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Design of Interior Daylighting Shading Control using LV and PVsyst Software

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Abstract

Vitality proficient, expense sparing inhabitance, planning and more regularity control the passive shading of interior lighting, a creative reasonable configuration methodology of rooftop solar PV module structure outline is presented here. This paper is centered to build up the utilization of inactive sun oriented shading systems for sunshine inside lighting to create a high visual level by considering different parameters, for example, establishment, site determination, and execution checking of the sun based PV framework utilizing worldwide radiation, temperature, mugginess, precipitation, days with precipitation, and course, daylighting span to focus the utilization and materialness of such frameworks in the Kolkotta areas in India. This paper is delineated specialized, savvy, shading movement module misfortune and sparing of non-risky gas and green perspectives, alongside execution enlightenment of LED installation with their lifespan utilizing Lithonia Visual software (LV) and photovoltaic (PVsyst) software.

Keywords*: photovoltaic (PVsyst) software, lithonia visual software (LV), daylighting, LED lamp*

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1. Introduction

Globally, advanced daylighting technology wondered about interior designing encompassed and exposed towards the cusp of a sophisticated lighting design by dint of cleaning solar photovoltaic (PV) resource from old age lighting texture to LED and organic LED (OLED) [1]. From field of both building and brightening of inner part lighting substance with an optical connection of association of windows or stylish impact on the based environment to exploit the opportunity, while focusing on the human interface inside a given scope of visualization, is clear when considering the starting number of cleaning green structures by selecting different irregular shading created by the LED at full quality will match user need [2].

The demography and stipulates of interior lighting environ have been renewed sense of expectation and exploration about India parade. The illumination topology is exhorted the civic community to fascinate best construction and function of 3 dimensional shadings scenes from PV resources. By accounting PV meteorological data in aid of designing optical lighting solutions using PV roof panel meant for building an attractive and decorative diverse area of inner surrounds for example shopping precinct, household lighting. Concurrently, stipulated energy expenditure enhancement of geographical/statistical sites,synthetic hourly data generation, visualization of the lighting hourly values and economy tariff can be possible by the first-rate highest quality of brightness with the lowest cost of proprietary right vision. This paper is tended to the presizing of standalone PV for Indian LED lighting diaspora at a verifiable robust state lighting for interior environmental facades to change the footprint by saving 60 percentage of global lighting electricity usage. The renewed illumination in commercial and residential appliances, Denon LED Flush Mount light has tendency of high-quality color rendering (CR), utmost enlightenment, optimum light effectiveness, negligible daylighting toxic waste plus hazardous green house impact.

By scheming shading on a roof of a building and its indoor/outdoor spaces can able to dimunish up to 90 percent of thermal heating plant and clipping down sunney season temperature, improve solace and save energy. The dissertation is strained to exemplify an innovative building room light design model frame based on solar panels on the top roof of building to control shading effect and irradiation of solar PV module for reduce building energy consumption and maintaining a comfortable indoor condition. Moreover, to minimize electrical

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and thermal impact and optical losses to full fill the shortfall of energy consumer demand, cost-cutting tariff optimization, efficiency enhancement and more luminance without interruption and most important quality, LED light production of interior lighting plan.

Here, this context has offered a new topology model for both shading and interior lighting design utilizing the daylighting concept with the help of Lithonia Visual (LV) software and PVsyst software. This PVsyst is a PC based analyzer, which is endeavoring to simulate all difficult imperatives with Si PV system and daylighting based LV software is for an illuminating interior room with LED light. Likewise, due to availability of the area around 125 m² in this software, the simulation animations of working window are endeavoring to gauge the shading component, irradiation, illumination and laminar distribution throughout the working plan of the surface in a three-dimensional model surface in a charging domain and construct a healthier lighting outline different with appliances.

For enhancing durability and reduction of glare, architectural and visual integration is a major requirement to improve efficiency of overall performance of interior lighting design of the building. Thus, installation of tilted solar PV module window has a capability to improve aesthetic appearance and tried to diminish light transmission and can therefore act as shading device discussed in [3].

Now days, a different kind of non conventional homo solar PV module in India are tried to install as much as to fulfill layoffs power demand, that's a great positive attempt to imminent forward for improving civic beneficial point of view and the specified beneficial summits are:

a) flashy and appealing modus operandi,
b) total shingle roof integrated for magnificent visualization and monument,
c) reduction of light pollution and green hazardous,
d) high durability and increased homo service,
e) reduction of electricity tariff and liberated electricity,
f) pleasant stand-alone system for domestic, commercial and hush-hush vicinity,
g) no structural support required for installation,
h) homo roof covering, module and inverter designing as UL listing,
i) reduction of operation and maintenance cost,
j) AC and DC high and low lumen load can be used.

The PV shading has happened because of the expanded number of introduced PV frameworks which was influenced pointed by an increment in the quantity of PV frameworks being introduced and lessened the sunlight of outside and inside structures, trees, hazed atmospheres, and so forth of the geometry and profundity of edge spaces. Also, the embodiment of solar rooftop building shading for minimizing the diverse sort of misfortune as befuddle misfortune of module show yield is a dependant on the sizes and parallel string cluster associations [4-6].

