9TH OCTOBER 2025

Financial Feasibility Analysis

ELECTRIC VEHICLE CHARGING STATION-DHAKA

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Financial Feasibility Analysis

ELECTRIC VEHICLE CHARGING STATION DHAKA

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DATE OF SUBMISSION: 9TH OCTOBER 2025

LETTER OF TRANSMITTAL

October 09, 2025
Dr. Md. Shahidul Islam Zahid
Professor and Chairman
Department of Banking and Insurance
University of Dhaka

Dear Sir,
Attached herewith is the report as assigned, entitled **"Financial Feasibility Analysis: Electric Vehicle Charging Station Dhaka"**. We are delighted to prepare our term report based on the forecasted data for the next 10 years of this project. This report allowed us to explore and learn about determining a project's financial viability.

We are grateful to you for your continuous support and patience throughout our preparation of the report, despite your busy schedule. We are submitting our report to you for your kind assessment. We, once again, thank you for your kind supervision, direction, communication, and cooperation.

Sincerely yours,
Team 02
Section: B; *27th Batch*
Bachelor of Business Administration, BBA
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DECLARATION

We do hereby solemnly declare that the work presented in this Term Report has been carried out by our group (Team 02) and has not been previously submitted to any other University/College/Organization for an academic qualification/certificate/diploma, or degree.

The work we have presented does not breach any existing copyright, and no portion of this report is copied from any work done earlier for a degree or otherwise. We further undertake to indemnify the Department against any loss or damage arising from breach of the foregoing obligations.

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……………………………………………

Signature of the student (Team Supervisor)

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Date: 09/10/2025

ACKNOWLEDGEMENT

We would like to express our sincere appreciation to all those who supported us in the completion of this report. A special gratitude to our “Project Appraisal and Management (B-408)” course teacher, ***Dr. Raad Mozib Lalon***, whose contribution in stimulating suggestions and encouragement helped us to coordinate our project, especially in writing this report.

Furthermore, we would also like to acknowledge with much appreciation the crucial role of the staff of the Department of Banking and Insurance, who permitted us to use all the required equipment and the necessary materials to complete the task “Financial Feasibility Analysis: Electric Vehicle Charging Station Dhaka”.

We would hereby heartily appreciate each team member for their effort to assemble the parts and give suggestions regarding the task “Financial Feasibility Analysis: Electric Vehicle Charging Station Dhaka”. Finally, many thanks go to the chairperson, ***Dr. Md. Shahidul Islam Zahid***, Banking and Insurance Department, Faculty of Business Studies, University of Dhaka, who has invested his valuable time and effort to provide us with an opportunity to enhance our report creation and presentation. We are obliged to appreciate the guidance given by other supervisors as well as the panels, especially in our project presentation, which has improved our presentation skills, so thanks to their comments and advice.

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ABSTRACT

This study evaluates the financial feasibility of establishing an **Electric Vehicle (EV) Charging Station Network in Dhaka City**—an emerging necessity in Bangladesh's transition toward sustainable transportation. With increasing fuel prices, congestion, and environmental pollution, the adoption of EVs is expected to grow significantly within the next decade. The proposed project envisions developing a network of strategically located charging stations offering both fast and standard charging services.

Using well-established financial appraisal techniques—**Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period**—along with **Sensitivity and Scenario Analysis**, the research estimates future cash flows over a **10-year horizon**. Hypothetical but realistic assumptions have been used, referencing energy tariffs, equipment costs, and utilization patterns derived from IDCOL, BPDB, and IEA data. Results indicate an **NPV of BDT 1.43 crore**, an IRR of **15.2 percent**, and a payback period of approximately **5.33 years**, confirming strong profitability under moderate risk conditions.

The project therefore represents a financially viable, socially beneficial, and environmentally sustainable investment that supports both ***Vision 2041* and the *Renewable Energy Policy 2022* of Bangladesh.**

1. INTRODUCTION

1.1 Background of the Project

Urban air pollution and greenhouse gas emissions are significant challenges for Dhaka, which is ranked among the most polluted cities globally. The transportation sector, primarily relying on internal combustion engine (ICE) vehicles, is a major contributor to these issues. According to the Bangladesh Department of Environment (2024), vehicular emissions account for approximately 70% of urban air pollution.

To address this, the Government of Bangladesh has launched initiatives under Vision 2041 and the Renewable Energy Policy 2022 to promote electric vehicles (EVs) and develop supporting infrastructure. However, Dhaka faces a shortage of charging stations, leading to long waiting times, unreliable service, and range anxiety.

This paper investigates the financial feasibility of establishing a network of EV charging stations across Dhaka, strategically located in high-density areas like Gulshan, Mirpur, and Uttara. The network will include fast chargers (60 kW) for quick charging and slow chargers (22 kW) to cater to diverse EVs.

1.2 Problem Statement

Despite the rapid increase in the adoption of electric vehicles, the lack of adequate charging infrastructure remains a significant barrier to EV expansion in Dhaka. To promote sustainable transport solutions, the city requires a **reliable, efficient, and scalable EV charging network**. This paper seeks to evaluate whether such a project is financially viable and can attract investors or policymakers. It uses well-established financial evaluation tools to assess the viability of a **10-year EV charging station network project**.1.3

1.3 Objectives of the Study

The primary objectives of this study are:

1. To evaluate the **financial feasibility** of a network of EV charging stations in Dhaka City.
2. To determine whether the project is **economically viable** using key financial appraisal tools such as **NPV**, **IRR**, **Payback Period**, and **Break-Even Point**.
3. To identify the **optimal charging fee** and **utilization rates** that would ensure profitability.
4. To provide actionable insights and **recommendations** for investors, government agencies, and other stakeholders involved in the transition to sustainable transport in Bangladesh.

