Machine Learning In Energy Industry

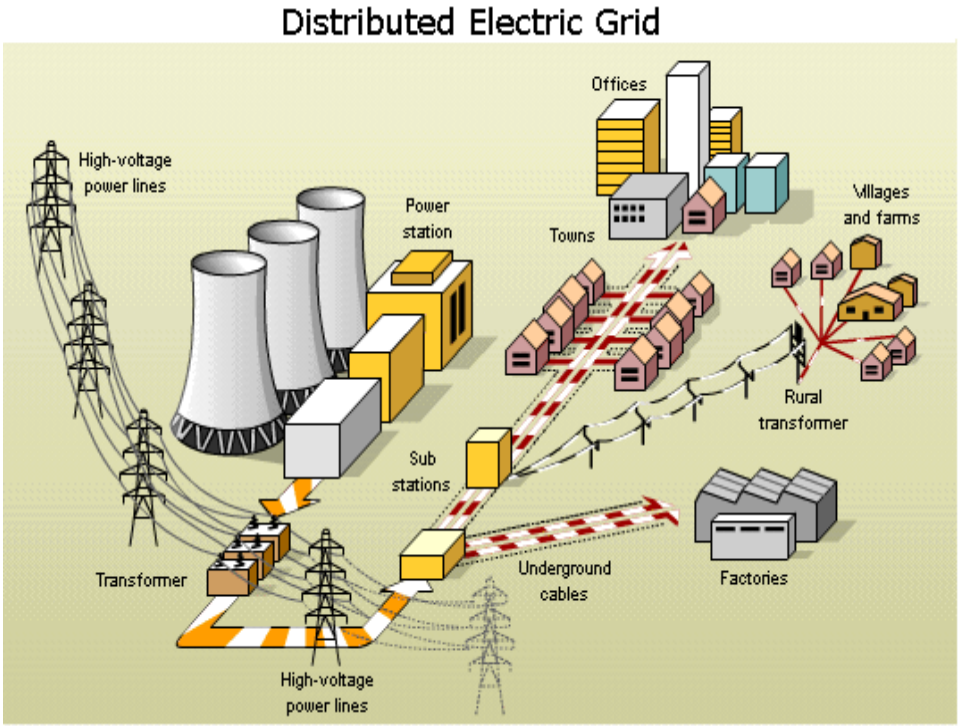
Apply Machine Learning To Renewable Energy

Distributed Electric Grid:

What is a power grid?

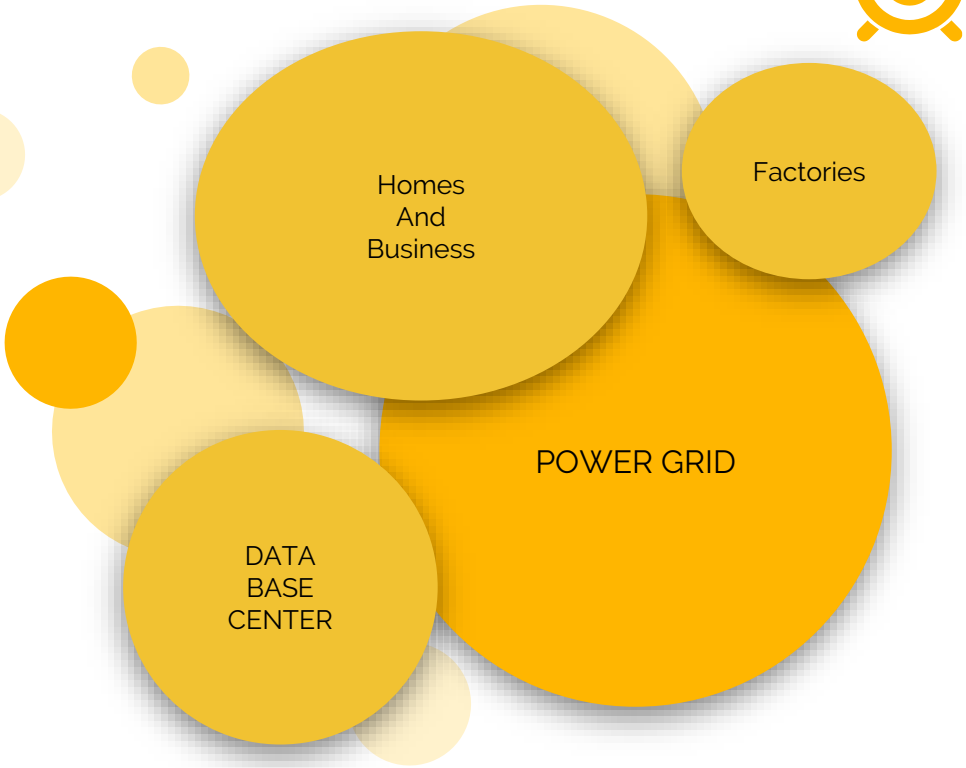
-An interconnected network for delivery electricity from producers to consumers

