Major Project Report on

FINANCIAL MODEL OF
AN ENERGY SAVINGS PROJECT
FOR
ENERGY SERVICES COMPANY (ESCO)

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Certificate

This is to certify that Rahul Aggarwal**,** Roll No. : 2K18/EMBA/533 student of Masters of Business Administration (Executive 2018 – 2020) at Delhi Technological University, Delhi has accomplished the project titled **Financial model of an Energy Savings project for Energy Savings Companies (ESCO)** under my guidance and to the best of my knowledge completed the project successfully, for the partial fulfilment of the course in final semester of Executive MBA course.

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Acknowledgments

To begin with, I would like to thank M/s Prekar Automation Private Limited, Delhi for providing me the opportunity to take up a project with them.

I wish to express my sincere gratitude to my project guide Prof Chandan Sharma, Assistant Professor, DSM, DTU for his guidance, help and motivation. Apart from the subject of my study, I learnt a lot from him, which I am sure, will be useful in different stages of my life.

I feel deep sense of gratitude towards Prof Rajan Yadav, Head of Department, Delhi School of Management, Delhi Technological University for being a constant source of motivation and guidance throughout the course. I am grateful to my friends who gave me the moral support in my times of difficulties. Last but not the least I would like to express my special thanks to my family for their continuous motivation and support.

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Executive Summary

Economic development of any nation is heavily linked with its per capita energy consumption levels rather we can say that per capita energy consumption is greatly indicates wellbeing of human life. This is very much evident in the developed economies in Europe and North America.

With the intent to develop the lives of their citizens and its people, most of the under developed nations in Asia, Africa and South America are going for economic developments. A consistent increase in the demand for energy has caused a significant exploitation of fossil fuels which has adversely impacted the environment. To "meet the needs of present generations without compromising the ability of future generations to meet their needs" (Our Common Future, Brundtland Report, 1987) has become one of the greatest challenge to the mankind.

"One unit of energy saved at the consumer end evades 2.5-3 times fresh capacity addition. Moreover, such savings via the efficient use of energy can be achieved at less than one-fifth of the cost of new capacity generation"[7].

"Energy efficiency is key to the transformation of energy systems and, it is estimated, will play a critical role in limiting the growth of world energy demand to one third by 2040" [1]. Energy Efficiency can helps , for example, help bring down the cost of lighting, heating, refrigeration and other services as we get the same performance with energy efficient system while reducing our energy expenditure. Moreover energy efficiency helps reduce pollution and greenhouse gas emissions also by a substantial amount.

"Enhanced energy efficiency offers a unique opportunity to reconcile economic competitiveness with sustainable development, and simultaneously reduces the cost of energy and increases productivity. Improvements in residential and public sectors, for example, have delivered a wide range of social, environmental and economic benefits, including energy security, job creation, poverty alleviation, improved health, and reduced greenhouse gas emission"[8].

India Government is providing incentives for usage of non-conventional energy sources besides mandating the businesses to reduce their energy consumption per unit production on year on year basis. This has led to increasing focus of corporates/ other organizations to reduce their energy usage.

With newer and efficient technologies besides modifications in the process/ layout, it is possible to reduce the energy consumption without impacting the overall process. A newer business line of energy services has developed wherein the projects are fully or partially funded from the savings achieved after implementation of the project.

"Energy Service Companies (ESCOs) is a company that offers energy services, usually design, retrofitting and implementation of energy efficiency projects after identifying energy saving opportunities through energy audit of existing facilities. It also includes energy infrastructure outsourcing, power generation and energy supply, financing or assist Facility's Owners in arranging finances for energy efficiency projects. ESCOs operates by providing a savings guarantee, risk management in the implementation of the energy efficiency projects and also perform measurement & verification (M&V) activities to quantify actual energy savings post implementation of energy efficiency projects etc "[2].

A financial model covering some of the aspects of such a project have been developed. This is an extension of the work taken up in the last semester and more aspects will be added in future work.

