FEMP - Technology Deployment - Overall Ranking for the Federal Sector

*** See Ranking Criteria Tab**

Scale: 5 = Highest , 0 = Lowest

				Ranking Criteria *			
Rank	**Technology**	**Category**	**Description**	**Overall Federal Building Energy Savings**	**Cost Effectiveness**	**Probability of Success**	**Weighted Score**
							(1-100)
1	**Spectrally Enhanced Lighting**	Lighting	DOE research studies show that by simply shifting the color in fluorescent lamps from the warmer yellow to the cooler blue end of the color spectrum, people see things more clearly and spaces appear brighter. Therefore, by changing the color of light to be more like daylight, lighting levels can be reduced to save energy while still achieving the same visual acuity. Conventional practice utilizes lamps with correlated color temperature (CCT) of 3000K to 4100K and SEL uses lamps with a CCT of 5000K. In T8s with electronically ballasted fluorescent lighting systems, this translates to a 20 percent energy savings, and in T12s with magnetically ballasted systems, SEL can achieve a 50 percent savings.	4.9	4	4.5	**91**
2	**Low Ambient / Task Lighting**	Lighting	The low ambient / task strategy improves the visual environment by adding controllable task fixtures that provide light directly where its needed for a given task, while reducing the overhead (ambient) light level. Occupancy sensors can also be incorporated into the system.	5.0	4	3.5	**88**
3	**Condensing Boilers**	HVAC	Commercial boilers that are high efficiency due to their design to extract heat from flue gas moisture	5.0	3	4.5	**86**
4	**Super T8 Lighting**	Lighting	Super T8 lamps are 32W T8 lamps but with a barrier-coat design, high lumen maintenance (88-92 percent end-of-life lumens), long service life and high light output—3100+ initial lumens as opposed to 2850 for a standard T8. Combining Super T8 Lamps with low ballast factor ballasts (BF of ≤ 0.77) on a one-for-one replacement will save 15 to 20%.	3.5	4	5.0	**79**
5	**Commercial ground source heat pumps**	HVAC	A ground source heat pump with loops feeding multiple packaged heat pumps and having a single ground source water loop. Unit capacity is typically 1-10 tons and may be utilized in an array of multiple units to serve a large load.	2.8	4	3.5	**66**
6	**High R-Value Windows**	Building Envelope	Highly insulating windows triple pane R5 or greater (U value 0.22 and lower) windows	3.7	2	4.0	**65**
7	**Duct Sealants**	HVAC	Aerosol sealant is injected into the duct work to seal leaks. Can save on heating, cooling and fan energy, depending on building.	1.6	5	4.3	**63**
8	**LED / Solid State Lighting - Interior**	Lighting	Interior LED retrofits are currently viable for downlights, track lighting, sconces, and task lighting both line and low voltage. Replacements for incandescent A-Lamps have also been improving rapidly. Replacements for fluorescent tube lighting may be viable for high cost maintenance areas.	2.5	3	4.5	**61**
9	**LED / Solid State Lighting - Exterior**	Lighting	LED lighting economics can work in high electric cost area with lot of hours of use. Pricing is continually decreasing. Provides quality, white even lighting with good color rendition. When combined with bi-level motion sensors to reduce light levels in parking areas, garages and walk ways, greater cost effective savings can be achieved.	2.2	3	4.8	**59**
10	**PC Power Management**	Other	Network based software that manages the power consumption of computers by automatically putting them in stand-by or hibernate or other low energy consuming state without interfering with user productivity or IT functions.	0.8	5	5.0	**58**
11	**Condensing Water Heaters - Gas**	Water Heating	Gas water heater that condenses water out of the flue gas to achieve higher efficiencies	0.8	5	5.0	**58**
12	**Water Cooled Oil Free Magnetic Bearing Compressors**	HVAC	Magnetic bearing, oil free 60 to 80 ton chiller compressor (also 150 tons). Onboard VFD and micro processor. Also small, light, quiet, low startup draw.	1.0	4	5.0	**54**
