



# Implementation of Solar Power System and Cost Analysis for an Institute: A Case Study

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## Abstract:

The energy review in a building is a feasibility study. For it not just serves to identify energy use among the different services and to recognize opportunities for energy preservation yet it is also a crucial initial step in building up an energy management program. The review will produce the information on which such a program is based. The investigation should reveal to the owner, director, or administration group of the building the alternatives available for decreasing energy waste, the costs included, and the advantages achievable from actualizing those energy-conserving opportunities (ECOs). At schools and colleges, energy utilization largely affects both money related and ecological interests. New development, maturing foundation, budgetary requirements, expanding energy costs, and environmental responsibility are inspiring organizations to re-assess their energy demand and related protection programs. In a time of development worry about expanding educational cost and greater competition for qualified students, organizations must take each possible measure to lessen this line-item detail in the financial plan. This paper is proposed to raise awareness of potential savings that relate to energy utilization at colleges and universities. Cost effective recommendations will be laid out, exhibiting how management can make a move to address energy inefficiencies aspects and execute new activities in their energy programs.

**Keywords:** Energy Conservation Measures, Energy-Conserving Opportunities, College Energy Management System, Maximum Power Point Tracking,

## 1. INTRODUCTION

A few stages are required to conserve the energy all around utilizing orderly approach. Anyway a more extensive technique in checking energy utilization and wastage is the "Energy Audit". Energy reviews don't give the final solution to the issue. This recognizes where the potential for development lies, and accordingly, where energy management efforts must be coordinated. A energy review is initial move towards seeing how energy is being utilized as a part of a given office [1].

### 1.1 Energy Audit Methodology

Effective Energy review is a procedure that comprises of four stages:

Stage 1: Identify every Opportunities

Stage 2: Prioritize the activities normally

Stage 3: Accomplish the activities effectively

Stage 4: Maintain the activities for the duration of the life of the office

By utilizing these basic advances the extents of works and the accessible assets for directing the energy review ought to be resolved. This piece of energy review indicates the degree and capability of energy sparing through energy review [2].

### 1.2 Aim of Energy review (require)

1. To limit costs for energy
2. To limit operational expenses
3. To limit costs for repairs and recreation
4. To expand nature of condition that adds to expanded work efficiency [3].

### 1.3 Load Scheduling Optimization

Load planning is the way toward sharing the accessibility of aggregate load and misfortunes in influence generators. In the

event that we plan the aggregate load in uniform way then it is known as uniform planning. On the off chance that we consider the parameters, for example, stack necessity, accessibility of energy, control misfortunes and cost then it is known as ideal booking [4].

## 2. RELATED WORK

**Xiaohua Xia et al.in 2012[1]** This paper goes for breaking down the energy management program for business structures of a money related administration organization in South Africa by energy performance, operation, task, equipment and technology (POET). The manageability of a general energy administration program is talked about inside this POET system. As a use of this discussion to the business building situation, the award winning energy administration program of this monetary administration gather organization is highlighted from the POET point of view of energy efficiency. The contextual investigation demonstrates that the POET based structure can cover all real energy administration exercises, as well as recognize facilitates energy productivity change openings.

**Sanjay Kumar et al. in 2013[2]** gives an outline of a general energy conservation measures (ECMs) that can be ordinarily prescribed for NIT Hamirpur. It ought to be noticed that the Energy review displayed in this paper does not claim to be thorough nor extensive. It gives just to show a portion of the choices that vitality inspector can consider when playing out an investigation of this establishment. energy protection and investigation of new energy roads are the all around acknowledged answer for satisfy the request in future. The aggregate cost of energy assumes a fundamental part in deciding

the item cost of a ware. Thusly the ID of potential vitality investment funds and usage for a given institutional office is insignificant to guarantee its upper hand over other organization. This printed material exhibits such energy sparing techniques in a methodological approach, experienced amid a point by point vitality review of NIT Hamirpur.

**Ms. Shradha Chandrakant Deshmukh et al. in 2010[3]** Energy is one of the real contributions for the financial improvement of any nation. On account of the creating nations, the energy area accept a basic significance in perspective of the regularly expanding vitality needs requiring colossal speculations to meet them. For lessening cost and expanding productivity, at that point utilize vitality protection, administration and review. The goal of Energy Management is to accomplish and keep up ideal energy acquisition and use, all through the association as to limit vitality costs/squander without influencing generation and quality. Energy Audit is the way to a precise approach for basic leadership in the zone of vitality administration. It endeavors to adjust the aggregate vitality contributions with its utilization, and serves to distinguish all the energy streams in an office.