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List of Abbreviations

RES = Renewable Energy Sources

PV = Photo Voltaic

IEA = International Energy Agency

CEA = Central Electricity Authority

KWh = Kilo Watt hour (1 Electrical Energy Unit)

MU = Million Units ie 1,000,000 KWh)

MW = Mega Watts ie 1000 KW

GW = Giga Watts ie 1000 MW

AI = Artificial Intelligence

CERC = Central Electricity Regulation Commission

GoI = Government of India

MoP = Ministry of Power, GoI

BEE = Bureau of Energy Efficiency

EESL = Energy Efficiency Services Limited

LED = Light Emitting Diode

Mtoe = Millions of tonnes of oil equivalent

IRR = Internal Rate of Return

NPV = Net Present Value

ECBC = Energy Conservation Building Code

DSM = Demand Side Management

SME = Small & Medium Enterprises

PAT = Perform, Achieve & Trade

SDA = State Designated Agencies

UNDP = United Nations Development Program

1.INTRODUCTION

1.1 About Prekar Automation Private Limited

M/s Prekar Automation Private Limited (PAPL) is a control and automation supplier & Information Technology Integration solution provider for industry verticals like manufacturing, infrastructure, education etc. They offer design, consultancy and business services for renewable energy, energy management, smart city applications etc. They have deep insights into the complete project life cycle and are very familiar with the process requirements of various industries.

M/s PAPL is focused on providing complete solutions to its customers. They assist their customers during their design phase and provide support throughout the complete project life cycle which besides supply includes installation, commissioning, training, operation & maintenance and post warranty support of the system. M/s PAPL always strives to deliver quality solutions & services by using their extensive experience. They are committed to ensure customer satisfaction and continuously try to add value to customers' business.

1.2 Industry Profile

For fulfilling the development/ growth objectives of a nation, energy security is one of the mandatory requirements and nations can adopt various strategies to ensure that the nations is able to secure their energy needs for the future:

- Diversification by deploying various sources of energy supply
- Build capacities/ stocking
- Restraining the demand
- Promotion of renewable energy sources
- Increased capacity of fuel switching
- Promoting & Incentivising measures taken to reduce energy consumption
- Promote energy efficiency for Sustainable development and compliance to emission standards
- Efficient production of coal, oil and natural gas
- Promoting gas transmission & distribution in cities
- Deregulation and privatization of energy sector - oil, coal and power sectors
- Oil products and electricity tariffs – cross subsidy reduction
- Making natural gas prices competitive
- Encourage FDI in energy

Energy Efficiency offers following benefits to the Nation –

- Falling Energy imports saves foreign exchange for country like India
- Avoiding excess costs that can be used for other social programs
- Protect and conserve natural resources
- Improved energy security
- Reduced Green House Gases and other emissions
- Maintaining a safe & environment friendly environment
- Reduced energy bills
- Increased competitiveness, productivity, profits

2.LITERATURE REVIEW

“India has been responsible for almost 10% of the increase in global energy demand since 2000. India’s energy demand in this period has almost doubled, pushing the country’s share in global demand up to 5.7% in 2013 from 4.4% at the beginning of the century. The primary energy demand in India has grown from about 441 Mtoe in 2000 to about 775 Mtoe in 2013. This demand is expected to increase to about 1250 (estimated by International Energy Agency) to 1500 (estimated in the Integrated Energy Policy Report) Mtoe in 2030. Yet the increase in domestic energy production is far below than India’s consumption needs. By 2040 more than 40% of primary energy supply will be imported, up from 32% in 2013. As per past observations, Human Development Index of 0.9 or more requires annual energy supply of at least 4 toe per capita. Consequently, there is a large latent demand for energy services that needs to be fulfilled in order for people to have reasonable incomes and a decent quality of life.”[1]

Though there is continuous and progressive addition of generation capacity in India, the gap between demand and supply remains wide. As per CEA report [3] in India, “during the year 2017-18, total ex-bus energy supplied increased by 6.0% over the previous year and the peak met increased by 2.0%. The energy requirement registered a growth of 6.2% during the year against the projected growth of 7.6% and Peak demand registered a growth of 3.0% against the projected growth of 6.0%”.

	2016-17	2017-18 (Actual)	2017-18 (Projected)	Actual Growth (%)	Projected Growth (%)
Energy Requirement (MU)	1,142,929	1,213,325	1,229,661	6.2	7.6
Peak Demand (MW)	159,542	164,006	169,130	3.0	6.0
Energy Supplied (MU)	1,135,334	1,204,697	1,337,828	6.0	17.8
Peak Demand met (MW)	156,934	160,752	180,601	2.0	15.1

Table: 1: Year on Year change in demand & supply of power & Energy – forecast and actual [3];

"With a total energy consumption of 553.9 Million Tonnes of Oil Equivalent (Mtoe)1 in 2017-18, India stood the third largest energy consumer in the world after United States of America and China. India also ranks highest in terms of growth rate of energy consumption in the world. India's energy consumption is expected to grow fastest among global economies and account for 11% of global energy demand by 2040. As India, submitted its Nationally Determined Contributions (NDC) target to United Nations Framework Convention on Climate Change (UNFCCC), intending to reduce emission intensity of its GDP, the role of energy efficiency would be crucial in complying with those targets" [3].

