-10% as water is a more efficient heating and cooling medium than air.	Water based systems in general are more efficient than air based systems, although they tend to require additional maintenance. They are most efficient in dry climates but are still effective in mixed climates like the Mid-Atlantic. www.aps.com/main/services/business/WaysToSave/BusWaysToSave_59.html
	6	Refrigeration Night Covers	Install energy saving thermal curtains that reflect warm temperatures away from refrigerated display cases and keep cold air in.	S, M, L/New, Adapted & Exist	\$	1-3 years	Energy savings	Not applicable for stores open 24/7. Econo-Frost www.econofrost.com
	7	Refrigerator Display Cases with Doors	Use refrigerators with doors over open cases as much as possible.	S, M, L/New, Adapted & Exist	0	Immediate	Doors reduce compressor energy and cold air leakage; savings as high as 50% over open cases; keeps customers more comfortable.	Existing cases can be retrofitted, but be sure to get input from a professional as to size the condenser properly. www.aps.com/main/services/business/WaysToSave/BusWaysToSave_59.html
	8	Floating Head Pressure Controls	Use pressure controls which vary head pressure based on outdoor conditions (load matching).	S, M, L/New, Adp & Exist	0-\$	1-3 years	Energy savings in the range 3%-10%; helps refrigeration equipment last longer.	Floating head pressure controls are often standard on new systems but existing systems can be retrofitted. www.aps.com/main/services/business/WaysToSave/BusWaysToSave_59.html
	9	Liquid Pressure Amplifiers	Use small refrigerant pumps that increase refrigerant liquid line pressure and system efficiency.	S, M, L/New, Adp & Exist	\$	1-3 years	Energy savings as high as 20%.	For systems with air-cooled condensers, the lower the outdoor air temperature, the greater the efficiency gain. www.aps.com/main/services/business/WaysToSave/BusWaysToSave_59.html
	10	Anti-Sweat Heater Controls	Use electric heater controls to sense store humidity conditions and turn the heaters off when they are not needed.	S, M, L/New, Adapted & Exist	\$	1-3 years	Savings in the range 6%-20% depending on the type of case. Most effective with reach-in refrigerators.	Anti-sweat heaters are electric heaters installed in virtually all low temperature and many medium temperature display cases to keep their external surfaces free of condensation during high humidity conditions. Typically they are on all the time. www.aps.com/main/services/business/WaysToSave/BusWaysToSave_59.html
	11	Defrost Controls	Use demand controls which initiate defrosting in a variety of ways such as measuring the temperature or pressure drop across the evaporator, measuring frost accumulation and sensing humidity.	S, M, L/New, Adapted & Exist	\$	1-3 years	Improves the defrost cycle providing energy savings in the range 1%-8%.	These methods are more effective than using a simple timer clock to initiate defrosting. www.aps.com/main/services/business/WaysToSave/BusWaysToSave_59.html
	12	Ambient Subcooling	Use an oversized condenser or additional heat exchanger to sub-cool liquid refrigerant.	M-L/New, Adp & Exist	\$	4-7 years	Savings in the range 1%-10% on the higher end for walk-in coolers.	www.aps.com/main/services/business/WaysToSave/BusWaysToSave_59.html
	13	Mechanical Subcooling	Cool liquid refrigerant below its saturation pressure to increase system capacity and improve efficiency.	M-L/New, Adp & Exist	\$	1-7 years	Savings as high as 30% for refrigeration systems.	www.aps.com/main/services/business/WaysToSave/BusWaysToSave_59.html