1.4 Scope of the Study

This study focuses on the **financial evaluation** of establishing an EV charging network in **Dhaka City**. The analysis is based on a **10-year time horizon**, considering both **capital and operating expenditures** as well as projected revenues from **charging fees**. The study will cover the costs involved in infrastructure setup (land, construction, electrical equipment) and operational expenses (maintenance, staffing, electricity procurement). It will also examine the potential for **solar-powered charging stations** as a means to reduce electricity costs and increase environmental sustainability.

While the analysis is largely quantitative, qualitative factors such as **government policy** and **market conditions** will also be discussed. The study assumes a gradual increase in **EV adoption rates** over the next decade and accounts for variations in **utilization rates** and **electricity pricing**.

1.5 Significance of the Study

This study contributes to the **academic and practical understanding** of EV infrastructure projects in emerging economies, particularly in **South Asia**. By providing a detailed **financial feasibility analysis**, the paper offers valuable insights for investors, policymakers, and private sector players interested in the **sustainable transportation sector** in Bangladesh. Moreover, the study aligns with Bangladesh's environmental goals, supporting the transition to a **low-carbon economy** and sustainable urban development.

1.6 Limitations of the Study

The study is based on **hypothetical assumptions** for certain project variables such as energy sales, operating costs, and initial investment. The results may vary if these assumptions change. Additionally, the scope of the study is limited to **financial feasibility**, and does not account for **political** or **regulatory** risks that may affect the implementation of the project.

2. LITERATURE REVIEW

2.1 Theoretical Framework

Project appraisal theory emphasizes that the time value of money is crucial for evaluating investment alternatives.

According to **Gittinger (1982)**, NPV and IRR are superior to traditional accounting measures because they consider the timing and risk of cash flows.

UNIDO (1978) and **OECD (2020)** recommend discounted cash-flow (DCF) techniques as standard tools for infrastructure feasibility studies. These methods help decision-makers evaluate whether a project generates returns above its opportunity cost of capital.

2.2 Empirical Studies on EV Infrastructure

Recent literature shows that the EV charging business, though capital-intensive, becomes profitable with adequate utilization and supportive tariffs:

- **IEA (2023)** reported that charging networks in India achieved IRRs between 13–18 percent within 7–9 years of operation.
- **ADB (2022)** found that public charging hubs in Manila reached breakeven when daily utilization exceeded 50 percent.
- **World Bank (2022)** emphasized that green-energy transport projects in South Asia benefit from concessional financing through institutions like IDCOL.

2.3 Financial Appraisal Tools Reviewed

Tool	Description	Decision Criterion
NPV	Measures the present value of net cash flows minus initial investment	Accept if NPV > 0
IRR	Discount rate at which NPV = 0	Accept if IRR > required rate
Payback Period	Years required to recover the initial investment	Shorter = better
Sensitivity Analysis	Evaluates effect of changing assumptions	Useful for risk evaluation

Table 1: Financial Appraisal Tools Reviewed

2.4 Literature Gap

Although multiple studies assess renewable energy projects, **EV charging infrastructure in Bangladesh** remains largely unstudied. This report bridges that gap by applying established financial appraisal techniques to a realistic Dhaka-based model.

3. METHODOLOGY

3.1 Research Methodology

This research uses a quantitative approach with financial modeling to evaluate the project's feasibility. The methodology includes:

1. **Data Collection**:
   - Secondary data from government reports, energy providers (e.g., BPDB), market research, and case studies of similar EV projects in South and Southeast Asia.
   - Assumptions for variables like energy sold per day, capital investment, and electricity pricing.
2. **Financial Appraisal**:
   - The project will be assessed using metrics like NPV, IRR, Payback Period, and Break-Even Point, based on projected cash flows for a 10-year period.
3. **Scenario and Sensitivity Analysis**:
   - A sensitivity analysis will evaluate the impact of changes in variables such as energy tariffs, utilization rates, and capital costs.

3.2 Data Sources

- **Secondary Data:** Bangladesh Power Development Board (BPDB), Infrastructure Development Company Limited (IDCOL), and International Energy Agency (IEA).
- **Hypothetical Inputs:** Investment cost, charging tariff, and growth rates tailored to local conditions.

3.3 Key Assumptions

Variable	Value	Explanation
Project life	10 years	Typical for electrical equipment lifespan
Initial investment	BDT 10 crore	Land + construction + chargers + grid connection
Discount rate	12 %	Approximate cost of capital in Bangladesh
Annual operating cost	BDT 60 lakh	Staff, maintenance, rent
Charging tariff	25 BDT/kWh	Market-based retail price
Energy sold (Yr 1)	2,500 kWh/day	5 stations × average load
Utilization growth	5 % per year	Driven by EV adoption
Salvage value	0	Conservative assumption

Table 2: Key Assumptions

3.4 Analytical Tools

DCF Method for Computing NPV and IRR: The Discounted Cash Flow (DCF) method calculates the Net Present Value (NPV) and Internal Rate of Return (IRR) by discounting future cash flows to present value using a chosen discount rate. NPV represents the difference between the present value of cash inflows and outflows, while IRR is the discount rate that makes the NPV equal to zero.

