

## Wind Energy Forecasting and Its Integration with the Grid DIREC 2010



## Topics Covered

- Why forecast?
- How is it done?
- What results are achieved?
- How certain is the forecast?
- A case for India



## Why forecast wind farm production?

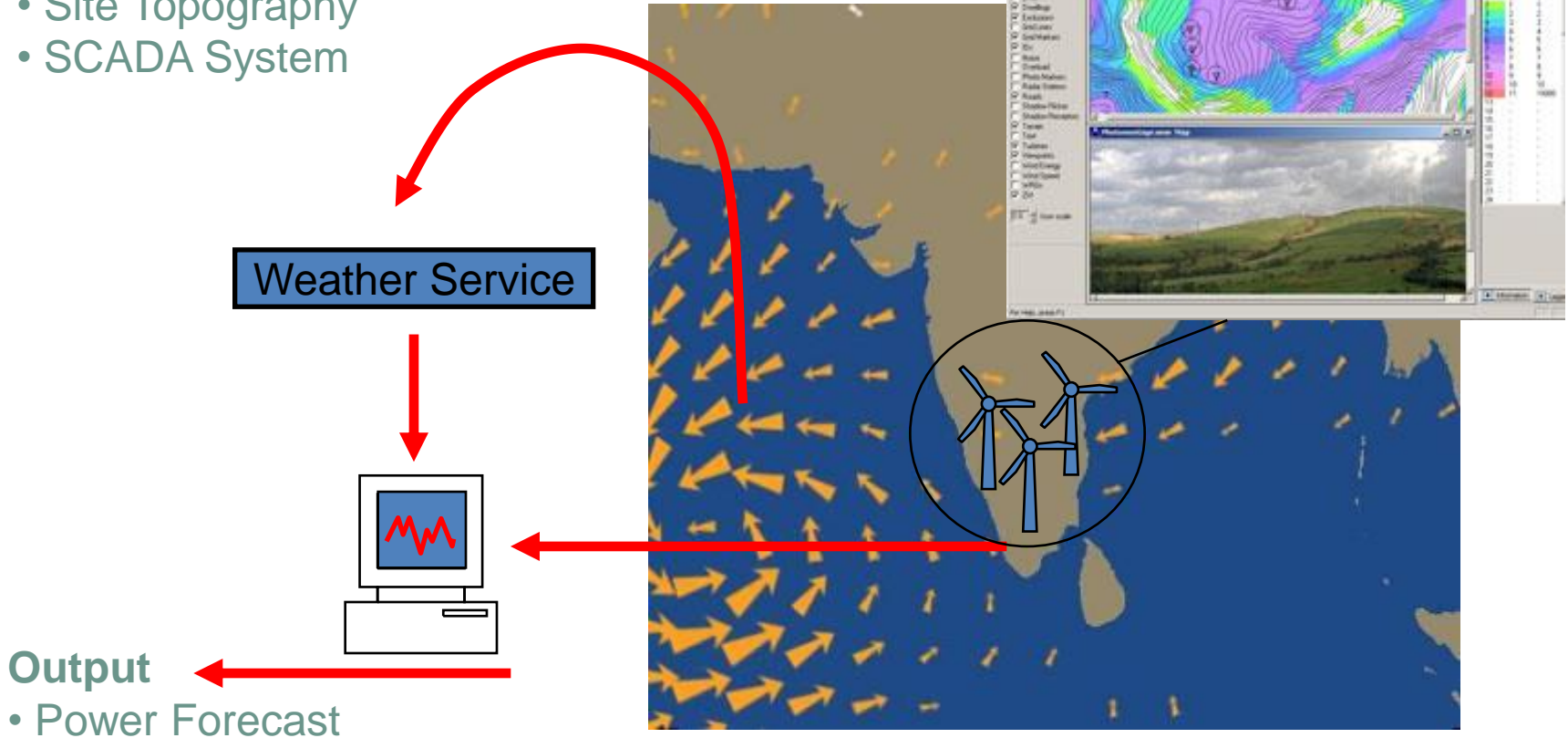
- Forecasting is an essential tool to aid the integration of increasing amounts of wind energy
  - Enables improved scheduling of other generation
  - Maximises the value of wind energy for trading
  - Enables maintenance to be planned for periods of low production
  - To comply with grid regulations
- 
- Forecasting helps make wind farms appear more like a conventional power station

