Energy-Efficient, Load-Shedding Lighting Technology

...a cost-effective means of reducing peak electric demand!

Will my lights go out this summer?

Businesses and consumers alike wonder each summer if there will be enough electricity to go around. These periods of concern, referred to as times of “peak electric load,” can pose a real threat if the demand for electricity exceeds the supply. Blackouts can result, crippling businesses within a city, state, or perhaps an entire region.

What’s the solution?

Certainly, building more power plants and erecting new transmission lines are answers. But building capacity is expensive and impacts the environment. There are other solutions. This project, sponsored by the New York State Energy Research and Development Authority (NYSERDA), demonstrates and evaluates the technology for one of these alternatives—load responsive lighting.

- Lighting is a major electrical load that can be dimmed while remaining effective for building occupants.
- Shedding the lighting load is repeatable, predictable, and immediate.
- Lighting Research Center (LRC) studies show that dimming electric lighting by up to 40% for brief periods is acceptable to occupants in an office setting.
- Dimming, as opposed to switching, maintains sufficient light levels for a productive work environment.

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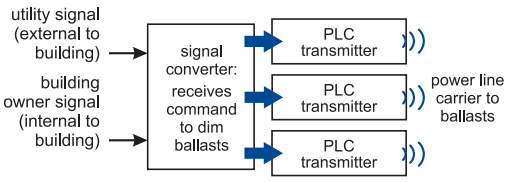
What is a load-shedding ballast?

A load-shedding ballast is a highly-efficient, instant-start ballast with bi-level dimming and a built-in power line carrier (PLC) signal receiver for automated dimming response. Appearance, installation, and wiring are identical to standard, instant-start ballasts.



Until now, controlling fluorescent lighting loads required customized solutions with expensive hardware and installation. The load-shedding ballast avoids the cost and complexity associated with traditional dimming methods. These new components are specifically designed for load management and energy efficiency.

- Preset step dimming level to 67% of full power.
- Simplified PLC signaling system—no additional wires, set-up, or programming.
- Instant-start lamp operation for robust, reliable, high-efficacy lighting enabling parallel lamp operation and easy wiring.
- Economical — With a low added cost, the load-shedding system has a 3-year or less payback period for new construction projects in New York State based on existing utility rates.

Ballast performance

	Load-shedding off	Load-shedding on
Power (watts)	85.1	56.3
Relative light output (%)	100	66.6
Ballast efficiency factor (BEF)	1.03	1.03

Performance as measured in the laboratory using 120 volts, the load shedding ballast, and three standard 32-watt T8 fluorescent lamps.

Features

- Power reduction by 33%
- High efficiency ballast design
- Universal input voltage (120 or 277 VAC)
- High power factor (>0.9) and low total harmonic distortion (<10%).
- UL listed

Signaling system as tested

- System coverage equals 20,000 ft² (150 load-shedding ballasts) per one PLC transmitter.
- Response time less than ten seconds.
- Unique PLC protocol features continuous signaling when load shedding is turned on, and highly reliable, simple detection.
- Transmitter may be configured to accept the load-shedding signal from different communication systems such as LAN (Internet), telephone line, radio, pager, cell phone, or other wired protocols. As tested, the system utilized a LAN to a server located external to the building.

Field Testing Results

A full-scale field demonstration and evaluation of the load-shedding ballast system was completed at the division headquarters of Consolidated Edison Company of New York in Rye, N.Y.

- 100% reliability — Each time the load-shedding signal was transmitted to the ballasts, all 150 ballasts reduced power by one-third.
- Measured power reduction for all load-shedding ballasts was 4.3 kilowatts, or 33.7% reduction in power. This load reduction met expectations.
- Control of the on/off function of the load-shedding ballast system was achieved either from signaling sources external to the building or from an energy management system.
- Building occupants noticed the changes in light levels when the load-shedding system was turned on and off. However, they accepted the lower light levels while the load-shedding system was on and did not find it a detriment to their productivity.