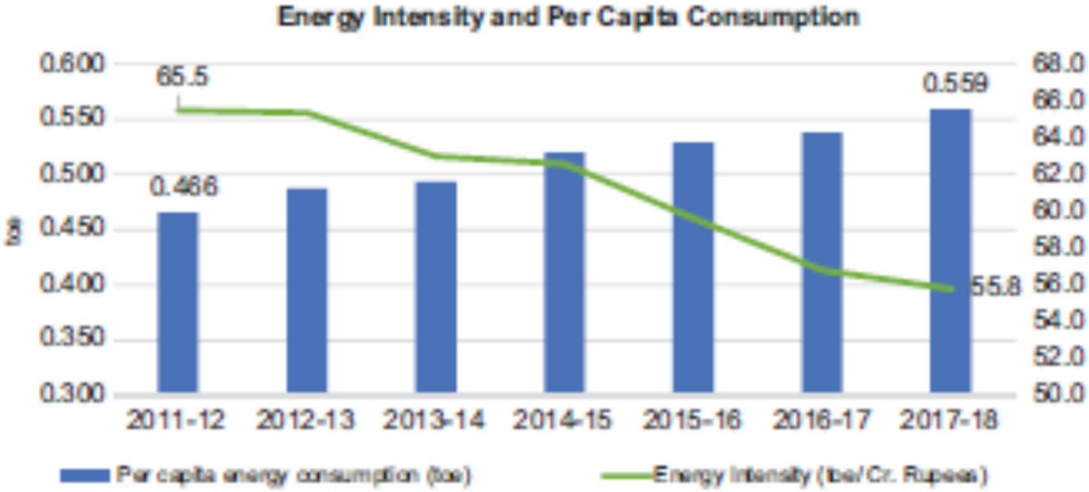

Figure: 1: Energy Intensity & Per Capita Trend [3]

The Energy Intensity of India (at 2011-12 prices) decreased from 65.5 toe per crore rupees in 2011-12 to 55.8 toe/Cr Rupees in 2017-18, which is presented in Figure 13. This decline is attributed to the services sector having a growing share of the economy, and deployment of energy efficiency programmes among other factors.

As the additional generation capacity takes time, the authorities deploy energy conservation as well as energy efficiency measures to bridge the demand gap.

"Energy conservation is achieved when growth of energy consumption is reduced, measured in physical terms. Whereas the **energy efficiency** is achieved when energy

intensity in a specific product, process or area of production is reduced without affecting output, consumption or comfort levels. Energy Efficiency simply means using less energy to perform the same task – that is, eliminating energy waste".

Thus **energy efficiency helps reduce imports leading to conserving limited resources and enables improved energy security.**

"Improving the energy efficiency meets the dual objectives of promoting sustainable development and of making the economy competitive. Recognizing the formidable challenges of meeting the energy needs and providing adequate and varied energy of desired quality in a sustainable manner and at reasonable costs, improving efficiency have become important components of energy policy. In addition, the environmental and health burdens arising out of the use of hydrocarbons may also force mankind towards energy efficiency and clean energy systems. Energy Conservation has also assumed enhanced importance with a view to conserve depleting energy resources".[1]

"Government of India has undertaken a two pronged approach to cater to the energy demand of its citizens while ensuring minimum growth in CO_2 emissions, so that the global emissions do not lead to an irreversible damage to the earth system. On one hand, in the generation side, the Government is promoting greater use of renewable in the energy mix mainly through solar and wind and at the same time shifting towards supercritical technologies for coal based power plants. On the other side, efforts are being made to efficiently use the energy in the demand side through various innovative policy measures under the overall ambit of Energy Conservation Act 2001".[1]

"The Energy Conservation Act (EC Act) was enacted in 2001 with the goal of reducing energy intensity of Indian economy. Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power is responsible for spearheading the improvement of energy efficiency in the economy through various regulatory and promotional

instruments. Bureau of Energy Efficiency (BEE) was set up as the statutory body on 1st March 2002 at the central level to facilitate the implementation of the EC Act".

Some of the key schemes of BEE are

Figure 2: Schemes of BEE Source: BEE Annual report 2018-19

Indian government through Bureau of Energy Efficiency/ Energy Efficiency Services Limited is having various initiatives for improving energy efficiency in the country and the ***key initiatives*** are as follows:

UJALA - Unnat Jyoti by Affordable LEDs for All (UJALA) wherein EESL "procures LED lamps, LED Tubelights and fans and distributes them to consumers through power distribution companies at subsidized rates".

