ASHOKA UNIVERSITY

CENTRE FOR A
People-centric Energy Transition

ENERGY TRANSITION FINANCING

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Welcome to the journey of transformation.
In a world teetering on the brink of environmental crisis,
India strides boldly into a new era of sustainability.
With a resolute pledge to achieve net-zero emissions by 2070,
the nation embarks on an unprecedented path towards cleaner energy solutions. At the forefront of this revolution stands our project,
Energy Transition Financing, a beacon of hope in the
quest for a greener tomorrow.

Spearheaded by the Ashoka Centre for a People-centric Energy Transition, this initiative embodies a people-first ethos, unraveling the complexities of financing renewable energy while championing broader developmental goals and equity. Supported generously by HSBC India, this project aims not only to allocate resources efficiently but also to foster inclusive growth across states and districts.

Over 21 months, meticulous research and stakeholder engagements pave the way for innovative frameworks, laying the groundwork
for a sustainable future.

OBJECTIVES & GOALS

The primary goal is to delineate how financial resources for clean energy can be strategically allocated across Indian state districts, harmonising with broader development objectives and the varying capacities of each district. The objectives encompass a comprehensive exploration of the current distribution of financial flows for energy transition finance, aligning with the developmental contexts, capacities, and equity considerations of districts nationwide. Additionally, the project seeks to evaluate the disparity between financial flow and distribution across districts, paving the way for informed decision-making and policy formulation tailored to the unique needs of each district.

Explore Current State of Energy Transition Finance:
Investigate the distribution of financial flows for energy transition finance across Indian districts, considering developmental paradigms, capacities, and equity considerations.

Assess Gap in Financial Flow Distribution:
Assess the gap between the flow and distribution of financial resources across districts to facilitate effective future decision-making and policy formulation.

Study Demand Side Aspects of Energy Transition Finance:
Examine distributive aspects of energy transition finance from a demand-side perspective across select states.

Focus on Renewable Energy Options:
Analyse micro grid, mini grid, and other portfolios of renewable energy options to understand their potential and financing requirements.

Study Supply Side of Finance:
Investigate the supply side of finance to establish and comprehend the demand-supply gap in energy transition finance.

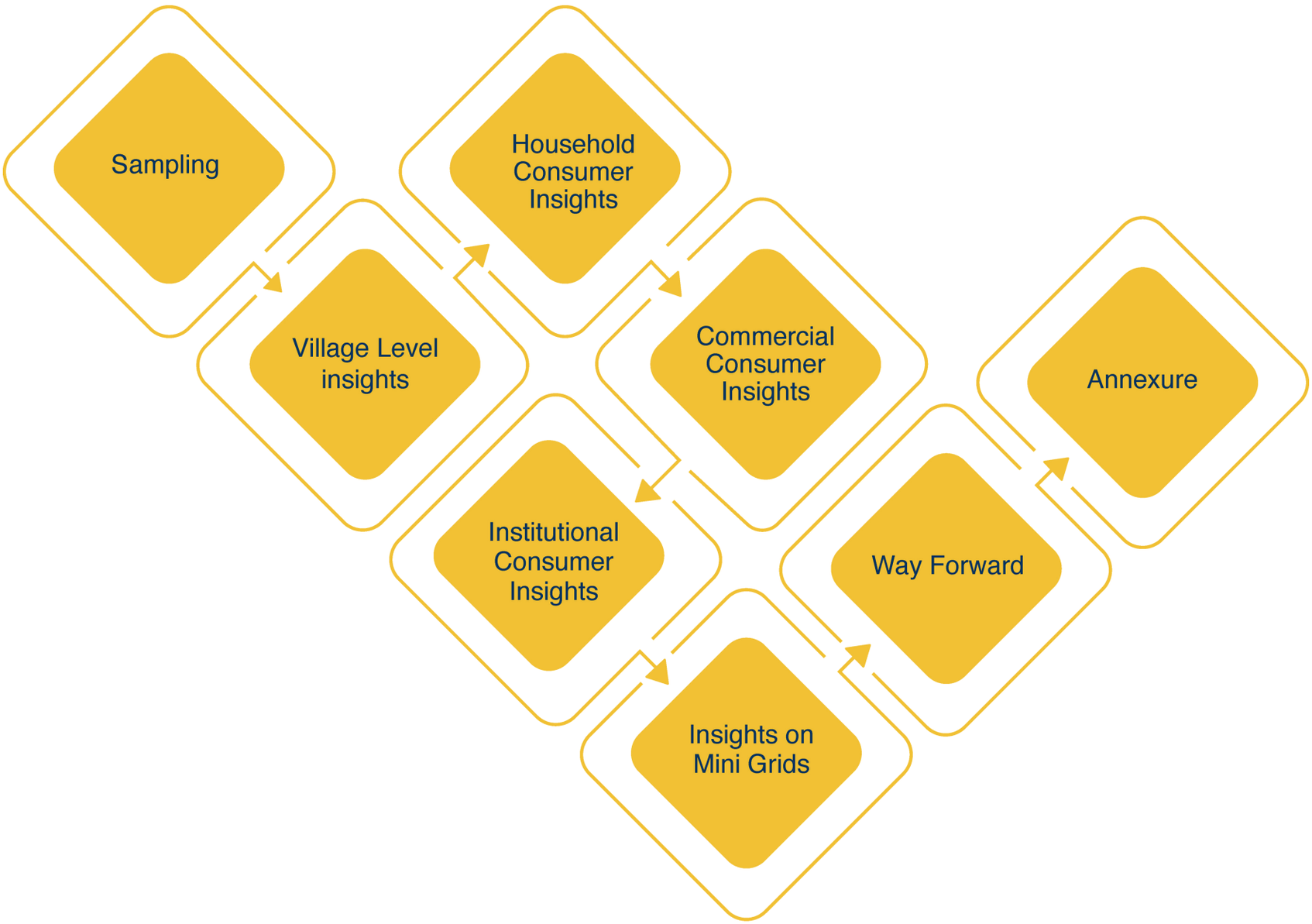
Establish Prioritization Framework:
Develop a framework for prioritising clean energy transition financing in selected districts, aligning with Sustainable Development Goals (SDGs) and state capacity.