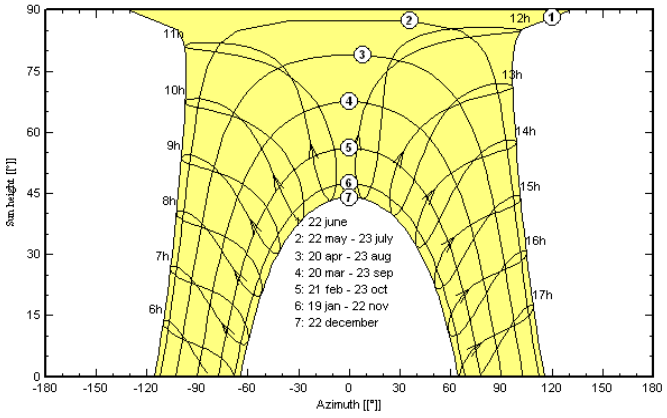

Figure 1. Solar path at Kolkata using PVsyst software

Site review information about the Kolkata area are gathered utilizing site requirements of the scope, longitude, elevation coordinates of Lat. 22.5˚N, Long. 88.3˚E, Alt.13m with time zone is shown in Figure 1 and contains month to month meteorological information from Meteonorm/Global record as NASA. The Figure 2, demonstrates the aggregate global radiation on horizontal plan is most extreme up to 4.84 KWh/m2day and tilted point of PV module and its beam distribution of horizontal plan is off 5.18 and 2.37KWh/m2. Contingent upon the latitude of the city area, the average dispersion of hourly solar irradiation array density can be evaluated utilizing Meteonorm and pyranometer with temperature and climate, atmosphere because of ingestion of exhibit through PV module by tilted between 20 to 25˚ with azimuthal edge of zero degree from surfaces for evaluating the warm execution of sunlight of structures as these frameworks/authorities are to be introduced at slanted plots for greatest proficiency, as shown in Figure 3.

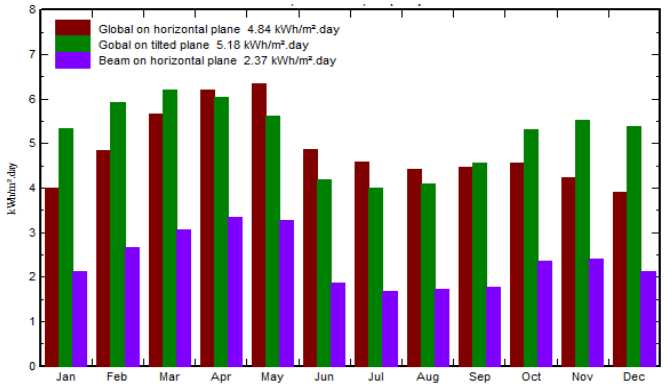

Figure 2. Meteo monthly computations at Kolkata

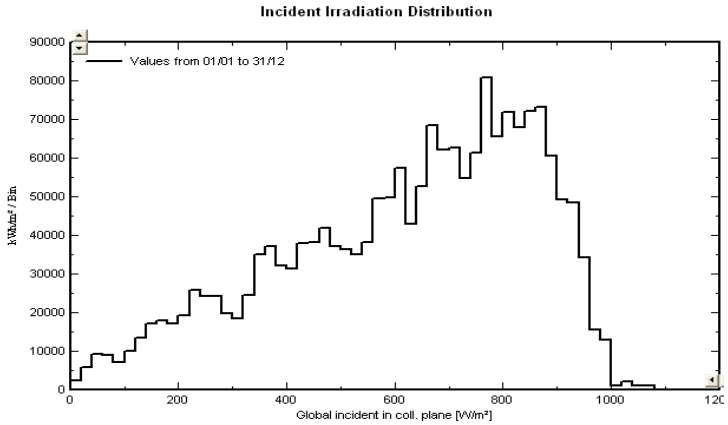

Figure 3. Incident rraditation Distribution

Thoroughness of load capacity and size intended for home use, reflectance window optics of poles apart shading patterns and different configuration of PV array are accounted by selecting a number of series parallel assemblies PV module and the output (i-v characterisitics), shading effect reports of solar PV can be determined by using nominal parametric values of the manufactured PV module.

2. Framework of Solar PV module

The goal is to have very concrete and tangible things that cleaned energy resources like solar PV for off-grid domestic / non-domestic and grid-connected distributed or centralized

power generation and other utilities with the ultimate objective of making power save and cost minimization of Indian exterior and interior lighting.

Worldwide, the on grid/off grid connected solar PV power perdured to be the fastest growing power generation technology. Whereas in case of India, due to lack of standards, land acquisition problems, lack of end user awareness and high cost, etc., negligible amounts of solar power have shared in the total installed renewable power capacity. Yet, for fulfill shortfall of power and growing population and push requirement, a mainly different program initiated by the Government's and power Sector Company, the Indian solar energy sector has been emigrating rapidly from 2007 to onwards [7-9]. For utilizing 5,000 Trillion kWh per year solar energy potential, In January 2010, India government has launched the JNNSM program, with a target to achieve 20,000 MW by the year 2022. As a consequence, the solar industry in India is looking towards to get the strong impulsion both in terms of advertising and manufacturing quality and low price polysilicon PV panel materials that would drive the growth of urban sector.

In spite of the fact that, the global radiation of producing sun based vitality ordinarily taking into account the sunspot number (SSN) i.e. era generation of photo current and flow from the sun oriented radiation activity index is needed by the scope of the spot, sunlight time, other than other neighborhood conditions, for example, daylighting climate condition, precipitation, daylighting hours, temperature and warm effect, seasons and snow spread list [10]. Conversely, these key factors action influenced on shades and Solar shading devices of Indian Kolkotta metropoliticians that is chosen as example for PVsyst software and Lithonia Visual softwares to play a significant role for cooling, heating and daylighting energy consumption of an interior room of a building.

