

Fluctuating Nature of Electric Demand & Renewable Energy = **Nightmares** for Grid Operators and Utilities

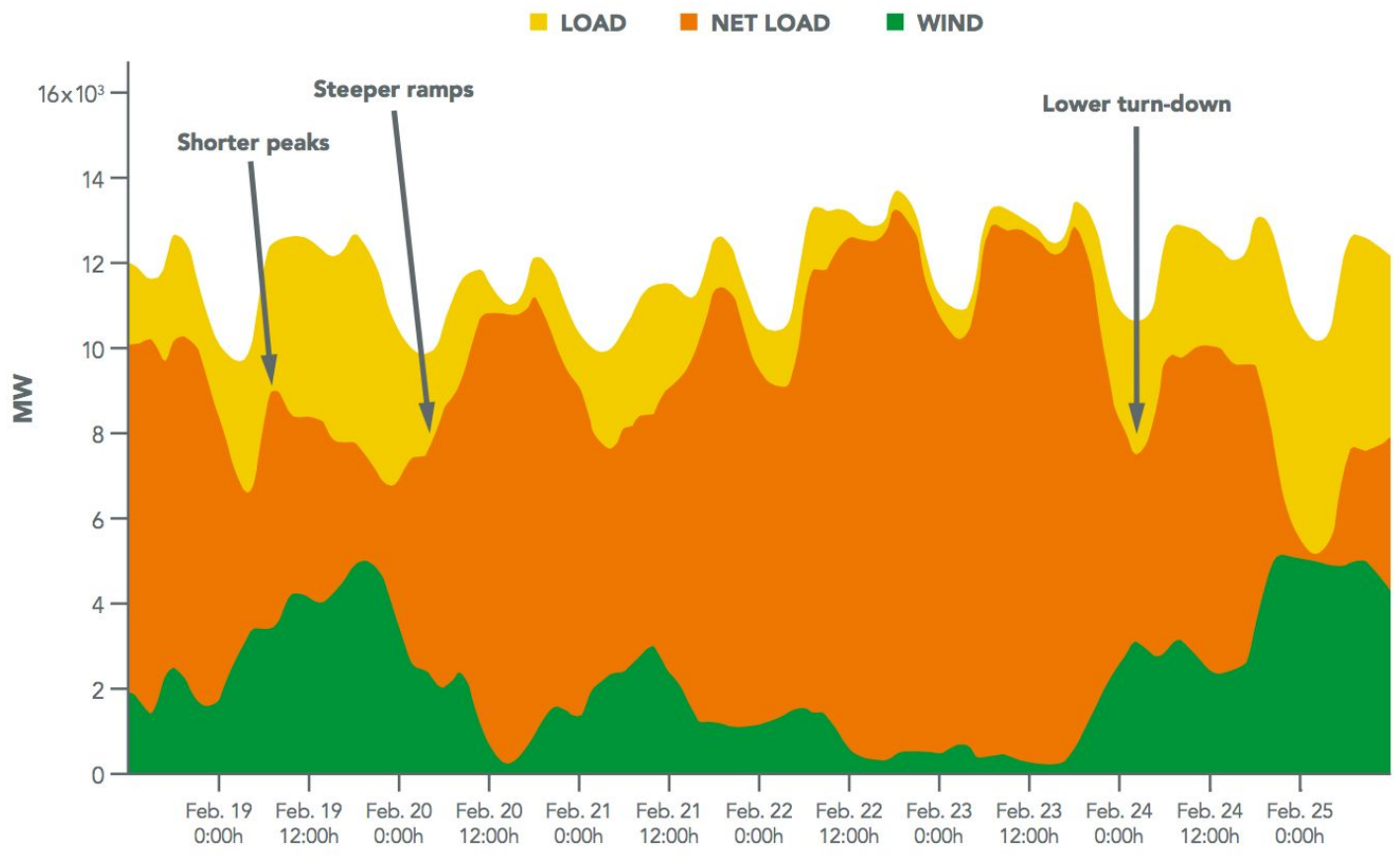
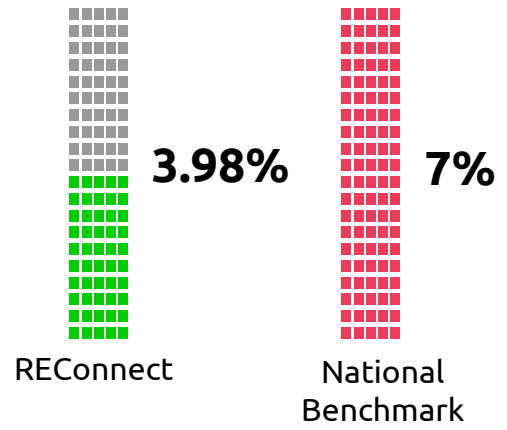


