

1-15 JUNE, 2022

30  
years

# Down To Earth

FORTNIGHTLY ON POLITICS OF DEVELOPMENT, ENVIRONMENT AND HEALTH

Subscriber copy, not for resale

₹60.00

WORLD ENVIRONMENT DAY SPECIAL

RUSSIA-UKRAINE CONFLICT

## GLITCH IN THE SYSTEM

It took a war to expose the flaws of a globalised food production system



HEALTH

Why India's tribes have shorter lifespan than other social groups **P12**

COAL

The contradictions in the government's mine closure framework and its policy to reopen abandoned mines

**P18**



Yuri, a Ukrainian farmer wearing body armour, works in a field in Zaporizhzhia region of the country on April 26, 2022



## Untapped Renewable Potential: Lesser-known Challenges that Operators Face

The renewable energy market has seen immense growth in the last couple of years due to the rising concerns about climate change and the limit of 1.5 C on the global temperature rise set forth in the Paris Agreement. In light of this, several countries have announced Nationally Determined Contributions (NDCs) to reduce climate change, and reducing dependence on fossil fuel-based energy has been at its heart. Though still today, fossil fuels remain the primary energy source, renewable energy will soon become a significant part of the energy sector.

While climate change has been the driver for renewable energy thus far, the Russia - Ukraine war has added another reason. Russia is the third-largest exporter of oil worldwide, with most European economies dependent on it. So imagine what will happen if Russia halts the flow of gas and oil to neighboring and other countries?

The potential impact of this crisis on the energy sector could act as an accelerator to boosting the expansion of renewable energies. It is imperative for all the countries to be self-reliant and what could be better than renewable energy harvested from natural sources.

### India is driving toward a Sustainable Future

The Indian government has affirmed its resolve to achieve about 500 GW capacity by 2030. It aims to reduce the carbon emission by one billion tonnes and reduce the carbon intensity of its economy by less than 45% by the end of this decade to reach net-zero carbon emissions.

### Diversifying with a Renewable Energy Investment

Amidst all this, we must realize that the intensity of renewable energy resources, which depend on the environment, fluctuates daily, and the sources may also be vulnerable to future climate conditions. Changing temperatures, precipitation, sea level, and extreme events in the future will impact how much energy will be produced, delivered, and consumed.

The constantly changing nature of renewable energy sources such as wind and solar radiation has led consumers and grid operators to be reluctant to invest in renewable energy technologies. What if it's not windy? Or what would happen when it's cloudy over solar panels? Unfortunately, questions like these exist in tandem to disrupt the development and acceptability of renewable energy sources.

So, it is critical for solar and wind power production companies and grid operators to determine the long-term solar and wind energy potential at the location of solar or wind parks before designing and setting them up. Also, the hourly forecast of power generation is essential for operating the power plants efficiently.

### Technological advances to Uncap the Renewable Energy Potential

Today, technological enhancements in the renewable energy sector make wind and solar power generation more reliable and economically competitive. Perovskite solar cells will give efficiency breakthroughs once commercialized; floating solar and the wind is another one to watch. The answer to how to generate energy if the sun isn't shining or the wind isn't blowing is to store energy produced when renewable generation capacity is high. The falling lithium battery prices makes it more affordable to build larger storage facilities.

In parallel to advances in renewable energy hardware, there is a strong need for solutions that enable operators to identify the best locations to set up power plants and predict how much energy will be generated by the hour the following day.

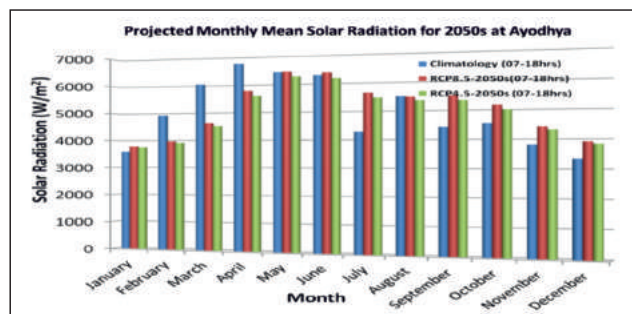
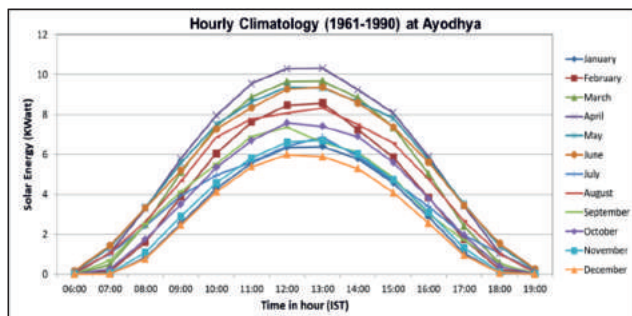
To resolve the operators' challenges, modelers at RMSI employed their knowledge of modeling weather parameters, such as solar radiation, wind, aerosols, rainfall, temperature, etc., to model the renewable energy generation potential at any place and time.

