FINANCIAL INVESTMENT DECISIONS IN INDIA THERMAL POWER SECTOR

LESSONS OF EXPERIENCE AND PROPOSALS FOR IMPROVEMENT

by

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(B.COM, FCA, FCS, LL. B, MBA)

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Abstract

Financial investment decisions in India's thermal power sector, highlighting lessons from past experiences and proposing strategies for improvement. The thermal power sector is crucial for meeting India's energy needs but faces many challenges, especially regarding financial investments.

The goal of this dissertation is to analyze financial investment decisions in India's thermal power sector, learn from past experiences, and suggest ways to improve. It aims to provide actionable insights for stakeholders to enhance their investment strategies.

The research uses a mixed-methods approach, combining literature review, empirical analysis, and qualitative interviews to explore factors influencing investment decisions in the thermal power sector.

The study finds that regulatory frameworks, market dynamics, and sustainability considerations are crucial in shaping investment outcomes. Case studies highlight both successful strategies and common pitfalls, underscoring the need for flexible approaches.

The study offers valuable insights for policymakers, investors, and other stakeholders, emphasizing the importance of informed decision-making and sustainable practices in the thermal power sector.

The study concludes that continuous learning and collaboration are essential to overcoming challenges and supporting a resilient and sustainable energy future in India.

The research is limited by its reliance on available data and its focus on the thermal power sector, indicating a need for ongoing research to address changing dynamics.

Future research should focus on long-term studies, explore emerging technologies, and promote collaboration to support sustainable development goals in India's energy sector.

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CHAPTER I

1.1 INTRODUCTION

The thermal power sector has long been a cornerstone of India's energy infrastructure, significantly contributing to the country's electricity generation. Predominantly reliant on coal, this sector faces numerous challenges, including financial constraints, environmental regulations, and operational inefficiencies. Despite a growing emphasis on renewable energy sources, thermal power remains vital due to its capacity to provide reliable base-load power. In recent decades, financial investment in this sector has undergone significant transformation (Zhang, Chi 2005). While the Indian government initially spearheaded investments through public sector undertakings (PSUs) like NTPC, the liberalization of the economy in the 1990s opened the doors for private sector participation and foreign investments. However, the sector's journey has been fraught with hurdles such as project delays, cost overruns, and financial distress among companies. Additionally, the increasing environmental concerns and regulatory pressures have further complicated the investment landscape.

The thermal power sector is a pivotal component of India's energy landscape, contributing significantly to the country's electricity generation. This sector predominantly relies on fossil fuels, with coal being the primary source, followed by natural gas and oil. Coal-fired power plants constitute over 70% of the total installed capacity in India, making coal the preferred choice due to its abundant domestic reserves. Natural gas and oil-based power plants, though fewer, play crucial roles in meeting peak demand and providing supply flexibility. The sector comprises both public sector undertakings (PSUs) like NTPC and private companies, with increased private participation following the economic liberalization of the 1990s. Initially dominated by government investments, the sector saw a rise in independent power producers (IPPs) and competition post-liberalization. Despite its significant capacity and reliable electricity generation, the thermal power sector faces several challenges. Environmental concerns, particularly greenhouse gas emissions and pollution from coal-based plants, have led to stricter regulations and a push towards cleaner energy sources (Saha, S. 2019). Financial viability is another major issue, with many projects struggling due to high debt levels, fluctuating fuel prices, and lower-than-expected demand growth, resulting in financial distress for several companies. To address these challenges, there have been investments in advanced technologies like supercritical and

ultra-supercritical power plants, which offer higher efficiency and lower emissions. Modernization efforts aim to improve operational efficiency and reduce environmental impacts by adopting cleaner technologies and best practices. The sector is experiencing a shift towards renewable energy sources, such as solar and wind, to reduce dependence on fossil fuels (Ghosh, A 2019). The future of the thermal power sector will heavily rely on supportive government policies and regulations that balance energy security with environmental sustainability. Strategic investments, policy reforms, and technological advancements will be crucial in ensuring the sector's continued contribution to India's energy needs while facilitating a transition to a more sustainable energy future.

1.2 Background of the Study

The thermal power sector in India has historically played a crucial role in meeting the country's energy demands. As a developing nation with a rapidly growing population and economy, India's energy requirements have been substantial and steadily increasing. The thermal power sector, primarily fueled by coal, has been the backbone of India's electricity generation, providing a reliable and continuous source of power (Yadav, A. 2018).

1.3 Historical Context

Pre-Independence Era: The development of the thermal power sector in India can be traced back to the early 20th century. During the British colonial period, the first coal-based power plants were established to support industrial activities and urban electrification.

- **Post-Independence Expansion**: After gaining independence in 1947, India embarked on a path of industrialization and economic development, leading to significant investments in the energy sector. The government played a pivotal role in expanding the thermal power infrastructure through state-owned enterprises and public sector undertakings (PSUs) such as NTPC (National Thermal Power Corporation) (Prasad, A. 2017)
- **Economic Liberalization**: The economic reforms of the 1990s marked a significant shift in India's energy policy. The liberalization of the economy opened the doors for private sector participation, attracting domestic and foreign investments in the power sector. This period saw the emergence of independent power producers (IPPs) and a more competitive market environment (Kumar, V., et al. 2018).

1.4 Current Scenario

- **Installed Capacity**: As of today, the thermal power sector remains the largest contributor to India's total installed power generation capacity. Coal-fired power plants dominate, followed by natural gas and oil-based plants. Despite efforts to diversify the energy mix, thermal power continues to be a critical component due to its ability to provide sTable base-load power (Nandy, D. 2017).
- **Challenges:** The sector faces several challenges that impact its efficiency and sustainability. Environmental concerns, particularly greenhouse gas emissions and air pollution from coal-based plants, have led to increasing regulatory pressures and the need for cleaner technologies. Financial issues such as high debt levels, fluctuating fuel prices, and lower-than-expected demand growth have also caused financial distress among power producers (Bhattacharya, 2019)
- **Technological Advancements**: In response to these challenges, there have been significant investments in advanced technologies. Supercritical and ultra-supercritical power plants, which offer higher efficiency and lower emissions, have been developed. Modernization efforts aim to improve the operational efficiency of existing plants and reduce their environmental footprint (Sharma,2020).

1.5 Future Prospects

- **Renewable Energy Integration**: The Indian government has set ambitious targets for increasing the share of renewable energy in the country's energy mix. While thermal power remains essential, there is a clear shift towards integrating more renewable sources such as solar and wind to reduce dependence on fossil fuels and address environmental concerns (Venkateswarlu, P. 2018).
- **Policy and Regulatory Reforms**: The future of the thermal power sector will depend significantly on supportive government policies and a sTable regulatory framework. Streamlining approval processes, incentivizing efficient technologies, and ensuring the financial health of distribution companies (DISCOMs) are crucial for attracting long-term investments (Sudarshan, A. 2018).
- **Public-Private Partnerships**: Promoting public-private partnerships (PPPs) can leverage private sector expertise and efficiency while benefiting from government support. This collaborative approach can help address the financial and operational

challenges faced by the sector. (Choudhury, S. 2020)

1.6 Research Problem

The scope of the research problem is specifically focused on understanding the factors influencing financial investment decisions within the thermal power sector in India. This includes analyzing the regulatory environment, market dynamics, technological advancements, fuel availability and pricing, environmental and social considerations, financial viability, risk management, and the policy and institutional framework governing investment in the sector.

Financial investment decisions in the thermal power sector are crucial for India's energy security, economic growth, and environmental sustainability. Thermal power remains a significant contributor to India's energy mix, providing essential base-load power to meet growing electricity demand. Additionally, investment in cleaner and more efficient thermal power technologies is essential for reducing greenhouse gas emissions and addressing climate change. Therefore, understanding the determinants of investment decisions and proposing strategies for improvement is vital for achieving sustainable energy development goals in India.

Existing literature suggests that regulatory uncertainty, fuel availability and pricing, environmental regulations, and financial viability are key considerations influencing investment decisions in the thermal power sector (Madhu Khanna,2001) However, there is a need for further research to comprehensively analyze these factors and identify effective strategies for promoting sustainable investment in the sector.

1.7 Objectives:

The objectives of the research include:

- Understanding current investment patterns and factors influencing financial investment decisions in the Indian thermal power sector.
- Identifying challenges and barriers to investment in the sector, including regulatory, economic, and environmental factors.
- Proposing strategies and policy recommendations to enhance investment attractiveness and sustainability in the thermal power sector.

1.8 Purpose of Research

The goal of this research is to thoroughly examine the factors that influence financial investment decisions in India's thermal power sector. In addition to this, the study intends to give suggestions for methods that might be utilized to improve the sector's sustainability and make it more appealing to investors. The research is directed by a number of important questions in order to accomplish this goal:

The first step of the research will be to investigate the historical investment patterns that have been observed in the thermal power industry of India. This will give insights into the dynamics of investing behavior by analyzing how these patterns have changed over time and providing a history of their development. Following this, the research will investigate the primary elements that have a role in the decisions that are made about financial investments. Regulatory rules, market dynamics, technology improvements, fuel supply and price, environmental considerations, and financial viability are some of the factors that fall under this category. When it comes to understanding the complexities of investment decision-making in this industry, it is necessary to have a solid understanding of these aspects.

The research will carry out an investigation of the obstacles and problems that investors encounter in the thermal power sector. This study will investigate the ways in which investment decisions are influenced by factors such as regulatory uncertainties, economic risks, environmental compliance costs, and social acceptance concerns. The process of identifying these challenges will assist in locating specific areas that require assistance and attention. At the completion of the research project, a synthesis of the findings will be performed in order to suggest feasible tactics and policy recommendations. Specifically, these are geared on enhancing the conditions under which investments are made and fostering sustainable investment in the thermal power sector.

The research intends to make a contribution to India's energy security, economic growth, and environmental sustainability by resolving the problems that have been posed. Through the facilitation of informed decision-making and the formation of effective policy in the thermal power sector, it aspires to eventually serve the greater goals of the country.

1.9 Significance of the Study

The study's emphasis on financial investment decisions within India's thermal power business, in addition to the industry's historical backdrop, current issues, and future prospects, has the potential to dramatically improve our understanding of the energy

environment.

The lessons that were learned and the new solutions that were developed can give insights into how emerging nations might negotiate the challenges of energy system changes while ensuring energy security and economic prosperity.

The significance of the study extends to the present geopolitical and economic environment, highlighting the necessity of investments that are both productive and cost-effective in order to achieve energy independence and economic growth in India. In order to make investments in the thermal power industry that are competitive, adaptable, and in line with national goals, it is vital to have a solid understanding of the dynamics of global energy markets, technical breakthroughs, and financial procedures.

In addition, the suggestions of the research have the potential to boost growth in interconnected markets, which would in turn drive demand for environmentally friendly technologies, provide new employment opportunities in renewable energy sectors, and diversify the distribution of energy sources. The findings of this research have larger implications for energy policy, the promotion of sustainable practices, the advancement of global dialogues on climate change mitigation, and the promotion of economic growth. These consequences extend beyond the strategic decision-making process in the thermal power business.

Ultimately, the study's findings and recommendations could significantly impact the future of India's thermal power industry, aligning it with the nation's objectives of energy independence, environmental stewardship, and socio-economic development.

1.10 Research Questions:

1. What are the current investment patterns in the Indian thermal power sector, and what factors influence these financial investment decisions?
2. What are the primary challenges and barriers to investment in the Indian thermal power sector, including regulatory, economic, and environmental factors?
3. How can strategic and policy recommendations enhance the attractiveness of investments in the Indian thermal power sector?
4. What measures can be implemented to ensure the sustainability of financial investments in the Indian thermal power sector?

CHAPTER II

2.1 Review of Literature

The review of literature on financial investment decisions in the Indian thermal power sector provides a comprehensive understanding of historical trends, current practices, and future prospects. Existing studies highlight the dominance of coal-fired power plants and the significant role played by public sector undertakings (PSUs) and private investors since the liberalization of the economy in the 1990s. Research has extensively examined the economic, regulatory, and environmental challenges that impact investment decisions, such as fluctuating fuel prices, stringent environmental regulations, and project delays. Furthermore, literature emphasizes the importance of technological advancements, market analysis, and management competence in determining the success of investments. Studies also underscore the critical role of government policies and incentives in shaping the investment landscape, advocating for enhanced regulatory support and diversification towards cleaner energy sources. This body of work provides valuable insights into the factors influencing investment decisions and the strategies necessary to enhance the attractiveness and sustainability of investments in the thermal power sector.

2.2 Factors influencing financial investment

The Indian thermal power sector has long been the cornerstone of the country's electricity generation, contributing significantly to the overall energy mix. This review of literature aims to provide a comprehensive understanding of the current investment patterns and the various factors influencing financial investment decisions in the Indian thermal power sector. It encompasses historical trends, economic influences, regulatory impacts, technological advancements, environmental concerns, and strategic considerations.

The evolution of the Indian thermal power sector can be traced back to the early 20th century. During the pre-independence era, the British colonial administration established the first coal-based power plants to support industrial activities and urban electrification (Marie Claire Mukeshimana. 2019).

Post-independence, the Indian government embarked on a path of rapid industrialization, significantly expanding the thermal power infrastructure through state-owned enterprises such as NTPC (National Thermal Power Corporation) (Uner M. M. Kose N. Gokten S. Okan P. 2008)

The liberalization of the Indian economy in the 1990s marked a pivotal shift, opening the doors for private sector participation and foreign investment. The emergence of independent power

producers (IPPs) introduced a competitive market environment, significantly altering the investment landscape (Bhattacharyya, Subhes C. 2007) Current investment patterns in the sector reveal a mix of public and private investments, with substantial contributions from both domestic and international financiers.

Economic factors play a crucial role in shaping investment decisions in the thermal power sector. Macroeconomic indicators such as GDP growth, inflation rates, and interest rates directly impact the attractiveness of investments. For instance, periods of robust economic growth typically correlate with increased electricity demand, making investments in thermal power plants more appealing (Juthathip Jongwanich. 2019).

Conversely, high inflation and interest rates can increase the cost of capital, thereby deterring investments.

Additionally, the availability and cost of fuel are critical economic considerations. India's reliance on coal imports to meet the demand-supply gap in the thermal power sector exposes investors to global market fluctuations and price volatility (CERC, 2019). This dependency necessitates careful risk assessment and strategic planning by investors to mitigate potential financial losses.

Regulatory frameworks and government policies significantly influence investment decisions in the thermal power sector. The Electricity Act of 2003 and subsequent amendments have provided a structured regulatory environment, promoting competition and private sector participation (CEA, 2022). However, navigating the complex regulatory landscape remains a challenge for investors. Bureaucratic red tape, land acquisition issues, and delays in project approvals are common obstacles that can lead to cost overruns and project delays (TERI, 2018).

Government policies, particularly those related to environmental regulations, also play a pivotal role. The Indian government has introduced stringent emission norms and pollution control measures to curb the environmental impact of coal-based power generation. While these regulations are essential for sustainable development, they impose additional compliance costs on thermal power plants, affecting their financial viability (Sharma & Jain, 2019). Subsidies, tax incentives, and other government incentives aimed at promoting cleaner technologies can offset some of these costs and attract investments.

Technological advancements have a profound impact on investment patterns in the thermal power sector. The shift from subcritical to supercritical and ultra-supercritical technologies has significantly improved the efficiency and reduced the emissions of coal-fired power plants (Reddy & Reddy, 2016). These advancements make thermal power plants more competitive and

environmentally sustainable, thereby attracting investments.

Investments in Research and Development (R&D) are crucial for fostering innovation in the thermal power sector. Technological innovations such as carbon capture and storage (CCS) and integrated gasification combined cycle (IGCC) hold the potential to further enhance efficiency and reduce the environmental footprint of thermal power plants (Mukherjee et al., 2017). However, the high initial costs and uncertain returns associated with these technologies can deter investors without adequate government support and incentives.

Environmental sustainability is increasingly becoming a critical factor in investment decisions. The thermal power sector is a major source of greenhouse gas emissions and air pollution, contributing significantly to climate change and public health issues (IEA, 2020). Investors are becoming more conscious of the environmental impact of their investments, driven by both regulatory requirements and societal pressure.

The global shift towards cleaner energy sources is influencing investment patterns in the Indian thermal power sector. There is a growing trend towards integrating renewable energy sources such as solar and wind with thermal power to create hybrid systems that offer both reliability and sustainability (MNRE, 2021). This trend is reflected in the increasing investments in cleaner technologies and the development of more environmentally friendly thermal power plants.

Strategic considerations such as market analysis, management competence, and financial health assessments are critical for successful investments in the thermal power sector. Accurate market analysis helps investors understand demand trends, competitive dynamics, and potential risks, enabling informed decision-making (IEA, 2020). Management competence, including the ability to navigate regulatory challenges and implement efficient operational practices, is equally important.

Assessing the financial health of thermal power companies is essential for mitigating investment risks. Financial metrics such as Return on Investment (ROI), Debt-to-Equity Ratio, and Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) are commonly used by investors to evaluate the attractiveness of investments (CERC, 2019). Regular financial health assessments help investors identify potential issues early and make necessary adjustments to their investment strategies.

2.3 Power Sector

(Katharine Nawaal Gratwick, Anton Eberhard 2008.) studied “Demise of the standard model for power sector reform and the emergence of hybrid power markets Katharine” After earlier reforms in the power sectors of industrialised nations and emerging markets (such as Chile),

developing countries were pushed to unbundle their electricity businesses and to bring competition and private sector engagement. This was done in response to prior reforms in the power sectors of these countries. This study focuses on the events that led to the definition of power sector reform as a standard model and theoretical framework in its own right, as well as the manner in which the model was utilised in a prescriptive manner in a number of developing nations. Nevertheless, we also demonstrate that, despite the fact that reform attempts have been going on for more than 15 years, this new industrial model has not fully taken root in the majority of developing nations. Finally, we identify and characterize the advent of new hybrid power markets, which provide significant difficulties in terms of both performance and investment. (Cannelle Gueguen-Teil. 2021) studied "Private Participation in the Indian Power Sector" In the National Electricity Policy that was implemented in 2005 by the government of India, it was acknowledged that electricity is one of the primary factors that contribute to the rapid economic growth and alleviation of poverty in the country. (Kablouti, G. 2015) studied "More Power to India The government of India has emphasised that it is necessary for growth and the eradication of poverty to have a power system that is efficient, resilient, and financially sound (Ministry of Power 2005). Almost all assessments on the investment climate refer to inadequate electricity availability and quality as major obstacles to commercial and manufacturing activities as well as to the nation's capacity to compete internationally. More than 300 million people in India do not have access to electricity, and those who do have access to it have to deal with an intermittent supply. This indicates that there is a significant amount of demand that is not being met, which in turn restricts consumer welfare.

(Dr. Tanaji G. Rathod 2014) studied FINANCIAL MANAGEMENT IN POWER PROJECTS OF KARNATAKA : Case Study Of Karnataka Power Corporation Limited. There has been a significant upward trend in urbanisation, industrialization, the information technology boom, and the agricultural sector in the Indian economy during the past two decades. In order to keep up with this increasing tendency, the electricity industry in Karnataka has not been able to keep up with the increased demand. The significant T&D loss that is prevalent in the system is a result of a number of obstacles, including a lack of emphasis on both new and current projects, a scarcity of substantial finances, and so on. It is necessary to place a greater emphasis on the electricity sector in order to provide support for the expansion of the economy in Karnataka. It is one of the state-owned electric utilities that holds more than half of the total installed capacity of the state as of the fiscal year 2006-2007. Additionally, it supplies more than 70 percent of the power that is consumed by users in the state. Karnataka Power Corporation Limited (KPCL) is one of the utilities that it is. An investigation into the KPCL's operational performance and

financial health has been carried out over the course of five years (FY 2002-2007), as part of a research project that has been carried out. The ideas that were received from responders, who were senior executives of KPCL, have been considered in this section. This section provides a narrative of the findings that were obtained from an investigation of the corporation's operational and financial performance. A comparison is also made between the performance of the KPCL and that of the main power production firms in India, such as the NTPC Limited, Reliance Energy Limited, the TATA Power Company Limited, the National Hydroelectric Power Corporation, and APGENCO. Several results and ideas have been interpreted in a very brief manner during the course of the investigation. (Dr. Tanaji G. Rathodn.2001) studied Management of Power Generation Projects in Karnataka: A case study of KPCL For the purpose of providing recommendations to the KPCL, this study examined the operational and financial performance efficiency of power generating projects in Karnataka. There are a number of problems plaguing India's power industry that stem from internal factors, such as significant technology and development losses, a lack of energy supplies, a lengthy gestation time, ineffective management at current utilities, and social, economic, and environmental concerns. Karnataka is no different. In India, the demand for power has been growing faster than the supply since the early 90s. As a result, there will always be a disparity between the energy market's peak demand and supply. The research shows that Karnataka needs an investment requirement of around Rs.2,000 cores per annum in the power generation sector alone if it wants to sustain a GSDP growth rate of 8 percent or more per annum. This is because the growth rate of power supply must be at least over 5 percent per annum. Karnataka Power Corporation Limited (KPCL), the state's major power generating business, is the site of this study. Three distinct kinds of research instruments were used in this investigation. Firstly, by monetary metrics; secondly, through survey questionnaires; and thirdly, through comparisons across other firms. The financial performance of KPCL has been evaluated using a variety of metrics, including liquidity ratios, leverage ratios, turnover ratios, profitability ratios, EVA, inter-firm comparison, and so on. Two hundred senior senior technical and non-technical officials of the company were sent a questionnaire. This study provides an interpretation of the feedback and recommendations given by the various respondents. We compare KPCL's performance to those of other prominent Indian power production firms, including NTPC Limited, Reliance Energy Limited, APGENCO, NHPC, and The TATA Power Company Limited. The new benchmarking criteria and many creative management methods for the power sector participants have been proposed by this research study. (Eric Martinot 2001) studied Renewable energy investment by the World Bank There was an increase in renewable energy financing by the World Bank Group in the 1990s,

leading to 17 green energy projects that received $700 million in loans and $230 million in grants from the Global Environment Facility. Investment in renewable energy sources was redirected in 1999 by the Bank's Fuel for Thought energy-sector policy. The possibilities and difficulties of putting Fuel for Thought techniques into action are discussed in this study. Limitations to executing energy and rural development goals are reviewed in the article, which also distinguishes between the two. Still in their early stages, project lessons point to five potential future sectors where the Bank may lend money for renewable energy projects: electric power regulatory frameworks, renewable energy firms in rural regions, regulated rural energy concessions, and domestic technology manufacturing. company plan assistance, financing pre-feasibility studies, reducing commercial risks, supporting joint ventures, increasing market volume and stability, and piloting and testing novel company models are all other sorts of help that the private sector interviews have suggested. Willingness and commitment of developing nations to pursue these strategies and the extent to which renewable energy applications are perceived as serving countries' development priorities are crucial to the Bank's ability to achieve its ambitious agenda.? 2001 Elsevier Science Ltd. All rights reserved.

(Peter M. Lamb 2006) studied The Indian Electricity Market: Country Study and Investment" "The electricity industry in India is like a bucket that is leaking; the holes were purposefully constructed, and the leaks were meticulously gathered as economic rents by the many players that run the system. Instead than continually highlighting electricity shortages and always making exaggerated forecasts of future power needs, the most reasonable course of action would be to fix the bucket. This would be the most rational thing to do. The majority of efforts in the power sector, such as independent power producers (IPPs) and mega power projects, are nothing more than techniques of adding more water to the bucket in order to guarantee the existence of leaks in both quantity and regularity. (Williams and Ghanadan 2006) studied "Electricity reform in developing and transition countries: A reappraisal" Beginning around the year 1990, a number of emerging and transitional nations have implemented market-oriented reforms in their electric power sectors. These goals include the provision of services, the supply of public benefits, reliable regulation, and social and political legitimacy. The most important thing is that changes should be based on realistic evaluations of the capabilities and needs of the nation. (David Newbery and Newbery 2006) studied "Power sector reform, private investment and regional co-operation The availability of modern infrastructure, notably power, is essential to the growth of the economy. Deficiencies lead to shortages, which in turn limit overall production, which in turn magnifies the return on investment for eliminating them. After being confronted with state-owned vertically integrated electrical supply businesses that were both inefficient and insolvent,

South Asia was under intense pressure to undergo major change. For the purpose of addressing shortages, private investment in generation was encouraged by an incorrect diagnosis. Independent power producers (IPPs) sold power to state energy boards (SEBs) under long-term contracts. The SEBs were essentially unreformed. When the SEBs were unable to even pay the cost of under-priced energy from state-owned generators, their financial suffering was aggravated by purchasing power from independent power producers (IPPs) at costs that were higher than retail tariffs. This was a prescription for conflict. An essential first step would be to reform the SEBs by unbundling, complete metering, effective accounting, and management structures that create commercial discipline. This would be done under multi-annual regulation that is protected from clientalist political influences. After the distribution firms have been adequately enterprised, that should be followed by the privatisation of such corporations in order to maintain reform. Reducing losses, both non-technical and technical, and increasing plant load factors yield far higher returns than generation investment, where India and Pakistan already appear above predicted levels of electric intensity, perhaps because of low effective prices, and could eliminate most shortages. A good place to begin is with the Indian Electricity Act of 2003, which mandates the installation of metres, the implementation of multi-annual regulations, and the regulation of third-party access to the national transmission system. Private investors will seek reassurance that the contracts that are necessary for IPPs are honoured, that legal disputes are addressed in a manner that is both efficient and fair, that they are subject to international arbitration as a fallback, and that their purchasers are creditworthy when they make purchases. Low-cost petrol, which is readily accessible in Bangladesh but in short supply in India, makes this task much simpler. Consequently, the trading of energy on a regional scale would significantly contribute to the improvement of the investment climate, and a South Asia Energy Charter might provide the foundation for enhanced energy commerce. Apart from the creation of lucrative trade opportunities, the enhancement of regional supply security, and the enhancement of resilience against external oil shocks, the European Energy Charter has been instrumental in facilitating the integration of the transition countries of Central Europe and has stimulated foreign direct investment (FDI) in the power sector. It is possible that the European Energy Charter will also have similar stimulative effects in South Asia.

(Anoop Singh 2007) studied Policy enviornment and regulatory reforms for private and foreign investment in developing countries: A case of the Indian power sector: Research conducted by Canning and Pedroni (2004) and Calderón and Servén (2004) found that the provision of infrastructural services, such as electricity, has an impact on the growth of the economy over the long term. According to the World Bank (2005a), infrastructure is also an essential component

of the overall market environment for investments. The Asian Development Bank (ADB) and other researchers found that it also helps reduce poverty and aids to closing the income gap. The literature on the effect of infrastructure on economic growth suggests, among other things, that infrastructure is more important in the case of low-income and emerging nations (Estache, 2004). This is the conclusion that can be drawn from a study of the literature. It is possible that the availability of different infrastructural services, such as electricity, would have an impact on the future development profile of growing economies such as Brazil, the People's Republic of China (PRC), India, and Russia. (Ashok Sarkar and Singh 2010) studied Financing energy efficiency in developing countries—lessons learned and remaining challenges The challenge of mainstreaming energy efficiency financing in developing country markets persists, despite the fact that policymakers around the world are increasingly acknowledging energy efficiency implementation as a powerful tool to combat environmental risks, increase energy security, and reduce the impact of growing energy prices. Evidence from the past suggests that there are several obstacles and unexpected transaction costs associated with turning potential for cost-effective energy savings into investments, especially when it comes to demand-side improvement prospects across sectors. Using case studies of effective energy efficiency funding in poor nations, this article analyses the critical success elements of different programming approaches and financial vehicles. A variety of institutional concerns pertaining to the methods used to identify, package, design, and monitor energy efficiency projects—both conventional and novel—are investigated via case studies. Even when there is sufficient capital in the markets of large developing nations and cutting-edge energy-saving technology is readily available, resolving institutional challenges becomes crucial for funding and launching effective programmes. Such investments in energy efficiency may be scaled up as more operational expertise is obtained through increasing information exchange. A few suggestions for speeding up implementation are offered at the end of the paper. (Chaudhary, Krishna, and Sagar 2015) studied Policy making for renewable energy in India: lessons from wind and solar power sectors To prevent dangerous climate change, developing nations must participate in the worldwide effort to reduce emissions of greenhouse gases. Many of these nations are already making substantial strides in this direction, albeit without legally binding commitments under the UNFCCC. Drawing lessons from previous programmes can help speed up and improve the efficacy of this deployment process, which is crucial because the deployment of GHG-mitigating technology is already a big component of this effort and will continue to be. So, the purpose of this article is to take a look at how wind and solar power have been implemented in India, with a focus on how the government has encouraged and supported this growth, how these policies

have changed through the years, what factors have influenced these changes, and what lessons have been learned from this experience. The goal of this analysis is to identify the most important takeaways from India's deployment policies and programmes in these two areas, so that future domestic policies and international cooperation programmes can help accelerate India's transition to climate-compatible development. Other developing nations trying to strike a balance between climate change and development goals through the use of renewable energy sources can also benefit from many of these lessons.

2.4 Government Investment Decision-making in the Energy Sector

(Jungwoo Lee Moon 2018) studied Government R&D Investment Decision-making in the Energy Sector: LCOE Foresight Model Reveals What Regression Analysis Cannot" Governments that put an emphasis on research and development spending will have to use performance-based budgeting to make decisions in the future. Regularly, governments examine the results and outputs of R&D programmes, and next year's budget is based on that evaluation. But current evaluation techniques don't take the long view; innovations in fields like energy take a very long time to go from research and development to commercialization. This research takes a look at the new government-oriented foresight model and compares it to other R&D appraisal models. Analysing the success of finished projects based on prior R&D spending is done through a regression analysis employing probit and ordinary least squares (OLS) models. We compare this to the foresight model, which uses the LCOE to determine costs. The government of Korea invests very little in expanding the market for renewable energy technology, according to the results of the regression study. On the other hand, renewable energy technologies are suiTable recipients of public funding for research and development, according to the LCOE foresight model. Government energy R&D decision-makers should employ the foresight model since it reveals previously unknown information, such as learning rates and technological dynamics, that is ignored by current R&D evaluation frameworks. (Tareq Mahbub and Jongwanich 2019) tudied "Determinants of foreign direct investment (FDI) in the power sector: A case study of Bangladesh" The purpose of this article is to explore the factors that influence the decision-making process of multinational corporations that engage in foreign direct investment (FDI) in the electricity industry. Considering that there is a lack of long-term data series on foreign direct investment (FDI) in Bangladesh's power industry, a mixed method approach is utilised, which includes both semi-structured interviews and questionnaires. When it comes to foreign direct investment (FDI) in the electricity industry, the data reveal that regulatory considerations are the most influential for enterprises, followed by economic and financial aspects, political and

sociological aspects, and finally regulatory aspects. When it comes to individual factors, the commitment of the government to contracts, land acquisition, and tax exemption are key decision-making factors in the process of foreign direct investment (FDI). On the other hand, road networks, gender diversity policies such as male predominance, and the right to freedom of association such as trade unions are considered to be of the least importance. When assessing the factors that determine whether or not foreign direct investment is carried out, firm-level variables, such as firm ownership, firm size, and contract time, are essential considerations. (Alan David Lee and Franz Gerner2020) studied "Learning from Power Sector Reform Experiences" Since the 1990s, Vietnam's power industry has seen fast development, allowing it to become one of the most successful energy sectors among emerging countries. Most of this accomplishment has been achieved through the operation of Electricity Vietnam, which is a state-owned utility. Certain market-oriented changes that have been implemented up to this point have also had some good influence. Towards the end of the 1990s, the government came to the realisation that it was necessary to gradually introduce competition in order to guarantee long-term viability without putting the supply security of the rapidly expanding economy in jeopardy. A competitive power market, the unbundling of Electricity Vietnam, the establishment of pricing that more accurately reflect costs, the promotion of private investment, and the establishment of a regulatory authority have all been made possible as a result of the Electricity Law of 2004, which was passed in Vietnam. At this time, state-owned entities continue to hold a dominant position in the industry. Although there is some degree of competition in the power industry, the increased operational efficiency and financial success of generators operating in this market have helped to keep generation costs at a reasonably low level. A transition to clean energy is one of the additional comprehensive reforms that are on track to be implemented, according to the plans. One of the lessons learned is that state-centric institutions have the potential to improve the power sector provided they have the commitment of the highest level of government, highly skilled staff, and unanimity across sector entities. Even while gradual changes provide an opportunity to learn by doing, the order in which reforms are implemented is important. It is possible that the efficacy of the market will be reduced if market mechanisms are introduced before other parts, and this may even make later reform steps more challenging. (Shrivastava, Sharma, and Chauhan 2017) studied "Efficiency assessment and benchmarking of thermal power plants in India India's per capita usage of power is significantly lower than that of Canada, the United States of America, Australia, Japan, Chaina, and the average for the entire globe. Despite the fact that the overall energy shortage2 and the peaking shortage3 were recorded as 11.2% and 11.85%, respectively, in 2008–2009, this indicates that there is not a sufficient supply of power

available. When it comes to financial terms, even a very minor increase in performance can result in a significant contribution. This contribution can then be used towards capacity expansion in order to close the demand-supply imbalance. In India, the primary sources of electricity come from thermal power plants that are powered by coal. Through the use of the CCR and BCC models of data envelopment analysis, this study has been conducted in order to evaluate and compare the relative technical efficiency of sixty coal-fired power plants.

(Naveen Upreti et al. 2018) studied Challenges of India's power transmission system The infrastructure of a country's electricity supply is the critically important infrastructure that determines the economic success and welfare of a nation. According to Singh (2006), what constitutes a comprehensive power value chain is the combination of the generation, transmission, and distribution sectors jointly. According to Daruka (2015), India's power industry is the fifth biggest in the world in terms of installed power producing capacity. It also has a complicated network that reaches 200 million different users that are dispersed around the country. The responsibility for the Indian power industry falls on the shoulders of both the Central and State utilities, as a result of the deregulation of the power sector and the objective of making power available to all. This developing nation is currently going through the period of its economic expansion that requires the largest energy consumption, and it is doing so with programmes such as Make in India and Digital India. In comparison to other nations across the world, India is placed third in terms of power output (Thakur et al., 2005). Additionally, India has had a remarkable increase in generation capacity over the course of the last few decades, which has reached more than 320 gigawatts (GW) (MOP, 2018). Figure 1 illustrates a prospective comparison of the expansion in generating capacity with regard to load. This comparison is presented in both directions. Currently, there is no need to be concerned about electricity generation because there is sufficient availability of both conventional and non-conventional resources. (S. Manju∗, Netramani Sagar 2017) studied Progressing towards the development of sustainable energy: A critical review on the current status, applications, developmental barriers and prospects of solar photovoltaic systems in India In order for a rising nation like India to be successful, it is necessary to strike a balance between economic development and environmental preservation. At the moment, the economy of India is expanding at a quick pace in a dynamic and effective manner, which in turn necessitates the provision of enormous amounts of energy that are delivered without interruption. Nearly seventy percent of the nation's electricity is produced by power plants that are fueled by coal, and the majority of the nation's energy requirements are satisfied by the utilisation of fossil fuels. According to estimates, around 840 million people in India rely on traditional biomass to meet their everyday

energy requirements. The fact that around 74 million people living in rural areas do not have access to modern lighting systems and approximately 81 million families do not have access to electricity is a significant obstacle for India's efforts to ensure its energy security. Significant advancements in the fields of renewable energy are required in order to realise the long-term goal of achieving steady and sustainable energy generation. Fortunately, India is blessed with significant renewable energy resources, which have not yet been entirely tapped. This is a result of the country's geoGraphic position, which is favourable. Therefore, in order to stimulate the utilisation of solar photovoltaic systems, the federal government as well as the state governments of the nation have formulated a variety of laws and are offering subsidies respectively. This article provides a concise summary of a detailed study of the potential, current developmental state, and prospects of solar energy in India. This article provides an explanation of the different uses of solar energy, including but not limited to water heaters, desalination units, pasteurizers, food drying units, water purifiers, space heating systems, air-conditioning units, cookers, water pumps, aerators, solar-wind hybrid systems, and grid-connected photovoltaic systems. In addition to this, the report discusses the policies that are now in place regarding renewable energy, the obstacles that are preventing the growth of solar manufacturing units, and some potential proposals for the future that might hasten the development of renewable energy in India.

2.5 Energy Development, Challenges, and barriers

(Elavarasan, Shafiullah, and Member 2020) studied A Comprehensive Review on Renewable Energy Development, Challenges, and Policies of Leading Indian States With an International Perspective The harvesting of energy that is both clean and friendly to the environment is now receiving a lot of attention since it is one of the most important factors that can help achieve the Sustainable Development Goals (SDGs), as well as because it speeds up social growth and improves living standards. There are 1.353 billion people living in India, making it the second most populated nation in the world. India is also one of the top users of fossil fuels in the world, which is a major contributor to the phenomenon of global warming. Up until the year 2050, it is anticipated that the population will continue to rise at an ever-increasing rate; accordingly, the demand for energy in the next decades will be co-accelerated by the rapid expansion of the industrial sector. The objective of this study was to provide academics, researchers, and policymakers in the nation with assistance by providing an insight into the current renewable energy landscape of the country. The study was conducted with the intention of analysing various prospects of the country in the field of renewable energy. (Ramakrishna Kappagantu and S. Arul

Daniel 2018) studied Challenges and issues of smart grid implementation: A case of Indian scenario" One of the rising trends in the electricity business is the smart grid, sometimes known as SG. It makes use of a wide variety of cutting-edge technology in order to address the problems that are associated with traditional electric networks. Even though it is capable of resolving a significant number of these concerns, SG is still encountering difficulties in implementation. In addition to the lack of knowledge and policies, these obstacles are connected with the adaptation of evolving technology, socio-economic concerns, and other related factors. In light of the fact that the Government of India (GoI) has begun the rolling out of SG projects across the whole country, the purpose of this paper is to highlight the difficulties and problems that are associated with the implementation of SG. In a scenario like this, it is of the utmost importance to identify and explain the obstacles that need to be solved in order to overcome deployment issues, including the acceptability of the customer. All of these significant difficulties and problems associated with the deployment of SG have been contained in this study. An indicative assessment framework has been constructed, and certain specifics are presented below. This framework was developed taking into consideration the vision and plan of the Indian SG. A survey of solar photovoltaic awareness has also been given as a case study in order to gain a better understanding of the customers' interest and concerns regarding the components of SG. (Kumar, Channa, and Maharvi 2018) studied "Strategic Investment Decisions: An Empirical Study of Power Sector in India" The culture of the organisation, the resources and tools available inside the organisation, the industry, the eco–techno environment, and the socio-political environment are all aspects that are integrated to construct a model that evaluates the influence that these factors have on the efficiency of strategic investment decisions. The study made use of empirical data that was acquired from decision makers in the Indian power industry. The findings of the study revealed that all latent components had a positive influence on the effectiveness of investment decisions at a level of confidence of ninety percent. Although the socio-political environment and the internal resources and tools do not have a positive impact on the effectiveness of investment decisions at a confidence level of 95% based on interaction effects, it is possible to argue that the socio-political environment strengthens a positive relationship between the effectiveness of strategic investment decisions and the efficiency of the internal resources and tools. There are no substantial differences, with the exception of the impact of the sociopolitical environment variables and the resources and tools that are available within the organisation. (Biswal, Muduli, and Satapathy 2018) studied "A framework for assessment of SSCM strategies with respect to sustainability performance: an Indian thermal power sector perspective" A large amount of pressure has been placed on India to create a

massive amount of energy, particularly electrical energy, as a result of the country's rapidly growing population. In point of fact, thermal power plants that are fueled by coal are responsible for producing more than fifty percent of the total electrical energy that is produced in the country, and this trend is anticipated to continue for another two to three decades. A growing concern about the environmental consequences generated by the supply chain activities of the power sectors has been drawing the attention of companies to focus on sustainability practices. These activities have a negative impact on ecosystems and quality of life, in addition to the depletion of natural resources. Recognising the significance of environmentally responsible procedures in conventional supply chain management, an attempt has been undertaken to create a framework by employing AHP TOPSIS for the purpose of researching supply chain management techniques. Rather than focusing on a small number of constrained characteristics, the findings of the research will make it easier to analyse and evaluate managerial techniques for supply chain management (SSCM) in power production facilities given the variety of variables involved.