Identify Current Prioritisation Gaps:
Identify current gaps in prioritisation and develop strategies to reduce them through effective policies, actions, and decision-making.

METHODOLOGY & SAMPLING

The methodology and sampling approach employed in this research project aimed to ensure comprehensive data collection and analysis across selected districts and villages. Through a meticulous process of survey partner selection, supply-side data collation, and formative research, the project laid the groundwork for robust data collection. The proposed sample design incorporated a diverse representation of households, institutional consumers, and commercial entities, with a focus on capturing insights from both aspiring and laggard districts.

Sampling Strategy



Survey Partner Selection:

- Premier research agencies were invited to bid for the survey partnership, with four agencies participating in the process.
- Selection was based on Quality and Cost Based Selection (QCBS) methodology, resulting in the engagement of Sambodhi Research & Communications Pvt. Ltd. as the survey research partner.

Supply Side Data Collation:

- Evaluated existing financing options and mechanisms for Renewable Energy projects through literature review and Key Informant Interviews (KIIs).
- Explored types of financing mechanisms, including blended finance, and business models in place, alongside assessing the actual cost of services compared to charges.

Formative Research:

- Conducted field visits to selected solar mini-grid villages in partnership with ACPET organisations.
- Engaged with stakeholders to understand the system of supply, metering, billing, payment systems, and operational challenges, which informed the development of survey tools.

Survey Tool Development & Finalisation:

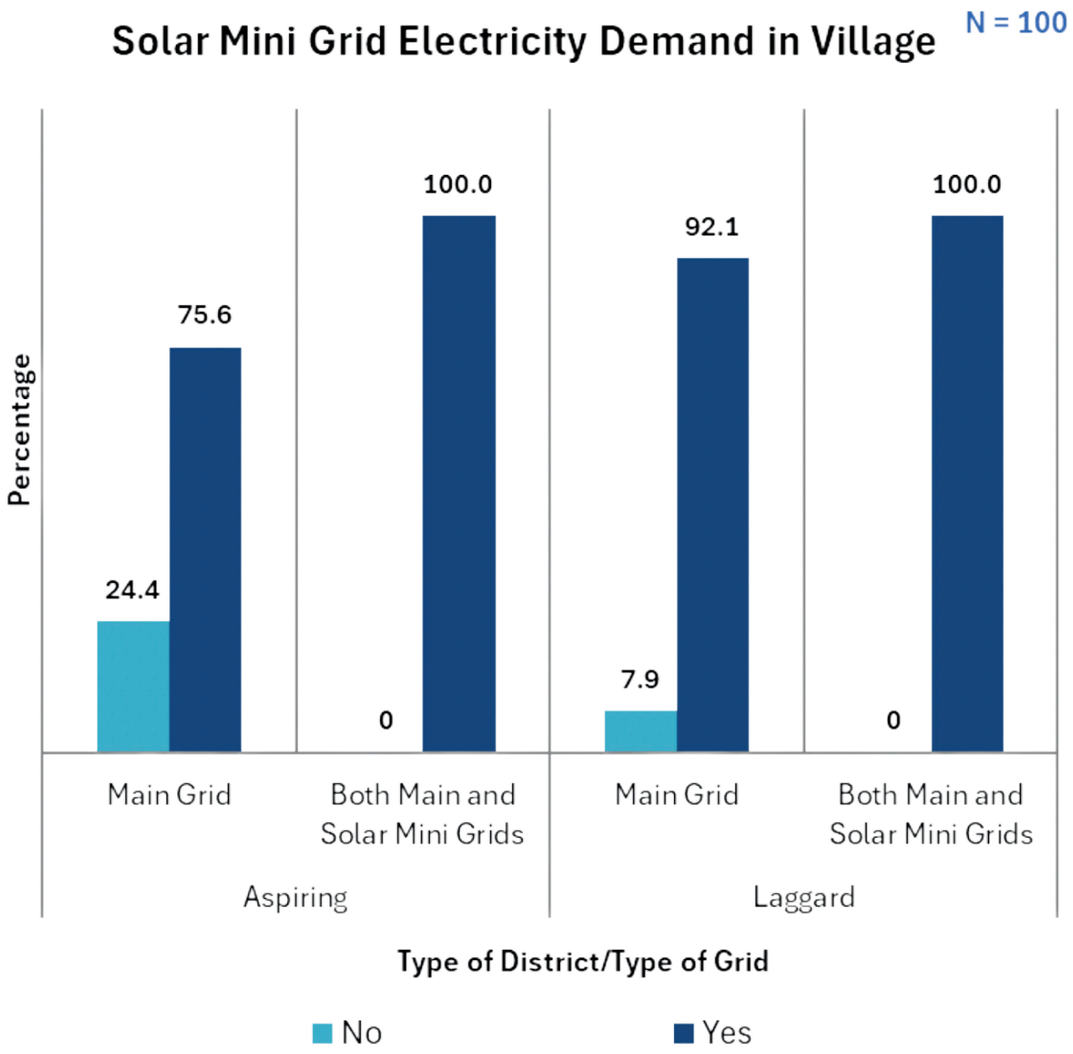
- Developed and iterated survey tools through multiple rounds of refinement, including quantitative questionnaires for various stakeholders and qualitative discussion guidelines.
- Piloted the tools in Gumla, Jharkhand, both in main grid and mini-grid villages, incorporating feedback for finalisation.
- Translated the tools into Hindi and developed a Computer-Assisted Personal Interviewing (CAPI) program for data collection.