13	**Integrated Day lighting Systems**	Lighting	Add electronic dimmable fluorescent ballasts, photosensors, and occupancy sensors where appropriate. This can be combined with network components, workstation controls and building management options. Integrated controls will provide significant savings on applied systems.	2.0	3	3.8	**53**
14	**Cool Roofs**	Building Envelope	Cool roofs—roofs that stay cool in the sun by minimizing solar absorption and maximizing thermal emission—lessen the flow of heat from the roof into the building, reducing the need for space cooling energy in conditioned buildings. Cool roofs may also increase the need for heating energy in cold climates. For a commercial building, the decrease in annual cooling load is typically much greater than the increase in annual heating load.	1.0	4	4.8	**53**
15	**Bi Level Garage / Parking Lot / Pedestrian Lighting**	Lighting	This technology uses fluorescent and LED lighting sources with bi-level motion sensors to reduce lighting levels when the parking area is not in use. This technology can also be applied to pathway lighting where appropriate.	0.9	4	5.0	**53**
16	**Wrap Around Heat Pipes**	HVAC	Where humidity control is critical the typical way to do it is to over cool the air to condense out the excess moisture. Air is then too cold to supply to the space so the air must be reheated. Wrap around heat pipes wrap around the cooling coil to pre-cool the outside air before it hits the cooling coil allowing the cooling coil to do more work condensing out moisture. The heat pipe then re-heats the air on the backside of the cooling coil so it doesn't have to be re-heated with strip heaters or some other means.	0.5	5	4.5	**53**
17	**Window Films**	Building Envelope	A spectrally selective film used to decrease heat gained through a window	0.3	5	5.0	**53**
18	**Commercial Energy Recovery Ventilation Systems (ERV)**	HVAC	ERV systems exchange heat between the outgoing exhaust air and the ventilation air being brought in. This allows reducing the capacity of the HVAC system and saves energy. Heat and energy recovery wheels are the most common. Other types include: energy recovery loops, heat pipes, plate exchangers. Some transfer both sensible and latent heat.	0.9	4	4.8	**52**
19	**Air-side Economizers and Filters for Data Centers**	HVAC	Install 100% outside-air cooling capability in a data center to provide free cooling.	0.2	5	5.0	**52**
20	**Induction Lighting**	Lighting	Induction lighting is essentially a fluorescent light without electrodes or filaments, the items that frequently cause other bulbs to burn out quickly. Induction lamps offer the potential for very long life—up to 100,000 hours—while providing good color quality at competitive efficiencies.	1.5	3	4.5	**51**

21	**HID Electronic/Dimming Ballasts**	Lighting	Most of these lights, typically metal halide or high pressure sodium lamps, are currently driven by magnetic ballasts. Several manufacturers now offer electronic ballasts (EBs) for these lamps. EBs promise better efficiency, longer lamp life, and faster start-up and restrike.	1.3	4	3.5	**51**
22	**HVAC Occupancy Sensors**	HVAC	Uses an occupancy sensor to detect when people are in spaces. When no one is in the room, controls reduce the thermostat setpoint in the winter and raise it in the summer.	0.6	5	3.8	**51**
23	**Vending Machine Occupancy Sensor**	Other	Device detects when there are no personnel in the vicinity and powers down beverage vending machines. Does not completely turn off compressor, but reduces run times.	0.1	5	5.0	**51**
24	**Data Center Cooling System Air Distribution Optimization**	HVAC	Implement appropriate air distribution controls to prevent the mixing and recirculation of data center air before it reaches the servers. This is done by confining the chilled air distribution to data center cold aisles.	0.1	5	5.0	**51**
25	**Tankless Water Heater - Gas**	Water heating	Water heater that does not have a storage tank. Sold in condensing and non-condensing. A conventional non-condensing storage tank water heater has an EF of 0.60 and a typical non-condensing tankless water heater has an EF of 0.80. Efficiencies are dependent on the frequency of water draws for tankless WHs and total hot water consumption for tank type WHs.	0.9	4	4.3	**50**