This paper is dealt with a stand alone 190W, 220V Si bipolar solar homo interior lighting intended for designed and sized to supply DC and/or AC power driven appliances along with an interior room lighting outline utilizing solid state LED lamps for shadingfull, embellish, enhanced proficiency and life compass of light, security of light contamination and nursery impact and additionally generally sparing of force utilization.

The luminous efficiency of DC load power LED lighting lamp of low- high lumen (60-150 lx) can be illuminated without the assist of inverter from a standalone solar PV panel means consumption of two third electricity can directly save, invented by Lie and Boeke in 2012 [11-12]. However, the requisite of inverter has effected a cornucopia efficiency loss in the presence of grid connected homo service.

Based on integrated solar roofing, selling of solar PV module for interior lighting design has analyzed as PV ($/kWh) and battery cost ($/Wh) has reduced from 2000 to 1000 and 1.1 to 0.25 between year of 2000 to 2030 where as PV and LED luminous efficiency has increased from 10 to 22 and 10 to 200W. Instead of a grid tied or grid interactive, off-grid roof top using micro inverter and power optimizer solar PV module technologies have the ability to make solar PV systems as more efficient and enhancing design flexibility with a tilted angle of 20˚ to 25˚ mounted towards south facing to produce further illuminance optics for homo interior lighting design which was designed by SIRSA, India [13] and have tried to save electricity of Rs 233,000 with a 52 tonns of toxic green house hazy carbon emission products which helped to cut off electric tariff is a good example for motiviate to implement and install monocrystallen PV panels in urban areas.

For proper shading effect control and more electricity generation to design for daylighting of interior lighting, the orientation, footprint with the long axis running east-westward, facades and sections of the edifice should be south facing roof is advantageous for solar PV. Hence and now, solar invention is aimed to intend more quantity of roof shingles or wall cladding with PV texture to eliminate the penetration of hazardous and extra components of the envelope and providing a rationalized, visually appealing façades. Besides, in the growth of sustainability, green energy and lower tariff/utility bills, solar PV roofing design is demanded to prove civic environ as an excellent method of boosting overall energy efficiency of interior lighting design of the building.

For solar home lighting design, in this paper, diffusion of global radiation of solar PV module to a particular Kolkata location in India is interpolated along with latitude, longitude, solar path, tracking, incidence angle modifier (IAM) of the reflector and degradation rate loss, daylighting array output energy, plane tilted and azimuth angle is accounted for generating electricity to to meet electric energy demand, especially for interior lighting design prospective, is shown in Figure 4.

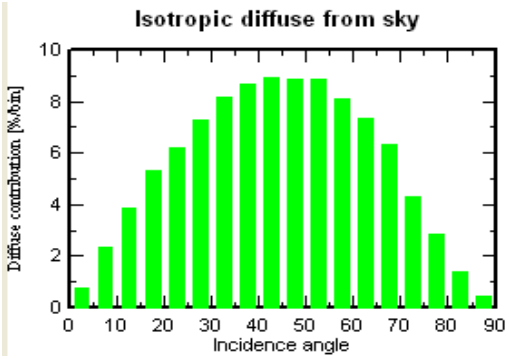

Figure 4. Isotropic diffuse from Kolkata climate

Since, the percentage of irradiance distribution for radiant array isotropic diffusion is substantially lower at higher latitudes and is also a function of incident angle depends on the metro data, module orientation and tilted angle. Hence, all the most important key dynamics required for designing and installing solar PV modules to improve illumination/shading of the reflector so that total generated current/power can be degraded according to the effect of shading ratio. Due to mismatch of module with that location area, shading loss gnarly generated which may high at a range of 3 to 5 percentage and the simulation results of PVsyst software, as shown below in Figure 5.

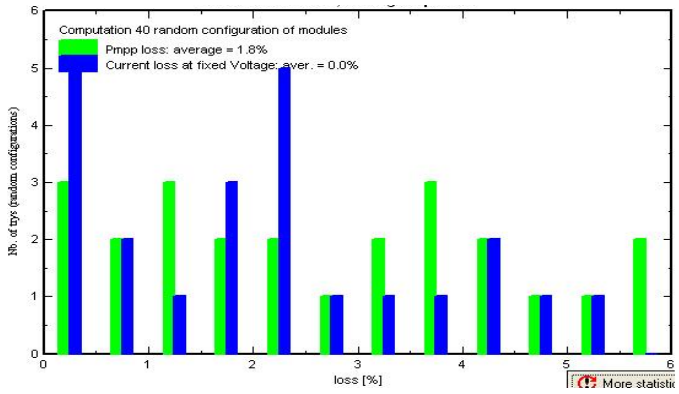

Figure 5. Mismatch loss of PV module using PVsyst

Decently outlined sun control and shading gadgets can significantly decrease building top high temperature pick up and cooling necessities and enhance the common lighting nature of building inside blinds, window ornaments and shades. As, Interior shading gadgets ought to have an intelligent surface to reflect undesirable light back outside yearly cooling vitality utilization can be diminished by 5 to 15 percentage have been reported in [14].

The different shading methods are utilized to enhance user visual solace by controlling glare and diminishing differentiation proportions, as an effect, currently interior glare control gadgets are attempted to design lighting using LED to give an electric lighting framework to Permit gathering of the cost effective energy saving with the help of Lithonia Visual software.

