

# NEW YORK STATE OF ENERGY



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Class:DSB1015

# Background

- The New York State Energy Planning Board intends to reduce greenhouse gas emissions to 85% of their 1990 levels by 2050.
- New York has the potential to be amenable to wind, solar, and hydroelectric power.

## Key Points:

Clustering Methods: Classify state into climatological zones

Purpose: Simplify land use decisions for renewable energy

Predictive Analysis: Ensure long-term energy plan alignment with the New York State Energy Plan

**GOAL:** Ensure that  
NYS can be fully  
supplied with  
renewable energy by  
2030



# Methods

- Time-Series Climate Model
- Predictive Electrical Load Model
- Cost Analysis Model



# Historic Energy Consumption

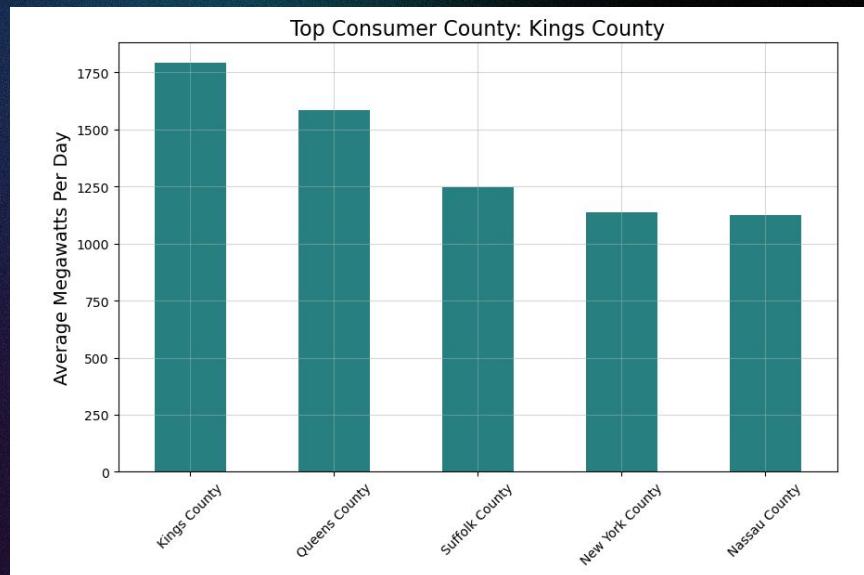


# New York State Energy Zones

Region	Counties
CAPITL	Albany County, Schenectady County, Rensselaer County, Saratoga County, Columbia County, Greene County, Washington County
CENTRL	Onondaga County, Oswego County, Cayuga County, Cortland County, Tompkins County, Madison County, Chenango County, Broome County
DUNWOD	Rockland County, Orange County, Putnam County
GENESE	Monroe County, Genesee County, Livingston County, Ontario County, Orleans County, Wyoming County
HUD VL	Dutchess County, Ulster County, Sullivan County, Delaware County, Schoharie County
LONGIL	Nassau County, Suffolk County
MHK VL	Herkimer County, Oneida County, Montgomery County, Fulton County, Schoharie County, Otsego County, Chenango County
MILLWD	Westchester County
N.Y.C.	New York County, Bronx County, Queens County, Kings County, Richmond County
NORTH	Clinton County, Essex County, Franklin County, Hamilton County, St. Lawrence County, Jefferson County, Lewis County, Warren County
WEST	Erie County, Niagara County, Chautauqua County, Cattaraugus County, Allegany County, Steuben County, Chemung County, Tioga County, Wayne County, Seneca County, Schuyler County, Yates County
N.Y.C. LONGIL	Nassau County, Suffolk County, Bronx County, Queens County, Kings County