**Dnyaneshwar S. Raut et al. in 2014[5]** A energy review is an investigation, study and examination of vitality streams in building, process or framework with the goal of understanding the energy elements of the framework under examination. Regularly a energy review is led to look for chances to decrease the measure of energy contribution to the framework without adversely influencing the yields when the question of study is a possessed building at that point lessening energy utilization while keeping up or enhancing human solace, wellbeing and security are of essential concern. Past essentially distinguishing the wellsprings of vitality utilize. An energy review tries to organize the vitality utilizes as indicated by the best to slightest financially savvy open doors for vitality reserve funds. The vitality review report sets up the requirements for plant metering and checking empowering the plant supervisor to organize the training and consequently, spare cash for the years to come. The means and sets the preparatory spending plans for the energy administration program.

**Manoj Kumar Lamba et al. in 2015[6]** This paper is only one stage, towards our goal of accomplishing vitality effectiveness and we might want to accentuation that a energy review is a persistent procedure. In this paper, creator examine about conceivable activities right off the bat i.e. The most effective method to monitor and proficiently use our rare assets and distinguished their funds potential; second thing is critical to actualize on it. In this proposition, a energy review is an investigation of a plant or office to decide how and where vitality is utilized and to recognize techniques for energy reserve funds. The open doors lie in the utilization of existing sustainable power source advances, more noteworthy endeavors at vitality productivity and the spread of these innovations and alternatives. Energy Saving should be possible by enhanced systems, better instrumentation and more effective hardware.

**Vijo M Joy et al. in 2016[13]** an effective load planning technique to meet fluctuating force supply needs is exhibited in this paper. At top load times, the power age framework bombs because of its precariousness. Customarily we utilize stack shedding process. In stack shedding process disengage the superfluous and additional heaps. The proposed strategy defeats this issue by planning the heap in view of the necessity.

Manufactured neural systems are utilized for this ideal load booking process. For produce monetary planning simulated neural system has been utilized on the grounds that age of energy from each source is monetarily unique. In this the aggregate load required is the contributions of this system and the power age from each source and power misfortunes at the season of transmission are the yield of the neural system. Preparing and programming of the counterfeit neural systems are finished utilizing MATLAB

### 3. PROPOSED WORK

#### 3.1 Proposed work

Establishment of solar panels in Haryana Engineering College is an efficient and simple way to set up a clean energy with verified technology. Solar panels give both an environmental and economic advantage, especially at universities where energy utilization is more. With total of population and resources which includes an undergraduate population of more than 2500 students, two major stadiums, 3 major dining locations, College is always utilizing huge amounts of energy. Our proposed work will give outline via thorough investigation of college building and gives what a Solar PV system offers. The investigations will give a complete plan for Haryana Engineering College moving forward. Solar PV will help in decreasing electricity bills, defend against increasing energy costs, and enhance sustainability initiatives. The primary goal is to create a realistic plan for the first implementation of solar panels on campus with the expectation that the HEC administration will agree to the idea. The electricity bills that are to be paid without using PV systems (CO) and the net energy cost to be paid (or earnings) with PV technology per year is, The cost of energy savings is the difference in these bills. And the net profit B is the energy cost savings subtracted by the annualized cost of investment of PV systems.

**The correlation is defined in the following equation:**

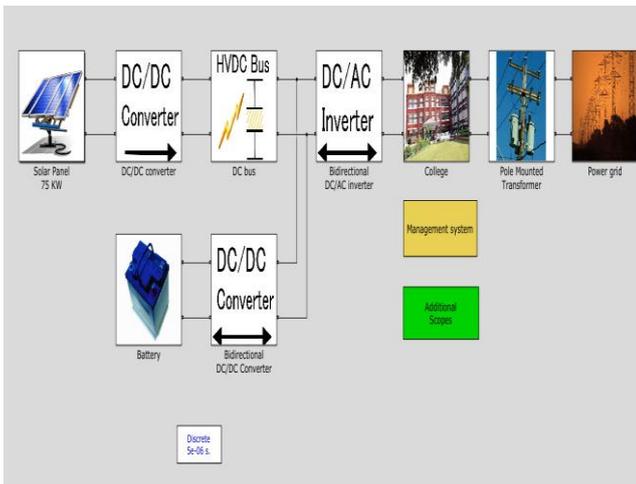
$$B = (C_0 - \sum C_E) - I_A \text{ i.e. } B = C_0 - C$$

Improved energy storage methods could dramatically advance the value of solar with respect to grid operations. The capability to store electricity from Solar Panel, and passes it to the grid when required, would be particularly valuable for the generation capacity variable.

