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A crucial study focuses on demand based Indian hotel industry energy efficiency needs by comparing two model theory by Cholesky decomposition

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Article Info	ABSTRACT
	Hotels operate on a stringent 24/7 operational model, every day operational model. They offer both top notch facilities and various civilities, including nearby workplaces, world-class wellness focuses, spas, warmed swimming pools, 24-hour eateries, and then some. These advantages add to visitor comforts additionally increment add up to vitality cost. While inn vitality utilization can appear to be stunning, the plenty of administrations and conveniences offer various open doors for vitality funds. The test for inn proprietors is choosing the ideal course to vitality reduction. Two methods top the list: energy audits and retro-commissioning To pick the best game-plan for a particular inn property, proprietors must survey the two strategies and recognize which arrangement would have the best effect on their building. The two procedures handle vitality use from various points, so here's a manual for what every involves and how it can enhance inn operations.

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1. INTRODUCTION

Energy audit is the capacity to do work and work is the exchange of energy starting with one form to another form. Energy audit comes in various structures-(Heat), light (luminance), mechanical, electrical, substance, and atomic audit. Coal and other fossil fuels, which have taken three million years to shape, are probably going to drain soon [1, 2].

In the last two hundred years, we have devoured 60% of all assets. For feasible advancement, we have to embrace energy audit proficiency measures. Today, 85% of essential energy originates from non-renewable and fossil sources (coal, oil, and so on). These stores are continually decreasing with expanding utilization and won't exist for future years [3].

In this paper we think about energy protection and energy productivity by how to lessen energy request to sensible least Cost, recoup and re-utilize warm where conceivable and furthermore consider utilization of vitality effective gear to supply remaining vitality request, and give a way to oversee utilization of energy and furthermore examine vitality and environment and study how to complete energy audit review [4, 5].

Energy Scenario and energy sources: Energy can be classified into various types based upon its utilization under the following criteria. Primary (Essential) and Secondary (Derived Essential) energy. Commercial (Business) and Noncommercial (Derived Business) energy. Renewable and Non-Renewable energy.

1.1. Primary energy sources

Essential (Primary) energy sources are those that are either found or put away in nature. Normal essential energy sources are coal, oil, characteristic gas, and biomass, (for example, wood). Other essential energy sources accessible incorporate atomic energy from radioactive substances, warm energy put away in earth's inside, and potential energy because of earth's gravity.

1.2. Secondary energy sources

Derived essential energy resources are like steam or steam vapors, Electricity are derived from primary energy sources (fossil fuels) like coal, oil & gases & are suitable for generation and nuclear energy resources like uranium and thorium ,transportation, distribution and control.

1.3. Commercial energy sources

Commercial Energy sources that are accessible in the market at an unequivocal cost are known as business sources that are accessible in the market at a clear cost are known as commercial energy. Commercial energy frames the premise of mechanical, horticultural, transport and business improvement in the cutting edge world.

1.4. Non-commercial energy sources

Derived business energy resources are not available in the commercial market for a price or any type of cost occupancy is classified as Non-commercial energy. Example: Firewood, agro waste in rural areas; solar energy, animal power, wind energy. These resources are in the secondary form of business generating resources [6, 7].

1.5. Renewable energy

These type of resources are utilizable resources are those that are essentially inexhaustible, like wind power, solar power, geothermal energy, tidal power and hydroelectric power. There generation and utilization are responsible for green energy generation, in other words it is also known as green energy. These types of resources are abundant in nature and must be utilize as renewed again and again [8].

1.6. Non-renewable energy

Non renewable energy resource is the conventional fossil fuels such as coal, oil and gas, which are likely to non consistent and depleting nature [6, 7, 9].

2.   ENERGY CONSERVATION AND EFFICIENCY
2.1. Energy conservation

Energy is defined as ability and the capability for work to be compete in the given time and for completion of work is transformation of energy from one form to another and also according the first law of thermodynamics the energy can neither be created nor destroyed. It includes any behavior that results in the use of less energy [5, 7, 10].

Example: Shutdown the lights in a room, Don't kept water running unless is required, Recycle (bottles, can, papers, glass, etc.) for providing green environment, Walk or ride a bike for kept incline in fossil fuels, Open a window in the summer instead of turning on the air conditioning, use public transportation facilities [2].

2.2. Energy efficiency

It involves the use of technology that requires less energy or more energy efficient to perform the same work to an accompanist. A compact fluorescent light bulb that uses less energy to produce the same amount of light as an incandescent light bulb is an example of energy efficiency. The decision to replace an incandescent light bulb with a compact fluorescent is an example of energy conservation. Driving a vehicle in a large distance with less consumption of fuel is efficiency in terms of utilization of fossil fuels.

