

GreenIndex: Making Informed Decisions by Visualizing, Exploring, and Evaluating Renewable Energy Data

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Motivation & Problem Definition

“Renewable energy is generated by sources that can be replenished with a relatively short period of time. Solar, wind, water, biomass, and geothermal are all renewable energy resources.”[1] Renewable Energy Sources (RES) vary widely in their cost-effectiveness and in their availability across the United State. They are not always practical. Our project provides a web application to allow the users to

- 1) easily view and evaluate the existing renewable energy data in a specific region (State/County), and
- 2) make an informed decision on selecting the optimal renewable energy options in that region.

Our project data set will include the renewable energy data of wind, hydropower, solar, biomass, and geothermal. (Q1)

Literature Survey

Four predefined types of Renewable Energy Potential (REP) are described in [2]. They are Resource Potential, Technical Potential, Economic Potential, and Market Potential. Each potential has their own methods and assumptions (Q2). Table 2 summarizes the results of these potential categories.

Table1 Summary of the Current Renewable Energy Potential Studies

Type No.	Renewable Energy Potential	Key Assumptions of the Current Analyses:	Level of granularity	Date of Results
1	Resource Potential	<ul style="list-style-type: none">• Physical Constraints• Theoretical Physical Potential• Energy Content Resource	State	
2	Technical Potential	<ul style="list-style-type: none">• System/Topographic Constraints• Land-use Constraints• System Performance	State	2022
3	Economic Potential	<ul style="list-style-type: none">• Projected technology Costs• Projected Fuel Costs	State	
4	Market Potential	<ul style="list-style-type: none">• Policy Implementation/Impacts• Regulatory Limits• Investor Response• Regional Competition with other Energy Sources	State	

Commented [SK1]: Do we need a quick description of the key assumptions instead of the level of granularity/date? For example, I’m not sure what “theoretical physical potential” exactly means.

Project Approach & Innovation (Q3)

A lot of information about Renewable Energy can be found online. However, national/global-scale models do not provide as much accuracy at local region level. In addition, there is no “one-stop shop” that integrating all types of renewable energy information, at a per region (e.g., State/County/City) level.

Our application integrates up-to-date data sources of all major four types of RESs and visualize them in a one page, by which policy makers, energy industry analysts can make data-driven decisions on selecting the most economically competitive and technically feasible RES of a given region.

4. Affected Parties & Impact Assessment

Anyone who cares about our environment, our life quality, and the future generation will be interested in this information. Energy industry, government agencies, policy makers, advocacy groups will find this of great value. (Q4) If we are successful, users will be able to identify the optimal renewable energy source for a given region based on a “data-driven” approach. (Q5)

5. Costs, Risks & Payoffs

Risk factors include: the lacking of data at fine-granularity (for a given local regional area), uncertainties of the global/macro-economic factors impacts to regional energy market. Time and availability of team members. (Q6) The project will be implemented using free, publicly available data sources, and the primary cost of this project will be the time and effort of the team. The web application will be hosted on AWS, using free tier AWS credit. (Q7)

Project Plan & Timeline of Activities

The project team has first team meeting on Thursday, January 19, 2023 and holds weekly meeting at 8PM PST, Thursday. From January through April 2023. The teamwork will be divided into three phases with respect to each of three required submittals in the course schedule (the proposal due on Friday, March 3, 2023, the progress report due on Friday, March 31, 2023, and the final report due on Friday, April 21, 2023). (Q8)

The detailed project plan and timeline activities are developed in a Gantt chart which is not included in this proposal due to the page limit. Table 1 below is a summary of the main items in the project plan:

Table 1 Summary of Project Plan and Timeline Activities (Q9)

Task No.	Task Content	Assigned to	Duration	Start Date to End Date
Phase I		All	6 weeks	01/19/2023-03/01/2023
I.1	Select Topic	All	2 weeks	01/19/2023-02/02/2023
I.2	Search Data Set	Kelly/Isabel	6 weeks	01/19/2023-03/01/2023
I.3	Literature Survey	All	3 weeks	02/03/2023-02/23/2023
I.4	Exploring UI Tool	Darren/Edmund	3 weeks	02/02/2023-02/24/2023
I.5	Submittal	Anjing/Hanh	3 weeks	02/09/2023-03/01/2023
Phase II		All	4 weeks	03/02/2023-03/31/2023
II.1	Download/Clean Data Set	All	4 weeks	03/02/2023-03/31/2023
II.2	Model Calculations	All	3 weeks	03/09/2023-03/31/2023
II.3	Data Visualization	Kelly/Isabel	3 weeks	03/09/2023-03/31/2023
II.4	Implementing UI	Darren/Edmund	4 weeks	03/02/2023-03/31/2023
II.5	Submittal	Anjing/Hanh	4 weeks	03/02/2023-03/31/2023
Phase III		All	3 weeks	04/01/2023-04/21/2023
III.1	Data Visualization	Kelly/Isabel	3 weeks	04/01/2023-04/21/2023
III.2	Implementing UI	Darren/Edmund	3 weeks	04/01/2023-04/21/2023
III.3	Experiment Design/Evaluation	All	3 weeks	04/01/2023-04/21/2023
III.4	Submittal	Anjing/Hanh	3 weeks	04/01/2023-04/21/2023

All team members have contributed a similar amount of effort.

Commented [SK2]: Created a Gantt chart with contents from the table – let me know what you think. We can create a png for the latex file.

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