



# **IEGC PROVISIONS FOR RENEWABLE GENERATION SCHEDULING & UI SETTLEMENT**

# Background

- CERC in September, 2009 constituted a Task Force with representation of Engineering Wing of the Commission Staff, CEA, System Operator, C-WET, WISE and State Commissions/ Utilities/ SLDCs of Tamil Nadu, Rajasthan, Gujarat and Karnataka for integration of renewable sources energy into the Grid
- Three meetings of Task Force held on 13.11.2009, 15.12.2009 & 18.1.2010 and its decisions were incorporated in Grid Code issued on 3.5.2010.

# Scheduling Procedure for Wind Generators

As per sub-regulation 23 of Regulation 6.6 of IEGC,2010

- Scheduling of wind power generation plants shall be done with effect from 1.1.2011 ( now w.e.f 01.01.2012) for the purpose of UI where
  - i) the sum of generation capacity of such plants connected at the connection point to the transmission or distribution system is 10 MW and above  
and
  - ii) connection point is 33 KV and above  
and
  - iii) where PPA has not yet ( by 03.05.2010) been signed.

## Scheduling Procedure for Wind Generators- Cont.

- For capacity and voltage level below this, as well as for old wind farms it could be mutually decided between the Wind Generator and the transmission or distribution utility, as the case may be, if there is no existing contractual agreement to the contrary .
- The schedule by wind power generating stations may be revised by giving advance notice to SLDC/RLDC, as the case may be. Such revisions by wind power generating stations shall be effective from 6<sup>th</sup> time-block ,the first being the time –block in which notice was given.
- There may be maximum of 8 revisions for each 3 hour time slot starting from 00:00 hours during the day.

# Scheduling Procedure for Solar Generators

- The schedule of solar generation shall be given by the generator based on availability of the generator, weather forecasting, solar insolation, season and normal solar generation curve and shall be vetted by the RLDC in which the generator is located and incorporated in the inter-state schedule.
- If RLDC is of the opinion that the schedule is not realistic, it may ask the solar generator to modify the schedule.

## Scheduling Procedure for Renewable Generators

- Concerned RLDC and SLDC shall maintain the record of schedule from renewable power generating stations based on type of renewable energy sources i.e wind or solar from the point of view of grid security.
- While scheduling generating stations in a region, system operator shall aim at utilizing available wind and solar energy fully.

## Forecasting for Wind Generation

As per Para 3 of Annexure-I ( Complementary Commercial Mechanism) of IEGC

- Wind energy being of variable nature, needs to be predicted with reasonable accuracy for proper scheduling and dispatching.
- Wind generation forecasting can be done on an individual developer basis or joint basis for an aggregated generation capacity of 10 MW and above connected at a connection point of 33 kV and above.
- If done jointly, the wind forecasting facility shall be built and operated by wind developers in the area and sharing of the cost shall be mutually discussed and agreed.

## Forecasting for Wind Generation

As per Para 4 of Annexure-I ( Complementary Commercial Mechanism) of IEGC

- The wind energy forecasting system shall forecast power based on wind flow data on day ahead basis.
- Wind/ power forecast with an interval of 15 minutes for the next 24 hours for the aggregate Generation capacity of 10 MW and above.

# UI Mechanism for wind Generators

As per Para 5 of Annexure-I ( Complementary Commercial Mechanism) of IEGC

- The wind generators shall be responsible for forecasting their generation upto an accuracy of 70%. Therefore, if the actual generation is beyond +/- 30% of the schedule, wind generator would have to bear the UI charges.
- For actual generation within +/- 30% of the schedule, no UI would be payable/receivable by Generator, The host state , shall bear the UI charges for this variation, i.e within +/- 30%.

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## UI Mechanism for wind Generators- Cont.

- UI charges borne by the host State due to the wind generation, shall be shared among all the States of the country in the ratio of their peak demands in the previous month based on the data published by CEA, in the form of a regulatory charge known as the Renewable Regulatory Charge operated through the Renewable Regulatory Fund (RRF).
- This provision shall be applicable with effect from 1.1.2011 ( now w.e.f 01.01.2012) ,for new wind farms with collective capacity of 10 MW and above connected at connection point of 33 KV level and above , and who have not signed any PPA with states or others as on the date of coming into force of this IEGC ( i.e. 03.05.2011).