(Irfan, Zhao, Ahmad, and Claire 2019) studied "Critical factors influencing wind power industry: A diamond model based study ofIndia" Industrialization and a rapidly expanding population have caused India's energy demands to skyrocket in recent years. We have used the Diamond model strategy for this objective. Our research has led us to the following conclusions: legislation, structure, competition, linked and support industries, demand and factor conditions, chance, and business strategy. Each of the model's identified elements is impacting the wind industry's competitiveness in its own unique way. As a result, these aspects need bolstering if the wind sector is to grow in the long run. The study's results shed light on the wind power industry's current situation, obstacles, and predicted future. Important policy suggestions for the long-term growth of this industry have been put forth. Government and stakeholders may utilise this study to their advantage by gaining a better understanding of the interplay between all the elements impacting the growth of the wind power sector. This knowledge will then allow them to tailor their procurement strategy appropriately. (Masini and Menichetti 2013) studied "Investment decisions in the renewable energy sector: An analysis of non-financial drivers" Renewable energy technologies (RE) only make up a small portion of the world's primary energy supply, despite the fact that they offer numerous benefits to the environment, the economy, and society. There is a possibility that this restricted dispersion is due to the fact that private investments in the renewable energy industry, despite the fact that they may be enticing, continue to be insufficient. It is also a clear indicator that our understanding of the mechanism by which investors fund real estate initiatives is still lacking, which is another obvious signal that inadequate funding is necessary. This research intends to fill up this vacuum and offer fresh

insight on the decisions that are made about real estate investments. Using behavioural finance and institutional theory as a foundation, we propose that the choice to invest in renewable energy sources is influenced by a number of non-financial variables in addition to a rational appraisal of the economics of the investment options. In order to determine the primary factors that influence the decisions that investors make on their investments, we conduct an analysis of the decisions made by a large sample of investors. Our findings shed new light on the role that institutional and behavioural factors play in determining the proportion of renewable energy technologies in energy portfolios. These findings have important implications for both investors and policy makers, as they suggest that RE technologies continue to be plagued by a number of biassed perceptions and preconceptions that favour energy production models that are similar to those that are currently in use rather than innovative alternatives. (Chowdhury and Charoenngam 2009) studied "Factors influencing finance on IPP projects in Asia: A legal framework to reach the goal" An suiTable legislative framework must be developed by the government in order to facilitate quicker economic growth in the electricity sector.

2.6 Modeling Techniques Power Generation

(Ahmed and Zahedi 2011) studied "Sustainable energy systems: Role of optimization modeling techniques in power generation and supply—A review Since electricity serves so many purposes in today's global economy, it is natural to associate it with progress in both human and economic realms. Subsidy reviews and reforms, credible regulatory frameworks, policy environment creation through regulatory interventions, and market-based approaches are all parts of energy sector reform, which is essential for sustainable energy development. Privatisation of the power sector has secured energy supply and provided cheaper energy services in some countries in the short term, but it has led to opposite effects elsewhere owing to increased competition, causing deferred investments in plant and infrastructure due to longer-term uncertainties, and energy security has recently become an important policy driver. Conversely, from the middle of the nineteenth century, more than 1100GtCO_2 has been released into the atmosphere as a result of fossil fuel use on a worldwide scale. Around 70% of all emissions, including carbon dioxide, methane, and trace amounts of nitrous oxide, are now attribuTable to energy-related GHGs. These emissions mostly result from the burning of fossil fuels for heat supply, power generation, and transportation. Electricity generation and delivery alternatives are debated in society based on a multiplicity of factors, including cost, greenhouse gas emissions, radiation and toxicological exposure, occupational health and safety, employment, residential energy security, and social perceptions. A scientific foundation for practical, integrated solutions to complicated energy

challenges is provided by energy systems engineering, which takes a systems-based, holistic approach, particularly during the decision-making and planning phases.Physical and chemical system research, engineering design, transportation and location issues, financial system resource allocation, and industrial planning and scheduling are just a few of the many fields that have found extensive use for modelling and optimisation. Sustainable energy systems are the focus of this study, which examines the literature on power and supply sector advancements, models and optimization's involvement in these sectors, and optimisation modeling's potential future applications. (Irfan, Zhao, Ahmad, Batool, et al. 2019) studied Competitive assessment of Indian wind power industry: A five forces model Overpopulation and increasing industrial demands have put India in a precarious position in terms of its energy infrastructure, as the country struggles to meet the demands of its expanding industrial sector and its rapidly expanding population. The nation experienced a shortfall of 23,010 kWh in 2018 due to an average power demand and supply mismatch of 1,617 MW. However, due to a dramatic spike in rates, both residential and commercial power consumers are finding it more difficult to purchase this essential resource. To get beyond these obstacles, we must focus on developing renewable energy sources.

The study's results shed light on the Indian wind power sector's current state, obstacles, competitive landscape, industry position within this landscape, and future predictions. There has been a lack of significant implementation of the measures that the Indian government announced to support the wind sector. Government measures that might use some tweaks include the Tariff Policy, the Wind Bidding Scheme, and Generation-Based Incentives. Additionally, our research shows that the wind power industry's value chain isn't performing up to scratch. Some important policy suggestions for the industry's growth include: better decision-making and institutional coordination; feed-in tariffs; grid structure reforms; encouragement of differentiated business models; increased investment in R&D; a stronger professional foundation; and comprehensive government support. By illuminating the interplay between the many elements impacting the wind power sector's competitiveness in India, this study will help policymakers and industry insiders make more informed decisions. (Gandhi et al., 2022) studied Strategic investment risks threatening India’s renewable energy ambition By 2030, India aims to have generated 450 GW of renewable energy. New generation and grid infrastructure finance of $600 billion, including $200 billion for PV and wind capacity, will be necessary to meet the aim. This goal can only be achieved if sector finance expands at a high pace. Given the complexity of the investment risks associated with the renewable energy (RE) industry, it will be difficult to mobilise the necessary cash. The purpose of this paper is twofold: first, to help stakeholders get a thorough awareness

of these risks; and second, to provide them the tools they need to reduce those risks.

2.7 Financial Performance of India's Power Sector

The Financial Performance of India's Power Sector Just ten years after the federal government of India bailed out state electricity boards (SEBs) in 2001, the power industry in India was in the midst of a financial crisis by the end of 2011. Some state-run electricity distribution utilities went bankrupt and couldn't pay their bills or get out from under their obligations. The industry is now anticipating a fourth rescue from the centre, despite the sector's extensive changes over the last decade and the historic 2003 Electricity Act. The nonperforming assets of banks and other financial institutions prompted this financial rescue plan, which amounts to around Rs 1.9 trillion ($42 billion)1. They have still not achieved the intended objective of the Electricity Act, which was to establish independent enterprises operating on commercial principles.

(Energy et al., 2013) studied Developing Markets for Implementation of R&M Schemes in Thermal Power Stations in India" Improving the efficiency of the country's current power plants is necessary due to high capital investment associated with new capacity augmentation, the utilities' low financial condition, and growing fuel shortages. Thermal power plants' renovation and modernization (R&M) is an important way to restore its rated capacity and decrease coal consumption. It's also a cost-effective way to generate more electricity quickly. The nation has been sluggish to adopt R&M despite its many advantages. The report's goals are to convey the country's R&M potential (subject to certain assumptions), provide an estimate of the total market size, and provide tactics to pique the attention of stakeholders. The report examines trends in heat rate, auxiliary power consumption, plant availability, and force outage—four critical operational plant parameters—for coal plants in India. It concludes that R&M is necessary to take advantage of the coal generation mix's enormous potential for improved energy efficiency.

(Leaders.) studied "transforming the indian power sector " India has adopted sustainable alternatives to meet its energy needs and set lofty goals to become one of the world's fastest-growing economies. As part of the Panchamrit plan that was revealed at COP26, India is aiming to raise its non-fossil energy capacity to 500 GW by 2030, obtain 50% of its energy from renewable sources by 2030, and reach the goal of net-zero emissions by 2070. A new age of rapid change and the incorporation of cutting-edge technology and processes will dawn on India's power industry as a result of this rallying cry. (Regy & Sarwal, 2021) studied "TURNING AROUND THE POWER SECTOR DISTRIBUTION" Significant changes have taken place in India's electricity distribution industry within the last few years. Everyone may now enjoy the

convenience of having access to energy. But the electricity sector's distribution network is still its weakest link in terms of supply. The majority of distribution utilities are incurring substantial losses due to several factors, including but not limited to costly power purchase agreements, inadequate infrastructure, and inefficient operations. Because of these losses, they are unable to invest in power supply quality improvements or infrastructure to accommodate greater use of renewable energy sources. Power producers and their lenders are put at risk when distribution companies are unable to pay them, which has a detrimental impact on the economy as a whole. (CRISIL Infrastructure Advisory, 2019) studied "Diagnostic study of the power distribution sector" Functional separation of discoms, competition preparation, and the launch of competition were all envisioned in the study as phases of independent content and carriage (C&C) deployment. Forming intermediary companies, transferring existing power purchase agreements, treating existing financial losses, allocating technical and commercial losses between distribution and supply companies, segregating balance sheets, defining the framework for consumer interface, phasing retail supply competition, and establishing a tariff-setting mechanism for new entities were all marked as critical areas that needed immediate attention. (Ghosh & Kathuria, 2016) studied "The effect of regulatory governance on efficiency of thermal power generation in India: A stochastic frontier analysis" Regulatory governance is an example of an institutional characteristic that has an effect on how well thermal power plants in India work. In the early 1990s, reforms were implemented in India's electricity industry. On the other hand, changes will only work if authorities are serious about seeing them through to completion. We postulate that electric production utilities in federal Indian states are more efficient when regulation is of better quality. One of the factors that determines inefficiency is the index of state-level independent regulation, which is used to estimate a translog stochastic frontier model. The information includes 77 thermal power plants that used coal as their fuel throughout the reform period. These plants accounted for more than 70% of the total installed capacity for generating electricity. With a mean technical efficiency of only 76.7 percent, the industry has a long way to go before it reaches its full potential. Regardless of the model parameters used, the results consistently demonstrate a favourable effect of state-level regulators on plant performance. Both regulatory expertise and the de-bundling of state utilities affect technical efficiency. The policy conclusion is that electricity sector performance will be significantly affected by future reforms that give independent regulators more authority. (Solutions, 2022) studied "paris alignment of power sector finance flows Challenges, Opportunities and IN INDIA: Innovative Solutions" In its recent efforts to provide energy to all of its citizens, India has achieved remarkable progress. The Central Electricity Authority of India reports that the fast increase in electrification in India

is due in large part to the combined efforts of public and private entities to improve power generation, transmission and distribution infrastructure, and last-mile grid connectivity.The average number of hours that power is supplied to different types of customers in India is around 17 hours per day. On the other hand, a third of the world's population lacks access to electricity, and 30 million people are still living in areas without it (CEA 2021). The power industry in India has the ever-changing problem of providing inexpensive, dependable, and sustainable energy to everybody. This is essential for socio-economic growth. (Victor, 2005) studied "Department of Economic and Social Affairs Division for Sustainable Development" Electricity and other modern energy services have been made available to low-income homes via a range of policies enacted in the last few decades in an attempt to reduce severe poverty and promote human wellbeing. In an effort to free up family budgets for other needs, policymakers have subsidised electric service access and consumption in an effort to reduce barriers to economic development. Electricity generation programmes have also garnered support from policymakers who believe they may mitigate some risks posed by the fuels they supplant, such as poisonings, fires, and indoor air pollution. (Mukherjee, 2014) studied "Private Participation in the Indian Power Sector" The Indian government acknowledged energy as a critical factor in the country's fast economic development and poverty reduction in its 2005 National energy Policy.

Jhirad (1990) studied "power sector innovation in developing countries: implementing multifaceted Solutions" When it comes to satisfying their electricity requirements for economic growth in a manner that is both fiscally and ecologically sustainable, developing nations are confronted with vast and insurmounTable challenges. In this study, the key power-sector problems that face decision-makers in developing nations and international financing organizations are examined, and many different strategies for successfully resolving these issues are presented. The idea that sustainable ways to supply electricity for economic growth may be envisioned and put into action is one of the primary focuses of the paper.

Kumar and Rao(2002) studied "estimating marginal abatement costs of spm: an application to the thermal power sector in india" This article provides estimates of the marginal abatement costs of suspended particulate matters (SPM) for the thermal power sector in India. The determination of these costs is made possible by the use of the duality that exists between the output distance function and the revenue function. The output distance function approach is used in this study in order to arrive at an estimation of the marginal abatement costs, also known as shadow pricing, of the pollution for certain plants. It has been determined that the average shadow price for SPM emissions from India's 33 thermal power plants in the years 1991-1992 was 145 rupees per kilogramme. This information was obtained via calculations. This number

was calculated using the information that was gathered during the relevant time period. This figure may be used in the process of designing market-based instruments for the purpose of controlling pollution in the thermal power sector in India. In other words, the goal of this regulation is to reduce the amount of pollution that is produced. In addition to this, the results of this study reveal that switching to coal with a decreased ash content delivers major economic advantages when it comes to the control of pollution within the Indian thermal power sector.

Reforms (2003) studied "The Political Economy of Indian Power Sector Reforms" The central government's reaction to these failings was to exercise more authority, as it did in many other sectors of the economy. Additionally, in order to support the SEBs, the central government established new state-owned enterprises for electricity production and transmission. This action was taken as a reaction to the fact that the SEBs had not lived up to their obligations in the past. They have seen significant growth over the course of the last two decades, and as a result, they are now responsible for more over one quarter of the generation and one third of the transmission in the nation. The SEBs remained the primary institutions responsible for distributing power to end users; nevertheless, the significant losses they incurred and continued to incur limited their capacity for expansion. This event occurred in 1991. They undertook comprehensive economic liberalization as a solution to a problem with the balance of payments, and one of the industries that was liberalized was the electrical sector.

Mathur, Bansal, and Wagner (2003) studied "Investigation of greenhouse gas reduction potential and change in technological selection in Indian power sector" Most developing countries are feeling the pressure to find alternative methods for energy conversion and policies that will make these technologies economically viable as their energy demands continue to rise along with their concerns regarding the control of greenhouse gas emissions. The imposition of a price on carbon emissions is one of the policies that a significant number of industrialized nations have begun to implement. Since the year 2000, researchers have been looking at their potential effects on the various options for the production of electricity over a period of time spanning 25 years. Large hydroelectric power plants have often been regarded as the top option, followed closely by wind power generation facilities. However, the lower cost of coal that is available in India maintains open the possibility of using technologies that are based on coal. Among the many fossil fuel technologies, pressurised fluidized bed combustion technology has been identified as the most reasonable option. In the presence of high carbon tax rates, there is the possibility that emissions of greenhouse gases might be reduced by around 25 percent as compared to the scenario in which business as usual is continued.

Zhang et al. (2005) studied "Baselines for carbon emissions in the Indian and Chinese power

sectors: implications for international carbon trading The goal of this study is to analyze the dynamics of carbon emission baselines for electricity generation in Indian states and Chinese provinces. The outcomes of the study indicate that the fuel mix is the key component that is accounTable for the trends that are exhibited by the carbon baselines in these five different circumstances. The instances show that there are chances to lower the carbon intensity of the electrical sectors in both India and China. Specifically, in India. To a lesser degree, this may be achieved by adopting technology for coal-fired power that is both more efficient and cutting-edge. However, the primary means by which this can be accomplished is by switching from coal to other types of fuelsHowever, taking into account all of the difficulties that are connected to the baseline problem, our case studies suggest that there is value in investigating alternative methods that depend on more aggregated baselines.

Sharma, Nair, and Balasubramanian (2005) studied "Performance of Indian power sector during a decade under restructuring: a critique" Over the course of the previous several decades, the Indian electricity industry has been confronted with significant functional challenges. The Indian electricity industry was experiencing a process of reorganization over the previous decade (1991-2001), and this article examines the sector's performance during that time period.

Zhang (2005) investigated investments in power production, with a specific focus on nuclear capacities, set against the increasing demand for energy and environmental challenges. Utilizing a multi-faceted methodology, Zhang integrated historical analysis of investment drivers with a structural evaluation to discern preferences and applied a value option method, highlighting nuclear technologies and comparing the efficiency of Generation IV reactors to existing ones. The research indicated that the appeal of nuclear energy persists even with the swift growth of renewable energy alternatives. However, the study leaves a gap in understanding the applicability of these insights to other energy domains, especially the thermal power sector in India, signaling an opportunity for subsequent research.

Williams and Ghanadan (2006) delved into the market-oriented reforms initiated around 1990 in the electric power sectors of developing and transition countries. Their study analyzed the common features of electrical reforms in non-OECD nations, reconsidering the assumptions and strategies of these reforms. The research methodology combined a thorough literature review with case studies spanning Asia, Africa, Latin America, and Eastern Europe. The findings indicated that changes in these non-OECD countries were often driven by national fiscal crises, broad economic reforms, and the influence of foreign lenders, contrasting with the deregulation-focused agendas of OECD nations. A recurrent theme from various non-OECD reform experiences was that unsatisfactory results often stemmed from an overemphasis on finance and

cost recovery applied in a rigid fashion. However, there appears to be a gap in understanding how these reforms and investment decisions are mirrored or differ in the thermal power sector in India. Further research is needed to provide a granular understanding of financial investment decisions specifically in the Indian thermal power context, drawing lessons from both successful and less-than-ideal reform outcomes in other regions.

Bhattacharyya (2007) explored the progress and challenges of electric power sector reforms in South Asia initiated in the 1990s. While many South Asian developing countries embarked on these reforms, often due to external lending agencies' influence, tangible success has been limited across the region. Four critical impediments to the reform process in South Asia were identified: (1) instability of rule-makers; (2) low levels of public acceptance; (3) slow-paced adaptation; and (4) inadequate transition management. The study's findings underscored the profound impact of the region's political turmoil on power sector reorganization, constraining pivotal decision-making. Consequently, the sluggish pace of reforms has adversely affected the sector's viability, with observable repercussions on both investment and overall performance. However, in the context of "Financial Investment Decisions in India's Thermal power Sector: Lessons of experience and proposals for improvement", a gap exists in comprehensively understanding the nuanced financial implications of these challenges on investment decisions specifically within India's thermal power sector.

Panel (2009) studied “Determinants of Capital Structure of Indian Corporate Sector: Evidence of Regulatory Impact” In this study, we attempted to find answers to two very important questions. The first of these questions was whether or not capital market regulations have any effect on the decisions that corporate firms in India make regarding their capital structure. The second issue that needed to be addressed was how to quantify the extent to which firm-specific variables may account for the variance in capital structure explanations offered by the various theories. The static trade-off theory and the pecking order hypothesis were the names given to these two hypotheses. In order to solve these two problems, we made use of a model that was provided by Driscoll and Kraay (1998) and it was called a static panel data model. Over the period of 21 years, from 1989 to 2009, we examined 1154 different businesses, which led to the generation of 6946 observations. In this study, we used a unique approach to analysing the impact of firm- specific and institutional characteristics on debt and equity. Our goal was to get a deeper comprehension of the predictive ability of the same set of parameters in support of the trade-off theory and the pecking order hypothesis. We come across evidence that gives support to the idea that institutional factors are important to the financing decisions that enterprises make. This lends weight to the hypothesis that institutional variables are relevant. According to the

findings of our research, the laws that govern the capital market in India appear to have a negative influence on the use of public debt but a positive impact on the use of private capital. This study may be of some use to academics and policymakers in their efforts to get a better understanding of the impact that regulation has on the ways in which businesses employ public debt and equity money received via the capital market.

Nixon, Dey, and Davies (2010) studied "Which is the best solar thermal collection technology for electricity generation in north-west India? This study on the generation of thermal electricity from concentrated solar radiation proposes to analyze the principal collecting technologies that are now in use, and it will do so by using the framework of the Analytical Hierarchy Process (AHP) (AHP). The comparison that follows takes into account the different technologies' relative advantages in terms of their effects on the environment, the economy, and technical aspects. It is found that there are a number of sub-criteria and sub-alternatives for each technology, and the same is true for each of these three groups. The utilization of a literature review, thermodynamic calculations, and a workshop with a panel of experts were among the methods that were used in order to arrive at quantitative and qualitative assessments.

Purohit and Purohit (2010) studied "Techno-economic evaluation of concentrating solar power generation in India With the ultimate objective of making solar energy competitive with options based on fossil fuels, the Jawaharlal Nehru National Solar Mission (JNNSM) of the recently announced National Action Plan on Climate Change (NAPCC) by the Government of India aims to promote the development and use of solar energy for power generation and other uses This study was conducted with the intention of making a first attempt in evaluating concentrated solar power (CSP) systems in India from both a technical and economic point of view. The preliminary results indicate that the use of CSP technology in India makes significant economic sense for the north-western portion of the country (particularly in Rajasthan and Gujarat states). Furthermore, the internalization of secondary benefits of carbon trading as a component of the clean development mechanism of the Kyoto Protocol greatly raises the financial feasibility of CSP systems in additional locations that were taken into account for this research.

Although policymakers in countries all over the world are beginning to recognise that increasing energy efficiency through implementation is one of the most effective means of mitigating rizing energy prices, tackling potential environmental risks, and improving energy security, mainstreaming its financing in the markets of developing countries continues to be a challenge. On the basis of previous experiences, it has been demonstrated that converting potentially cost-effective energy savings into investments, particularly opportunities for demand-side improvement across industries, is met with a large number of obstacles and unexpectedly high

transaction costs. This is especially the case when comparing the potential for demand-side improvement across industries. The objective of this article is to investigate the most important aspects of a variety of programming methods and funding mechanisms that have been used effectively in the past with the intention of providing energy efficiency solutions. It accomplishes this goal by pulling from a variety of the lessons that have been learned through the process of funding energy efficiency in developing nations. Case studies are used to investigate a wide variety of institutional issues that are related to the identification, packaging, designing, and monitoring of approaches that have been used to catalyse both conventional and novel methods of financing energy efficiency projects. These issues relate to the identification of approaches that have been used to catalyse both conventional and novel methods of financing energy efficiency projects.

Malik et al. (2011) studied estimating the impact of restructuring on electricity generation efficiency: the case of the Indian thermal power sector In this article, we study how the recent re-organization of the electrical sector in India has impacted the operating efficiency of coal-fired power plants in that country. Between the years 1995 and 2009, 85 percent of the coal-based generation capacity that is controlled by state governments was moved from vertically integrated State Electricity Boards into state-owned generating companies. These transfers took place in state-owned generating enterprises. We found that generating units in states that unbundled prior to the passage of the Electricity Act of 2003 experienced reductions in forced outages of approximately 25 percent and improvements in availability of approximately 10 percent, with the greatest effects appearing between three and five years after the restructuring. The Electricity Act of 2003 was passed in the United States in 2003. There is little evidence to suggest that the reforms have resulted in improvements to the thermal efficiency of power plants that are owned by the state.

Makajić Nikolić et al. (2011) studied Project finance risk evaluation of the Electric power industry of Serbia Because it is a field of strategic relevance, the energy sector is one of the most significant sectors to concentrate on when thinking about the expansion of a country, making it one of the most important areas to focus on overall. Activities that belong to the public sector and are normally subject to the control of the government in the majority of countries, such as the production of energy and the use of energy resources, are common examples of activities that belong to this sector. An examination of the risks that are inextricably linked to the activities of the publicly traded corporation known as Electric Power Industry of Serbia is presented in this article (EPS). EPS has started the process of re-organizing its operations in order to better prepare for the changes and challenges that will be brought on as a result of the recent reforms

that were adopted in the energy market. In order to get funding for the project, it was necessary to classify it in this manner (FMEA). A risk assessment was carried out for two possible scenarios that anticipated different sorts of changes to occur during the time period that was under consideration, and it was based on the current conditions. According to the results of the study, the potential strategic partner has to pay a heightened level of attention to the following aspects: price risks, estimation, investments, project activity neglect, quasi- risks, and debt collection.

Sharma, Tiwari, and Sood (2012) studied Solar energy in India: Strategies, policies, perspectives and future potential" Renewable energy sources and technologies have the ability to bring answers to the persistent energy difficulties that emerging nations like India are now facing. Emerging renewable energy technologies, such as solar thermal electricity (STE), also known as concentrated solar power (CSP), have the potential to be developed in India as a future possible alternative for the country's electricity supply. In this article, an attempt has been made to provide a concise summary of the many solar energy alternatives available in India, including their availability, present state, tactics, viewpoints, promotion policies, noTable successes, and future potential.

Hernández-Moro and Martínez-Duart (2013) studied "Analytical model for solar PV and CSP electricity costs: Present LCOE values and their future evolution In the first part of this article, we are going to perform a complete study of the historical annual production of energy as well as the total installed capacity of photovoltaic (PV) and concentrating solar power (CSP) technologies. This information, in conjunction with the annual pricing of PV modules and CSP systems, allows us to compute the experience curves and the learning rates that correlate to each of those curves. After that, we will go on to an in-depth explanation of the methodology that was used throughout the process of calculating the value of the levelized cost of electricity (LCOE) for photovoltaic and concentrated solar power systems. The levelized cost of energy (LCOE) calculation takes into account a variety of independent factors, including solar resource, discount and learning rates, initial cost and lifespan of the system, operating and maintenance expenses, and many more. Following that, we will present an in-depth description of the process by which certain values are allocated to each of these twelve variables. This appears to be particularly valuable in energy planning strategies such as tariff-in schemes, tax exemptions, and other similar programmes, as well as in the process of deciding how much to invest

Martínez Ceseña, Mutale, and Rivas-Dávalos (2013) studied "Real Options Theory Applied to Electricity Generation Projects: A review" Even in situations where there is a great deal of unpredictability, it is generally acknowledged that real options theory, often known as RO theory, may raise the value of initiatives. This is performed by mimicking the flexibility that

managers possess in order to adjust projects in line with changes that occur in their specific contexts. This allows for a more efficient and effective management of resources. On the basis of this, the RO theory might potentially be utilized to tackle the continuing energy and environmental concerns by raizing the value of electricity generating projects (EGP), in particular renewable energy production projects (REP)

(Siva Reddy et al. 2013) STUDIED "State-of-the-art of solar thermal power plants—A review V." Solar thermal power plants are one of the renewable energy sources that show a lot of potential for meeting the ever-increasing demand for conventional energy. Another renewable energy source that shows a lot of promise is wind power. When compared to earlier times, the per-kilowatt cost of solar power as well as the overall efficiency of the system are both much improved Acharjee (2013) studied "Strategy and implementation of Smart Grids in India The global electricity business is facing a number of issues that demand urgent attention to be paid to development, expansion, and variety into renewable energy resources such as wind. In this article, the current electricity situation in India is dissected, and possible future energy sources are laid forth for consideration. It is explained how the development of SG will have an impact on the social, economic, and electricity sectors.

(Schwarz et al. 2014) studied An AHP/ANP-based multi-criteria decision approach for the selection of solar thermal power plant investment projects In this article, the Analytic Hierarchy Process and the Analytic Network Process are used to assist the managing board of a significant Spanish solar power investment company in making a decision regarding whether or not to invest in a particular solar thermal power plant project and, if so, to determine the order of priority of the projects in the company's portfolio. The goal of this article is to help the managing board make a decision regarding whether or not to invest in a specific solar thermal power plant project Kablouti (2015) studied Cost of water use: A driver of future investments into water- efficient thermal power plants? This article investigates the economic and geoGraphical factors that have a role in determining whether or not new thermal power facilities should be built. The study that was conducted all around the globe and included a comprehensive evaluation of the data formed the foundation for this analysis. In today's world, the key reasons that drive investments are, to a lesser degree than the financial implications of water consumption, the availability of water and the law that governs its utilization. This research aims to contribute to the creation of effective policies and decision-making tools that will support long-term investments in solutions that will minimize water use. This is the objective of this study. In its conclusion, the paper argues that there should be a new investment choice model that takes into account the total value of water-related solutions rather than focusing solely on the disparities in direct cost that are

associated with the various technical possibilities. It does this by taking into account the overall value of water-related solutions.

Xu et al. (2016) studied “Prospects and problems of concentrating solar power technologies for power generation in the desert regions” Concentrated solar power plants, more commonly referred to as CSPs, are gaining popularity due to the fact that they have the ability to supply electricity throughout the day for base load applications in arid locations that get an exceptionally high amount of direct normal irradiance. This is one of the reasons why CSPs are gaining popularity (DNI). Solar tower power technologies are becoming the front runners among the various types of CSPs, particularly in the United States and around the world. These technologies have the potential to compete with conventional methods of power generation in terms of efficiency and levelized cost of electricity, and they are currently in the lead position. The possibility of adverse consequences on the surrounding environment is one more obstacle to overcome. Each of the issues is dissected in great detail, and suggestions for resolving the issues are provided in the form of several kinds of proposals.

Schinko and Komendantova (2016) studied “De-risking Investment into Concentrated Solar Power in North Africa: Impacts on the Costs of Electricity Generation It is of the highest importance to make the transition to a low-carbon energy system that is built on renewable energy sources if we are going to find a solution to the interlinked global crises of climate change and energy security. Nevertheless, more efforts to promote RES, such as reconsidering subsidies for fossil fuels, would be necessary.

Hirth and Steckel (2016) studied The role of capital costs in decarbonizing the electricity sector The generation of electricity through the use of low-carbon sources, such as renewable energy, nuclear power, and carbon capture and storage, requires a greater financial investment than the generation of electricity through the use of fossil fuel power plants, which produce carbon dioxide. These low-carbon sources include nuclear power, carbon capture and storage, and renewable energy. Therefore, high capital costs, also known as a high weighted average cost of capital (WACC), have a propensity to encourage the use of alternative fuels rather than fossil fuels. Countries that have low capital costs need to place a lower price on carbon emissions in order to achieve the same degree of decarbonization as nations that have high capital costs because countries with high capital costs need to put a higher price on carbon emissions. Because costs of capital are often higher in developing and emerging economies than they are in industrialized nations, it is particularly crucial to keep this fact in mind while discussing the economy of those sorts of countries. In this study, we utilize a numerical techno-economic model of the power system to carry out a quantitative analysis of the influence that high capital

costs have on the transformation of the energy system in response to climate policies. We provide evidence that shows how high capital costs may significantly reduce the effectiveness of carbon pricing. For instance, if the price of carbon emissions is set at USD50 per tonne and the WACC is set at 3 percent, the cost-optimal power mix would comprise 40 percent renewable energy sources. When both the price of carbon and the weighted average cost of capital are maintained constant at 15 percent, the cost-optimal mix comprises practically very little renewable energy sources. There is no significant reduction in emissions even with a carbon price of up to USD50 per tonne and a WACC of 15 percent; nevertheless, with the same WACC and carbon price, emissions are dropped by almost half when the WACC is lowered to 3 percent.

The purpose of this study is to evaluate the influence that historical shifts in India's power sector have had on the continuing growth of on-grid solar energy and to assess the possibility of future solar sector development. In addition, the study will also evaluate the possibility of future solar sector development. we consider the potential hurdles and openings that lie ahead for the expansion of the solar industry by looking into the future and having a converzation about the ongoing support of the government as well as the impending rivalry between various sources. In the last section of the article, we discuss the necessary actions that need to be made in order to guarantee the successful completion of the goals set for solar power in the future.

Zeng et al. (2017) studied A review of renewable energy investment in the BRICS countries: History, models, problems and solutions" This article is a survey of the past history of the development of renewable energy in the BRICS nations. Bank finance, institutional loans, industry funds, and international funding are the many financing strategies that BRICS nations are using in order to expand their renewable energy industries. According to the findings of this study, there are a number of issues with funding in the BRICS nations. These issues include a scarcity of financing channels, a lack of investment for small and medium-sized firms, and flawed policies from the government. Expanded capital markets, the financing of leasing services, build-operate- transfer and build-own-operate projects are some of the solutions to these problems. In addition, a financial citizen participation model similar to that used by Germany and the European Union emissions trading system should be used (EU ETS It has been recommended that a regional reserve ratio monetary policy be implemented in order to make it possible for areas to promote renewable energy.

Jeyakumar et al. (2017) studied "Technology Investment Decisions under Uncertainty: A New Modeling Framework for the Electric Power Sector In order to effectively manage carbon dioxide (CO 2) emissions from the sector of the industry that generates electric power that is dominated by fossil fuels, it is essential to strike an effective balance between the adoption of

current technology and the development of new technology. The returns on investments made in research and development are inherently unpredicTable, despite the fact that there is a varied range of chances for financial investment in technological breakthroughs. However, the development of new technologies and the choices that are made regarding research and development have the potential to help lower the total costs of cutting emissions down to a more manageable level".

Mittal, Ahlgren, and Shukla(2018) studied "Barriers to biogas dissemination in India: A review" Biogas is a potentially renewable technology that has evolved in recent years, and it has the ability to transform many types of waste, including those from agriculture, animals, industry, and municipalities, into usable forms of energy. The objective of this study is to determine not only the technological but also the non-technological barriers that are inhibiting the widespread use of biogas in India. This is due to the fact that different biogas systems are at varying stages of technological development, feedstock availability and quality, supply chain, awareness level, and policy support.

Biswal et al. (2018) studied "A framework for assessment of SSCM strategies with respect to sustainability performance: an Indian thermal power sector perspective" The tremendous pace of population growth in India has resulted in a major rise in the urgency of generating vast quantities of energy, especially electrical energy. This is owing to the fact that these activities have a detrimental effect not only on ecosystems but also on quality of life and the exhaustion of natural resources. In addition to this, natural resources are being depleted.

Skoczkowski et al. (2018) studied "Impact assessment of climate policy on Poland's power sector This article examines the effects that the Emissions Trading System (EU ETS) will have on Poland's conventional energy industry between the years 2008 and 2020, as well as beyond that, up to the year 2050. It has been established that there is a significant political and economic interconnectedness between the coal and power sectors, as well as the influence that is created by the involvement of the EU ETS in various technological groups of power plants. In conclusion, the total expenses associated with such a change have been analyzed and contrasted with the financial assistance that is being provided by the EU. In order to minimize stranded expenses, they need to adjust the power capacity in accordance with the expected future demand. The changes have to be comprehensive, built on a broad political agreement, and they can't be skewed against the coal industry in any way. The future energy mix and the technologies that correspond to it will need to be properly conceived, matched, and should be able to maintain their consistency over the long term. Because coal-based power capacity is getting close to the end of its lifespan, there is an economically feasible alternative to begin switching fuels, which

will be followed by the replacement of existing equipment. The real advantages and costs associated with the energy transition need to be explained to the general public and distributed properly among all relevant parties". There is a possibility that the social costs and consequences in coal-dependent areas will be considerable, particularly in the viewpoint of the near term; nevertheless, the transition will eventually provide rewards to the whole community.

Zhao et al. (2018) studied "ESG and Corporate Financial Performance: Empirical Evidence from China's Listed Power Generation Companies These days, publicly traded firms all over the globe are moving their focus from the short-term aim of increasing profits to the long-term goal of achieving environmental, social, and governance (ESG) sustainability. People are beginning to understand that environmental, social, and governance (ESG) issues have emerged as a significant risk factor for corporations and may have an impact on a business's financial performance and profitability. Recent studies have shown that a strong performance with regard to ESG factors might increase financial success in some nations the findings indicate that strong environmental, social, and governance (ESG) performance may, in fact, increase financial performance, which has important ramifications for shareholders, management of companies, decision- makers, and regulators of industries.

Reddy (2018) studied economic dynamics and technology diffusion in indian power sector when it comes to the challenges of energy security and climate change on a global scale, policymakers are growing more worried about the method in which power is generated and used. It is likely that renewable energy sources, particularly solar and wind energy, will play a significant role in the provision of dependable and sustainable electricity to consumers in such a scenario.. The amount of power that will be produced in the future from renewable sources will be significantly influenced by a number of factors, including the anticipated level of production costs, the degree of government support for financial investments in the renewables sector, and other factors. Using the levelized cost methodology, one is able to make a direct comparison between the different methods of generating energy in terms of their initial investment costs, ongoing operating expenditures, and fuel prices. This paves the way for the widespread adoption of technologies that are connected to alternative or renewable forms of energy within the Indian power sector. Polzin et al. (2019) studied How do policies mobilize private finance for renewable energy?—A systematic review with an investor perspective In light of the gravity of the climate change crisis and the billions of dollars spent worldwide on policies to encourage renewable energy (RE), it is of the utmost importance to determine which policies are successful. The analysis of specific design elements of feed-in tariffs, auctions, and renewable portfolio standards reveals that these instruments are most effective when they are designed in such a way

that they reduce the risk of renewable energy projects while simultaneously increasing the return on investment. We distil major implications for policymakers who want to encourage the development of clean technology and renewable energy more generally.

Irfan, Zhao, Ahmad, and Mukeshimana (2019) studied Critical factors influencing wind power industry: A diamond model based study of India As a result of its rapid industrialization and continuously rizing population, India's need for energy has multiplied by an enormous factor in recent years. Wind power offers a number of promizing avenues for contributing to the nation's effort to meet its energy demands. Because it is a renewable resource, it has a significant potential for resource use.

Irfan, Zhao, Ahmad, Batool, et al. (2019) studied Competitive assessment of Indian wind power industry: A five forces model" Overpopulation and expanding industrial requirements are two of the primary factors contributing to India's severe energy-related challenges, which also include a shortage of fossil fuel supplies, emissions of greenhouse gases, and a widening imbalance between power demand and supply. In the meanwhile, a considerable increase in the cost of power has made it very difficult for commercial and industrial users to acquire energy at a price that is affordable for their budgets. This has made it very difficult for commercial and industrial consumers. In a similar vein, the wind industry is also currently grappling with a variety of challenges at the present time.

