Bellagio Roadmap:

Behavioral Insights for the Global South's Energy Transition

Acknowledgements

Participants of 2024 GEAPP Bellagio Convening (L-R): Deepak Bawari, Amber Woodward, Daniel Crow, Nilesh Kane, Kanv Garg, David Morgado, Neha Dhingra, Saksham, Nidhi Sarin, Sunita Dubey, Mary Sprayregen, Chaitanya Kanuri, Rachita Mishra, Kabir Malik, Sara Constantino, Dipak Kokate, Pavan Mamidi, Teevrat Garg and Joshua Wycliffe.

Introduction

The Paris Agreement calls for a reduction of emissions by nearly 45 percent by 2030. Consumer behavior change can play a critical role in the adoption of energy efficiency (EE) and renewable energy (RE) solutions. In September 2024, the Global Energy Alliance for People and Planet (GEAPP) convened energy leaders at the Rockefeller Foundation's Bellagio Centre to explore how behavioral science can drive the Global South's energy transition. The event fostered collaboration among key stakeholders, refining strategies and identifying scalable opportunities. Expected outcomes include pilot programs, innovative policy frameworks, and strengthened global partnerships integrating behavioral science principles.

The Role of Behavioral Science in Energy Transition

The International Energy Agency (IEA) estimates that behavioral changes, combined with energy efficiency improvements and electrification, are instrumental in achieving net zero by 2050 [1]. Behavioral science, which relates to studying human decision-making, provides insights into why and how individuals make decisions around energy. These decisions are influenced not just by price signals alone but also by behavioral factors such as social norms, framing, salience, and cognitive biases.

There are several examples of leveraging behavioral insights for energy transition from the Global North. Oracle Energy and Water's Home Energy Reports (HER) in the U.S. reduce peak energy demand by 65 MW through neighborhood energy-use comparisons. The program does so by providing personalized feedback to customers on their energy use compared to their neighbors. Octopus Energy's research in the U.K. using one-of-a-kind utility customer data finds that adoption of heat pumps leads to nearly 70 percent lifetime emissions savings [2]. Evidence on consumer preferences helps save costs and carbon.

In the Global South, countries are preparing for fast-moving advances in grid modernization, RE deployment, and behind-the-meter power management innovations. The Global South is experiencing unprecedented energy demand, driven by a combination of climate change-related factors, such as extreme weather events like heat waves, and challenges unique to developing economies, such as rapid urbanization. Challenges also remain in consumer energy efficiency, renewable technology adoption, and consumers' navigation of complex regulatory environments. Although there is new and emerging evidence on energy consumer decision-making from the Global South, more evidence is much needed.

Behavioral insights can support energy providers' consumer strategies by turning insights into action, driving customer engagement, and boosting revenue through targeted incentives and nudges. Behavioral insights can directly support outcomes such as energy efficiency and renewable energy adoption, drive participation for subsidies and programs, and increase adherence to demand response programs. By leveraging human behavior, energy providers can reduce energy losses while fostering greater participation in renewable energy (RE) and demand-side management (DSM) for grid stability. Tailored behavioral interventions not only optimize energy consumption but also empower customers, enhancing both utility profits and sustainable energy use. Understanding and influencing consumer behavior change can be critical to more efficient, stable, and profitable energy systems.

Addressing Energy Challenges in the Global South

Following the 2024 Bellagio convening, the aim is to embed behavioral insights for use in programs and pilots that support EE, RE, and DSM outcomes. These include:

- **Market Innovations:** Using consumer behavior insights to enhance utility services and drive adoption.
- **Policy Innovations:** Integrating behavioral science into policy frameworks for consumer-centric energy governance.
- **Awareness and Advocacy:** Supporting design and delivery of public campaigns for social and behavioral change towards a just energy transition.
- **Knowledge Sharing:** Stakeholder capacity building and development of a cross-sector learning platform to inform policies and scale successful pilots.

