Shentong Li (Opening)

Intro:

Hello and welcome. I am Shentong Li. (I am Haohui Zheng) Our project, inspired by the 2024 Super Bowl's renewable energy achievement, explores optimizing solar farm efficiency. Focusing on geographic, technological, and temporal influences, we aim to extend these sustainable principles across various sectors, enhancing solar energy's role in future developments.

Task 1

Our journey began with a geospatial exploration, revealing that solar farms near coasts benefit from higher solar irradiance and cooler temperatures, improving efficiency. A pivotal finding was the negative correlation between latitude, longitude, and power capacity. Supportive policies, like those in Texas, further enhance solar farm establishment and efficiency, as we can see in figure 2. Environmental factors also play a crucial role. Atmospheric pressure increases output significantly, with every unit rise boosting generation by around 176 kW. Higher cloud cover negatively impact efficiency, while higher humidity surprisingly supports power generation.

Now, I'll hand it over to Haohui Zheng to delve deeper into our findings.

Task 2

Thank you, Shentong.

In analyzing solar farm data across different states, we've uncovered consistent trends in many aspects. When it comes to orientation towards the sun, the range of 170-200 degrees and 0-30 degrees for tilt angles suggest a preference for a general south-facing direction in the Northern Hemisphere, maximizing exposure to sunlight throughout the day. Moreover, single-axis and fixed system emerge as preferred choices due to their ease of installation and maintenance compared to dual-axis systems. Additionally, we observe a transition towards crystalline silicon panels for higher capacity, signaling a shift towards more reliable panel tech. However, thin-film remains prevalent in budget-constrained regions.

Task 3

Over time, we've seen fluctuations in solar farm sizes and a consistent rise in electricity capacities. Our predictive model forecasts a steady increase in efficiency ratios over the next decade, with a notable peak anticipated in 2026. This demonstrates the industry's potential for significant advancements in efficiency and capacity.

Ending:

In summary, our study of American solar photovoltaic data underscores the transformative potential of renewable energy, exemplified by the 2024 Super Bowl's milestone achievement. Moving forward, leveraging sophisticated geospatial analysis tools and diverse data sources will be instrumental in optimizing solar farm locations and refining energy forecasts, driving us towards a greener and more sustainable future.

Thank you for your listening and support.