

WHERE MEETS ENERGY

Introduction

Al can help solve some of the most critical problems we are facing, including in the energy sector. This is what Bill Gates, founder of Microsoft, had to say about Al while addressing college students graduating worldwide in 2017 -

"If I were starting out today... I would consider three fields. One is artificial intelligence. We have only begun to tap into all the ways it will make people's lives more productive and creative. The second is energy, because making it clean, affordable, and reliable will be essential for fighting poverty and climate change."

The third he said is biosciences. If Energy and AI are two key areas of the future, does it mean they are mutually exclusive? Surely not.



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Applications

O Al powering the energy sector.

The global energy industry is experiencing a major shift in the way it generates, sells and distributes energy. There is a greater influx of renewable energy from different sources - and hence, a greater need to manage this energy better while taking into account the unpredictability and weather-dependency of these sources. With all this comes the cost factor. Al can play an integral part here by increasing the efficiency of distribution, improving reliability and hence, keeping the costs down.

O The smart grid

In the near future, AI can greatly help in managing, optimising and maintaining the grid and power plants - it will be an important component of the smart grid. At the same time, we will soon be using AI for predicting renewable energy output that depends on weather forecasts and climate data. Technology giants such as GE and IBM are already working on building prediction and maintenance AI machines for the power sector.

O Using data intelligently

The energy industry produces massive amounts of data. AI can compress and analyse this data like never before to gather powerful insights and utilise it to improve productivity and cut costs drastically.

Infrastructure management

Al can also aid in giving alerts and alarms for grid failures by constantly monitoring the health of electrical grids. This means we will have a better idea of the points of failure, and in turn, can better optimise maintenance.

Managing demand

Another area of application of AI is demand management. By better managing demand and supply, not only will it create greater efficiency for energy companies but also a better experience for the end user.



Creating the future

We, at .Kreate technologies, believe that the future is about intelligent systems that can seamlessly create efficiency at every step to result in the best possible outcome, under any given circumstances. It requires us to create an ecosystem that can utilise AI to the greatest advantage. While energy companies around the world are still getting their heads around AI, there has already been a ten-fold increase in investment in AI within the industry until 2017. The signs are clear - the future is in AI. There are plenty of reasons to look forward to it - not just for energy companies but also for governments and ultimately, consumers who will gain from greater efficiency and reliable, clean energy.

The company believes that AI & ML will be the biggest enabler of human civilization's transition to a 100% renewables powered grid with 100% reliability of supply.

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.Kreate's Al and Machine Learning Expertise & Offerings:

Renewable Energy and Demand Forecast solutions for renewable energy generation companies and distribution companies.

.Kreate uses advanced data analytics algorithms that include AI, machine learning and statistics to create highly accurate forecasts. .Kreate's >REDF_x platform creates intraday, day-ahead and weekahead forecasts.

.Kreate's portfolio of clients includes 1,500 MW of wind plants, 900 MW of solar PV plants and about 50,000 MW of demand.

Machine Learning (AI)

- Automated learning of complex relationships between events, developments, and outputs
- Option for unbiased modelling
- Self-learning and self-adaptive modelling approach
- Easily scalable across different parts and load sizes
- E.g.: Artificial Natural Networks

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Deep Machine Learning

- Al application that imitates human brain functions
- Still evolving, being used in cameras, self - driving cars
- Wider application on Big Data impending

Cross-impact Matrix

- Examines relationships between events and developments
- Probabilistic approach to determine likelihood of an event/output

Simulation

- Based on initial assumptions
- Validation of these assumptions and choice of variables chosen for forecast essential to achieve satisfactory accuracy
- E.g.: Multiple regression

Trend Extrapolation

- Historical data necessary
- Complete dependence on historical data
- Time series based forecast
- E.g..: Curve fitting and ARIMA

The Problem



With the world's largest renewable energy programme, India is targeting a renewable capacity of 175 Gigawatt by 2022 which includes 100 GW of solar and 75 GW of wind, hydro and other renewables.