SLNP - Street Lighting National Program

“Under the program, EESL replaces the conventional street lights with LEDs at its own costs, with no upfront investment by the municipalities, thereby making their adoption even more attractive”.

BEEP - Buildings Energy Efficient Program

“BEEP gives building facility managers access to a Building Management System to track power consumption in real-time and identify how they can cut down power wastage from lighting, audio-visual and information technology equipment, and other appliances left on when not in use. Additionally, the system also provides data-driven insights to optimize energy management strategies and minimize operational costs”.

AgDSM - Agricultural Demand Side Management (AgDSM) program

“Under the program, inefficient agricultural pump sets are replaced with BEE 5 star-rated energy efficient pump sets. AgDSM implantation can reduce peak demand, and, ultimately, the total energy consumption in the agriculture sector”.

Energy Efficient Air Conditioners

“Under this initiative, Consumers are able to buy the superior Super-Efficient Air Conditioners distributed by EESL at prices that are comparable to the most energy-efficient ACs in the market. These Super-Efficient ACs will provide 1.5-TR cooling capacity at high ambient temperature reducing energy consumption by almost 40%”.

SMNP - Smart Meter National Program

“This program is working to eventually replace 25 crore conventional meters with smart meters across India. By bringing standardized solutions based on the GPRS technology, these meters will ease integration in the sector, while cutting capital costs and boosting efficiency in billing and collection. Customers will also benefit from accurate bill readings,

and real-time understanding of their electricity usage, catalysing a pan-India movement towards energy efficiency".

Solar AgDSM - Agriculture Demand Side Management: solar mini-grids

"EESL is providing reliable solar power supply to agricultural pump sets by setting up solar mini-grids. Solar powered PV pump sets can be used to irrigate the farms during the day time, thereby reducing dependence on diesel fuel".

MEEP - Municipal Energy Efficient Program

"Municipal corporations' 40 to 60 percent of India's energy costs arise only from supplying water, and an estimated 48 crore units in electricity is wasted every year due to inefficient water pumps. As part of India's Atal Mission for Rejuvenation and Urban Transformation (AMRUT), EESL is working with concerned agencies to retrofit energy efficient pumps for water supply and sewerage systems across various Cities in India".

Trigeneration

"It is the simultaneous process of cooling, heating and power generation from only one fuel input. Typically, gas-fired generators are used to produce electricity. The byproduct is waste heat, which is then directed to absorption chillers and boilers for space cooling, hot water and related purposes".

"The energy efficiency market in India is estimated to be worth INR 150,000 Crore, out of which only 5% potential has been tapped by ESCOs so far[2]. Accordingly, a significant Energy Efficiency potential is left untapped in India and ESCOs are supposed to be the main vehicle to harness this potential. While renewable energy technologies also help accomplish these objectives, improving energy efficiency is the cheapest – and often the most immediate – way to reduce the use of fossil fuels. There are enormous opportunities for efficiency improvements in every sector of the economy, whether it is buildings, transportation, industry, or energy generation"[3].

3. LED Retrofit project

This is an extension of the minor project taken up in 3rd semester wherein a financial model was generated for LED retrofit project. Some of the future work considered in the past has now been undertaken.

An independent and objective assessment of various aspects of an investment proposition is done by ESCO to assess the economic, social and financial viability of the project.

Financial feasibility is done for checking

1. the financial viability of the entire project
2. means of financing
3. preparation of cost estimates,
4. financial projections,
5. break-even point, ratio analysis etc.

Project cost includes

1. Land & site development,
2. plant and machinery required for the project,
3. pre-operation expenses – consultant, designer, sanctions, installation & commissioning, disposal, manpower, insurance for personnel & assets etc
4. contingency expenses due to unforeseen reasons etc.

Project Finance may include

1. Term loan from financing organization eg banks/ NBFC etc
2. Investment subsidy, margin money loan etc.
3. Share capital from developer

In addition to the 3rd semester minor project **objectives**:

- Finding out the factors affecting a project's capital and operational expenditure which in turn have an impact on the cash outlay and revenue flow of the project and their study.
- To create a financial model of a LED retrofit project and study the effect of tariff, project cycle, interest and operating expenses on cash flows
- To find out probable values of IRR, DSCR . LLCR among other ratios using the financial model to study the feasibility and attractiveness of project

Following are the objectives for this project report

- Effect on GST on the financial model
- Salvage value may not be the same as the depreciation amount as per the books and its impact
- Impact of difference between loan repayment agreement with lendor and sales agreement term with client
- Effect of inflation on project returns

The project is executed on public private partnership framework and awarded to the consortium by NHAI for a concession period of 20 years. The highway is one of the busiest inter-city route in India.