Diverse specialists have composed distinctive topology on inner part sun powered shades for Graber Blinds, Shades, Shutters, and window hangings that have gone down to earth and embellishing components to make a sound, vitality proficient, lovely home: the impeccable choice for homes or business locales that don't permit outer surface items.

3. Methodology

3.1. Modus Operandi for Shading Design using PVsyst Software

Solar shading procedure of the solar home system has attempted to play a significant role to maintain daylighting illumination throughout in an interior room of the building and helping to curtail energy consumption. Either, this composition is trying to pick out a better model with internal wave shades and a rigorous simulation method for solar roof panel inside diverse weather conditions to supply DC and/or AC electrical domestic appliances. In this paper 6.32 version of user freindly approaching PVsyst software is used for simulating I-V characteristics of PV module and their efficiency using module, battery bank, backup generator, regulator and user need load, IAM verse tilt angle of the panel, daily Meteo for Kolkata, solar radiation on a horizontal surface, shading states along with shading loss for a whole year, average daily solar radiation distribution, partial shading of cells and shaving of light pollution plus toxic gas hazards.

In this PVsyst software, solar GIS/Climate data are included Kolkotta stations by importing data from interactive map using Meteosat © EUMETSAT, ERA Interim © ECMWF, NCEP GFC and CFS data source. For designing and simulating shading of a solar roof of a building, different parameters have to set in the computer based PVSyst software such as preliminary mode, project design, database and special tools for getting an approximation value of solar radiation, monthly production with their performances and user defined loss of load consists of various input parameters, sizes, inverter efficiency, shading analysis and several variable output powers of the simulating system and the schematic diagram of PVsyst. To harvest the cost effective and energy saving remuneration of day lighting for building interior room lighting with ample PV roof space design in the Kolkata area zone, Si-monocrystalline based PV module (AE CQ M5/72 185) is chosen in this article and their voltage and current characteristics with respect to irradiation as shown in Figure 6.

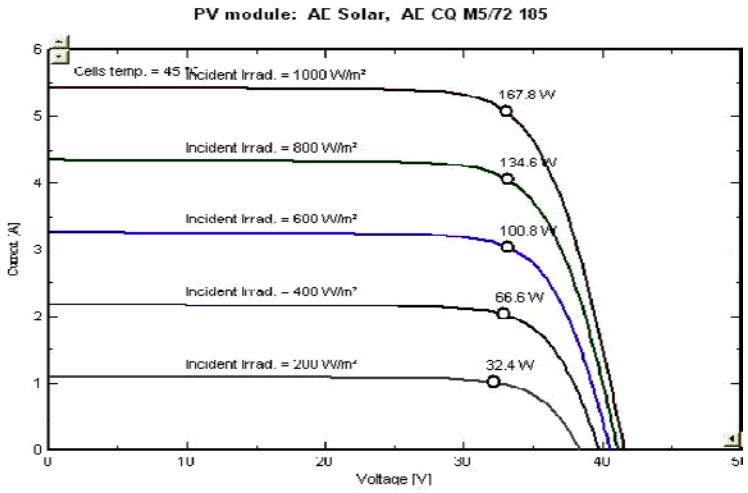

Figure 6. Mismatch Voltage and Current characteristics of PV modue using PVsyst

As, mono-crystalline silicon cells are generally more energy efficient, high performance, paired charges with quality output invention, longevity, lesser installation Costs, non toxic environmental Concerns, high thermal resistivity properties, generate more electricity and mostly the PV roof panels are installed on the roof of buildings with tilted at 20˚ focused towards the latitude of the Kolkata city. For boosting module efficiency, proper tilted and oriented solar PV in the locality environs, should be mounted at peak periods during daylighting hour. So that, solar tracking can be functioned concentrate to absorb a more solar array to produce maximum power using the MPPT technique, which is approximately 34 percent of flat PV panels. With the heading of results will upshot the whole system more dependable and economic cost effective and long life span approximately 20 years.

Only multi-crystalline solar PV are little bit higher cost than thin film solar PV panels,

however achieving the daylighting, initiative's PV outlay reduction targets have aimed to cheap design and reduce global price tag at a faster rate that the monetary value of PV systems next to about 75 percente by 2020.

In contemplation of enormous the nominal array power for economic optimization, a solar PV inverter assists in power conversion from PV array to AC for homo utensil load or to be fed into the utility grid. Currently, stand alone inverter, battery and regulators use with PV for coping with the power surges for solar roof design to control the shading effect of a building when starting certain loads, especially those incorporating high-power appliances. For backup storing charges to prevent from bad weather and to mitigate the shortage power, solar 12V/160Ah batteries and of nominal capacity 480 Ah with battery voltage of 24V at fixed 20˚ temperature are inserted with solar PV panel over a period of hours.

Problematic gist such as glare reduction and preserving right solar shading, fading, and increased cooling tariff is attempting to curtail along with controlling the building's orientation on the meridian of weather climate and latitude. With the aim of observation, solar power can be managed to illuminate the indoor lighting design requirements, be executed in a three dimensional construction on near shadings of PV systems in computer based PVsyst software. The criteria of this software are only executed on the realistic Meteo data of a total surrounding area even it will not match the real geometrical compatibility.

Generally, south-north facades are adopted for a shading pattern to choose the wanted degree of shade due to the high absorption capacity of solar energy through PV panel during summer and peak time of day. In the Three dimensional construction of a building, different configurations such type parallelepiped and elementary object / new object shape are taken for solar roof design. By defining their sizes of base width, top length for eaves, roof tilt 20°, and gable 1 angle of (-45°) and by fixed azimuth value exactly 90°. By adding more shading objects at the same time as storage tower and a tree to the aspect for more optimization and interpenetrate the roof of the building, simulation result is shown in Figure 7 bellow.