Quantitative Sample Coverage

S.N.	Type of sample	Uttar Pradesh	Bihar	Jharkhand	Total
1	Districts	4	4	4	12
2	Villages	40	40	40	120
3	Community representative interviews (Village questionnaire)	40	40	40	120
4	Household interview	800	800	800	2,400
5	Institutional consumer interview	80	80	80	240
6	Commercial consumer interview	80	80	80	240
7	Mini/micro grid operator	10	10	10	30
	Total quantitative interviews				**3,030**

Qualitative Sample Coverage

S.N.	Stakeholder category	Tool	Tentative Sample
1.	Renewable energy consumers – mini/micro-grid, rooftop solar panels, PM KUSUM pumps	Focus Group Discussion (FGD)	9 (3 per state)
2.	Consumers with non-functional/disconnected electricity connections	Focus Group Discussion (FGD)	3 (1 per state)
3.	Community stakeholders (Gram Panchayat, SHGs/CBOs/FPOs)	Focus Group Discussion (FGD)	6 (2 per state)
4.	District level electricity department officials	Key Informant Interview (KII)	12 (1 per district)
		Total	**30**



- Main grid preference: Cheaper monthly bills, no restrictions on motor load operation, government backing.
- Mini grid preference: More hours of electricity supply per day, consistent service with minimal disruptions year-round, streamlined connection procedures.

Proposed Sample:

- Planned a comprehensive sample across states and districts, with a focus on equal representation from aspiring and laggard districts.
- Utilised systematic random sampling methodology to select mini-grid habitations and main grid villages from available databases and census records.
- Aimed to cover 2400 households across three states, alongside interviews with institutional and commercial consumers, mini/micro-grid operators, and focus group discussions (FGDs) with community stakeholders.

Other Stakeholders & Field Operations:

- Engaged village representatives for data collection and conducted FGDs with community stakeholders.
- Centralised field training was conducted in Lucknow, focusing on survey protocols, questionnaire guidelines, and quality check protocols, with teams trained separately for quantitative and qualitative data collection.
- Fieldwork, including interviews and FGDs, was completed in two weeks by trained teams, followed by data cleaning and analysis to generate top line and detailed reports.

HOUSEHOLD CONSUMPTION

Household consumption of solar energy serves as a vital component in rural electrification endeavours, shedding light on the dynamics of energy access and utilisation in diverse communities. Here's an overview of the key findings:

Household-level Sampling:

- 2400 households surveyed across 3 states, covering a broad spectrum of consumer demographics.
- Sampling ensured representation from households with functional electricity connections as well as those experiencing disconnections or lacking connections.
- Two commercial and two institutional consumers randomly selected within each village.