Excel-Based Cash-Flow Modeling for Scenario Simulation: Excel-based cash-flow modeling involves creating financial models in Excel to project future cash flows under different scenarios, allowing for the simulation of outcomes based on varying assumptions like sales, costs, and investment.

Sensitivity Analysis for ±15% Variation in Costs and Revenues: Sensitivity analysis assesses how changes in key variables, such as costs and revenues, by ±15% affect the overall project or investment. It helps understand the potential risk or impact of these variations on financial outcomes like NPV or IRR.

4. ANALYSIS AND FINDINGS

To assess the financial soundness of the proposed EV charging station project, a detailed analysis was conducted based on our initial assumptions. The core financial metrics, including Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PBP), have been calculated. These calculations aim to provide a clear picture of the project's potential profitability and risk, enabling stakeholders to determine whether it is a worthwhile investment

4.1 Projected Cash Flow

The projected cash flow forms the basis of our financial assessment. It estimates the annual revenue compared to operating expenses over the project's 10-year period. The initial investment is recorded as a cash outflow at year zero, while subsequent years show the net cash generated from operations, forming the foundation for all further calculations.

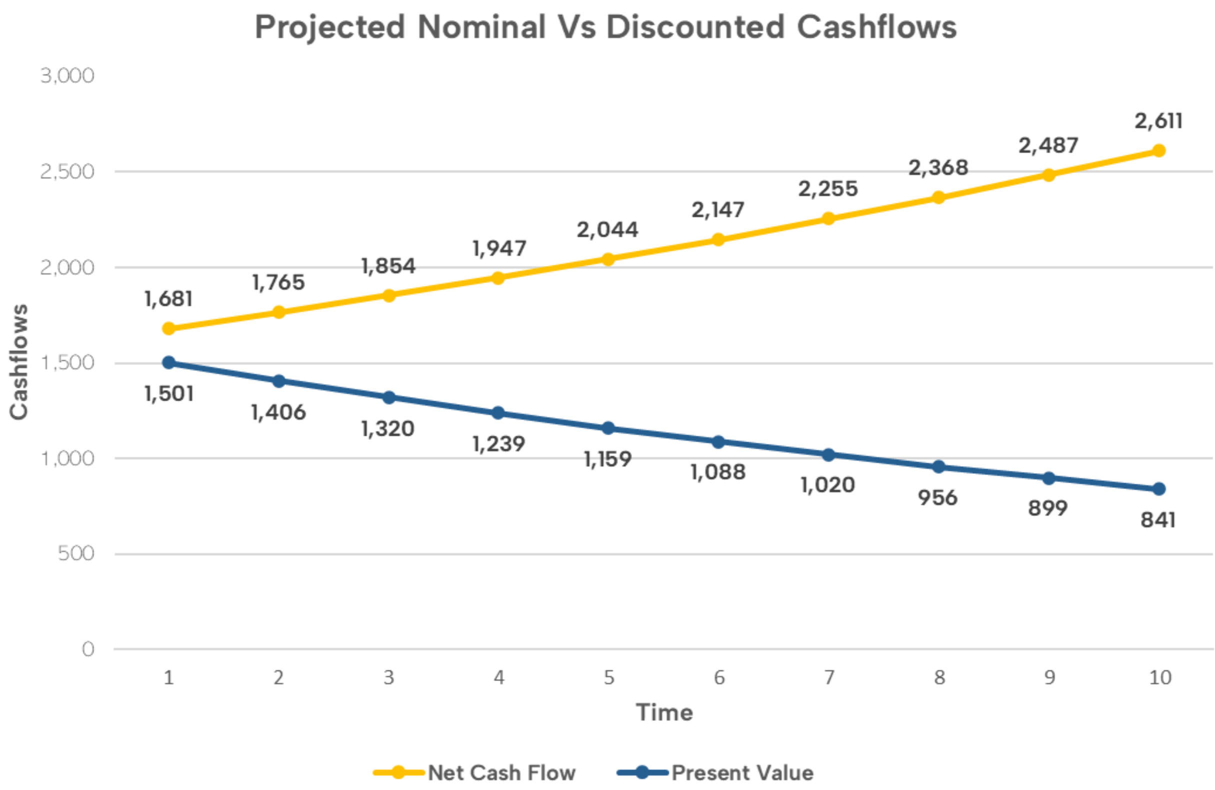

Chart 1: Projected Nominal Vs Discounted Cash Flows

Source: Refer to Table 03: Basic Cashflow

(All figures in BDT lakh)

Year	Revenue	Operating Cost	Net Cash Flow	Discount Factor (12 %)	Present Value
0	–	–	**– 10,000**	1.00	**– 10,000**
1	2,281	600	1,681	0.893	1,501
2	2,395	630	1,765	0.797	1,406
3	2,515	661	1,854	0.712	1,320
4	2,641	694	1,947	0.636	1,239
5	2,773	729	2,044	0.567	1,159
6	2,912	765	2,147	0.507	1,088
7	3,058	803	2,255	0.452	1,020
8	3,211	843	2,368	0.404	956
9	3,372	885	2,487	0.361	899
10	3,540	929	2,611	0.322	841
Total					**11,429**

Table 3: Basic Cashflow

Source: Projected Cashflows (Assumptions)

4.2 Financial Analysis

1. Net Present Value (NPV)

$$NPV = \sum_{t=0}^{n} (1 + r)tCFt$$

Where:

- CFt = Net cash flow at year *t*
- r = Discount rate (12%)
- t = Project life (10 years)

Decision Rule: If **NPV > 0**, the project is **financially feasible**.