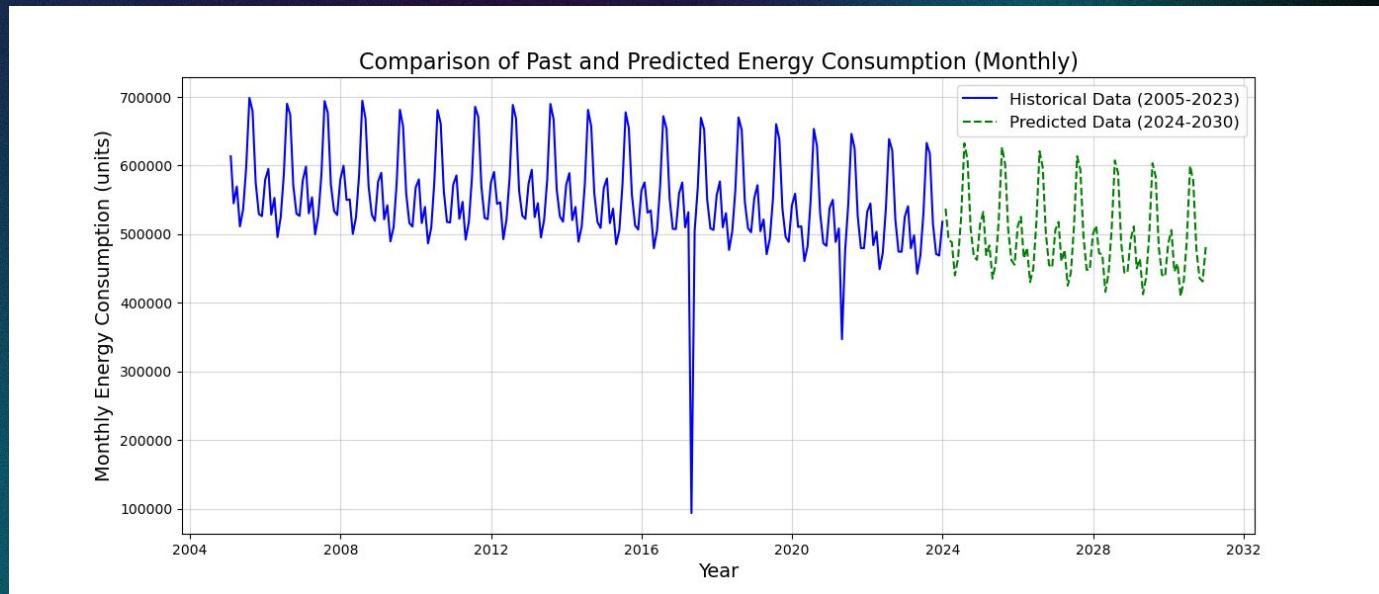
# High Power Consumer Counties

- Kings County leads energy consumption in New York, averaging 1,750 megawatts per day, driven by:
- High population density (largest in the state). Extensive urban infrastructure and economic activity.
- High residential and commercial energy demands.
- Other top counties, such as Queens and New York counties, exhibit similar urban-driven consumption patterns.