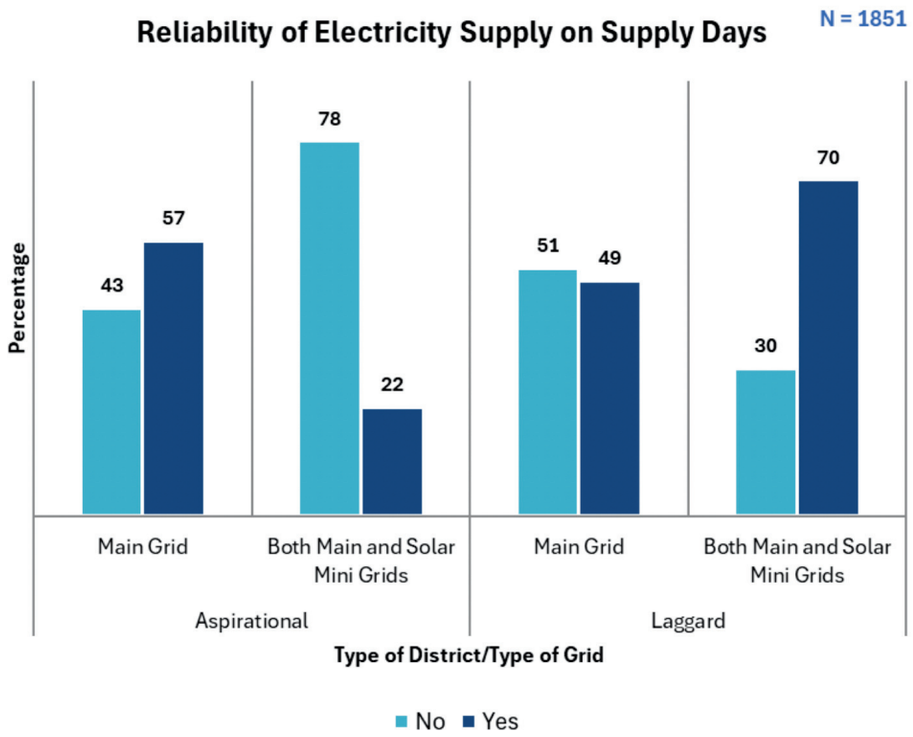
Consumer Demographics:

- Significant representation of Scheduled Tribes (STs) observed in villages with only mini-grid consumers.
- Household ownership of essential electrical appliances such as lights, fans, mobile phones, and kitchen appliances reported across categories.
- PM Saubhagya scheme and Deen Dayal Upadhyaya Gram Jyoti Yojana recognised as major government programs availed by respondents.

Key Findings:

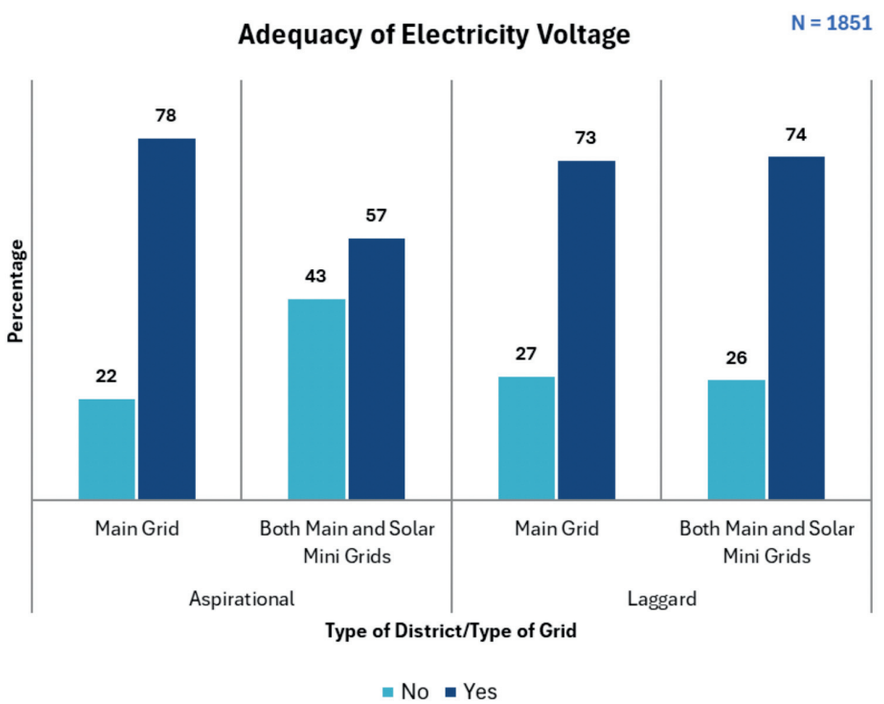
- Majority of consumers reported daily availability of electricity services, albeit with variations in reliability and voltage adequacy.
- Peak electricity usage hours typically observed in the evening and afternoon, reflecting consumer energy consumption patterns.
- Reliability and adequacy of supply assessed across main grid and mini-grid villages, revealing notable differences in consumer satisfaction levels.
- Main grid consumers in laggard districts reported higher frequency of electricity outages, particularly during summer seasons.
- Satisfaction levels varied across districts and electricity sources, with mini-grid consumers expressing higher levels of satisfaction compared to main grid consumers.
- Overall, consumer satisfaction emerged as a crucial factor, influencing perceptions of service quality and reliability.