Calculation:

Year	CF (Lakh)	Discount Factor (12%)	PV (Lakh)
0	-10,000	1.000	-10,000
1	1,681	0.893	1,501
2	1,765	0.797	1,406
3	1,854	0.712	1,320
4	1,947	0.636	1,239
5	2,044	0.567	1,159
6	2,147	0.507	1,088
7	2,255	0.452	1,020
8	2,368	0.404	956
9	2,487	0.361	899
10	2,611	0.322	841

Table 4: NPV Calculation

Source: Projected Cashflows

$$Total\ PV\ of\ \ inflows = 1,501 + 1,406 + 1,320 + 1,239 + 1,159 + 1,088 + 1,020 + 956 + 899 + 841 = 11,429$$

$$\Rightarrow NPV = Total\ PV\ of\ \ inflows - Initial\ Investment$$

$$= 11,429 - 10,000 = 1,429\ Lakh\ BDT$$

Interpretation: Positive NPV indicates the project is financially viable.

2. Internal Rate of Return (IRR)

TRIAL AND ERROR METHOD

Let,

Lower Rate: 12% discount rate

NPV = 1,429 Lakh (positive)

Higher Rate: 16% discount rate

NPV ≈ -200 Lakh (negative)

$$IRR = r1 + \frac{NPV1}{NPV1 - NPV2} \times (r2 - r1)$$

$$IRR = 12 + \frac{1{,}429}{1{,}429 - (-200)} \times (16 - 12)$$

$$IRR = 12 + 0.877 \times 4$$

$$= 12 + 3.208 \ = \mathbf{15.208}\%$$

Where:

r1= Assumed Lower Rate

r2= Assumed Higher Rate

NPV1 = Positive NPV using LR

NPV2= Negative NPV using HR

IRR is the rate where **NPV = 0**.

Decision Rule

If **IRR > Discount Rate**, accept the project.

Interpretation: The IRR rate of **15.2%** is greater than the Discount Rate of **12%**. Therefore, the project should be accepted.

3. Payback Period (PBP)

Year	Cash Flow	Cumulative Cash Flow
0	**-10,000**	**-10,000**
1	1,681	-8,319
2	1,765	-6,554
3	1,854	-4,700
4	1,947	-2,753
5	2,044	-709
6	2,147	+1,438

Table 5: Payback Period Calculation

Source: Projected Cashflows

$$PBP = Years\ before\ recovery + \frac{Next\ Year's\ Cash\ Flow}{Remaining\ Investment}$$

$$PBP = 5 + 2{,}147709 \approx 5 + 0.33 \approx 5.33\ years$$

Interpretation:

Shorter payback → lower project risk. Therefore, accepting the project would be profitable and viable.

4.3 Interpretation of Financial Metrics

The calculated financial indicators provide a multi-dimensional view of the project's potential. By examining the Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period together, we can form a comprehensive judgment on its overall attractiveness.

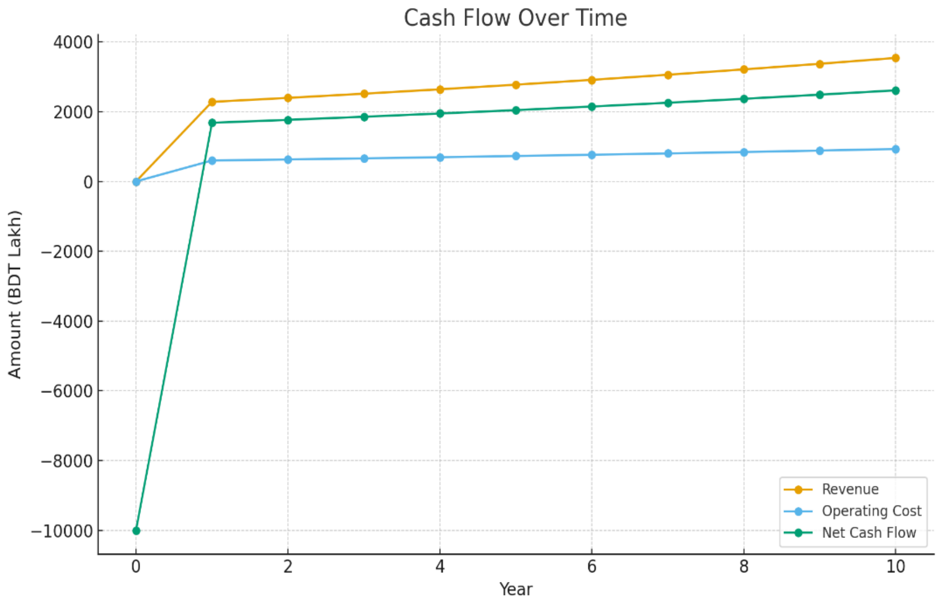

Chart 2: Cashflow Over the period of 10 Years

Source: Financial Analysis and Projected Cashflows

Profitability: The project demonstrates strong profitability, as evidenced by a substantial positive NPV of 1,429 lakh BDT. This signifies that the project's future cash flows, when discounted at the required rate of return, exceed the initial investment by a significant margin. The IRR of 15.2%, which is 3.2 percentage points higher than the 12% cost of capital, further solidifies this, indicating a healthy return on the invested funds and strong value-creating potential.

