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## FINANCIAL IMPACT OF THE GRUHA JYOTHI ELECTRICITY SUBSIDY ON DOMESTIC CONSUMERS: EVIDENCE FROM MESCOM, MANGALURU, KARNATAKA

Mrs. Pavithra Jain and Mrs. Princy P F

Assistant Professor, Alva's Institute of Engineering and Technology, Moodbidri, Mangalore

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### ABSTRACT

Electricity affordability is an important dimension of household welfare, particularly where electricity subsidies are used to reduce the cost of an essential service. This study examines the perceived financial impact of the Gruha Jyothi Scheme among domestic consumers served by the Mangalore Electricity Supply Company Limited (MESCOM) in Mangaluru, Karnataka. The study uses a descriptive and analytical design and draws on primary data from 200 beneficiaries selected through convenience sampling. A structured questionnaire measured Scheme Exposure, Electricity Consumption Behaviour, Influencing Factors, Financial Impact, Financial Benefit, Utilization of Savings and Financial Dependency using five-point Likert-scale items. Data were analysed using descriptive statistics, Cronbach's alpha, Pearson correlation, multiple linear regression, one-way ANOVA and an independent-samples t-test. Scheme Exposure recorded the highest construct mean ( $M = 3.053$ ), whereas Financial Benefit recorded the lowest ( $M = 2.637$ ), indicating moderate awareness and perceived financial gains. Influencing Factors had the strongest association with Financial Impact ( $r = 0.607$ ,  $p < 0.001$ ), followed by the relationship between Financial Impact and Utilization of Savings ( $r = 0.590$ ,  $p < 0.001$ ). The regression model was statistically significant,  $F(6,193) = 33.634$ ,  $p < 0.001$ , and explained 51.1% of the variance in Financial Impact ( $R^2 = 0.511$ ; adjusted  $R^2 = 0.496$ ). Influencing Factors ( $\beta = 0.399$ ), Utilization of Savings ( $\beta = 0.320$ ), Financial Benefit ( $\beta = 0.185$ ) and Scheme Exposure ( $\beta = 0.127$ ) were significant positive predictors. Electricity Consumption Behaviour and Financial Dependency were not significant predictors. Age was significantly associated with Scheme Exposure, whereas gender was not significantly associated with Financial Benefit. The findings indicate that the consumer-side financial experience of the scheme is associated not only with bill relief but also with awareness, household circumstances and the way savings are utilised. However, several measurement scales showed weak reliability, including a negative alpha for Electricity Consumption Behaviour; therefore, the inferential findings should be regarded as exploratory until the original dataset and item coding are revalidated. The study contributes localized evidence on the household financial dimension of an electricity subsidy programme in coastal Karnataka.

**KEYWORDS:** Gruha Jyothi Scheme; electricity subsidy; household financial impact; MESCOM; electricity affordability; consumer welfare; financial benefit; utilization of savings; Karnataka

## **1. INTRODUCTION**

Affordable and reliable electricity is both an infrastructure requirement and a household welfare concern. Electricity supports lighting, communication, education, healthcare, household production and access to digital services. Consequently, the price paid for electricity can affect the disposable resources available to households for other essential expenditures. International and Indian evidence has shown that access to and quality of electricity can influence household expenditure, income, education, labour allocation and poverty-related outcomes. Khandker et al. (2014), for example, found that rural electrification in India was associated with higher household income and expenditure and reductions in poverty, although the distribution of benefits was not uniform. Chakravorty et al. (2014) similarly reported that both electricity connection and supply quality were associated with higher non-agricultural income in rural India.

Against this broader welfare context, electricity subsidies represent an important policy instrument. Subsidies can reduce the effective price paid by households and potentially release disposable income for food, education, healthcare, debt repayment, savings and other needs. At the same time, subsidy programmes create fiscal and utility-level considerations because the difference between the cost of supply and the consumer price must be financed or compensated. Recent evidence on India's distribution sector also highlights the continuing financial pressures faced by distribution companies, making the consumer-utility trade-off relevant to policy evaluation.

The Government of Karnataka introduced the Gruha Jyothi Scheme in 2023 as a residential electricity support programme. A recent Karnataka Fiscal Policy Institute assessment reports that the scheme was announced on 1 July 2023 and disbursement began in August 2023. The scheme provides an entitlement based on a household's previous average consumption plus an additional allowance, subject to a maximum of 200 units per month, with specific provisions for certain consumer categories. The programme is therefore not simply a uniform transfer of 200 free units to every household; the actual entitlement depends on scheme rules and the consumer's eligible consumption history. The present research focuses on how beneficiaries themselves perceive the resulting financial consequences.