Reliability of Supply & Adequacy of Voltage – Main Grid

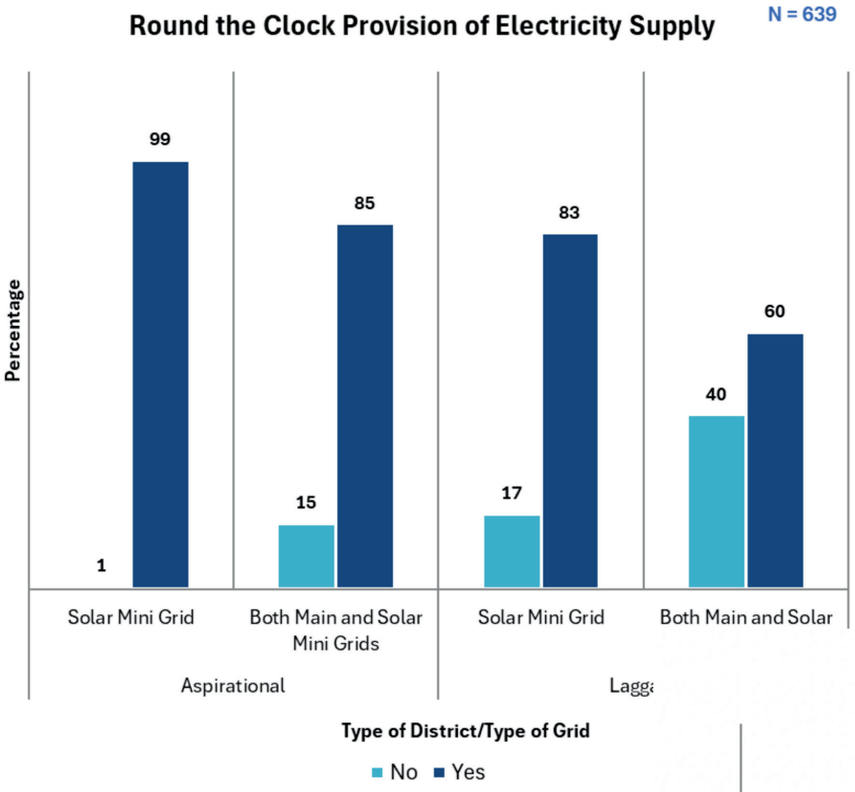


- Mixed responses on electricity supply reliability were noted.
- Reliability was defined as availability at specific times for expected durations.
- In aspirational districts, consumers with both main and mini grid connections reported main grid unreliability.
- Similar reports came from only main grid consumers in laggard districts.

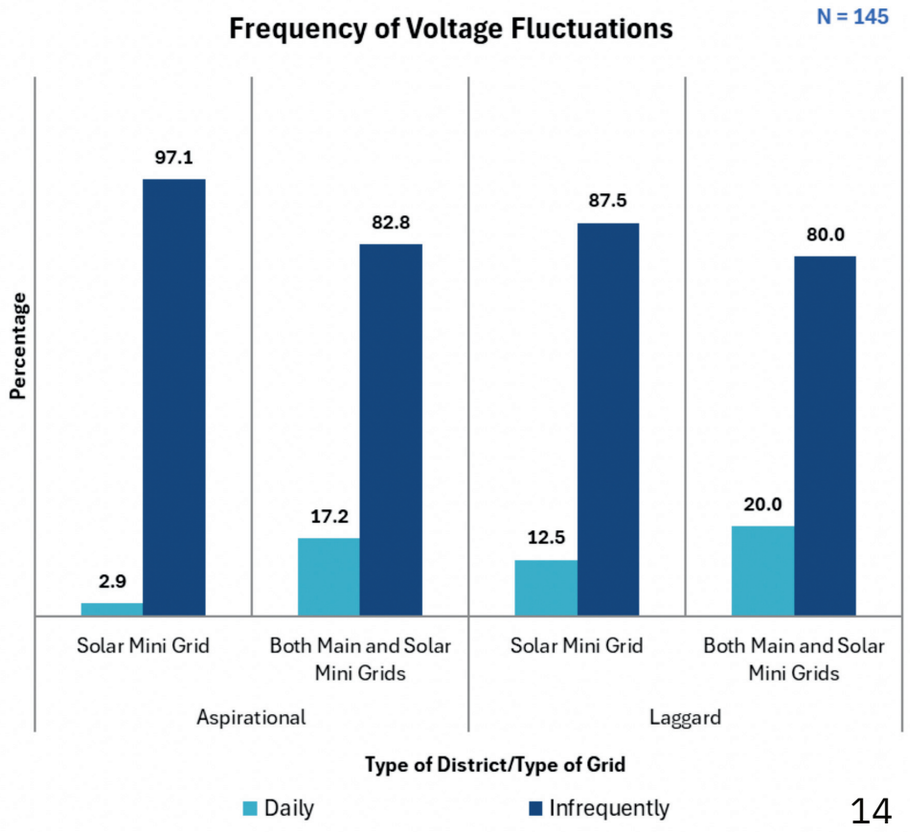
- Across all categories, a substantially high proportion of consumers have reported that the main grid electricity supply voltage maintained is adequate.



Reliability of Supply & Adequacy of Voltage – Mini Grid



- Across all categories, a substantial majority of mini grid consumers reported that they receive round the clock provision of electricity supply.



- Across all categories, a substantial majority of mini grid consumers reported that voltage fluctuations from the mini grid supply are infrequent in nature.

AGRICULTURAL CONSUMPTION

The utilisation of solar energy for agricultural purposes presents a compelling opportunity to enhance sustainability and efficiency in rural communities. Across all categories, the majority of respondents are actively engaged in agricultural practices on their own land, highlighting the significance of agriculture as a livelihood source. However, it is noteworthy that a substantial portion, more than 90%, lacks a dedicated electricity connection for agricultural activities, indicating a potential gap in access to power for farm-related tasks. Interestingly, the choice of irrigation methods varies across different districts and consumer categories. While aspirational districts witness a preference for diesel-operated pumps among certain consumer groups, the adoption of solar-powered pumps is more prevalent among consumers with both main grid and mini grid connections. In contrast, laggard districts exhibit a greater reliance on solar pumps, particularly among consumers with main grid connections, signifying a shift towards cleaner and more sustainable energy solutions in agricultural operations.

