Community Supported Renewables Microgrid

ENERGY JUSTICE AND EQUITY

PEEYUSH KUMAR

MICROSOFT RESEARCH

(PEEYUSH.KUMAR@MICROSOFT.COM)

3.9X

The median energy burden of low-income households in Seattle is 3.9 times higher than non-low-income households

2.7X

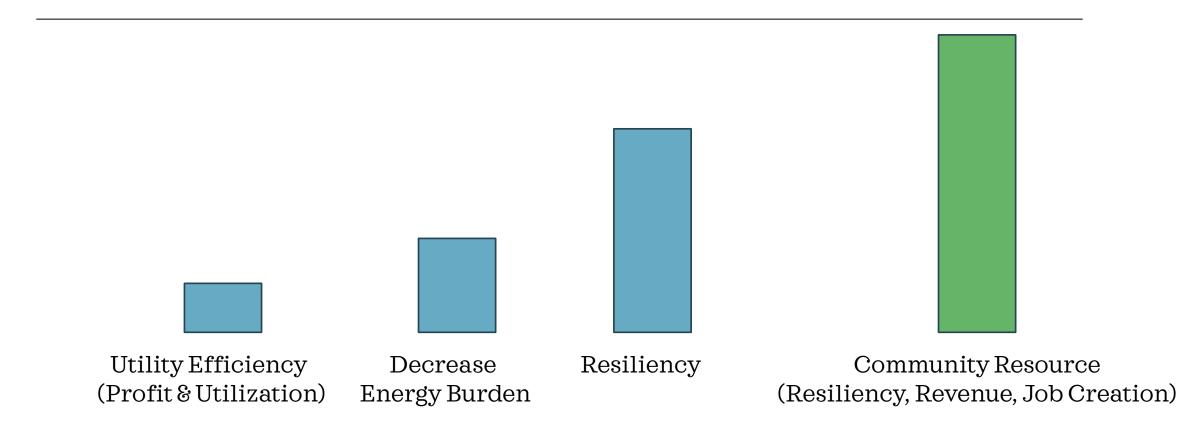The median energy burden of low-income multifamily households in Seattle is 2.7 times higher than multifamily households
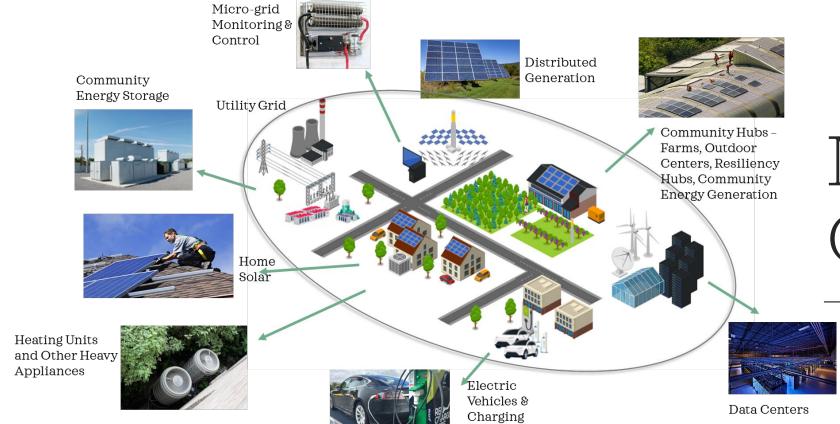
28%

The median energy burden of Black households in Seattle is 28% higher than that of non-Hispanic white households

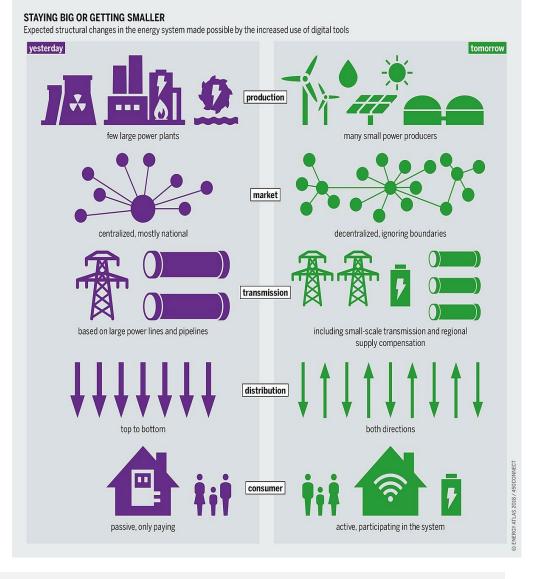# Higher Energy Burden of Low-income Households

Optimization Goals

Micro-Grid

Community Energy Storage

Micro-grid Monitoring & Control

Utility Grid

Distributed Generation

Community Hubs – Farms, Outdoor Centers, Resiliency Hubs, Community Energy Generation

Home Solar

Heating Units and Other Heavy Appliances

Electric Vehicles & Charging Stations

Data Centers

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

STAYING BIG OR GETTING SMALLER
Expected structural changes in the energy system made possible by the increased use of digital tools

yesterday — tomorrow

production
few large power plants — many small power producers

market
centralized, mostly national — decentralized, ignoring boundaries

transmission
based on large power lines and pipelines — including small-scale transmission and regional supply compensation

distribution
top to bottom — both directions

consumer
passive, only paying — active, participating in the system

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> "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.