## UI Mechanism for wind Generators- Cont.

As per Para 6 of Annexure-I ( Complementary Commercial Mechanism) of IEGC

- A maximum generation of 150% of the schedule only, would be allowed in a time block, for injection by wind, from the grid security point of view.
- For any generation above 150% of schedule, if grid security is not affected by the generation above 150%, the only charge payable to the wind energy generator would be the UI charge applicable corresponding to 50-50.02 HZ .(At present Rs 1.55/kWh)

# Type of forecast required-Time Horizon

- Energy Forecast Over day month and year – Cash Flow of Wind Generator
- MW Forecast- Day ahead useful for System operation
- Ramp Forecast- Hours ahead -to reduce forecast gap

# Operational Requirements

As per Regulation 5.2 (u) of IEGC,2010:

- System Operator ( SLDC/RLDC) shall make all efforts to evacuate the available solar and wind power and treat them as a must run station.
- However, system operator may instruct the wind or solar generator to back down on consideration of grid security or safety of equipment or personnel and the generators shall comply these directions.

# Operational Requirements-contd.

As per Regulation 5.2 (u) of IEGC,2010:

- For this Data Acquisition system facility shall be provided for transfer of information to concerned SLDC/RLDC.
- SLDC/RLDC may direct a wind farm to curtail its Var drawal/injection in case the security of grid or safety of any equipment or personnel is endangered.

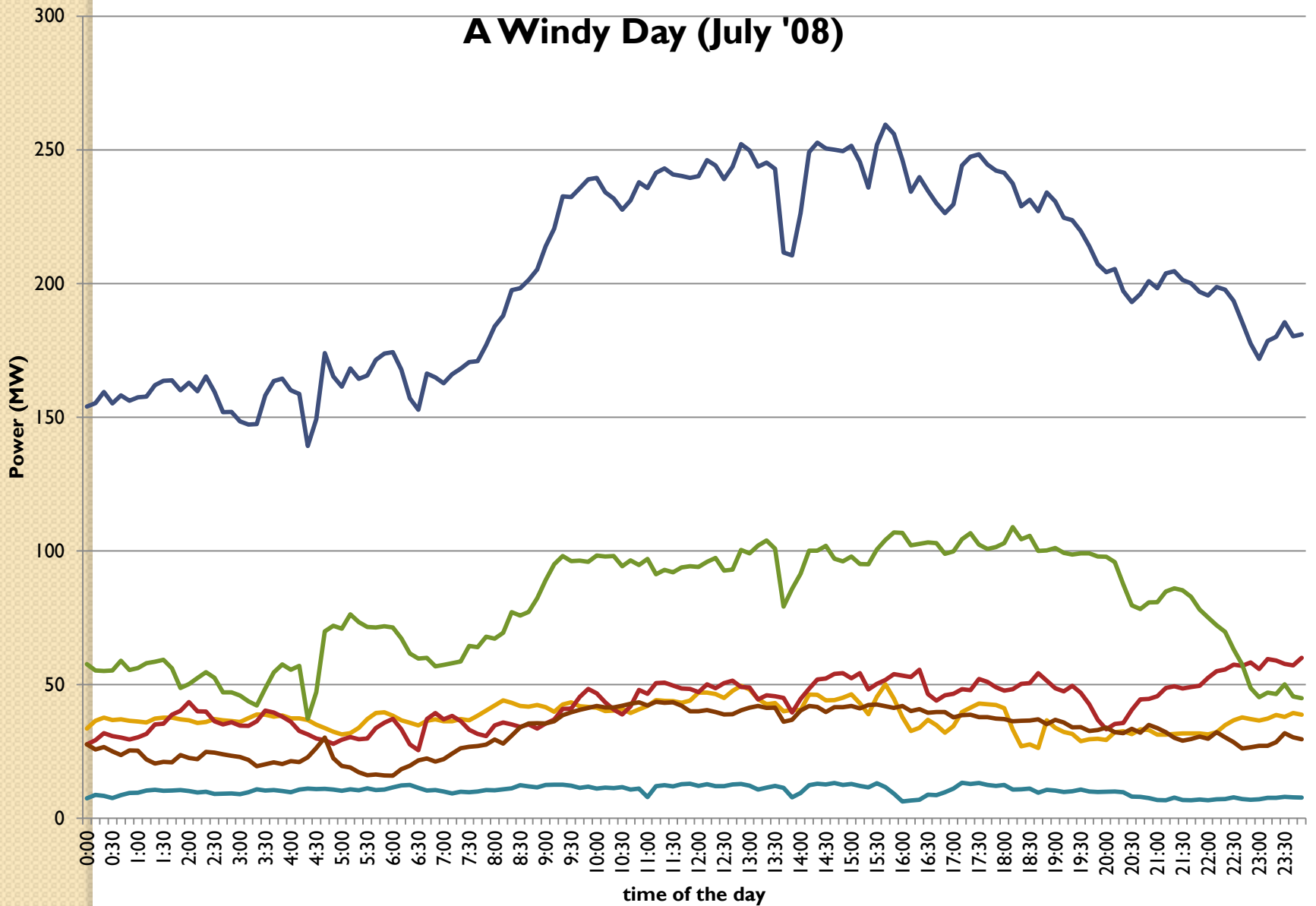
# Operational Requirements-contd.

