

Minneapolis Urban Solar Capacity Study Proposal



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PROJECT DEFINITION

This project will analyze the validity of the 2040 plan to reduce Minneapolis greenhouse gas emissions by 80% through adopting 100% renewable energy sources, specifically solar energy. The result will quantify the potential impacts of solar energy in an urban setting.

PROJECT SETTING

Emissions from electricity consumption comprise the largest share of Minneapolis's greenhouse gas emissions. To reduce greenhouse gas emissions from energy, The Minneapolis 2040 plan sets a goal of powering the city entirely with renewable energy sources, such as wind and solar power, by 2040. This project will provide a comprehensive examination of the future impacts to Minneapolis of the shift from non-renewable to renewable energy. Naturally different income levels pose an accessibility problem therefore to ensure that this project is inclusive in its scope it will consider three different study areas. These areas are at different developmental levels and therefore would be impacted differently by the integration of renewable solar energy. Assuming Minneapolis only builds out X percent capacity of solar energy and the remaining Y percent is supplemented with alternative renewable energy sources.

Study Areas

- Minneapolis
 - High-density urban core – Downtown Minneapolis
 - Urban residential – Downtown City neighborhoods
 - Representative of average home size
 - Urban industrial – Downtown Manufacturing

Project Relevance and Rationale

A city like Minneapolis would benefit from converting to 100% renewable energy sources to minimize greenhouse gas emissions and make buildings more energy efficient. While the city's energy efficiency targets are centered on a transition to solar energy and efficient buildings, it is yet uncertain if a city can rely on solar energy for the majority of its energy needs. Minneapolis going green in the 2040 plan includes all residential, public, and private sectors. This would necessitate substantial investments in renewable energy infrastructure, like as wind turbines and solar panels, and the upgrading of the city's power grid to accommodate the changing supply of renewable energy. While solar energy offers numerous environmental benefits, a city that relies primarily on solar energy faces significant difficulties due to space limitations, costs, solar power's intermittent nature, energy storage, grid infrastructure, and regulatory obstacles. These obstacles must be evaluated before the 2040 plan can continue to pursue its objectives.

Project Objectives

To further understand the possibilities of Minneapolis running on 100% renewable energy, specifically, solar energy in the three study areas, this project will:

1. Determine Urban solar capacity
2. Discover what proportion of all city structures require renovation due to the usage of exclusively sustainable solar energy
 - a. Provide pertinent suggestions on how to utilize spaces not reachable by solar
3. Determine the impacts of solar energy on the three study areas
 - a. Evaluate the economics of all three areas and additional support needed for community set-up costs
4. Assess the validity of the 2040 plan reaching 100% renewable energy
 - a. Highlight additional programs and regulations to achieve goals ethically

DELIVERABLES

Deliverable	Description
Urban solar capacity, capability report	Report including maps and data analysis needed, including an explanation of data. -Identify long term implications and issues.
Economics/affordability Report for Minneapolis	Report including maps and analysis, case studies, data analysis and explanation of affordability findings. Constructed for Minneapolis to assess the full costs of implementing solar energy.
Community Solar Projects	Identification of successful solar developmental projects and typologies for affordable development. -Broken into four possible approaches 1-Outside Organization 2-Neighborhood Organization 3-Homeowner 4-Municipality
Appendix	Technical explanation of the data and analysis to show renewable solar energy analysis methodology.
PowerPoint	Presentation of maps, data, analysis, findings, and recommended development strategies.
Data Summary	Data including Excel files, Power BI files, R code, and data for future use.
Presentation	Direct and concise presentation of findings and proposed development strategies for Minneapolis.

Project Methodology

1. This project will use data from Xcel Energy, MN Solar Pathways, SolarReviews, EnergySage and Minneapolis Green Cost Share Program to show the amount of space/rooftops in the three study areas viable for solar energy and identify areas that will need to be transformed to accommodate solar energy.
2. Through the review of case studies, this project will propose development strategies for areas lacking existing solar capabilities, including rationale, and intended impacts for proposed strategies.
3. Through the research of financial costs, this project will create a report detailing the capability/capacity of solar energy in the three study areas that identifies areas in need of additional support to convert to all renewable energy by 2040.
4. By understanding solar power availability in Minneapolis, and that solar will only account for X% of the 2040 renewable energy plan, this project will discover why solar is more readily available in some part of the city and not in others.
5. This project will make it more transparent that city of Minneapolis going green means all residential, public, and private sectors and determine four possible ways (Outside Organization, Neighborhood Organization, Homeowner, and Municipality) the city could commence implementation through.

Research Resources/Methods

1. The first part of this project will utilize literature reviews, case studies, and data to analyze the effects of urban solar energy and to propose development strategies. This will be found using the materials provided through Canvas site, through resources on the University of St. Thomas library website, and through online resources.
2. The second part of this project will utilize additional data to quantify the extent of requiring urban renewable energy. This includes identifying areas with developmental need and demonstrating the effects of proposed strategies

Timetable

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