Qiu et al. (2020) studied "Multi-Faceted Analysis of Systematic Risk-Based Wind Energy Investment Decisions in E7 Economies Using Modified Hybrid Modeling with IT2 Fuzzy Sets" This study was conducted with the intention of investigating and evaluating the systemic risks that are linked with financial investments in wind energy. Due to the use of this methodology, the E7 countries are taken into consideration throughout the course of the inquiry. This step was necessary in order to complete the process. Second, countries who are members of the E7 group were evaluated based on how well they manage the risks that are linked with investments in wind energy.

J and Majid(2020) studied "Renewable energy for sustainable development in India: current status, future prospects, challenges, employment, and investment opportunities" The implementation of renewable energy sources in India will fulfil a number of important aims, the most important of which are the acceleration of economic development, the enhancement of energy security, the enhancement of access to energy, and the mitigation of climate change. It is possible to accomplish sustainable development by making use of sustainable energy and by ensuring that citizens have access to energy that is not only modern but also affordable, reliable, and kind to the environment. It is possible that India's position as one of the top leaders in the

world's most attractive markets for renewable energy markets may be ascribed to the country's substantial support from the federal government as well as the improving economic environment.

Pont, Gueguenteil, and Johnson (2020) studied "Perceptions of climate- related investment risk in Southeast Asia's power sector The purpose of this article is to investigate how investors in the power industry perceive risks associated with climate change and how they incorporate these risks into investment decision-making. In doing so, we seek to explain (a) why countries in Southeast Asia are making plans for – and investors are continuing to invest in – fossil-based power generation rather than options for renewable or clean generation; and (b) what it would take to make a substantial shift in investment away from fossil generation and toward renewable options in the region.

Baumli and Jamasb (2020) studied Assessing Private Investment in African Renewable Energy Infrastructure: A Multi-Criteria Decision Analysis Approach The lack of access to affordable energy continues to be a problem in many African nations, which slows economic growth and exacerbates existing socioeconomic disparities. In order to get a better understanding of the obstacles that prevent private involvement in African renewable energy projects, the purpose of this article is to distinguish between the financial and non-financial factors that influence investment choices.

Probst et al. (2021) studied Leveraging private investment to expand renewable power generation: Evidence on financial additionality and productivity gains from Uganda In order to effectively counteract the consequences of climate change, there has to be a rapid rise in the total amount of money spent in clean power infrastructure, as well as a shift in the direction of that investment. Because the majority of the increase in greenhouse gas emissions that will occur between now and 2050 will come from nations with low and moderate incomes, it is absolutely essential to identify solutions to reduce climate change while still fulfilling development objectives that do not break the bank.

However, recent research has shown that broad financing mechanisms, such as the Clean Development Mechanism (CDM) and existing carbon markets, have specific limits that are built into them by their very nature. This has resulted in a growing interest in the design of innovative investment support schemes, such as modifications of feed-in tariffs (FiTs), which may be more cost effective and better targeted toward particular outcomes when compared to traditional deployment subsidies or broad financing mechanisms.

Johnson, du Pont, and Gueguen-Teil (2021) studied Perceptions of climate-related risk in Southeast Asia's power sector When considered in light of the growing global drive to address climate change and the building worries about the possible ramifications of climate change, the

current expectations of continuous investment in fossil fuels in Southeast Asia's power sector seem odd. In this research, we analyze how investors in the power business perceive the risks connected with climate change and how they weigh these risks when making investment choices. Specifically, we look at how investors in the United States see the hazards associated with climate change. By doing so, we are attempting to explain why nations in Southeast Asia are making plans for, and investors are continuing to invest in, power production that is mostly based on fossil fuels at the cost of renewable or clean generating sources. In addition, we want to find out what it would take to achieve a significant change in investment away from generation based on fossil fuels and toward renewable possibilities in the area. This is something that we want to figure out. The results of an analysis of 17 interviews with industry experts suggest that there is a significant gap between the need to integrate climate-related risks within the decision-making process of investors and the way in which these risks are currently being integrated and addressed in the Southeast Asian power sector.

Jelti et al. (2021) studied Renewable Power Generation: A Supply Chain Perspective" The shift to a system that is more sustainable and clean has, in recent years, placed an emphasis on accelerating the development of technologies that utilize renewable energy sources. To accomplish high levels of efficiency and sustainability in the power sector, the primary elements that have an impact on the performance of the supply chain are first identified, and then key performance indicators associated with the renewable energy supply chain are developed.

Shrimali (2021) studied "Financial Performance of Renewable and Fossil Power Sources in India" The objective of this study is to explore and compare the financial performance and risk profile of the power industry that relies on fossil fuels with that of the sector that relies on renewable energy, both historically and in the present day. The outcomes of our investigation are summarised in the following.

To get things started, power portfolios that make use of renewable energy have, historically speaking, proven more appealing investment qualities. These features include annual returns that are higher by an average of 12 percent, yearly volatility that is lower by an average of 20 percent, and risk-adjusted returns that are higher by an average of 61 percent. In addition to this, these portfolios have traditionally shown a weaker connection to the risk that is associated with the market. Second, investors see investments in fossil fuel power as being associated with a higher level of risk compared to investments in renewable energy power. "This is due to the fact that the anticipated returns on loan provided to the fossil fuel power industry are at least 80 basis points greater than the anticipated returns on debt provided to the renewable energy power sector. Third, the main risk factors that are responsible for the risk perception of both fossil fuels and

renewable energy are counterparty risk, grid risk, and financial sector risk; the risk associated with the counterparty is by far the most significant risk, followed by the risk associated with the grid, and then by the risk associated with the financial sector". To say the least, the implications of our study for monetary investments in these technologies in India are staggering, and this is just scratching the surface.

Mahbub et al. (2022) studied "Factors encouraging foreign direct investment (FDI) in the wind and solar energy sector in an emerging country" By employing the OLI and TCE theories in an investigation of the factors that influence the level of foreign direct investment (FDI) in the renewable energy industry in Bangladesh, this study helps to fill a gap in the existing body of literature. Specifically, this study looks at the factors that influence the level of FDI in the renewable energy industry in Bangladesh. In order to accomplish this, it investigates the factors that influence the decisions that companies in the United Kingdom, Singapore, the United States of America, Denmark, Thailand, China, and South Korea make regarding their foreign direct investment activities in the renewable energy sector in Bangladesh.

(Athawale and Felder 2023) studied "Overbuilding transmission: A case study and policy analysis of the Indian power sector" As part of the policies that aim to substantially increase the amount of renewable energy that is produced as well as electrify a significant portion of the transportation and industrial sectors in order to meet reduction targets for greenhouse gas emissions, it is envisioned that an extensive expansion of the transmission system will be carried out. When anticipatory transmission planning is employed, when significant promised returns are made, and when there is a lack of oversight, there is a possibility of overbuilding the transmission system.

This cautionary conclusion drives numerous proposed improvements to public policy in order to prevent future overbuilds while encouraging economically efficient and ecologically sound transmission development". These goals can be achieved by improving economic efficiency and maintaining ecological integrity. The findings of this research led to the implementation of these policies.

Hughes and Downie (2023) studied "Bilateral finance organizations and stranded asset risk in coal: the case of Japan" We conduct an analysis of how climate-related financial risk is managed by bilateral finance organizations and other associated governmental entities engaged in the planning and execution of funding for thermal coal power generating technologies. The Japanese bilateral funding of thermal coal power production in the Asia-Pacific region is the primary subject of our empirical investigation. After looking over documents that are available to the

public from nine different organizations and supplementing our research with interviews, we came to the conclusion that while some Japanese lending and policy-setting bodies take climate risk into consideration, none of them are required to consider the risk that infrastructure investments may become stranded

2.8 Policy Recommendations

The literature on enhancing investment attractiveness and sustainability in the Indian thermal power sector underscores the importance of comprehensive regulatory reforms, financial incentives, technological advancements, environmental sustainability, and stakeholder collaboration. Bhattacharyya (2005) and Bhattacharya and Patel (2020) highlight the need for simplifying approval processes, establishing single-window clearance systems, and revising tariff policies to ensure fair returns on investment. Financial incentives, such as tax breaks, subsidies for cleaner technologies, and innovative financing instruments like green bonds and infrastructure investment trusts, are advocated by Reddy and Reddy (2016) and Mukherjee et al. (2017) to offset high initial costs and attract private investments. Technological advancements, including the adoption of supercritical and ultra-supercritical power plants and investments in R&D for innovations like carbon capture and storage, are emphasized by Sharma and Jain (2019) and Reddy and Reddy (2016) for improving efficiency and reducing emissions. Environmental sustainability measures, such as stricter emission standards, integrating renewable energy sources, and comprehensive environmental management systems, are recommended by Mukherjee et al. (2017) and Rao and Rao (2021) to address the sector's environmental impact. Furthermore, fostering public-private partnerships, establishing dialogue platforms among stakeholders, and forming advisory councils are suggested by Bhattacharyya (2005) and Sharma and Jain (2019) to facilitate effective collaboration and consensus-building. By implementing these strategies and policy recommendations, the thermal power sector can overcome its challenges, attract sustainable investments, and contribute significantly to India's energy security and economic growth. echnological advancements, including the adoption of supercritical and ultra-supercritical power plants and investments in R&D for innovations like carbon capture and storage, are emphasized by Sharma and Jain (2019) and Reddy and Reddy (2016) for improving efficiency and reducing emissions. Environmental sustainability measures, such as stricter emission standards, integrating renewable energy sources, and comprehensive environmental management systems, are recommended by Mukherjee et al. (2017) and Rao and Rao (2021) to address the sector's environmental impact. Furthermore, fostering public-private partnerships, establishing dialogue platforms among stakeholders, and forming advisory councils are

suggested by Bhattacharyya (2005) and Sharma and Jain (2019) to facilitate effective collaboration and consensus-building. Collaborative efforts are further supported by Bhattacharya and Patel (2020), who highlight the need for continuous technological upgrades and modernization of existing plants to maintain competitiveness and appeal to investors. Integrating renewable energy sources with thermal power, as suggested by Rao and Rao (2021), can create hybrid systems that enhance reliability and sustainability while reducing environmental impact. By implementing these strategies and policy recommendations, the thermal power sector can overcome its challenges, attract sustainable investments, and contribute significantly to India's energy security and economic growth. The integration of these diverse approaches ensures a balanced strategy that addresses both economic viability and environmental sustainability, making the sector more resilient and attractive to investors.

Literature Gap: While many studies emphasize the importance of regulatory reforms, there is a lack of detailed analysis on the implementation challenges and specific bureaucratic obstacles investors face at different stages of project development. Bhattacharyya (2005) and Bhattacharya and Patel (2020) highlight the need for streamlining approval processes and establishing single-window clearance systems, but they do not delve into the practical hurdles in implementing these reforms. Comprehensive case studies and empirical research focusing on these aspects could provide deeper insights into effectively overcoming regulatory barriers. Despite extensive research on enhancing investment attractiveness and sustainability in the Indian thermal power sector, several gaps persist that necessitate further investigation. Regulatory reforms are often highlighted, yet detailed analysis of the practical implementation challenges and specific bureaucratic obstacles remains sparse (Bhattacharyya, 2005; Bhattacharya & Patel, 2020). Financial incentives like tax breaks and green bonds are proposed (Reddy & Reddy, 2016; Mukherjee et al., 2017), but empirical evidence on their effectiveness in the Indian context is limited, necessitating more rigorous quantitative studies. While technological advancements and innovations like carbon capture and storage are documented (Sharma & Jain, 2019; Reddy & Reddy, 2016), the socio-economic implications, such as impacts on employment and local communities, are not thoroughly explored. Environmental sustainability measures are discussed (Mukherjee et al., 2017; Rao & Rao, 2021), but comprehensive studies on the long-term impacts of hybrid systems integrating renewable energy with thermal power are lacking. Additionally, there is insufficient empirical research on fostering effective public-private partnerships and optimizing stakeholder collaboration (Bhattacharyya, 2005; Sharma & Jain, 2019). Research on the feedback loop between policy implementation and investor response is scarce, highlighting

the need for dynamic policy frameworks that adapt to market conditions (Bhattacharya & Patel, 2020). Lastly, the socio-economic impacts of thermal power investments, including effects on local communities and income distribution, require more detailed examination. Addressing these gaps through targeted research will provide a deeper understanding of the sector's challenges and opportunities, informing more effective policy-making and strategic planning to support the sector's long-term viability and growth.

In this chapter, we have established that there is a strong theoretical link between the thermal power sector in India has been a significant source of electricity generation, primarily relying on coal due to its abundance and cost-effectiveness. However, the sector has faced challenges, including environmental concerns related to emissions and air pollution. In response, the Indian government has implemented policy measures to promote cleaner technologies and renewable energy sources. One major challenge is the issue of stranded assets, as many thermal power plants have become economically unviable with the rise of renewable energy. This has led to underutilized capacity and financial losses for power producers. To address this, the government has introduced competitive bidding for power procurement and set ambitious targets for renewable energy capacity addition. the thermal power sector continues to play a vital role in meeting India's electricity demand, especially in areas where renewable resources are limited. However, to ensure a sustainable and resilient energy future, the industry must adapt and embrace cleaner practices, reducing its environmental impact and increasing its efficiency. The ongoing reforms in the sector aim to strike a balance between traditional thermal power and the growing importance of renewable energy sources in India's energy mix.

CHAPTER III

METHODOLOGY

3.1 Overview of the Research Problem

Insights and chances for improvement may be gained by studying the historical financial investment climate in India's thermal power industry, which provides a formidable research task. This research dives into the complex web of this industry's investment choices in search of trends, roadblocks, and opportunities for growth. While the thermal power industry has long served as a cornerstone of India's energy infrastructure, it has recently come up against challenges like increased regulation, environmental concerns, and technical improvements. Poor investment returns, financial hazards, and inefficiencies in operations have frequently resulted from these problems. This study aims to draw useful lessons for future decision-making by studying the relationship between prior investment decisions and their outcomes. The research hopes to offer workable changes by analysing existing regulatory structures, technology developments, and risk management techniques. This study aims to help India's thermal power industry expand sustainably by resolving key financial issues, creating a more robust investment climate, and bringing the industry into line with the country's wider energy ambitions.

3.2 Operationalization of Theoretical Constructs

The process of operationalizing theoretical constructs is crucial in translating high-level ideas into concrete, observable, and studyable phenomena. The term "operationalization" refers to the process of turning important theoretical concepts into observable measurements for analysis, and it is central to our study of financial investment choices in India's thermal power industry.

The efficiency with which investment choices provide profits is quantified by this concept. It may be put into practise with the use of measures like ROI, NPV, and IRR, which measure the monetary benefits gained from an investment.

Financial risk mitigation techniques are evaluated as part of the operationalization of the risk management concept. Risk management frameworks, risk hedging strategies, and other factors may all play a role.

Incorporation of Innovation Metrics might include R&D spending, patent applications, and

the frequency with which innovative technologies are adopted.
Development schedules, construction delays, and other contributors to projects finishing onor beyond time may all be monitored to gauge this concept.
Our study is able to compare and contrast investment choices in the thermal power industry by operationalizing these theoretical constructs. These functional measurements allow for empirical research, allow us to draw relevant conclusions, and allow us to recommend changes that may be implemented in the sector's financial decision-making process.

3.4 Variables in the Study: Operational Definitions

1. Investment Patterns

Definition: The specific trends and characteristics of financial investments in the Indian thermal power sector, including the types of investments (equity, debt, government funding), sources of funding (domestic, foreign), and the distribution of investments across different types of power plants.

Operationalization: This will be measured by collecting data on the amount and type of financial investments made over a specific period, categorized by the source and type of investment, and analyzed through financial reports, industry publications, and investment records.

2. Factors Influencing Financial Investment Decisions

Definition: The key elements that impact the decision-making process for financial investments in the thermal power sector. These factors include economic conditions, government policies, market demand, technological advancements, and environmental regulations.

Operationalization: This will be assessed through surveys and interviews with key stakeholders in the thermal power sector, including investors, government officials, and industry experts. Additionally, secondary data from financial analyses and policy documents will be used to identify and quantify these factors.

3. Challenges and Barriers to Investment

Definition: The obstacles and difficulties faced by investors in the thermal power sector, including regulatory, economic, and environmental challenges.

Operationalization: These will be identified through qualitative analysis of interviews and surveys with investors and industry experts, as well as a review of regulatory and policy documents. Quantitative data on project delays, cost overruns, and financial distress cases will also be collected and analyzed.

4. Regulatory Factors

Definition: The set of rules, laws, and guidelines governing the thermal power sector, which can affect the ease of investing and operating within the industry.

Operationalization: This will be measured by analyzing the regulatory framework, compliance requirements, and changes in policies over time. Surveys with industry participants will be conducted to assess the impact of these regulations on investment decisions.

5. Economic Factors

Definition: The economic conditions and trends that influence the investment climate in the thermal power sector, including GDP growth, inflation rates, interest rates, and energy demand.

Operationalization: This will be evaluated using macroeconomic data from government publications, economic reports, and market analyses. The impact of these factors on investment decisions will be further explored through stakeholder interviews and surveys.

6**. Environmental Factors**

Definition: The environmental considerations and regulations that impact investment in the thermal power sector, including emissions standards, pollution control measures, and sustainability requirements.

Operationalization: This will be measured through an analysis of environmental regulations, compliance costs, and the adoption of green technologies in the sector. Data will be collected from environmental reports, regulatory bodies, and industry surveys.

7. Strategies and Policy Recommendations

Definition: Proposed actions and guidelines aimed at improving the attractiveness and sustainability of investments in the thermal power sector.

Operationalization: These will be developed based on the analysis of current investment patterns, challenges, and barriers. Surveys and interviews with industry experts and policymakers will help formulate effective strategies. The effectiveness of these recommendations will be evaluated through scenario analysis and stakeholder feedback.

8. Investment Attractiveness

Definition: The degree to which the thermal power sector is considered favorable for financial investments, influenced by factors such as risk, return, regulatory environment, and market potential.

Operationalization: This will be assessed through investor sentiment surveys, analysis of investment trends, and comparison with other sectors. Key indicators such as return on investment (ROI), risk assessments, and investment inflows will be used to measure attractiveness.

9. Sustainability

Definition: The ability of the thermal power sector to maintain long-term viability and environmental responsibility, balancing economic growth with environmental protection.

Operationalization: This will be measured by evaluating the adoption of sustainable practices, compliance with environmental regulations, and the integration of renewable energy sources. Sustainability indices and performance metrics will be used to quantify this variable.

By operationalizing these variables, the study aims to provide a comprehensive understanding of the financial investment landscape in the Indian thermal power sector and offer actionable insights for enhancing its attractiveness and sustainability.

3.5 Research Purpose and Questions

The study's main goals and objectives are summed up in the research purpose, which explains why the study is being conducted. Our study goal is to understand the factors that influence the thermal power industry in India's financial investment choices.

The major objective of this study is to investigate the factors that influence thermal power industry investment choices in India. This research aims to increase our comprehension of the investment-related elements that affect the development and sustainability of the industry by reviewing historical experiences, identifying problems, and suggesting workable changes. The study's primary purpose is to help Indian politicians, investors, and industry players make better energy-related decisions. The ultimate goal of this study is to help improve India's thermal power industry so that it can meet the country's energy demands while both protecting the environment and making a profit.

1. What are the key factors that influence financial investment decisions in the Indian thermal power sector?
2. What lessons can be drawn from past experiences in financial investment decisions within the Indian thermal power sector ?
3. What are the current challenges and limitations faced in financial investment practicesin the Indian thermal power sector?
4. What strategies and recommendations can be proposed to enhance financial investment decisions in the Indian thermal power sector?

3.6 Research Design

This study will use a mixed-method design, combining qualitative and quantitative approaches. The research aims to investigate financial investment decisions within the Indian thermal power sector, focusing on extracting valuable lessons from past experiences and proposing strategies for improvement. The study will employ a mixed-methods approach, combining quantitative analysis of financial data with qualitative insights gathered through interviews and surveys with key stakeholders. Quantitative analysis will involve evaluating the financial performance of thermal power projects using metrics such as net present value (NPV), internal rate of return (IRR), and profitability ratios. This analysis will provide a comprehensive understanding of investment outcomes across different projects and timeframes. Concurrently, qualitative data collection will involve engaging with stakeholders including investors, policymakers, industry experts, and project developers to capture their perspectives, experiences, and recommendations regarding investment decisions in the thermal power sector. Thematic analysis will be used to identify common challenges, success factors, and areas for improvement. The integration of quantitative and qualitative findings will inform the development of actionable recommendations for enhancing financial investment decisions in the sector. These recommendations may

encompass regulatory reforms, risk mitigation measures, technology adoption strategies, and stakeholder engagement practices. Ultimately, the research aims to contribute to the advancement of knowledge and decision-making processes within the Indian thermal power sector, facilitating sustainable and effective investment practices.

3.7 Population and Sample

I select 110 respondents but 3 respondents no proper give answer so I select 107 population size in this study is constituted by financial investment decisions made in the Indian thermal power sector within a specified timeframe. Participant Selection

One of the most important steps in designing a study is deciding which people or organizations will take part in it and provide useful information and perspectives. Our study's selection procedure is described below in the context of our investigation of the economics of India's thermal power industry: A representative cross-section of the thermal power industry's important players will be surveyed for this study's sample.Professionals in related fields, as well as financial analysts, regulatory authorities, project creators, investors, and ecologists, are included here. To guarantee a wide variety of opinions, the selection procedure will use a mix of purposive sampling, in which individuals with extensive knowledge and expertise in the industry are expressly selected,and random sampling. To get a complete picture of the intricacies of the industry, we will choose participants based on their positions, areas of expertise, and participation in investment choices. Interviews, questionnaires, and maybe focus groups will be used to

compile information about the difficulties, past successes, and future plans for financial investments in the thermal power industry. The study strives to get a more nuanced and thorough knowledge of the research topic and its possible solutions by choosing a diverse sample of participants to reflect the population at large.

The selection of participants in this study is justified by the need to capture diverse perspectives and expertise relevant to financial investment decisions in the Indian thermal power sector. Investors are included to understand their decision-making processes and risk perceptions, while policymakers and regulatory authorities provide insights into the regulatory environment and policy incentives. Industry experts and consultants offer market intelligence and best practices, while project developers and operators share firsthand experiences and project-specific insights. Financial institutions contribute insights into financing trends and risk management strategies. By including these participants, the study ensures a comprehensive analysis of investment dynamics and facilitates the development of

informed recommendations for improving investment decisions in the thermal power sector.

Instrumentation

The primary instrument for data collection in this study will be a structured questionnaire, complemented by semi-structured interviews and secondary data analysis. The questionnaire will be designed to capture quantitative data, while the interviews will provide qualitative insights. Additionally, existing financial reports, industry publications, and regulatory documents will be analyzed to gather secondary data.

3.8 Methods of data collection

Data collection is a process in which data is systematically gathered and evaluated. These data are gathered and analysed for specified criteria. It will analyse the findings and clarify the linked questions on the basis of this examination. While techniques differ by field, the focus remains on ensuring that the collection is accurate and honest. The fundamental purpose underlying the accumulation of information is the collection of evidence whose standard is excellent. After that it changed for analytical purposes. It gives answers to the queries imposed.

- **Primary information**

This kind of information is collected with the assistance of the survey. This survey has a chain of issues. These issues are well organized. This survey is done to gather information on *"Financial Investment Decisions in India Thermal Power Sector Lessons of Experience And Proposals For Improvement"*

- **Secondary information**

The examination of this material has saved a lot of time. If not, this time is used for the accumulation of data. It can provide records whose quality is excellent in support of quantitative information. Individual researchers cannot gather these data alone.

The sources from which this kind of information is collected are:

1. World Wide Web, daily papers, presses, transmission channels, research papers, etc.

2. Book store, education and other sources.

In addition, corporate and commercial specialists believe secondary data to be important since it

is not feasible to conduct an inquiry that adequately identifies previous changes or growth. Secondary information may be collected through research papers and publications.

3.9 Analysis of data

The analysis of the data is a data inspection, purification, transformation and modelling process designed to detect valuable data, to draw conclusions and to assist decision-making. Data analysis includes many aspects & methodologies in different commercial, research and social sciences areas, including diverse approaches under a number of titles.

Analysis is a procedure in which the whole item is split into its many components in support of a certain evaluation. A procedure that is done to get natural knowledge is an analysis of the data. It was modified as a useful tool in support of users' decision-making.

3.10 Statistical Treatment of Data

The data will be analyzed with the help of descriptive statistics. Statistical techniques i.e. Percentage will be used to check to what extent the opinion/ suggestions /views matters for the successful implementation of inclusive practices.

The Survey System contains the survey statistics most frequently used. It includes some or all of the following methods :

1. Percent
2. Medians
3. Means
4. Standard divergences
5. t-tests”

3.11 Piolet study

To obtain high-quality outcomes, a good research study with relevant experimental design and accurate performance is required. Analysing its feasibility prior to performing the main study (also known as the full study or large-scale main trial) can be very beneficial for this purpose. A pilot study is the first step of the entire research protocol and is often a smaller-sized study assisting in planning and modification of the main study. More specifically, in large-scale clinical studies, the pilot or small-scale study often precedes the main trial to analyze its validity. Before a pilot study begins, researchers must fully understand not only the clear purpose and question of the study, but also the experimental methods and schedule. Researchers become aware of the procedures involved in the main study through the pilot study,

which aids in the selection of the research method most suiTable for answering the research question in the main trial. Despite the benefits and importance of the pilot study, researchers often are not interested. A pilot study is performed either as an external pilot study independent of the main study or as an internal pilot study included in the research design of the main study. This article describes the core items of an external pilot study and misconceptions and ethical aspects of a pilot study and introduces the appropriate method for reporting the outcomes of the pilot study.

3.12 Reliability and Validity

Two important qualities of surveys, as with all measurement instruments, are consistency and accuracy. These are assessed by considering the survey's reliability and validity.

There are a number of different statistics we can use to estimate reliability and to make an assessment of validity. Choices of which statistics to consider will depend on the survey design and purpose. Some statistics may be more suiTable in certain situations, and different statistics will give different results, reflecting different aspects of the survey's performance. Reliability and validity are also not fixed qualities, they may change over time. Consequently it is desirable to use a number of alternative statistics to get a rounded assessment of a survey's qualities.

3.13 Reliability

Reliability is the extent to which an instrument would give the same results if the measurement were to be taken again under the same conditions: its consistency.

1. One estimate of reliability is test-retest reliability. This involves administering the survey with a group of respondents and repeating the survey with the same group at a later point in time. We then compare the responses at the two time points.
2. An alternative is split-half reliability. Here we divide the survey arbitrarily into two halves (odd and even question numbers, for example), and calculate the correlation of the scores on the scales from the two halves. Reliability is also a function of the number of questions in the scale, and we have effectively halved the number of questions. So we adjust the calculated correlation to estimate the reliability of a scale that is twice the length, using the Spearman Brown formula.
3. Cronbach's alpha is another measure of internal consistency reliability. For surveys or assessments with an even number of questions Cronbach's alpha is the equivalent of the average reliability across all possible combinations of split-halves.

Split half, Cronbach's alpha and Test-Retest reliability values

Methods	**N**	**Index on reliability**
Split- Half	107	0.912

Test-Retest	107	0.87
Cronbach's alpha	107	0.902

3.14 Validity

Questionnaire Validity

This measures the degree of agreement of the results or conclusions gotten from the research questionnaire with the real world. Steps in validating a questionnaire include;

Establish face validity

First, have people who understand your topic go through your questionnaire. They should check if your questionnaire has captured the topic under investigation effectively. Secondly, get an expert on questionnaire construction to check your questionnaire for double, confusing and leading questions.

3.15 Interview questionnaire

Interview questionnaire was designed by keeping the key parameters or factors for the Industry such as:

1. Past Investments Parameters:
2. Changes in Evaluation Factors:
3. Sources for Projected Energy Demand:
4. Addressing Environmental Impact and Technological Advancements:
5. Financing Thermal Power Plants:
6. Financial Metrics for Investment Attractiveness:
7. Influence of Government Policies and Incentives:
8. Key Factors for Poor Returns in Past Investments:

3.16 Limitation of the Study

- Limited response rate from key stakeholders might affect the representativeness of the survey data.
- Potential biases in self-reported data from questionnaires and interviews could influence the study's findings.
- Difficulty in accessing up-to-date and comprehensive secondary data sources may limit the scope of analysis.
- Regulatory and policy changes during the study period could impact the relevance of

the findings.

- Generalizability of the results may be constrained by focusing solely on the Indian thermal power sector.

3.17 Challenges Encountered

Reluctance on the part of participants to respond thru normal questionnaire via email, so I was compelled to visit them in person and get the questionnaire filled and also collected replies via interview schedule

CHAPTER IV

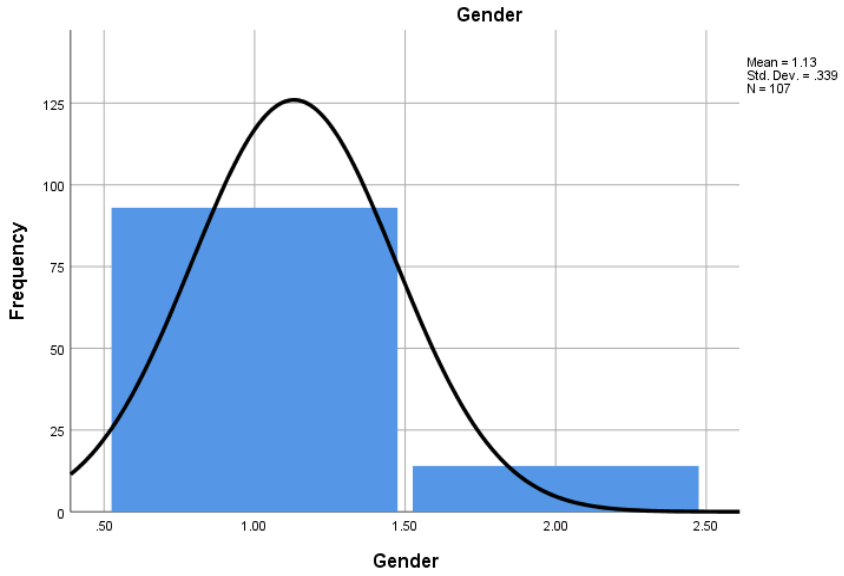
4.1 Data analysis

Data analysis is the process of inspecting, cleaning, transforming, and modelling data in order to discover useful information, draw conclusions, and support decision-making. It involves a wide range of techniques and methods to explore and analyze data, including statistical analysis, data visualization, and machine learning. The main goals of data analysis are to identify patterns and trends, make predictions, and generate insights that can inform decisions and drive action. It involves using data to answer specific questions, uncovering relationships and dependencies, and testing hypotheses. Effective data analysis requires a combination of technical skills, domain expertise, and critical thinking. It involves working with large and complex datasets, choosing the right tools and techniques for the job, and communicating findings clearly and effectively.

Table 4.1 Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	93	86.9	86.9	86.9
	Female	14	13.1	13.1	100.0
	Total	107	100.0	100.0	

Graph 4.1 Gender



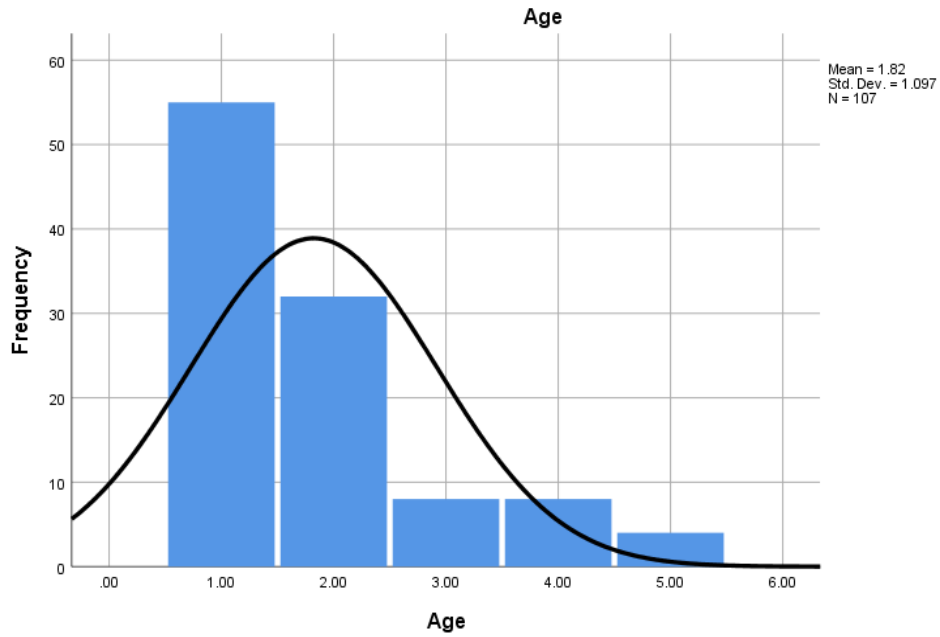
From the analysis it was observed with the help of Graph and Table above, which indicate the sample data which includes 107 . It was discussed about "Gender" and 93(86.9%) respondents

responded as Male, whereas 14(13.1%) respondents responded as Female

Table-4.2 Age

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Under 25	55	51.4	51.4	51.4
	25-34	32	29.9	29.9	81.3
	35-44	8	7.5	7.5	88.8
	45-54	8	7.5	7.5	96.3
	55 and above	4	3.7	3.7	100.0
	Total	107	100.0	100.0	

Graph-4.2 Age

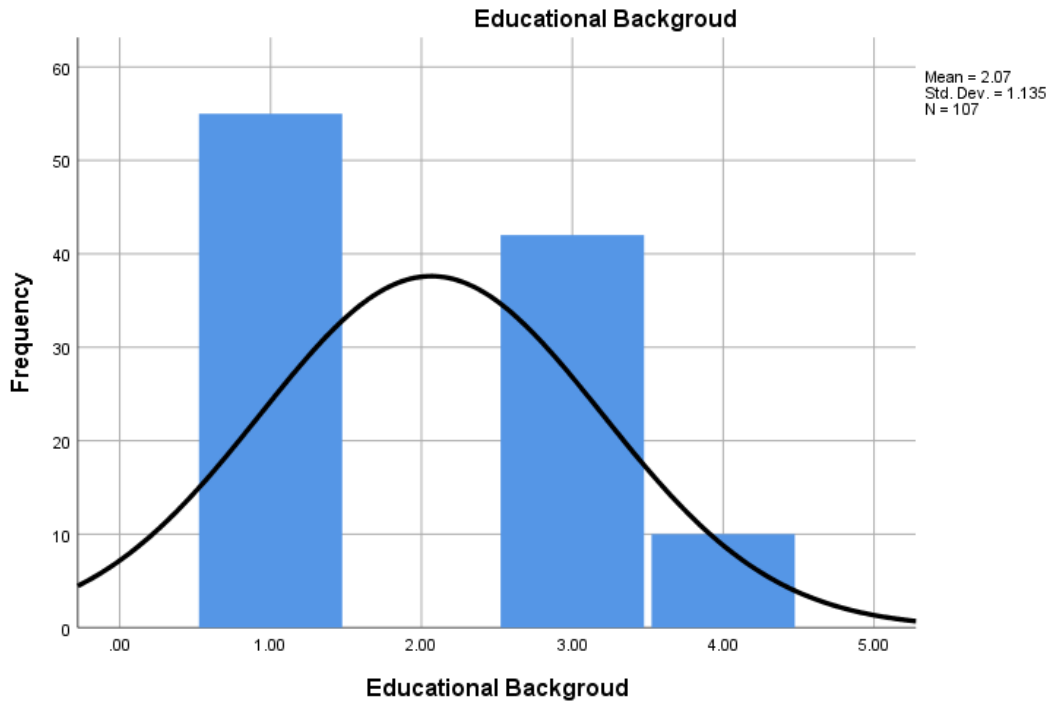


From the analysis it was observed with the help of Graph and Table above, which indicate the sample data which includes 107 respondents. It was discussed about "Age" 55(51.4%) respondents responded Under 25, 32(29.9%) respondents responded 25-34, 8(7.5%) respondents responded 35-44 and 8(7.5%) respondents responded 45-54 and 4(3.7%) respondents responded 55 and above.

Table-4.3 Educational Background

Educational Background					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Engineering	55	51.4	51.4	51.4
	Business/Management	42	39.3	39.3	90.7
	Other (please specify): ___	10	9.3	9.3	100.0
	Total	107	100.0	100.0	

Graph-4.3 Educational Background

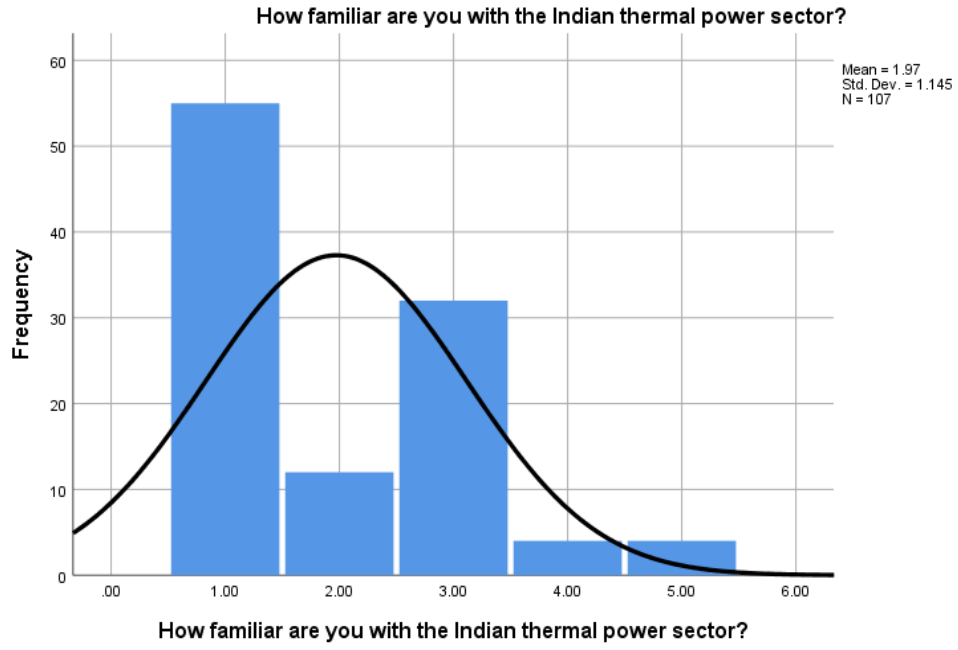


From the analysis it was observed with the help of Graph and Table above, which indicate the sample data which iincludes 107. It was discussed about "Educational Background" 55(51.4%) respondents responded as Engineering, and 42(39.3%) respondents responded as Business/Management, whereas 10(9.3%) respondents responded as Other (please specify): ___

Table-4.4 How familiar are you with the Indian thermal power sector?