Key Findings:

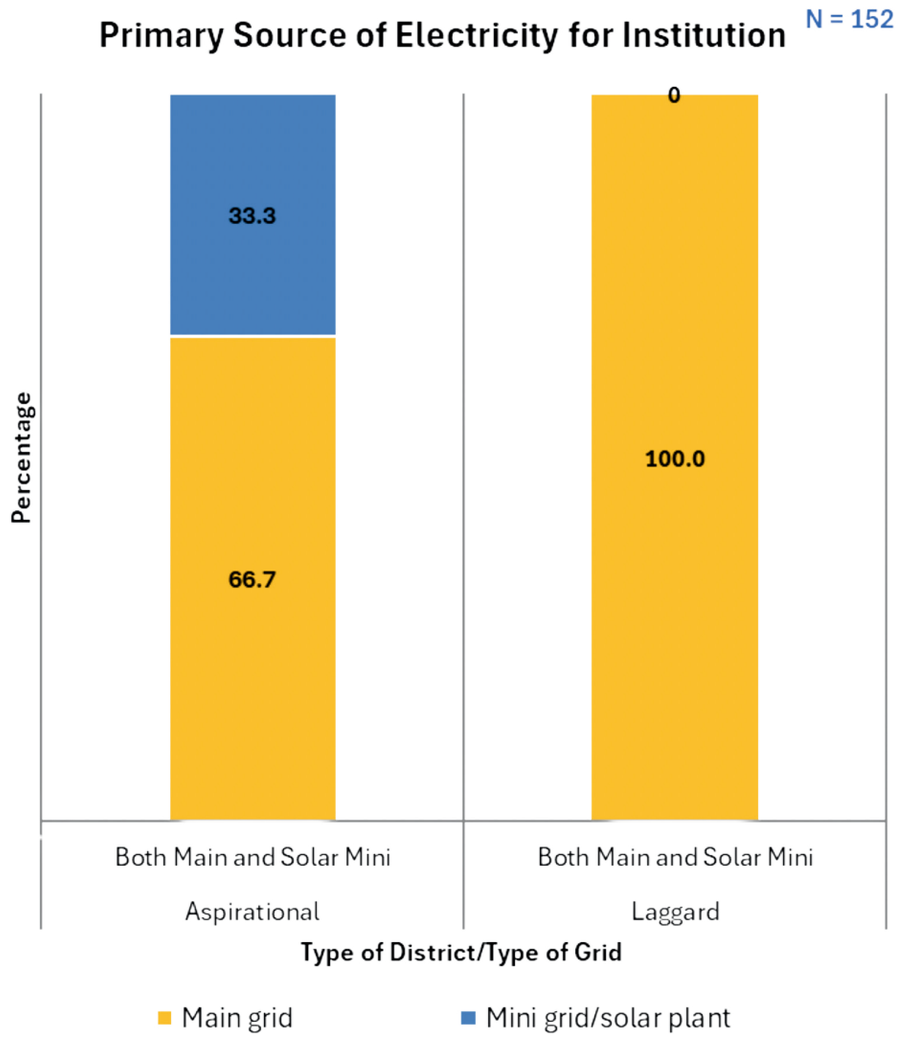
- Majority of households engage in entrepreneurial activities leveraging domestic electricity connections.
- Aspirational districts host a diverse range of businesses, from grocery stores to agricultural processing, while laggard districts also feature handicrafts, poultry, and milk-based products.
- Businesses express a need for electrical appliances in production processes, with varied impacts on growth post-electrification across districts.
- Challenges faced by enterprises include frequent power outages, inadequate load capacity, and unreliability in supply timing and duration, differing between main grid and mini grid supplies.
- Satisfaction levels with electricity services vary, with mini grid consumers exhibiting higher satisfaction rates.
- Selection criteria for electricity service providers predominantly prioritise per unit rate and availability of electricity hours, particularly in aspirational districts.

COMMUNITY INSTITUTION CONSUMPTION

Institutional consumption serves as a cornerstone in the energy landscape, with schools, Anganwadi Centres, and Panchayat Bhawans emerging as primary consumers. Despite their essential role, institutions encounter challenges stemming from unpredictable electricity supply, particularly during peak load months from April to June. In aspirational districts, common issues include frequent power outages and disruptions due to weather-related factors, while laggard districts face additional challenges such as breakdowns of electrical assets and high repair costs.

Key Findings:

- Majority of institutions interviewed were schools (43%), Anganwadi Centres (27%), and Panchayat Bhawans (13%).
- All institutions across categories have functional electricity connections.
- Challenges include unpredictable electricity supply, breakdowns of electrical assets, and high repair costs.
- Primary criteria for selecting electricity service providers vary, with per unit rate being crucial for only main grid institutions and nominal installation charges gaining importance for only mini grid respondents.
- Majority of institutions opt for prioritising the lowest per unit rate and installation charges, despite uncertainties in service guarantee.