As per Regulation 5.2 (u) of IEGC,2010:

- During the wind generator start-up, the wind generator shall ensure that the reactive power draw shall not affect the grid performance.
- As per Regulation 5.3 (g) the SLDC shall take into account the wind energy forecasting to meet the active and reactive power requirements.

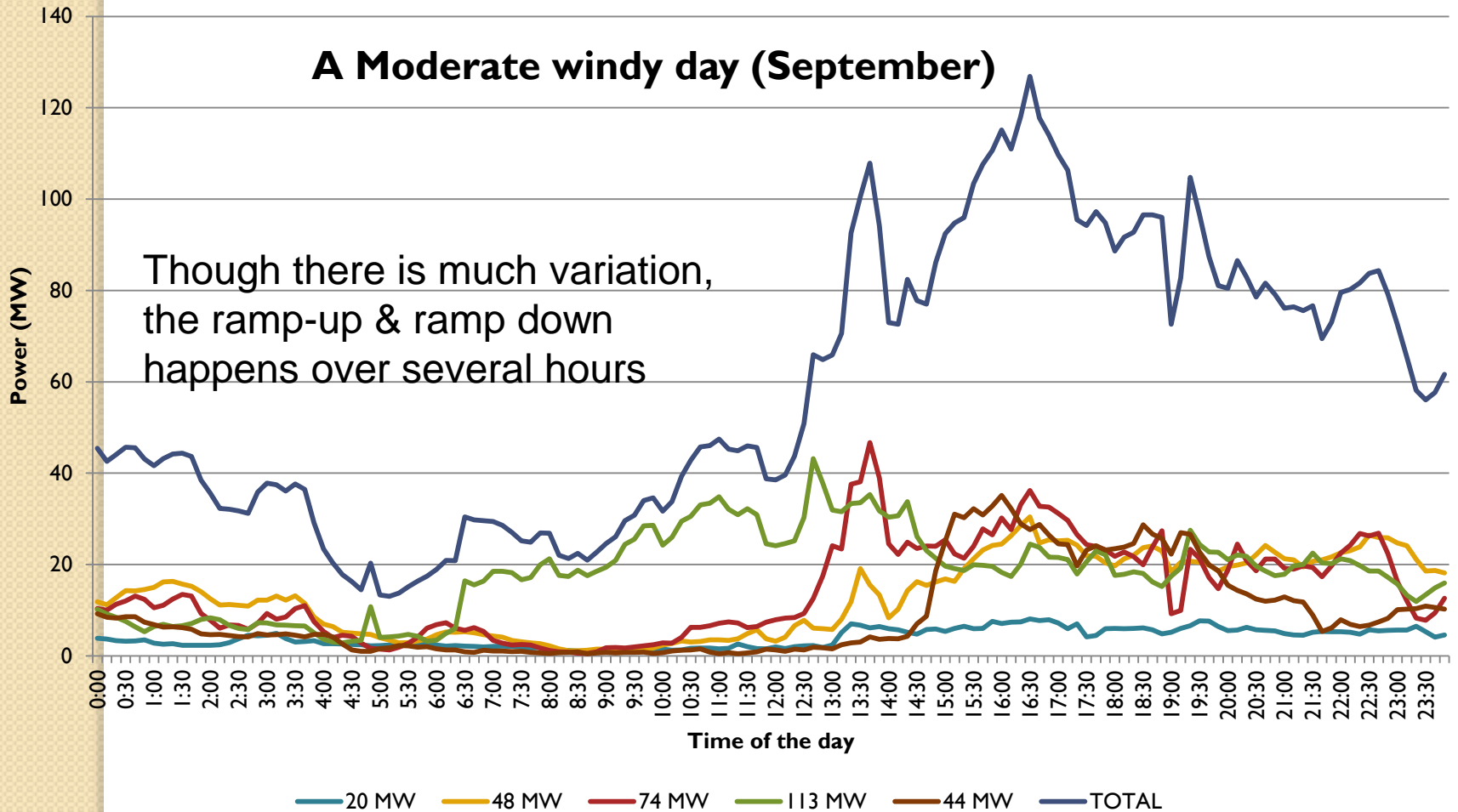
# Variability of Wind Generation

## A Windy Day (July '08)



— 20 MW — 48 MW — 74 MW — 113 MW — 44 MW — TOTAL

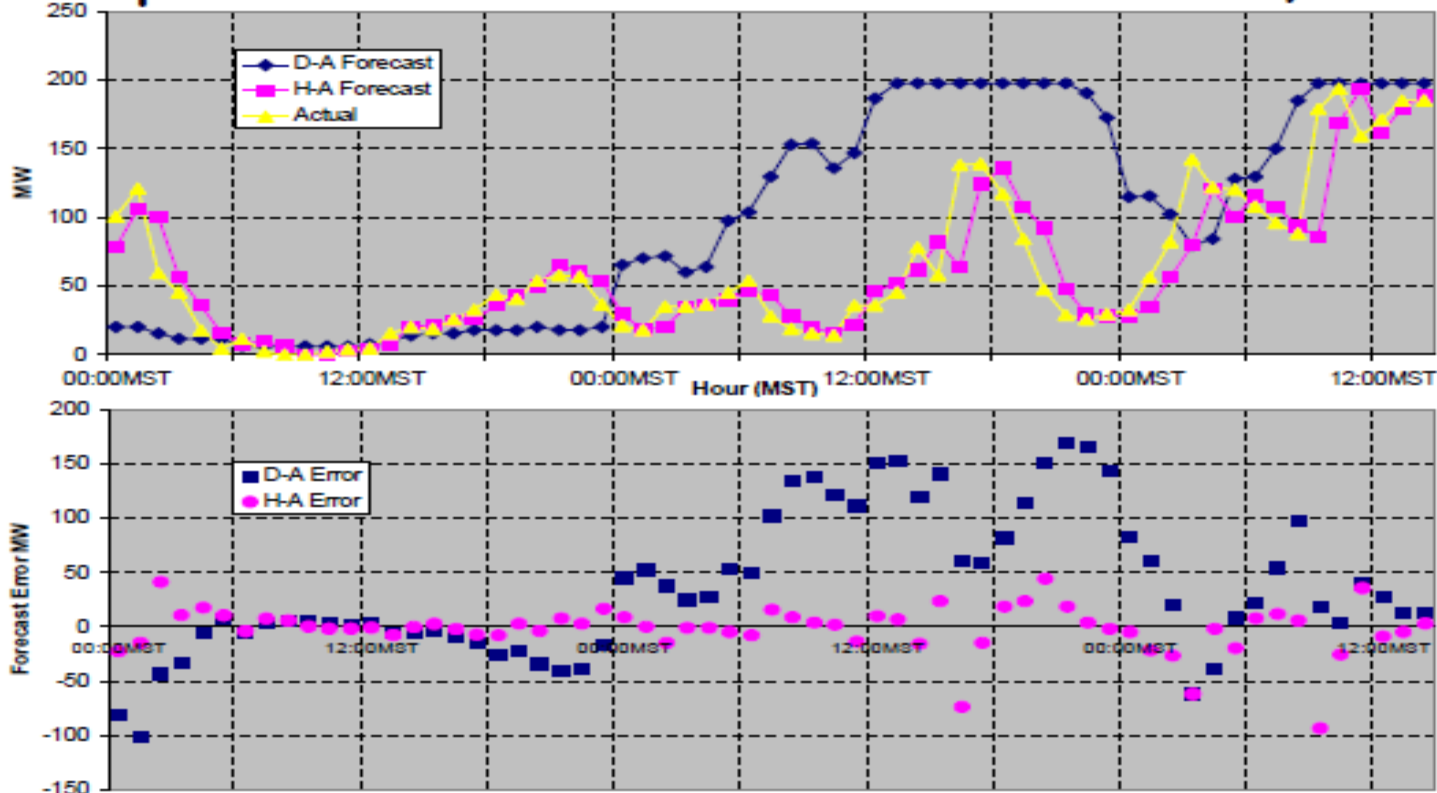
## A Moderate windy day (September)



