Community Supported Renewables Microgrid

ENERGY JUSTICE AND EQUITY

PEEYUSH KUMAR
MICROSOFT RESEARCH

(PEEYUSH.KUMAR@MICROSOFT.COM)
Higher Energy Burden of Low-income Households

- The median energy burden of low-income households in Seattle is 3.9 times higher than non-low-income households.
- The median energy burden of low-income multifamily households in Seattle is 2.7 times higher than multifamily households.
- The median energy burden of Black households in Seattle is 28% higher than that of non-Hispanic white households.
Optimization Goals

- Utility Efficiency (Profit & Utilization)
- Decrease Energy Burden
- Resiliency
- Community Resource (Resiliency, Revenue, Job Creation)
Modern Power Grid

- Generation-
  - Renewable Energy Resources with **variable** and **intermittent supply** – uncertainty of generation
  - Multiple **decentralized energy resources** and different forms of storage

- Markets-
  - Multi-time scale forward markets
  - **Green incentives**

- Transmission-
  - **Bidirectional** flow of energy
  - Localized transmission for mini/micro grids

- Consumption-
  - Consumers are moved to active **prosumers**
  - Ability to participate in **demand shifting/reduction** techniques

Automation and optimization would play a fundamental role with technology opportunities for AI and IoT to enabling flexible supply, elastic demand, real-time optimization through new energy markets.
Dashboard – Questions to Answer

- For Communities and Organizations:
  ◦ What is the economics of setting up micro-grids? Multiple Scenarios
  ◦ What are the regulatory challenges?
  ◦ How does it work with our financing vehicles?
  ◦ How does it help towards our climate action/sustainability goals?

- For Policy Makers:
  ◦ In cities: what is the potential for micro-grids to reduce the energy burden to communities?
  ◦ In cities and utilities: how do micro-grids assist in reaching climate action/sustainability goals?
  ◦ In cities and utilities: how do micro-grids support the shift of demand to off-peak times of day/night?
  ◦ In cities and utilities: how much net metering is needed to incentivize micro-grid development?

Easy to use by embedding ChatGPT (LLM) based Q/A interface
Appendix
Resources

Federal: https://betterbuildingssolutioncenter.energy.gov/
https://www.energy.gov/scep/slsc/low-income-community-energy-solutions#:~:text=Energy%20burden%20is%20defined%20as,which%20is%20estimated%20at%203%25.

Think Tanks: https://clean-coalition.org/community-microgrids/

Other WA Resources:
https://ilsr.org/washingsons-community-solar-program/
Dashboard – Economics Planning

Overview

Economics

Cost Savings and Revenue Opportunities

Regulatory Requirements

| Regulation 1 |
| Regulation 2 |
| Regulation 3 |
| ... |

Resources to Implement

Financing & Planning

Query Box Powered by ChatGPT

Ask a question

Personas

Community/Organizations

Policy Makers
Dashboard – Economics Planning

- For Communities and Organizations
  - Economics
    - Utility costs
    - Energy production and cost savings
    - Amortized cost of installation, tax benefits, grants
    - Cost savings and revenue opportunities that can happen with intelligent switching
  - Regulatory Implications
  - Resources to Implement
  - Financing & Planning
    - Eg: Green Revolving Fund
    - Etc...

- For Policy Makers
  - Highly specific usage data
  - Sustainability Goals, Climate Action

Easy to use by embedding ChatGPT (LLM) based Q/A interface
Scaled Version for Experimentation