2.3. Need of energy conservation

Fossil fuels like coal, oil that has taken years to form is on the verge of depleting soon. In last 200 years we have consumed 65% of all resources. For sustainable development we need to adopt energy efficiency measures. Today 80% of primary energy sources come from non-renewable and fossil sources. These reserves increasing exponentially consumption and will not even exist for future generations and its utilization may be inappropriate.

2.4. Determining efficiency targets

There are numerous variables that need to be considered while setting efficiency targets including occupancy rate, operating expenses, etc. The profitability of running a hotel must also be considered while identifying the appropriate variables. Operating expenses is one of the significant "constant" variables to be considered while determining savings objectives. Others like occupancy rate, cost of materials and supplies will fluctuate based on external factors. Operating expenses are largely influenced by actions you can take and on average, the cost of energy accounts for 3% to 5% of the total operating expense1. Through this guide, your hotel can aim to reduce energy costs by up to 20%.
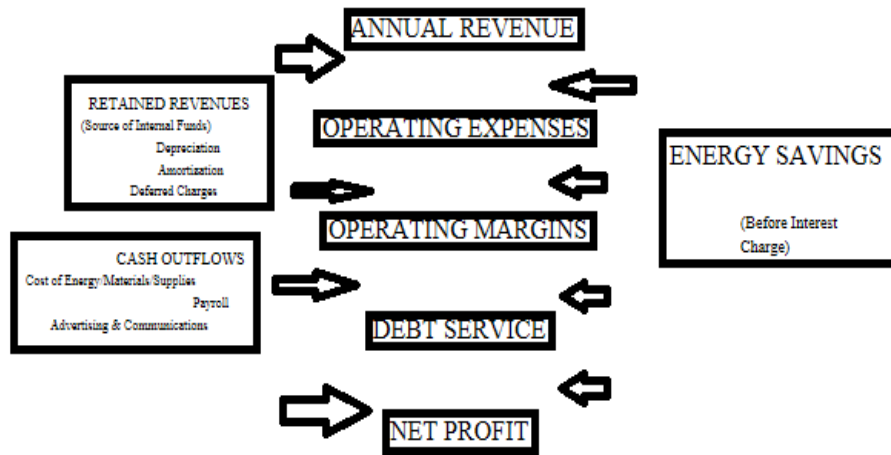
Figure 1. Factors involved in establishing profitability for hotel

3. UTILITY FUNCTION

We assume by induction that we can construct a Cholesky Decomposition for any positive definite n-1 × n-1 matrix and show how to construct the Cholesky Decomposition of an n × n positive definite matrix X. Since A is positive definite it is symmetric and so we can represent A as follows

$$X = \begin{pmatrix} x_{11} & X^T_{21} \\ X_{21} & X_{22} \end{pmatrix}$$

Since X is positive definite $x_{11}>0$, and so we can define

$$l_{11} = \sqrt{x_{11}}$$

$$L_{21} = (1/l_{11})X_{21}$$

Let Z be any n-1 x 1 column vector with Z≠ 0 and let

$$V = (-1/x_{11})X^T_{21}Z$$

It now follows that

$$X = \begin{pmatrix} x_{11} & X_{21}^T \\ X_{21} & X_{22} \end{pmatrix} = \begin{pmatrix} l_{11} & 0 \\ L_{21} & L_{22} \end{pmatrix} \begin{pmatrix} l_{11} & L^T_{21} \\ 0 & L^T_{22} \end{pmatrix}$$

3.1. Energy management pay

Estimated Cost consumption in Hotel Industry as shown in Table 1.

Table 1. Estimated cost consumption in hotel industry

Facility Type	If Annual Energy Costs is	Estimated Annual Savings for Reductions		
		Lighting by 20%	HVAC by 20%	Water heating by 20%
50,000 sq. ft.	INR 3,525,000	INR 375,000	INR 164,500	INR 164,500
100,000 sq. ft.	INR 7,050,000	INR 750,000	INR 329,000	INR 329,000
150,000 sq. ft.	INR 10,575,000	INR 1,125,000	INR 488,800	INR 470,000

