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# Case Study 1: Prototyping a Result-Based Financing (RBF) Framework for Minigrid Investors

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## Context

Mini-grids are a critical solution for rural electrification, especially in Sub-Saharan Africa. In recent years, public and private sector actors have mobilized financing to support their deployment. However, investment decisions in the mini-grid sectors are often made with limited access to reliable performance data. Moreover, there is a heavy reliance on metrics that may not accurately reflect the true reliability or quality of service experienced by end-users. As a result, funding mechanisms and policy frameworks risk being misaligned with actual mini-grid

performance, potentially undermining efforts to improve energy access and long-term sustainability.

Result-Based Financing (RBF) offers a way to tie financial disbursement to verifiable performance outcomes. Various RBF mechanisms have been proposed and implemented—linking payments to KPIs such as system uptime, amount of energy delivered, and number of customer connections. However, these metrics often prioritize coverage over quality. For example, rewarding the number of Customer connections doesn't account for whether the power delivered is stable, usable, or consistently available. A mini-grid that connects many households but delivers frequent undervoltage or long power outages may still receive funding—despite poor end-user experience.

Few RBF schemes incorporate high-resolution operational data or power quality indicators, and there's little consensus on which KPIs best reflect real-world performance. This presents an opportunity to revisit the design of RBF mechanisms using more granular data and meaningful KPIs.

## Your Challenge

***Research existing RBF mechanisms in the energy access and/or mini-grid space, then prototype your own RBF mechanism that improves on the existing ones. Using the RBF mechanism you have developed together with the provided dataset (minigrid SAIDI, SAIFI, undervoltage hours, and number of connections), determine the payouts allocated to each minigrid.***

## Data Provided

1 year of daily performance data from several mini-grids in North Kivu, DRC:

- SAIDI (average outage duration per customer)
- SAIFI (average outage frequency per customer)
- Hours of undervoltage

## Guiding Questions

1. Identify some RBF mechanisms that exist for minigrid funding. Which organizations have used these mechanisms? Draw examples from minigrid development in African countries.
2. Identify which KPIs the minigrid investors/funders have used to reward or penalize minigrid developers.
3. What sources of data are used to determine these KPIs for minigrid developers? Are there any gaps/challenges in obtaining such datasets?
4. Are there any limitations to using such KPIs in evaluating minigrid performance? Are these KPIs sufficient to determine the impact of the minigrids on customers' lived grid experiences?
5. Using the information from Q1-Q4
  - a. Determine the KPIs that are best suited for rewarding/penalizing minigrids.
  - b. Develop an improved RBF mechanism that addresses the issues identified above and fairly rewards/penalizes minigrids based on performance and impact on customers' grid experiences.
6. Now use your developed RBF mechanism to reward/penalize the minigrids based on their performance (based on the provided minigrid dataset) and:
  - a. Use your data manipulation and descriptive statistics skills to report on minigrid performance.
  - b. Use visualizations to compare across sites or time.
  - c. Try formulating a few "if-then" RBF payout conditions — e.g., *"payout if average SAIDI is below X for 3 months."*
7. Discuss why your new RBF mechanism is an improvement from the existing ones.

## Deliverables

- A detailed report responding to the guiding questions.

- A data analysis notebook analyzing minigrid performance and implementing the RBF mechanism you have developed to determine payouts to different minigrids.
  - A dashboard presenting the RBF mechanism.
  - A short slide deck to present your work to potential investors.
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