How familiar are you with the Indian thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all familiar	55	51.4	51.4	51.4
	Somewhat familiar	12	11.2	11.2	62.6
	Moderately familia	32	29.9	29.9	92.5
	Very familiar	4	3.7	3.7	96.3
	Expert	4	3.7	3.7	100.0
	Total	107	100.0	100.0	

Graph-4.4 How familiar are you with the Indian thermal power sector?

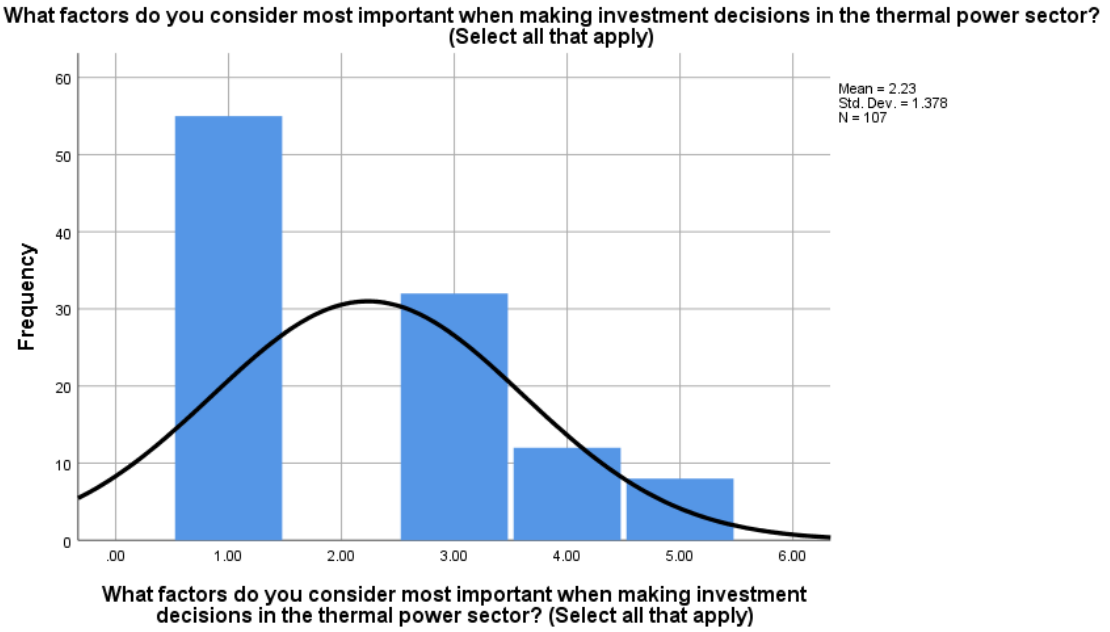


From the analysis it was observed with the help of Graph and Table above, which indicate the sample data which includes 107 respondents. It was discussed about "How familiar are you with the Indian thermal power sector?" 55(51.4%) respondents responded Not at all familiar, 12(11.2%) respondents responded Somewhat familiar, 32(29.9%) respondents responded Moderately familia and 4(3.7%) respondents responded Very familiar and 4(3.7%) respondents responded Expert.

Table-4.5 What factors do you consider most important when making investment decisions in the thermal power sector? (Select all that apply)

What factors do you consider most important when making investment decisions in the thermal power sector? (Select all that apply)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Projected energy demand	55	51.4	51.4	51.4
	Environmental impact and sustainability	32	29.9	29.9	81.3
	Technological advancements	12	11.2	11.2	92.5
	Market trends and competition	8	7.5	7.5	100.0
	Total	107	100.0	100.0	

Graph-4.5 What factors do you consider most important when making investment decisions in the thermal power sector? (Select all that apply)

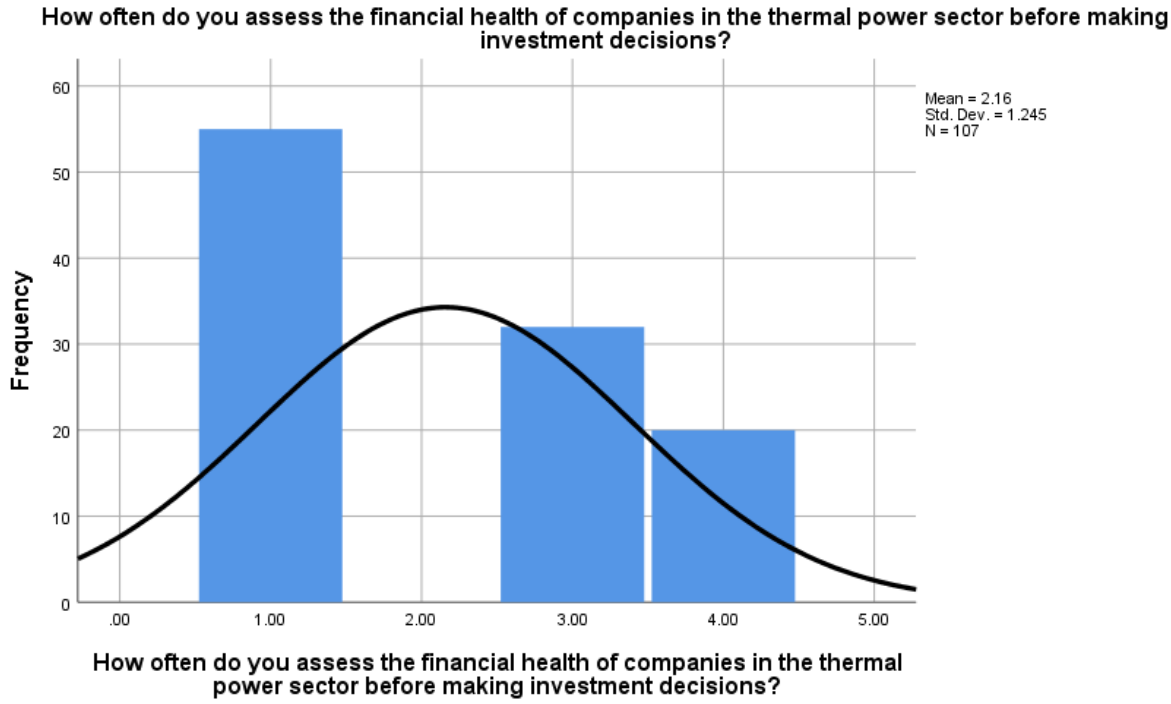


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "What factors do you consider most important when making investment decisions in the thermal power sector? (Select all that apply)" 55(51.4%) respondents responded Projected energy demand, 32(29.9%) respondents responded Environmental impact and sustainability and 12(11.2%) respondents responded Technological advancements whereas 8(7.5%) respondents responded Market trends and competition.

Table-4.6 How often do you assess the financial health of companies in the thermal power sector before making investment decisions?

How often do you assess the financial health of companies in the thermal power sector before making investment decisions?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rarely or never	55	51.4	51.4	51.4
	Regularly	32	29.9	29.9	81.3
	Always	20	18.7	18.7	100.0
	Total	107	100.0	100.0	

Graph-4.6 How often do you assess the financial health of companies in the thermal power sector before making investment decisions?

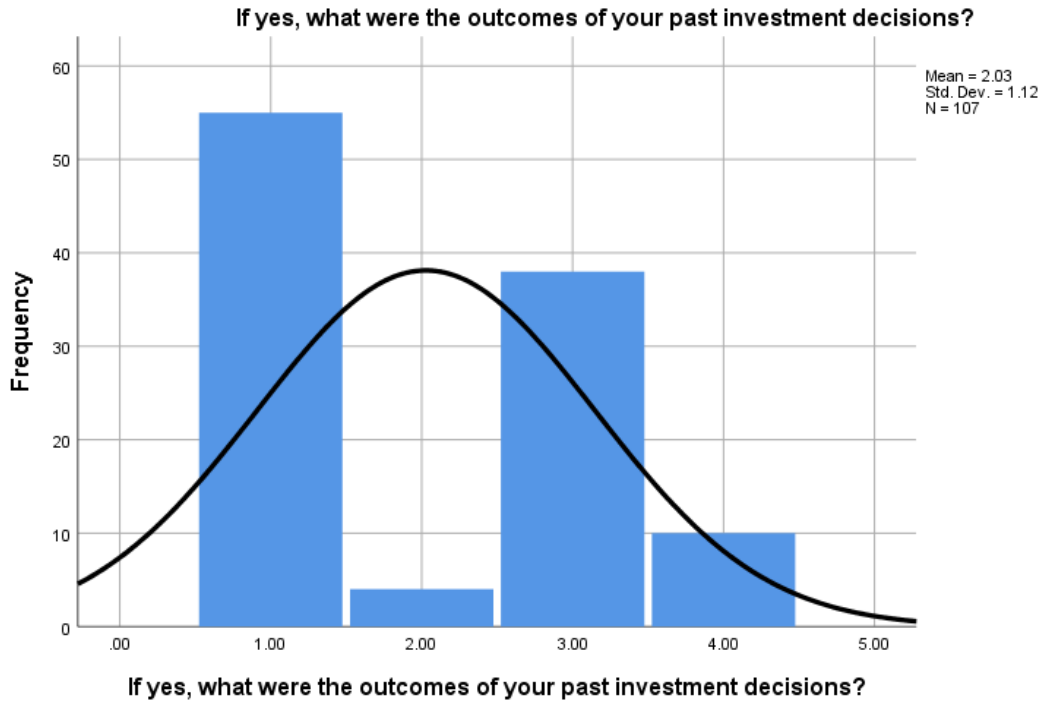


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "How often do you assess the financial health of companies in the thermal power sector before making investment decisions?" 55(51.4%) respondents responded as Rarely or never, and 32(29.9%) respondents responded as Regularly, whereas 20(18.7%) respondents responded as Always

Table-4.7 If yes, what were the outcomes of your past investment decisions?

If yes, what were the outcomes of your past investment decisions?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Positive returns	55	51.4	51.4	51.4
	Negative returns	4	3.7	3.7	55.1
	Break-even	38	35.5	35.5	90.7
	Not applicable (no past investments)	10	9.3	9.3	100.0
	Total	107	100.0	100.0	

Graph-4.7 If yes, what were the outcomes of your past investment decisions?

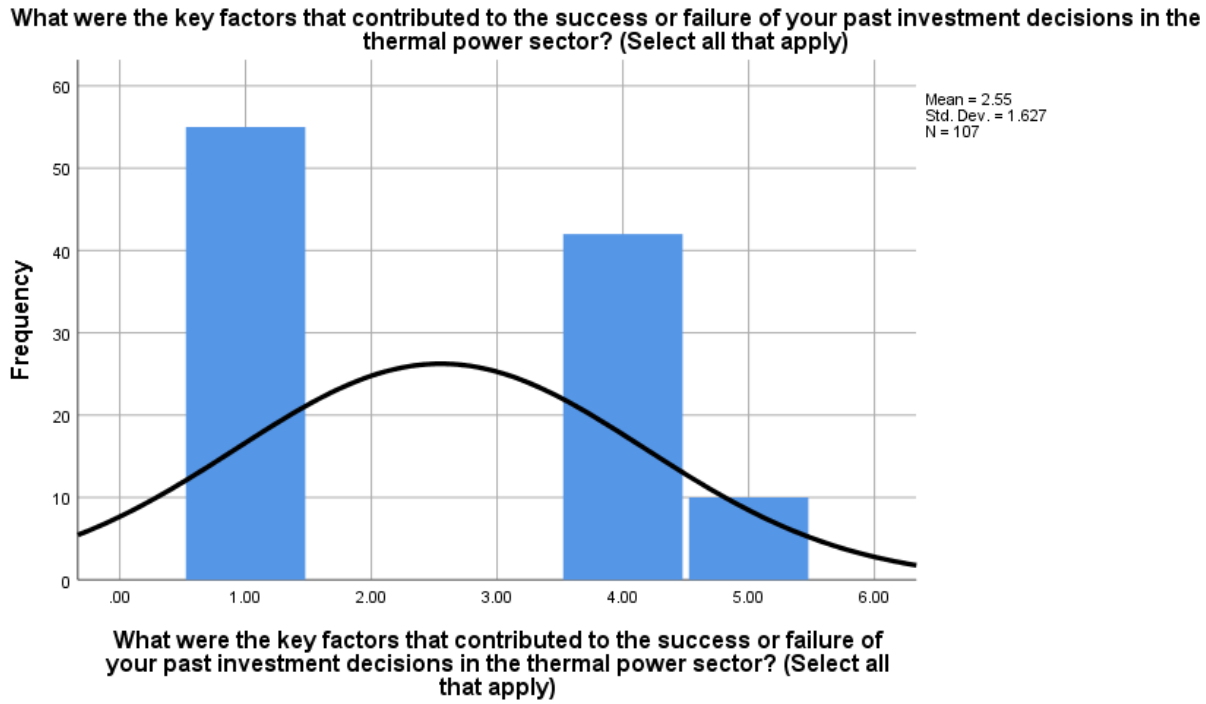


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "If yes, what were the outcomes of your past investment decisions?" 55(51.4%) respondents responded Positive returns, 4(3.7%) respondents responded Negative returns and 38(35.5%) respondents responded Break-even whereas 10(9.3%) respondents responded Not applicable (no past investments).

Table-4.8 What were the key factors that contributed to the success or failure of your past investment decisions in the thermal power sector? (Select all that apply)

What were the key factors that contributed to the success or failure of your past investment decisions in the thermal power sector? (Select all that apply)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Accurate market analysis	55	51.4	51.4	51.4
	Management competence	42	39.3	39.3	90.7
	Other (please specify): _____	10	9.3	9.3	100.0
	Total	107	100.0	100.0	

Graph-4.8 What were the key factors that contributed to the success or failure of your past investment decisions in the thermal power sector? (Select all that apply)

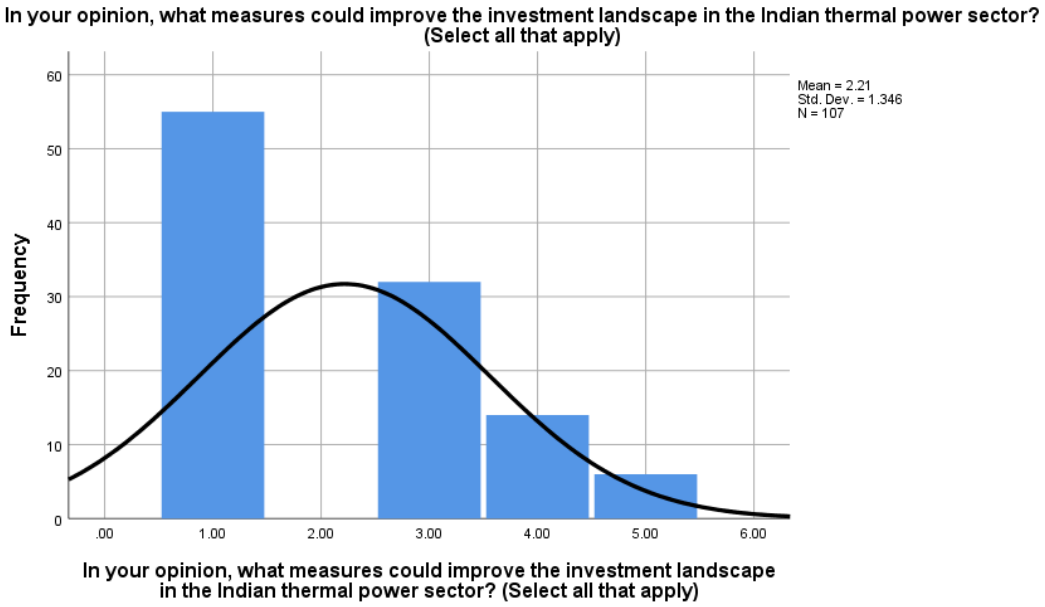


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "What were the key factors that contributed to the success or failure of your past investment decisions in the thermal power sector? (Select all that apply)" 55(51.4%) respondents responded as Accurate market analysis, and 42(39.3%) respondents responded as Management competence, whereas 10(9.3%) respondents responded as Other (please specify): _____

Table-4.9 In your opinion, what measures could improve the investment landscape in the Indian thermal power sector? (Select all that apply)

In your opinion, what measures could improve the investment landscape in the Indian thermal power sector? (Select all that apply)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Enhanced government incentives	55	51.4	51.4	51.4
	Strengthened environmental regulations	32	29.9	29.9	81.3
	More diversified energy sources	14	13.1	13.1	94.4
	Other (please specify):	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.9 In your opinion, what measures could improve the investment landscape in the Indian thermal power sector? (Select all that apply)

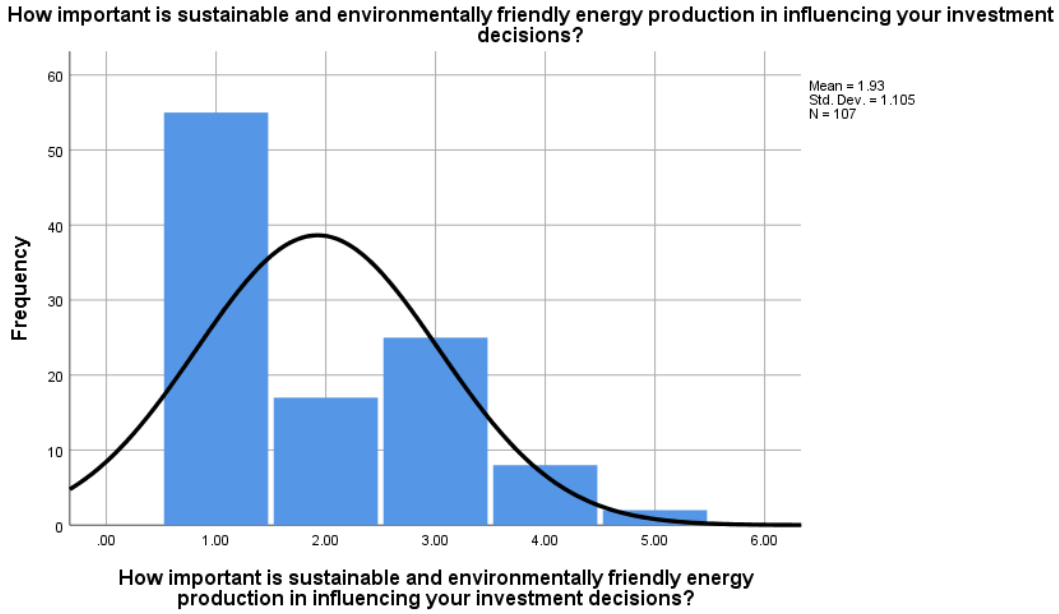


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "In your opinion, what measures could improve the investment landscape in the Indian thermal power sector? (Select all that apply)" 55(51.4%) respondents responded Enhanced government incentives, 32(29.9%) respondents responded Strengthened environmental regulations and 14(13.1%) respondents responded More diversified energy sources whereas 6(5.6%) respondents responded Other (please specify): _____.

Table-4.10 How important is sustainable and environmentally friendly energy production in influencing your investment decisions?

How important is sustainable and environmentally friendly energy production in influencing your investment decisions?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not important	55	51.4	51.4	51.4
	Somewhat important	17	15.9	15.9	67.3
	Moderately important	25	23.4	23.4	90.7
	Very important	8	7.5	7.5	98.1
	Extremely important	2	1.9	1.9	100.0
	Total	107	100.0	100.0	

Graph-4.10 How important is sustainable and environmentally friendly energy production in influencing your investment decisions?

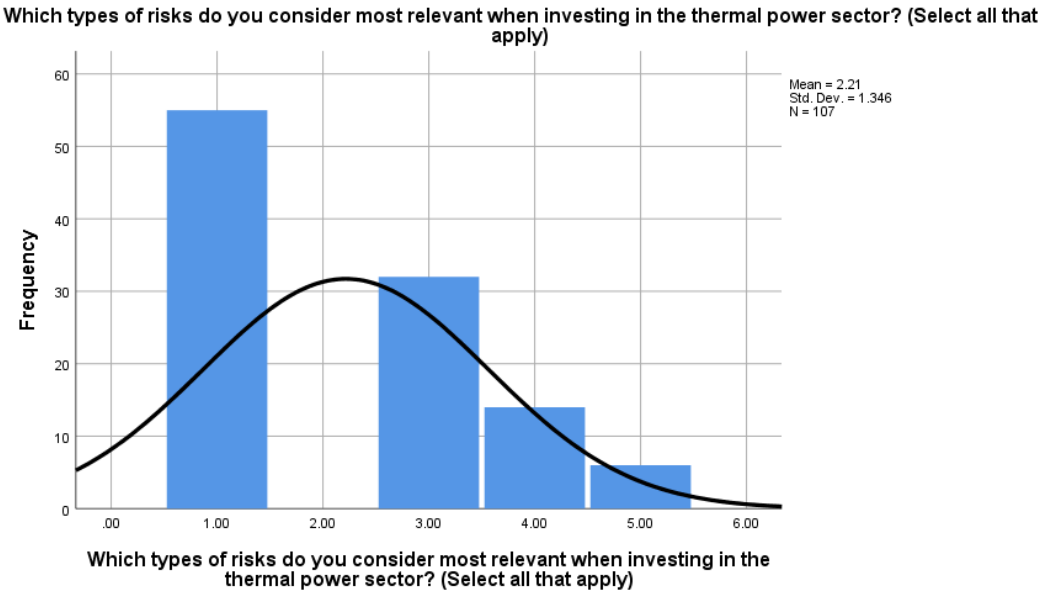


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. "How important is sustainable and environmentally friendly energy production in influencing your investment decisions?" 55% respondents responded Not important, 17(15.9%) respondents responded Somewhat important, 25(23.4%) respondents responded Moderately important and 8(7.5%) respondents responded Very important and 2(1.9%) respondents responded Extremely important.

Table-4.11 Which types of risks do you consider most relevant when investing in the thermal power sector? (Select all that apply)

Which types of risks do you consider most relevant when investing in the thermal power sector? (Select all that apply)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Regulatory and policy changes	55	51.4	51.4	51.4
	Technological obsolescence	32	29.9	29.9	81.3
	Interest rate fluctuations	14	13.1	13.1	94.4
	Geopolitical factors	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph -4.11 Which types of risks do you consider most relevant when investing in the thermal power sector? (Select all that apply)

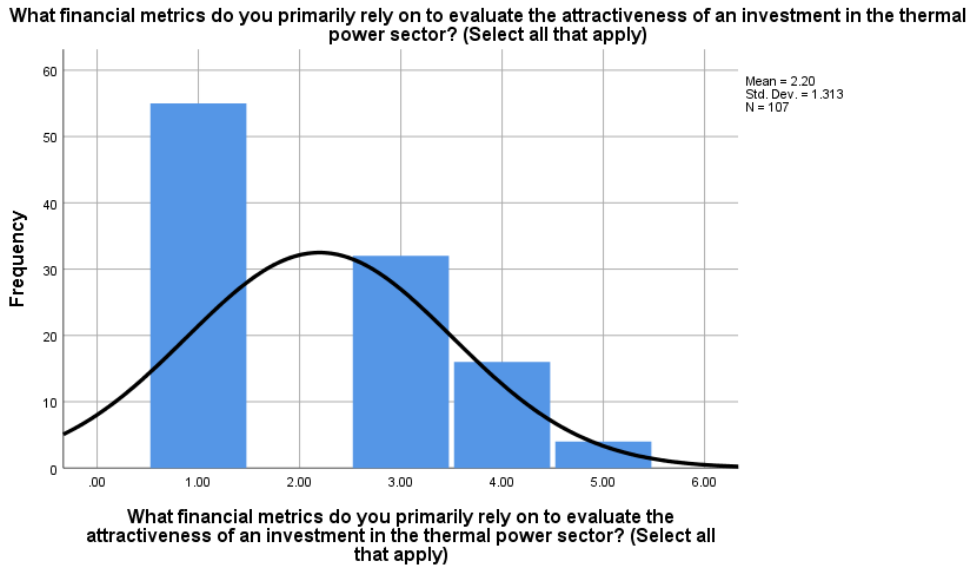


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Which types of risks do you consider most relevant when investing in the thermal power sector? (Select all that apply)" 55(51.4%) respondents responded Regulatory and policy changes, 32(29.9%) respondents responded Technological obsolescence and 14(13.1%) respondents responded Interest rate fluctuations whereas 6(5.6%) respondents responded Geopolitical factors.

Table-4.12 What financial metrics do you primarily rely on to evaluate the attractiveness of an investment in the thermal power sector? (Select all that apply)

What financial metrics do you primarily rely on to evaluate the attractiveness of an investment in the thermal power sector? (Select all that apply)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Return on Investment (ROI)	55	51.4	51.4	51.4
	Debt-to-Equity Ratio	32	29.9	29.9	81.3
	Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)	16	15.0	15.0	96.3
	Payback Period	4	3.7	3.7	100.0
	Total	107	100.0	100.0	

Graph-4.12 What financial metrics do you primarily rely on to evaluate the attractiveness of an investment in the thermal power sector? (Select all that apply)

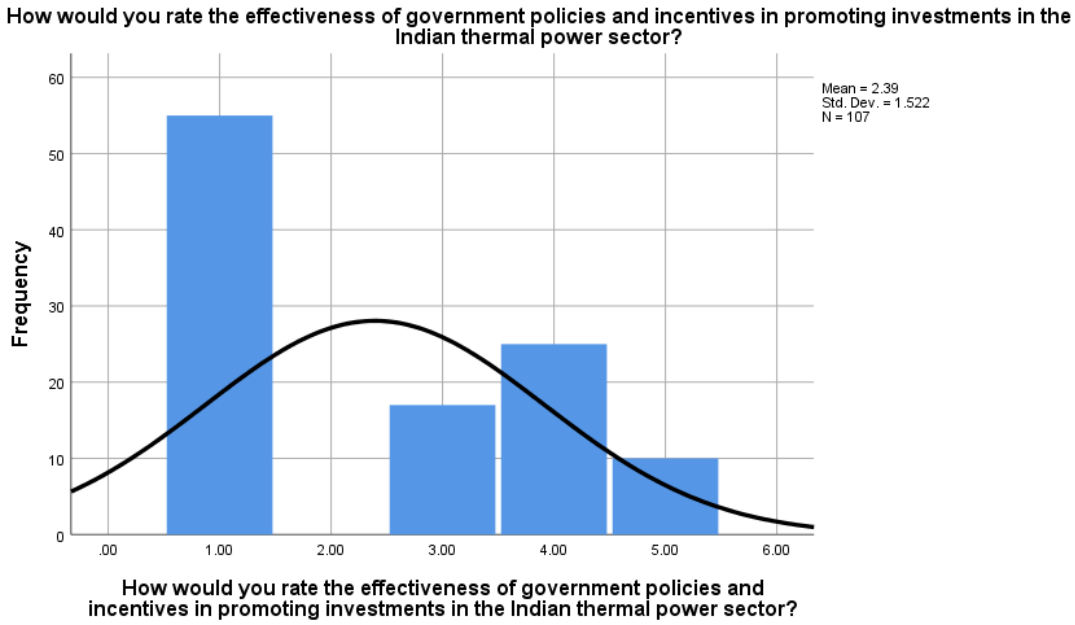


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "What financial metrics do you primarily rely on to evaluate the attractiveness of an investment in the thermal power sector? (Select all that apply)" 55(51.4%) respondents responded Return on Investment (ROI), 32(29.9%) respondents responded Debt-to-Equity Ratio and 16(15%) respondents responded Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) whereas 4(3.7%) respondents responded Payback Period.

Table-4.13 How would you rate the effectiveness of government policies and incentives in promoting investments in the Indian thermal power sector?

How would you rate the effectiveness of government policies and incentives in promoting investments in the Indian thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly effective	55	51.4	51.4	51.4
	Neutral	17	15.9	15.9	67.3
	Somewhat ineffective	25	23.4	23.4	90.7
	Highly ineffective	10	9.3	9.3	100.0
	Total	107	100.0	100.0	

Graph-4.13 How would you rate the effectiveness of government policies and incentives in promoting investments in the Indian thermal power sector?

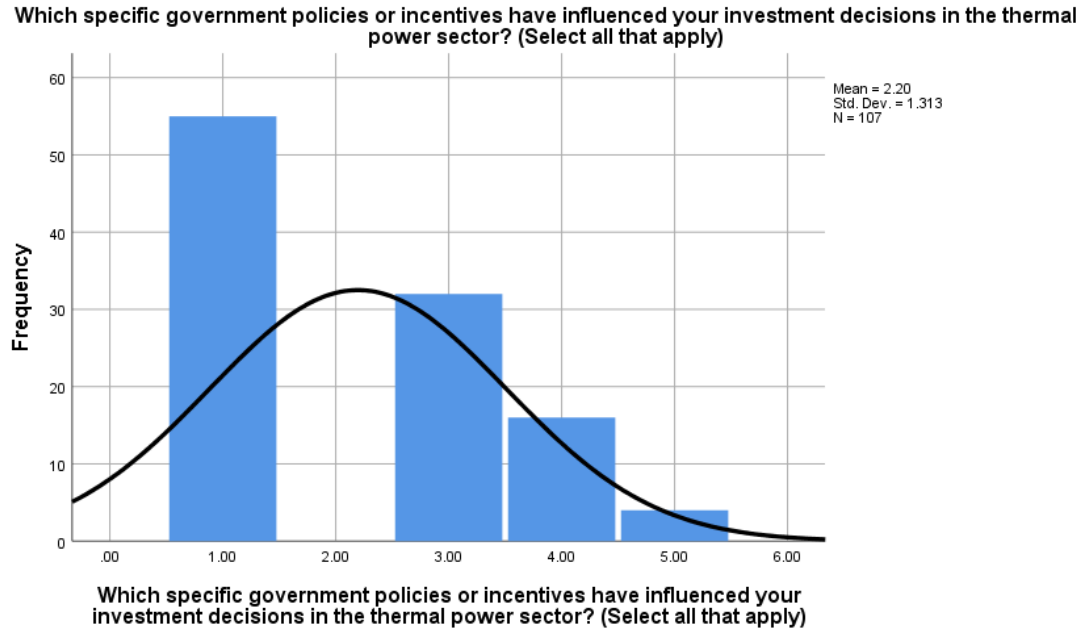


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "How would you rate the effectiveness of government policies and incentives in promoting investments in the Indian thermal power sector?" 55(51.4%) respondents responded Highly effective, 17(15.9%) respondents responded Neutral and 25(23.4%) respondents responded Somewhat ineffective whereas 10(9.3%) respondents responded Highly ineffective.

Table-4.14 Which specific government policies or incentives have influenced your investment decisions in the thermal power sector? (Select all that apply)

Which specific government policies or incentives have influenced your investment decisions in the thermal power sector? (Select all that apply)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Subsidies for clean energy projects	55	51.4	51.4	51.4
	Renewable energy certificates	32	29.9	29.9	81.3
	Power purchase agreements	16	15.0	15.0	96.3
	Other (please specify): _____	4	3.7	3.7	100.0
	Total	107	100.0	100.0	

Graph-4.14 Which specific government policies or incentives have influenced your investment decisions in the thermal power sector? (Select all that apply)

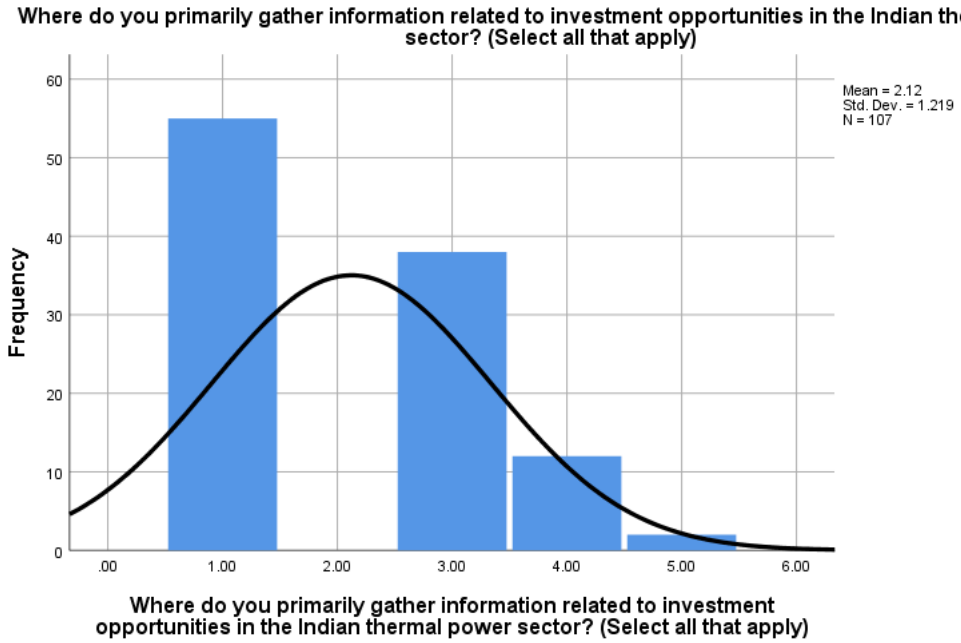


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Which specific government policies or incentives have influenced your investment decisions in the thermal power sector? (Select all that apply)" 55(51.4%) respondents responded Subsidies for clean energy projects, 32(29.9%) respondents responded Renewable energy certificates and 16(15%) respondents responded Power purchase agreements whereas 4(3.7%) respondents responded Other (please specify): _____.

Table-4.15 Where do you primarily gather information related to investment opportunities in the Indian thermal power sector? (Select all that apply)

Where do you primarily gather information related to investment opportunities in the Indian thermal power sector? (Select all that apply)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Financial news websites	55	51.4	51.4	51.4
	Government publications	38	35.5	35.5	86.9
	Analyst reports	12	11.2	11.2	98.1
	Professional networking events/conferences	2	1.9	1.9	100.0
	Total	107	100.0	100.0	

Graph-4.15 Where do you primarily gather information related to investment opportunities in the Indian thermal power sector? (Select all that apply)

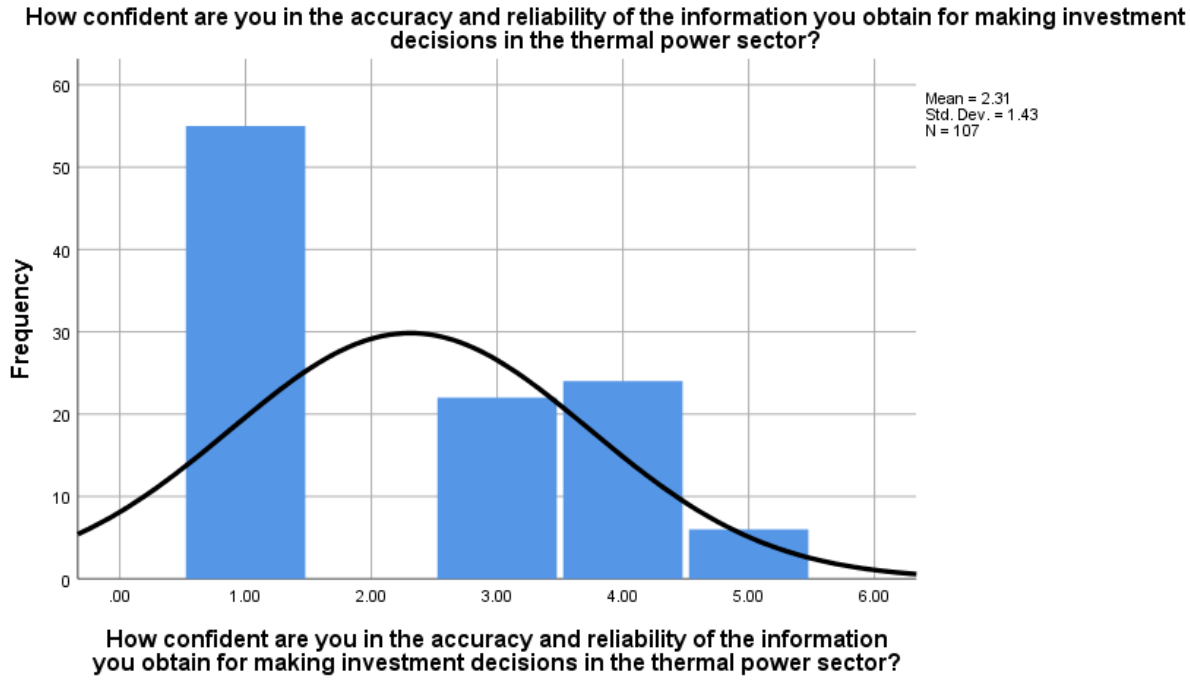


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Where do you primarily gather information related to investment opportunities in the Indian thermal power sector? (Select all that apply)" 55(51.4%) respondents responded Financial news websites, 38(35.5%) respondents responded Government publications and 12(11.2%) respondents responded Analyst reports whereas 2(1.9%) respondents responded Professional networking events/conferences.

Table-4.16 How confident are you in the accuracy and reliability of the information you obtain for making investment decisions in the thermal power sector?

How confident are you in the accuracy and reliability of the information you obtain for making investment decisions in the thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very confident	55	51.4	51.4	51.4
	Neutral	22	20.6	20.6	72.0
	Not very confident	24	22.4	22.4	94.4
	Not confident at all	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.16 How confident are you in the accuracy and reliability of the information you obtain for making investment decisions in the thermal power sector?

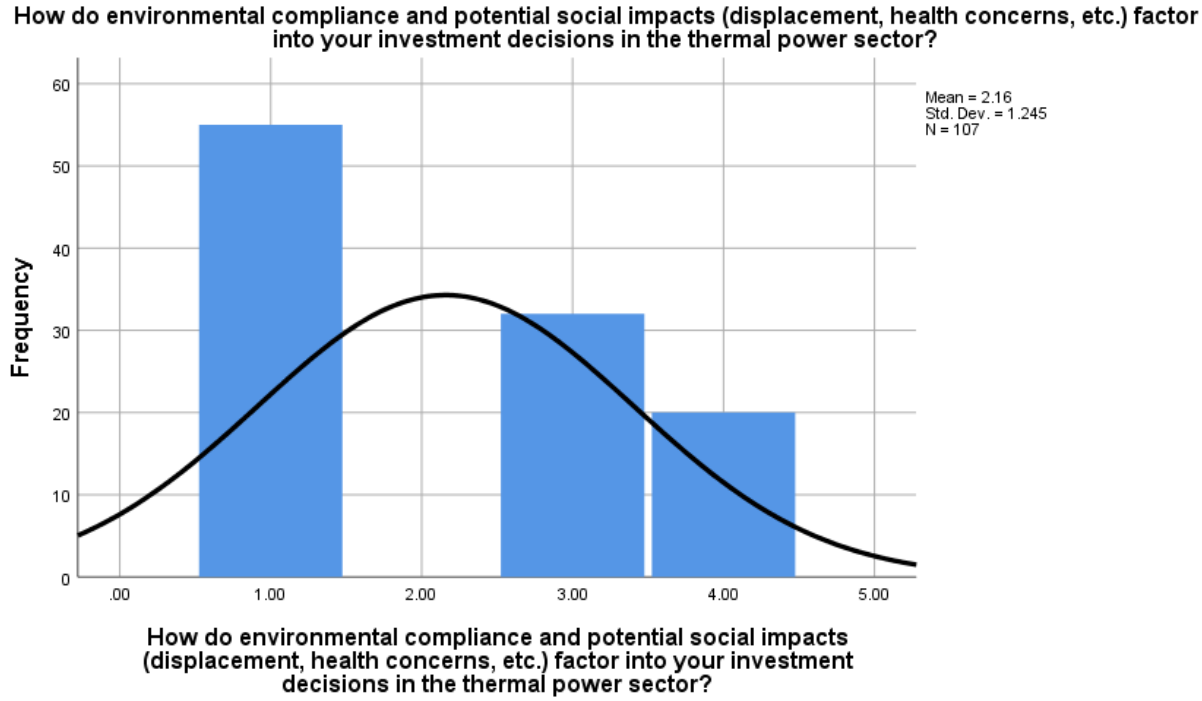


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "How confident are you in the accuracy and reliability of the information you obtain for making investment decisions in the thermal power sector?" 55(51.4%) respondents responded Very confident, 22(20.6%) respondents responded Neutral and 24(22.4%) respondents responded Not very confident whereas 6(5.6%) respondents responded Not confident at all.