Image Reference: NREL

## Calls For...

### Accurate Predictions

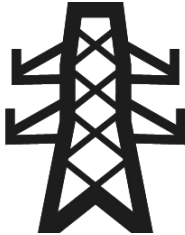


### Market Integration

- Contracting
- Dispatch
- Settlement

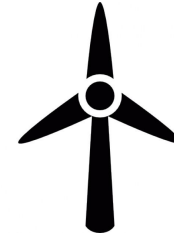
## Key Constituents for RE Integration

### Grid Operators



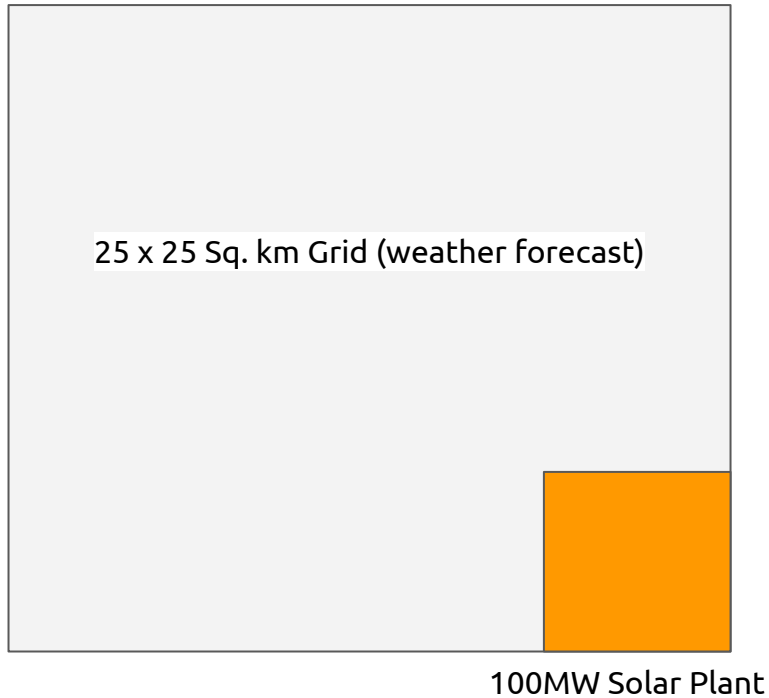
- Strong desire for forecasting at state / regional level
- Institutional support emerging in form of REMCs
- Assets/data visibility still an issue for large no of Grid Operators
- Select states like Gujarat taking own initiatives for better RE integration through state sponsored central forecasting

### Generators



- Resistance to adapt to forecasting regulations and DSM charges
- Initiatives from IWPA and IWTMA setting good examples for public-private partnerships for efficient RE Integration
- Assurance on no or minimal grid curtailment would encourage generators to actively participate in RE DSM regulations

## Forecasting Problem in Solar



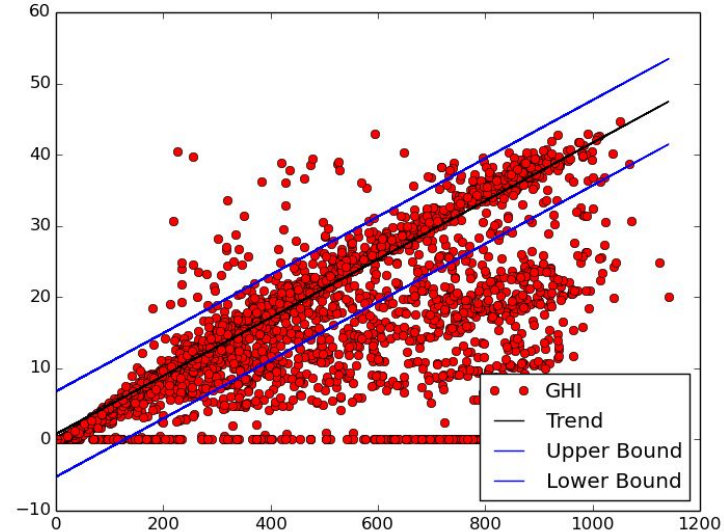
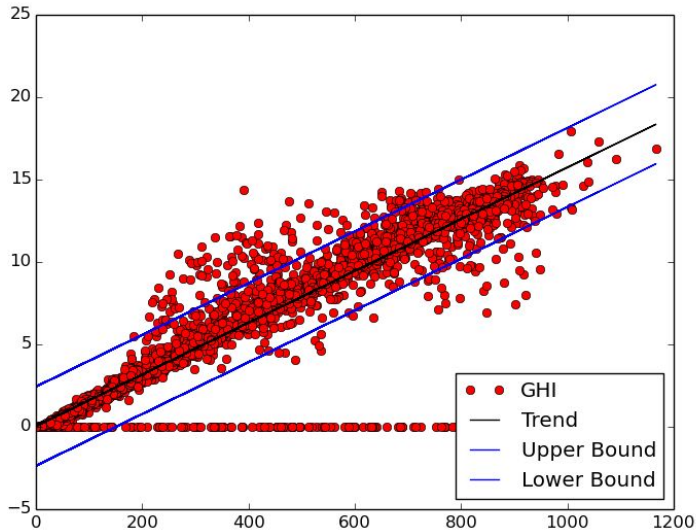
- High resolution weather forecast - **expensive**
- Significant impact of cloud cover on generation
- % cloud cover - inaccurate and significant geographical errors
- Utility scale projects (REMCs) - no access to real-time weather data, thus - higher dependency on real-time power data and innovative forecast modelling