MESCOM is a state-owned electricity distribution utility serving Dakshina Kannada, Udupi, Shivamogga and Chikkamagaluru. The project frames the consumer-side financial impact through seven constructs: Scheme Exposure (SE), Electricity Consumption Behaviour (ECB), Influencing Factors (IF), Financial Impact (FI), Financial Benefit (FB), Utilization of Savings (UTS) and Financial

Dependency (FD). The central proposition is that the financial consequences of the scheme may depend not only on the nominal subsidy but also on awareness, household characteristics, perceived benefits and the manner in which savings are used.

### **1.1 Problem Statement**

Although electricity subsidy programmes are designed to provide financial relief, the existence of a subsidy does not by itself establish the magnitude or distribution of household-level financial benefits. A reduction in an electricity bill may be absorbed into routine consumption, redirected toward essential expenditure, saved, invested or used for debt repayment. Beneficiaries may also differ in their awareness of eligibility and scheme conditions. Therefore, a consumer-level assessment is needed to complement analyses that focus on government expenditure or the financial sustainability of distribution utilities.

The paper identifies a specific empirical gap concerning the financial experience of domestic beneficiaries in the MESCOM area of Mangaluru. It seeks to determine whether scheme exposure, household and behavioural factors, perceived financial benefits and utilization of savings are associated with perceived financial impact.

### **1.2 Objectives**

- To examine the level of awareness and exposure of domestic consumers towards the Gruha Jyothi Scheme.
- To examine the electricity consumption behaviour and perceptions of domestic consumers under the Gruha Jyothi Scheme.
- To identify the factors influencing the utilisation and perceived financial impact of the Gruha Jyothi Scheme among domestic consumers.
- To examine the utilization of savings generated through the scheme and the extent of financial dependency on the scheme.

### **1.3 Research Questions**

- How do domestic consumers perceive their exposure to and awareness of the Gruha Jyothi Scheme?
- How are Scheme Exposure, Electricity Consumption Behaviour, Influencing Factors, Financial Benefit, Utilization of Savings and Financial Dependency associated with perceived Financial Impact?
- Which of the measured constructs significantly predict perceived Financial Impact?
- Do perceptions differ across selected demographic groups?

## **2. POLICY AND INSTITUTIONAL CONTEXT**

### **2.1 Gruha Jyothi Scheme**

The Gruha Jyothi Scheme was introduced in Karnataka in 2023. The Karnataka Fiscal Policy Institute describes its design as a fixed monthly electricity entitlement linked to the consumer's average monthly consumption in FY 2022–23, with an additional allowance and a maximum of 200 units per month. The report also notes that new installations and certain legacy beneficiary categories have specific entitlements. This design matters for empirical research because household-level financial benefit can vary with baseline consumption and eligibility conditions rather than being identical across beneficiaries.

The scheme belongs to a wider policy environment in which governments attempt to balance affordability, social protection and utility sustainability. A 2025 Karnataka policy assessment reported a substantial number of domestic consumers enrolled in Gruha Jyothi and a sizeable annual state budget allocation, illustrating that the programme has material fiscal significance. These policy-level figures provide context, but they do not measure the financial experience of individual households; that is the specific level addressed by the present study.

### **2.2 MESCOM as the Study Setting**

The paper identifies MESCOM as the electricity distribution utility serving the study area. The project profile reports that MESCOM was established in 2002 following restructuring of Karnataka's electricity sector and serves domestic, commercial, industrial and agricultural consumers across four districts. The original project also documents MESCOM's distribution infrastructure and financial statements for 2021–2025. These institutional data are contextual rather than explanatory variables in the present consumer-level analysis; they demonstrate that the scheme operates within a regulated distribution system where consumer affordability and utility financial sustainability are interconnected.

### **2.3 Conceptual and Theoretical Foundation**

The paper draws on six complementary theoretical perspectives. Welfare Economics provides the broad rationale for government intervention to improve social welfare through public programmes. Subsidy Theory explains how public financial support can reduce the effective consumer price of an essential service. Public Utility Theory is relevant because electricity distribution involves an essential service for which affordability and service quality matter alongside financial viability. Financial Impact Theory provides the direct analytical lens for assessing lower expenditure, savings and financial stability. Consumer Satisfaction Theory links perceived benefits with consumer evaluation of service and policy outcomes. Regulatory Theory recognises the institutional role of the electricity regulator in tariff-setting, consumer protection and service oversight.

For the present study, these perspectives can be integrated into a consumer-welfare pathway: scheme exposure and household-level influencing factors shape access to and utilisation of the benefit; the

perceived financial benefit and the use of resulting savings contribute to household financial outcomes; and these outcomes form the perceived Financial Impact of the scheme. Electricity Consumption Behaviour and Financial Dependency represent behavioural and sustainability-related dimensions that may either strengthen or weaken the household-level impact.