Table-4.17 How do environmental compliance and potential social impacts (displacement, health concerns, etc.) factor into your investment decisions in the thermal power sector?

How do environmental compliance and potential social impacts (displacement, health concerns, etc.) factor into your investment decisions in the thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Major considerations	55	51.4	51.4	51.4
	Minor considerations	32	29.9	29.9	81.3
	Not considered at all	20	18.7	18.7	100.0
	Total	107	100.0	100.0	

Graph-4.17 How do environmental compliance and potential social impacts (displacement, health concerns, etc.) factor into your investment decisions in the thermal power sector?

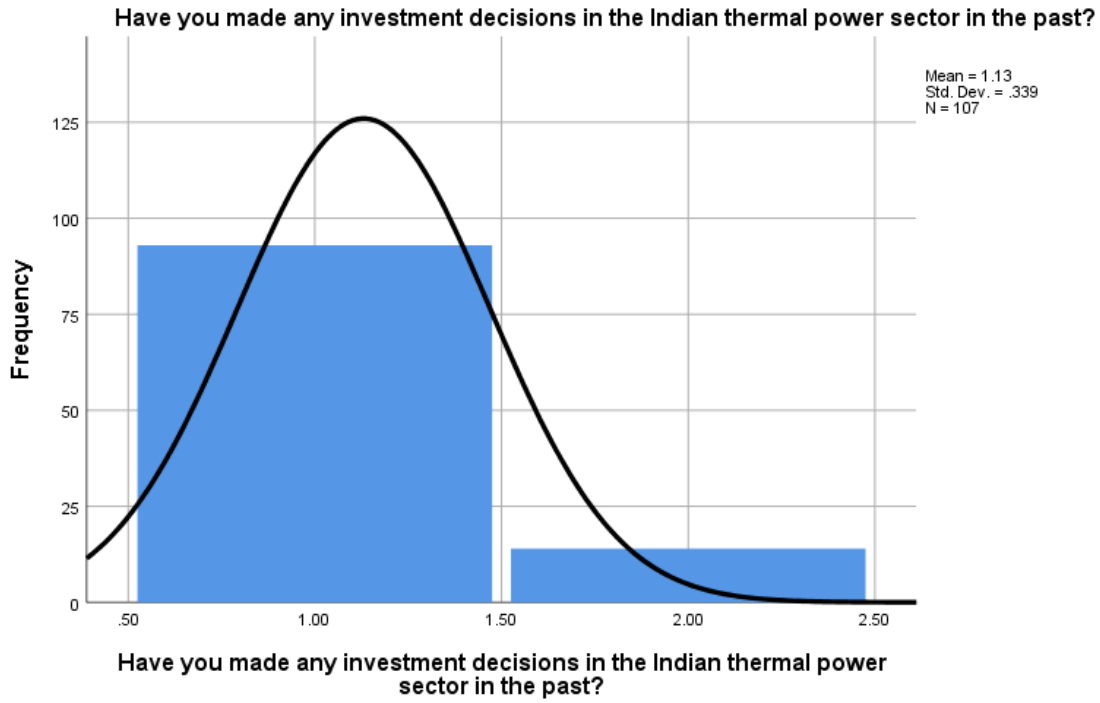


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "How do environmental compliance and potential social impacts (displacement, health concerns, etc.) factor into your investment decisions in the thermal power sector?" 55(51.4%) respondents responded as Major considerations, and 32(29.9%) respondents responded as Minor considerations, whereas 20(18.7%) respondents responded as Not considered at all

Table-18 Have you made any investment decisions in the Indian thermal power sector in the past?

Have you made any investment decisions in the Indian thermal power sector in the past?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	93	86.9	86.9	86.9
	No	14	13.1	13.1	100.0
	Total	107	100.0	100.0	

Graph-18 Have you made any investment decisions in the Indian thermal power sector in the past?

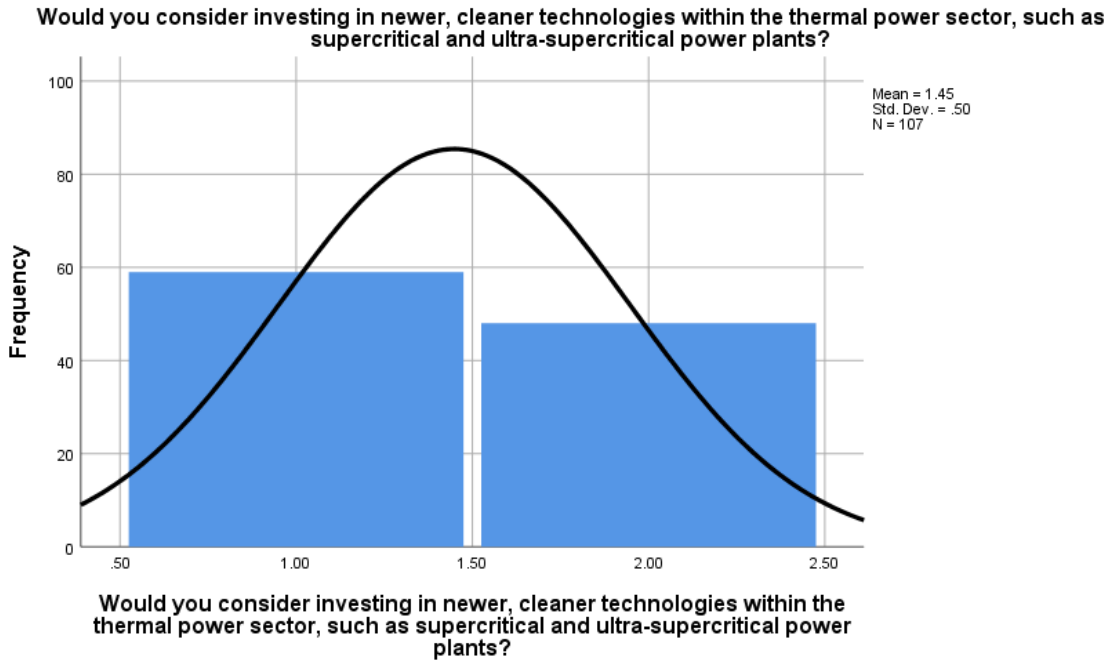


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Have you made any investment decisions in the Indian thermal power sector in the past?" and 93(86.9%) respondents responded as Yes, whereas 14(13.1%) respondents responded as No

Table-4.19 Would you consider investing in newer, cleaner technologies within the thermal power sector, such as supercritical and ultra-supercritical power plants?

Would you consider investing in newer, cleaner technologies within the thermal power sector, such as supercritical and ultra-supercritical power plants?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	59	55.1	55.1	55.1
	No	48	44.9	44.9	100.0
	Total	107	100.0	100.0	

Graph-4.19 Would you consider investing in newer, cleaner technologies within the thermal power sector, such as supercritical and ultra-supercritical power plants?

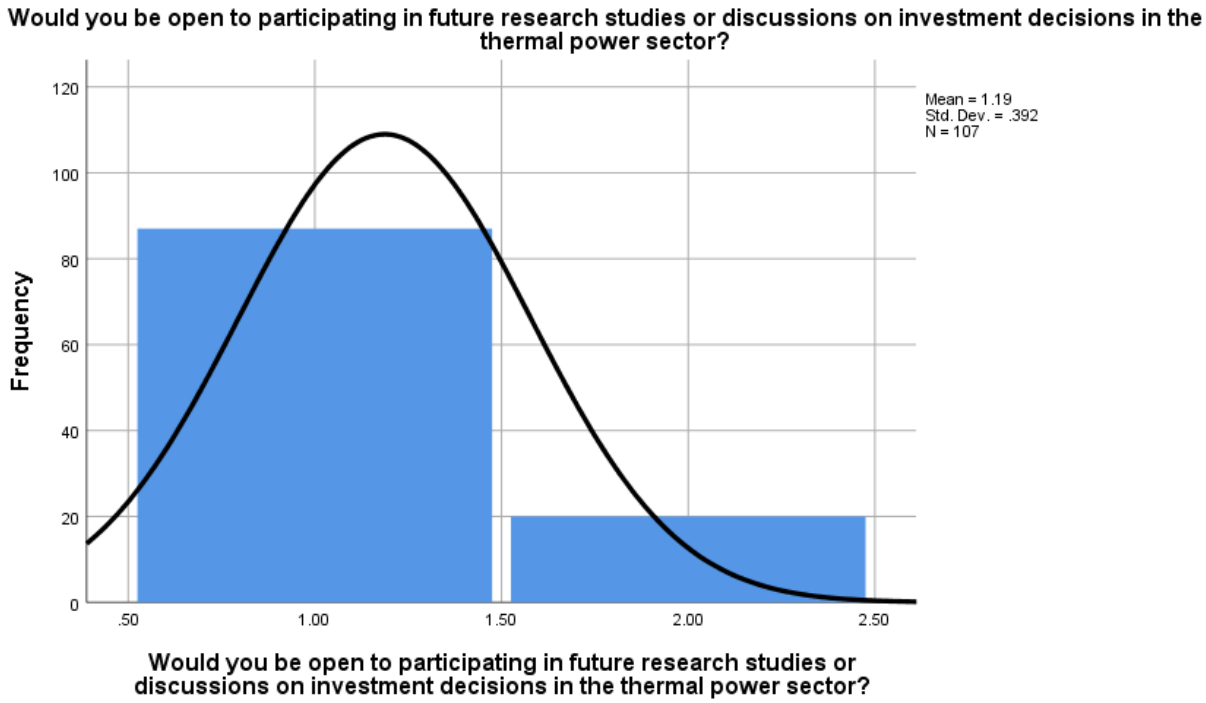


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Would you consider investing in newer, cleaner technologies within the thermal power sector, such as supercritical and ultra-supercritical power plants?" and 59(55.1%) respondents responded as Yes, whereas 48(44.9%) respondents responded as No

Table-4.20 Would you be open to participating in future research studies or discussions on investment decisions in the thermal power sector?

Would you be open to participating in future research studies or discussions on investment decisions in the thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	87	81.3	81.3	81.3
	No	20	18.7	18.7	100.0
	Total	107	100.0	100.0	

Graph-4.20 Would you be open to participating in future research studies or discussions on investment decisions in the thermal power sector?

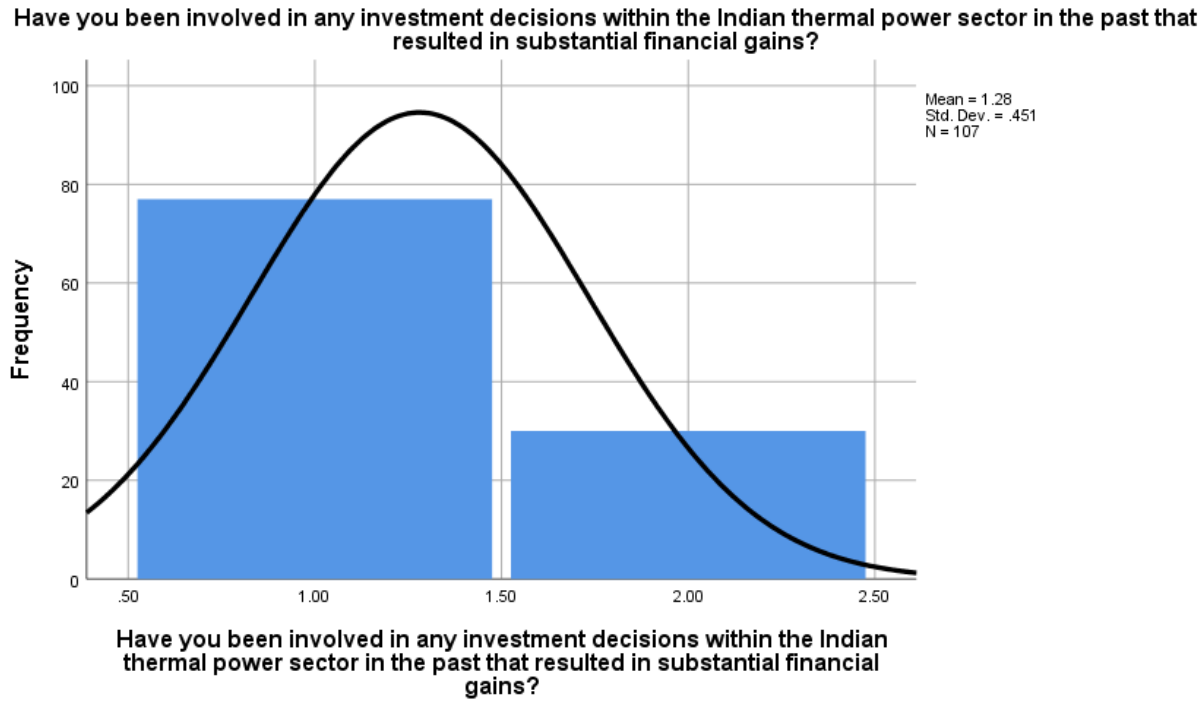


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Would you be open to participating in future research studies or discussions on investment decisions in the thermal power sector?" and 87(81.3%) respondents responded as Yes, whereas 20(18.7%) respondents responded as No

Table-4.21 Have you been involved in any investment decisions within the Indian thermal power sector in the past that resulted in substantial financial gains?

Have you been involved in any investment decisions within the Indian thermal power sector in the past that resulted in substantial financial gains?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	77	72.0	72.0	72.0
	No	30	28.0	28.0	100.0
	Total	107	100.0	100.0	

Graph-4.21 Have you been involved in any investment decisions within the Indian thermal power sector in the past that resulted in substantial financial gains?

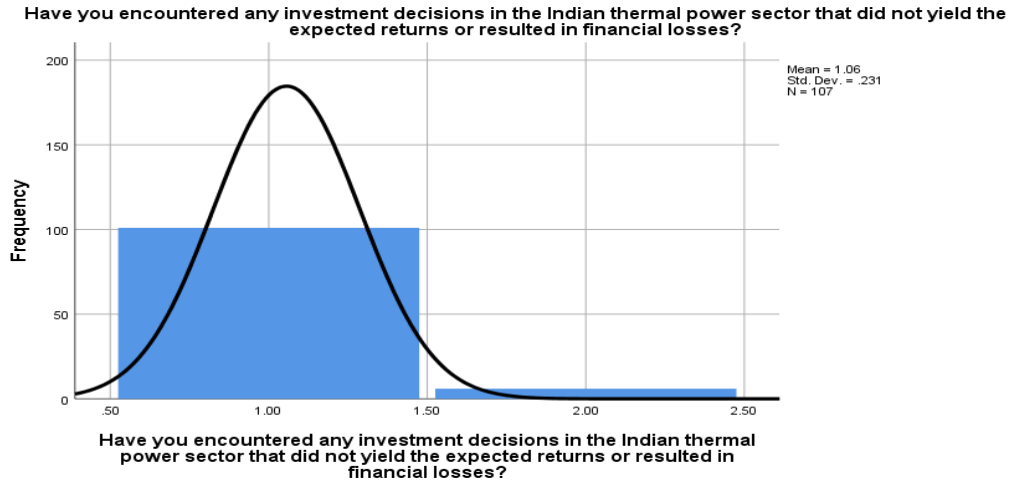


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Have you been involved in any investment decisions within the Indian thermal power sector in the past that resulted in substantial financial gains?" and 77(72%) respondents responded as Yes, whereas 30(28%) respondents responded as No

Table-4.22 Have you encountered any investment decisions in the Indian thermal power sector that did not yield the expected returns or resulted in financial losses?

Have you encountered any investment decisions in the Indian thermal power sector that did not yield the expected returns or resulted in financial losses?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	101	94.4	94.4	94.4
	No	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.22 Have you encountered any investment decisions in the Indian thermal power sector that did not yield the expected returns or resulted in financial losses?

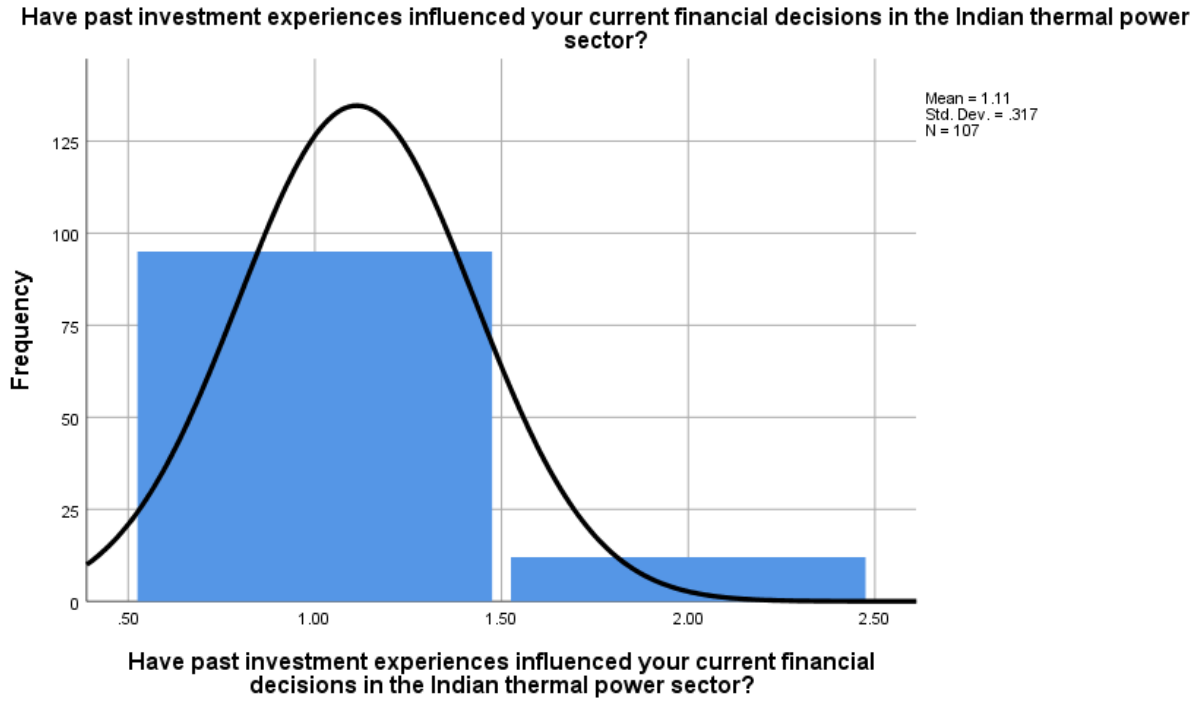


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Have you encountered any investment decisions in the Indian thermal power sector that did not yield the expected returns or resulted in financial losses?" and 101(94.4%) respondents responded as Yes, whereas 6(5.6%) respondents responded as No

Table-4.23 Have past investment experiences influenced your current financial decisions in the Indian thermal power sector?

Have past investment experiences influenced your current financial decisions in the Indian thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	95	88.8	88.8	88.8
	No	12	11.2	11.2	100.0
	Total	107	100.0	100.0	

Graph-4.23 Have past investment experiences influenced your current financial decisions in the Indian thermal power sector?



From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Have past investment experiences influenced your current financial decisions in the Indian thermal power sector?" and 95(88.8%) respondents responded as Yes, whereas 12(11.2%) respondents responded as No

Table-4.24 Have lessons learned from past experiences led you to modify your investment strategies in the thermal power sector?

Have lessons learned from past experiences led you to modify your investment strategies in the thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	101	94.4	94.4	94.4
	No	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

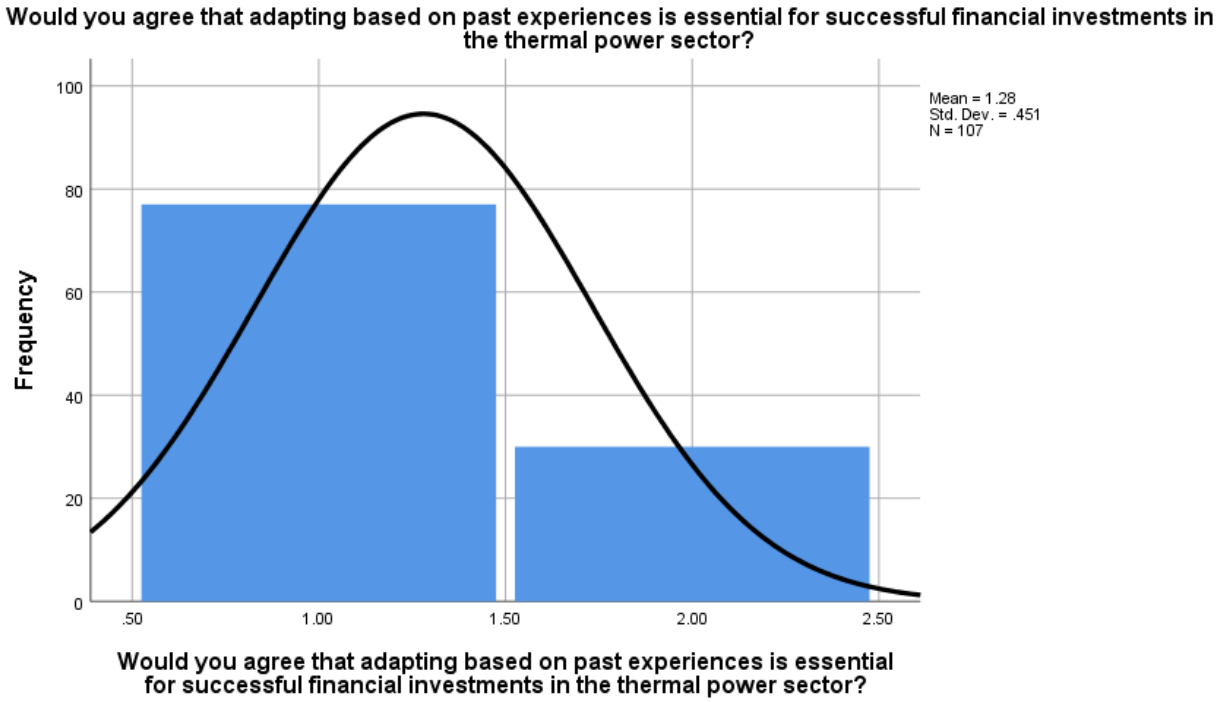
Graph-4.24 Have lessons learned from past experiences led you to modify your investment strategies in the thermal power sector?

From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Have lessons learned from past experiences led you to modify your investment strategies in the thermal power sector?" and 101(94.4%) respondents responded as Yes, whereas 6(5.6%) respondents responded as No

Table-4.25 Would you agree that adapting based on past experiences is essential for successful financial investments in the thermal power sector?

Would you agree that adapting based on past experiences is essential for successful financial investments in the thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	77	72.0	72.0	72.0
	No	30	28.0	28.0	100.0
	Total	107	100.0	100.0	

Graph-4.25 Would you agree that adapting based on past experiences is essential for successful financial investments in the thermal power sector?

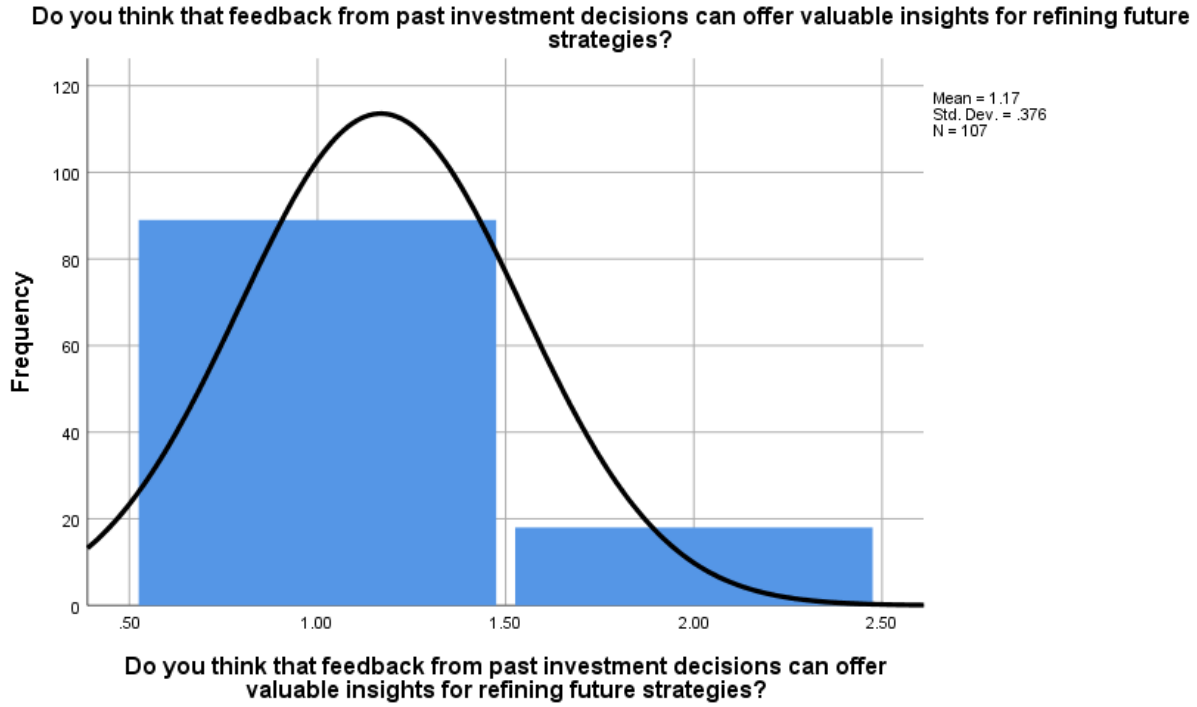


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Would you agree that adapting based on past experiences is essential for successful financial investments in the thermal power sector?" and 77(72%) respondents responded as Yes, whereas 30(28%) respondents responded as No

Table-4.26 Do you think that feedback from past investment decisions can offer valuable insights for refining future strategies?

Do you think that feedback from past investment decisions can offer valuable insights for refining future strategies?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	89	83.2	83.2	83.2
	No	18	16.8	16.8	100.0
	Total	107	100.0	100.0	

Graph-4.26 Do you think that feedback from past investment decisions can offer valuable insights for refining future strategies?

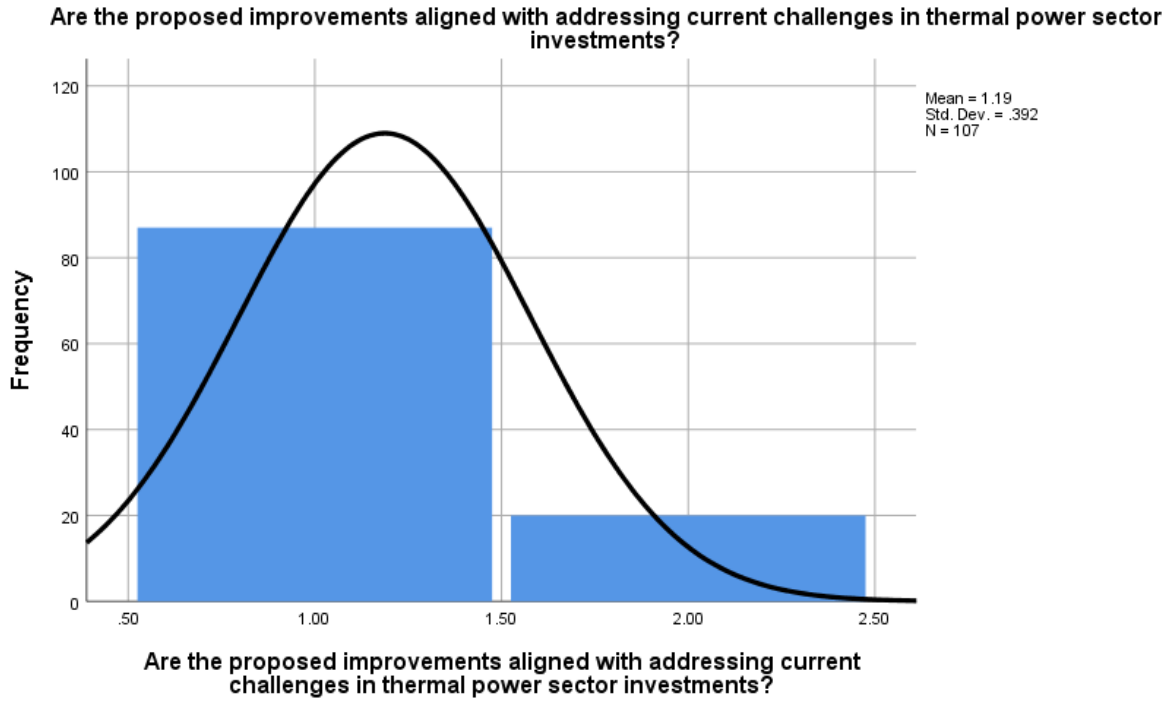


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Do you think that feedback from past investment decisions can offer valuable insights for refining future strategies?" and 89(83.2%) respondents responded as Yes, whereas 18(16.8%) respondents responded as No

Table-4.27 Are the proposed improvements aligned with addressing current challenges in thermal power sector investments?

Are the proposed improvements aligned with addressing current challenges in thermal power sector investments?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	87	81.3	81.3	81.3
	No	20	18.7	18.7	100.0
	Total	107	100.0	100.0	

Graph-4.27 Are the proposed improvements aligned with addressing current challenges in thermal power sector investments?

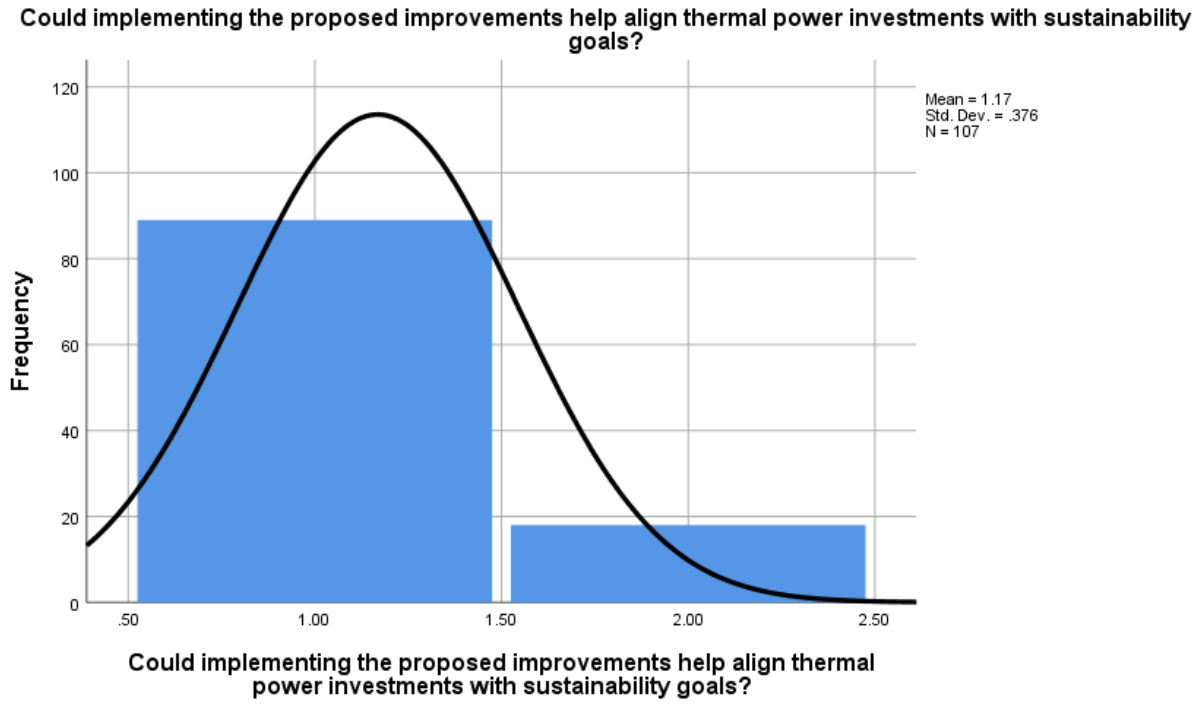


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Are the proposed improvements aligned with addressing current challenges in thermal power sector investments?" and 87(81.3%) respondents responded as Yes, whereas 20(18.7%) respondents responded as No

Table-4.28 Could implementing the proposed improvements help align thermal power investments with sustainability goals?

Could implementing the proposed improvements help align thermal power investments with sustainability goals?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	89	83.2	83.2	83.2
	No	18	16.8	16.8	100.0
	Total	107	100.0	100.0	

Graph-4.28 Could implementing the proposed improvements help align thermal power investments with sustainability goals?

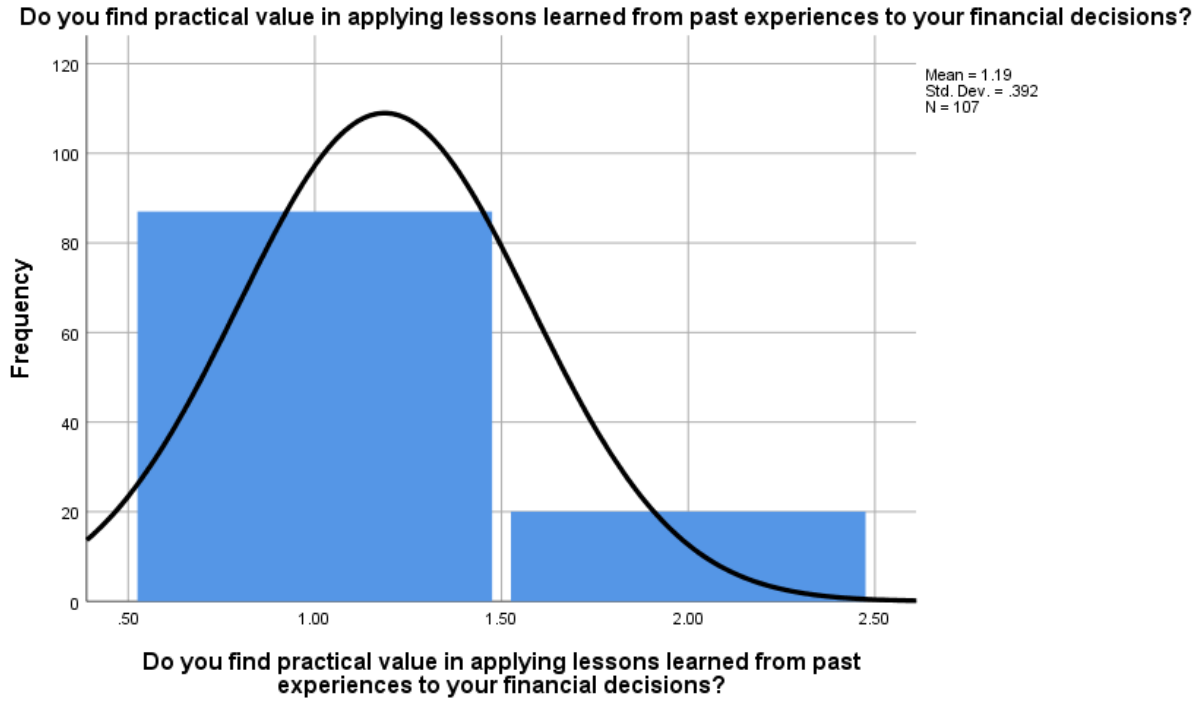


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Could implementing the proposed improvements help align thermal power investments with sustainability goals?" and 89(83.2%) respondents responded as Yes, whereas 18(16.8%) respondents responded as No

Table-4.29 Do you find practical value in applying lessons learned from past experiences to your financial decisions?

Do you find practical value in applying lessons learned from past experiences to your financial decisions?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	87	81.3	81.3	81.3
	No	20	18.7	18.7	100.0
	Total	107	100.0	100.0	

Graph-4.29 Do you find practical value in applying lessons learned from past experiences to your financial decisions?

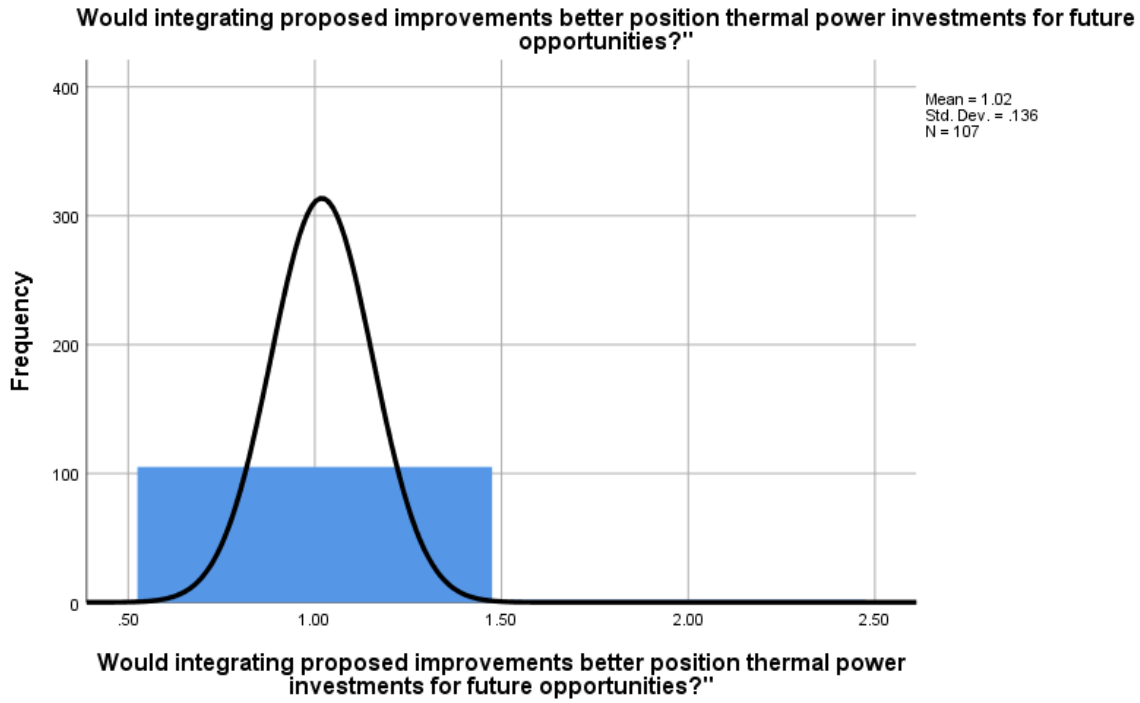


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Do you find practical value in applying lessons learned from past experiences to your financial decisions?" and 87(81.3%) respondents responded as Yes, whereas 20(18.7%) respondents responded as No

Table-4.30 Would integrating proposed improvements better position thermal power investments for future opportunities?