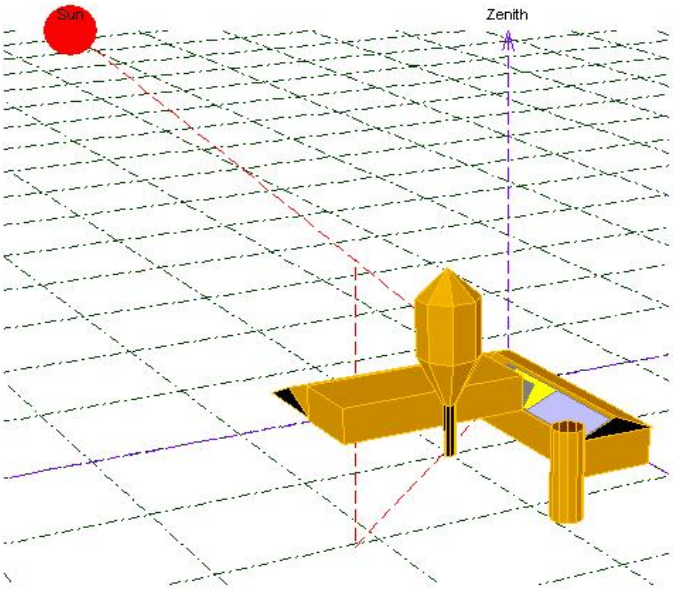

Figure 7. Shading scene using PVsyst

The execution of the shadow simulation tool is simulated for the whole selected daylighting hours. For each step time, the date/hour, sun orientation of the selected building façade and its shading factor are displayed along the real end of the 3-dimensional window.

3.2. Modus Operandi for Interior Lighting Design using LV Software

The way to planning an interior lighting of a sunlight based top building is to best exploit the nearby day lighting, room size, coating sort and their window situation, warm protection and

shading impacts. Since the daylighting has a huge part of outlining structures to use characteristic light to its fullest light hotspot for all intents and purposes all inside spaces to maintain a strategic distance from Shading impact in the veneer and fenestration of undesirable sun based radiation.

From an energy productivity perspective, usually, urban consumers require 16.9 percentages of power for utilizing their electric utensils, which can be controlled by a fitting solar roof PV panel and designing interior lighting. With the service of low consumption, long life and more brightness electric LED lamp design that takes into account the full acknowledgment of the vitality reserve funds advantage of daylighting. If there should arise an occurrence of sunshine and brightening of room surface, daylighting illumination is generally fluctuated from a cloudy sky to splendid with a range of 10,000 and 100,000 lux and the CCT for distinctive climate atmosphere are varied between 2000k to 6000K. The high CRI of 100 and inherent connected shading temperature (CCT) of 2700K to 4000K of LED beam has the capacity to illuminate appropriately in residential appliances as foyers, corridors, parlors, living rooms, bedrooms, work places, stairways, and so on. Contrasting and other solid state lighting fixtures, illuminance, luminarie output of the high CRI LEDs is favored for to create warm white light with a prevalent daylighting quality outline [15-16].

Headed for check the expense situated displaying and outline enhancement for inside room arrangement sunshine, enhanced shading rendering record and temperature reliant of LED DEEP DISH DENON fixture of 3000K is chosen in this framework using computer based Lithonia visual (2012 2.07.0710) software (LV) to visualizing 3-dimensional viewing raises productivity by decreasing vitality misfortunes to control thermal mismatch. For energy efficiency in lumen output, an innovative interior lighting is designed for daylighting shading and the PV shade of a sun based roof ought to be planned in such an approach to scoop light retires straightforwardly into the way and onto the roof.

Currently, for the daylighting simulation design of interior room lighting, features of LED flush mount 14” diameter optics luminaries are 1649.3 lumens at long life span of 50,000 hours. The light loss factor (LLF) of 0.85 and module/CRI is off LED beam of 208>80 are set with various parameters of locality in the software such as 0° of site orientation and ground reflectance should be 15 for overcast sky with moderately graded and slight brighting towards the windows which have a number of panes 2 and glass thickness of 0.125 inches. From an electrical point of view, the ballast of LED Can be operated at 120 Vac with an input voltage of 23.16 and beam distribution of 72 lumens per watt to each recess of a room is direct, sc-0=1.18, sc-90=1.17 and efficiency is 100 percentage which is received from the photometric tool of this LV software and PVsyst software [17] are shown below in Figures 8-10.