#### 3.2 Implementation

A photovoltaic system, grid power, and a battery are connected to a College energy management system (CEMS) as complementary power sources. The photovoltaic system is connected directly to the CEMS. The system is rated to 75 kW and is defined by a current-voltage look-up table. To track to most extreme power point, as figured by the MPPT control, a course control component drives a unidirectional DC/DC converter. The cascade control system is a series of voltage, current, and PWM controllers. A controller made out of a Power Conditioning System and Battery Control System is likewise associated specifically to the CEMS. The power framework is associated with the College from a pole mounted distribution transformer. It can assimilate surplus power from the CEMS or requested supply energy to the CEMS. The association between the grid and the CEMS is controlled by a bidirectional DC/AC inverter.

## 4. RESULTS



**Figure .4.1. Simulation Model**

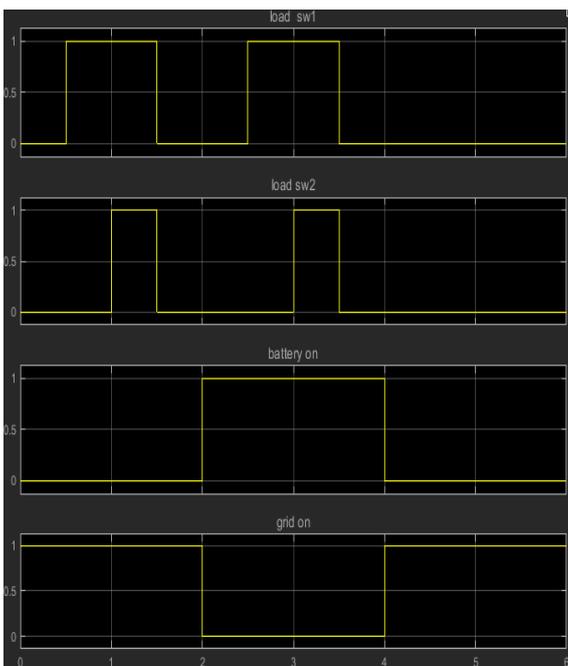
Execute the model and watch the signals on the scopes in the Additional Scopes subsystem.

Step 1: in starting, the battery is not attached to the system and the two loads are not yet enabled. The power produced by the photovoltaic is held nearly constant at the rated 70 kW by the MPPT control and is returned to the power grid.

Step 2: Load 1 (30 kW) is turned ON and consumes less than 1/2 of the power generated by the photovoltaic system. The remaining power is returned to the power grid.

Step 3: Load 2 is turned ON for an aggregate of 40 kW of consumed power. The photovoltaic framework does not supply adequate power, in this manner complementary power is given by the grid.

Step 4: Load 1 and 2 are then detached and the Battery is connected with the framework. loads 1 and 2 are then reconnected in an same sequence from above. The management framework would now be able to be separated from the power grid since the mix of solar power and battery control is adequate to supply the aggregate load.



**Figure .4.2. Load Switching**

## 5. CONCLUSION

To meet the required power we should consider all the accessible power sources. So the optimal scheduling of various

power sources is essential. Solar power source isn't generally adequate to meet the required power and grid control sources are extremely costly. Solar power energy is effectively accessible however the power created from it is inadequate to take care of the load demand. At the point when think about every one of these angles, we should require an ideal load planning technique for energy saving. Energy Management is to accomplish and keep up optimum energy and usage, all through the organization as to limit energy costs/waste without influencing production and quality. for taking decision in the field of energy management, Energy review is the way to an systematic technique One arrangement comprises on the association of photovoltaic (PV) panel and battery. Battery can store energy from PV panel and give it back when required. In this paper, a novel strategy was proposed for the energy organization of micro-grids with PV-battery systems. This strategy implemented a rule-based controller intended at reducing the utilization of electricity from the public grid for a given load. Based on the framework of this study, feed-in energy was the least desirable option. Through experimental data and simulations, we demonstrated the suitability of the proposed strategy for efficient management of these kinds of systems. This methodology can be simply adjusted to larger-scale grids.

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