#### **2.4 Review of Empirical Literature**

Existing research establishes that electricity access and affordability can affect household welfare, but much of the literature examines electrification, reliability or economy-wide subsidy reform rather than a specific contemporary state-level free-electricity programme. Khandker et al. (2014) used Indian household data and reported positive effects of rural electrification on income, expenditure, schooling and poverty, while also finding differences in the distribution of benefits. Chakravorty et al. (2014) showed that the quality of electricity supply matters for household economic outcomes, not merely connection status. These studies support the premise that electricity policy can have financial and socioeconomic consequences beyond the electricity bill itself.

Sudarshan (2017) provides a behavioural perspective from India by showing that information interventions and monetary incentives can alter household electricity consumption and responsiveness to prices. This is relevant to the present study's inclusion of Scheme Exposure and Electricity Consumption Behaviour. Sedai et al. (2021), using panel data from India, found that greater electricity reliability was associated with household consumption, income, assets, borrowing and poverty outcomes, reinforcing the connection between electricity services and welfare.

Research on electricity subsidies also highlights the importance of distributional effects and fiscal sustainability. Ilyas et al. (2022) examined residential electricity subsidy reform and household welfare and found that electricity price changes can have substantial expenditure effects. In India, broader work on energy subsidy reform has considered price and consumption responses, while research on electricity distribution has emphasised the financial pressures created by subsidised tariffs and the need for financially sustainable distribution systems. The World Bank's recent assessment of India's distribution sector likewise stresses the need to combine reliable and affordable electricity with improved DISCOM financial viability.

The literature therefore supports three observations relevant to the present research. First, electricity policy can affect household welfare through expenditure and consumption channels. Second, behavioural and informational factors may influence how households respond to electricity-related incentives. Third, subsidy design has implications for both consumers and utilities. The specific consumer-level evidence on Gruha Jyothi beneficiaries in the MESCOM/Mangaluru setting remains comparatively localized and is the principal contribution claimed by this study.

#### **2.5 Research Gap**

The research gap is primarily contextual and empirical. Existing literature provides substantial

evidence on electrification, electricity reliability, energy subsidies and distribution-sector sustainability, but these strands do not directly answer how beneficiaries of Karnataka's Gruha Jyothi Scheme experience the financial benefit at household level. The original project further identifies a lack of consumer-focused evidence for MESCOM beneficiaries in Mangalore. The present study addresses this gap by linking scheme exposure, electricity consumption behaviour, influencing factors, perceived financial benefit and utilization of savings to a composite measure of perceived Financial Impact.

## 2.6 Conceptual Model

The empirical model specified in the paper treats Financial Impact (FI) as the dependent construct and Scheme Exposure (SE), Electricity Consumption Behaviour (ECB), Influencing Factors (IF), Financial Benefit (FB), Utilization of Savings (UTS) and Financial Dependency (FD) as explanatory constructs. Demographic variables are used for subgroup comparisons. The resulting model can be expressed conceptually as:

*Financial Impact = f (Scheme Exposure, Electricity Consumption Behaviour, Influencing Factors, Financial Benefit, Utilization of Savings, Financial Dependency)*

## 3. Hypotheses

| Hypothesis | Proposed relationship                                                                    |
|------------|------------------------------------------------------------------------------------------|
| H1         | Scheme Exposure has a significant positive effect on Financial Impact.                   |
| H2         | Scheme Exposure has a significant positive relationship with Financial Benefit.          |
| H3         | Electricity Consumption Behaviour has a significant relationship with Financial Benefit. |
| H4         | Influencing Factors have a significant positive effect on Financial Impact.              |
| H5         | Financial Benefit has a significant positive effect on Financial Impact.                 |
| H6         | Utilization of Savings has a significant positive effect on Financial Impact.            |
| H7         | Financial Dependency has a significant effect on Financial Impact.                       |
| H8         | Financial Benefit differs significantly by gender.                                       |
| H9         | Scheme Exposure differs significantly across age groups.                                 |

## 4. METHODOLOGY

### 4.1 Research Design

The study follows a descriptive and analytical research design. It uses primary cross-sectional survey data to describe beneficiary characteristics and construct perceptions and to test associations and predictive relationships among the study variables. The design is appropriate for an exploratory consumer-level assessment, but it does not establish causal effects or long-term changes attributable to the scheme.

#### 4.2 Population, Sampling and Sample Size

The population comprises domestic electricity consumers benefiting from the Gruha Jyothi Scheme within the MESCOM study area in Mangaluru. The original project used non-probability convenience sampling and collected responses from 200 respondents. Because the sampling frame was non-probabilistic and the sample was geographically limited, statistical generalisation to all Gruha Jyothi beneficiaries should be made cautiously.