3.2. Optimized output

The following output graph based upon the Analysis depicted in the data sets of the possible combination is Maximization and the Minimization of Annual Cost as shown in Table 1. The main objective of the study is to reduce the operating Cost of Hospitality Industry by taking the corrective measures of energy efficient Hotels. The cost density has to optimized based upon the needs generated and the units consumed as shown in the Figure 1.
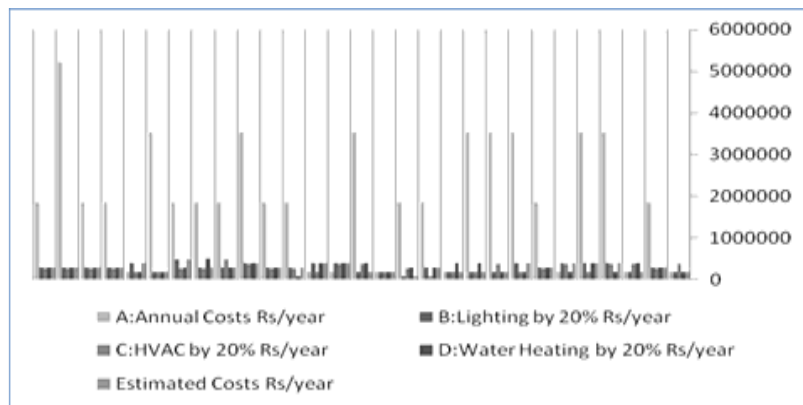

Figure 1. Cost density

The generating Cost shows the cummulative growth according to years of span the energy utilized and the wastage due to the lagging power factor, as well as the unnessasary useless consumption of electricity dipicted in the Figure 2.
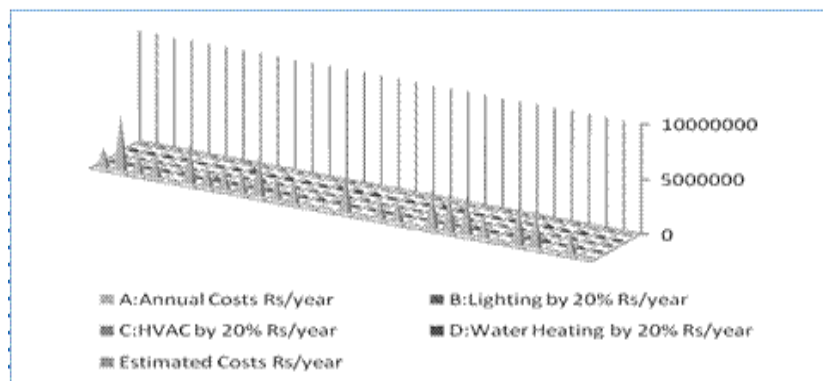