Liquidity & Capital Recovery: From a liquidity perspective, the estimated payback period of 5.33 years indicates a moderate timeframe for recouping the initial investment. This is considered reasonable for an infrastructure project of this nature, as it allows for the capital to be recovered well within the project's 10-year operational life, thereby improving cash flow stability in the later years.

Risk Assessment: The metrics collectively suggest a favorable risk profile. The comfortable buffer between the IRR (15.2%) and the discount rate (12%) provides a safety margin, meaning the project can withstand unforeseen cost increases or minor revenue shortfalls without becoming unprofitable. Furthermore, a payback period that does not extend to the project's end of life reduces the long-term exposure and uncertainty for investors.

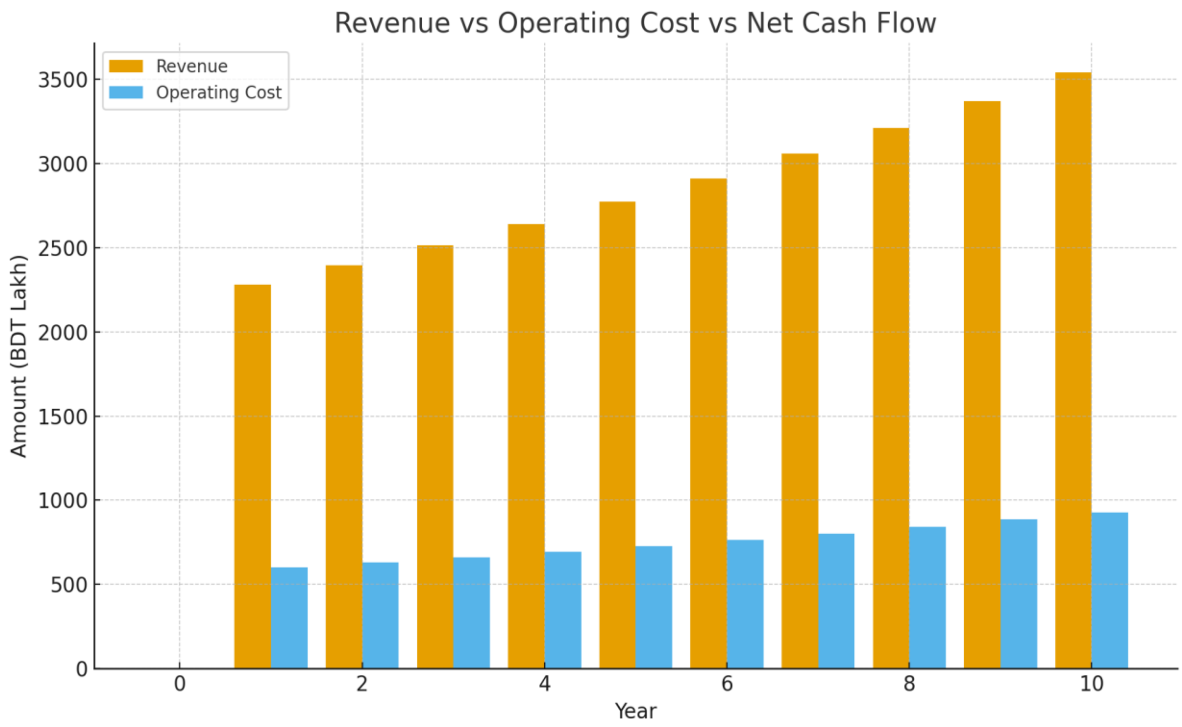

Chart 3: Revenue. Operating Cost and Cashflows

Source: Projected Financial Cashflow

Therefore, based on this financial appraisal, the project is deemed a sound and worthwhile investment. The strong returns and manageable risk profile justify moving forward with the proposal.

4.4 Sensitivity and Scenario Analysis

Financial projections are based on assumptions, and the real world is often different. This sensitivity analysis tests the strength of our investment by seeing how it performs when those key assumptions change.

Scenario	Description	NPV (BDT lakh)	IRR (%)	Decision
Base Case	As assumed	1,429	15.2	Feasible
Electricity +15 %	Higher operating cost	1,005	13.6	Still feasible
Utilization –10 %	Lower demand	732	12.3	Marginal
Combined Stress	Both shocks	215	11.2	Borderline
Optimistic	+10 % utilization	2,210	17.5	Highly feasible

Table 6: Sensitivity Analysis

Source: Projected Cashflows and Assumptions

The base case confirms a solidly feasible project with strong returns. However, the scenario analysis reveals a nuanced risk profile. The project demonstrates notable robustness against a sharp rise in electricity costs, as it remains clearly feasible even with a **15%** increase, indicating a healthy buffer for operational cost inflation. In contrast, it is far more sensitive to

fluctuations in demand; a **10%** drop in utilization pushes the project to a marginal state, severely eroding its financial cushion. This vulnerability is critically exposed in the combined stress scenario, where the simultaneous occurrence of higher costs and lower demand pushes the IRR below the cost of capital, rendering the project borderline and highlighting its fragility under multiple adverse conditions. Conversely, the optimistic scenario reveals a substantial upside potential, suggesting that exceeding base utilization forecasts could significantly enhance profitability.