The project is under operation for more than 10 years and is illuminated with halogen lamps for the entire stretch. As the fluorescent lamps have reached the end of life, there has been frequent failure of lamps. Failures of lamps results in:

- Higher replacement costs for old inventory
- Penalty due to non-compliance of contract terms

It is felt that replacement of conventional lighting system with LEDs for the highway stretch being operated and maintained will offer the following advantages:

- Longer life of LED lamps
- Reduced operation & maintenance cost
- Longer product support – LED life is almost 15 years

Based on the above understanding, detailed project report was prepared and a financial model for the project development and operation phase was made.

Scope of the project comprised of

1. Replacement of existing lighting with energy efficient LED luminaires
2. Supply of distribution panel (DG panel) with all equipment & personnel safety features embedded in the panel
3. Remote Energy monitoring system for consumption monitoring from grid as well as DG

Benefits of the proposed system

1. Higher lux levels shall be achieved with lesser usage of energy. Following are the expected lux levels at various sections of the highway stretch
    i. On main Carriageway – approximately 30lux
    ii. On Service roads – approximately 20lux
2. Reduced energy load for lighting by almost 50% - *reduced operational cost*
3. 5 year manufacturing warranty of the LEDs – *reduced maintenance cost*
4. Requirement of lower capacity DGs for reduced load - *less rental*
5. Reduced diesel consumption due to reduced load – *reduced operational cost*
6. Better diagnostics – *faster fault detection*
7. Real-time availability of the energy consumption at every DG panel – *ease of operation & maintenance*
8. Remote operation of the lighting system – *optimize operation and maintenance costs*
9. Operation based on sun clock, lux level – *better user experience, enhanced safety*
10. Web-based application with following features -

i. Instantly sends alerts (SMS/ email) to nominated personnel from the maintenance team for timely corrective action
ii. Modelling of equipment based on energy/ critical parameters being monitored for predictive maintenance
iii. Scheduling preventive maintenance plans based on usage

Figure 4: Typical highway lighting view

Figure 5: Highway Toll Plaza

For financial appraisal of the project, following details were considered:

1. Details of existing lights/ lamps – Qty and wattage
2. Details of proposed LEDs – Qty and Wattage
3. Operating hours per day
4. Operating days per year
5. Electricity tariff (INR/ Unit)
6. Expected cost escalation in Tariff per year
7. Project cost including material, installation & commissioning costs,
8. Insurance cost as percentage of project cost with escalation year on year
9. Operation and maintenance cost as percentage of project cost with escalation year on year
10. Project construction period

For the Financial model, following additional details are required:

1. Funding pattern – Debt % of the overall project cost
2. Loan Tenure (in months)
3. Bank Interest rate
4. Loan Moratorium period (assumed same as construction period)
5. Savings shared with end user (%age)
6. Depreciation rate – (Written down value method considered in model)
7. ESCO agreement period, must be higher than loan term

Other assumptions/ constraints:

1. Project is fully funded by ESCO with a combination of debt & equity that can be decided by ESCO
2. All O&M and insurance costs are borne by ESCO during agreement period

3. Savings assumed are only due to load reduction, other savings in diesel etc are not considered
4. Moratorium period can be maximum 12 months
5. Loan repayment can be either Fixed EMI or constant Principal during the loan term
6. Salvage value will be the Written down value of asset at the end of agreement term.

Some of the key concepts:

K_d = Cost of Debt * (1 – Tax rate)

Equation 1: After tax Cost of Debt

$K_e = R_f + \beta * (R_m - R_f)$ ……. Cost of equity using CAPM

Equation 2: Cost of Equity using CAPM Model

Where,
K_e = Cost of Equity
R_f = Risk Free Rate
R_m = Rate of return on Market portfolio or average return on all the assets
$R_m - R_f$ = Market risk premium
β = Beta coefficient (Systematic risk)

Weighted Average Cost of Capital, WACC (K_o) can be calculated by formula:

$K_o = w_e K_e + w_d K_d$

Equation 3: Weighted Average Cost of Capital

As the agreement is over a long term, the real return will be less than the nominal return as inflation will reduce the effective return.

$$Real\ Rate\ of\ Return = \frac{1 + nominal\ rate}{1 + inflation\ rate} - 1$$

Equation-4: Real rate of return

For the specific case, following parameters were considered

- Debt amount – 80% of project cost
- Bank interest rate – 10%
- Moratorium period – 3 months
- Loan term - 7 years
- Agreement period - 7 years
- Power tariff @ Rs 10/ unit with 3% escalation every year
- Savings shared with customer – 10%
- O & M amount – 0.25% of project cost with 5% escalation every year
- Insurance cost – 0.1% of project cost with 1% escalation every year
- Debt repayment in equal installments on monthly basis
- GST is considered as a Cost to ESCO as it is assumed that ESCO can consume GST credit against billing to the client

