NAVITAS Energy

Analytics Programming ‘24

Navitas Energy Project

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In 2023, can you guess what percentage of Texas' total energy came from solar and wind?

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22.2%

Wind

5.1%

Solar

#2

Texas ranks second in the nation for battery storage capacity.

NAVITAS ENERGY OVERVIEW

A developer that conducts feasibility studies, secures permits, and **identifies land suitable for construction of battery energy storage systems**, considering factors like fuel source proximity, infrastructure, environmental impact, demand, and financial feasibility.

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Our Project

Project Selection: Interest in energy sector & applying technical expertise to solve real world problem.

Problem Statement: Predict the chance of success of power plant sites by analyzing factors such as energy type, capacity, cost, and interconnection challenges.

Importance of Problem: Priotizes high potential locations, optimizes energy investments, and accelerates the development of renewable energy infrastructure.

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STAKEHOLDERS

Developers

Build and operate power plants.

Investors

Provide funding and manage financial risks.

Utility Companies

Distribute electricity to consumers.

Consumers

Affected by economic and environmental changes.

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50,673

Total Rows

19

Categorical Variables

19

Numeric Variables

3

Binary Variables

Orennia: Data service provider for the power industry that scrapes public wide power plant project data from bunch of different sources and complies them into user friendly datasets.

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DATA DICTIONARY

Power Project Type

Type of technology the project is using (solar, wind).

Capex (Million)

Cost to build the project displayed in millions of dollars.

Interconnection Cost Total

Cost to build the connection & substation between the power plant and the grid.

Connection Voltage (kV)

The voltage that must be matched by power plant to connect to power line.

Operational Status

Binary variable created from Power Project Status, returning a 1 if Operational and 0 if other.

Capacity (MW)

Size of the project (1 MW is enough power for 500 homes) .

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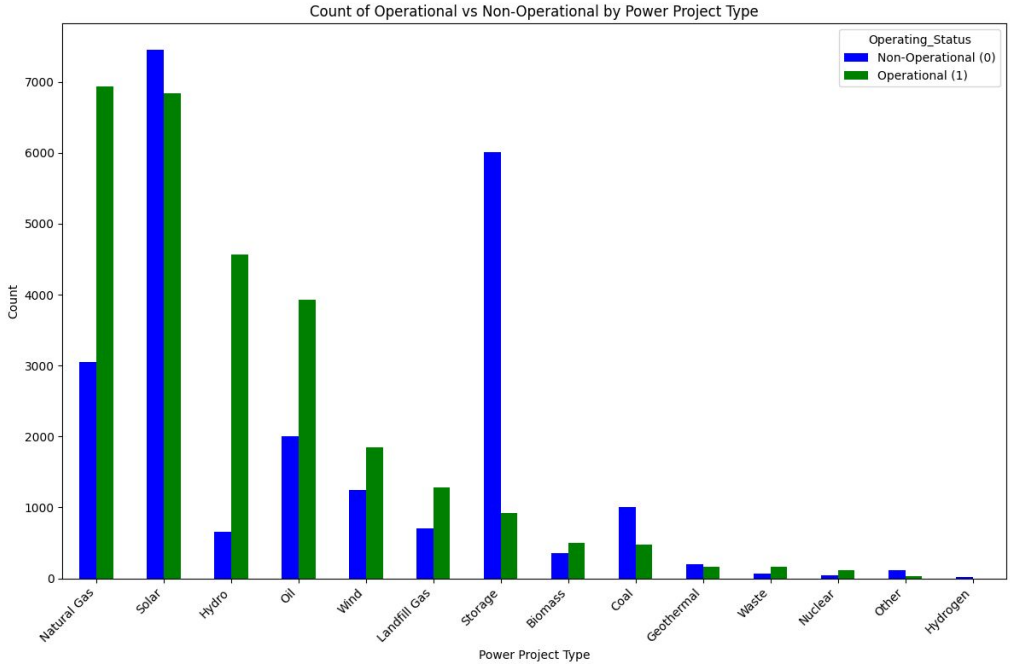
STATUS OF PROJECT BY TYPE

Natural Gas and **Solar**: high counts of operational projects at 6941 and 6941.

Storage: many non-operational projects (6005).

Hydro, **Oil**, and **Wind**: lower counts but more operational projects.