26	**Bi Level Stairwell Lighting**	Lighting	These products use integral occupancy sensor motion detectors to monitor the stairwell. When occupancy is detected, the lights go to full level. When the space has been vacated after a programmed period of time, the fixture goes to a minimum level.	0.6	4	5.0	**50**
27	**CO2 Demand Ventilation Control (DVC)**	HVAC	A DVC system modulates the level of ventilation to a building based on the current occupancy of the building, saving energy while still maintaining proper IAQ. Carbon dioxide sensors are commonly used but a multiple-parameter approach using TVOC, PM, formaldehyde an RH levels can also be used.CO2 sensors control the outside air damper to reduce the amount of outside air that needs to be conditioned and supplied to the building when occupancy is low. Works especially well for conference rooms and auditoriums that are frequently low occupancy but must be designed to supply outside air volume for worst case scenario.	0.5	5	3.8	**50**
28	**Thermal Displacement Ventilation**	HVAC	Thermal displacement ventilation provides slightly cooled air into the space at relatively low velocity, either through a raised floor system or via wall diffusers near floor level. These are combined with a 100% outside air system and can also provide heating.	0.3	5	4.3	**50**
29	**Demand Control Ventilation for Commercial Kitchen Hoods**	HVAC	A demand control ventilation system (DCV) is an energy management system for commercial kitchen hoods. It optimizes energy efficiency by reducing the exhaust and MUA fan speed. This is accomplished by leveraging sensors to determine the minimum amount of exhaust air required to capture and contain effluent from the cook line.	0.1	5	4.8	**50**
30	**Active Chilled Beam Cooling with Dedicated OSA Ventilation**	HVAC	In a "chilled beam" system chiller energy is delivered efficiently to the zone by being carried in water. Air in occupied spaces is passed across the radiant chilled beam. Warmer water is used than in a VAV system, which helps reduces energy consumption. Small amounts of outdoor air are entrained into the larger supply of recirculated air to provide required ratio of fresh air.	0.3	5	4.0	**49**
31	**Heat Pump Water Heater**	Water Heating	Air to water heat pump to replace an electric resistance water heater.	0.7	4	4.3	**48**
32	**Multi-Stage Indirect Evaporative Cooling**	HVAC	An advanced evaporative cooler that can lower air temperatures without adding moisture. These systems evaporate water in a secondary (or working) airstream, which is discharged in multiple stages. No water or humidity is added to the primary (or product) airstream in the process.	0.6	5	3.0	**48**
33	**Colored Paint for Heat Reflective or Absorptive Applications**	Building Envelope	New technology allows for paint to be any color in the visible spectrum, yet have either absorptive or reflective properties in the heat spectrum.	0.1	5	4.0	**47**
34	**Dehumidification Enhancements for Air Conditioning in Hot-Humid Climates**	HVAC	Incorporation of a Cromer cycle dehumidification feature on a packaged air conditioner in hot-humid climates. The Cromer cycle is a novel combination of a desiccant wheel and a vapor compression air conditioner.	0.5	5	2.8	**46**
35	**Compressor Cycling Controller**	HVAC	Add-on system compliments existing controls to maximize (optimize) compressor operation. Software dynamically analyzes compressor cycles, achieving an overall reduction in run time without causing over cycling. Energy efficiency gains are achieved without affecting cooling capacity	0.4	5	2.8	**45**
36	**Efficient High Bay Fluorescent Lighting**	Lighting	These can include either T5 or T8 fluorescent lighting systems for high-bay applications currently using metal halide fixtures. Fluorescent fixtures offer better light distribution, better light maintenance over the life of the lamp, improved color quality and on-off control (re-strike time) with lower energy consumption.	1.2	2	4.5	**42**