#### 4.3 Data Collection Instrument

A structured questionnaire was used. The annexed instrument contains demographic questions covering age, gender, occupation, monthly household income, family size and area of residence, followed by five-point Likert-scale statements. The construct domains are Scheme Exposure, Electricity Consumption Behaviour, Influencing Factors, Financial Impact, Financial Benefit, Utilization of Savings and Financial Dependency. The response scale ranges from Strongly Disagree to Strongly Agree.

| Construct                               | Items in annexed questionnaire | Role in analysis                     |
|-----------------------------------------|--------------------------------|--------------------------------------|
| Scheme Exposure (SE)                    | 3                              | Awareness/exposure                   |
| Electricity Consumption Behaviour (ECB) | 4                              | Consumption and energy-use behaviour |
| Influencing Factors (IF)                | 7                              | Household and behavioural influences |
| Financial Impact (FI)                   | 5                              | Primary dependent construct          |
| Financial Benefit (FB)                  | 3                              | Perceived monetary benefit           |
| Utilization of Savings (UTS)            | 5                              | Use of savings generated             |
| Financial Dependency (FD)               | 3                              | Dependence on scheme benefits        |

Important data-integrity note: the project text reports 41 variables consisting of six demographic variables and 35 measurement items, whereas the annexed questionnaire visibly contains 30 Likert-scale measurement items across the seven constructs shown above. This discrepancy must be reconciled against the original SPSS dataset and questionnaire version before journal submission. The results below are reproduced from the project's reported statistical output and should not be interpreted as a new re-analysis.

#### 4.4 Variables and Operationalisation

| Variable                          | Operational meaning in this study                                                                                         | Measurement      |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------|------------------|
| Scheme Exposure                   | Awareness, understanding and following of scheme information                                                              | Likert composite |
| Electricity Consumption Behaviour | Monitoring, staying within eligible usage, perceived consumption change and energy efficiency                             | Likert composite |
| Influencing Factors               | Income, family size, awareness, financial discipline, saving habits and household needs                                   | Likert composite |
| Financial Impact                  | Reduction in electricity expenditure, financial condition, financial stress, household needs and overall financial impact | Likert composite |
| Financial Benefit                 | Perceived monetary benefit, expectation fulfilment and purchasing power                                                   | Likert composite |
| Utilization of Savings            | Use of savings for household, education, healthcare, saving/investment and other needs                                    | Likert composite |
| Financial Dependency              | Dependence on the scheme, budget effects of removal and importance in financial planning                                  | Likert composite |

#### 4.5 Data Analysis

The data analysed the responses using Microsoft Excel and IBM SPSS Statistics. Percentage analysis was used for demographic characteristics. Means and standard deviations were calculated for the construct scores. Cronbach's alpha was used to assess internal consistency. Pearson's correlation coefficient was used to assess bivariate associations. Multiple linear regression was used to estimate the contribution of six explanatory constructs to Financial Impact. One-way ANOVA was used for selected demographic comparisons, and an independent-samples t-test was used to examine gender differences in Financial Benefit.

#### 4.6 Ethical and Research-Integrity Considerations

The project describes primary survey data collected from domestic consumers but does not document an institutional ethics approval number, informed-consent wording, data-protection procedure or survey administration protocol. These details should be added before submission to a Scopus-indexed journal if applicable. The final manuscript should also state whether participation was voluntary, whether respondents were informed about the research purpose, and how anonymity/confidentiality were maintained.

## 5. RESULTS

### 5.1 Demographic Profile

| Characteristic | Category               | n   | %    |
|----------------|------------------------|-----|------|
| Age            | 18–25 years            | 86  | 43.0 |
| Age            | 26–35 years            | 65  | 32.5 |
| Age            | 36–45 years            | 30  | 15.0 |
| Age            | 46–60 years            | 15  | 7.5  |
| Age            | Above 60 years         | 4   | 2.0  |
| Gender         | Male                   | 81  | 40.5 |
| Gender         | Female                 | 119 | 59.5 |
| Occupation     | Student                | 58  | 29.0 |
| Occupation     | Private employee       | 76  | 38.0 |
| Occupation     | Government employee    | 3   | 1.5  |
| Occupation     | Self-employed/business | 17  | 8.5  |
| Occupation     | Professional           | 13  | 6.5  |
| Occupation     | Homemaker              | 19  | 9.5  |
| Occupation     | Daily wage labourer    | 3   | 1.5  |
| Occupation     | Retired                | 6   | 3.0  |
| Occupation     | Unemployed             | 5   | 2.5  |
| Income         | Below ₹10,000          | 10  | 5.0  |
| Income         | ₹10,000–₹25,000        | 81  | 40.5 |
| Income         | ₹25,000–₹50,000        | 67  | 33.5 |
| Income         | ₹50,000–₹1,00,000      | 29  | 14.5 |
| Income         | Above ₹1,00,000        | 13  | 6.5  |
| Family size    | 1–2                    | 5   | 2.5  |
| Family size    | 3–4                    | 130 | 65.0 |
| Family size    | 5–6                    | 52  | 26.0 |
| Family size    | 7–8                    | 6   | 3.0  |
| Family size    | Above 8                | 7   | 3.5  |
| Residence      | Urban                  | 75  | 37.5 |
| Residence      | Rural                  | 73  | 36.5 |
| Residence      | Semi-urban             | 52  | 26.0 |