After detailed design, the change in connected load was as follows:

LOAD CALCULATION				
Model Type	**Current System**		**LED System**	
	Qty	Wattage	Qty	Wattage
Type-1	2,000	400	2000	225
Type-2	900	250	900	120
Type-3	290	150	290	70
Total Wattage (KW)		**1,068.50**		**578.3**

Table 3: Load calculation with existing and LED lights

ANNUAL PROJECTED SAVINGS		
Description/ Item	**Qty**	**UoM**
Current Installed Load (kW)	1,068.50	KW
Connected Load after Retrofit	578.30	KW
Load Reduction	490.20	KW
Number of Working Days in a year	360	days/year
Number of Working Days in a year	360	days/year
Number of Hours in a day	11	hours/ day
Power saved through Energy Efficiency	1,941	MWH
Monthly Savings (MWH)	162	MWH
Monthly Savings (INR)	1.62	INR MN
Tariff for Power (Rs/ Unit)	10.0	INR/ Unit
Annual Tariff Increase	3%	Year on Year

Table- 4: Power Saving calculation due to load reduction

APPLICABLE TARIFF		
Year	FY Ending	Tariff (Rs/Unit)
1	2019	10.00
2	2020	10.30
3	2021	10.61
4	2022	10.93
5	2023	11.26
6	2024	11.59
7	2025	11.94
8	2026	12.30
9	2027	12.67
10	2028	13.05

Table- 5: Applicable power tariff for the agreement period

OTHER PROJECT & OPERATING COSTS	
Cost Head	**% of Project Cost**
Safe Disposal Cost	2%
Contingency Amount	3%
Insurance Cost	0.1%
Annual Increase	1.00%
O&M Cost	0.5%
Annual Increase (year-on year)	5%

Table 6: Other project and operating cost assumptions

TOTAL PROJECT COST				
Particulars	Total Value (INR Mn)	GST Amount (INR Mn)	GST Rate	Basic Value (INR Mn)
Material Cost	78.75	3.75	5%	75.00
Labour, installation & Other Cost	2.95	0.45	18%	2.50
Disposal Cost	1.86	0.2835	18%	1.58
Insurance Cost	0.09	0.0135	18%	0.08
Contingency Cost	2.66	0.405	18%	2.25
Total	**86.30**	**4.902**		**81.40**

Table 7: Total project cost

PROJECT FINANCING DETAILS		
Particulars	**UoM**	**Value**
Basic Project Cost	INR Mn	86.30
Equity Contribution (%)	%	20
Debt Funding (%)	%	80
Equity Contribution	INR Mn	18.26
Bank Loan (Principal)	INR Mn	66.92
Interest During Construction	INR Mn	1.12
Total Bank Loan (Including IDC)	INR Mn	68.04
Rate of Interest on Debt	%	10.00

Table 8: Financing details for the project

Note:

1. Since contingency cost may not be incurred, thus it is not considered for Debt funding and accordingly the equity share will go up by equivalent amount
2. Likewise Interest During Construction will be additional to the project cost and is fully funded by the debtor.
3. The effective Debt & equity share shall be as follows:

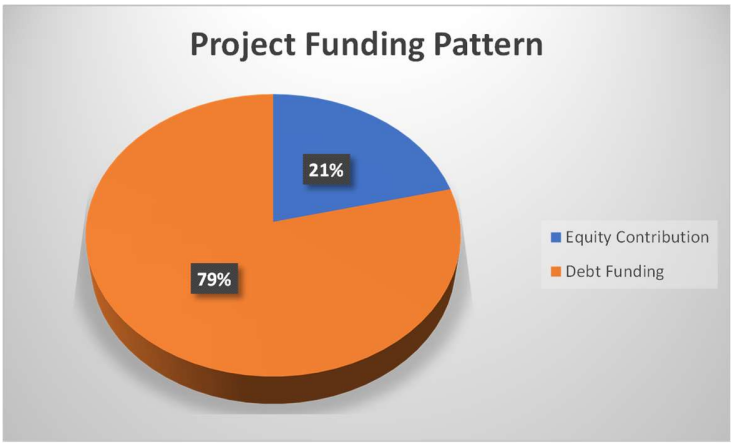

Figure 3: Project Funding Pattern

PROJECT SCHEDULE		
Activity	**Period (Months)**	**Period (Years)**
Construction Period (months)	3	0.25
Moratorium Period (months)	3	
Total Tenure of Loan (months)	84	7
Principal Repayment Period	81	6.75
Total Tenure of Agreement	84	7
Maximum Tenure Permissible	84	