RMSI has developed an approach that amalgamates numerical modeling and machine learning techniques to assess the location-specific renewable energy potential and generate hourly power generation forecasts. We provide technical and consulting services for location-specific hydro, solar, wind, power potential assessment, and power generation forecasts across the country at different spatio-temporal scales. Our power generation forecasts are 48 to 72 hours in advance at the sub-hourly interval.

At RMSI, we do not solely base our location-specific assessments on historical data, climate, or weather but on a variety of future-based predictions, allowing us to anticipate how much potential power the plant can generate by 2050 or 2100.

### Estimates of Solar Power Potential in Ayodhya City

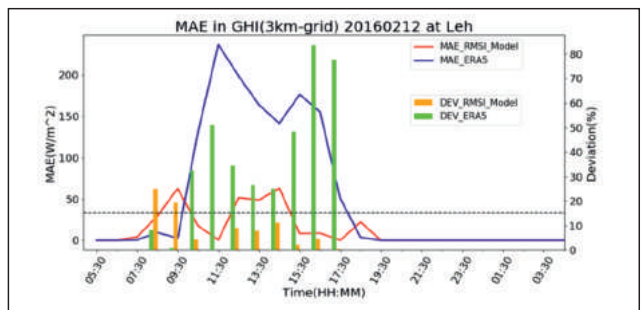
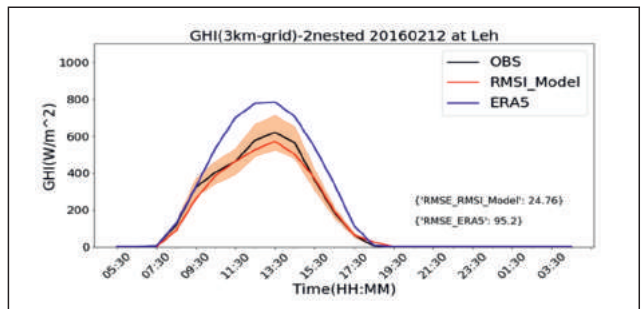
A case in point is a recent solar power potential analysis that we did for Ayodhya city, where we estimated monthly rooftop solar energy potential based on the present-day climatology. RMSI has deployed GIS software and tools to calculate the usable and effective areas of the captured building rooftop signatures.



Solar radiation-based power output assessment at Ayodhya city for the present and future

### Solar Energy Resource Assessment for Ladakh Union Territory

A 10 GW Renewable Energy Project is under Implementation in Ladakh within 20,000 acres of land. RMSI has estimated hourly and monthly climatology of solar irradiation and solar energy over the Leh district. It includes the opacity of various types of clouds for solar radiation calculations. Our analysis suggests an increase in total solar irradiation during the winter months (November-January) in the 2050s, which might happen due to the decrease in the frequency and intensity of western disturbances over northern India and the Himalayan region.



Solar radiation-based power output forecasts at the Leh site minimize penalty under a deviation settlement mechanism

RMSI has strong 3D Geospatial modeling capabilities with a repository of more than 100 years of historical weather data for India. In addition, our experts have already created a parametric incident solar radiation model. So estimating the solar / wind power potential at any location is a natural extension of these already existing Numerical Weather Prediction (NWP) forecast capabilities.

For more than two decades, RMSI has been using numerical weather models for predicting weather parameters like rainfall, temperature, solar radiation, wind, and associated hazards like thunderstorms, dust storms, cyclones, etc. Our renewable energy forecasts are based on the application of these complex, high-resolution models. RMSI can successfully produce a robust power generation forecast at a sub-hourly scale at solar plant/wind farm sites and save penalties for power producers (as depicted in the illustrations).