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HVAC								
	Category	Strategy	Relevant Store Size/Type	Initial Cost	** Return on Investment	Operator Benefits	Technical Considerations	Product + Manufacturer Suggestions/Resources/Examples
1	Integrated Air Based HVAC with Refrigeration System	Use units with premium efficiency motors. Use waste heat from refrigeration to temper ventilation and heating air.	S,M,L/New, Adapted & Exist	\$	4-7 years	Energy savings are yielded from higher efficiency unit and the use of waste heat and from not using energy to remove the waste heat.	Involves direct integration of the heat pump evaporator and the refrigeration condenser; Typically roof top units.	Hussman Corp; Energy efficient motors www.aceee.org/ogeece/ch4_index.htm
* 2	Integrated Water Based HVAC with Refrigeration System	Design for water source heat pumps (WSHP) in conjunction with water-loop heat rejection for the refrigeration.	M-L/New, Adapted & Exist	\$\$	4-7 years	Produces the highest reduction in operating costs; Savings in the range 10-20% on HVAC and refrigeration loads; uses less refrigerant and reduces environmental impacts.	Refrigeration and HVAC units need to interface.; employ glycol loops for heat rejection; requires additional maintenance over air based system.	Loblaws Supermarket, Canada
3	Variable Speed Economizer Fans	The economizer allows for outdoor air usage rather than mechanical; Variable flow provides the ability to vary the speed of pump and fan motors as well as match load conditions.	S,M,L/New, Adapted & Exist	\$	1-3 years	Savings in the range 10%-30%.	Allows system to use outdoor air, when temperature and humidity allow, particularly relevant to supermarkets where interior loads create the need for cooling; typically an option for all package AC units.	
* 4	Humidity Control	Install rooftop units using desiccant energy recovery wheels which moderate indoor humidity levels and help to reduce energy demands by recovering some of the energy to heat or cool outdoor makeup air.	S,M,L/New, Adapted & Exist	\$	1-3 years	Reduces the cost to condition outside air by up to 80%; Improves indoor air quality; immediate payback when conditioning units are downsized to take advantage of work by ERW, extends shelf life of food by preventing sweating, creates a more comfortable environment for shoppers.	Humidity becomes present through infiltration, open doors, and ventilation. It is important to have good humidity control and a tight building. Where high outdoor air quantities are being introduced, consider liquid desiccant humidity control systems.	McQuay; See attached sheet
5	Demand Ventilation	Decouple ventilation from space conditioning.	M-L/New & Adapted	\$ - \$\$	4-7 years	Less energy used for space conditioning in off-hours and temperate times. Helps control humidity which contributes to energy savings.	Requires additional duct work. CO2 monitoring recommended. Not a good application in areas of cooking.	

Hot Water								
1	Heat Recovery	Waste heat from refrigeration, AC units, and drain water can be used to heat water; options include a hot-gas-to-water heat exchanger, double-bundled condensers, and pipe wrapped drain lines.	S,M,L/New, Adapted & Exist	\$	4-7 years	Energy savings are yielded both from the use of waste heat and from not using energy to remove the waste heat.	Heated water can be used for tempering ventilation/heated air, domestic hot water, and water for food heating tables. Kitchens offer great opportunities for captured drain heat as quantities and temperatures are typically high.	Therma-Stor; Turbotec; Heat recovery water heating http://gfxtechnology.com/HR3-7-1.PDF
2	Tankless Hot Water Heaters	Install instant hot water heaters that don't require water storage of heated water.	S/New, Adp & Exist	\$	1-3 years	Space savings by eliminating space for water heater. Energy savings from not heating stored hot water.	Best used for small stores not able to use heat recovery.	Takagi, Rinnai
3	Radiant Heating in Exterior Paving Areas	For projects heating water with recovered heat, install radiant piping in sidewalks for snow and ice removal.	M-L/New	\$	4-7 years	Helps reduce cost for snow and ice clearing by using on-site generated energy.	Can use recovered heat already heating water for other purposes; only costs are those to lay flexible tubing; best for projects providing new or replacement sidewalks.	