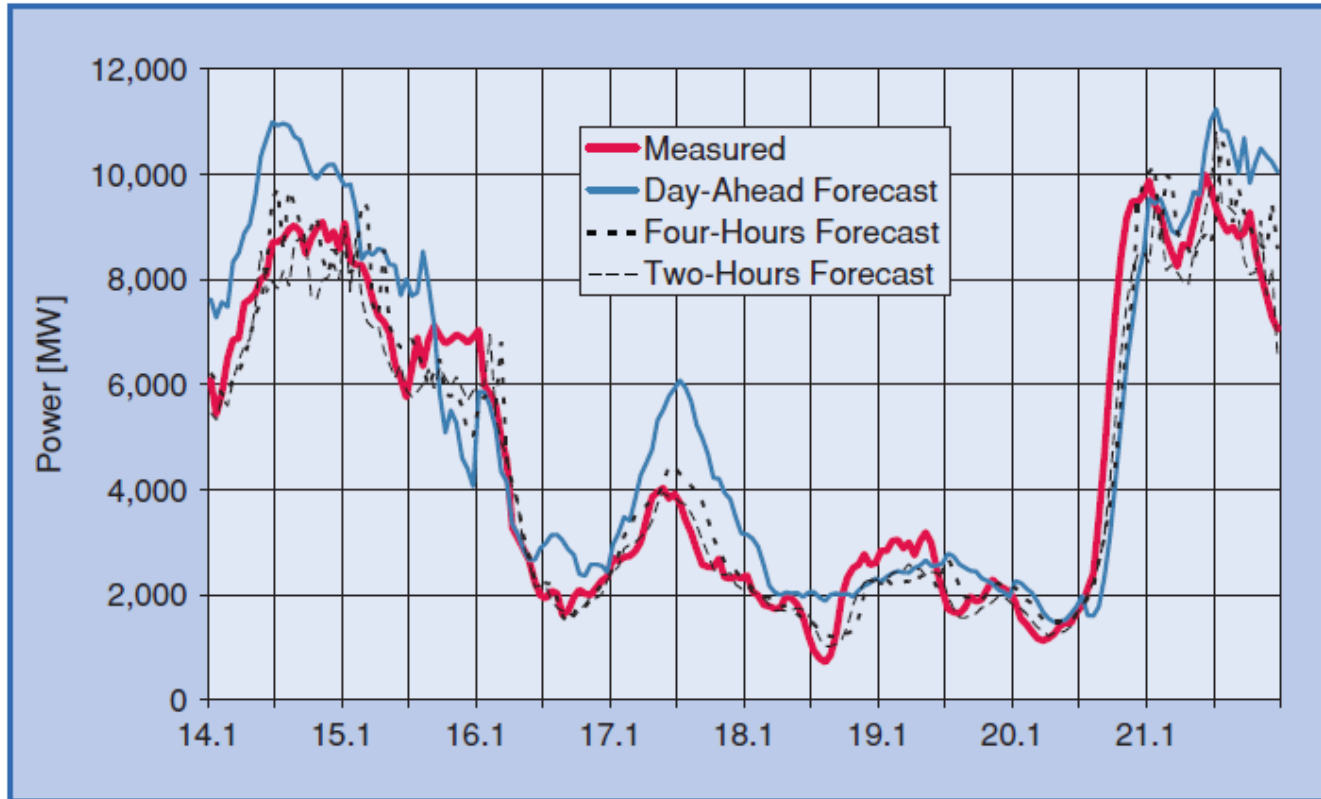
# Example New Mexico 204 MW

## How Good is the Forecast?

➤ Sample D-A and H-A forecasts for Nov 1-3, 2005

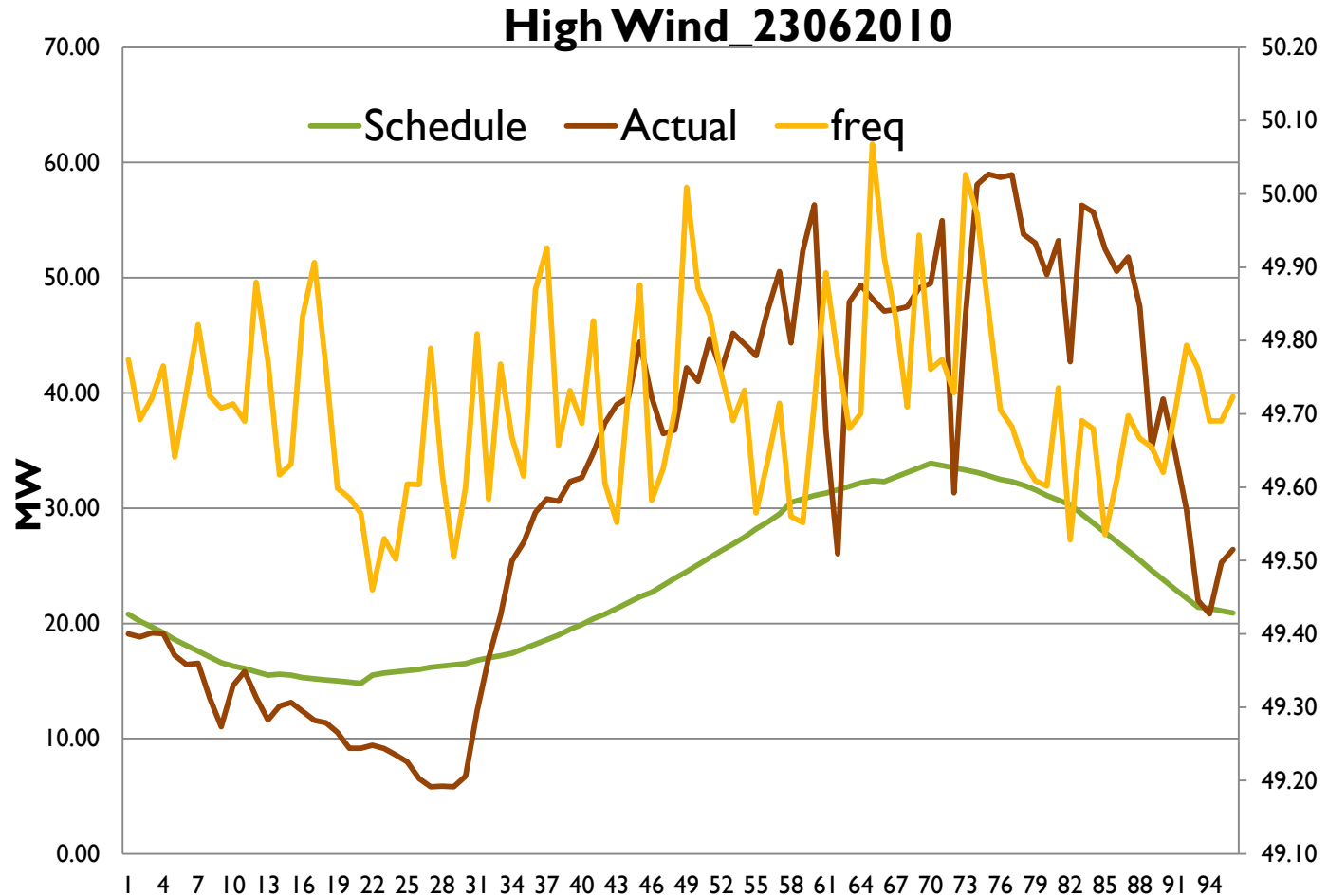