### Calls For...

Innovative Modelling

Quality Real-Time Data

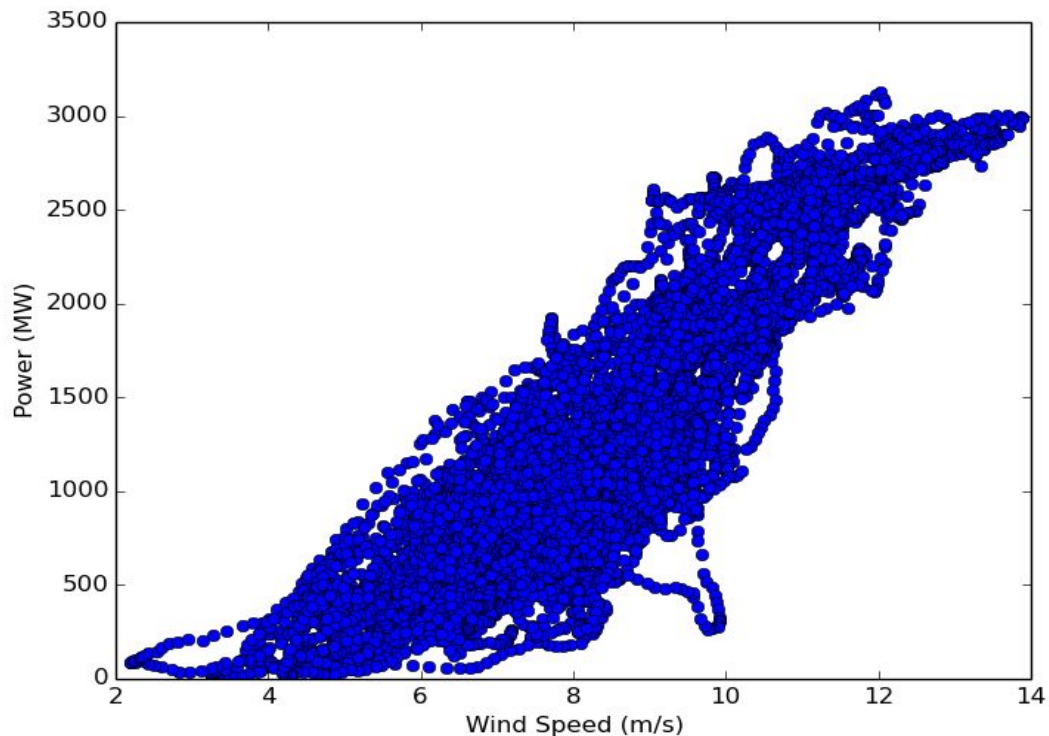
## Solar Generation Challenges



- Expected characteristics of solar generation and physical realities vary from site to site.
- Reasons may vary from operator action and adverse weather conditions to panel deterioration.
- Weather Forecast must be augmented with data from sites.