The sample is concentrated among younger respondents: 75.5% are below 35 years of age. Females constitute 59.5% of the sample. Private employees (38.0%) and students (29.0%) are the two largest

occupational groups. Household income is concentrated in the ₹10,000–₹50,000 range, which accounts for 74.0% of respondents. Households with three to four members represent 65.0% of the sample. Urban and rural respondents are almost equally represented (37.5% and 36.5%, respectively), while 26.0% are from semi-urban areas.

## 5.2 Descriptive Statistics

| Construct                               | N   | Mean  | SD    | Minimum | Maximum | Skewness |
|-----------------------------------------|-----|-------|-------|---------|---------|----------|
| Scheme Exposure (SE)                    | 200 | 3.053 | 0.834 | 1.000   | 5.000   | 0.137    |
| Electricity Consumption Behaviour (ECB) | 200 | 2.901 | 0.417 | 1.500   | 4.000   | -0.719   |
| Influencing Factors (IF)                | 200 | 2.858 | 0.698 | 1.000   | 5.000   | -0.243   |
| Financial Impact (FI)                   | 200 | 2.752 | 0.798 | 1.000   | 5.000   | 0.113    |
| Financial Benefit (FB)                  | 200 | 2.637 | 0.678 | 1.333   | 4.333   | 0.200    |
| Utilization of Savings (UTS)            | 200 | 2.683 | 0.704 | 1.000   | 4.600   | -0.054   |
| Financial Dependency (FD)               | 200 | 2.723 | 0.594 | 1.000   | 4.333   | -0.394   |

Scheme Exposure has the highest mean score ( $M = 3.053$ ,  $SD = 0.834$ ), indicating a moderate level of awareness and engagement. Financial Benefit has the lowest mean ( $M = 2.637$ ,  $SD = 0.678$ ), suggesting that perceived monetary gains are comparatively modest. The construct means generally cluster around the midpoint of the five-point scale, indicating moderate rather than strong agreement.

## 5.3 Reliability Analysis

| Construct                         | Items | Cronbach's $\alpha$ | Interpretation reported in project |
|-----------------------------------|-------|---------------------|------------------------------------|
| Influencing Factors               | 7     | 0.803               | Good                               |
| Financial Impact                  | 5     | 0.793               | Acceptable                         |
| Utilization of Savings            | 5     | 0.693               | Borderline acceptable              |
| Financial Dependency              | 3     | 0.505               | Poor                               |
| Scheme Exposure                   | 3     | 0.497               | Poor                               |
| Financial Benefit                 | 3     | 0.380               | Poor; needs revision               |
| Electricity Consumption Behaviour | 4     | -0.154              | Very poor; serious issue           |

Reliability is a central methodological issue in the manuscript. Influencing Factors and Financial Impact demonstrate comparatively strong internal consistency. Utilization of Savings is borderline. Financial Dependency, Scheme Exposure and Financial Benefit fall below conventional thresholds.

Electricity Consumption Behaviour produces a negative alpha ( $-0.154$ ), which indicates that the items do not behave as a coherent scale under the reported coding. This may arise from reverse-worded items, coding problems or conceptual heterogeneity. Consequently, relationships involving the weaker constructs should be treated as exploratory. Before publication, the original item-level dataset should be audited, reverse-coded items checked, item-total correlations examined, and reliability recomputed.