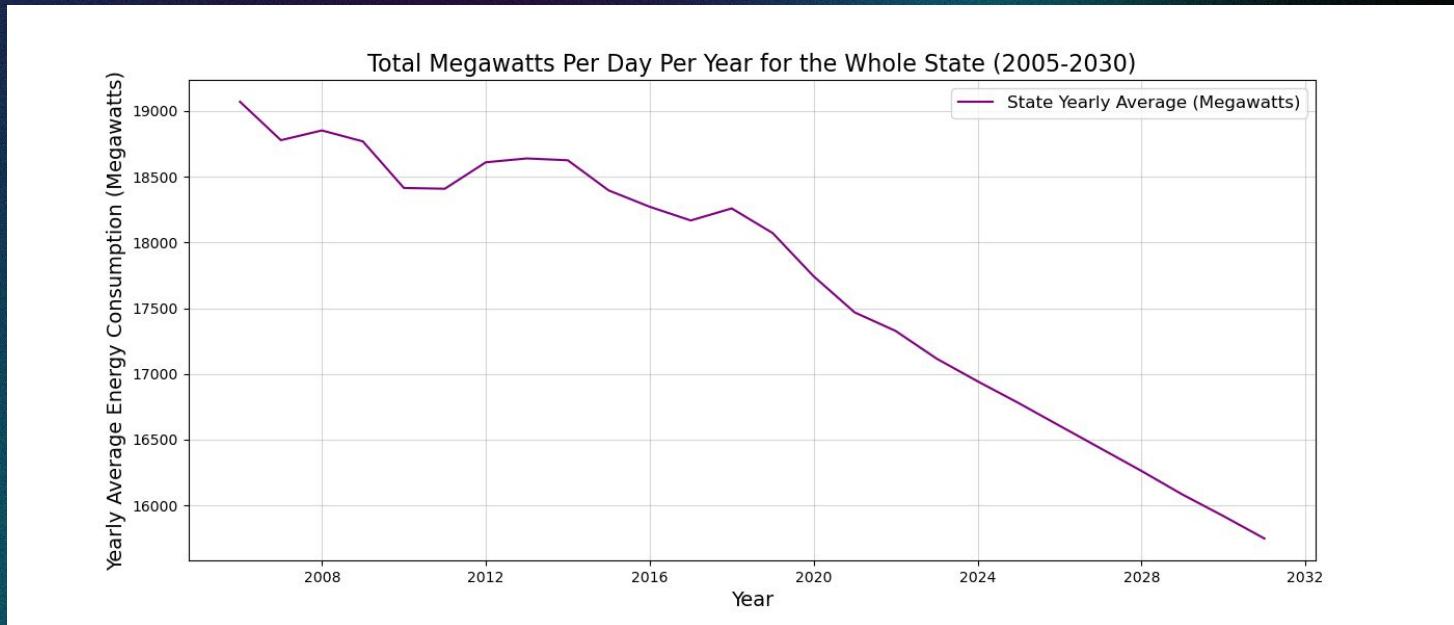
# Historical And Future Consumption Trends

- New York's energy consumption shows consistent seasonal peaks in winter and summer, driven by heating and cooling needs.
- A sharp dip in 2020 reflects reduced industrial and economic activity during the COVID-19 pandemic
- Predictions for 2024–2030 align with historical trends but reflect a slight **decrease in peak values**, suggesting improved energy management.



# Statewide Trends

- Statewide energy consumption is on a **steady decline**, dropping from **~19,000 megawatts/year in 2005** to **~16,000 megawatts/year projected for 2030** (16% decrease).
- The decline demonstrates progress in:
- Adopting **renewable energy sources**.
- Transitioning away from traditional energy systems.
- Implementing **energy-saving policies**.