## How is it done? – An overview

### Inputs

- Numerical Weather Prediction (NWP)
- Site Topography
- SCADA System

### GH WindFarmer



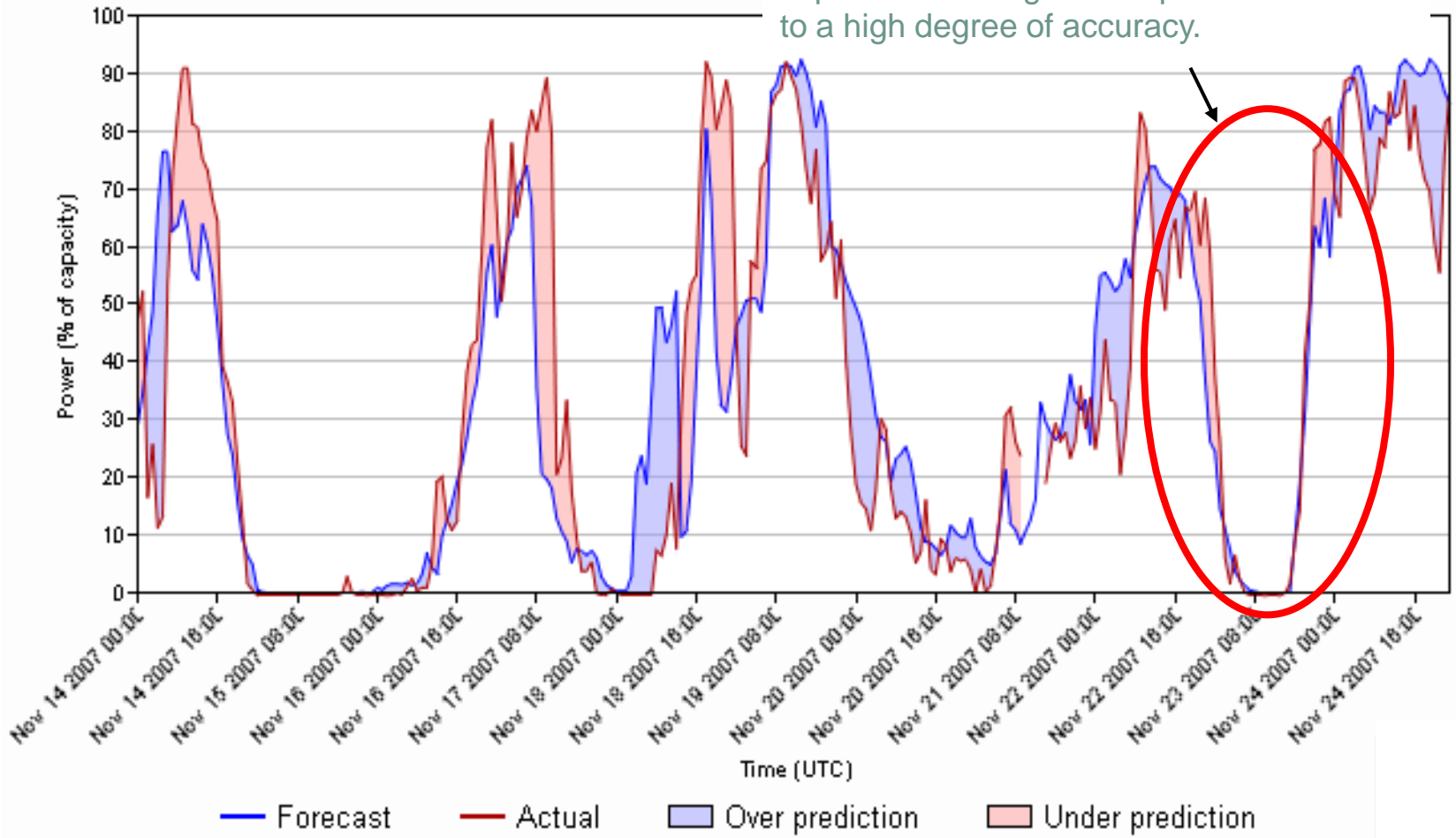
### Output

- Power Forecast