Would integrating proposed improvements better position thermal power investments for future opportunities?"					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	105	98.1	98.1	98.1
	No	2	1.9	1.9	100.0
	Total	107	100.0	100.0	

Graph-4.30 Would integrating proposed improvements better position thermal power investments for future opportunities?

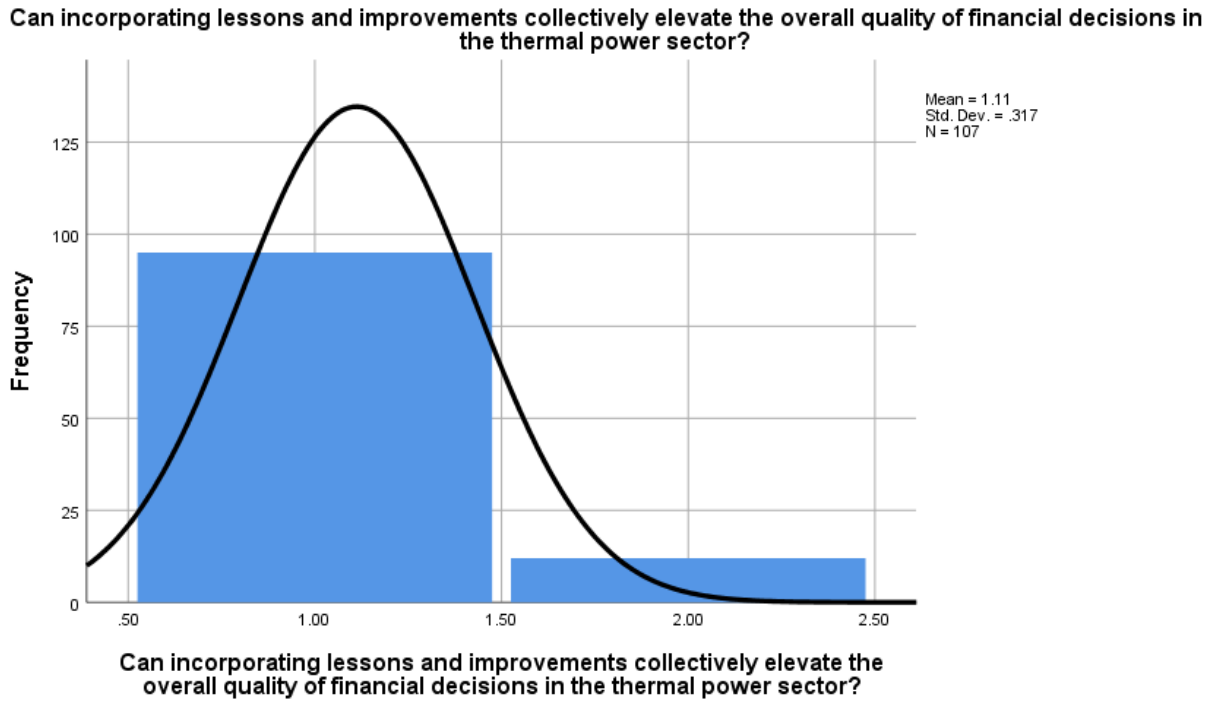


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Would integrating proposed improvements better position thermal power investments for future opportunities?"" and 105(98.1%) respondents responded as Yes, whereas 2(1.9%) respondents responded as No

Table-4.31 Can incorporating lessons and improvements collectively elevate the overall quality of financial decisions in the thermal power sector?

Can incorporating lessons and improvements collectively elevate the overall quality of financial decisions in the thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	95	88.8	88.8	88.8
	No	12	11.2	11.2	100.0
	Total	107	100.0	100.0	

Graph-4.31 Can incorporating lessons and improvements collectively elevate the overall quality of financial decisions in the thermal power sector?

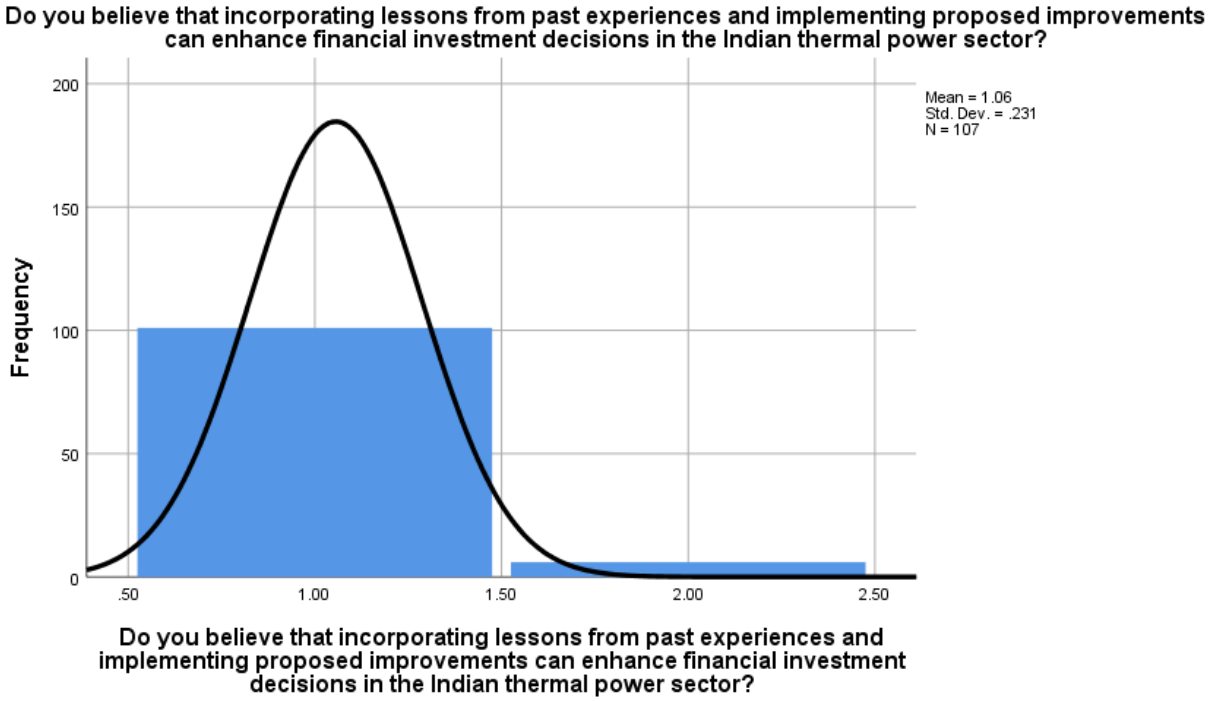


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Can incorporating lessons and improvements collectively elevate the overall quality of financial decisions in the thermal power sector?" and 95(88.8%) respondents responded as Yes, whereas 12(11.2%) respondents responded as No

Table-4.32 Do you believe that incorporating lessons from past experiences and implementing proposed improvements can enhance financial investment decisions in the Indian thermal power sector?

Do you believe that incorporating lessons from past experiences and implementing proposed improvements can enhance financial investment decisions in the Indian thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	101	94.4	94.4	94.4
	No	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.32 Do you believe that incorporating lessons from past experiences and implementing proposed improvements can enhance financial investment decisions in the Indian thermal power sector?



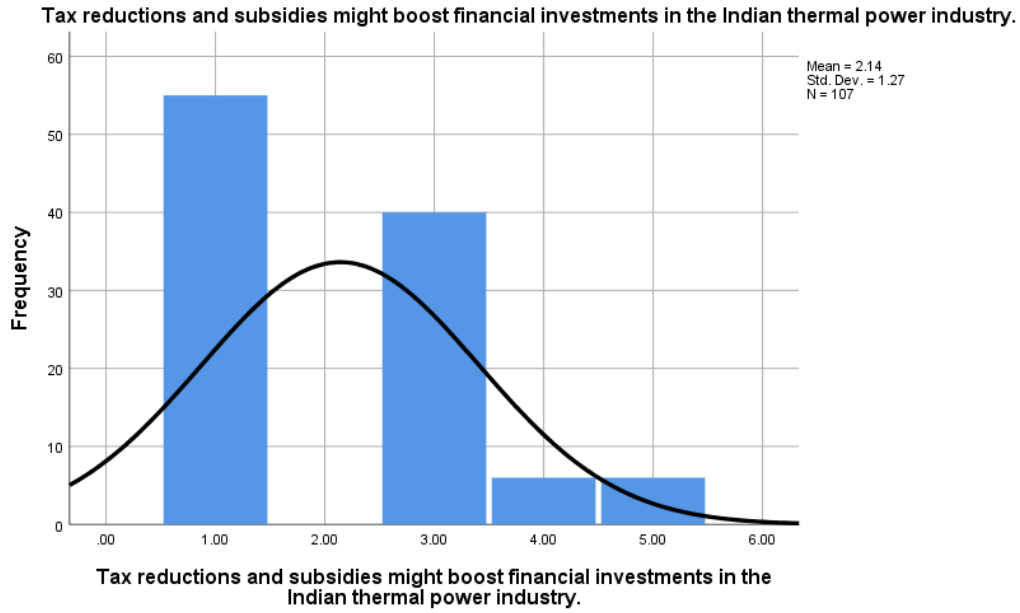
From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked about "Do you believe that incorporating lessons from past experiences and implementing proposed

improvements can enhance financial investment decisions in the Indian thermal power sector?" and 101(94.4%) respondents responded as Yes, whereas 6(5.6%) respondents responded as No

Table-4.33 Tax reductions and subsidies might boost financial investments in the Indian thermal power industry.

Tax reductions and subsidies might boost financial investments in the Indian thermal power industry.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	40	37.4	37.4	88.8
	Disagree	6	5.6	5.6	94.4
	Strongly Disagree	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.33 Tax reductions and subsidies might boost financial investments in the Indian thermal power industry.

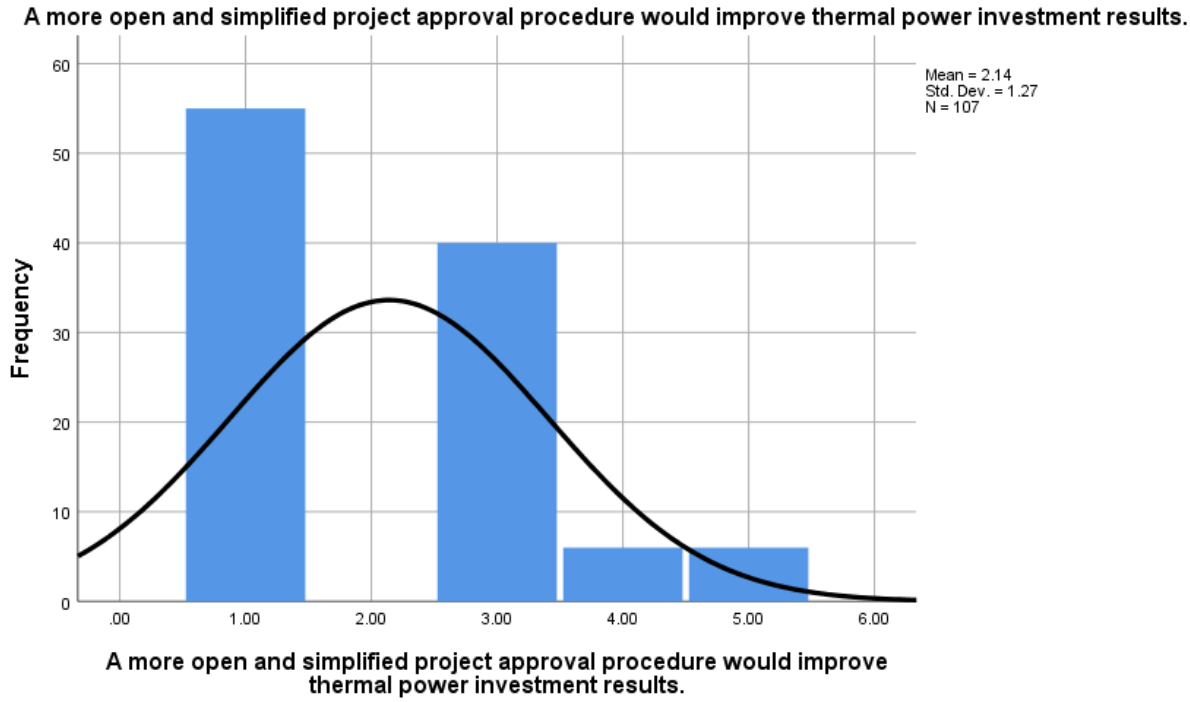


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Tax reductions and subsidies might boost financial investments in the Indian thermal power industry." 55(51.4%) respondents responded Strongly Agree, 40(37.4%) respondents responded Neutral and 6(5.6%) respondents responded Disagree whereas 6(5.6%) respondents responded Strongly Disagree.

Table-4.34 A more open and simplified project approval procedure would improve thermal power investment results.

A more open and simplified project approval procedure would improve thermal power investment results.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	40	37.4	37.4	88.8
	Disagree	6	5.6	5.6	94.4
	Strongly Disagree	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.34 A more open and simplified project approval procedure would improve thermal power investment results.

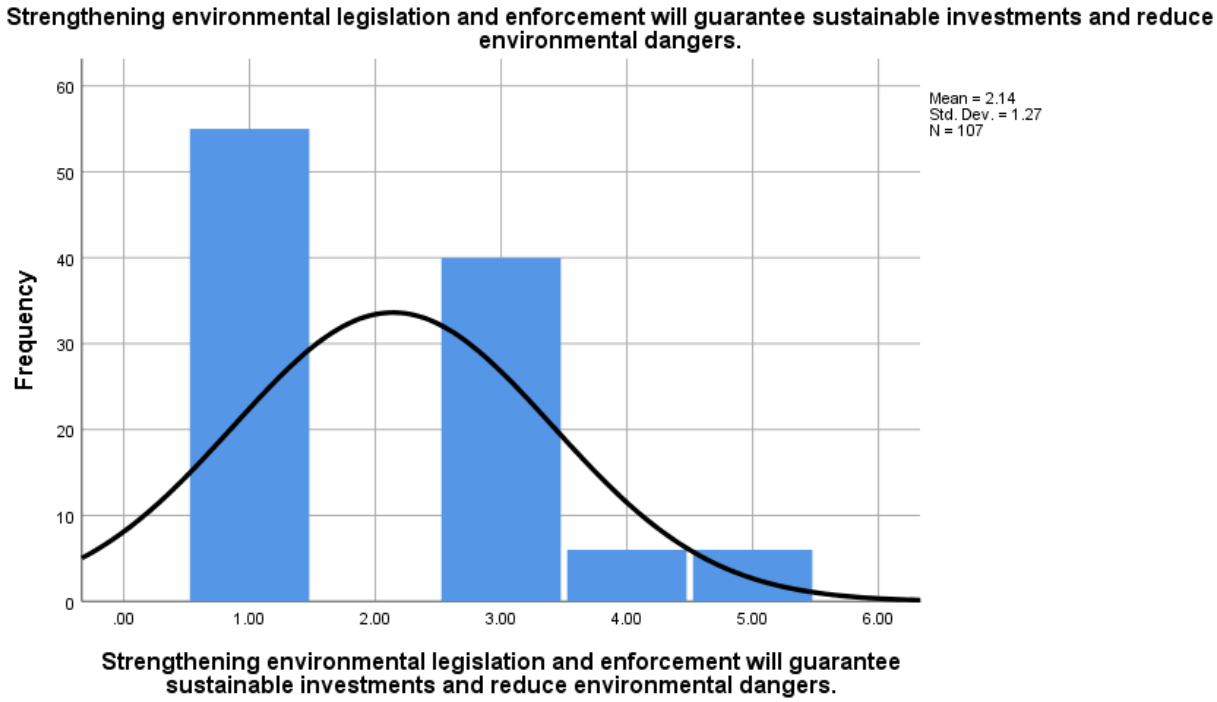


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "A more open and simplified project approval procedure would improve thermal power investment results." 55(51.4%) respondents responded Strongly Agree, 40(37.4%) respondents responded Neutral and 6(5.6%) respondents responded Disagree whereas 6(5.6%) respondents responded Strongly Disagree.

Table-4.35 Strengthening environmental legislation and enforcement will guarantee sustainable investments and reduce environmental dangers.

Strengthening environmental legislation and enforcement will guarantee sustainable investments and reduce environmental dangers.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	40	37.4	37.4	88.8
	Disagree	6	5.6	5.6	94.4
	Strongly Disagree	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.35 Strengthening environmental legislation and enforcement will guarantee sustainable investments and reduce environmental dangers.

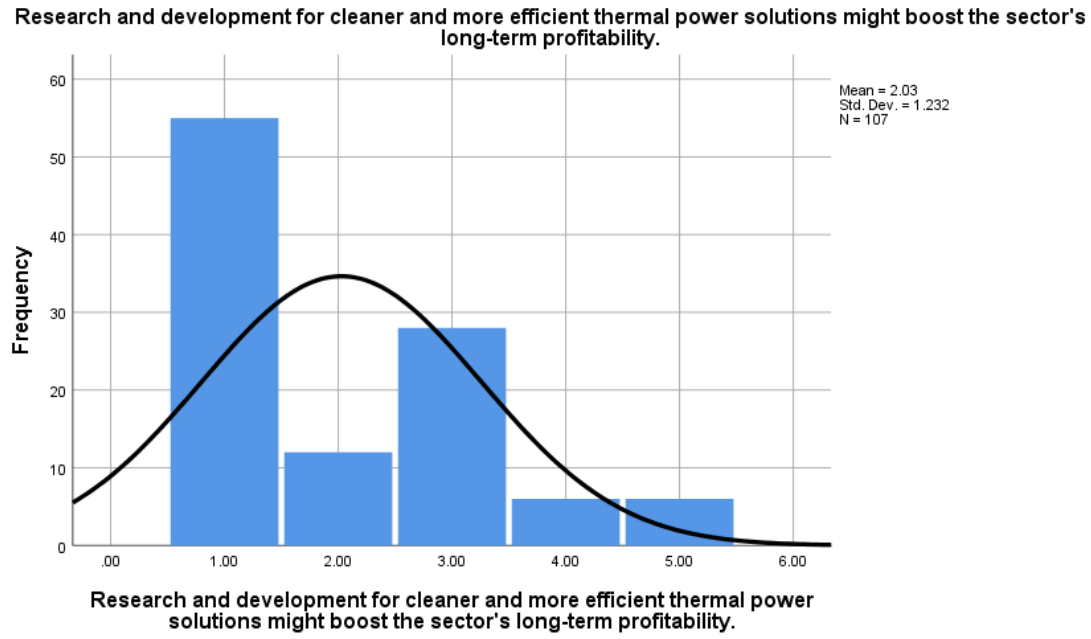


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Strengthening environmental legislation and enforcement will guarantee sustainable investments and reduce environmental dangers." 55(51.4%) respondents responded Strongly Agree, 40(37.4%) respondents responded Neutral and 6(5.6%) respondents responded Disagree whereas 6(5.6%) respondents responded Strongly Disagree.

Table-4.36 Research and development for cleaner and more efficient thermal power solutions might boost the sector's long-term profitability.

Research and development for cleaner and more efficient thermal power solutions might boost the sector's long-term profitability.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Agree	12	11.2	11.2	62.6
	Neutral	28	26.2	26.2	88.8
	Disagree	6	5.6	5.6	94.4
	Strongly Disagree	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.36 Research and development for cleaner and more efficient thermal power solutions might boost the sector's long-term profitability.

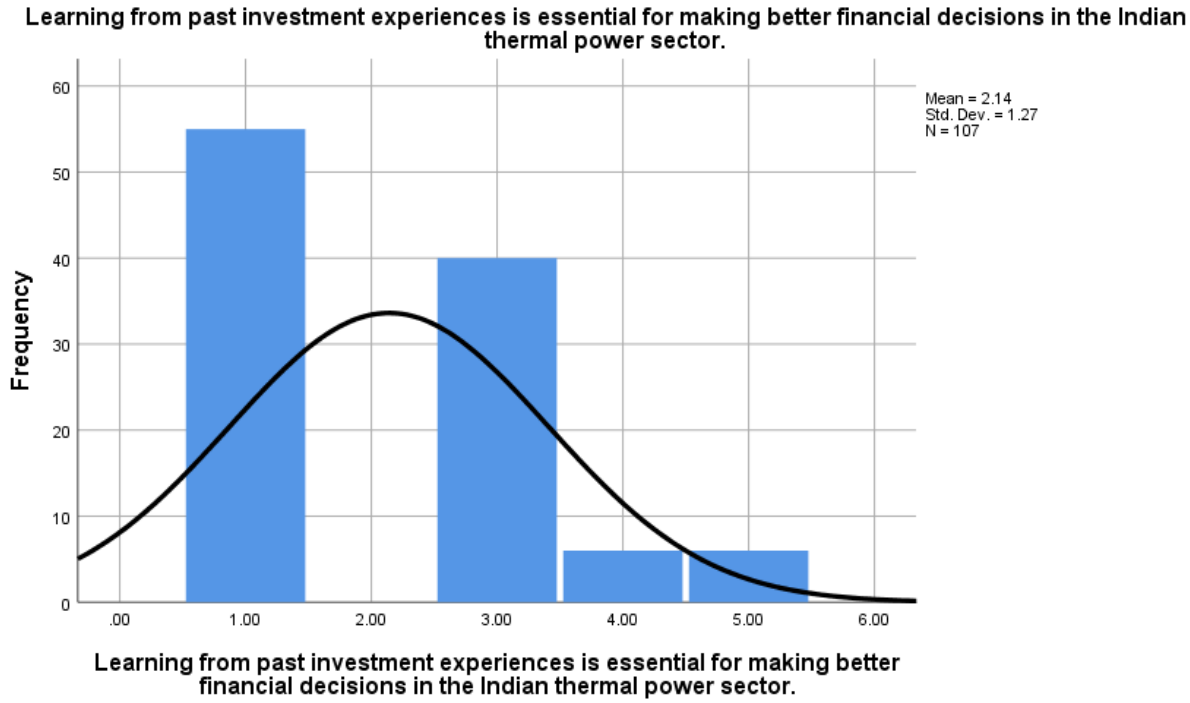


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. "Research and development for cleaner and more efficient thermal power solutions might boost the sector's long-term profitability." 55% respondents responded Strongly Agree, 12(11.2%) respondents responded Agree, 28(26.2%) respondents responded Neutral and 6(5.6%) respondents responded Disagree and 6(5.6%) respondents responded Strongly Disagree.

Table-4.37 Learning from past investment experiences is essential for making better financial decisions in the Indian thermal power sector.

Learning from past investment experiences is essential for making better financial decisions in the Indian thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	40	37.4	37.4	88.8
	Disagree	6	5.6	5.6	94.4
	Strongly Disagree	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.37 Learning from past investment experiences is essential for making better financial decisions in the Indian thermal power sector.

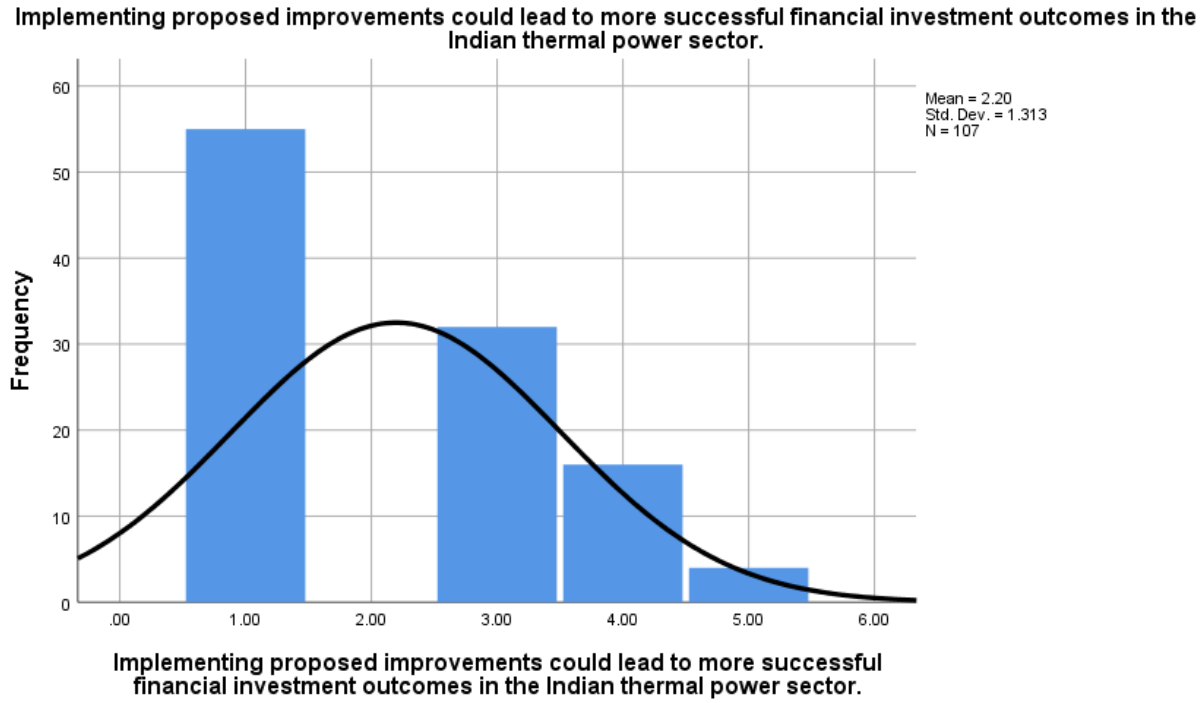


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Learning from past investment experiences is essential for making better financial decisions in the Indian thermal power sector." 55(51.4%) respondents responded Strongly Agree, 40(37.4%) respondents responded Neutral and 6(5.6%) respondents responded Disagree whereas 6(5.6%) respondents responded Strongly Disagree.

Table-4.38 Implementing proposed improvements could lead to more successful financial investment outcomes in the Indian thermal power sector.

Implementing proposed improvements could lead to more successful financial investment outcomes in the Indian thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	32	29.9	29.9	81.3
	Disagree	16	15.0	15.0	96.3
	Strongly Disagree	4	3.7	3.7	100.0
	Total	107	100.0	100.0	

Graph-4.38 Implementing proposed improvements could lead to more successful financial investment outcomes in the Indian thermal power sector.

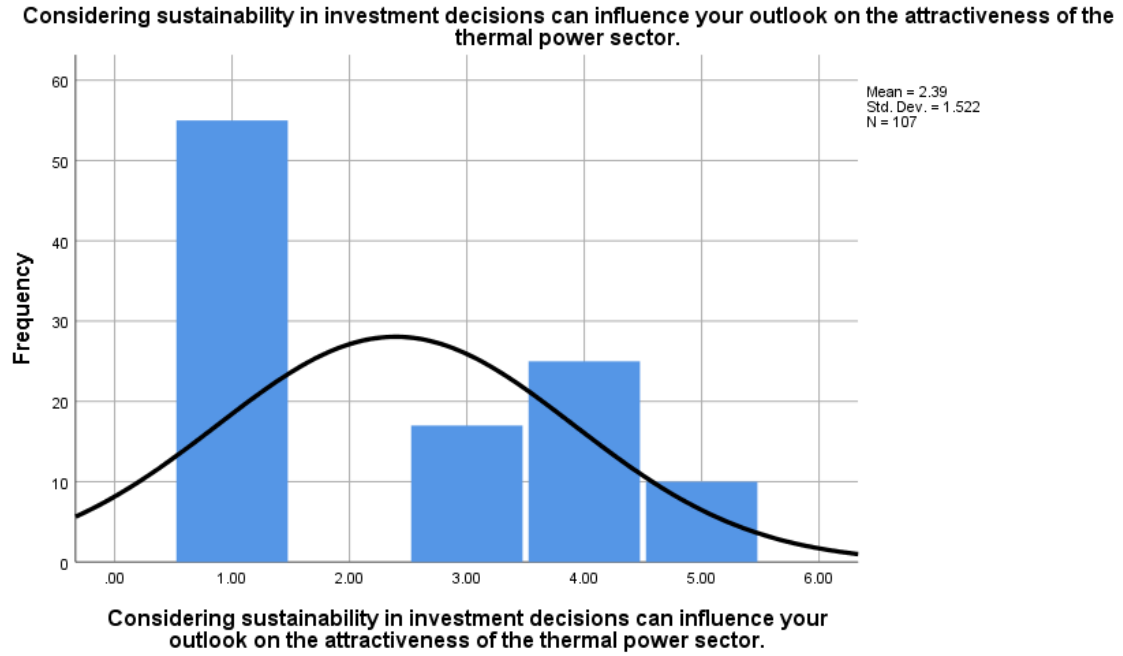


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Implementing proposed improvements could lead to more successful financial investment outcomes in the Indian thermal power sector." 55(51.4%) respondents responded Strongly Agree, 32(29.9%) respondents responded Neutral and 16(15%) respondents responded Disagree whereas 4(3.7%) respondents responded Strongly Disagree.

Table-4.39 Considering sustainability in investment decisions can influence your outlook on the attractiveness of the thermal power sector.

Considering sustainability in investment decisions can influence your outlook on the attractiveness of the thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	17	15.9	15.9	67.3
	Disagree	25	23.4	23.4	90.7
	Strongly Disagree	10	9.3	9.3	100.0
	Total	107	100.0	100.0	

Graph-4.39 Considering sustainability in investment decisions can influence your outlook on the attractiveness of the thermal power sector.

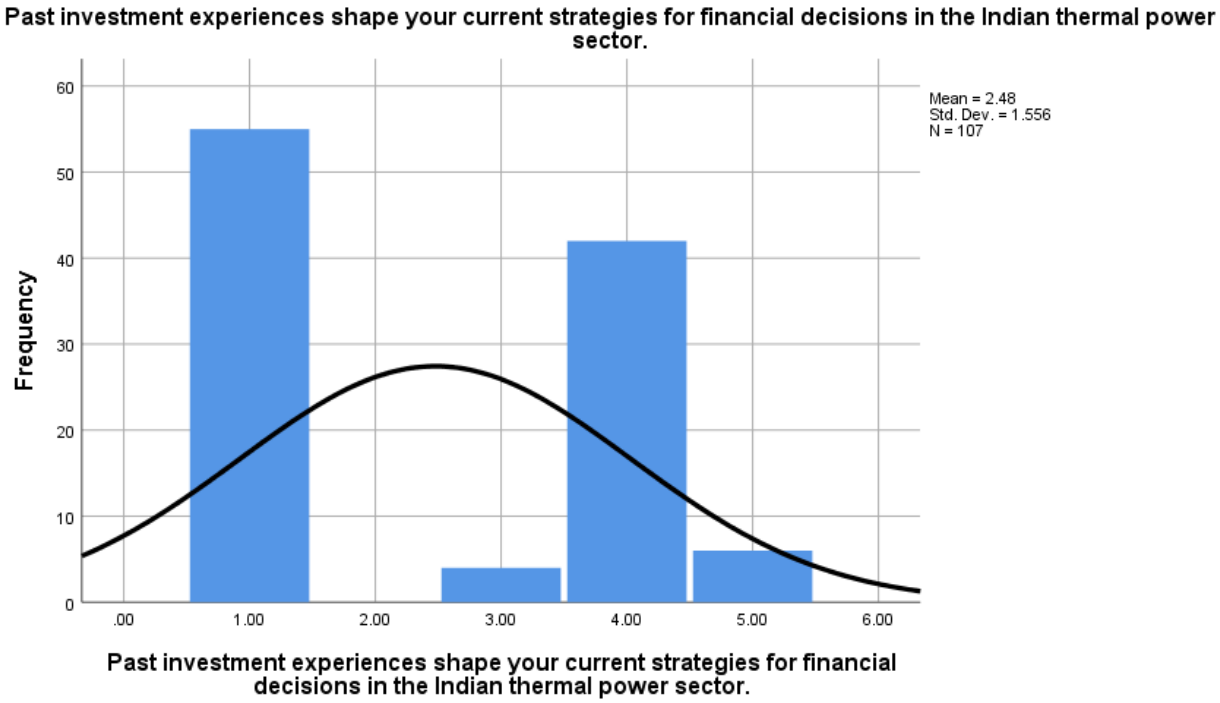


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Considering sustainability in investment decisions can influence your outlook on the attractiveness of the thermal power sector." 55(51.4%) respondents responded Strongly Agree, 17(15.9%) respondents responded Neutral and 25(23.4%) respondents responded Disagree whereas 10(9.3%) respondents responded Strongly Disagree.

Table-4.40 Past investment experiences shape your current strategies for financial decisions in the Indian thermal power sector.

Past investment experiences shape your current strategies for financial decisions in the Indian thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	4	3.7	3.7	55.1
	Disagree	42	39.3	39.3	94.4
	Strongly Disagree	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.40 Past investment experiences shape your current strategies for financial decisions in the Indian thermal power sector.

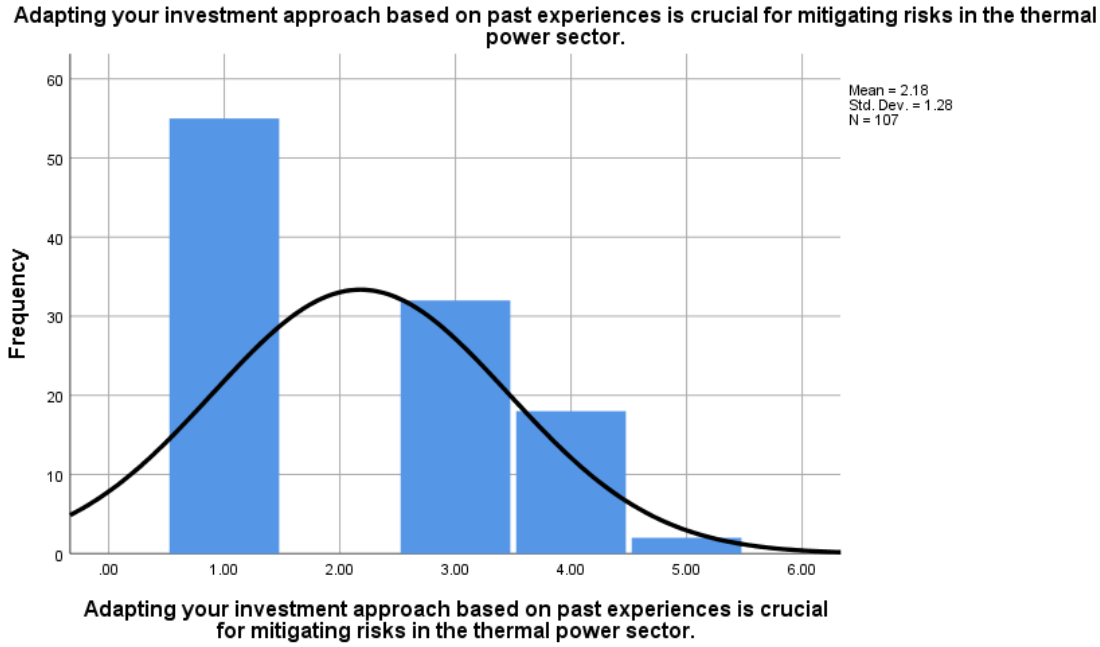


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Past investment experiences shape your current strategies for financial decisions in the Indian thermal power sector." 55(51.4%) respondents responded Strongly Agree, 4(3.7%) respondents responded Neutral and 42(39.3%) respondents responded Disagree whereas 6(5.6%) respondents responded Strongly Disagree.

Table-4.41 Adapting your investment approach based on past experiences is crucial for mitigating risks in the thermal power sector.

Adapting your investment approach based on past experiences is crucial for mitigating risks in the thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	32	29.9	29.9	81.3
	Disagree	18	16.8	16.8	98.1
	Strongly Disagree	2	1.9	1.9	100.0
	Total	107	100.0	100.0	

Graph-4.41 Adapting your investment approach based on past experiences is crucial for mitigating risks in the thermal power sector.

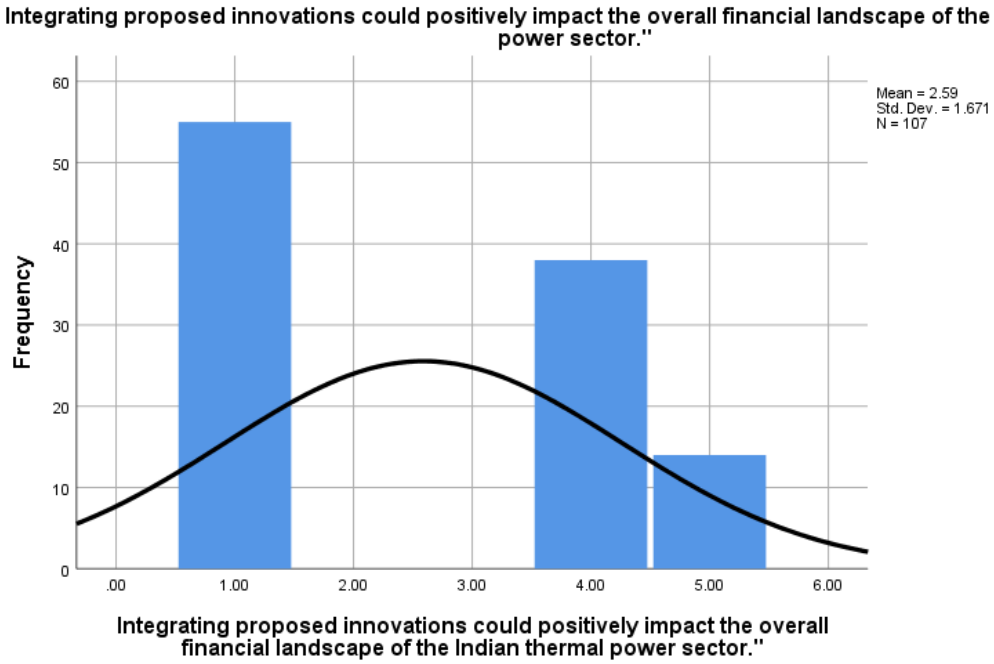


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Adapting your investment approach based on past experiences is crucial for mitigating risks in the thermal power sector." 55(51.4%) respondents responded Strongly Agree, 32(29.9%) respondents responded Neutral and 18(16.8%) respondents responded Disagree whereas 2(1.9%) respondents responded Strongly Disagree.