# Time-Series Clustering Analysis and EDA insights

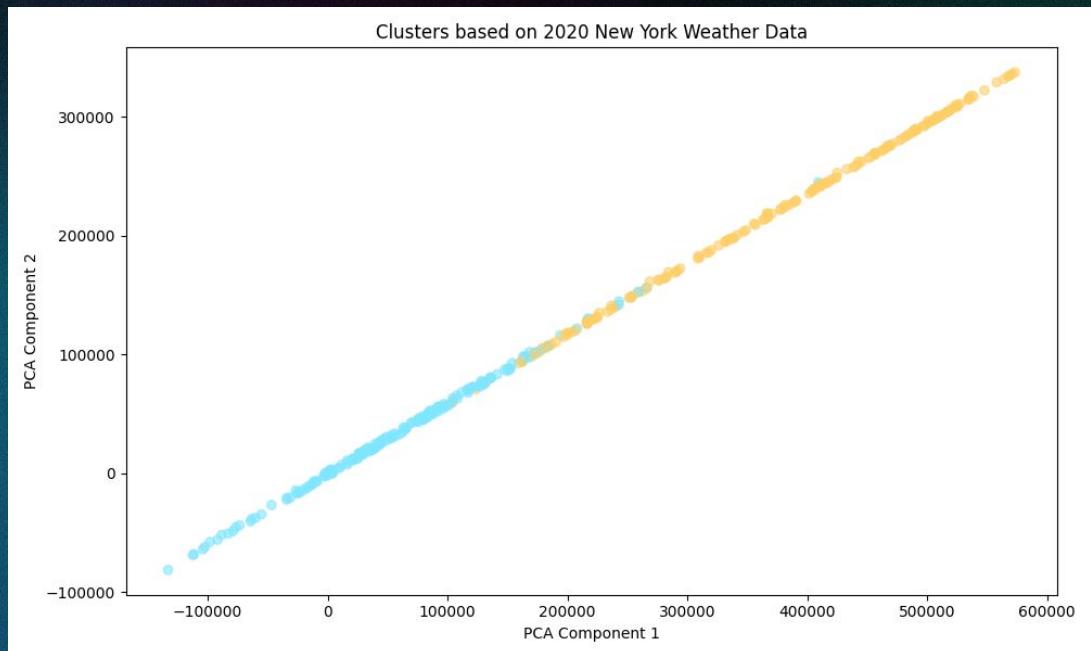


# Weather Cluster Data for 2020

Silhouette Score:

- A measure of the closeness of clusters
- Goes from -1 to 1, with 1 meaning the clusters are highly separated

Silhouette Score on weather data from 2020: 0.575



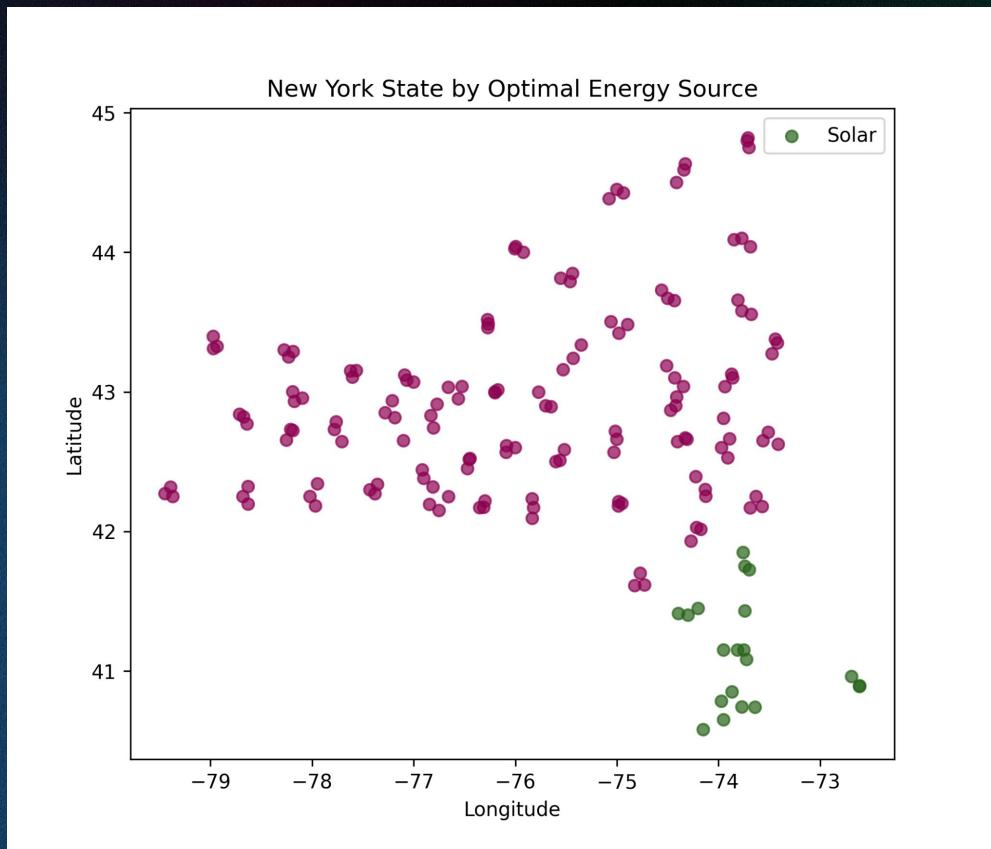
# Clusters Accounting for Historic Changes