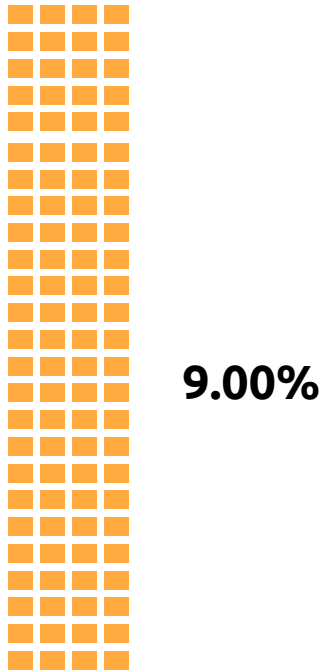


## Forecasting Problem for Wind

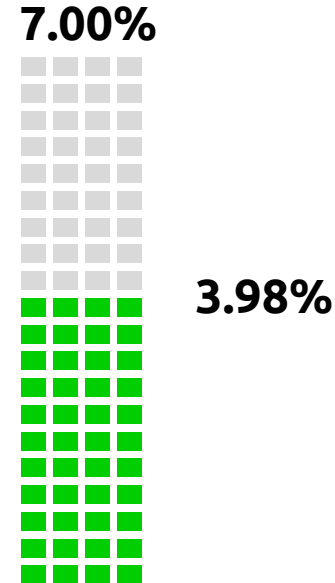


- Wind Speed vs. Power mapping of entire state
- @ 6 m/s, the power generation varied from **50MW to 1,500MW**
- Non-availability of actual weather data may call for a quality real-time data for accurate power forecasts for both wind and solar
- The statistical models work better in cases where actual weather data is not available and quality of real-time power data is good

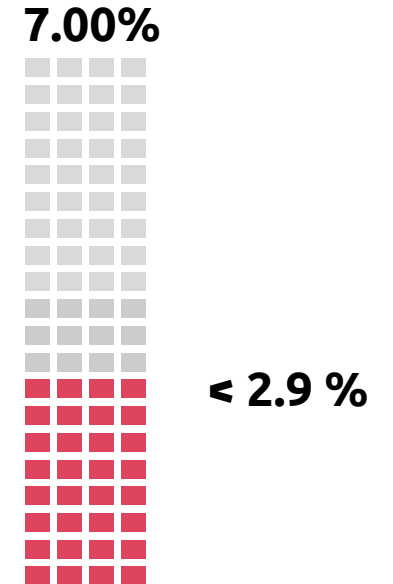
# REConnect Energy - Performance in Forecasting



- REConnect Forecast for about 50 Wind Farms across AP, TN, KA, RJ
- Performance in NRMSE



- REConnect Forecast for State of **Gujarat**
- Performance for Jan'17 till Dec'17 in **NRMSE**



- REConnect's target for REMCs
- Performance in **NRMSE** as per REMC terms

# about



RECONNECT  
ENERGY

## The Ecosystem & Engagements - REConnect Energy

Ministry

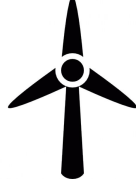


सत्यमेव जयते

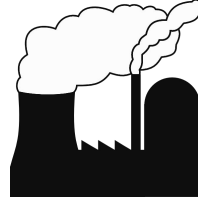
Regulator



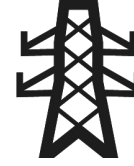
Renewable



Conventional



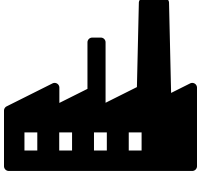
Transmission



Distribution



Consumer



Investor Relations



Policy Research



Transactions Mgmt.



Predictive Analytics



Weather / Energy Data



**450+ Clients, 3 Grid Operators**





**Best Indian Start-up**, Social Impact Boot Camp (GIZ), **Berlin, Germany**

**Top 30 Global Energy Start-ups**, NewEnergy Expo, **Astana, Kazakhstan**

**Top 50 Start-ups**, The Smart CEO - 2016, India

**Best Wind Energy Forecaster of the Year (2014/15/16)**, Indian Wind Energy Forum

**Best REC Trader of the Year (2014/15/16)**, Indian Electricity Market

**Top 100 Global Energy Start-ups**, Start-up energy transition Awards, **Berlin, Germany**

**Technology Start-up Enterprise of the Year (Energy & Utilities) - 2017**, 24MRC Network, India

**Digital Energy Transition Award 2017**, Times Network, New Delhi, India

**Industrial IoT Award**, IoTNext 2017, Bangalore, India

## Equity Partner



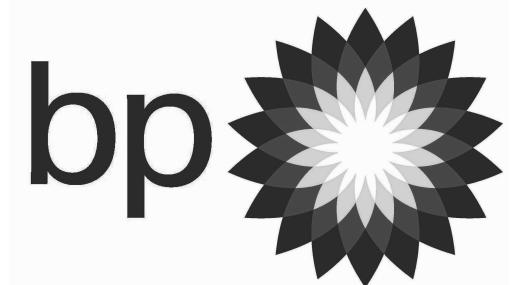
- India's First Cleantech Venture Fund
- An MNRE + IIM Ahmedabad initiative
- **Core Focus - To promote innovation in Indian Cleantech space with focus on Energy & Renewables**
- Key venture fund partners of INFUSE are...



Ministry of  
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Renewable  
Energy



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Thank You!



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