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Equipment								
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1	High Efficiency Equipment	Install/upgrade to high efficiency equipment; select equipment with Energy Star ratings where applicable.	S,M,L/New, Adapted & Exist	\$	1-3 years	Savings in the range 15%-35%.	Applies to packaged refrigeration units, all kitchen equipment, lighting/lamps, and water heaters. Use gas ovens, instead of electric. Install compensating hoods to reduce demand on HVAC and hood controllers that shut down the hood when not in use.	Select Energy Star rated equipment www.energystar.gov , follow CEE commercial recommendations www.cee1.org/com/com-main.php3 (Consortium for Energy Efficiency)
2	High Efficiency Condenser Fan Motors	Select condensers using premium efficiency motors.	S,M,L/New, Adapted & Exist	\$	1-3 years	Savings range 3%-5%.		
3	High Efficiency Compressor Motors	Select compressors using premium efficiency motors.	S,M,L/New, Adapted & Exist	\$	1-3 years	Savings in the range 8%-18% depending on item (reach-ins, ice machines, vending machines, beverage merchandisers, etc).		
4	High Efficiency Evaporator Fan Motors	Select evaporator fans using premium efficiency motors.	S,M,L/New, Adapted & Exist	\$	1-3 years	Savings in the range 2%-30% depending on item (reach-ins, display cases, ice machines, vending machines, beverage merchandisers, etc).		

Lighting								
* 1	High Performance Lighting Strategies - Ambient Lighting	Use high performance fluorescent fixtures on occupancy and daylight controls.	S,M,L/New, Adapted & Exist	\$	1-3 years	High performance lighting systems have potential saving in the range of 8%-15%. Lighting improvements can be done incrementally with immediate payback.	Consider a lower level of overall general lighting to allow the display lit areas to better stand out; use fixtures with T8 or ideally T5 lamps; install occupancy sensors in storage rooms, back-of-house offices and other vacant and low traffic areas; install and adjust automatic dimming controls to take advantage of daylighting and enable lowering light levels for restocking and cleaning while the store is closed.	See attached sheet
* 2	High Performance Lighting Strategies - Display Lighting	Use LED lighting in cases, and fluorescent or metal halide lighting placed closer to product for display.	S,M,L/New, Adapted & Exist	\$	1-3 years	High performance lighting systems have potential saving in the range of 8%-15%. Lighting improvements can be done incrementally with immediate payback.	Use 39w HID display lighting hung lower in place of 70w. LEDs are 40x more efficient than incandescent however color rendition and throw need to be checked for display use, best for refrigerated cases.	See attached sheet
* 3	High Performance Lighting Strategies - Exterior	Use Metal Halide LED exterior fixtures for exterior applications, zoned for after hours usage.	S,M,L/New, Adapted & Exist	\$	1-3 years	High performance lighting systems have potential saving in the range of 8%-15%. Lighting improvements can be done incrementally with immediate payback.	Use 3fc average in parking lots. Consider solar pv in parking lots which offsets cost of conduit runs. Zone exterior site lighting - turn off certain areas of parking lot after hours.	See attached sheet

Operations and Maintenance								
* 1	Measurement and Verification/ Submetering	Tracking energy cost and usage involves the use of submetering to measure individual loads, such as lighting, refrigerators, main meter, and HVAC. "If you don't measure it, you can't control it."	M-L/New	\$	4-7 years	Very helpful in testing new strategies. Data can be used to help determine problem areas or areas not performing as expected. General energy analysis data can be applied to all stores in chain.	Special consideration needs to be given to electrical design in order to more effectively allow for submeters. Need to have a facilities person that is collecting and analyzing data; often works well with building automated systems and controls.	See attached sheet
2	Comprehensive Building Commissioning	Engage a commissioning agency to test all equipment for performance.	M-L/New, Adapted & Exist	\$ - \$\$	4-7 years/7+	Tested systems will perform at their peak efficiencies; Typically done for new facilities on the onset, but can provide benefit existing stores.	Commissioning agents typically will test HVAC, domestic hot water, and building controls. Refrigeration unit and controls testing are usually commissioned separately. Ideally the two would overlap and be cross-coordinated to maximize efficiency.	
3	Operating and Maintenance Procedures	Create and implement a well defined and consistently executed O&M plan.	S,M,L/New, Adapted & Exist	\$	Immediate	Regular coil cleaning, door seals, refrigerant leakage detection and repair, not overloading cases, etc. will yield long term consistent energy savings.	Use contract maintenance over in-house as it increases the chances of it happening regularly. Ideal to have all systems under the same contract. Requires some employee training.	
4	Energy and Waste Education Program for Employees	Train and educate employees on importance of energy efficiency and provide incentives for them to report leaks and under- functioning equipment.	S,M,L/New, Adapted & Exist	\$	Immediate	Helps systems run at their most efficient levels and yield operational savings in the 2% - 10% range.	Provide incentives for staff to report leaks and malfunctions in addition to training.	