Silhouette Score:

- A measure of the closeness of clusters
- Goes from -1 to 1, with 1 meaning the clusters are highly separated

Silhouette Score on historically clustered weather data: 0.434

Note: We're observing the impact of climate change!



# Data Insights

## Temperature Correlations:

- **Max & Min Temperature:** Strong correlation (0.9436) informs energy demand and solar efficiency.

## Precipitation Patterns:

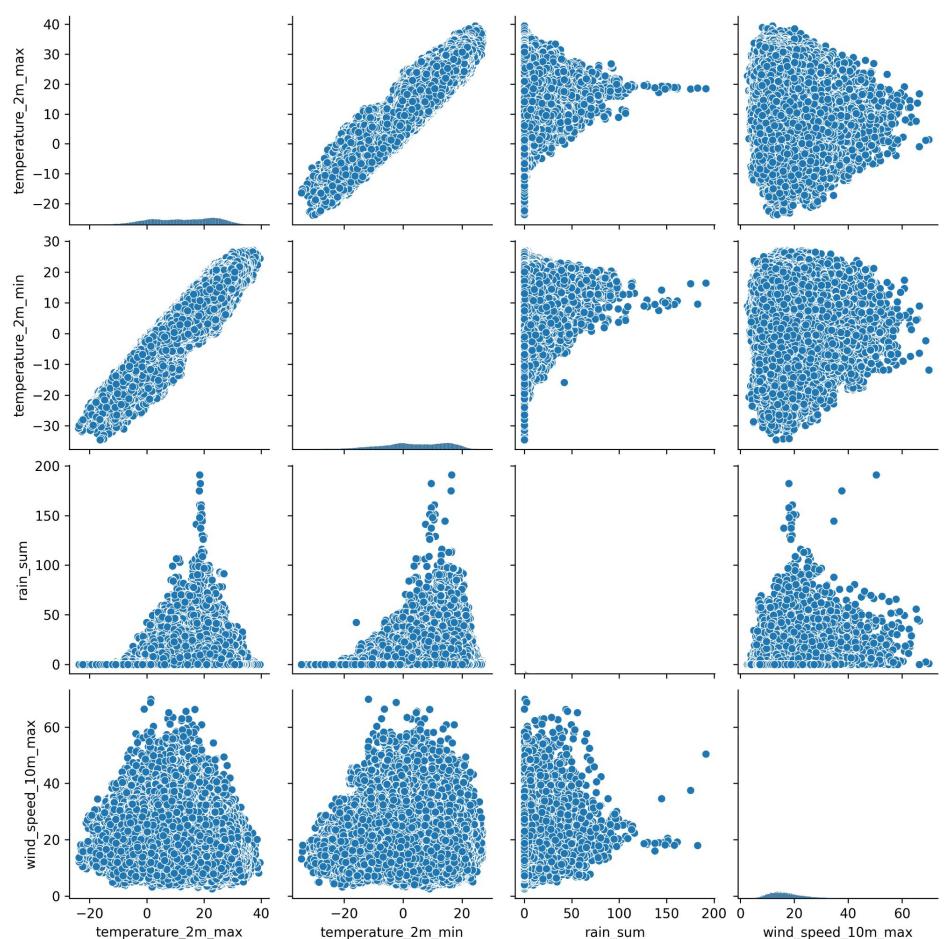
- **Total Precipitation & Rainfall:** Very high correlation (0.9696) critical for hydroelectric energy planning.