However, unlike highly centralized sources of power (nuclear power and fossil fuel), wind and solar energy production are based upon a decentralized model with numerous generating stations spread across a large area.

Integrating different sources (wind, solar, and hydro) of renewable energy poses unique challenges to the equilibrium between supply and consumption. The production also depends variable factors such as weather and location. Subsequently, those who maintain a constant balance between demand and supply high chances of output mismatch in the power grids.



Moreover, the mismatch is often subjected to penalties levied for inaccuracies between forecasting and generation.

Hence, several of our solar and wind power plant clients were dealing with the following challenges:

- Regulatory requirement for delivering generation forecasts for every 15 minute time block
- O Huge losses due to forecasting deviations.

Similarly, there are challenges pertaining to demand forecasting and power system planning. Demand or Load forecasting is integral to power grid management because it helps estimate future electricity consumptions. Short-term (monthly, dayahead and intraday)

Demand forecasts are essential for:

- O Daily power scheduling and operational planning
 - Avoiding under drawl or over drawl of power
 - Reducing the overall cost of power purchase

The Solution



The uncertainty inherent in demand and renewable energy generation calls for advanced forecasting solutions which can facilitate large-scale integration of Wind/ Solar power, maintain grid stability, and accurately predict the consumption of power. The relationships between different weather parameters and generation and demand forecasts are extremely complex and dynamic. Vast amount of historical data Is used along with AI and machine learning techniques to extract meaningful patterns and create dynamic models. The patterns and models are tweaked/learned continuously as more and more real time data is ingested into the system.

Kreate offers **PREDF**× - an RE and Demand (Load) forecasting tool which implements AI, machine learning and statistics. It uses sophisticated dual-ensemble approach using physical and statistical modeling to achieve high accuracy of energy forecast.

- With **>REDF**x and expertise in Demand forecasting, we currently provide Demand Forecasting services to large utilities that have a combined load in excess of 50,000 MW.
- ♦ With ▶REDFx and in depth knowledge of RE generation forecasting, we currently provide RE Generation Forecasting & Qualified Co-coordinating Agency (QCA) services to more than 2,400 MW of Wind/Solar generators on a PAN India basis.

The Features



Kreate's forecasting tool **PREDF** provides intraday/day ahead/week ahead generation forecasting for Wind/ Solar plants, and Day Ahead & Intra Day Forecasting for Power Utilities, along with various customized services.

We offer solutions that generate high accuracy Demand & Wind/ Solar forecasts to help utilities, asset owners, system operators manage and optimize financial losses.

Features of **PREDF**x

- Sophisticated AI, machine learning and statistics based algorithms, combined with tools to inject human experience and expertise
- Real-time analytical dashboard & mobile application for monitoring demand forecast & solar/ wind Plant generation data and Deviation Settlement Mechanism (DSM) charges.
- O Monthly MIS reports on forecast Vs actual generation/Demand, DSM charges summary and any other MIS as per requirement.



SMS/Email alerts to the concern officials.



- Compatible with most browsers.
- Available on cloud and for in-house installation.

With Kreate \triangleright REDFx solution, our clients have benefitted in the following ways:

- They have significantly mitigated the mismatch and deviations between demand and supply.
- Our two clients in the power sector have availed its real-time analytics dashboard and monthly reports to enable judicious operational scheduling.
- The challenges pertaining to over-drawl and under-drawl of power have been mitigated resulting in an overall reduction in the cost of power purchase.
- The 24*7 operational support and forecasting accuracy has reduced the risk of DSM penalty, thereby, enabling asset owners and system operators to manage and optimize financial losses.
- O The dynamic models that take Into account complex relationships between large numbers of meteorological variables using AI, machine learning and statistics have allowed users of RED to obtain higher levels of forecasting accuracy.