LightLouver Daylighting System vs. Photovoltaic System Generated Lighting

Prepared by LightLouver LLC

During the architectural design process, an analysis of both active and passive energy saving design strategies should be undertaken to select the most appropriate solutions. Integrated design solutions, that achieve the proper balance of both passive and active strategies, typically have the lowest first cost and life-cycle cost, and the best long-term performance.

Photovoltaic (PV) panels, which generate electricity from sunlight, have become a popular energy saving strategy, and are promoted by utility companies, state and federal government agencies, and other organizations that may offer financial incentives for incorporating a PV system into new or existing building. On the surface, it may seem that a passive energy saving strategy, such as daylighting, to replace electric lighting is unnecessary, since an active energy saving strategy, such as PV, can be used to generate the electricity to power electric lighting. In-depth examination of the costs and benefits of daylighting using the LightLouver Daylighting System indicates that the LightLouver Daylighting System will provide the same quantity of lighting as can be provided with PV panels at one-fifth the initial cost and have low or no future costs for repairs, maintenance or equipment replacement.

This performance case study compares the cost of using of the LightLouver Daylighting System to provide interior illumination versus using PV panels to generate electrical energy to power electric lighting to provide similar quantities of interior illumination.

The general assumptions used in this comparison are as follows:

- Room Size: 900 sf (30’ x 30’)
- Location/Climate: Boulder, Colorado
- Interior Design Illuminance: 30 fc
- Operating Hours: 8 hours/day x 365 days/year, 2,920 hours annually

The electric lighting system design assumptions are as follows:

- Electric Lighting Efficiency: The design illuminance is achievable with a Lighting Power Density (LPD) of 0.76 W/sf. This can be achieved using a reasonably efficient suspended indirect lighting fixture using fluorescent sources.

The assumptions for providing ambient light with the LightLouver Daylighting system are as follows:

- Five (5) LightLouver units, each 5'W x 2'H. This gives an annual average of 30 fc in the space for all daylight hours.
- LightLouver units cost of $35/sf / LightLouver Unit

The assumptions for providing ambient electric lighting power with the PV system are as follows:

- Photovoltaic panels with an efficiency of 17.4%.
- Panel cost -- $1,195 per 190W panel.
- Panels with a capacity of 1,255W and area of 77.3 sf are needed (6.6 panels).
- Panels are tilted at an angle equal to the latitude (40 degrees). Support brackets are not included in the cost estimate.
- Inverter with 92.4% peak efficiency, assumed 85% annual conversion efficiency.
- Inverter costs $1,029 for a 1.5 kW capacity.
- 5% line losses.

Results:

Cost of PV system[1]: panels $7,895, inverter $859, total cost $8,754.
Cost of LightLouver Daylighting System[2]: Total cost $1,750.
LightLouver Daylighting System, providing the same amount of illumination as the PV-powered electric lighting system, is less expensive by $7,004 or approximately one-fifth the cost.

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1. Does not include installation labor or mounting brackets.
2. Does not include installation labor, assumed to be two people for two hours.