## Wind Energy Insights:

- **Wind Speeds:** Strong correlations (0.7886 & 0.7064) guide optimal wind turbine placement and efficiency.

## Geographical Considerations:

- **Latitude & Wind Frequency:** High correlation (0.9567) helps identify ideal locations for wind energy development.

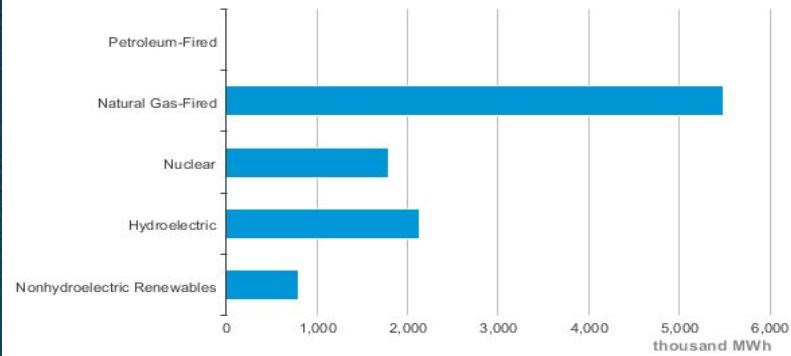


# Cost analysis

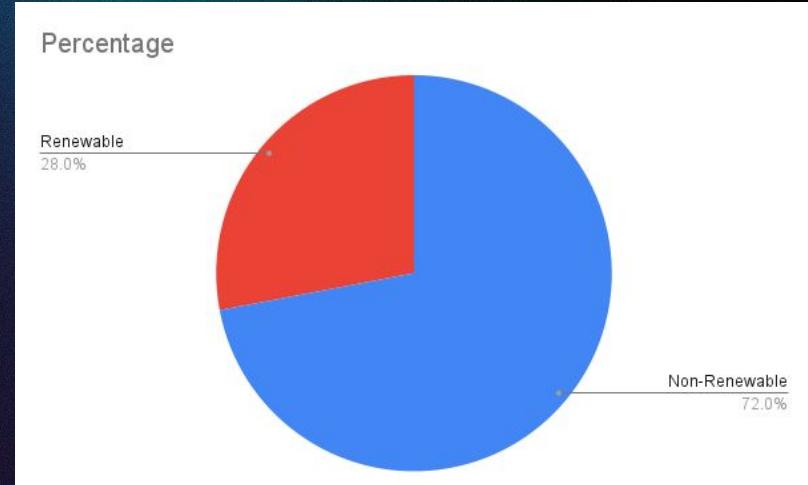
- New York aims to achieve carbon neutrality by 2040, requiring a shift to renewable energy sources.
- Currently the State of New York energy mix is 72% non-renewable and 28% renewable.
- Cost-effective renewable solutions to meet energy demand whilst reducing the costs and emissions.

A strategic energy plan in renewables will put the state of New York in the pilot seat as the leader in clean energy and economic growth. Let's talk numbers!