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Water Efficiency: Strategies focus on reducing use of municipally treated domestic water. Conventional supermarkets use 3500 - 4000 gallons/day of water. Most of this water is consumed for water based mechanical equipment or wash-down requirements at food prep areas. The benefits are realized in cost savings on water and energy bills from reduced use and in reducing the environmental impacts from treating municipal water.

	Category	Strategy	Relevant Store Size/Type	Initial Cost	** Return on Investment	Operator Benefits	Technical Considerations	Product + Manufacturer Suggestions/Resources/Examples
1	No Irrigation / Native Vegetation	Install adapted/native vegetation that will require no irrigation after plant has taken hold.	S,M,L/New	0	Immediate	Water savings; eliminates cost of irrigation installation.	Plantings will probably need some initial irrigation until established; consider drip irrigation that can be easily removed or hand watering.	
2	High Efficiency Spray Nozzles for pre-rinse and wash-down / Aerators / Water Flow Restrictors on Hand Sinks and Spray Tables	Install equipment that restricts water flow over conventional flow rates.	S,M,L/New, Adapted & Exist	\$	1-3 years	Cost savings on water.	High pressure nozzles with lower water volume can perform wash-down as well as conventional nozzles.	Zurn, Encore, Fisher, Niagara Conservation
3	High Pressure Sprayers for Washing in Meat Department	Sprayers that use high pressure to achieve the same water force with less water.	S,M,L/New, Adapted & Exist	\$	1-3 years	Cost savings on water.	High pressure nozzles with lower water volume can perform wash-down as well as conventional nozzles.	
4	High Efficiency Toilets and Urinals	Install 1.1gpf or dual flush toilets; waterless or .5gpf or less urinals.	S,M,L/New, Adapted & Exist	\$	4-7 years	Cost savings on water.		Kohler, Zurn, Sloan
5	Aerators on lavatories and staff showers	Install .5 gpm aerators on lavatories and 1.5gpm heads on any staff showers provided.	S,M,L/New, Adapted & Exist	0-\$	Immediate	Cost savings on water.		Sloan, Bricor, Zurn
6	Condensate Re-Use from Refrigeration and AC Units	Recycle water back to water based heating and cooling systems.	M-L/New, Adapted & Exist	\$	4-7 years	Cost savings on water.	Applicable to water based systems; Much of water used in mechanical equipment is lost to evaporation.	
* 7	Rainwater Collection and Reuse	Collect rainwater on site to be used for toilet flushing, in water based cooling and heating equipment, and irrigation if required.	M-L/New, Adapted & Exist	\$\$	7+	Payback in 12 years or as little as 4 depending on tank sizing and demand.	Tank sizing is critical.	See attached sheet

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* Additional information provided in cut sheets

Return on Investment: This information is meant to show at what point the initial cost investment has paid for itself and will accrue savings that go directly to the bottom line. This information is broad as it will be different for different size stores and impacted by location. Energy modeling will give the best sense

** of return on investment during the design process for each particular project. For non-energy based systems, it's the point at which the costs for the strategy will have paid for themselves through the benefits listed. In some cases, the initial investment is negligible so the return on investment is shown as immediate.

Initial Cost Notes

- 0 No additional construction cost over conventional building method/technology
- \$ 1% - 20% additional cost to equivalent conventional building method/technology
- \$\$ 20% - 50% additional cost to equivalent conventional building method/technology
- \$\$\$ 50%-75% additional cost to equivalent conventional building method/technology

Store Size Notes

- S - Small store; Bodega style; 1000-5000sf
- M - Medium sized store; Grocery store; 5000 -25,0000 sf
- L - Large store; Supermarket; > 25,000sf, typ. 45,000sf - 60,000sf

Store Type Notes

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Materials and Resources / Environmental Concerns: Strategies focus on using less material, re-using materials, and using local materials in order to reduce material costs and impacts to the environment caused by material manufacturing and transportation costs. Additional strategies focus on using materials that minimize the impacts to air quality both internally and globally. Benefits are realized through lower material costs, increased durability, a healthier building for its occupants, and reduced global environmental impact.