Energy Consumer Sandbox

The concept of an Energy Consumer Sandbox is envisioned as a data-driven multi-stakeholder institutional framework to i) test and scale up behavior change programs for energy transition and ii) support the design and implementation of consumer-facing energy programs and policy. Programs and pilots will initially focus on specific regions in the Global South before expanding. Examples of behavioral insights outfits in the Global South include the Government of India's Behavioral Insights Unit (BIU). The Energy Consumer Sandbox will pool resources committed by organizations to,

- **Design and Test Innovations:** Support the design and development of innovations in policy and programs for consumer behavior change. Innovations will range from AI/ML use cases (e.g., behavioral load management) to embedding consumer insights into the design of policy frameworks (e.g., Demand Flexibility

Program). It will support the design and implementation of structured behavioral pilot programs and evaluations to test EE, DSM, and RE programs and interventions.

- **Knowledge and Advisory:** Maintain an open repository of behavioral evidence to guide global and regional initiatives. Build collaborations (e.g. with IEA) to host evidence repositories as public goods. Provide advisory services for capacity building and support implementation agencies for program and project design using existing evidence. Lastly, it will support building regional and sector-focused LLMs and training datasets for consumer energy analysis.

Structure and Key Stakeholders

The first-of-its-kind Energy Consumer Sandbox (The Sandbox) will be housed as a Technical Support Unit (TSU) in a regional anchor institution in the Global South. Its primary objectives will be to i) support implementation partners (e.g., utilities) to deploy new initiatives and strengthen existing programs with behavior change components and ii) generate evidence using experimentation and innovation for consumer outcomes. The stakeholders will include:

- **Government:** The Sandbox will work in close coordination with regional and sub-regional level ministries, departments, and regulators. The Sandbox will receive strategic and institutional support and converge its activities with existing and emerging energy policies and programs. The Sandbox will also provide program evaluation support.
- **Technology Providers:** The Sandbox will host empanelled technology services. They will play a crucial role in developing and supporting the operational and logistical frameworks necessary for EE, RE, and DSM.
- **Implementation Partners:** Organizations such as distribution companies (DISCOMs) and renewable energy entities will leverage and apply behavioral insights to enhance program effectiveness. The Sandbox will serve as a platform to support both ongoing and new initiatives.
- **Academia:** Research institutions specializing in energy and behavioral science will provide an evidence-based foundation for initiatives. Their contributions will include the design, development, and evaluation of interventions.
- **Global Agencies and Philanthropy:** Multilateral organizations and philanthropic foundations will play a key role in strategic funding, assist program development, and scale up innovative solutions.

Consumer Innovation Philosophy

The Sandbox will host captive and on-demand resources to deploy a high-frequency, iterative methodology to design and evaluate consumer-focused initiatives. The focus will be on rapid testing using robust evidence generation methods, including AI/ML and causal inference methods, to inform the scale-up of consumer innovations for the energy transition. This is illustrated using the example of the Government of India's Prime Minister's Surya Ghar Yojana (Household Rooftop Solar Program).