New York Net Electricity Generation by Source, Sep. 2024



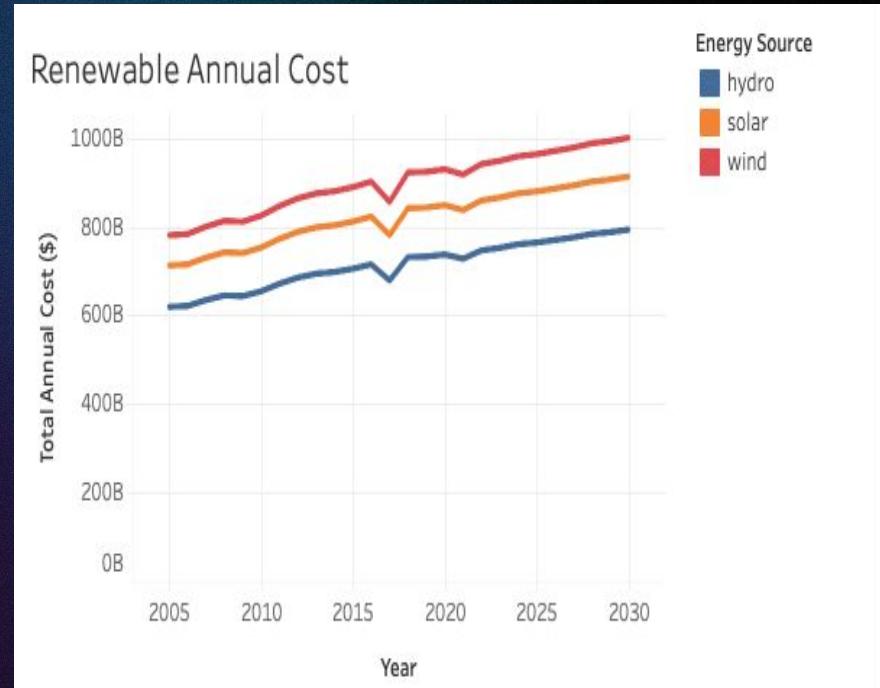
Source: Energy Information Administration, Electric Power Monthly



# Comparative Cost Analysis(1)

## Annual cost per year with the incentives:

- Wind \$1,200,000 - \$2,500,000 per MW (\$800B+ per year)
- Solar \$200,00 - \$400,000 per MW (\$600B+ per year)
- Hydro \$1,000,000 - \$5,000,000 per MW (\$600B+ per year)



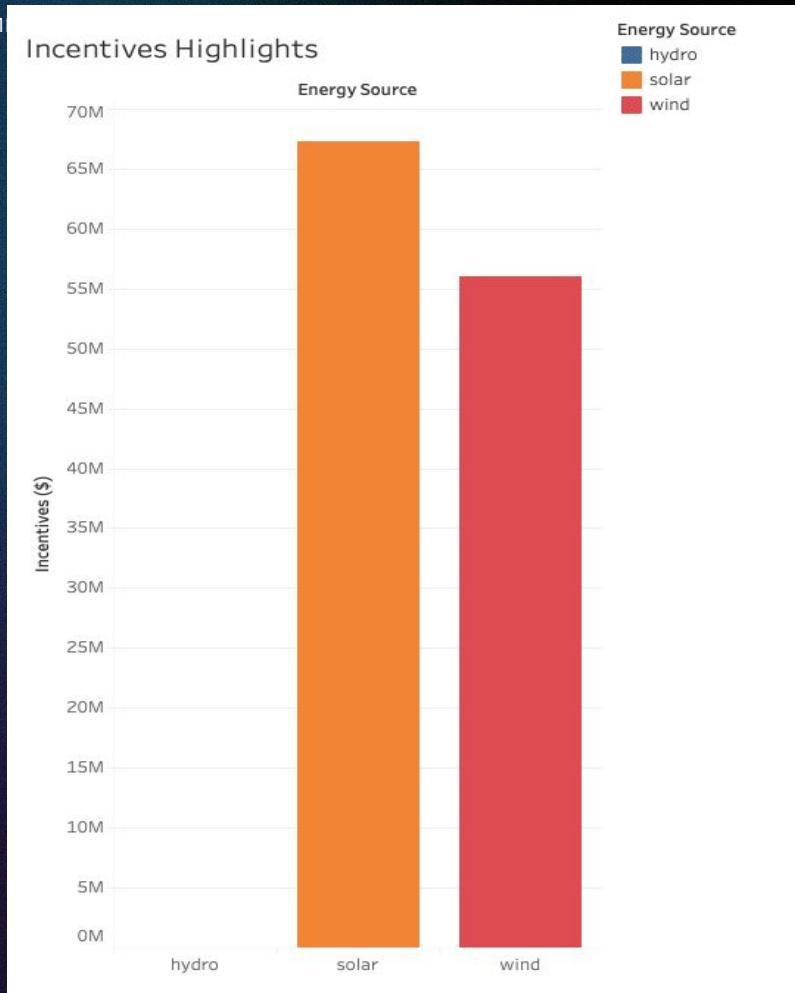
# Comparative Cost Analysis(2)