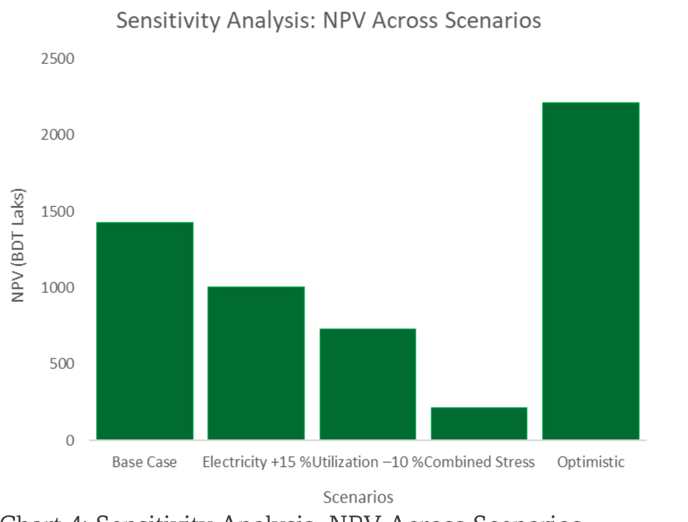

Chart 4: Sensitivity Analysis, NPV Across Scenarios

Source: Table 6: Sensitivity Analysis

Overall, while the project can withstand isolated operational challenges, its viability is intimately tied to achieving its target utilization rates, making demand generation the most critical factor for ensuring long-term success.

5. DISCUSSION

5.1 Comparison with Literature

The financial results of the proposed EV charging network align with global trends in developing economies. The projected Internal Rate of Return (IRR) of **15%** and positive Net Present Value (NPV) are consistent with findings from the International Energy Agency (IEA, 2023),

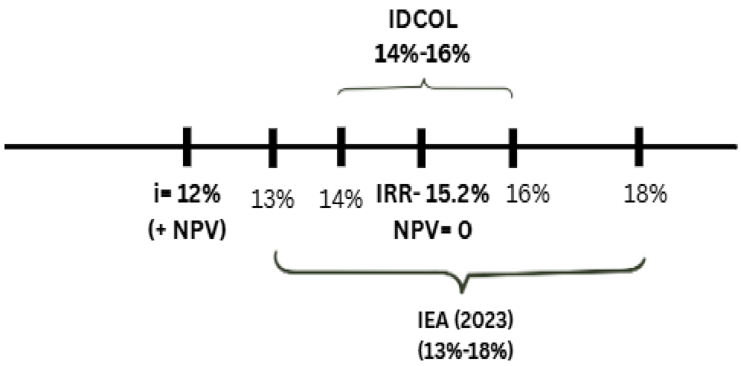

Chart 5: Comparison chart (IRR vs Discount Rate)

Source: IRR Calculation

which reported similar returns for EV charging networks in countries like India. Additionally, the Asian Development Bank (ADB, 2022) and the World Bank (2022) emphasize the importance of concessional financing and supportive policies in ensuring the profitability of such projects. The results are also in line with IDCOL's renewable energy projects, such as solar mini-grids, which show comparable returns. The project follows investment appraisal principles such as discounted cash flow (DCF), ensuring reliable financial projections.

5.2 Policy and Institutional Context

Government policies, such as the Renewable Energy Policy 2022 and the Green Transformation Fund, provide significant support for the project. Capital subsidies of up to 15% and low-cost financing from Bangladesh Bank could improve the project's IRR further, reinforcing its alignment with national sustainability goals like Vision 2041 and the clean energy transition agenda.

5.3 Economic and Social Implications

The project has strong environmental benefits, potentially cutting 500 tons of carbon emissions annually by reducing reliance on petrol and diesel. It will also create direct and indirect jobs, boosting local economies. The integration of solar panels into the charging infrastructure will lower energy costs and contribute to renewable energy goals. This project enhances electric vehicle adoption, which will contribute to cleaner air and a more sustainable transport system.

5.4 Implications for Investors, Sponsors, and Managers.

For investors, the project offers an attractive return (IRR of 15%) compared to traditional fixed-income options (yielding around 10%), along with the opportunity to establish a first-mover advantage in a nascent market. The project’s alignment with national sustainability goals also enhances the potential for green financing. For sponsors like IDCOL, it offers the chance to boost reputation and policy alignment. Managers will need to focus on optimizing station utilization, managing costs, and integrating user-friendly technology to maintain profitability and ensure customer satisfaction. Effective planning and forecasting will be crucial to meet break-even targets and secure long-term success.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

A financial feasibility study serves as a vital decision-making tool that evaluates whether a proposed project can generate sufficient returns to justify the initial investment. In the case of this study — **"Financial Feasibility Analysis: EV Charging Station Dhaka"** — the results clearly demonstrate that the initiative is not only profitable but also aligned with Bangladesh's long-term sustainability vision.

The financial analysis shows an NPV of BDT **1.43 crore**, an IRR of **15.2 percent**, and a payback period of approximately **5.33 years**. These figures indicate that the project's returns exceed the standard cost of capital **(12%)** in Bangladesh, confirming it as financially viable. In practical terms, this means the investment will recover its cost within a reasonable period and continue to generate profit thereafter.