Figure 2. Optimized value

The interrelated value is well explained in the Figure 3, how does (Lightning, water heating and HVAC) utilization of enrgy consumes the electricity. Figure 3 relates the consumption and its effects on the costs of utilization of energy. Simulated output (optimized values) as shown in Figure 4.
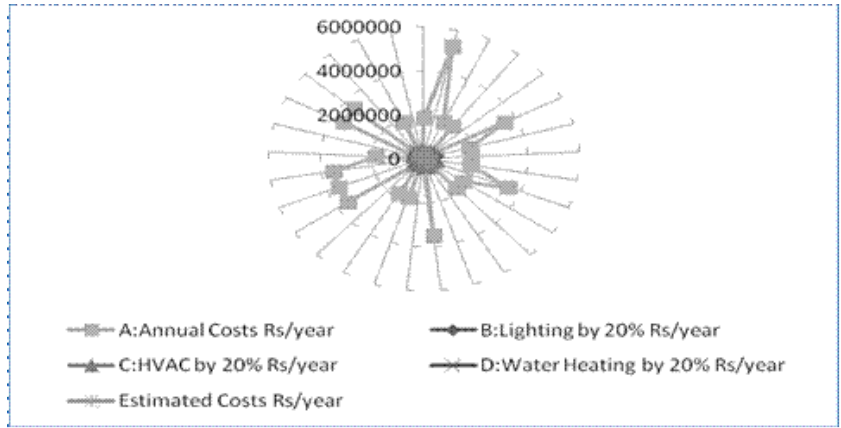
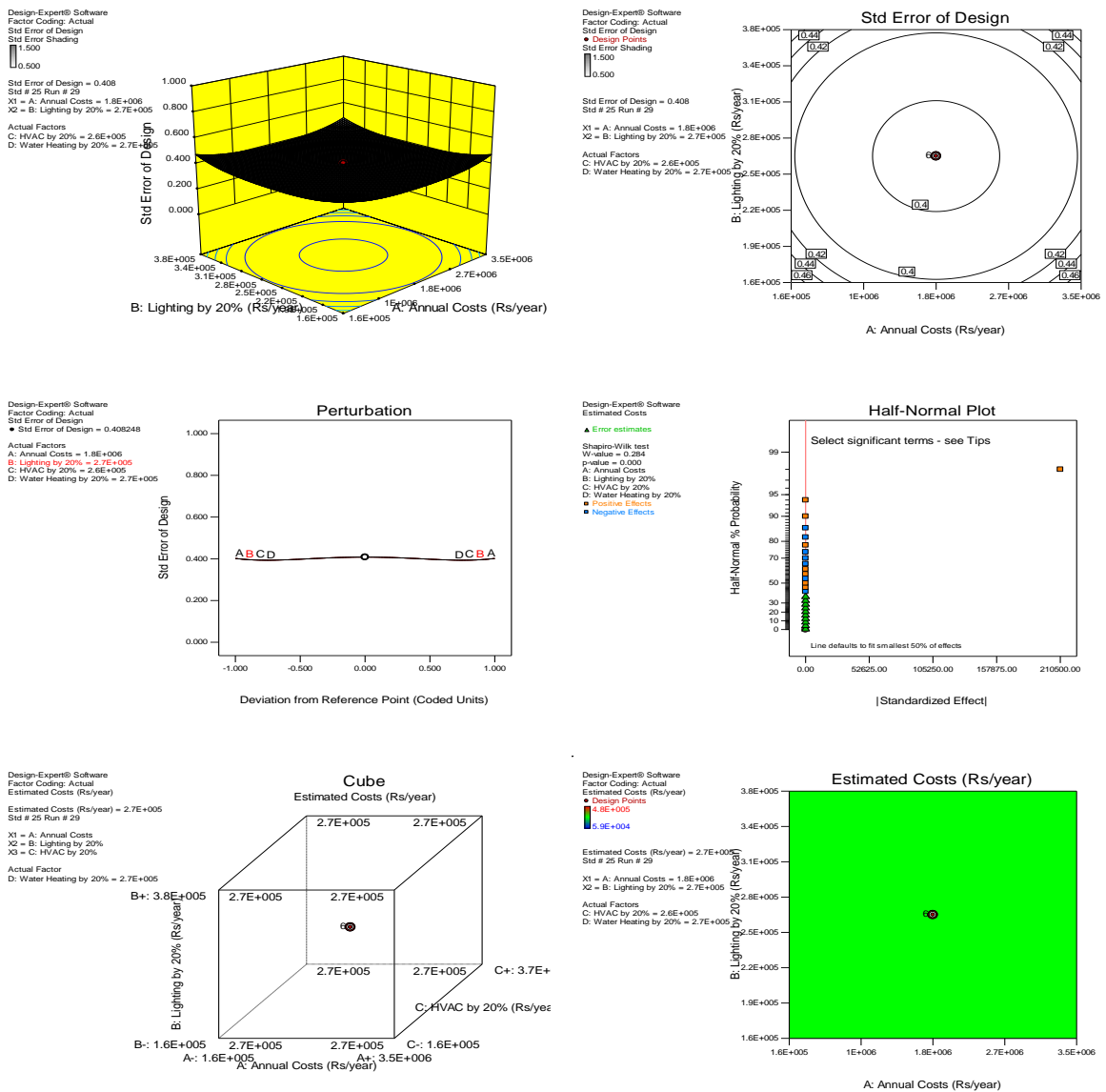Figure 3. Interrelated value of cost of consumption

Figure 4. Simulated output (optimized values)

Table 2. Calculated cost in hotel industry

A:Annual Costs Rs/year	B:Lighting by 20% Rs/year	C:HVAC by 20% Rs/year	D:Water Heating by 20% Rs/year	Estimated Costs Rs/year
1844750	269750	264750	274750	269750
5205250	269750	264750	274750	269750
1844750	269750	264750	274750	269750
1844750	269750	264750	274750	269750
164500	375000	164500	164500	375000
3525000	164500	164500	164500	164500
1844750	480250	264750	274750	480250
1844750	269750	264750	495250	269750
1844750	269750	465250	274750	269750
3525000	375000	365000	385000	375000
1844750	269750	264750	274750	269750
1844750	269750	264750	54250	269750
164500	375000	164500	385000	375000
164500	375000	365000	385000	375000
3525000	164500	365000	385000	164500
164500	164500	164500	164500	164500
1844750	59250	264750	274750	59250
1844750	269750	64250	274750	269750
164500	164500	164500	385000	164500
3525000	164500	164500	385000	164500
3525000	164500	365000	164500	164500
3525000	375000	164500	164500	375000
1844750	269750	264750	274750	269750
164500	375000	365000	164500	375000
3525000	375000	164500	385000	375000
3525000	375000	365000	164500	375000
164500	164500	365000	385000	164500
1844750	269750	264750	274750	269750
164500	164500	365000	164500	164500

4. CONCLUSION

The following research article shows the variation of conservation electricity, the emphasis has been paid on the utilization of electricity generation and the use of alternate energy resources. "More we make use of Renewable energy resources more the energy conserves". The statement governs optimal utilization of resources which may be extinct in the near future. The net cost generating output as shown in Table 2 represents the optimized output.

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