## Federal Investment Tax Credit (ITC) for Solar:

- **Incentive:** 30% of the installation cost for solar projects and it expires in 2032.
- **For Example:** A tax credit of \$300,000 is awarded to a \$1,000,000 installation.

## Production Tax Credit (PTC) for Wind:

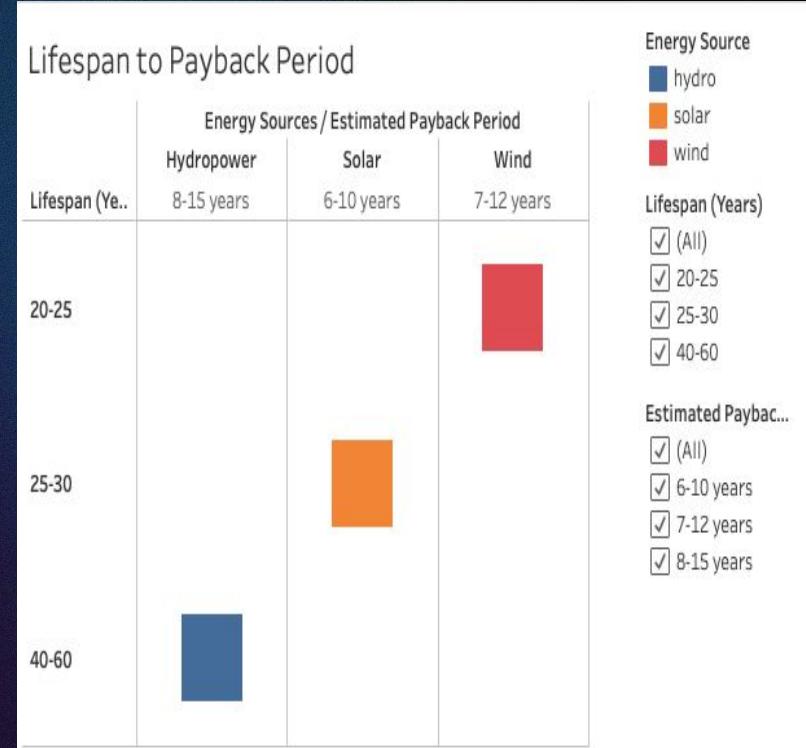
- **Incentive:** \$25 per MWh of electricity produced for the first 10 years of operation.
- **For Example:** A 100 MW wind farm generating 250,000 MWh annually could receive upwards of \$6,250,000 annually in PTCs.



# Comparative Cost Analysis(3)

## Payback period to Lifespan

- Wind has a lifespan of 20 - 25 years but it takes half of life to see returns on investment.
- Solar has a lifespan of 25 - 30 years and takes less than half its life for returns.
- Hydro has a lifespan of 40 - 60 years and also takes less than half of its life for returns.



# Next Steps and Recommendations

- Take advantage of wind and solar farms for statewide energy production and storage
- Climate data suggests the clusters will shift over time
- Future-proofing: consider land use agreements over more of Southern New York
- Confirm that our analysis meets NYS energy needs through 2050 and beyond

250,000+

JOBs CREATED IN 2024

8,000,000+

JOBs AVAILABLE

3

RENEWABLE SOURCES

MILLIONS

(\\$) SAVED & BILLIONS MADE

# THANK YOU

Our heartiest thanks to Matt Brems, Asha Mathis, and ChatGPT for their assistance in preparing our data and generating our models.