# Forecast in Different Time Horizon

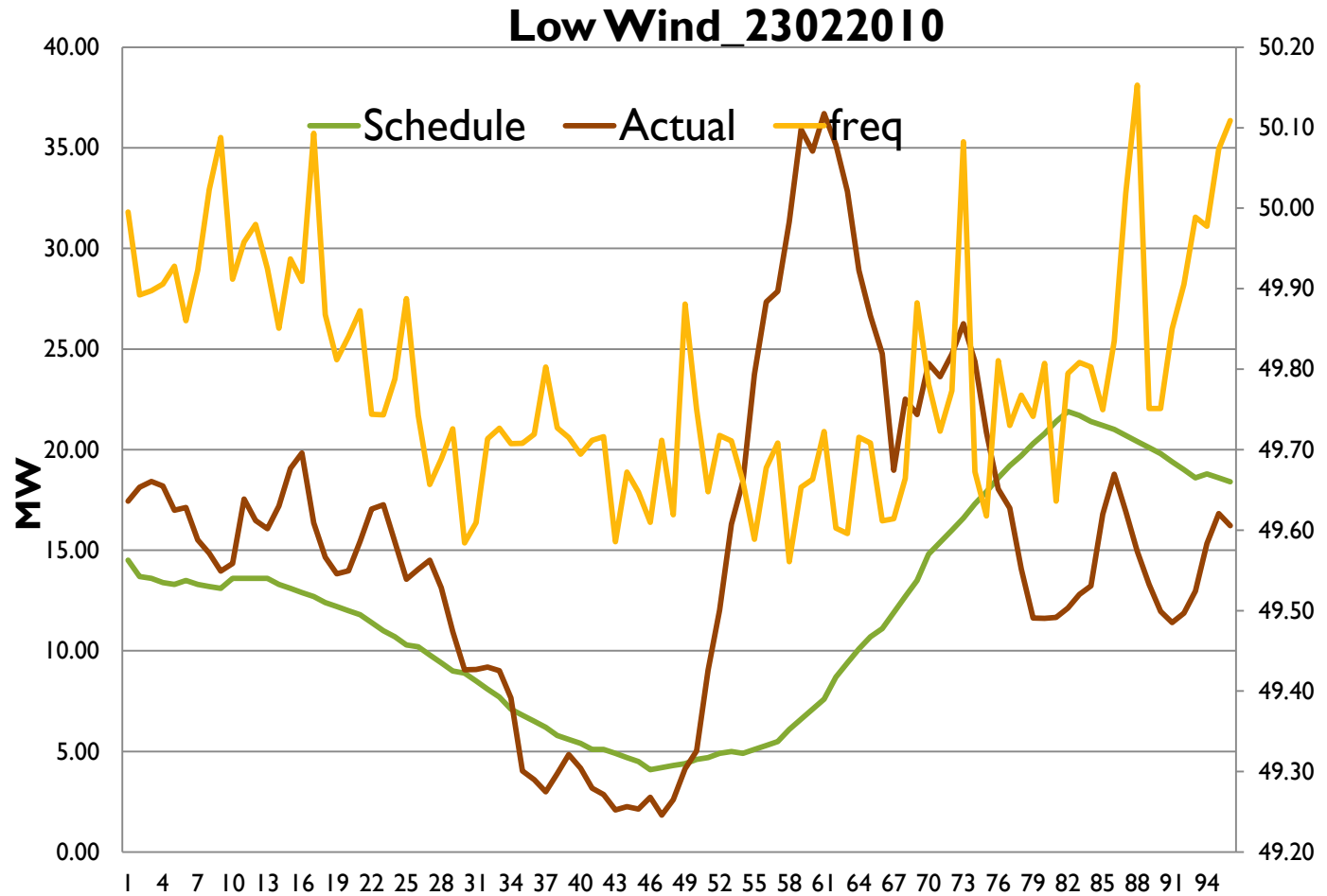


**figure 5.** Example time series of online measurement and forecasts of wind power generation in Germany; forecasts with different forecast horizons are shown.