#### 5.4 Correlation Analysis

| Relationship | r     | p      | Interpretation                 |
|--------------|-------|--------|--------------------------------|
| SE–ECB       | 0.035 | 0.624  | Not significant                |
| SE–IF        | 0.283 | <0.001 | Positive                       |
| SE–FI        | 0.337 | <0.001 | Positive                       |
| SE–FB        | 0.364 | <0.001 | Positive                       |
| SE–UTS       | 0.153 | 0.031  | Positive                       |
| SE–FD        | 0.352 | <0.001 | Positive                       |
| ECB–FI       | 0.209 | 0.003  | Positive                       |
| ECB–UTS      | 0.205 | 0.004  | Positive                       |
| ECB–FB       | 0.071 | 0.319  | Not significant                |
| IF–FI        | 0.607 | <0.001 | Strongest positive association |
| IF–UTS       | 0.576 | <0.001 | Positive                       |
| IF–FD        | 0.341 | <0.001 | Positive                       |
| IF–FB        | 0.276 | <0.001 | Positive                       |
| FI–FB        | 0.430 | <0.001 | Positive                       |
| FI–UTS       | 0.590 | <0.001 | Positive                       |
| FI–FD        | 0.309 | <0.001 | Positive                       |
| FB–UTS       | 0.418 | <0.001 | Positive                       |
| FB–FD        | 0.276 | <0.001 | Positive                       |
| UTS–FD       | 0.291 | <0.001 | Positive                       |

The strongest bivariate association is between Influencing Factors and Financial Impact ( $r = 0.607$ ,  $p < 0.001$ ). Financial Impact is also strongly associated with Utilization of Savings ( $r = 0.590$ ,  $p < 0.001$ ). Scheme Exposure is positively associated with Financial Impact ( $r = 0.337$ ,  $p < 0.001$ ) and Financial Benefit ( $r = 0.364$ ,  $p < 0.001$ ). In contrast, Scheme Exposure and Electricity Consumption Behaviour are not significantly correlated ( $r = 0.035$ ,  $p = 0.624$ ), and Electricity Consumption Behaviour and Financial Benefit are also not significantly correlated ( $r = 0.071$ ,  $p = 0.319$ ).

## 5.5 Multiple Regression

| Model statistic            | Reported value |
|----------------------------|----------------|
| R                          | 0.715          |
| R <sup>2</sup>             | 0.511          |
| Adjusted R <sup>2</sup>    | 0.496          |
| Standard error of estimate | 0.567          |
| F(6,193)                   | 33.634         |
| p-value                    | <0.001         |

The multiple regression model is statistically significant,  $F(6,193) = 33.634$ ,  $p < 0.001$ . The  $R^2$  of 0.511 indicates that the six predictors collectively explain 51.1% of the observed variance in Financial Impact in this sample. The adjusted  $R^2$  is 0.496. The model should be interpreted as an association model rather than a causal model because the data are cross-sectional and were collected using convenience sampling.

| Predictor                         | $\beta$ | t     | p      | Decision in project  |
|-----------------------------------|---------|-------|--------|----------------------|
| Scheme Exposure                   | 0.127   | 2.295 | 0.023  | Significant positive |
| Electricity Consumption Behaviour | 0.150   | 1.499 | 0.136  | Not significant      |
| Financial Benefit                 | 0.185   | 2.642 | 0.009  | Significant positive |
| Utilization of Savings            | 0.320   | 4.198 | <0.001 | Significant positive |
| Financial Dependency              | 0.013   | 0.169 | 0.866  | Not significant      |
| Influencing Factors               | 0.399   | 5.325 | <0.001 | Significant positive |

Influencing Factors is the strongest reported predictor of Financial Impact ( $\beta = 0.399$ ,  $p < 0.001$ ), followed by Utilization of Savings ( $\beta = 0.320$ ,  $p < 0.001$ ), Financial Benefit ( $\beta = 0.185$ ,  $p = 0.009$ ) and Scheme Exposure ( $\beta = 0.127$ ,  $p = 0.023$ ). Electricity Consumption Behaviour ( $p = 0.136$ ) and Financial Dependency ( $p = 0.866$ ) do not make statistically significant unique contributions after the other predictors are considered.

## 5.6 Demographic Tests

| Independent variable     | Dependent variable | F / t     | p     | Result          |
|--------------------------|--------------------|-----------|-------|-----------------|
| Age group                | Scheme Exposure    | F = 2.477 | 0.045 | Significant     |
| Monthly household income | Financial Impact   | F = 1.368 | 0.247 | Not significant |

|                   |                                   |           |       |                 |
|-------------------|-----------------------------------|-----------|-------|-----------------|
| Occupation        | Financial Benefit                 | F = 1.245 | 0.275 | Not significant |
| Family size       | Electricity Consumption Behaviour | F = 1.535 | 0.194 | Not significant |
| Area of residence | Financial Impact                  | F = 2.445 | 0.089 | Not significant |
| Gender            | Financial Benefit                 | t = 1.585 | 0.115 | Not significant |

The one-way ANOVA indicates a statistically significant difference in Scheme Exposure across age groups ( $F = 2.477$ ,  $p = 0.045$ ). The project reports no significant differences for the other demographic comparisons. The independent-samples t-test also indicates no statistically significant gender difference in Financial Benefit ( $t = 1.585$ ,  $p = 0.115$ ). Because the project does not report post-hoc tests for the age-group ANOVA, the specific pairs of age groups that differ cannot be identified from the available output.