- **Define & Diagnose:** Break down and define consumer behavior change challenges. Identify behavioral, technological, and policy barriers by workshopping with key stakeholders and collating existing evidence.
  - Identification of behavioral barriers that customers face in availing rooftop solar subsidy and the PM-Surya Ghar application portal using in-depth qualitative exercises.
- **Design:** The Sandbox team will help design elements of the programs for implementation across all stages of the program. These include communication collaterals, such as campaigns, and elements for implementation, such as user journeys and application design.
  - The team will help support the design of elements for the behaviorally informed communications campaign of the PM-Surya Ghar Program to drive demand for uptake of the subsidy.
- **Test:** The team will identify the pathway for rapid testing and evaluation of programs. Testing methodologies will range from Qualitative interviews, Impact Evaluation Surveys, and Randomized Control Trials.
  - The Sandbox team will help design an A/B test and survey to evaluate the impact of the deployment of Rooftop Solar on household energy use.
- **Learn & Adapt:** A critical element will be the Sandbox's ability to learn and adapt through iterations of testing and deployment. Design and implementation will be refined, tweaked, and adjusted across various stages of the program.
  - The design of the PM-Surya Ghar communications and application portal will be tweaked using findings to increase consumer engagement with the dashboard.
- **Scale-Up:** Expand successful innovations through policy integration and industry collaboration.
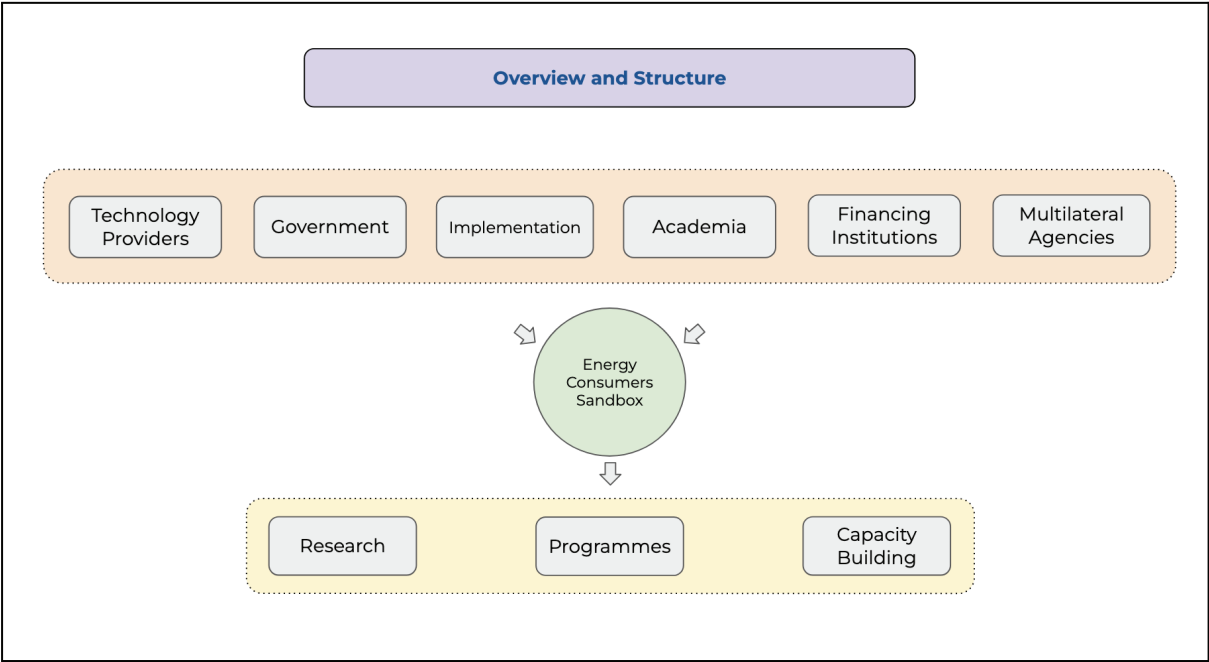 - Findings will be shared and implemented in the PM-Surya Ghar program for roll-out at scale.