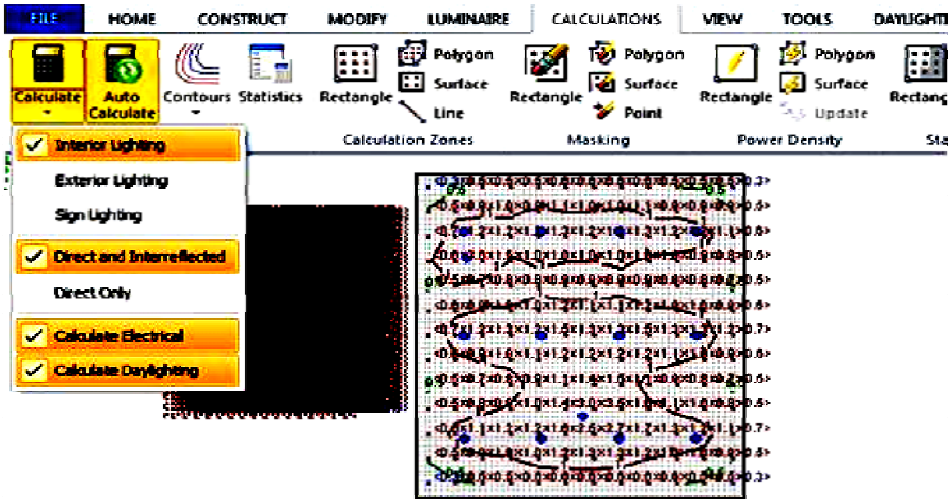

Figure 8. Rendering of daylighting of interior room design using LV software

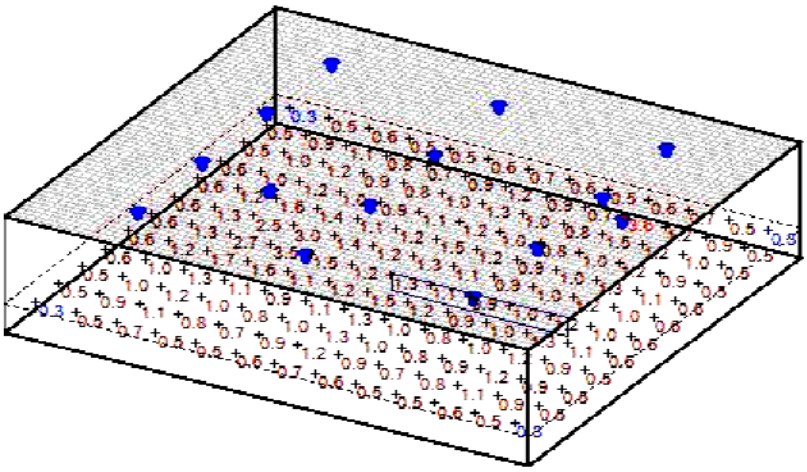

Figure 9. Wireframe of daylighting of interior room design using LV software

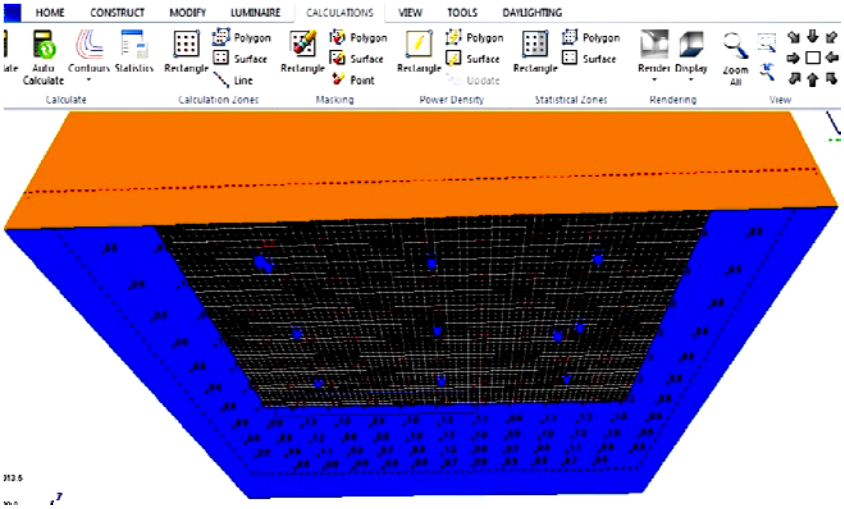

Figure 10. Wireframe Illuminance pattern of daylighting of interior room design using LV software

4. Simulation Results and Disscusion

4.2. Shading Design using PVsyst Software

For appraisal on energy computation of PV systems, this is a novel modeling implemented for ergonomic approach of simulating and projecting 3-D animation where all meteorological, geographical sites of statistics directly fed to control the influence of photovoltaic array shading and mismatch loss and engendered different kind of multiple shading effects like row to row and nearby object to achieve consistent results in PVsyst.

The electric energy need for a solar rooftop of building reflective footprint is obtained by 56W uptown evening hours under clear and bright sky conditions in PVsyst software, but the electricity demand is spiked at a rate of 187 at 8 p.m., shown in Figure 11 and the average reduction during the on-peak period is 83W with a total day sum and monthly sum of 2.0 kWh/day and 60kwh/mth.

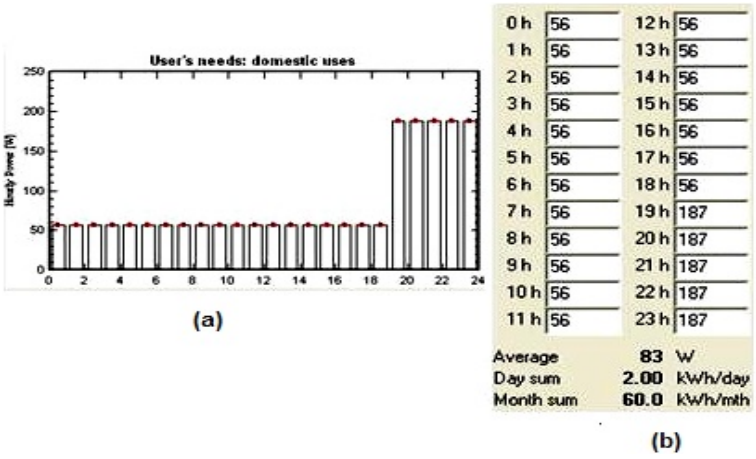

Figure 11. a) User's needs: domestic uses and (b) Simulation results in PVsyst software

This is a hit and trial method that is tested out only the entire surroundings and does not take into account the individual sizes and geometrical positions of the PV modules.For every hourly estimation of shading, animation, the simulation methodology will insert interpolate simulation, animation data as per the sun position to assess the current shading component of the solar roof of building and the simulation result of beam loss and module loss amended by 8.0 and 16.3 percentage is shown in Figure 12. This technique likewise permits the development of the iso-shadings chart and attempted to provide a shade over the roof top of the building and outside spaces intended for reducing temperatures and preserve energy, which gives an engineered perspective of the times of the day and seasons where the shadings are especially risky.