Table 9: Project schedule

DEPRECIATION	
Method	WDV
Rate	40.0%

Table 10: Depreciation details

CORPORATE INCOME TAX RATE	
Tax Head	**Rate (in %)**
Basic Tax	25%
Surcharge	10%
Edu/ HSE Cess	3%
Effective Corporate Tax Rate	28.325%

Table 11: Corporate Income Tax Rate

CALCULATION OF WEIGHTED AVERAGE COST OF CAPITAL

Cost of Equity		
Risk Free Return	**Beta**	**Equity Risk Premium**
6.50%	1	5.50%
Cost of Equity	**12.00%**	

Table 12: Cost of Equity

Cost of Debt	
Interest Rate	**Effective Tax Rate**
10.00%	28.325%
Cost of Debt	**7.17%**

Table 13: Cost of Debt

Debt - Equity Ratio	
Debt	**Equity**
78.84%	21.16%

Table 14: Debt/ Equity Ratio

Weighted Average Cost of Capital	**8.19%**

SAVINGS TABLE											
Year		1	2	3	4	5	6	7	8	9	10
Total Energy Saving	KWh	1455.89	1941.19	1941.19	1941.19	1941.19	1941.19	1941.19	1941.19	1941.19	1941.19
Reduction in Energy Efficiency	KWh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Energy Saving	KWh	1455.89	1941.19	1941.19	1941.19	1941.19	1941.19	1941.19	1941.19	1941.19	1941.19
Energy saving share of Client	KWh	145.59	194.12	194.12	194.12	194.12	194.12	194.12	194.12	194.12	194.12
Energy saving share of ESCO	KWh	1310.30	1747.07	1747.07	1747.07	1747.07	1747.07	1747.07	1747.07	1747.07	1747.07
O&M services Expenses	INR Mn	0.32	0.32	0.34	0.36	0.37	0.39	0.41	0.43	0.46	0.48
Insurance Expenses	INR Mn	0.43	0.44	0.44	0.44	0.45	0.45	0.46	0.46	0.47	0.47
Tariff	INR `	10.00	10.30	10.61	10.93	11.26	11.59	11.94	12.30	12.67	13.05
Savings share of ESCO	INR MN	13.10	17.99	18.53	19.09	19.66	20.25	20.86	21.49	22.13	22.80

Table 15: Savings chart per annum after retrofit

DEPRECIATION AS PER INCOME TAX ACT										
Method – Written Down Value										
Rate : 40%										
Year	1	2	3	4	5	6	7	8	9	10
Opening Balance	86.30	51.78	31.07	18.64	11.18	6.71	4.03	2.42	1.45	0.87
Depreciation	34.52	20.71	12.43	7.46	4.47	2.68	1.61	0.97	0.58	0.35
Cumulative Depreciation	34.52	55.23	67.66	75.12	79.59	82.28	83.89	84.85	85.43	85.78
Closing balance	51.78	31.07	18.64	11.18	6.71	4.03	2.42	1.45	0.87	0.52

Table 16: Depreciation as per IT Act

PROFIT AND LOSS STATEMENT										
Year	1	2	3	4	5	6	7	8	9	10
Incomes										
Savings share of ESCO	13.10	17.99	18.53	19.09	19.66	20.25	20.86	-	-	-
Salvage Value after agreement term	-	-	-	-	-	-	2.42	-	-	-
GST @ 18%	2.36	3.24	3.34	3.44	3.54	3.65	4.19	-	-	-
Total Income (A)	**15.46**	**21.23**	**21.87**	**22.53**	**23.20**	**23.90**	**27.47**	**-**	**-**	**-**
Expenditure										
Operating & Maintenance Cost	0.32	0.32	0.34	0.36	0.37	0.39	0.41	-	-	-
Insurance Cost	0.43	0.44	0.44	0.44	0.45	0.45	0.46	-	-	-
GST on revenue	2.36	3.24	3.34	3.44	3.54	3.65	4.19	-	-	-
Total Expenditure (B)	**3.11**	**4.00**	**4.12**	**4.24**	**4.36**	**4.49**	**5.06**	**-**	**-**	**-**
Income from Operations (C = A-B)	**12.35**	**17.24**	**17.75**	**18.29**	**18.84**	**19.41**	**22.41**	**-**	**-**	**-**
Depreciation (D)	34.52	20.71	12.43	7.46	4.47	2.68	1.61	-	-	-
PBIT (E = C-D)	**(22.17)**	**(3.48)**	**5.33**	**10.83**	**14.37**	**16.72**	**20.80**	**-**	**-**	**-**
Interest on Term Loan (F)	4.92	5.89	5.05	4.13	3.10	1.97	0.72	0.00	0.00	0.00
Gross Op Profit Before Taxation (G=E-F)	**(27.09)**	**(9.37)**	**0.27**	**6.71**	**11.26**	**14.75**	**20.07**	**-**	**-**	**-**
Losses brought Forward (H)	0.00	-27.09	-36.46	-36.19	-29.49	-18.23	-3.48	0.00	0.00	0.00
Net operating Profit Before Taxation (I = G-H)	(27.09)	(36.46)	(36.19)	(29.49)	(18.23)	(3.48)	16.59	-	-	-
Applicable Tax on I (J)	-	-	-	-	-	-	4.70	-	-	-
Profit After Taxation (K= I-J)	**(27.09)**	**(9.37)**	**0.27**	**6.71**	**11.26**	**14.75**	**15.37**	**-**	**-**	**-**