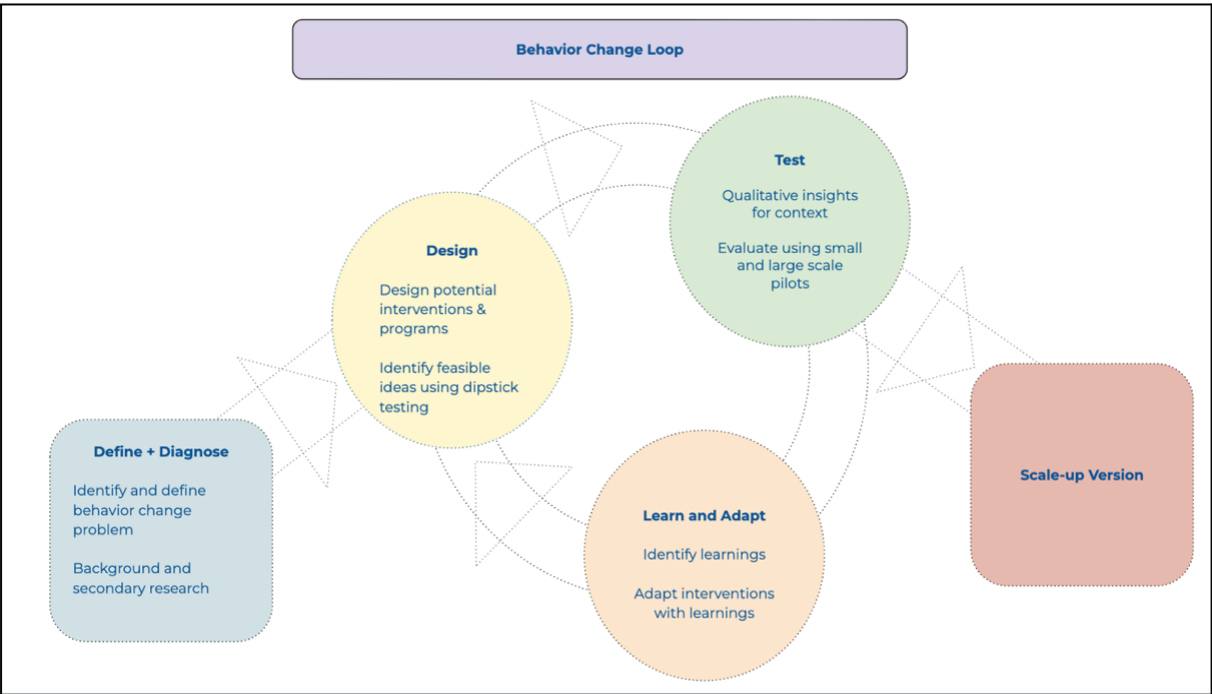*Figure 1: Structure of the Energy Consumers Sandbox.*

Figure 2: Iterative process 'Behavior Change Loop' for designing consumer behavior change programs.

Role of Sandbox

The following table lists pressing consumer behavior challenges during the energy transition. It also proposes the role of The Sandbox to address them. Approx. $5 million over 5 years will be raised as funding for projects on Global South energy transition challenges.

Challenges	Role of Sandbox
Peak Shaving/Shifting: Lack of demonstrated projects and evidence on the deployment of Demand Response programs that actively require consumer behavior change during peak hours. The challenge is exacerbated by differences in regulatory environments and tariff design.	Consolidate existing evidence and generate context-specific evidence for use by Global South stakeholders. Training and capacity building to design and test demand response programs. Low-cost behavioral demand response and load analysis features using AI/ML to learn and engage with customers. Support the design of Demand flexibility policies.
Utility Digitization: Utilities struggle to onboard customers alike on RE and EE initiatives that leverage digital tools such as smartphone applications and enrollment into energy efficiency programs and initiatives.	Identify global evidence on consumer barriers and levers to the adoption of digital services. Design communication programs on RE and EE that help design and implement utility engagement programs with onboarding and compliance outcomes with customers.
Smart Meter Rollouts: Utilities face unprecedented challenges in installing Smart Meters for customers with frequent disruptions to rollout.	Evaluate India's RDSS program, which evaluates how smart meter installation drives consumption and consumer level challenges to rollout.. Support utilities in community engagement and program design for smart meter rollout.
Challenges	**Role of Sandbox**