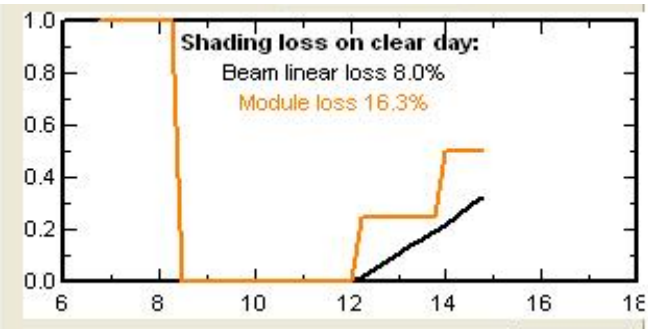

Figure 12. Shadow animation of PVsyst software

4.2. Interior Lighting Design using LV Software

Lithonia Visual software is applied to emphasize on daylighting electrical design with point by point lighting analysis for optimal interior and exterior lighting applications and only target uniform horizontal work plane illuminance by minimizing sample run time with maximizing accuracy by generating numerical results of lax/foot-Candela, dilution factor and unity power density. This software program genetrated a 3-D interface for rendering any angle to calculate grids or the orientation of lighting fixture on any surface of work space and figure out dynamically to view lighting environments. The deliberations of this software also let users to generate economic cost optimization, simple payback and life cycle cost of a luminari type of lighting fixtures. The simulation results of interior/exterior work space are available in numerical, ISO-counter and gray scale rendered formats.

The depth of illuminance and luminanarie daylighting distribution is a function of room window height relative to the working plane. Since, internal shading is less effective than

external shading by reducing solar heat gain because the solar radiation has already rejected trough the glass. For that reason, by using LV software, interior LED light design is simulated for determining economic, luminaries hours of operation, energy and maintenance cost energy savings from day lighting depend on skylights and windows and electric lighting controls.

The bolded letters are represented as daylighting simulation result, is discussed in Table 1 and Table 2 and the rendering results of luminarie location of LED lamp in the room which is represented by “A” in the work plan of LV software is discussed in Figure 13. Similarly, surface schedule of luminaries during rendering is discussed in Figure 14 and simulation result of visual economic tool cost analysis is discussed in Table II and their simulation graphs are presented in Figures 15-17. All these graphs show, by using LED lamps has more energy efficient with less maintenance per annum, which is a better option for daylighting design of a building due to concentrated luminaries spread throughout each corner of room, a variety of color in the visual spectrum, longer lifespan, lesser thermal impact, less HVAC cost and minimal of toxic presence.

	Location						Aim		
Label	X	Y	Z	MH	Orientation	Tilt	X	Y	Z
A	-27.94	-9.38	32.81	32.81	0.00	0.00	-27.94	-9.38	0.00
A	-27.94	32.62	32.81	32.81	0.00	0.00	-27.94	32.62	0.00
A	-27.94	74.62	32.81	32.81	0.00	0.00	-27.94	74.62	0.00
A	0.06	-9.38	32.81	32.81	0.00	0.00	0.06	-9.38	0.00
A	0.06	32.62	32.81	32.81	0.00	0.00	0.06	32.62	0.00
A	0.06	74.62	32.81	32.81	0.00	0.00	0.06	74.62	0.00
A	28.06	-9.38	32.81	32.81	0.00	0.00	28.06	-9.38	0.00
A	28.06	32.62	32.81	32.81	0.00	0.00	28.06	32.62	0.00
A	28.06	74.62	32.81	32.81	0.00	0.00	28.06	74.62	0.00
A	56.06	-9.38	32.81	32.81	0.00	0.00	56.06	-9.38	0.00
A	56.06	32.62	32.81	32.81	0.00	0.00	56.06	32.62	0.00
A	56.06	74.62	32.81	32.81	0.00	0.00	56.06	74.62	0.00
A	-27.00	64.00	10.00	10.00	0.00	0.00	-27.00	64.00	0.00
A	15.00	0.00	21.00	10.00	0.00	0.00	15.00	0.00	11.00

Figure 13. Luminaries location of daylighting of interior room using LV

Surface Schedule						
	Reflectances		Normal			
Name	Front	Back	X	Y	Z	Area(ft2)
Room						
Floor	0.20	0.20	0.00	0.00	1.00	15500.03
Wall 1	0.50	0.50	0.00	1.00	0.00	3875.01
Wall 2	0.50	0.50	-1.00	0.00	0.00	4305.56
Wall 3	0.50	0.50	0.00	-1.00	0.00	3875.01
Wall 4	0.50	0.50	1.00	0.00	0.00	4305.56
Ceiling	0.80	0.80	0.00	0.00	-1.00	15500.03

Figure 14. Surface schedule of luminaries of rendering daylighting of interior room using LV software