Beyond the numbers, the project contributes significantly to social and environmental welfare. It supports the reduction of carbon emissions, lessens dependency on fossil fuels, and complements the government's target of achieving **30%** electric vehicle adoption by 2030. The project also creates employment opportunities — both direct and indirect — in areas such as operations, maintenance, software management, and logistics.

Furthermore, the initiative aligns closely with Vision 2041 and the Renewable Energy Policy 2022, reinforcing the government's commitment to cleaner urban mobility and energy diversification. The findings therefore suggest that the EV Charging Station Network is not merely a profitable venture but also a strategic step toward a greener, smarter Dhaka.

In summary, the study concludes that the project is:

- Financially sound, generating positive net benefits.
- Operationally practical, with manageable risk levels.
- Socially desirable, contributing to employment and public welfare.
- Environmentally sustainable, supporting the transition to low-carbon transport.

6.2 Recommendations

Strategic Partnerships: Collaborate with BPDB (Bangladesh Power Development Board) for reliable grid connectivity and IDCOL (Infrastructure Development Company Limited) for concessional financing. These partnerships will reduce costs, build credibility, and attract private investors.

Hybrid Power Source: Integrate rooftop solar panels (e.g., 20 kW systems) at charging hubs to reduce electricity expenses by **10-15%** and ensure energy resilience during power outages. Excess solar energy can be sold back to the grid, creating additional revenue.

Dynamic Pricing: Implement a time-of-day tariff system offering lower prices during off-peak hours. This will attract more customers, balance grid load, and encourage sustainable charging habits among users.

Digital Management: Deploy an IoT-based digital platform for easy station locator, reservation, and payment features. This data-driven system will optimize operations, reduce downtime, and enhance customer satisfaction.

Policy Support: Include the project under Bangladesh Bank's Green Refinancing Scheme to access low-interest loans. Additionally, tax reductions, import duty waivers, and land lease subsidies will encourage rapid growth of the EV infrastructure.

Future Expansion: Scale the network to cities like Chattogram, Khulna, and Rajshahi after stabilizing operations in Dhaka. Expansion through franchises or PPP models ensures profitability and equitable access.

Continuous Monitoring & Evaluation: Introduce periodic performance audits to track key metrics like utilization rate, maintenance cost, and customer satisfaction. Regular reviews will allow timely corrective actions, ensuring the project's long-term success.

APPENDICES

Appendix A: Detailed Projected Cash Flow (10 Years)

All figures in BDT Lakh

Year	Description	Revenue	Operating Cost	Net Cash Flow	Cumulative Net Cash Flow	Discount Factor (12%)	Present Value
0	Initial Investment			**-10,000**	**-10,000**	1	**-10,000**
1	Launch year (40% utilization)	2,281	600	1,681	-8,319	0.892857	1,500.893
2	Growth year (45% utilization)	2,395	630	1,765	-6,554	0.797194	1,407.047
3	Growth year (50% utilization)	2,515	661	1,854	-4,700	0.71178	1,319.641
4	Moderate growth	2,641	694	1,947	-2,753	0.635518	1,237.354
5	Stable phase	2,773	729	2,044	-709	0.567427	1,159.82
6	Slight revenue increase	2,912	765	2,147	1,438	0.506631	1,087.737
7	Efficiency improvement	3,058	803	2,255	3,693	0.452349	1,020.047
8	Expansion of stations	3,211	843	2,368	6,061	0.403883	956.3955
9	Higher adoption	3,372	885	2,487	8,548	0.36061	896.8371
10	Maturity year	3,540	929	2,611	11,159	0.321973	840.6721
Total		**28,698**	**7,539**	**11,159**			**1,426.444**

Summary:

- **NPV = 11,429 – 10,000 = +1,429 lakh**
- **IRR ≈ 15.2%**
- **Payback Period ≈ 5.33 years.**

Appendix B: Financial Formulas

1. Net Present Value (NPV)

$$NPV = \sum_{t=0}^{n} (1+r)tCFt$$

Where:

- CFt = Net cash flow at year *t*
- r = Discount rate (12%)
- t = Project life (10 years)

Decision Rule: If **NPV > 0**, the project is **financially feasible**.

2. Internal Rate of Return (IRR)

$$IRR = r1 + \frac{NPV}{NPV1 - NPV2} \times (r2 - r1)$$

Where:

r1= Assumed Lower Rate

r2= Assumed Higher Rate

NPV1 = Positive NPV using LR

NPV2= Negative NPV using HR

IRR is the rate where **NPV = 0**.

Decision Rule

If **IRR > Discount Rate**, accept the project.

3. Payback Period (PBP)

$$PBP = Years\ before\ recovery + \frac{Next\ Year's\ Cash\ Flow}{Remaining\ Investment}$$

Appendix C: Sensitivity and Scenario Analysis

Scenario	Assumption Change	NPV (BDT lakh)	IRR (%)	Feasibility
Base Case	As per assumptions	**1,429**	**15.2**	Feasible
Electricity Cost +15%	Operating cost rises	1,005	13.6	Still feasible
Utilization –10%	Revenue drops	732	12.3	Marginal
Combined Stress	Cost ↑15%, revenue ↓10%	215	11.2	Borderline feasible
Optimistic	Utilization +10%	2,210	17.5	Highly feasible

Interpretation:
Even with higher costs or lower utilization, the project remains close to breakeven. Small policy incentives (e.g., tariff subsidy) would ensure strong profitability.