# Case Study for implication on Wind Generator

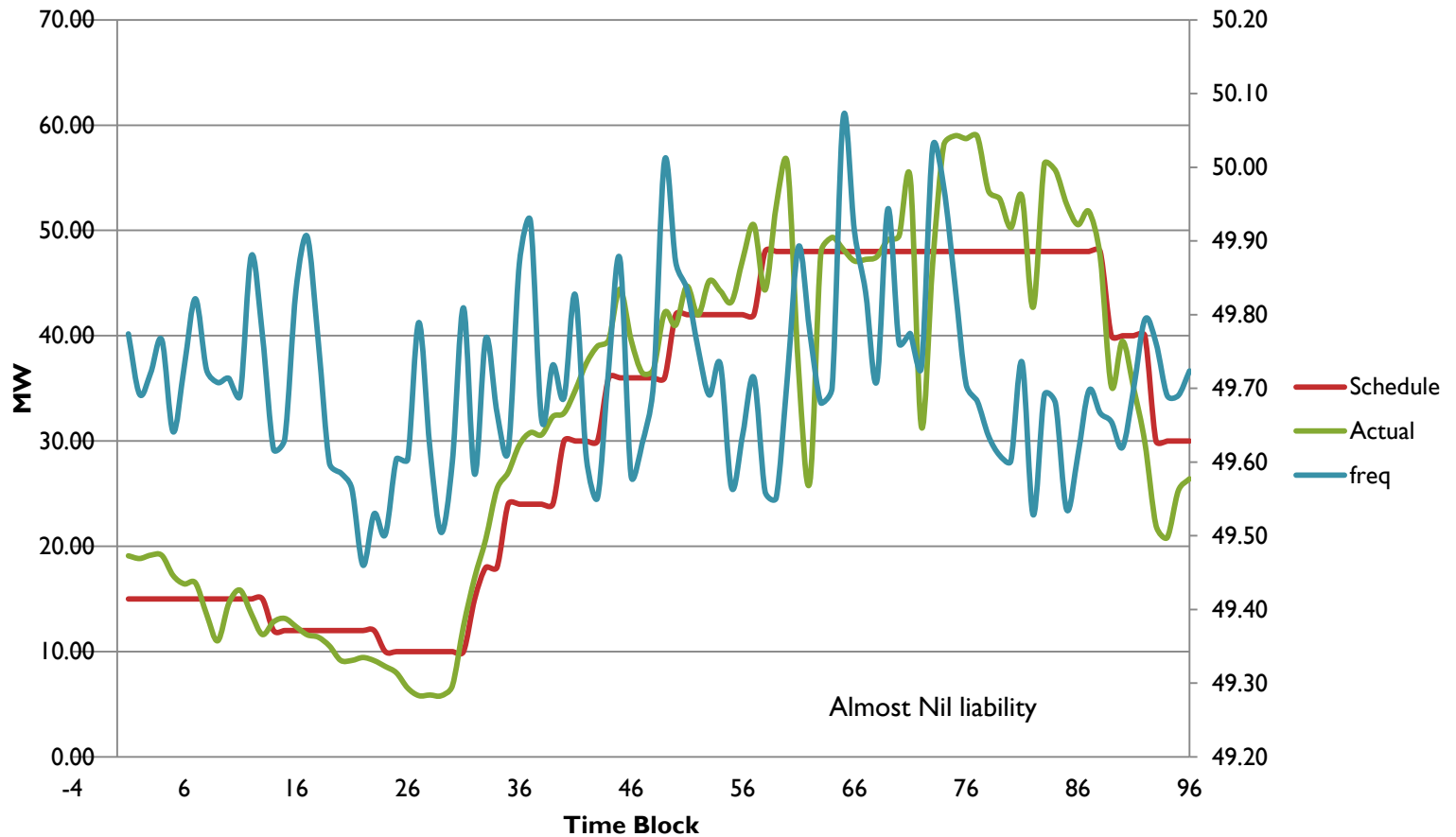


# Low Wind 23.02.2010