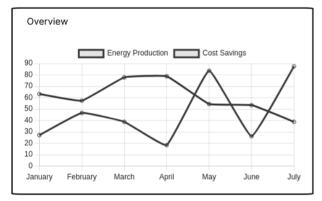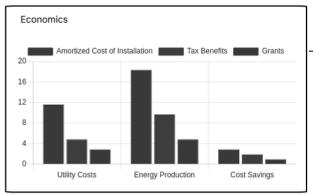Think Tanks: https://clean-coalition.org/community-microgrids/

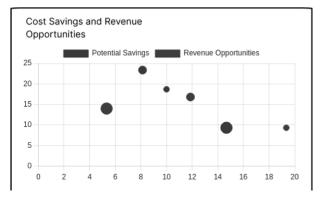Other WA Resources: https://www.energy.wsu.edu/RenewableEnergy/CommunitySolarProgram.aspx

https://ilsr.org/washingtons-community-solar-program/

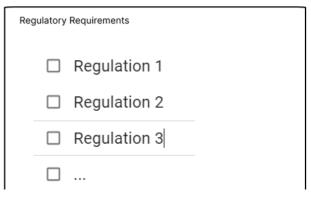https://www.utc.wa.gov/sites/default/files/2021-02/Community%20Solar%20Fact%20Sheet.pdf
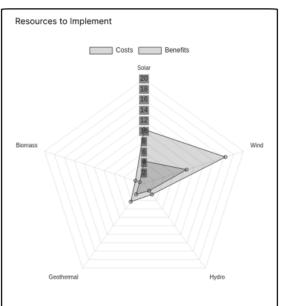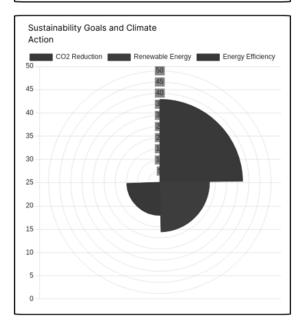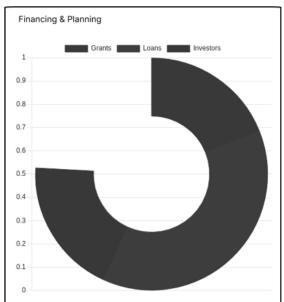
Dashboard – Economics Planning

Overview

Energy Production — Cost Savings

January, February, March, April, May, June, July (90, 80, 70, 60, 50, 40, 30, 20, 10, 0)

Economics

Amortized Cost of Installation — Tax Benefits — Grants

Utility Costs, Energy Production, Cost Savings (20, 16, 12, 8, 4, 0)

Resources to Implement

Costs — Benefits

Solar, Wind, Hydro, Geothermal, Biomass (20, 18, 16, 14, 12, 10, 8, 6, 4, 2)

Financing & Planning

Grants — Loans — Investors

(1, 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2, 0.1, 0)

Cost Savings and Revenue Opportunities

Potential Savings — Revenue Opportunities

(0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20) (25, 20, 15, 10, 5, 0)

Regulatory Requirements

☐ Regulation 1

☐ Regulation 2

☐ Regulation 3

☐ ...

Sustainability Goals and Climate Action

CO2 Reduction — Renewable Energy — Energy Efficiency

(50, 45, 40, 35, 30, 25, 20, 15, 10, 5, 0)

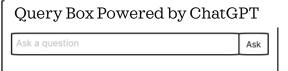Query Box Powered by ChatGPT

| Ask a question | Ask |

Personas
Community/Organizations

Policy Makers

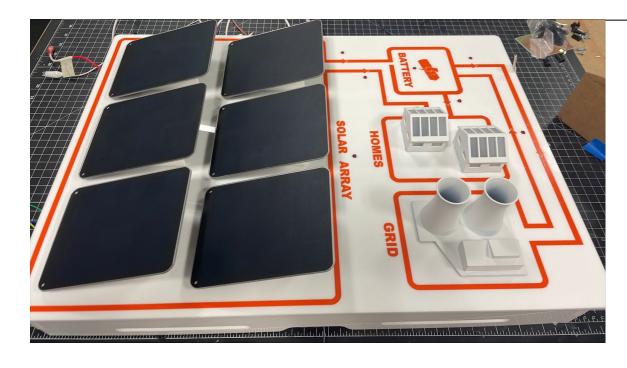# Dashboard – Economics Planning
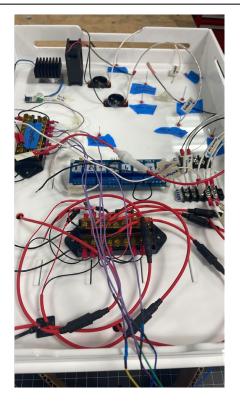
- For Communities and Organizations
    - Economics
        - Utility costs
        - Energy production and cost savings
        - Amortized cost of installation, tax benefits, grants
        - Cost savings and revenue opportunities that can happen with intelligent switching
    - Regulatory Implications
    - 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

Front

Back