Table 17: Profit & Loss Statement

CASH FLOW STATEMENT										
Year	1	2	3	4	5	6	7	8	9	10
Debt Serviced (Principal + Interest)	10.43	13.90	13.90	13.90	13.90	13.90	13.90	0.00	0.00	0.00
Cash Flow from operations (C)	12.35	17.24	17.75	18.29	18.84	19.41	17.71	0.00	0.00	0.00
GST Credit (from purchases - available at the beginning of the year) (X)	4.90	2.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GST Payable (Charged to customer - during the year) (Y)	2.36	3.24	3.34	3.44	3.54	3.65	4.19	0.00	0.00	0.00
Balance GST Credit (Available for next year) (Z)	2.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Realized due to GST Credit	2.36	2.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Cash Flow (P = C + Z)	14.71	19.78	17.75	18.29	18.84	19.41	17.71	0.00	0.00	0.00

Table 18: Cash Flow Statement

4.0 CONCLUSIONS

Based on the information provided, we get the following results:

a) **Impact of GST Credit** under different Payment options with same client agreement & loan period of 7 years:

Financial Metrics	Equal Principal Payment		Equated Monthly Instalment	
	With GST	Without GST	With GST	Without GST
Payback Period (Years)	4.862	5.097	4.862	5.097
NPV (in INR MN)	6.16	1.80	6.57	2.22
Average DSCR	1.39	1.34	1.35	1.29
LLCR	1.36	1.29	1.37	1.30
IRR	14.38%	12.09%	14.54%	12.26%

Table 19: Impact of GST credit on project NPV

Taking advantage of GST credit with fixed EMI option, is the best option and offers relatively maximum IRR & highest NPV

b) Impact of inflation on the return

Inflation will reduce the real return. We have considered 12% as required rate return (nominal rate of return) however inflation (assuming 4%) will result in real rate of return of 7.69%.

c) **Salvage value** may not be the same as the depreciation amount as per the books and its impact – It was observed that assets ie the LED lights considered in the Energy Efficiency project are treated as plant and machinery and thus attracts 40% Depreciation. The industry operates with agreement for minimum lock-in of about seven years in most of cases thus the salvage value after 7 years is almost Zero thus ignored. However incase the client contributes a certain equity, in that case, the agreement period may be lesser and the salvage value may be significant percentage in that case, depending on agreement closure period.

d) Impact of different client agreement & loan duration

Parameter	Loan > Service	Loan < Service
Payback Period (Years)	4.862	4.862
NPV (in INR MN)	7.15	21.83
Average DSCR	1.31	1.44
LLCR	1.37	1.59
IRR	14.77%	19.12%
Loan Period	8	8
Service Period (with Client)	7	9

Table 20: Effect of Different Loan Period & Service agreement duration

Longer service agreement than the loan period is advantageous to the implementing agency.

The project can be evaluated considering different scenarios of

- Debt & equity percentage
- Tariff escalation rate
- Repayment options from Bank/ debtor
- Savings sharing percentage

5.0 FUTURE WORK

This analysis is limited to considering the expenses made per annum as well as revenue. It assumes that the product warranty is the product life is high almost 10 years plus as claimed by vendors and the product failures are almost negligible.

The model can be modified to incorporate:

- Tariff variations during the operating phase
- Effect of variable principal payment by client
- Effect of LED failure beyond a certain period
- Generalization for other energy saving options like steam, compressed air, HVAC etc

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PLAGIARSM CHECK RESULTS

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by Hj Ty

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