-Consists of generating station that generates power and transports it using transmission line



Supply vs Demand

Homes and Businesses account for nearly 40% of U.S. energy consumption.



Problems with Renewable Energy?

Supply
-depends heavily on weather
-can be dip too low or soar too high

Transport
-located far from the cities and factories.
-needs high-voltage power lines to transport electricity

Solutions:

Giant Storage Battery

Pros:
-cleaner energy
-cost effective in long run

Cons:
-Battery disposal waste
-Still produces for making battery

AI Forecast Response

Pros:
-reducing CO_2 emissions
-cleaner energy
-cost effective in long run

Cons:
-expensive upfront investments
-still relies on many factors

Chasing the wind

- A few years ago:

-Xcel Energy's old AI model was usually 20% off, and sometimes wind power's prediction failed completely.
-Relied on backup fossil-fuel plants idling, ready to replace all of that wind power in a few minutes

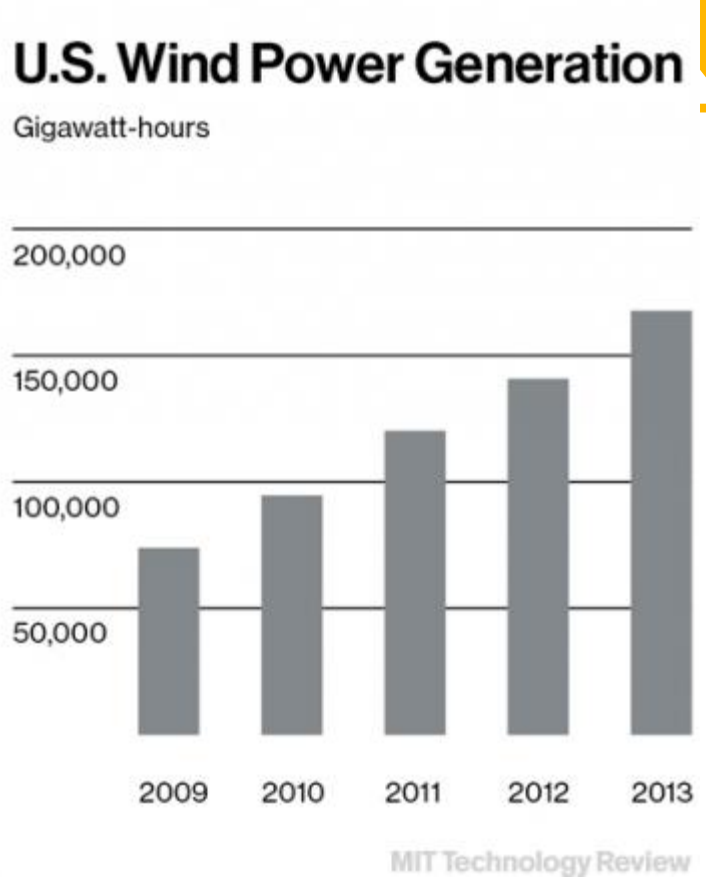
- Cons:

-Expensive to maintain idling plants.
-non-reliable

How AI can help?