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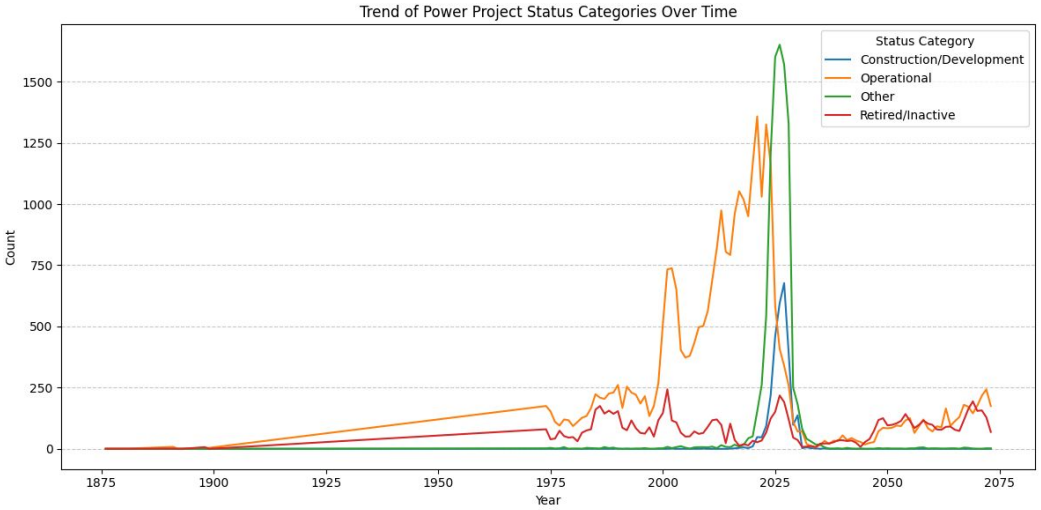
TREND ANALYSIS

2025 Surge: A sharp rise in **Operational** projects aligns with growth in **Construction/Development**, indicating a transition from development to operation.

Stabilization: Post-2025, categories stabilize, with **Retired/Inactive** and **Operational** projects steadily increasing.



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CLASSIFICATION MODEL

X = Power Project Type Encoded, Connection Voltage (kV), Interconnection Cost Total ($)
Y = Successful Operation

Model Performance:

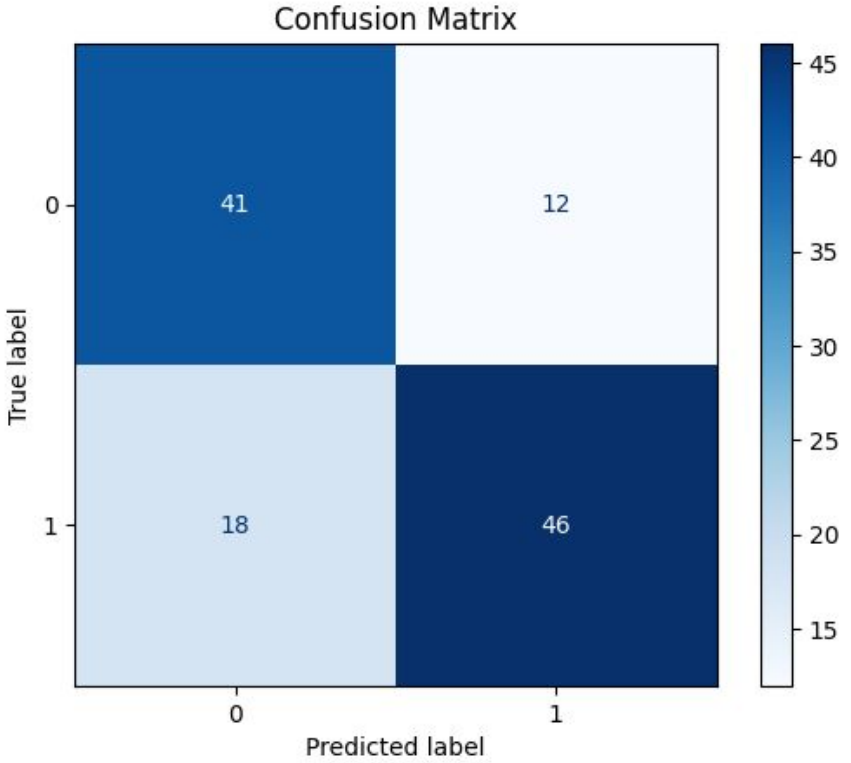
- **Accuracy**: 74%
- **Overall balance**: Decent performance, but Class 1 slightly lags.
- **Recall**: Class 0 (77%), Class 1 (72%)

Confusion Insights:

- **Class 0**: 41 correct predictions, 12 incorrect predictions
- **Class 1**: 46 correct predictions, 18 missed predictions

Improvement:

- The model performs well, but adding more features could improve Class 1 recall.