Table-4.42 Integrating proposed innovations could positively impact the overall financial landscape of the Indian thermal power sector.

Integrating proposed innovations could positively impact the overall financial landscape of the Indian thermal power sector."					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Disagree	38	35.5	35.5	86.9
	Strongly Disagree	14	13.1	13.1	100.0
	Total	107	100.0	100.0	

Graph-4.42 Integrating proposed innovations could positively impact the overall financial landscape of the Indian thermal power sector.

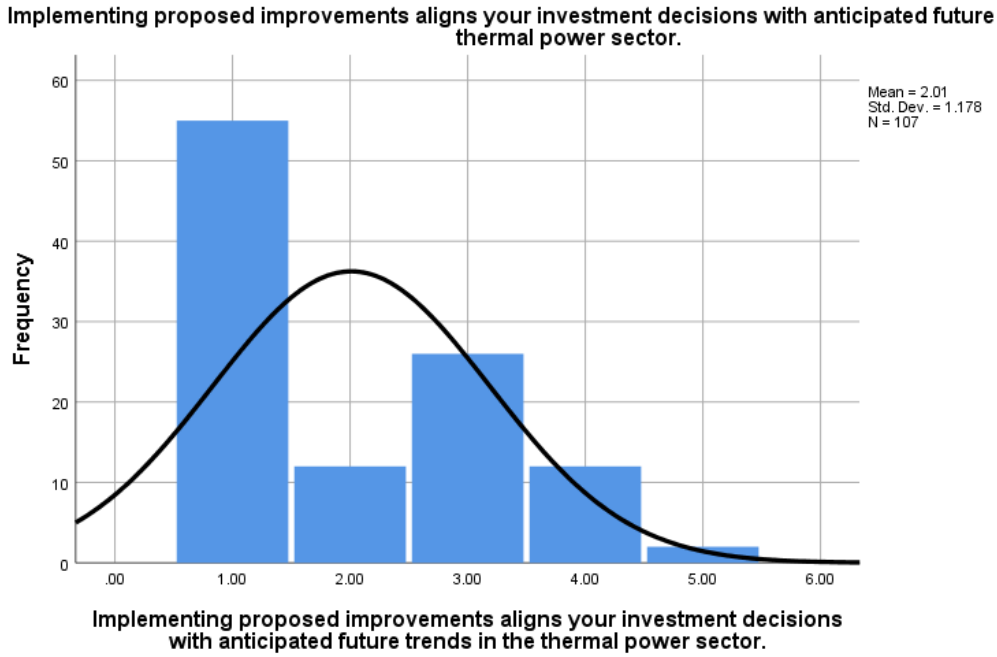


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "Integrating proposed innovations could positively impact the overall financial landscape of the Indian thermal power sector."" 55(51.4%) respondents responded as Strongly Agree, and 38(35.5%) respondents responded as Disagree, whereas 14(13.1%) respondents responded as Strongly Disagree

Table-4.43 Implementing proposed improvements aligns your investment decisions with anticipated future trends in the thermal power sector.

Implementing proposed improvements aligns your investment decisions with anticipated future trends in the thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Agree	12	11.2	11.2	62.6
	Neutral	26	24.3	24.3	86.9
	Disagree	12	11.2	11.2	98.1
	Strongly Disagree	2	1.9	1.9	100.0
	Total	107	100.0	100.0	

Graph-4.43 Implementing proposed improvements aligns your investment decisions with anticipated future trends in the thermal power sector.

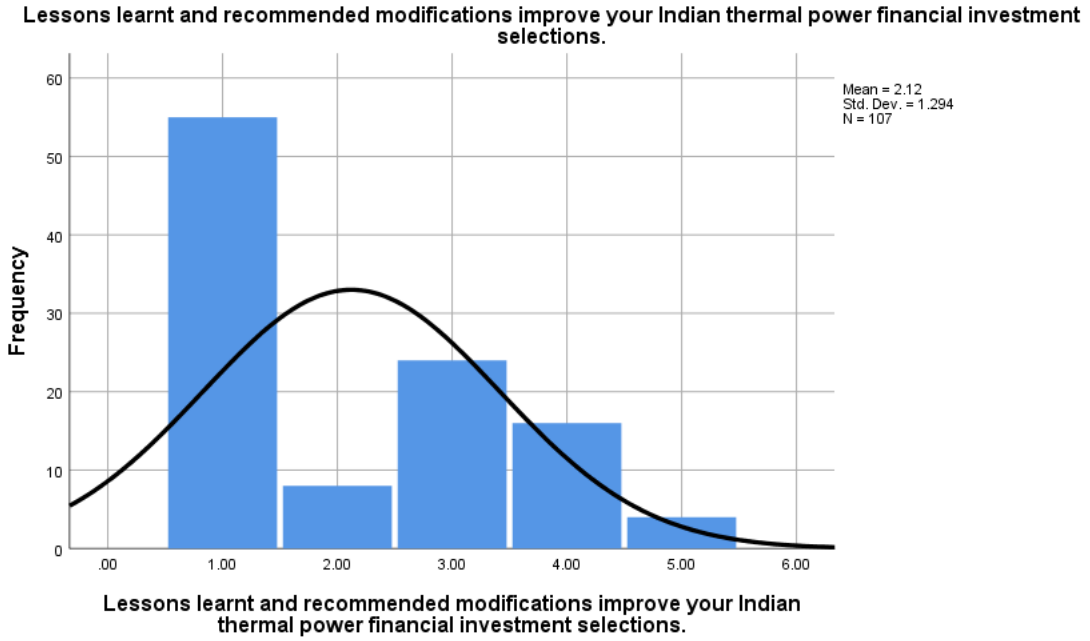


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. "Implementing proposed improvements aligns your investment decisions with anticipated future trends in the thermal power sector." 55% respondents responded Strongly Agree, 12(11.2%) respondents responded Agree, 26(24.3%) respondents responded Neutral and 12(11.2%) respondents responded Disagree and 2(1.9%) respondents responded Strongly Disagree.

Table-4.44 Lessons learnt and recommended modifications improve your Indian thermal power financial investment selections.

Lessons learnt and recommended modifications improve your Indian thermal power financial investment selections.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Agree	8	7.5	7.5	58.9
	Neutral	24	22.4	22.4	81.3
	Disagree	16	15.0	15.0	96.3
	Strongly Disagree	4	3.7	3.7	100.0
	Total	107	100.0	100.0	

Graph-4.44

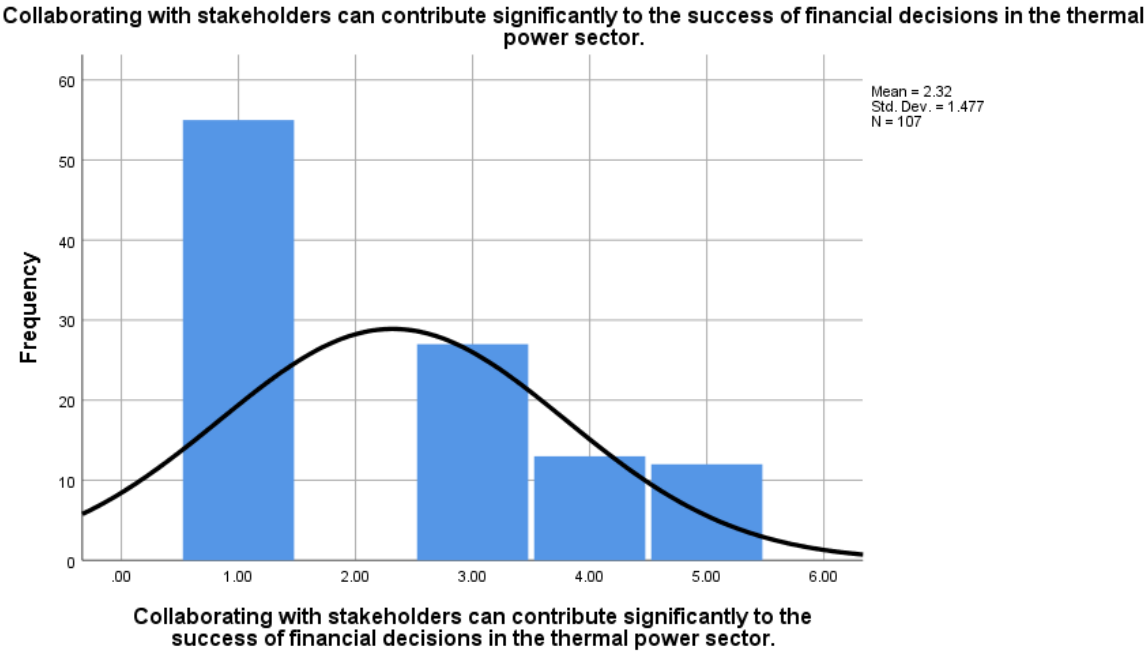


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. "Lessons learnt and recommended modifications improve your Indian thermal power financial investment selections." 55% respondents responded Strongly Agree, 8(7.5%) respondents responded Agree, 24(22.4%) respondents responded Neutral and 16(15%) respondents responded Disagree and 4(3.7%) respondents responded Strongly Disagree.

Table-4.45 Collaborating with stakeholders can contribute significantly to the success of financial decisions in the thermal power sector.

Collaborating with stakeholders can contribute significantly to the success of financial decisions in the thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	27	25.2	25.2	76.6
	Disagree	13	12.1	12.1	88.8
	Strongly Disagree	12	11.2	11.2	100.0
	Total	107	100.0	100.0	

Graph-4.45 Collaborating with stakeholders can contribute significantly to the success of financial decisions in the thermal power sector.

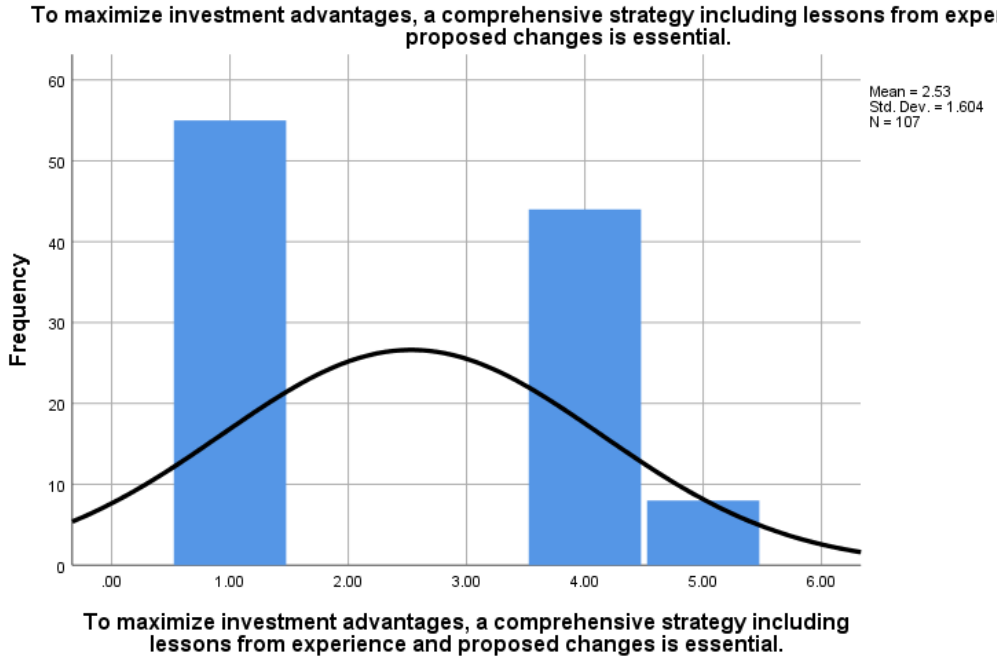


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Collaborating with stakeholders can contribute significantly to the success of financial decisions in the thermal power sector." 55(51.4%) respondents responded Strongly Agree, 27(25.2%) respondents responded Neutral and 13(12.1%) respondents responded Disagree whereas 12(11.2%) respondents responded Strongly Disagree.

Table-4.46 To maximize investment advantages, a comprehensive strategy including lessons from experience and proposed changes is essential.

To maximize investment advantages, a comprehensive strategy including lessons from experience and proposed changes is essential.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Disagree	44	41.1	41.1	92.5
	Strongly Disagree	8	7.5	7.5	100.0
	Total	107	100.0	100.0	

Graph-4.46 To maximize investment advantages, a comprehensive strategy including lessons from experience and proposed changes is essential.

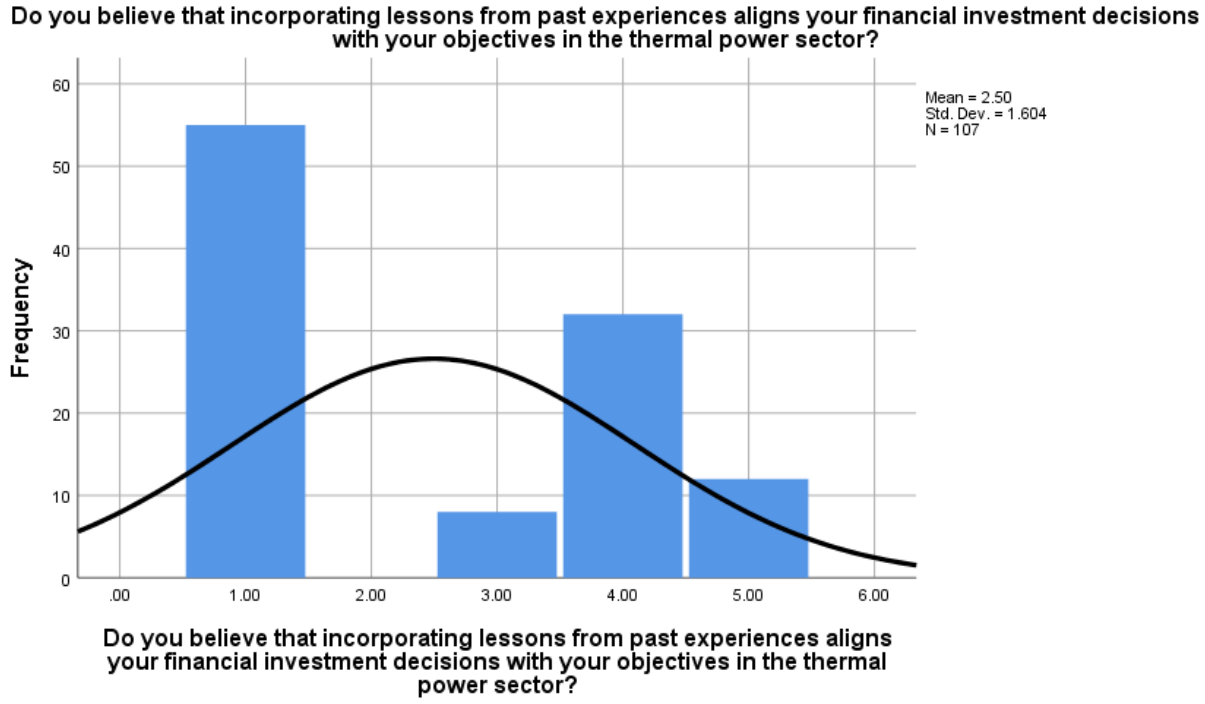


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "To maximize investment advantages, a comprehensive strategy including lessons from experience and proposed changes is essential." 55(51.4%) respondents responded as Strongly Agree, and 44(41.1%) respondents responded as Disagree, whereas 8(7.5%) respondents responded as Strongly Disagree

Table-4.47 Do you believe that incorporating lessons from past experiences aligns your financial investment decisions with your objectives in the thermal power sector?

Do you believe that incorporating lessons from past experiences aligns your financial investment decisions with your objectives in the thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	8	7.5	7.5	58.9
	Disagree	32	29.9	29.9	88.8
	Strongly Disagree	12	11.2	11.2	100.0
	Total	107	100.0	100.0	

Graph-4.47 Do you believe that incorporating lessons from past experiences aligns your financial investment decisions with your objectives in the thermal power sector?

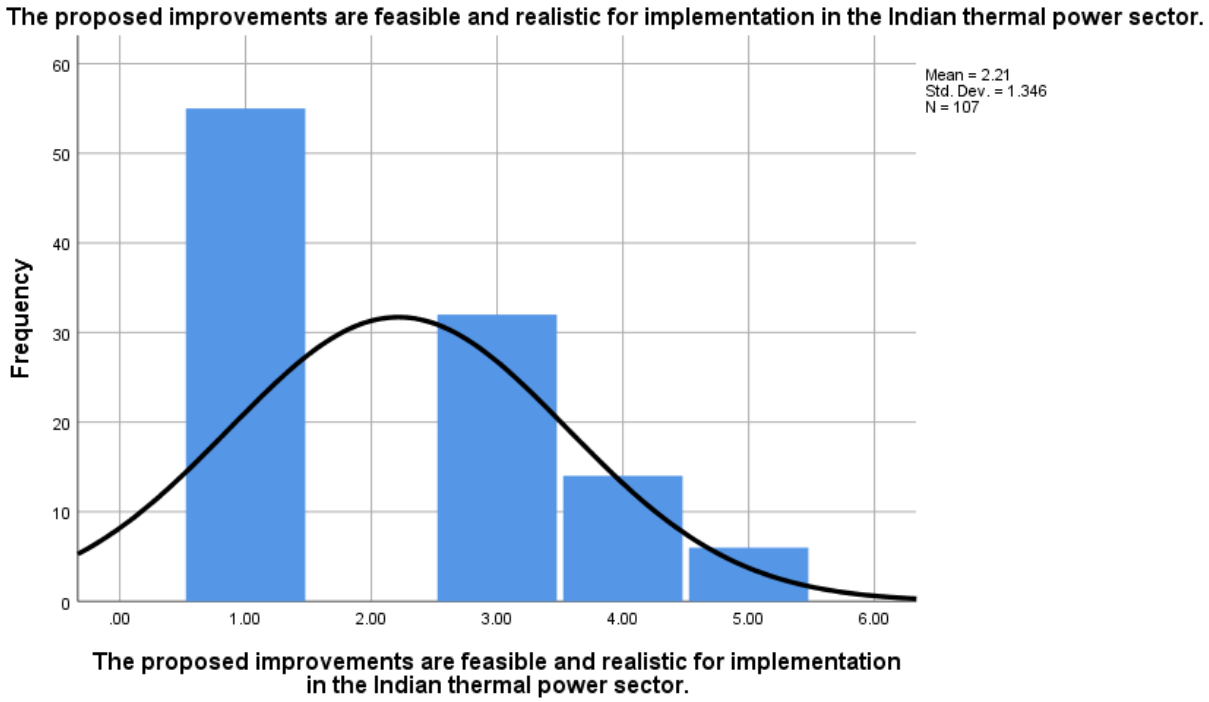


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Do you believe that incorporating lessons from past experiences aligns your financial investment decisions with your objectives in the thermal power sector?" 55(51.4%) respondents responded Strongly Agree, 8(7.5%) respondents responded Neutral and 32(29.9%) respondents responded Disagree whereas 12(11.2%) respondents responded Strongly Disagree.

Table-4.48 The proposed improvements are feasible and realistic for implementation in the Indian thermal power sector.

The proposed improvements are feasible and realistic for implementation in the Indian thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	32	29.9	29.9	81.3
	Disagree	14	13.1	13.1	94.4
	Strongly Disagree	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.48 The proposed improvements are feasible and realistic for implementation in the Indian thermal power sector.

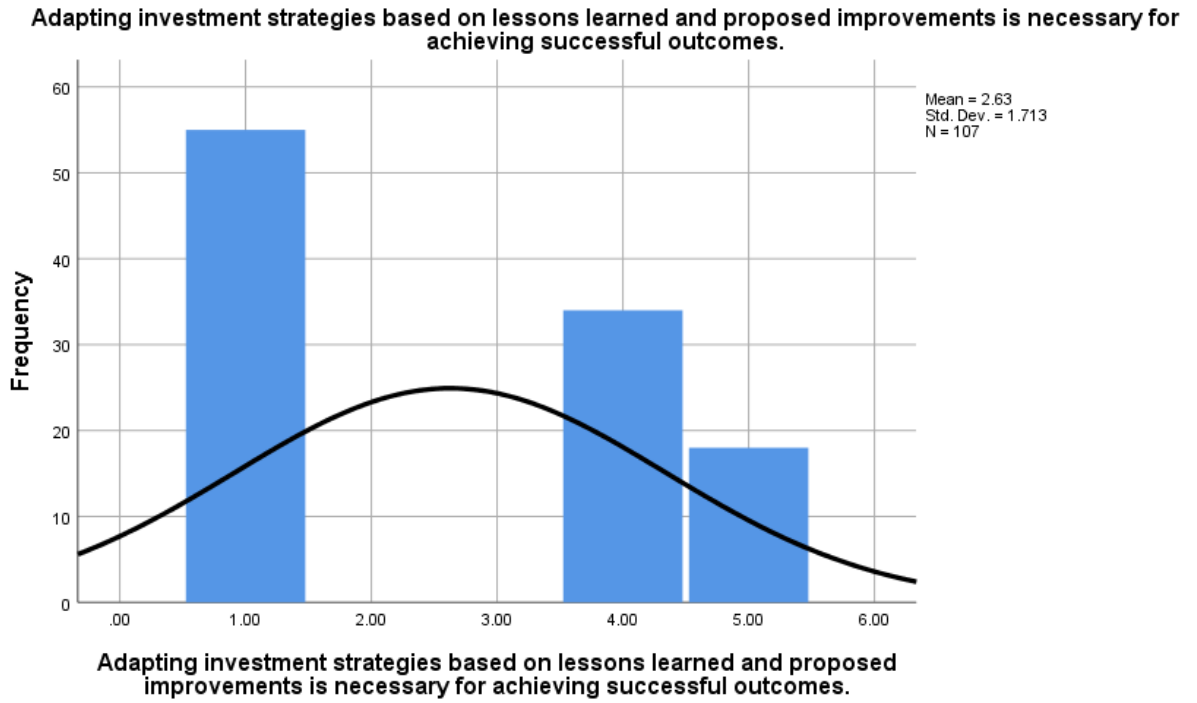


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "The proposed improvements are feasible and realistic for implementation in the Indian thermal power sector." 55(51.4%) respondents responded Strongly Agree, 32(29.9%) respondents responded Neutral and 14(13.1%) respondents responded Disagree whereas 6(5.6%) respondents responded Strongly Disagree.

Table-4.49 Adapting investment strategies based on lessons learned and proposed improvements is necessary for achieving successful outcomes.

Adapting investment strategies based on lessons learned and proposed improvements is necessary for achieving successful outcomes.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Disagree	34	31.8	31.8	83.2
	Strongly Disagree	18	16.8	16.8	100.0
	Total	107	100.0	100.0	

Graph-4.49 Adapting investment strategies based on lessons learned and proposed improvements is necessary for achieving successful outcomes.

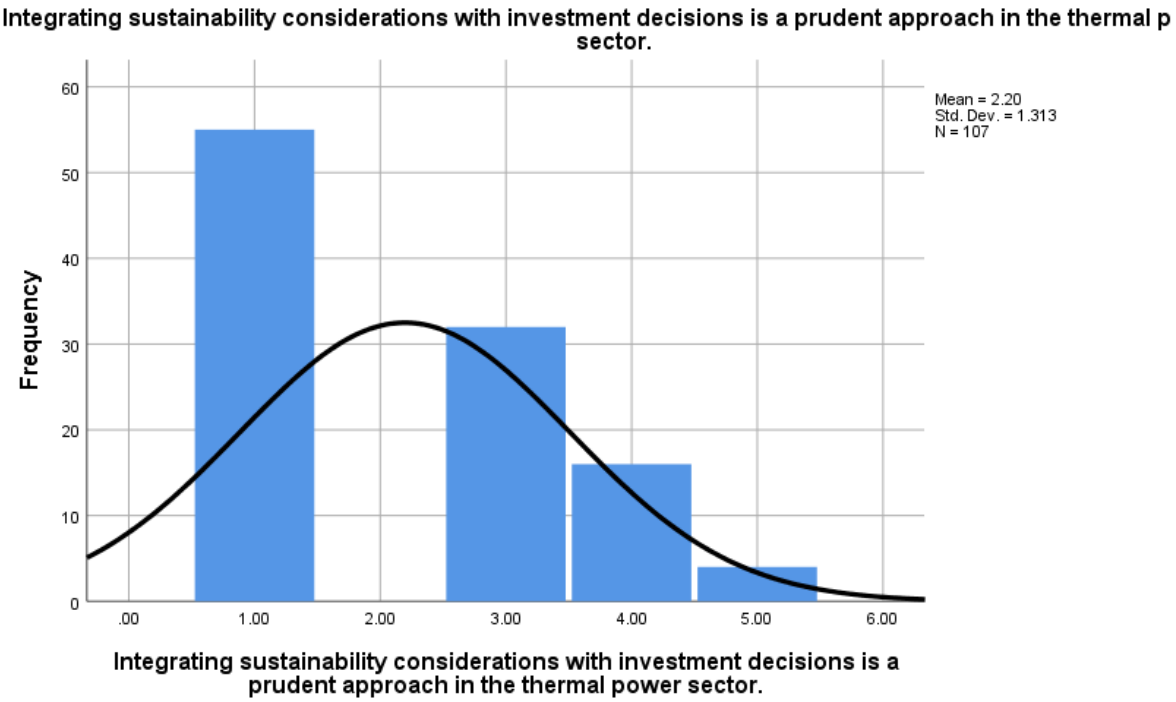


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "Adapting investment strategies based on lessons learned and proposed improvements is necessary for achieving successful outcomes." 55(51.4%) respondents responded as Strongly Agree, and 34(31.8%) respondents responded as Disagree, whereas 18(16.8%) respondents responded as Strongly Disagree

Table-4.50 Integrating sustainability considerations with investment decisions is a prudent approach in the thermal power sector.

Integrating sustainability considerations with investment decisions is a prudent approach in the thermal power sector.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	32	29.9	29.9	81.3
	Disagree	16	15.0	15.0	96.3
	Strongly Disagree	4	3.7	3.7	100.0
	Total	107	100.0	100.0	

Graph-4.50 Integrating sustainability considerations with investment decisions is a prudent approach in the thermal power sector.

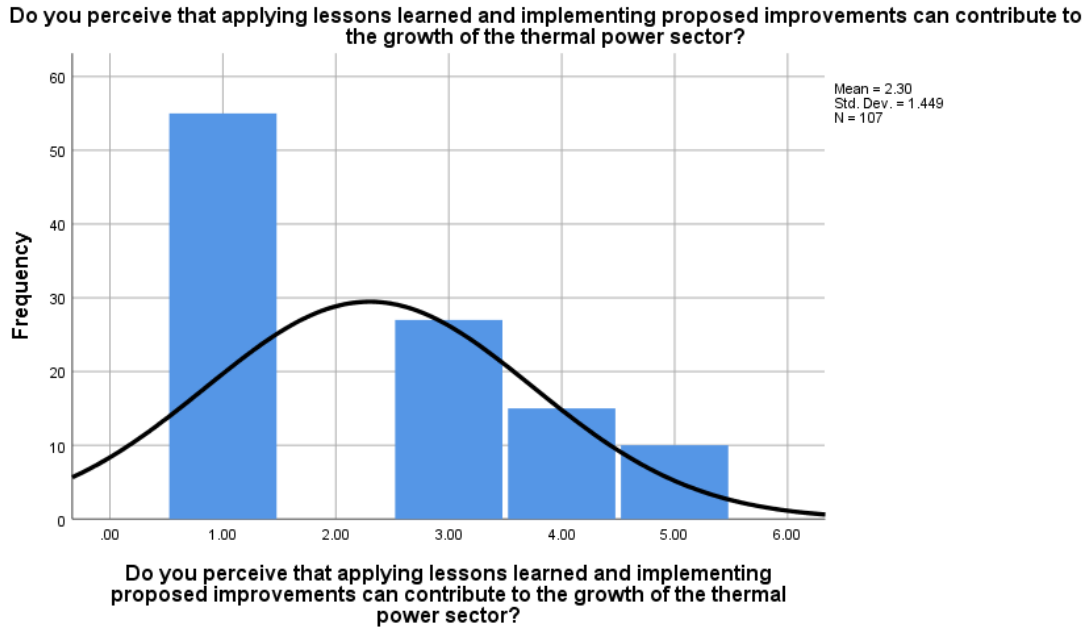


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "Integrating sustainability considerations with investment decisions is a prudent approach in the thermal power sector." 55(51.4%) respondents responded as Strongly Agree, and 32(29.9%) respondents responded as Neutral, whereas 16(15%) respondents responded as Disagree

Table-4.51 Do you perceive that applying lessons learned and implementing proposed improvements can contribute to the growth of the thermal power sector?

Do you perceive that applying lessons learned and implementing proposed improvements can contribute to the growth of the thermal power sector?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	27	25.2	25.2	76.6
	Disagree	15	14.0	14.0	90.7
	Strongly Disagree	10	9.3	9.3	100.0
	Total	107	100.0	100.0	

Graph-4.51 Do you perceive that applying lessons learned and implementing proposed improvements can contribute to the growth of the thermal power sector?

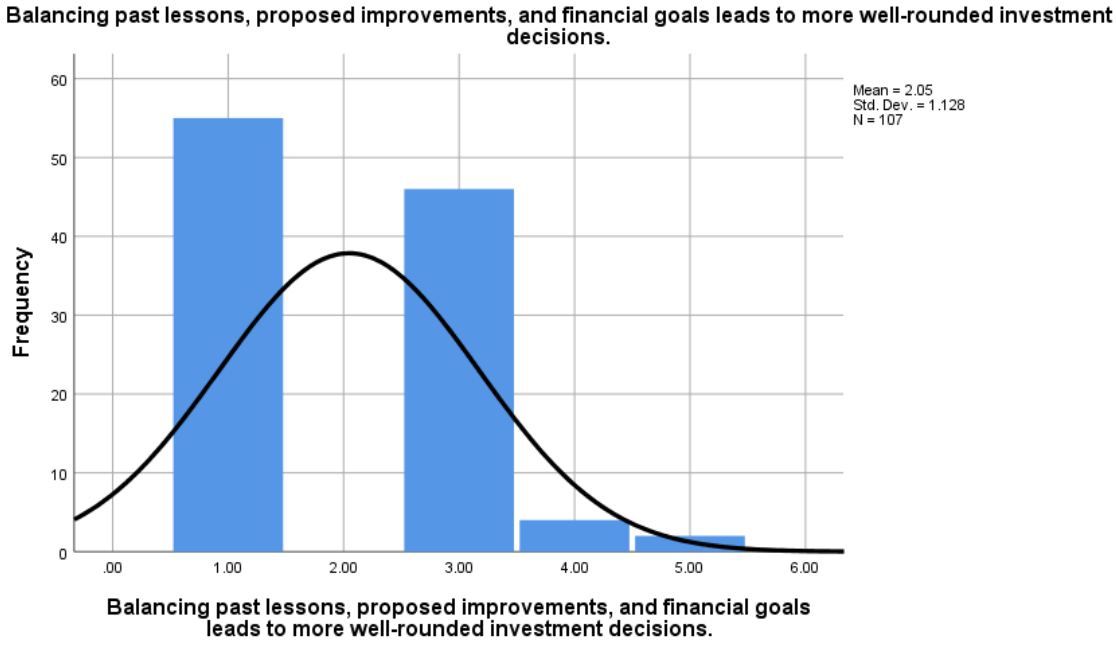


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "Do you perceive that applying lessons learned and implementing proposed improvements can contribute to the growth of the thermal power sector?" 55(51.4%) respondents responded as Strongly Agree, and 27(25.2%) respondents responded as Neutral, whereas 15(14%) respondents responded as Disagree

Table-4.52 Balancing past lessons, proposed improvements, and financial goals leads to more well-rounded investment decisions.

Balancing past lessons, proposed improvements, and financial goals leads to more well-rounded investment decisions.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	46	43.0	43.0	94.4
	Disagree	4	3.7	3.7	98.1
	Strongly Disagree	2	1.9	1.9	100.0
	Total	107	100.0	100.0	

Graph-4.52 Balancing past lessons, proposed improvements, and financial goals leads to more well-rounded investment decisions.

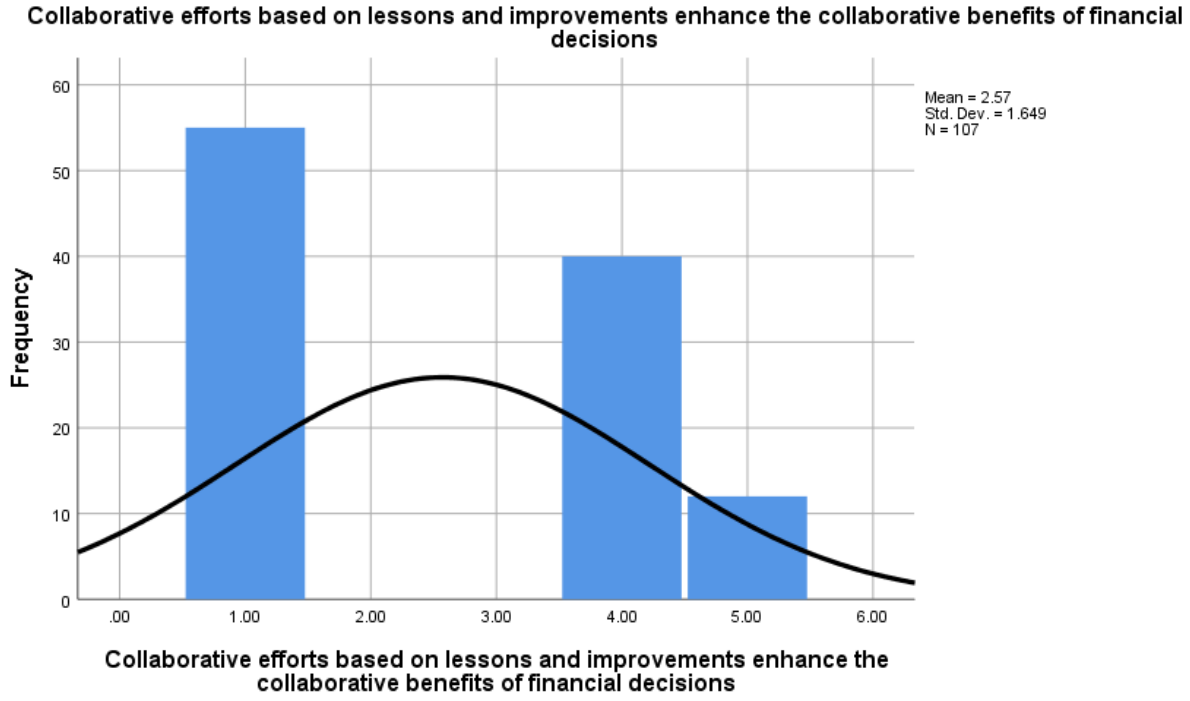


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "Balancing past lessons, proposed improvements, and financial goals leads to more well-rounded investment decisions." 55(51.4%) respondents responded as Strongly Agree, and 46(43%) respondents responded as Neutral, whereas 4(3.7%) respondents responded as Disagree

Table-4.53 Collaborative efforts based on lessons and improvements enhance the collaborative benefits of financial decisions

Collaborative efforts based on lessons and improvements enhance the collaborative benefits of financial decisions					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Disagree	40	37.4	37.4	88.8
	Strongly Disagree	12	11.2	11.2	100.0
	Total	107	100.0	100.0	

Graph-4.53 Collaborative efforts based on lessons and improvements enhance the collaborative benefits of financial decisions

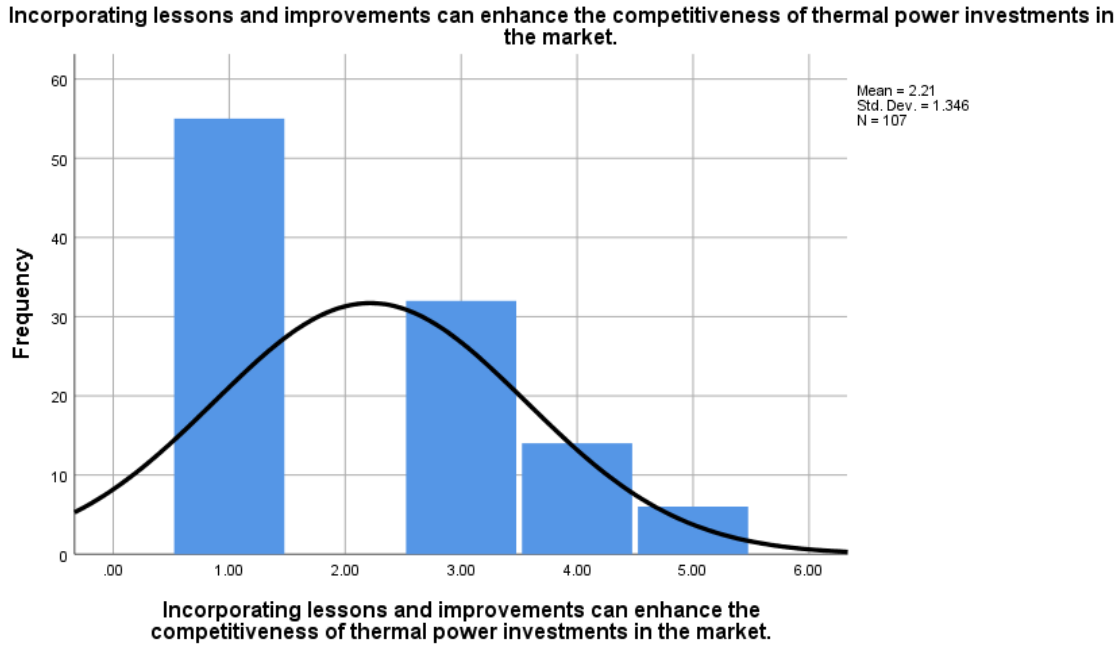


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. It was asked "Collaborative efforts based on lessons and improvements enhance the collaborative benefits of financial decisions" 55(51.4%) respondents responded as Strongly Agree, and 40(37.4%) respondents responded as Disagree, whereas 12(11.2%) respondents responded as Strongly Disagree

Table-4.54 Incorporating lessons and improvements can enhance the competitiveness of thermal power investments in the market.

Incorporating lessons and improvements can enhance the competitiveness of thermal power investments in the market.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	32	29.9	29.9	81.3
	Disagree	14	13.1	13.1	94.4
	Strongly Disagree	6	5.6	5.6	100.0
	Total	107	100.0	100.0	

Graph-4.54 Incorporating lessons and improvements can enhance the competitiveness of thermal power investments in the market.