How:
-The new AI-based softwares analyzes data from weather satellites, weather stations of NCAR.

Result:
The amount of wind has more than doubled since 2009



How AI can help?

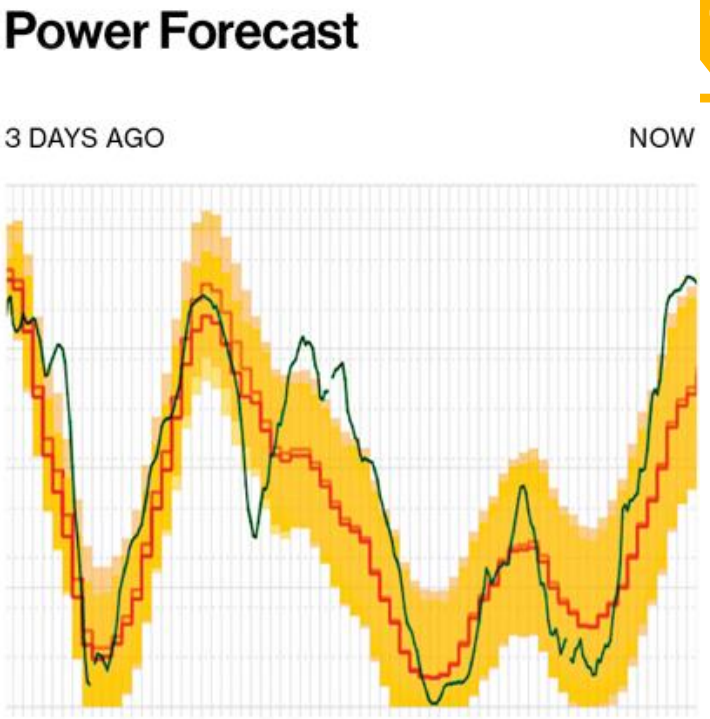
How:

-If the weather is cold and wet, factories switch to fossil-fuel backup.

-On abundant wind day, factories shut down many of the idling backup plants.

Result:

-Power supply matches demand

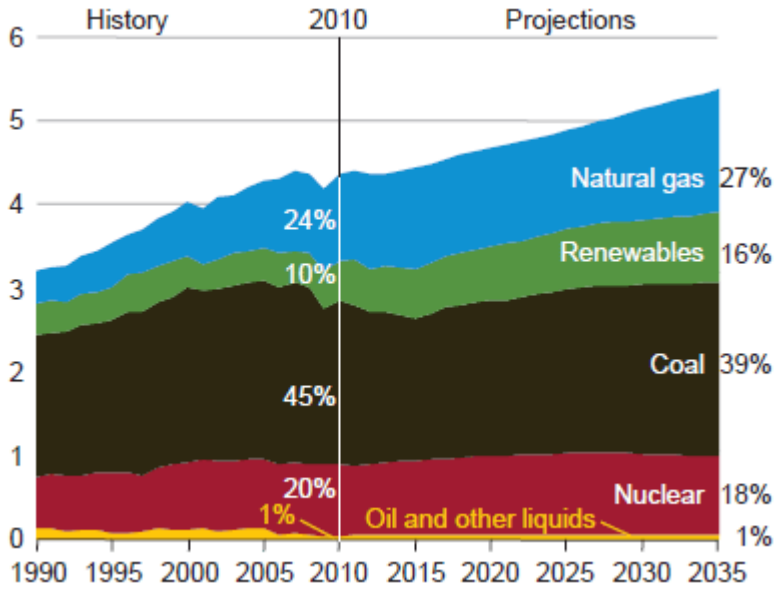


-Green: Actual power output, red: forecast

-The larger the yellow area, the more uncertainty the forecast

Future Prediction

- Renewable energy will increase to 16% by 2035
- Investment into renewable energy will heavily increase



Source: NREL Lab

Citations:

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- [5]Burston, Jane. “Predictions For Energy In 2030”. Nov 10 2016. Web. <https://www.weforum.org/agenda/2016/11/5-predictions-for-energy-in-2030/>