### 5.7 Hypothesis Testing Summary

| H  | Test and statistic              | p        | Project decision |
|----|---------------------------------|----------|------------------|
| H1 | Regression; $t = 2.295$         | 0.023    | Accepted         |
| H2 | Pearson $r = 0.364$             | $<0.001$ | Accepted         |
| H3 | Pearson $r = 0.071$             | 0.319    | Rejected         |
| H4 | Regression; $t = 5.325$         | $<0.001$ | Accepted         |
| H5 | Regression; $t = 2.642$         | 0.009    | Accepted         |
| H6 | Regression; $t = 4.198$         | $<0.001$ | Accepted         |
| H7 | Regression; $t = 0.169$         | 0.866    | Rejected         |
| H8 | Independent t-test; $t = 1.585$ | 0.115    | Rejected         |
| H9 | ANOVA; $F = 2.477$              | 0.045    | Accepted         |

For journal style, the terms "supported" and "not supported" are preferable to "accepted/rejected" because statistical tests evaluate evidence against a null hypothesis rather than proving a research proposition. Accordingly, the results indicate statistical support for H1, H2, H4, H5, H6 and H9, while H3, H7 and H8 are not supported at the 5% level.

## 6. DISCUSSION

The results indicate that the consumer experience of Gruha Jyothi is multidimensional. Scheme Exposure has the highest construct mean, but Financial Benefit has the lowest. This combination suggests that awareness or engagement with the programme does not automatically translate into a strong perception of monetary benefit. The result is important because the financial value of an

electricity subsidy depends on household consumption, eligibility, baseline expenditure and the way the household experiences the reduction in its bill.

The strong association between Influencing Factors and Financial Impact is consistent with the theoretical proposition that household circumstances and financial-management behaviour shape the way policy benefits are experienced. Income, family size, awareness, financial discipline, electricity-saving habits and household needs were incorporated into the Influencing Factors construct in the original questionnaire. The finding should therefore be interpreted as a composite relationship rather than evidence that any single one of these components independently causes financial impact.

Utilization of Savings is another important result. Its strong correlation with Financial Impact and significant regression coefficient suggest that the perceived benefit of lower electricity expenditure is connected with what households do with the resources released by the scheme. This extends the analysis beyond the electricity bill itself and supports a household-budget perspective. However, because both variables are measured through self-reported cross-sectional scales, the result cannot establish that the scheme caused a particular allocation of savings.

Scheme Exposure is significantly associated with Financial Benefit and is a significant positive predictor of Financial Impact. This supports the importance of information and awareness in welfare-programme utilisation. It is also compatible with behavioural evidence showing that information can influence electricity-related decisions. At the same time, the age-group difference in Scheme Exposure suggests that communication strategies may not reach all demographic groups equally.

Electricity Consumption Behaviour is not significantly related to Financial Benefit and is not a significant unique predictor of Financial Impact in the regression model. This result should be interpreted cautiously because the ECB scale has a negative Cronbach's alpha in the reported analysis. A statistically non-significant result from an unreliable scale cannot be taken as strong evidence that consumption behaviour is irrelevant. Revalidation of the item coding and scale construction is therefore necessary before drawing a firm behavioural conclusion.

The absence of significant differences in Financial Benefit by gender and the absence of significant differences in Financial Impact across income and residential-area categories indicate that the perceived financial outcome was relatively similar across the tested groups in this sample. These findings should not be generalized beyond the sample because of convenience sampling and the relatively small number of respondents in some categories.

## **7. THEORETICAL AND PRACTICAL IMPLICATIONS**

### **7.1 Theoretical Implications**

- The study extends a welfare-economics perspective from programme provision to perceived household financial outcomes.

- It connects subsidy design with consumer behaviour by incorporating scheme exposure, electricity-use behaviour and utilization of savings.
- It supports a multidimensional view of electricity affordability in which the benefit is not limited to bill reduction but includes the household's subsequent use of released financial resources.
- The findings provide localized empirical evidence that can be compared with wider literature on electricity access, reliability and subsidy reform.

## **7.2 Policy and Managerial Implications**

- Strengthen beneficiary awareness through local-government outreach, digital communication, community meetings and simple explanations of eligibility and entitlement rules.
- Develop age-sensitive communication because Scheme Exposure differs significantly across age groups in the study sample.
- Encourage households to use savings productively for education, healthcare, debt repayment, emergency funds or investment, while avoiding any assumption that all households have the same priorities.
- Improve grievance-resolution and beneficiary-support mechanisms for registration, eligibility, billing and scheme-related queries.
- Conduct periodic independent evaluations using administrative electricity-bill data in addition to self-reported perceptions.
- Promote energy efficiency alongside affordability so that the welfare objective does not undermine longer-term resource efficiency.
- Use consumer-level evidence alongside utility-level financial indicators when evaluating electricity subsidy programmes.