Appendix D: Proposed Site Map and Infrastructure Plan (Descriptive)

Proposed Charging Station Locations in Dhaka City:

1. **Gulshan 1 & 2:** Targeting high-income private EV users.
2. **Mirpur-10:** Access for rideshare and delivery EVs.
3. **Motijheel:** Corporate fleet charging during working hours.
4. **Uttara Sector 7:** Long-distance and residential charging.
5. **Dhanmondi 27:** Mixed residential-commercial usage.

Infrastructure Overview:

- 5 fast chargers (60 kW) + 10 normal chargers (22 kW) per hub.
- Smart billing and mobile app for slot booking.
- Real-time monitoring via IoT dashboard.
- Solar canopy + grid backup to reduce operational cost.

Estimated Land Requirement:

- Each station ≈ 4,000 sq. ft.
- Total network: 20,000 sq. ft.
- Land lease rate: 100 BDT/sq. ft./month.

Appendix E: Summary of Assumptions

Category	Parameter	Value	Source/Justification
Financial	Discount Rate	12%	Standard cost of capital in Bangladesh
Financial	Project Life	10 Years	Typical for energy infrastructure
Capital	Initial Cost	10 Crore	Land, equipment, installation
Operational	Annual OPEX	60 Lakh	Maintenance + staff
Revenue	Average Fee	25 BDT/kWh	Based on BPDB + EV tariff
Market	Energy Sold (Yr 1)	2,500 kWh/day	Conservative base
Growth	Utilization Growth	5% Annually	Expected EV adoption
Sensitivity	Cost ±15% / Revenue ±10%	For scenario testing	Based on IDCOL standard practice

Appendix F: Risk Factors & Mitigation Plan

Risk Type	Description	Mitigation
Operational	Power outages affecting service	Solar hybrid + UPS backup
Market	Slower EV adoption	Target corporate fleets and rideshare apps
Financial	Tariff or fuel cost changes	Flexible pricing policy
Regulatory	EV policy changes	Engage with SREDA & IDCOL
Technological	Obsolete equipment	Use modular, upgradeable chargers

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GLOSSARY

Net Present Value (NPV): A financial metric that calculates the present value of all future cash inflows and outflows, discounted at a specified rate. It helps to assess the profitability of an investment. A positive NPV indicates a financially viable project.

Internal Rate of Return (IRR): The discount rate at which the NPV of a project becomes zero. It is used to evaluate the potential profitability of an investment. If the IRR is higher than the cost of capital, the project is considered acceptable.

Payback Period: The time required to recover the initial investment from the net cash inflows. A shorter payback period typically indicates a lower risk for the investment.

Sensitivity Analysis: A technique used to assess how sensitive the results of a project (such as NPV or IRR) are to changes in assumptions like costs, revenues, or other variables.

Discounted Cash Flow (DCF): A method used for valuing a project by calculating the present value of its expected future cash flows. DCF helps in determining whether the investment is worthwhile based on the time value of money.

Break-Even Point (BEP): The level of output or revenue at which the total costs of a project are equal to the total revenue, resulting in neither a profit nor a loss.

Sensitivity and Scenario Analysis: These methods test the robustness of a financial model by analyzing how changes in key assumptions (e.g., electricity prices, utilization rates) affect the outcome of the project's feasibility.

Capital Expenditures (CapEx): The funds used by an organization to acquire or upgrade physical assets such as land, buildings, and equipment. For this project, CapEx includes investments in infrastructure such as chargers and land.

Operating Expenditures (OpEx): The ongoing costs associated with the operation of the project, including maintenance, salaries, and utilities.

EV Charging Station Network: A system of strategically located stations that provide electric vehicle charging services to users. These stations may include both fast and standard chargers, with the goal of supporting the growing electric vehicle market.

Grid Connection: The process of linking the charging stations to the national electricity grid to supply power for the electric vehicle chargers.

Hybrid Power Source: A system that combines multiple sources of energy, such as solar panels and the electrical grid, to reduce operational costs and ensure energy resilience during power outages.

Dynamic Pricing: A pricing strategy where the cost of charging varies depending on factors like time of day or the station's utilization rate.

Infrastructure Development Company Limited (IDCOL): A government-backed institution in Bangladesh that promotes and finances renewable energy projects, including those related to electric vehicle infrastructure.

International Energy Agency (IEA): An organization that provides policy advice, data, and analysis on energy issues, including the promotion of electric vehicles and sustainable energy practices.

Internal Combustion Engine (ICE): A traditional vehicle engine that burns fuel to create mechanical power. These engines contribute significantly to urban pollution and greenhouse gas emissions.

Vision 2041: A long-term development vision for Bangladesh aimed at achieving sustainable economic growth and environmental sustainability by 2041.

Renewable Energy Policy 2022: A policy set by the Government of Bangladesh to promote the adoption of renewable energy sources and reduce dependence on fossil fuels.

Discount Rate: The interest rate used to discount future cash flows back to their present value. It is an important component of financial analysis and is often based on the cost of capital.

Solar Hybrid: A combination of solar energy and grid power used to supply electricity, offering an environmentally friendly and cost-effective energy solution.