	Category	Strategy	Relevant Store Size/Type	Initial Cost	** Return on Investment	Operator Benefits	Technical Considerations	Product + Manufacturer Suggestions/Resources/Examples
1	Refrigerant Selection	Pick refrigerants that are more environmentally friendly.	S,M,L/New, Adapted & Exist	0-\$	Immediate/1-3 years	These refrigerants tend to be more energy efficient; improves system design and maintenance.	Many older refrigeration systems are also energy inefficient, resulting in increased costs, as well as increased energy demand (further increasing GHG emissions).	www.epa.gov/ozone/partnerships/greenchill/
2	Reduce and Re-Use Materials	For existing facilities, use/renovate existing materials; design for less material need.	S,M,L/New, Adapted & Exist	0	Immediate	Savings on building materials.	Eliminate dropped ceilings, expose structure, use materials serving more than one purpose (structural and finish); consider exposed/stained concrete floor finishes.	
3	Local/Regional Materials	Use building materials that were extracted and manufactured locally (within 500 miles is the generally accepted target).	S,M,L/New & Adapted	0-\$		Savings on transportation costs.	When selecting materials, consider maintenance and life cycle of the options.	Armstrong; USG
4	Recycled Materials	Use building materials that have recycled content; gyp board can be specified with 95% recycled content.	S,M,L/New & Adapted	0-\$		Some recycled materials cost less; many don't cost more. Materials are a visible statement of environmental commitment.	When selecting materials, consider maintenance and life cycle of the options; compare recycled content percentages and specify the higher levels when cost competitive.	Armstrong ceiling tiles; USG and National Gypsum; Forbo marmoleum
5	Low VOC Adhesives and Finishes	Use adhesives and finishes that have low quantities of air contaminants (volatile organic compounds, VOCs).	S,M,L/New, Adapted & Exist	0-\$		Improves indoor air quality for employees and patrons. Reduces down-time due to fumes after renovations and repairs.	Including adhesives for plumbing and duct work.	Most paint manufactures have low VOC lines, some don't have a premium; Oatey for plumbing adhesives

Waste Management / Recycling: Strategies focus on reducing waste sent to the landfill. An average supermarket sends 1,000 tons of garbage to the landfill/year. The benefits of this are realized in cost savings in waste disposal fees, increased store traffic and in improving global environmental impacts by creating better soil and from minimized waste to a landfill.

* 1	Use/Compost Organic Waste	Use immediately ripe produce in salad bars and other kitchen food prep; compost organic waste for use on site or by other local organizations/ community gardens.	S,M,L/New, Adapted & Exist	\$	1-3 years	Reduces refuse fees. Re-using ripe produce increases profit.	Requires additional staff coordination. Needs to be designed not to attract vermin. Consider using industrial pulpers or water extractors with organic waste to minimize size and weight and then use/sell/give away for fertilizer.	
* 2	Comprehensive Recycling Strategy	Recycle cardboard and any metal, glass, and paper products used by store. Return/reuse any wood pallets. Provide area for customers to drop-off recycling - particularly cardboard and plastic bags which are not items picked up residentially by the City. Reduce use of packaging.	S,M,L/New, Adapted & Exist	0-\$	Immediate/1-3 years	Reduces refuse fees. Good PR. Attracts customers.	Requires additional coordination and staff education for garbage separation. Consider how items are packaged and ways to reduce packaging, such as sale of bulk items. Some packaging can be re-sold inexpensively as storage containers.	
3	Construction Waste Hauler During Construction	Recycle construction waste in lieu of sending it to the landfill.	S,M,L/New, Adapted & Exist	0-\$		Reduces landfill dump fees during construction.	Higher savings and recycling success if materials are separated on site rather than off.	