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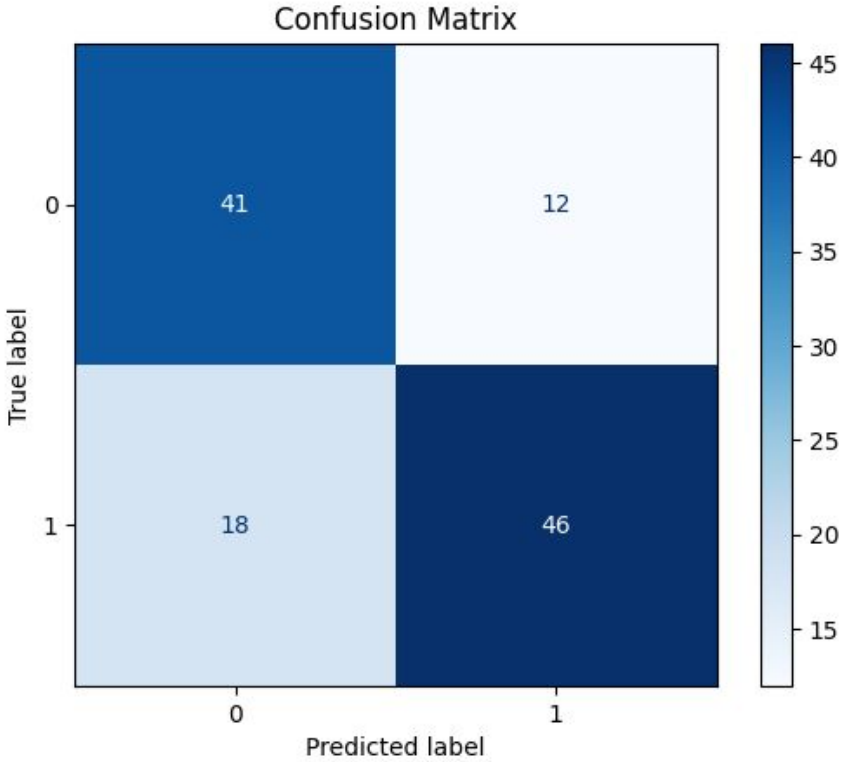
CLASSIFICATION MODEL TWO

X = Capex Per Watt ($/W)
Y = Successful Operation



Model Performance:

- **Accuracy**: 92%
- **Overall balance**: Good performance for both groups.
- **Recall**: Class 0 (94%), Class 1 (89%)

Confusion Insights:

- **Class 0**: 2086 correct predictions, 135 incorrect predictions
- **Class 1**: 1623 correct predictions, 209 missed predictions

Improvement:

- The model works well overall, but **Class 1** could be improved with more data or features.

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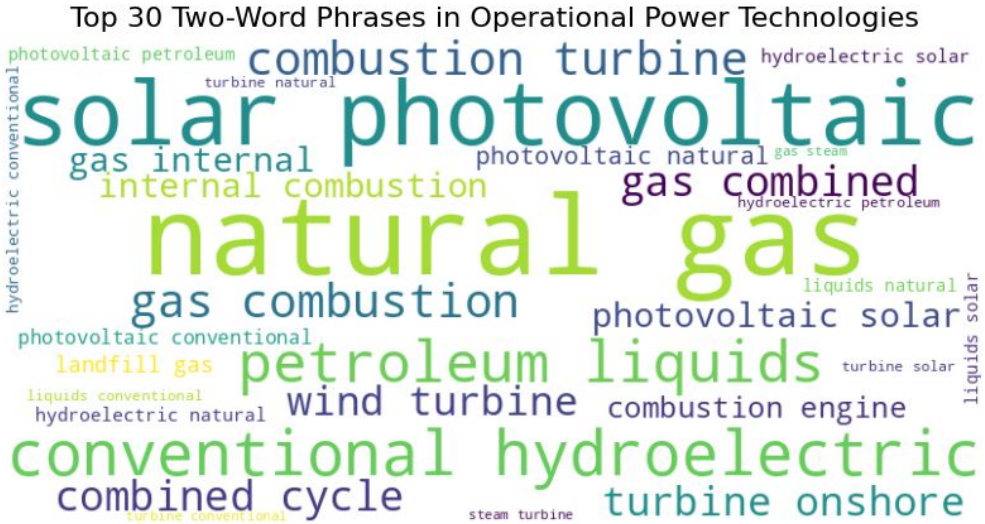
TEXT BASED ANALYSIS

Top 3 Operational Generator Types

1. Natural gas: 6936
2. Solar photovoltaic: 6840
3. Conventional hydroelectric: 4562
4. Petroleum liquids: 3923
5. Gas combustion: 2373



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IMPLICATIONS

Increased Investment Confidence

Developers that have higher success rates and minimal failed sites will attract more investment on better terms.

Efficient Allocation of Resources

Directs resources to the most promising sites.

Faster Project Development

Accelerating site selection and implementation leads to reduced capital costs and improved returns.

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FUTURE EXTENSION

01

Location Based Analysis

Expand the analysis to other states or countries, helping optimize global site selection for energy projects.

02

Incorporating Real-Time Data for Dynamic Predictions:

Integrate real-time data (e.g., weather, demand, power prices) to adjust predictions, improving accuracy for project success forecasting.

03

Analyze Similar Industries

Use methodology to analyze other industries that have similar characteristics as the power industry (large scale industrial projects with complicated development characteristics).