## Forecast Results – UK Example

Hourly data 24 hours in advance

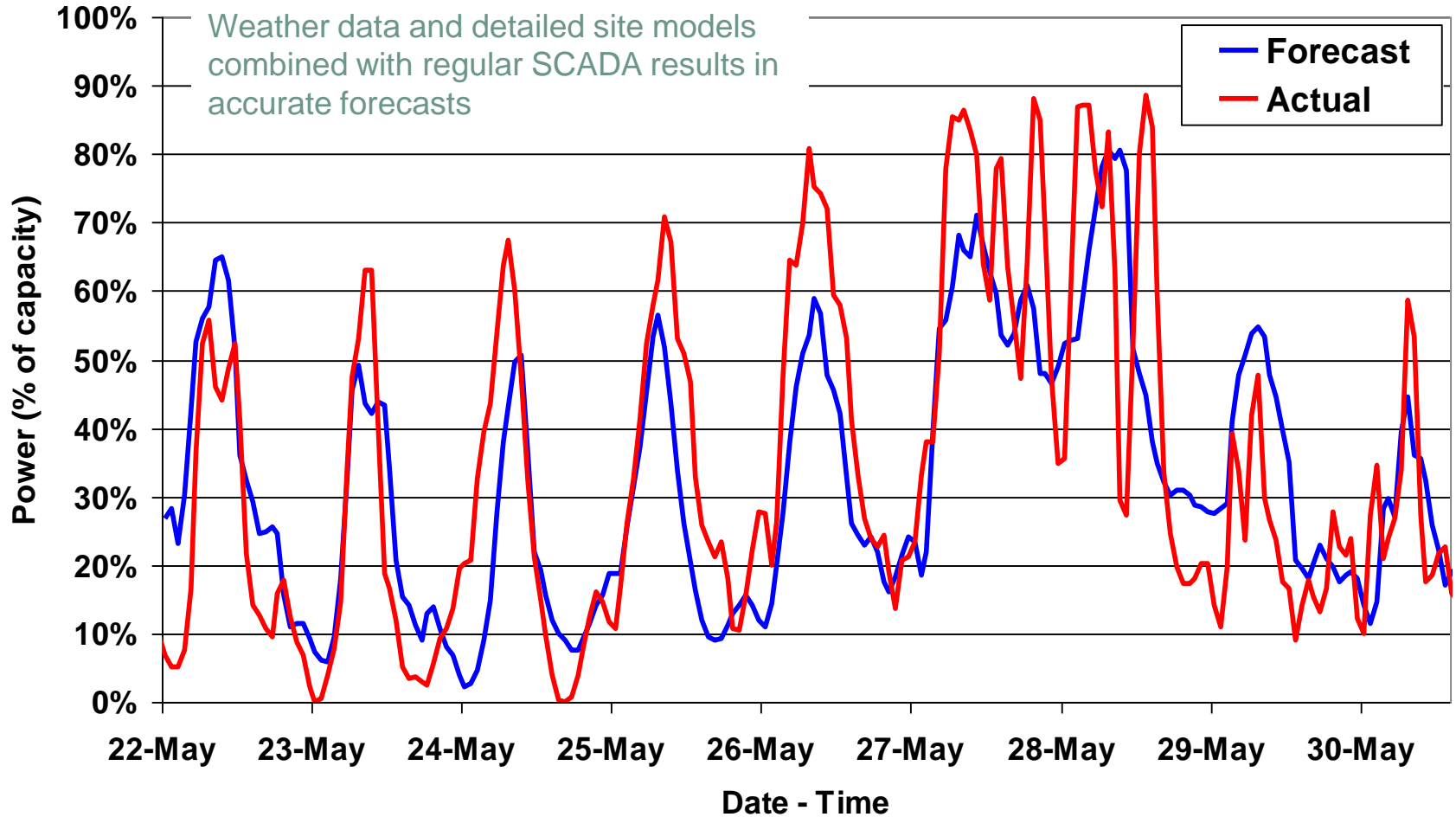
State of the art forecasting methods aim to capture the timing and amplitude of events to a high degree of accuracy.