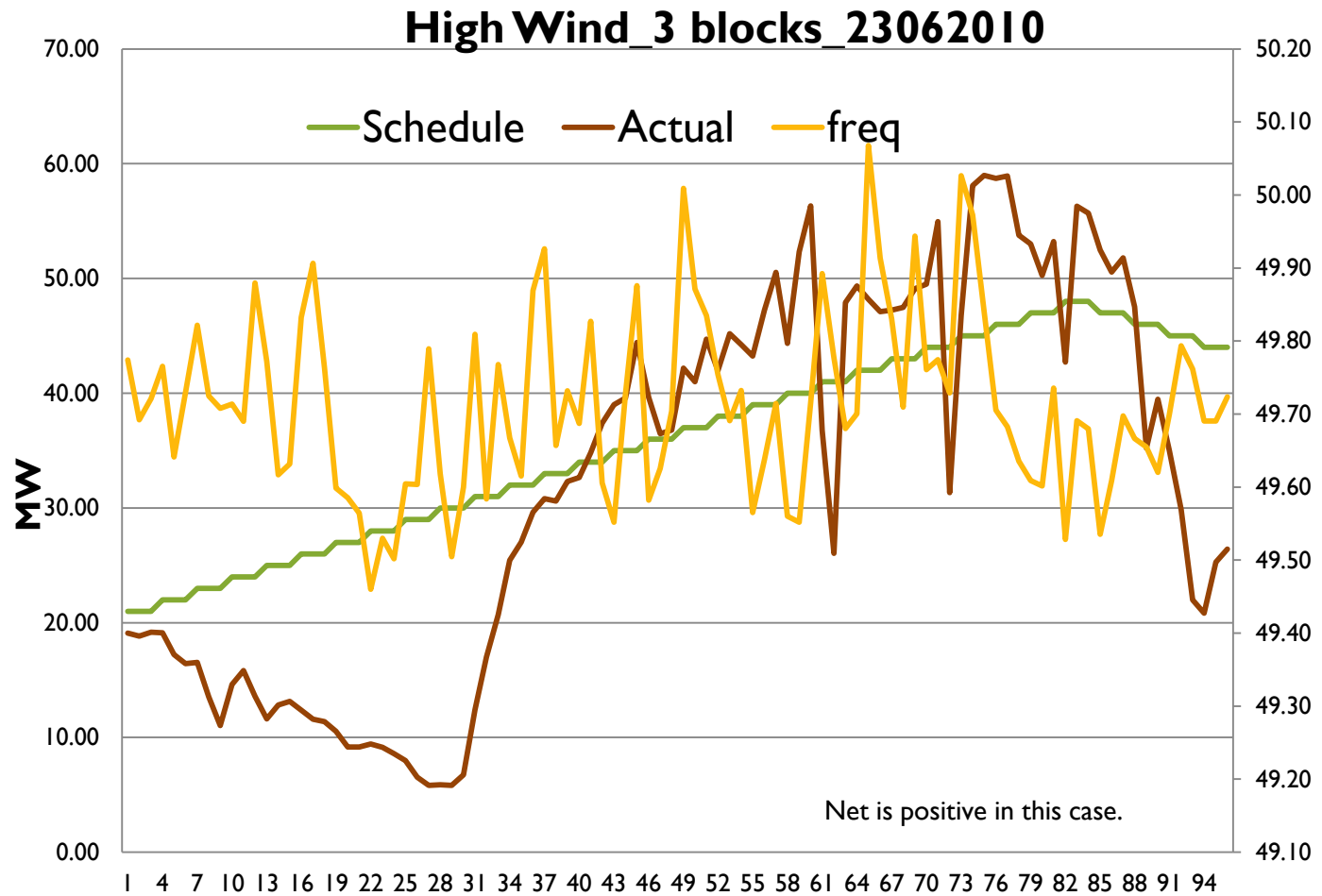


# Ramp up down change schedule

## High Wind\_Ramp



# Suggestion





**Thank You**