Appliance Replacement Programs: Drive the adoption of higher efficiency programs for cooling and efficient use.	Identify consumer barriers and incentives to accelerate appliance replacement for energy efficiency. Design rebate and incentive programs that improve customer participation and maximize grid benefits.
Municipal Water Pump Use: Align pump operations with grid efficiency goals.	Support municipalities in optimizing pump scheduling to reduce peak demand and enhance grid integration. Building programs to nudge municipal organizations. Develop policy frameworks and incentive structures to align municipal water pumping with renewable energy availability.
Rooftop Solar Adoption: Improve outcomes for the adoption of residential rooftop solar.	Evaluate global best practices in policy and consumer engagement to drive rooftop solar uptake. Design programs that streamline installation, improve financing access, and enhance grid interactivity for residential solar users.
Vehicle-to-Grid Management: Align charging of vehicles (individual-owned or fleet-owned) for grid stability.	Develop strategies for integrating individual- and fleet-owned EV charging with demand response programs. Design regulatory and incentive structures to encourage vehicle-to-grid participation for grid flexibility and resilience.

Case Studies from the Global South

Case Study	Details	Project Description
Overcoming barriers and seizing opportunities for smart meters in developing countries: Insights from a large-scale field study in India [3]	**Team:** Rohit Gupta, Denise L. Mauzerall, Sara Constantino, Gregg Sparkman, Malini Nambiar, Elke Weber **Region:** Jaipur, India **Year:** 2024	The study on smart meter adoption in Jaipur highlights the role of socio-economic and political factors in consumer decision-making. Unlike developed countries, concerns are on meter accuracy and billing rather than data privacy. Findings emphasize the need for community engagement and tailored policies to ensure successful deployment by state-owned utilities.
Understanding the barriers to the diffusion of rooftop solar: A case study of Delhi (India) [4]	**Team:** Dwarkeshwar Dutt **Region:** Delhi, India **Year:** 2020	The study explores barriers to rooftop solar adoption in Delhi despite favorable conditions. The study uses in-depth interviews with Delhi residents. Insights highlight that cost, lack of finance and information, mistrust, and complex institutional procedures hinder its diffusion.
A Comparison of Contests and Contracts to Deliver Cost-Effective Energy Conservation [5]	**Team:** Teevrat Garg, Jorge Lemus, Guillermo Marshall, Chi Ta **Region:** Hanoi, Vietnam **Year:** 2025	The Vietnam Energy Contests study compares contests and tiered contracts in reducing household energy consumption. A randomized field experiment in Hanoi found that while both mechanisms achieved 7-9% reductions, contests were more cost-effective, reducing energy use at half the cost of contracts. Findings inform demand-side management policies in low- and middle-income countries.
Scaling-Up A WhatsApp EnergyBot for Reducing Peak Energy Demand [6]	**Team:** Saksham, Deepansh Jagga, Anirudh Tagat, Yiwei Zhang **Region:** Kolkata, India **Year:** 2024 (*Ongoing*)	The EnergyBot pilot tests personalized, behaviorally informed messages to encourage residential energy conservation. Over five weeks, 5,500 households received one of five message types: Demand-Side Management, Financial Incentives, or Social Norms. The study assesses engagement and behavioral responses, informing future energy nudges and scalability for climate-friendly interventions.

Energy Consumer Sandbox Roadmap

The Energy Consumer Sandbox offers a structured approach to embedding behavioral insights into energy transition efforts. By integrating behavioral science with policy and market innovations, the aim is to create a more inclusive, data-driven, and sustainable energy ecosystem for the Global South. This initiative will empower consumers, optimize utility engagement, and support the broader clean energy transition on a global scale.

Phase 1: Identification of Priority Areas (Months 1-6)

- Stakeholder mapping
- Fundraising effort and advisory board
- Identification of anchor and supporting agencies
- Identification of key focus areas
- Sandbox coordination framework development

Phase 2: Implementation plan (Months 7-12)

- Project and program pipeline creation
- Onboarding of supporting agencies
- Pilot design and feasibility assessment
- Staffing and expert panel formation
- Regulatory and financial readiness assessment

Phase 3: Deployment (Months 13-24)

- Launch of programs and pilots
- Policy recommendations and knowledge dissemination.
- Scale-up of Energy Consumer Sandbox

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