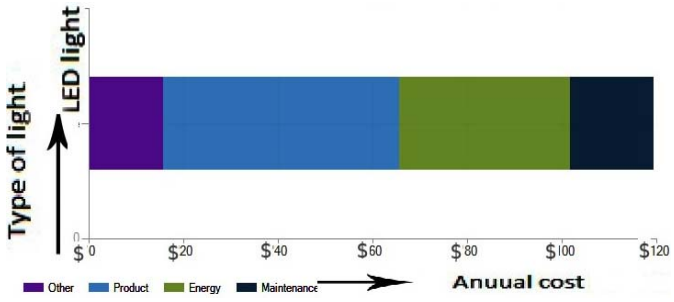

Figure 15. Total cost of LED lamp for interior lighting room design

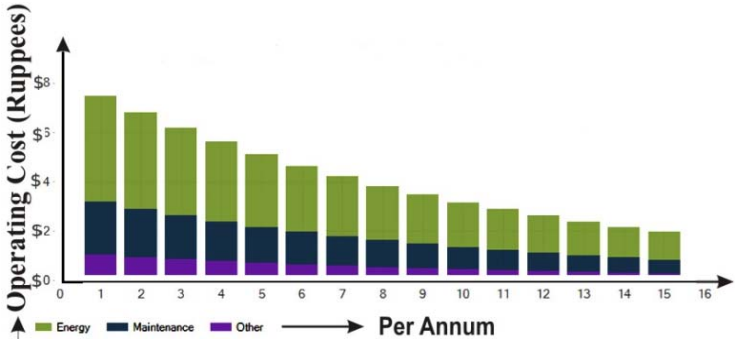

Figure 16. Operating cost for design of interior lighting

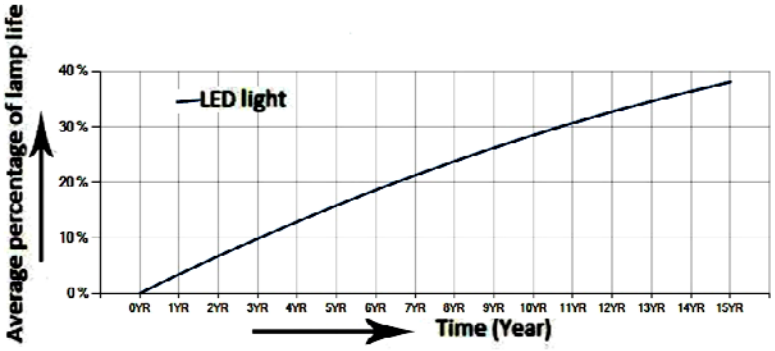

Figure 17. Average percent of lamp life over time for interior room lighting design

Table 1. Simulation Resault of Visual economic tool

LED lamps		Visual economic Tool simulation results	
Total Wattage	23.16	Energy Reduction (Weekday and Weekend day)	**28% (Save energy by dimming lights)**
Installed Luminaire Cost	$50	Cost per Therm (¢ / thm),	**7**
		Heat Initial Savings ($/thm	**2**
Lumens	1649.35	HVAC (Cooling Hours)	**935**
Life	100000	Life Cycle Cost	**$120**
Type	Daylighting	Life Cycle Cost /year	**15**
		Energy Use (kWh)	**887**
		CO_2 Emissions (tons CO_2)	**0.61**
		SO_2 Emissions (tons SO_2)	**0.00**
		NO_2 Emissions (tons NO_2)	**0.00**
		Annual Energy (homes)	**0.05**

Table 2. Simulation Results of LV software using Daylighting

Room Dimension		LED lamp Room Reflectance		**Criteria**		**Constraints**		**Spacing Results**		**Simulation results Illuminance**	Luminaire properties	
											Calzone	Workplane copy
length [x]	30 ft	Ceiling	80 %	Illumination	30 fc	**Spacing X [SC=14]**	15.2 ft	Spacing	**15.2x15 ft**	Average	**1465.0fc**	**1.0fc**
width [y]	20 ft	Wall	50 %			**Spacing Y [SC=14.1]**	15 ft	Arrangement	**1 x 2**	Maximum	**1468.6fc**	**3.6fc**
height [z]	12 ft	Floor	20 %			**Rows**	2	outside spacing [x-axis]	**14.47 ft**	Minimum	**1452.6fc**	**0.3fc**
										Max/Min	**1.0:1**	**12.0:1**
work plan celling type	2.5 2X2	Quantity	1			**Columns**		outside spacing [y-axis]	**1.97 ft**	Average/ Max	**1.0:1**	**0.3:1**
										Average/ Min	**1.0:1**	**3.3:1**

5. Conclusion

PVsyst and LV software with daylighting interior design has been proposed with an extremely valuable bay window advancement minimize the confound misfortune and controlling the shading impact in the midst of expanding sunlight inner part lighting which spares power levy. Utilizing this method, the reproduction initially assessed the beam component as indicated by the horizon line and after producing close shading element of the shaft and module part so that diminishment of befuddle misfortune and shading can be controlled. In this way when the sun is underneath the horizon line, there will be no close shading misfortune as the horizon line is invalid. As it were, potential close shadings for sun positions officially concerned by horizon line won't deliver any extra misfortunes. What's more, the building's indoor lighting autonomously and naturally conforms light levels, working naturally to the solar shade automation. A solar roof building can be enlightened while sparing the majority of the electric lighting vitality with shading system and about a large portion of the energy expected to cool the shading of building load commonly made by electric lights.

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