37	**Advanced Rooftop Packaged AC**	HVAC	Roof top AC with features that can improve their efficiency. These include Improved fans, economizers, diagnostics. Roof top units that have (a) condensing units that drain to the interior of a building, (b) better insulation, (3) duct dampers that prevent off-cycle losses due to convection loops that loose heat from the building. In addition, a roof top unit with a modulating compressor will be more efficient and have better humidity control (if the indoor blower or air handler is also variable speed).	0.6	3	4.4	**42**
38	**Liquid Desiccant Air Conditioner**	HVAC	A liquid desiccant air conditioner (LDAC) deeply dries air using natural gas, solar energy, waste heat, bio-fuel or other fossil fuel to drive the system. By providing mostly latent cooling, the LDAC controls indoor humidity without overcooling and reheating. This unit is supplemented by an electric chiller or DX air conditioner that sensibly cools the building's recirculation air. The liquid desiccant is a concentrated salt solution that directly absorbs moisture. Most attractive in humid climates.	0.5	4	3.3	**42**
39	**Solar Water Heating**	Water Heating	Using solar thermal collectors to heat water for commercial building hot water	0.6	3	4.3	**41**
40	**Thermal Destratifiers**	HVAC	Small turbine like fans are mounted near the ceiling in high bay buildings such as hangars and warehouses to move warm air down to the occupant level in the heating season resulting in using less energy to heat the building. Needs to be installed in well insulated high bay buildings.	0.2	4	3.5	**40**
41	**Refrigeration Management System**	Refrigeration	Refrigeration Management System for walk-in coolers and freezers	0.2	4	3.0	**38**

42	**High Bay LED**	Lighting	LED light sources offer several potential benefits compared to metal halide or fluorescent: reduced energy consumption because of the ability to provide a more precise light distribution; longer operating life and lower maintenance requirements; less heat introduced into the space; and greater controllability for dimming and on/off control. The net result is an overall potential for life cycle savings despite the current high cost of the technology. Relevant to the cold storage application, LED performance improves in colder temperatures.	1.6	1	3.8	**37**
43	**Off-peak Precooling**	HVAC	Air conditioning and associated ventilation accounts for almost half of peak electric demand of commercial buildings so using off-peak electricity to provide a significant portion of space cooling can achieve considerable electricity cost savings.	0.1	4	3.0	**37**
44	**Evaporative Precooling Systems**	HVAC	Evaporative Precooling System installs ahead of the condenser to lower the condenser pressure. These systems can also work with an economizer. Overall evaporative precooling reduces the requirement for energy intensive DX cooling.	0.3	3	3.8	**36**
45	**Wireless Temperature Sensors**	HVAC	Wireless thermostats are connected into a building automation system (BAS). Ease of adding temperature sensors in more zones allows for greater spatial resolution of zone temperatures thereby providing confidence in control improvements through thermostat reset. In addition, ease of moving thermostats allows for a diagnostic capability in checking existing hard-wired thermostats.	0.1	4	2.3	**34**
46	**Airfield LED Lighting**	Lighting	Good application for colored LED lights, since LED is monochromatic. Reduced maintenance costs dramatically improve economics over existing incandescent.	0.1	3	3.8	**34**
47	**Green Roofs**	Building Envelope	Vegetation on the roof reduces heat load and adds insulation to the roof. Reduces storm runoff from roof.	0.4	3	2.8	**33**
48	**Aerogel Insulation - Piping, Ducts, and Buildings**	Building Envelope	Aerogel products displace current insulation material. As the thermal conductivity of the aerogels is so low, aerogel insulation tends to be far thinner than current insulation.	0.2	3	2.0	**28**
49	**Smart Windows**	Building Envelope	Electrochromic glass uses electrical energy to transition between clear and darkened states. Darkened glass transmits less light and reduces heat gain when darkened, especially in dual pane windows.	0.6	2	1.8	**25**