Stochastic Techno-Economic Microgrid Model – A Microgrid Investment Risk Assessment Tool: Model Development and Case Study

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Overview

- Understanding the Problem
- Project Objective
- Solution overview
- Use cases & Results
- Further work
- Influences & Sources
Understanding the problem

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<th>Background</th>
<th>Constraint</th>
<th>Problem</th>
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<td>Electrification rates have experienced significant growth within the past two decades, and so has the population growth. About a billion people still left out, more than 85% of which are in developing countries</td>
<td>Microgrids often hailed as potential solution to electrification in remote areas but there’s low adoption of Microgrids due to investor perception that micro-grids in developing countries are risky business ventures</td>
<td>There are limited data to support the notion that microgrids are risky and at the same time there are limited data to support that they are not</td>
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Project Objective

Build a software tool that permits modelling of microgrid utilities from an investor’s perspective, simulating the financial returns of a microgrid under uncertainty.
The STEMM Techno-Financial Model

- Model microgrid technical and financial performance
- Account explicitly for uncertain inputs
- End goal: enable scale up of microgrid deployment by facilitating easier techno-financial modeling for microgrid investors
The STEMM Techno-Financial Model
The Software Tool

- Graphical User Interface collects all project parameters
- Linked to the NASA Meteorological API for Irradiance and Temperature data.
- Links with techno-financial model to produce and graph results
Model Outputs

- Indicators used
  - For bankability
    - Debt Service Coverage Ratio (DSCR)
  - For Equity
    - Net Present Value (NPV)
Possible Applications/Uses

- Technology based cost function optimization for project developers

- Financial viability analysis for financial institutions, lenders and Investors.
Future Work

Deliverable 1: Add more microgrid renewable energy technologies (Wind, Hydro Biogas, etc).

Deliverable 2: Understand how business models, technologies and policies improve financial performance and mitigate risk.

Deliverable 3: Measure the probability of project success/failure to a higher confidence level for investors.

Deliverable 4: Create a downloadable PDF document report summarizing the results of the model.
Some of the papers that informed our project