## **8. LIMITATIONS**

- The sample consists of 200 respondents selected through convenience sampling within the MESCOM/Mangaluru setting; therefore, external validity is limited.
- The study is cross-sectional and cannot establish causality or long-term changes in household financial well-being.
- Most outcome measures are self-reported perceptions rather than verified electricity-bill or bank-account data.
- Several scales have weak reliability, particularly Financial Benefit, Scheme Exposure, Financial Dependency and Electricity Consumption Behaviour.
- The reported project contains an internal discrepancy between the stated number of measurement items/variables and the number of items visible in the annexed questionnaire; this must be reconciled before submission.

- The project does not report item-level diagnostics, factor analysis, regression diagnostics, multicollinearity statistics, effect sizes or confidence intervals; these would strengthen a journal submission.
- The age-group ANOVA is significant, but post-hoc comparisons are not reported, so the specific age groups that differ cannot be established from the available results.
- The project does not document ethics approval, informed consent procedures or a detailed survey period; these should be added if applicable.

## **9. CONCLUSION**

This study examined the perceived financial impact of the Gruha Jyothi Scheme among 200 domestic consumers served by MESCOM in Mangaluru. The results indicate moderate levels of scheme exposure and perceived financial outcomes. Scheme Exposure had the highest mean, while Financial Benefit had the lowest. Influencing Factors showed the strongest association with Financial Impact, and Utilization of Savings also demonstrated a strong relationship. The regression model explained 51.1% of the variance in Financial Impact, with Influencing Factors, Utilization of Savings, Financial Benefit and Scheme Exposure emerging as significant positive predictors.

The findings support the view that electricity subsidies should be evaluated not only through the number of beneficiaries or the value of electricity provided, but also through the household-level financial pathway created by the subsidy. Awareness, household circumstances and the subsequent use of savings appear relevant to perceived financial outcomes. Nevertheless, the study should be viewed as exploratory because of its non-probability sample, cross-sectional design and measurement-reliability concerns. In particular, the negative reliability coefficient for Electricity Consumption Behaviour requires item-level revalidation before firm behavioural conclusions are drawn.

Future research should combine survey responses with administrative electricity-consumption and billing records, use probability or stratified sampling, cover multiple MESCOM districts and other ESCOMs, and follow households longitudinally. Such designs would permit stronger estimates of actual monetary savings, distributional effects, behavioural responses and longer-term welfare outcomes. A robust future model could also examine energy efficiency, household debt, savings, health and education expenditure, environmental attitudes and the interaction between subsidy exposure and household income.

## **10. FUTURE RESEARCH AGENDA**

- Use a larger probability-based sample covering urban, rural and semi-urban households across multiple MESCOM districts.
- Compare beneficiaries with eligible non-beneficiaries or pre-scheme/post-scheme observations where ethically and methodologically appropriate.

- Link survey responses with actual monthly electricity bills and consumption records, subject to consent and data-governance requirements.
- Revalidate the measurement model using exploratory and confirmatory factor analysis before estimating structural relationships.
- Test mediation pathways, such as Scheme Exposure → Financial Benefit → Financial Impact, and moderation by income or family size.
- Study whether savings are allocated to education, health, debt repayment, durable goods, savings or investment.
- Assess both consumer welfare and utility/fiscal sustainability so that programme evaluation captures both sides of the policy.
- Replicate the research across Karnataka's other electricity distribution companies to assess geographical and institutional variation.

## **11. DATA-VALIDATION**

- Verify the exact study period and insert it in the Methods section.
- Verify the final author list, affiliations, corresponding-author details and ORCID information.
- Reconcile the reported 41 variables/35 measurement items with the 30 Likert items visible in the questionnaire annexure.
- Re-run Cronbach's alpha from the original SPSS dataset and check all reverse-coded items, especially the Electricity Consumption Behaviour scale.
- Conduct item-total correlation and, if justified, exploratory factor analysis; report KMO, Bartlett's test and factor loadings if a factor model is used.
- Re-run regression diagnostics, including VIF/tolerance, residual normality, heteroskedasticity, influential observations and confidence intervals.
- Report exact p-values where available rather than only thresholds.
- Provide ethics approval or an explicit statement explaining the applicable institutional/ethical procedure.
- Verify every bibliographic reference and DOI. Do not retain unverified literature entries from the project merely because they appear in the original bibliography.
- Where possible, replace self-reported financial impact claims with verified bill-level measures or clearly label the outcomes as perceived financial impact.

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