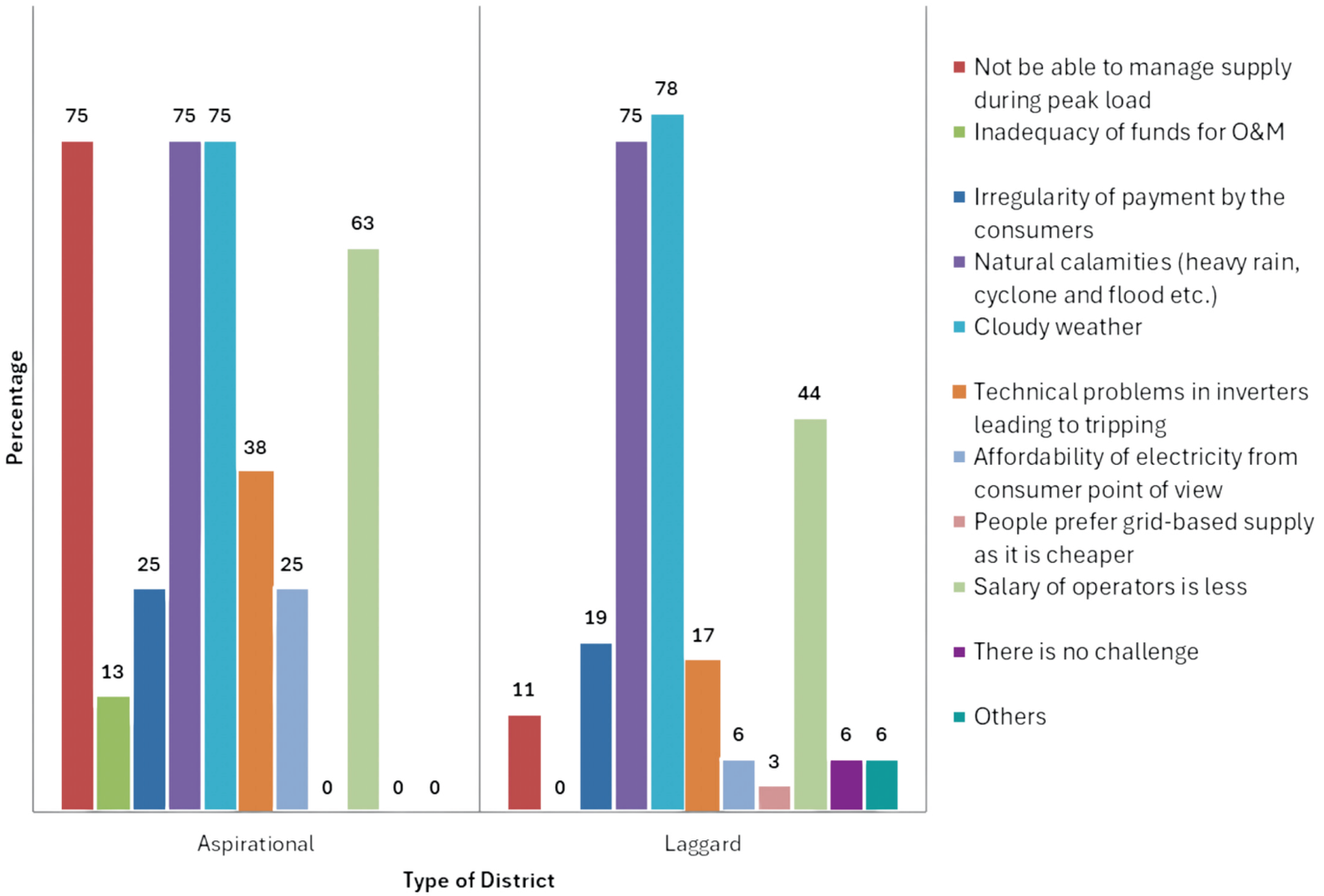


Institutional Distribution: Schools (43%), Anganwadi Centres (27%), Panchayat Bhawans (13%). All institutions have functional electricity connections. Higher load demand observed from April to June.

Challenges Faced: Unpredictable electricity supply disrupts work schedules.
Aspirational districts: Frequent power outages, weather-related disruptions, unreliable timing.
Laggard districts: Electrical asset breakdowns, high repair costs, inadequate load capacity.

