Beta Presentation
Electricity Grid Planning Tool

The Capstone Experience
Team Anthropocene Institute 2

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Project Overview

• The goal is to help grid planners and policy makers understand the costs and benefits of deploying SMRs at substations in California.
• The tool will be able to make comparisons and create a general overview of statistics on SMR placement.
System Architecture

Front End
- Google Maps API
- HTML/CSS/JS
- User

API
- Gunicorn
- Flask

Back End
- Python
- Scikit-Learn
- SQLite

Tools:
- Flask
- Gunicorn
- HTML/CSS/JS
- Google Maps API
- Python
- SQLite
- Scikit-Learn
Substation Map
Substation Dashboard
Overview

Electricity Grid Planning Tool - Overview

County: Alameda

SMR Generation: 23%
SMR Cost: 5.6 c/kW

Top Substations in Alameda County for SMR Deployment

<table>
<thead>
<tr>
<th>Substation Name</th>
<th>Benefits ($)</th>
<th>Emissions (tons of CO2)</th>
<th>Lives Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tesla</td>
<td>720,726</td>
<td>176,978,336</td>
<td>21.06</td>
</tr>
<tr>
<td>Tracy</td>
<td>714,428</td>
<td>175,431,896</td>
<td>20.876</td>
</tr>
<tr>
<td>Newark Distribution</td>
<td>343,893</td>
<td>84,445,262</td>
<td>10.049</td>
</tr>
<tr>
<td>Fayette Energy Corp.</td>
<td>338,49</td>
<td>83,117,99</td>
<td>9.881</td>
</tr>
<tr>
<td>Prowind Corp.</td>
<td>336,401</td>
<td>82,605,225</td>
<td>9.83</td>
</tr>
<tr>
<td>Lawrence Livermore</td>
<td>329,328</td>
<td>80,868,351</td>
<td>9.623</td>
</tr>
<tr>
<td>Eastshore</td>
<td>329,067</td>
<td>80,804,34</td>
<td>9.615</td>
</tr>
<tr>
<td>Castro Valley</td>
<td>324,316</td>
<td>79,637,66</td>
<td>9.477</td>
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<tr>
<td>Newark</td>
<td>322,633</td>
<td>79,224,278</td>
<td>9.427</td>
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<tr>
<td>Las Postas</td>
<td>316,227</td>
<td>77,651,223</td>
<td>9.24</td>
</tr>
</tbody>
</table>

Showing 1 to 10 of 80 entries
Multiple Substations
How It Works

• Raw CAISO Data

• For Each Type Of Model
  ▪ Data Is Synthesized
  ▪ Training
    o Model Input Is Standardized
    o Shuffle And Split
    o Trained with MLPRegressor
  ▪ Score Each Model with $R^2$
  ▪ Low Scores Are Retrained
Model Performance Example

Substation 3000300 on 9/8/2021 with error 4.81%
What’s left to do?

• Features
• Stretch Goals
  ▪ Power Outage Rates
  ▪ Coloring Substations On The Map
  ▪ Overview “All County” Displaying County Level
• Other Tasks
  ▪ Minor Bug Fixing
  ▪ Organizing/Refactoring
  ▪ Update Visual Elements Based On Feedback
Questions?