



Total Cost of LED Ownership in New Construction

Introduction



With continued escalation in facility operating costs, many building owners and construction professionals are contemplating the long-term impact of implementing today's LED lighting technology in new construction and renovation projects. The "value-added" attributes of a properly designed solid-state lighting system can greatly offset the higher initial cost, and can be accurately calculated as "value engineering"

measures. The economic advantages of LED lighting are greatly increased when total cost of ownership over the life of the building is considered. The following is an analysis of hard-cost systems savings and long-term ownership costs that the owner, architect, and engineers involved must consider in the conceptual budgeting for these types of projects.

Hard-Cost Construction Savings

According to the U.S. Department of Energy, solid-state lighting reduces wattage consumption by an average of 55% over the other lighting technologies currently available. 'Maximum potential wattage required' is the main consideration that the electrical design of any building, exterior illuminated area, or utility grid system must be based upon. The following are infrastructure points in which LED lighting systems will provide hard-cost construction savings over conventional lighting technologies. These potential savings also apply to any illuminated exterior area serviced when installed as a fault-protected secondary system of an electrical service.

Incoming Service: Service transformer and cable

Distribution Panel: Busses, contacts, size and quantity of overload devices and cabinets

Secondary Transformer: Transformer size, footprint, and heat generation

Breaker Panel Sizes: Reduced number of circuits reduces breaker quantities, panel sizes, and wall footprint

Quantity of Breaker Panels: Reduced wall footprint

Conduit Sizes and Quantities: Reduced materials and reduced footprint

Branch Wiring Conductor Counts and Sizing: Reduced materials

Air Conditioning tonnages: HVAC unit sizing is calculated on wattage used within a building envelope. These wattages are then calculated to BTUs, which are calculated to tons of cooling required when determining the size of the units needed to service an envelope

- Rooftop Unit (RTU) Structural Support Members: Downsized as a result of RTU size decrease



- Resizing of Emergency Generator Systems: Considered when lighting is part of the capacity calculations
- Delivery Costs: Building material delivery based on weights and quantities are reduced from all of the above reductions
- Construction Labor: Labor based on steel tonnages, equipment sizing, and quantities is reduced

Operational Cost Savings

Beyond these construction cost factors, the total ownership of operating solid-state lighting systems is much lower than any traditional technology when the following costs are considered:

- Energy consumption: Minimum of 55% reduction over other technologies
- Replacement lamps: Life ratings are 5-20x longer than conventional lighting
- Replacement ballasts: Most LED fixtures and lamps have integral drivers that don't require field servicing
- Maintenance labor: Long life results in nearly zero maintenance labor costs for years
- Maintenance equipment: Unplanned high-access equipment needs for lighting systems are virtually eliminated
- Maintenance risk: Near-zero maintenance work at heights, reduces or eliminates fall risk
- Overhead costs of facility operations: Communication of maintenance needed, service requests, work orders, maintenance contracting, insurance risks, material ordering and lighting material storage areas are practically eliminated
- Production loss: Downtime for lighting maintenance is virtually eliminated
- Production loss: Downtime due to re-strike cycles in power spikes, outages and generator transfer events are eliminated due to the "instant-on" attribute of solid-state lighting
- Increased maintenance with control systems: Conventional lamp and ballast lives are greatly reduced with increased on/off cycles when used with control systems. On/off cycles have no degrading effect on solid-state lighting systems

Conclusion

While the higher initial cost of LED lighting systems may give the impression that the technology is too expensive, the reality is that LED lighting offers a true "value-engineered" solution for modern building practices. When calculated from a global perspective, the savings in infrastructure construction costs and the resulting leaner operating profile of the building prove that LED lighting is the right choice. Modern design-build and construction professionals who embrace solid-state lighting set themselves apart as the most forward-thinking members of the construction community. Projects that incorporate this technology yield tremendous long-term benefits to building owners. When the "total cost of ownership" is calculated for any project, LED lighting proves out as true "value-engineering."