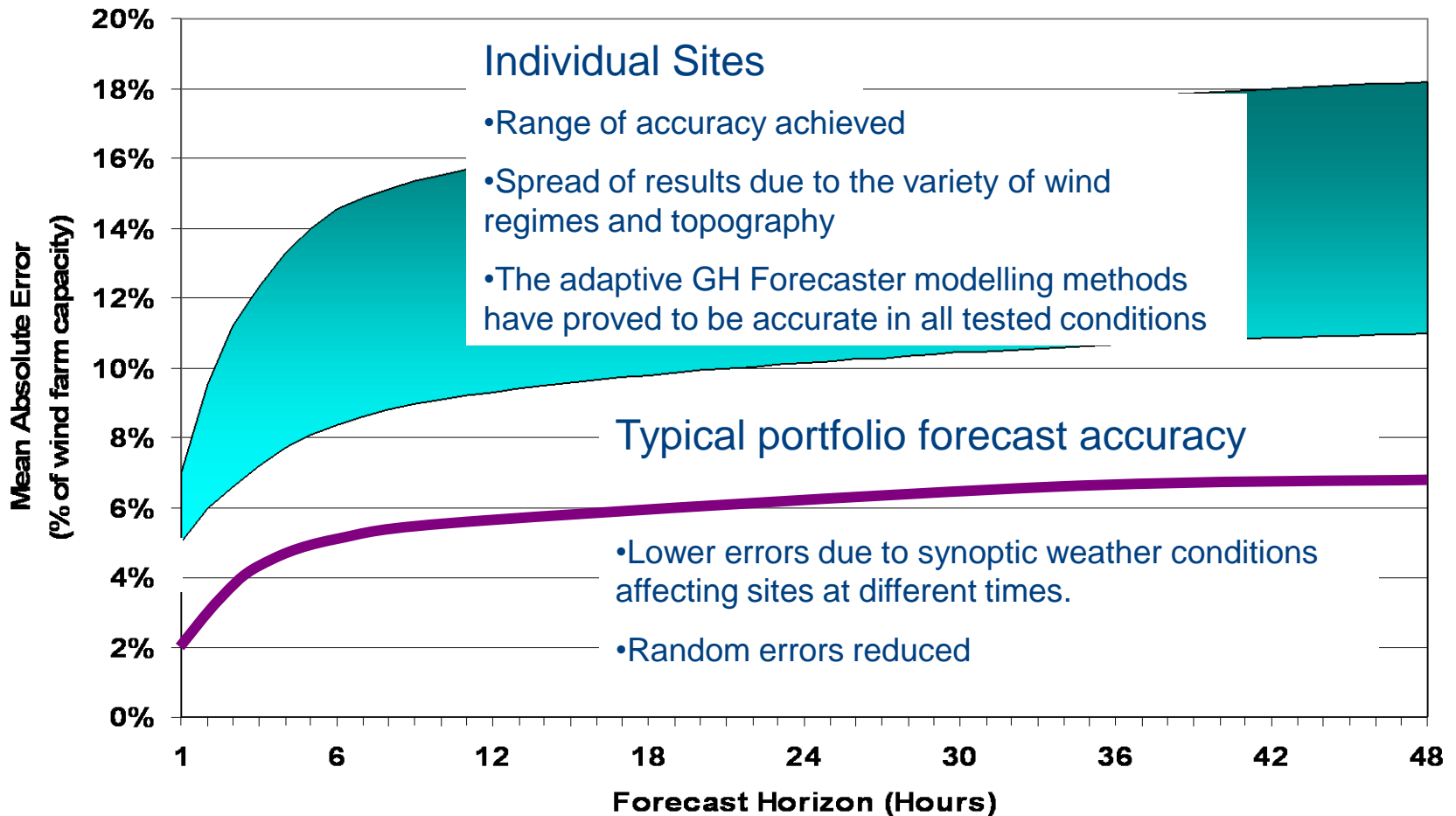
## Forecast Results – Indian Example

Diurnal weather patterns captured well

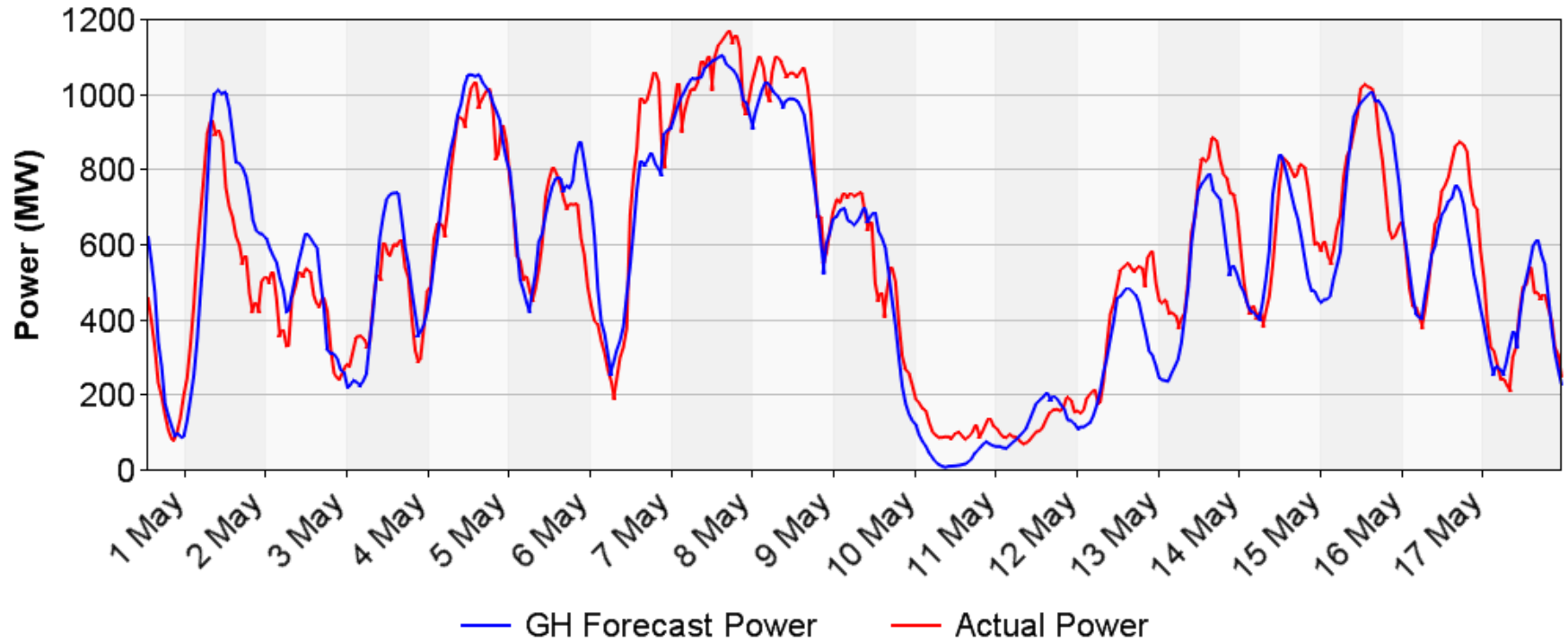
Hourly data 24 hours in advance



## Forecast Results – Accuracy

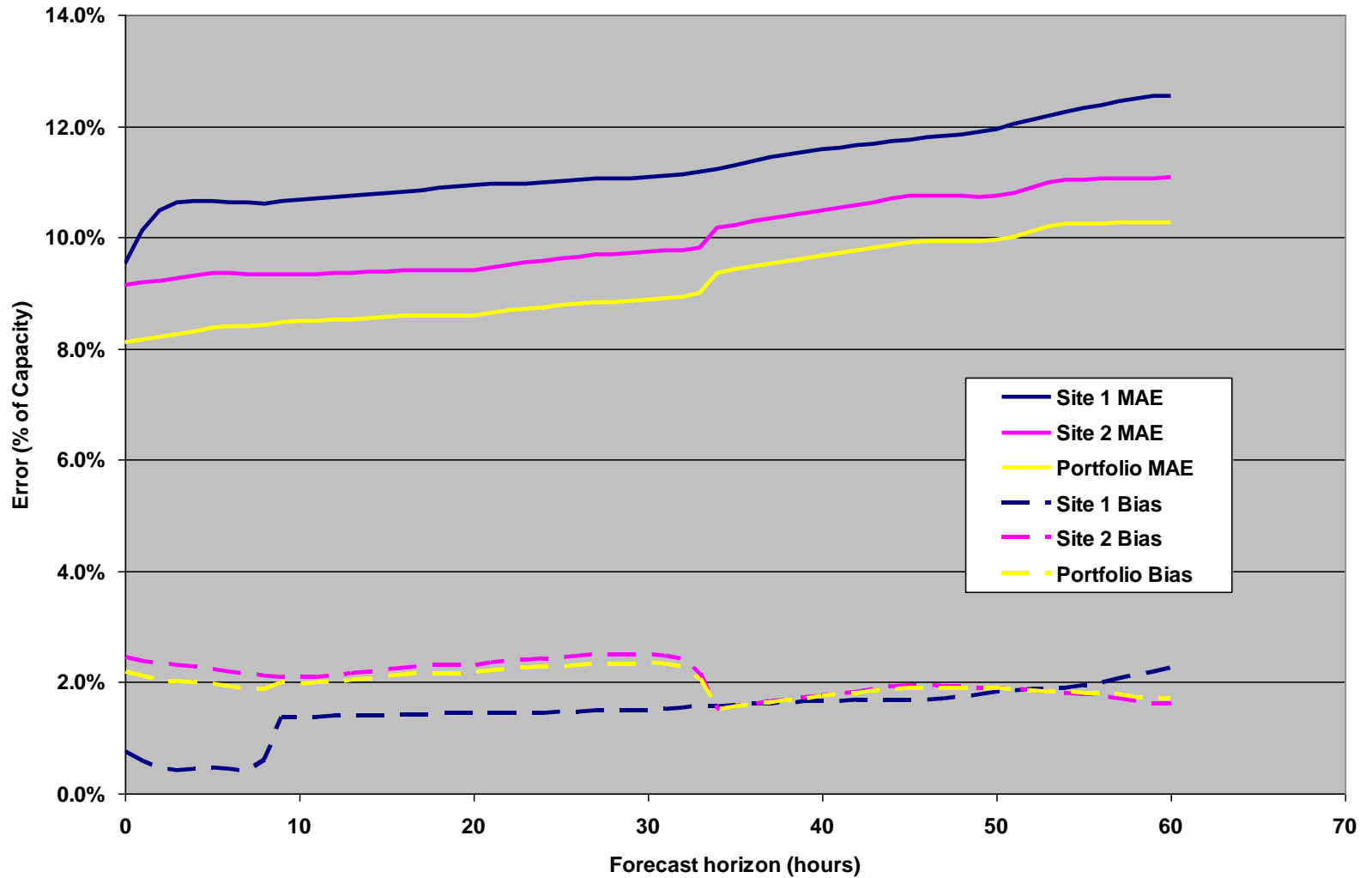


## UK Forecast, T+24 hour time history



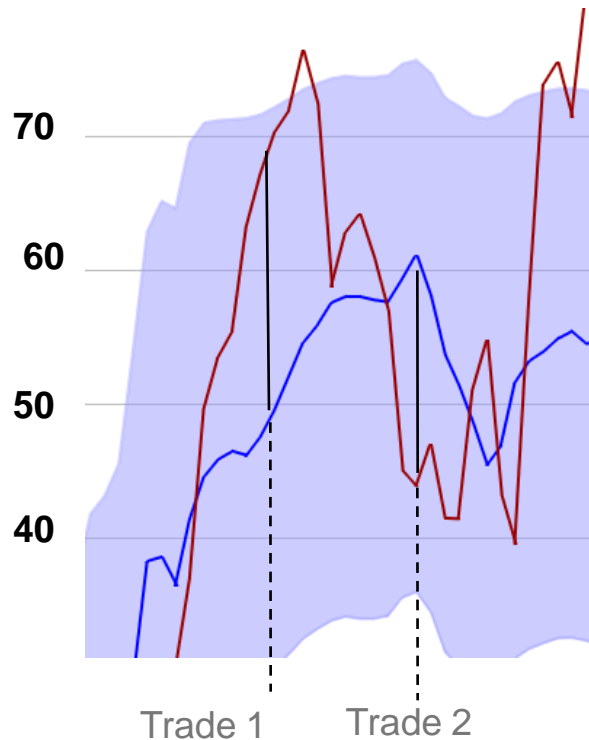


## Inida - Mini Portfolio Results



## A Case For India – Market Trading

- The potential value of forecasting - approximately 400 Rupees/MWh
  - Savings made through market trading, GLGH paper published at EWEC 2006



Example hourly trades

	Trade 1	Trade 2
Forecast Energy (MWh)	50	60
Produced Energy (MWh)	70	45
Revenue from forecast (£)	1750	2100
Cost for energy shortfall (£)	0	-675
Revenue from additional energy (£)	500	0
Total revenue (£)	2250	1425
Revenue normalised by production (£/MWh)	32.14	31.67

Assumed energy prices

	£/MWh
Buy	45
Sell	25
Trade	35

- Average revenue using forecasts £5/MWh higher than sell price

## Summary

- Wind energy forecasting is a proven technology around the world and is starting to be used in India
- Forecasting is a valuable tool to enable reliable and efficient integration of variable renewable energy such as wind.
- With appropriate regulation or market conditions everyone can benefit
  - More revenue for generators
  - Lower integration costs for the grid
  - Lower energy prices for consumers