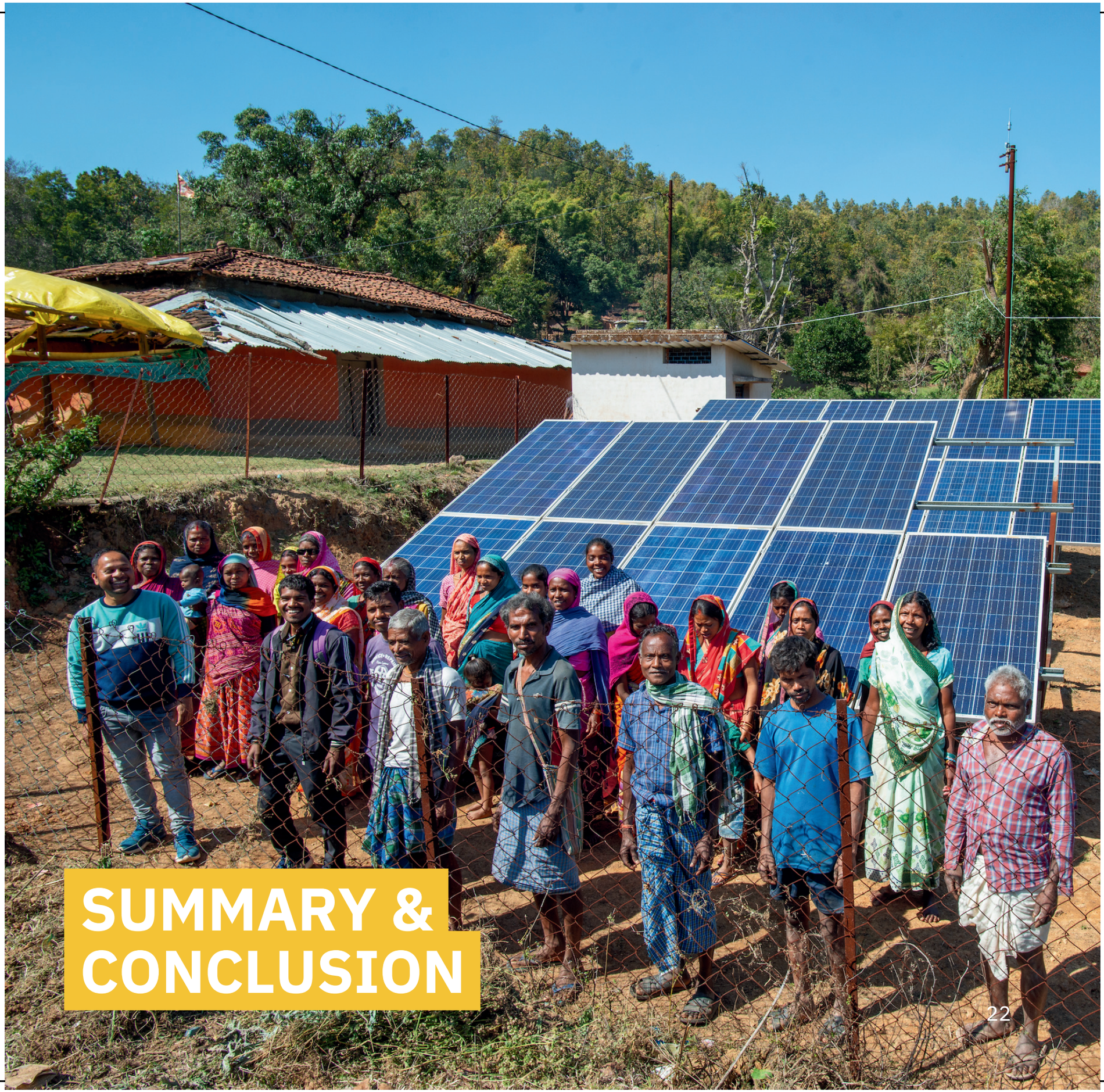
Operational Challenges of Mini/Microgrids

N = 44



- Managing supply during peak load and cloudy weather.
- A significant proportion reported no operation challenges in both categories.
- Operator salary concerns were noted in both, but more prevalent in aspirational districts.


Plate Making Machine
प्लेट बनाने का मशीन
Wastage Material



SUMMARY & CONCLUSION

The implementation of Consumer Specific Blended Catalytic Financing is essential for boosting Energy Transition Financing in various districts of India, particularly those categorised as Aspiring and Laggard.

- This strategy not only helps in reducing investor risks but also encourages community involvement and trust-based financial mechanisms.

- Prioritising distributed renewable energy-centric financing and outreach initiatives in areas and terrains where installing the main grid is economically unfeasible due to their remote locations is essential and limited reliability.

- Financing of mini-grid villages should be based on their daily load profile and demand patterns and degree and not based on their district category.

- Financing of small businesses in mini-grid villages of laggard districts has a larger propensity to create business scale-up in comparison to the small businesses of mini-grid villages of aspiring districts.

- The Subsidy-Based Financing program through the PM Shourya Yojana should broaden its scope to include unaccounted houses from the Indira Awaz Yojana and focus on households with an average monthly load consumption of 2-3 units to promote greater inclusivity in clean energy transition financing.

ACKNOWLEDGEMENTS

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We also extend our gratitude to Sambodhi Research and Communications Private Limited, PRADAN, TRIF, and MCT for their active engagement and valuable contributions to this study.

Above all, we wish to convey our heartfelt thanks to the communities of Gumla, Simdega, Khunti, and Amroha.
Your participation and openness have been invaluable, guiding us through a journey of transformation. It is through your experiences that we gain insights into blending hope and humility, leveraging innovation and diligence for meaningful change.

PROJECT TEAM

Dr. Anandajit Goswami, PI
Sharmistha Baig, Survey Lead
Animesh Ghosh, Core Team Lead
Pradeep Gaur, Visual Documentation

Ashoka University

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