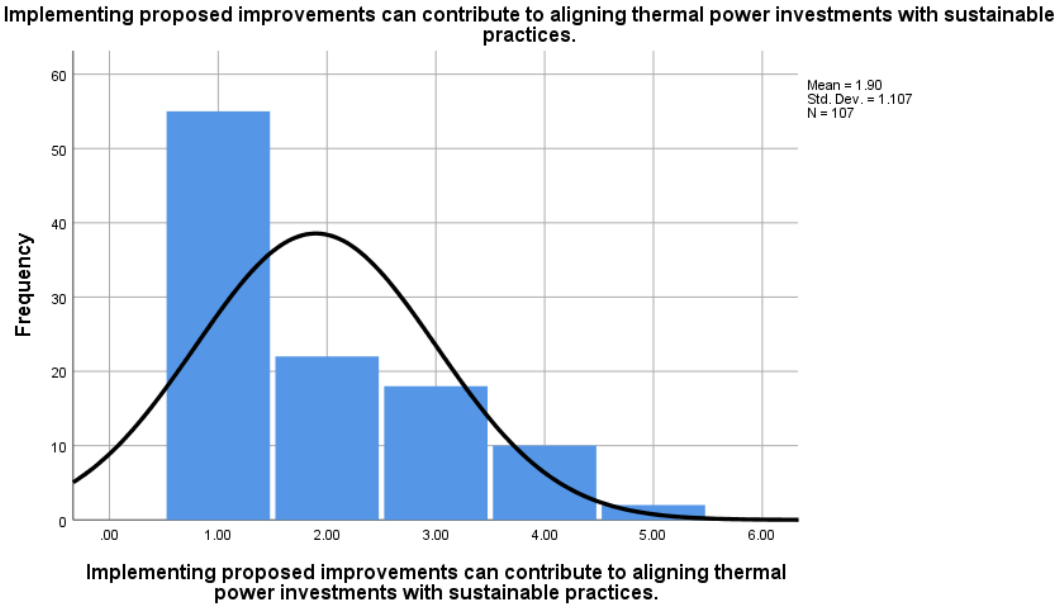


From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Incorporating lessons and improvements can enhance the competitiveness of thermal power investments in the market." 55(51.4%) respondents responded Strongly Agree, 32(29.9%) respondents responded Neutral and 14(13.1%) respondents responded Disagree whereas 6(5.6%) respondents responded Strongly Disagree.

Table-4.55 Implementing proposed improvements can contribute to aligning thermal power investments with sustainable practices.

Implementing proposed improvements can contribute to aligning thermal power investments with sustainable practices.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Agree	22	20.6	20.6	72.0
	Neutral	18	16.8	16.8	88.8
	Disagree	10	9.3	9.3	98.1
	Strongly Disagree	2	1.9	1.9	100.0
	Total	107	100.0	100.0	

Graph-4.55 Implementing proposed improvements can contribute to aligning thermal power investments with sustainable practices.

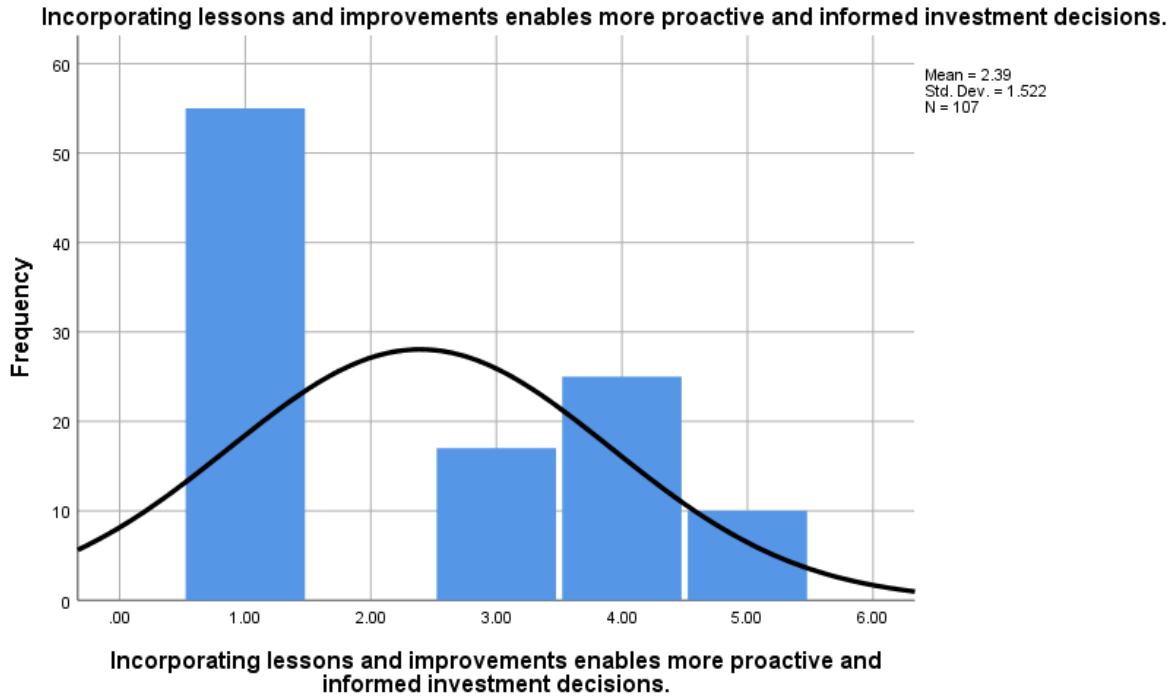


From the analysis we have found the details mentioned in the above Graph and Table and it states that the sample data is concerned about 107 respondents. "Implementing proposed improvements can contribute to aligning thermal power investments with sustainable practices." 55% respondents responded Strongly Agree, 22(20.6%) respondents responded Agree, 18(16.8%) respondents responded Neutral and 10(9.3%) respondents responded Disagree and 2(1.9%) respondents responded Strongly Disagree.

Table 4.56 Incorporating lessons and improvements enables more proactive and informed investment decisions.

Incorporating lessons and improvements enables more proactive and informed investment decisions.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	55	51.4	51.4	51.4
	Neutral	17	15.9	15.9	67.3
	Disagree	25	23.4	23.4	90.7
	Strongly Disagree	10	9.3	9.3	100.0
	Total	107	100.0	100.0	

Graph-4.56 Incorporating lessons and improvements enables more proactive and informed investment decisions.



From the analysis as discussed randomly with people as respondents, we observed their opinion and the details mentioned in the above Graph and Table is concerned about 107 respondents. It was observed about "Incorporating lessons and improvements enables more proactive and informed investment decisions." 55(51.4%) respondents responded Strongly Agree, 17(15.9%) respondents responded Neutral and 25(23.4%) respondents responded Disagree whereas 10(9.3%) respondents responded Strongly Disagree.

4.2 Interview questionnaire

Interview questionnaire was designed by keeping the key parameters or factors for the Industry such as:

1. Past Investments Parameters:
2. Changes in Evaluation Factors:
3. Sources for Projected Energy Demand:
4. Addressing Environmental Impact and Technological Advancements:
5. Financing Thermal Power Plants:
6. Financial Metrics for Investment Attractiveness:
7. Influence of Government Policies and Incentives:
8. Key Factors for Poor Returns in Past Investments:

1. Past Investments Parameters:

- **Question:** In the past, significant investments were made in the Thermal Power Sector (especially between 2009-2015) based on projected energy demand, government policies, regulations, environmental and technological impacts. Would you apply the same parameters or look at other factors for evaluation?
- **Answer:** The unviability of past investments was largely due to lack of long-term power purchase agreements, non-availability of affordable coal, discriminatory government policies, and deteriorating financial position of distribution companies. Additionally, there was insufficient enforcement of environmental regulations.
- **Qualitative Insight:** This response highlights several critical factors that need reassessment for future investments. Firstly, the absence of secure, long-term power purchase agreements led to instability and unpredictability in revenue streams, which is a fundamental risk. Future evaluations should emphasize securing these agreements to ensure financial stability. Secondly, the availability and cost of coal, as a key raw material, were significant constraints. Therefore, securing affordable and reliable coal supplies, or exploring alternative fuels, should be prioritized. Thirdly, the discriminatory policies between public and private sector companies created an uneven playing field. Future policies need to ensure fairness and equal opportunities for all players in the sector. Lastly, the financial health of distribution companies is crucial as their inability to pay can cause a cascading effect on the entire value chain. Ensuring their financial stability and improving the enforcement of environmental regulations will be essential for future investments.

2. Changes in Evaluation Factors:

- **Question:** In what way has the situation changed with respect to the above factors as considered for determination to evaluate investments in the Thermal Power Sector?

- **Answer:** Participants noted changes such as the introduction of security mechanisms for payment of overdue receivables and enforcement of environmental regulations. The main factors now include projected energy demand, environmental impact, and technological advancements.

- **Qualitative Insight:** The introduction of security mechanisms for overdue payments addresses a major financial risk identified in the past. This change provides a more reliable cash flow for power generation companies, reducing the financial uncertainty that previously plagued the sector. Enhanced enforcement of environmental regulations indicates a shift towards more sustainable practices, which can mitigate long-term environmental and health costs. Moreover, the focus on projected energy demand ensures that investments are aligned with realistic market needs, avoiding the pitfalls of overestimating demand. Technological advancements also play a crucial role, as they can improve efficiency and reduce costs, making new investments more attractive.

3. Sources for Projected Energy Demand:

- **Question:** What source of information was mainly relied upon to factor projected demand of the energy?

- **Answer:** Most participants relied on government publications, Ministry of Power data, company websites, and annual accounts.

- **Qualitative Insight:** The reliance on government and authoritative sources underscores the importance of accurate and comprehensive data in making informed investment decisions. Government publications and data from the Ministry of Power provide an official outlook on energy demand, which is crucial for long-term planning. Company websites and annual accounts offer detailed insights into the operational and financial health of potential partners and competitors. This practice not only ensures that projections are based on credible information but also helps in aligning investments with national energy policies and market trends.

4. Addressing Environmental Impact and Technological Advancements:

- **Question:** How have environmental impact and technological advancements been addressed? Please state a few initiatives the sector has taken in the recent past.

- **Answer:** Participants mentioned regulatory provisions to control emissions, such as setting up Flue-Gas Desulfurization (FGD) plants to contain sulfur particles.

- **Qualitative Insight:** The sector's initiatives to address environmental impacts, such as the installation of FGD plants, reflect a significant shift towards compliance with stricter environmental regulations. These advancements not only help in reducing harmful emissions but also improve the overall sustainability of the power generation process. By adopting such technologies, companies can mitigate regulatory risks and potential fines, enhance their corporate social responsibility (CSR) profile, and appeal to environmentally conscious investors. Additionally, technological advancements can lead to improved efficiency and cost savings, making power generation more competitive.

5. Financing Thermal Power Plants:

- **Question:** In light of past experience with the changed outlook for the Thermal power requirement, how and who will provide the required finance for setting up the plant?
- **Answer:** Most participants responded that initial investments come from long-term investors like private equity partners, Foreign Institutional Investors (FIIs), venture capitalists, and high net worth entrepreneurs.
- **Qualitative Insight:** The shift towards diverse financing sources, such as private equity, FIIs, and venture capitalists, indicates a more sophisticated and robust financial strategy for setting up thermal power plants. These investors typically have a long-term perspective and are willing to commit significant capital, which is crucial for the capital-intensive nature of power projects. Their involvement not only provides the necessary funding but also brings in expertise and strategic oversight, which can enhance project management and execution. Furthermore, high net worth entrepreneurs investing their own equity demonstrate confidence in the sector, which can attract additional investment and boost market sentiment.

6. Financial Metrics for Investment Attractiveness:

- **Question:** Which financial metrics are used to evaluate the attractiveness of an investment in the Thermal Power Sector, considering that ultimate public shareholders are concerned with getting sustainable returns on their investments?
- **Answer:** Participants mentioned ROI and Debt/Equity ratio as important metrics. They also noted that once the plant achieves sustainable EBITDA, public participation would be initiated, focusing on stock price and its price-earnings multiple.
- **Qualitative Insight:** The emphasis on ROI and Debt/Equity ratio as key financial metrics reflects a focus on ensuring that investments provide a healthy return while maintaining a manageable level of debt. These metrics are crucial for assessing the financial viability and risk profile of a project. A strong ROI indicates that the project is expected to generate significant profits relative to the investment, while a balanced Debt/Equity ratio ensures that the company can manage its debt obligations without over-leveraging. Achieving sustainable EBITDA is a milestone that demonstrates operational stability and profitability, which can attract public investors and enhance stock market performance.

7. Influence of Government Policies and Incentives:

- **Question:** How have specific government policies and incentives influenced investment decisions in the Thermal Power sector? Which regulatory provisions are considered in your viewpoint and basis to respond to the survey questionnaire?
- **Answer:** Participants highlighted subsidies for clean energy, tax concessions, and renewable energy certificates as influential factors. These policies help reduce the cost of generation and raise liquidity while addressing environmental concerns.

- **Qualitative Insight:** Government policies and incentives play a crucial role in shaping investment decisions. Subsidies for clean energy and tax concessions reduce the effective cost of power generation, making investments more attractive. Renewable energy certificates provide additional revenue streams and liquidity, incentivizing the adoption of cleaner technologies. These incentives align with broader policy goals of promoting sustainable energy while ensuring that investors can achieve favorable financial returns. By reducing financial barriers and enhancing the profitability of projects, these policies encourage more investments in the thermal power sector.

8. Key Factors for Poor Returns in Past Investments:

- **Question:** On the overall questionnaire, a few sub-questions were raised regarding why past investment decisions did not yield the expected returns or resulted in financial losses. What key factors were responsible for the poor returns and losses?
- **Answer:** Participants identified factors such as mismatch of energy supply and demand, poor infrastructure, project delays due to lack of government support, and issues related to land allotment and coal availability.
- **Qualitative Insight:** The identification of key factors responsible for poor returns in past investments provides valuable lessons for future projects. The mismatch of supply and demand highlights the importance of accurate market forecasting and flexible planning. Poor infrastructure, particularly in transmission and distribution, underscores the need for investments in modernizing and expanding the grid. Project delays due to lack of government support and issues with land and coal highlight the critical role of effective government policies and streamlined regulatory processes. Addressing these challenges is essential for improving the financial performance and sustainability of future investments in the thermal power sector.

4.3 Conclusion

The qualitative analysis of the questionnaire responses provides valuable insights into the critical factors influencing investment decisions in the thermal power sector in India. The retrospective examination of past investments (particularly from 2009-2015) underscores the significance of addressing key challenges such as the absence of long-term power purchase agreements, affordable coal availability, discriminatory government policies, and the financial instability of distribution companies. These historical lessons highlight the need for a more secure, equiTable, and financially sTable approach to future investments.

Recent changes in the evaluation of investment factors reflect a shift towards a more comprehensive and sustainable approach. The introduction of security mechanisms for overdue payments, stricter enforcement of environmental regulations, and a focus on technological advancements indicate a more robust framework for future investments. Reliance on credible sources like government publications and

Ministry of Power data ensures that projections are based on reliable information, enhancing the accuracy and reliability of investment decisions.

The sector's proactive stance on environmental impact and technological advancements, such as the installation of Flue-Gas Desulfurization (FGD) plants, demonstrates a commitment to sustainability and regulatory compliance. These initiatives not only mitigate environmental risks but also enhance operational efficiency and cost-effectiveness.

Diverse sources of financing, including private equity, FIIs, venture capitalists, and high net worth entrepreneurs, provide robust financial backing for the capital-intensive nature of thermal power projects. This diverse financial support, combined with a focus on key financial metrics like ROI and Debt/Equity ratio, ensures that investments are evaluated for their potential to provide sustainable returns and maintain financial prudence.

Government policies and incentives, such as subsidies for clean energy, tax concessions, and renewable energy certificates, play a pivotal role in making investments more attractive and viable. These policies reduce financial barriers and promote the adoption of cleaner technologies, aligning with broader sustainability goals.

Identifying the key factors responsible for poor returns in past investments, such as supply-demand mismatches, poor infrastructure, project delays, and regulatory challenges, provides valuable lessons for future projects. Addressing these issues through improved market forecasting, modernized infrastructure, and effective government support is crucial for enhancing the financial performance and sustainability of investments in the thermal power sector.

In conclusion, the qualitative insights from this analysis emphasize the importance of a balanced and forward-looking approach to investment decisions in the thermal power sector. By learning from past experiences, leveraging credible information sources, adopting sustainable practices, securing diverse financing, and aligning with supportive government policies, investors can enhance the viability and profitability of their investments. This comprehensive approach ensures that the thermal power sector can meet the evolving energy demands while contributing to environmental sustainability and economic growth.

CHAPTER V

5.1 **Discussion of Results**

The influence that rules and regulations imposed by the government have on this industry is an essential component to consider. Researchers such as Ghosh and Saha (2019) have highlighted

the influence of various government policies, such as the policy for Ultra Mega Power Projects (UMPP), on investment decisions in the thermal power sector. The National Electricity Policy is another policy that has been cited as having an impact. These regulations have attempted to address difficulties relating to fuel supply as well as price, with the goal of encouraging engagement from the private sector. In addition, research on the economic viability of thermal power plants in India has been carried out by a number of researchers, including Prakash and Panda (2020), among others. They have investigated the aspects that affect the profitability of the project, such as plant efficiency, cost overruns, and revenue realization; these factors may greatly impact the choices that are made about investments

They stress how important it is to choose technologies that are both innovative and efficient in order to enhance the operational performance of thermal power projects, since this may have a considerable impact on the financial sustainability of such projects. Problems with the Supply of Fuel: In the field of thermal power generation, the availability of fuel and the price of fuel, in particular coal, play an essential role. Several studies, such as the one that was carried out by Ganguly and Nandy (2017), have investigated the effect that changes in coal supply and price have on the economics of a project. When making judgments about investments, it is essential to guarantee a fuel supply chain that is consistent and dependable. Factors Related to the Environment and Society: Regulations pertaining to the environment and factors having to do with society are becoming an increasingly significant part of investment choices. Bhattacharya et al. (2019) conducted research that investigated the relationship between environmental compliance and community participation as it relates to the success of thermal power plants. For a business to be financially viable over the long term, it is critical to implement practices that are both sustainable and responsible. Integration of Renewable Energy Sources: With a greater focus being placed on the use of renewable energy sources, there has been an increase in interest in the integration of renewables with thermal power projects. Researchers such as Sharma et al. (2020) have conducted studies in which they investigated the financial consequences and advantages of hybrid power projects. These projects mix conventional thermal energy sources with renewable energy sources. This kind of integration has the potential to increase the profitability of the project while simultaneously lowering its effect on the environment. Incentives and Subsidies from the Government : The incentives and subsidies offered by the government may have a substantial impact on investment choices.

In order to stimulate investment and play its part, the government may facilitate the provision of risk-mitigation tools as well as insurance systems. The demand-supply dynamics and pricing structures of the Indian power market are both susceptible to regular shifts due to the market's

dynamic nature. Investors need to maintain a constant vigilance toward prevailing market trends in order to adjust their tactics as necessary.

5.2 Summary of findings

The analysis reveals several key insights into the financial investment landscape of the Indian thermal power sector. The gender distribution among respondents shows a significant male dominance, with 86.9% identifying as male and only 13.1% as female, indicating a potential gender disparity in engagement or interest in this sector. Age-wise, over half of the respondents (51.4%) are under 25, suggesting that younger individuals are more engaged or accessible for this survey. This is followed by 29.9% aged 25-34, with smaller proportions in older age groups. In terms of educational background, the majority of respondents come from Engineering (51.4%) and Business/Management (39.3%) fields, reflecting the technical and managerial focus required in the thermal power sector. However, a significant portion of respondents (51.4%) reported being not at all familiar with the sector, while only 29.9% are moderately familiar, indicating a general lack of deep knowledge or exposure to the sector.

When it comes to investment decisions, projected energy demand (51.4%) and environmental impact and sustainability (29.9%) are the most important factors for the respondents, highlighting a strong focus on demand forecasts and sustainability issues. Despite this, most respondents (51.4%) rarely or never assess the financial health of companies before making investment decisions, pointing to a potential gap in thorough financial analysis.

Past investment outcomes have been generally positive or neutral, with 51.4% reporting positive returns and a substantial number reporting break-even results. Accurate market analysis and management competence are identified as the key factors for investment success or failure, underscoring the importance of thorough market research and effective management.

To improve the investment landscape, respondents emphasize the need for enhanced government incentives, followed by strengthened environmental regulations and more diversified energy sources. This underscores the necessity for supportive government policies to attract investments. Interestingly, the majority of respondents do not consider sustainable and environmentally friendly energy production important in influencing their investment decisions, suggesting an area for increased awareness and emphasis on sustainability.

Investment risks are primarily associated with regulatory and policy changes, technological obsolescence, and interest rate fluctuations, indicating significant concern about the stability and

predictability of the regulatory environment. Financial metrics such as Return on Investment (ROI), Debt-to-Equity Ratio, and EBITDA are predominantly used by respondents to evaluate investment attractiveness, showing a preference for traditional financial performance indicators.

The effectiveness of government policies and incentives is perceived variably, with many respondents considering them highly effective or neutral, reflecting mixed perceptions about regulatory support. Financial news websites and government publications are the primary sources of investment information, indicating a reliance on widely accessible and official information channels.

Confidence in the accuracy and reliability of investment information is generally high, though a noTable percentage remain neutral or not very confident, highlighting a potential area for improving information transparency. Environmental compliance and social impacts are major considerations for most respondents, emphasizing the importance of integrating sustainability into investment strategies.

A majority of respondents are willing to invest in newer, cleaner technologies within the thermal power sector, reflecting a positive outlook towards innovation and sustainability in future investments. Additionally, many respondents are open to participating in future research studies, demonstrating a willingness to engage further in improving investment practices. Lastly, most respondents believe that incorporating lessons from past experiences and implementing proposed improvements can enhance financial investment decisions, highlighting the value of continuous learning and adaptation in investment strategies.

5.3 Interview Schedule

The information acquired from the interview form clarifies important elements affecting investment decisions in the Thermal Power Sector. Respondents pointed up a number of factors, mostly related to earlier investments made between 2009 and 2015, that led to low returns. These were the lack of long-term power purchase agreements, the non-availability of reasonably priced coal, unfair government policies, and the worsening financial situation of distribution businesses. Such elements underlined the need of future evaluations to guarantee long-term agreements, prioritise economical and reliable coal supply, establish equiTable regulations, and stabilise the financial health of distribution businesses since they resulted in instability and unpredictability in revenue sources. Since then, the situation has changed as participants have observed environmental rules being more strictly enforced and security systems for past-due payments

introduced. These developments show a move towards sustainable practices and offer more consistent cash flows, therefore matching investments with reasonable market needs and technology development. Projections for energy consumption today mostly rely on government publications, Ministry of Power data, company websites, and yearly accounts, therefore underlining the need of reliable and complete data for informed decision-making.

Technologies and environmental effect have also been addressed with projects including the installation of Flue-Gas Desulfurization (FGD) plants to lower emissions. These steps not only lower negative emissions but also improve sustainability and regulatory compliance, thereby lowering risks and raising operational effectiveness. Long-term investors including private equity partners, Foreign Institutional Investors (FIIs), venture capitalists, and high net worth entrepreneurs now play a major influence on the diverse financing for thermal power facilities. For the capital-intensive character of power projects, this varied financial support brings in significant capital and experience.

Two important financial indicators of investment appeal are debt/equity ratio and return on investment (ROI). A key milestone is sustainable EBITDA since it shows operational consistency and profitability, luring public investors and thereby improving stock market performance. By lowering costs and encouraging the acceptance of greener technology, government policies and incentives include subsidies for clean energy, tax rebates, and renewable energy certificates have greatly affected investment decisions.

Finally, the questionnaire answers pointed up a number of elements causing low returns on earlier investments: supply-demand mismatches, inadequate infrastructure, project delays, and legal problems. These realisations underline the need of accurate market forecasting, modernised infrastructure, efficient government support, and simplified regulatory procedures for enhancing financial performance and sustainability in next thermal power industry projects.

CHAPTER VI
SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

SUMMARY

6.1 Summary

Given that it is responsible for a sizeable amount of India's total capacity to generate

electricity, the thermal power industry in India is an essential component in the process of satisfying the nation's energy requirements. However, in order to make intelligent decisions regarding financial investments in this industry, one must have a comprehensive understanding of a variety of factors. These factors include understanding the dynamics of the market, regulatory frameworks, technological advancements, and environmental considerations. The purpose of this dissertation is to investigate the difficulties of judgments of this nature and to propose proposals for modifications. The thermal power sector has been able to attract large investments as a result of India's increasing demand for energy and the anticipated stability of returns. Nevertheless, a number of obstacles have surfaced, which have an effect on the financial feasibility of projects and provide barriers to the expansion of the sector. The following are some of the obstacles that may arise: delays in the project, cost overruns, concerns over fuel supply, environmental laws, and changing market dynamics. When it comes to making judgments regarding investments, one of the most important things that can be gained from previous experiences is the significance of completing extensive due diligence. In order to accomplish this, it is necessary to evaluate various aspects, including the feasibility of the project, compliance with regulations, financial viability, and risk management measures. In addition, investors have a responsibility to take into account the long-term viability of projects, taking into account the potential effects on both the environment and society. Reducing the amount of uncertainty that is connected with investments in thermal power requires the use of risk management measures that are effective. The incorporation of environmental, social, and governance (ESG) issues into investment decisions, the diversification of investment portfolios, and the protection against volatility in commodity prices are all key imperatives. It is also essential to establish solid partnerships and collaborations with important players in order to effectively overcome obstacles.

6.2 Implications

- **Investor Confidence and Risk Management**: Investors can increase their confidence in the thermal power business by comprehending the lessons learnt from previous experiences and putting improvement recommendations into practise. Thick due diligence, diversification, and ESG integration are just a few examples of effective risk management techniques that can assist reduce uncertainty and raise the chances of profiTable investment outcomes.

- **Sector Growth and Sustainability**: The Indian thermal power industry can expand by putting into practise plans to improve infrastructure development, integrate renewable energy sources more effectively, and simplify regulatory frameworks. In turn, by lessening environmental effects and fostering clean energy solutions, this advances sustainability goals and the nation's aspirations for energy security.
- **Policy Reforms and Government Action:** The recommendations made have an impact on government officials and agencies in charge of establishing regulations and promoting industry growth. Changes in policy that support investor-friendly rules, encourage investments in renewable energy, and strengthen public-private partnerships can be very important for drawing in capital and propelling industry expansion.
- **Environmental and Social Impact**: Enhancing social and environmental protections in the thermal power industry has consequences for regional communities, environmental preservation initiatives, and more general sustainability objectives. Reducing adverse effects and promoting responsible development can be achieved by following international standards, interacting with stakeholders, and following best practises in environmental management.
- **Economic Development and Energy Access:** The expansion of the thermal power industry in India has wider effects on the country's economic growth and energy availability. Encouraging economic opportunities, raizing living standards, and promoting industrial expansion all depend on having access to cheap, reliable electricity. Consequently, increasing investment in the thermal power industry can support more general goals of socioeconomic development.

The topic's consequences highlight how financial investment decisions, regulatory frameworks, environmental concerns, and socio-economic development objectives are all interconnected and have a significant impact on how India's thermal power sector develops. Through the application of retrospective analysis and proactive enhancement strategies, stakeholders can realize the maximum potential of the sector and progress toward a future in energy that is both more robust and sustainable.

6.3 Recommendations for Future Research

- **Longitudinal Studies:** carrying out long-term research to monitor the effects and progress of suggested changes and investment plans. This will offer insights into how well industry activities and policy actions address problems and promote sector growth.

- **Case Studies**: conducting in-depth case studies of particular thermal power projects in order to examine the variables affecting project results, investment choices, and the efficacy of risk management techniques. One such approach to identifying best practises and lessons gained across many projects is to undertake comparative case studies.
- **Stakeholder Perspectives**: examining the viewpoints and experiences of the many parties involved in the thermal power industry, such as investors, decision-makers, regulators, business leaders, local communities, and environmental groups. Comprehending their viewpoints can facilitate the identification of areas of agreement and disagreement and provide guidance for the creation of investment frameworks that are more sustainable and inclusive.
- **Technological Innovations**: examining how technical advancements like digitization, energy storage, and sophisticated power production technologies might improve the sustainability, dependability, and efficiency of thermal power projects. Industry stakeholders may find useful information from research on upcoming technology and how it can affect investment choices.
- **Risk Assessment Models**: creating sophisticated risk assessment models and decision support systems that are suited to the unique features of thermal power projects in the Indian environment. To help investors make more intelligent and calculated investment decisions, this may entail incorporating financial, technological, environmental, and social risk considerations into thorough risk assessment frameworks.
- **Policy Evaluation**: assessing how current policy incentives and regulatory frameworks affect project creation, investment flows, and sectoral results. This can entail evaluating the efficacy of laws intended to encourage the integration of renewable energy sources, expediting the approvals process, encouraging private investment, and bolstering social and environmental protections.

6.4 Conclusion

The analysis of financial investment choices in India's thermal power sector provides insightful information on the difficulties and complexities the sector faces, as well as suggestions for improvement. Several important themes come to light through an examination of the lessons acquired from previous experiences and tactical suggestions. First off, it's clear that thorough due diligence and risk management are essential for profiTable investment results. In order to

reduce uncertainty and improve financial viability, investors need to carefully consider project feasibility, regulatory compliance, and risk concerns.

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APPENDIX -A

QUESTIONNAIRE

Financial Investment Decisions in India Thermal power Sector Lessons of experience and proposals for improvement

1. Gender:
   a) Male
   b) Female

2. Age:
   a) Under 25

b) 25-34
c) 35-44
d) 45-54
e) 55 and above

3. Educational Background:
   a) Engineering
   b) Finance/Economics
   c) Business/Management
   d) Other (please specify): ___

4. How familiar are you with the Indian thermal power sector?
   a) Not at all familiar
   b) Somewhat familiar
   c) Moderately familiar
   d) Very familiar
   e) Expert

5. What factors do you consider most important when making investment decisions in the thermal power sector? (Select all that apply)
   a) Projected energy demand
   b) Government policies and regulations
   c) Environmental impact and sustainability
   d) Technological advancements
   e) Market trends and competition

6. How often do you assess the financial health of companies in the thermal power sector before making investment decisions?
   a) Rarely or never
   b) Occasionally
   c) Regularly
   d) Always

7. If yes, what were the outcomes of your past investment decisions?
   a) Positive returns
   b) Negative returns
   c) Break-even
   d) Not applicable (no past investments)

8. What were the key factors that contributed to the success or failure of your past investment decisions in the thermal power sector? (Select all that apply)
   a) Accurate market analysis
   b) Timely information
   c) Regulatory stability
   d) Management competence
   e) Other (please specify): _____

9. In your opinion, what measures could improve the investment landscape in the Indian thermal power sector? (Select all that apply)
    a) Enhanced government incentives
    b) Improved transparency in project approvals
    c) Strengthened environmental regulations
    d) More diversified energy sources
    e) Other (please specify): _____

10. How important is sustainable and environmentally friendly energy production in influencing your investment decisions?
    a) Not important
    b) Somewhat important
    c) Moderately important
    d) Very important
    e) Extremely important

11. Which types of risks do you consider most relevant when investing in the thermal power sector? (Select all that apply)
    a) Regulatory and policy changes
    b) Fluctuations in fuel prices
    c) Technological obsolescence
    d) Interest rate fluctuations
    e) Geopolitical factors

12. What financial metrics do you primarily rely on to evaluate the attractiveness of an investment in the thermal power sector? (Select all that apply)
    a) Return on Investment (ROI)
    b) Net Present Value (NPV)
    c) Debt-to-Equity Ratio
    d) Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)
    e) Payback Period

13. How would you rate the effectiveness of government policies and incentives in promoting investments in the Indian thermal power sector?
    a) Highly effective
    b) Somewhat effective
    c) Neutral
    d) Somewhat ineffective
    e) Highly ineffective

14. Which specific government policies or incentives have influenced your investment decisions in the thermal power sector? (Select all that apply)
    a) Subsidies for clean energy projects
    b) Tax benefits for power generation companies
    c) Renewable energy certificates
    d) Power purchase agreements

e) Other (please specify): _____

15. Where do you primarily gather information related to investment opportunities in the Indian thermal power sector? (Select all that apply)
    a) Financial news websites
    b) Industry reports and research papers
    c) Government publications
    d) Analyst reports
    e) Professional networking events/conferences

16. How confident are you in the accuracy and reliability of the information you obtain for making investment decisions in the thermal power sector?
    a) Very confident
    b) Confident
    c) Neutral
    d) Not very confident
    e) Not confident at all
17. How do environmental compliance and potential social impacts (displacement, health concerns, etc.) factor into your investment decisions in the thermal power sector?
    a) Major considerations
    b) Moderate considerations
    c) Minor considerations
    d) Not considered at all

Part 2

Every question has two options, respondents can choose any one of the options. Options are based upon five Likert scale as Y (YES), N (NO)

1	Have you made any investment decisions in the Indian thermal power sector in the past?	Yes	No
2	Would you consider investing in newer, cleaner technologies within the thermal power sector, such as supercritical and ultra-supercritical power plants?		
3	Would you be open to participating in future research studies or discussions on investment decisions in the thermal power sector?		
4	Have you been involved in any investment decisions within the Indian thermal power sector in the past that resulted in substantial financial gains?		
5	Have you encountered any investment decisions in the Indian thermal power sector that did not yield the expected returns or resulted in financial losses?		
6	Have past investment experiences influenced your current financial decisions in the Indian thermal power sector?		
7	Have lessons learned from past experiences led you to modify your investment strategies in the thermal power sector?		
8	Would you agree that adapting based on past experiences is essential for successful financial investments in the thermal power sector?		
9	Do you think that feedback from past investment decisions can offer valuable insights for refining future strategies?		
10	Are the proposed improvements aligned with addressing current challenges in thermal power sector investments?		
11	Could implementing the proposed improvements help align thermal power investments with sustainability goals?		
12	Do you find practical value in applying lessons learned from past experiences to your financial decisions?		
13	Would integrating proposed improvements better position thermal power investments for future opportunities?		
14	Can incorporating lessons and improvements collectively elevate the overall quality of financial decisions in the thermal power sector?		
15	Do you believe that incorporating lessons from past experiences and implementing proposed improvements can enhance financial investment decisions in the Indian thermal		

	power sector?		

PART 3

Every question has five options, respondents can choose any one of the options. Options are based upon five Likert scale as Strongly Agree (SA), Agree(A), Neutral(N), Disagree (D), Strongly Disagree (SD)

1	Tax reductions and subsidies might boost financial investments in the Indian thermal power industry.	SA	A	N	D	SD
2	A more open and simplified project approval procedure would improve thermal power investment results.					
3	Strengthening environmental legislation and enforcement will guarantee sustainable investments and reduce environmental dangers.					
4	Research and development for cleaner and more efficient thermal power solutions might boost the sector's long-term profitability.					
5	Learning from past investment experiences is essential for making better financial decisions in the Indian thermal power sector.					
6	Implementing proposed improvements could lead to more successful financial investment outcomes in the Indian thermal power sector.					
7	Considering sustainability in investment decisions can influence your outlook on the attractiveness of the thermal power sector.					
8	Past investment experiences shape your current strategies for financial decisions in the Indian thermal power sector.					
9	Adapting your investment approach based on past experiences is crucial for mitigating risks in the thermal power sector.					
10	Integrating proposed innovations could positively impact the overall financial landscape of the Indian thermal power sector.					
11	Implementing proposed improvements aligns your investment decisions with anticipated future trends in the thermal power sector.					
12	Lessons learnt and recommended modifications improve your Indian thermal power financial investment selections.					

13	Collaborating with stakeholders can contribute significantly to the success of financial decisions in the thermal power sector.					
14	To maximize investment advantages, a comprehensive strategy including lessons from experience and proposed changes is essential.					
15	Do you believe that incorporating lessons from past experiences aligns your financial investment decisions with your objectives in the thermal power sector?					
16	The proposed improvements are feasible and realistic for implementation in the Indian thermal power sector.					
17	Adapting investment strategies based on lessons learned and proposed improvements is necessary for achieving successful outcomes.					
18	Integrating sustainability considerations with investment decisions is a prudent approach in the thermal power sector.					
19	Do you perceive that applying lessons learned and implementing proposed improvements can contribute to the growth of the thermal power sector?					
20	Balancing past lessons, proposed improvements, and financial goals leads to more well-rounded investment decisions.					
21	Collaborative efforts based on lessons and improvements enhance the collaborative benefits of financial decisions					
22	Incorporating lessons and improvements can enhance the competitiveness of thermal power investments in the market.					
23	Implementing proposed improvements can contribute to aligning thermal power investments with sustainable practices.					
24	Incorporating lessons and improvements enables more proactive and informed investment decisions.					

APPENDIX- B

QUALITATIVE QUESTIONNAIRE

INTERVIEW GUIDE

Questions raised during interview to obtain qualitative aspects for overall analysis in response to Questionnaire cum interview guide

Part A (Process and mechanism of conducting Interview)

1 Explained the purpose of survey interview arizing out of research proposal submitted to SSBM and significance of the topic titled as "Financial Investment Decisions in India –Thermal Power Sector –Lessons of experience and proposals for improvement ".

2. Participants were chosen covering varied background for both the gender in terms of education and academic qualifications, engagements in corporate services and manufacturing, Investment bankers, Auditors, Valuers and qualified students with primary focus on finance like CA, ICWA or MBA in finance etc.

3. Most of the participants were covered thru tele conference or VC meets with prior intimations and few were covered thru personal visits to their offices or other designated places for the meetings, within city of Mumbai.

4. For any ambiguity or incomplete responses provided, they were reconnected as per their convenient time with a request to provide supplemental and additional information in order to make the survey findings more effective in terms of its relevance ,completeness and purposeful .

Part B

Specific additional questions were raised to obtain qualitative perspective to the questionnaire cum Interview guide as shared with each of the participants. Following is structured summary of model sub questions which were raised and factored in the overall analysis.

Q: In the past also ,significant Investments were made in the Thermal Power Sector (esp year 2009-2015) based on projected energy demand ,margins envisaged ,Govt policies and regulations prevailing then, environment and technological impact and concerns etc. Would you apply the same parameters or look at other factors for evaluation.

Q: In what way situation has changed with respect to the above factors as considered for determination to evaluate investments in Thermal Power Sector.

Q: In response to the above, question was raised as what source of information was mainly relied upon to factor projected demand of the energy.

Q How environment impact and technological advancement has been addressed, please state a few initiatives the sector has taken in the recent past.

Q: In light of past experience with changed outlook for the Thermal power requirement, how and who will provide the required finance for setting up the plant.

Q: Which are financial metrics used to evaluate the attractiveness of an investment in Thermal Power Sector ,considering ultimate public shareholders are concerned with getting sustainable returns on their Investments.

Q: How specific Govt policies and Incentives have influenced the Investment decisions in the Thermal Power sector. Which are the regulatory provisions in your viewpoint and basis to respond the survey Questionnaire .

Q: On the overall Questionnaire, few sub questions were raised to the fact that in the past Investment decisions, in most of the cases, did not yield the expected returns and /or resulted in financial losses ,the respondents were asked to identify the key factors which were responsible for the poor returns and losses.