Emerging Technologies Checklist

- [ ] **LED Lighting**
Light-emitting diode (LED) lighting is robust (shock resistant), uses little energy, has a long life (50,000 hours), is fully dimmable, turns on instantly, and has no infrared or ultraviolet components. Although LED lights are still relatively expensive, the price is expected to go down. There are many applications where LED lighting is applicable, so consideration should be given to LED lighting.

- [ ] **Plasma Lighting**
Using plasma lighting has many advantages that make it a good fit for a variety of lighting applications. Plasma light bulbs use all benign materials in their construction and offer high efficacy, long life (20,000–60,000 hours), constant light output over the life of the bulb, and excellent color rendering.

- [ ] **Super T-8 Fluorescent Lamps**
Super T-8 fluorescent lamps have the same light output as standard T-8 lamps, but they use less energy, last longer, and have improved color rendering. The only disadvantage of super T-8 lamps over standard T-8 lamps is that they are slightly more expensive.

- [ ] **Scotopic Lighting**
Scotopic lighting uses a slightly more blue light than traditional lights to stimulate the eye's photoreceptors in order to make the pupils contract and increase visual acuity. This allows the light levels in a building to be reduced while allowing people to see better.

- [ ] **Task-Ambient Lighting Design**
Task-ambient lighting uses direct and/or indirect lighting with lower ambient light levels and localized task lights to illuminate a work surface. This method saves energy and also improves occupant comfort. This approach takes experienced designers to be correctly implemented.

- [ ] **Intelligent Lighting Design Scheme**
Intelligent lighting uses a combination of workstation-specific direct-indirect lighting with personal controls where the indirect portion is constant and the direct portion is controlled by the occupant and occupancy sensors.

- [ ] **Variable Refrigerant Flow System**
Variable refrigerant flow systems control the amount of refrigerant flow to multiple evaporators throughout a building. Not only does this system save energy, it also improves occupant comfort and control, is easy to install, and allows for simultaneous heating and cooling. This technology is beneficial in a building with diverse zones that require individual control. Some downsides of the technology include a relatively high initial cost and poor performance in cold climates.

- [ ] **Sensible and Latent Energy Recovery Ventilators**
Sensible and latent energy recovery ventilators use heat exchangers between the exhaust and incoming ventilation air to precondition the sensible and latent portion of the ventilation air. By using both a heat exchanger and desiccants, a large amount of energy can be recovered from exhausting air.

- [ ] **Heat Recovery Chillers**
Heat recovery chillers are water-cooled chillers with condenser water leaving at a temperature in the range of 130°F that can be used for hot water heating applications. This system can be used in any building that has simultaneous hot water heating and cooling.

- [ ] **Liquid Desiccants with Solar Thermal Energy**
This system uses solar thermal energy as the input energy for a liquid desiccant cooling system. The system can be used for both cooling and dehumidification. This system has very low operating costs.

- [ ] **Fuel Cells**
Fuel cells can be highly advantageous for producing electricity that can be used in cases when uninterrupted power is required. With a long life of 40,000 hours, fuels cells are clean, quiet, and reliable. Two drawbacks of fuel cells include high initial cost ($3,000–$4,000/kW) and efficiencies only falling between 40% and 50%.

- [ ] **Power-Spar Concentrating Solar**
A Power-Spar parabolic trough solar concentrator can be used for electricity, heating, cooling, and lighting applications. The main benefit of the system is its versatility. It can be ground mounted, roof mounted, have two axes or use bi-directional tracking.

- [ ] **Power Panel Solar Collector**
The power panel system is a solar collector that has both a photovoltaic (PV) component for producing electricity and a solar thermal component for producing hot water. This is advantageous because the water is used to cool the PV panels, increasing their efficiency while producing hot water. These systems are beneficial to use when there are space constraints on the solar collector area.

- [ ] **Concentrating PV**
Concentrating PV uses optics to concentrate sunlight on a small area of solar cells. Most concentrating PV systems use either single- or dual-axis tracking. These systems are advantageous over traditional solar panels because of higher efficiencies and lower associated costs. The market for concentrating PV is still in the development phase and there are some reliability issues associated with tracking, but these systems have great potential for growth.

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NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

NREL/FS-7A20-50120 • June 2011