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Store Operations:								
	Category	Strategy	Relevant Store Size/Type	Initial Cost	** Return on Investment	Operator Benefits	Technical Considerations	Product + Manufacturer Suggestions/Resources/Examples
1	No Idling Policy for Trucks	Develop an operations policy requiring that all delivery trucks turn engines off when parked for delivery.	S,M,L/New, Adapted & Exist	0		Improves indoor air quality and acoustics for the store.	Involves education of drivers.	See Appendix: Philadelphia Transportation/Parking Policy for City Idling Policy
2	Cooking / Nutrition Classes and Demonstrations	Develop on-site programs to promote healthy eating including fresh produce.	M and L/New, Adapted & Exist	0-\$		Develops a loyal customer base, increases produce demand in underserved neighborhoods, brings in more shoppers, and creates a sense of the store serving the community.	Requires staff time and space allotment within store.	New Seasons Market (Portland OR); www.peoplesgrocery.org
3	Seasonal and Local Food Buying	Purchase and sell food raised and grown from nearby farms in-season; label location of food source.	S,M,L/New, Adapted & Exist	0-\$		Better quality food items, develops a loyal customer base, brings in more shoppers, and creates a sense of the store serving the community.	Requires more coordination for purchasing; tends to be more appropriate for independents and co-ops with more flexible buying policies.	Weaver's Way, Mariposa Co-op, Essene Market, Sue's Produce, Almanac (Philadelphia), Hen House Market (6238 N. Chatham Ave, Kansas City)

Advanced Technologies: These resource conserving strategies were studied for application in supermarkets and grocery stores. They are best for operators who have a sustainability agenda or a long-term hold on their properties, often coupled with a relatively good return on investment. Energy modeling is recommended to best understand the cost versus return as these will vary per particular store. While these strategies may not be commonplace today, they are likely strategies for the future.

* 1	CHP Systems / Cogen	Systems that provide simultaneous cooling, heating and power generation.	L/ New	\$\$\$	7+	Far more efficient than conventional refrigeration; uses waste heat; 50% savings on energy bills.	Due to high initial costs, most viable for supermarkets which have high operating costs	See attached sheet
2	On-Site Testing/Treatment of Rainwater for Wash-Down	Treating captured rainwater on site to meet Health Department requirements for wash down of food areas.	L/New, Adapted & Exist	\$\$\$	7+	Savings on water bills.	First step is to work with local jurisdictions to understand what is really required as using rainwater becomes more frequently utilized. If on-site treatment is required, consider reverse osmosis.	

On-Site Renewable Energy: Strategies focus on using renewable energy created on-site. The benefits of these will most likely be realized in the future when fossil fuel rates are de-regulated

1	Ground Source Heat Pumps	Where land is available, consider replacing or augmenting air-cooled condensers, cooling towers and evaporative condensers with ground-coupled condensers. Deep ground wells coupled with electric pumps used to pre-heat water for space conditioning and/or act as the condenser (including heat dissipation) for refrigeration system in either air or water based units.	M-L/New	\$\$\$	7+	Significant electrical energy savings.	Augments heat recovery and can be used for reverse heat exchange where unused waste heat, particularly in the cooling months; requires land for ground source wells. Locate wells in parking lots or sidewalks; viability of this system is high for new construction or renovation projects with ample land area (parking lots or green space) available for the well field.	
2	Solar Hot Water	Building mounted equipment to generate hot water heated by the sun. Typically first strategy for hot water is recovered energy; however, additional energy as needed for hot water can be achieved with this strategy.	S,M,L/New, Adapted & Exist	\$\$-\$	4-7 years	Grocery stores require high amounts of hot water and this strategy reduces monthly energy costs for heating hot water. Very low initial cost with quick return on investment.	Solar thermal hot water heating is a relatively inexpensive option for heating hot water but in the northeast it needs to be part of a 2-stage system with solar as the primary and heat recovery to augment.	
3	Photovoltaics	Building mounted, site mounted, or building integrated panels to provide electrical power from the sun.	M-L/New, Adapted & Exist	\$\$\$	7+	Significant electrical energy savings.	Future rebates are anticipated. Need area on roof or site for mounting panels which can require a significant amount of area depending on energy offset desired. Can be integrated with any solar shading, such as building mounted or over parking.	

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