GridMod

Decarbonizing the Energy Sector through Cost-Effective Electric Grid Modernization

Global energy demand is expected to rise by 50% by the year 2040 - the energy grid of the future calls for **decarbonization**, **digitalization** *and* **decentralization**. *We must transition away from a centralized energy system that relies on fossil fuels to a more distributed system that prioritizes renewables, and a data driven approach is crucial to ensure rapid and cost-effective modernization.*

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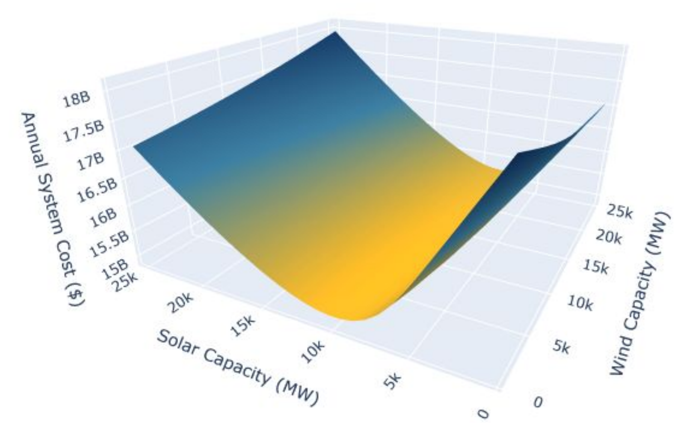
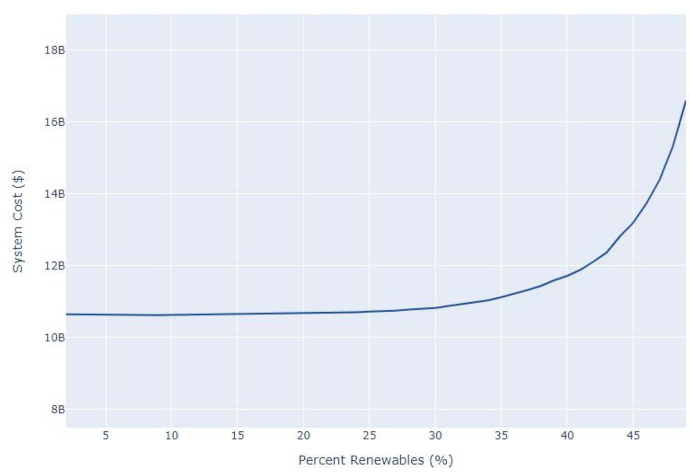
Step 1: Data Collection		Step 2: Modeling	Step 3: Solution
National Renewable Energy Laboratory	Solar Irradiance & Wind Speed Data	If we were to build an electric grid today, how much wind, solar, and natural gas infrastructure would we need to meet demand while minimizing costs, maximizing renewables delivered to the grid, and minimizing curtailment?	**Cost optimal modernized grid configurations**
Utilities & ISOs	Electricity demand		
Literature & Industry Reports	Pricing data		

Renewable Plant Capacity vs. System Cost



Percent Renewables vs. System Cost



Approach:
We built a program to model historical hourly weather (solar and wind) and electricity demand data as a grid that **prioritizes renewables** and **minimizes costs.**

Outputs:
Our model calculates the annual system cost of a modernized grid as a function of its production of renewable energy. For a fixed renewable energy fraction, the model optimizes the amount of solar and wind power to minimize overall costs, including financing.

Results:
Running our model on California, increasing renewable capacity from 0% to 35% shows little impact on annual grid costs, incentivizing investment in renewable technologies.