


# ASI Solar Energy Forecasting Workshop

## AEMO PERSPECTIVE ON THE PROPOSED AUSTRALIAN SOLAR ENERGY FORECASTING SYSTEM

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# AGENDA

1. AEMO's dispatch process and the need for forecasting
  2. Experience with wind generation
  3. Solar forecasting proposal
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- A decorative graphic at the bottom of the slide consisting of multiple overlapping, wavy lines in shades of orange and red, creating a sense of motion and depth.

- AEMO releases to the market a new dispatch of scheduled and semi-scheduled generation every 5 minutes – 24 hours a day every day
- The NEM dispatches and settles about 200TWh of electricity or \$9billion annually (average \$45/MWh pool price)
- If the pool price is at the market cap of \$12,500/MWh then the settlement is about \$300million per hour
- To provide secure management of the power system:
  - There are 2 control centres in the NEM with each site being able to run the full NEM
  - Each site has duplicated computer systems to allow secure management of the power system

- This dispatch is a security constrained dispatch that optimises the cost of dispatch and meets the following requirement:
  - Dispatched generation = Forecast load – unscheduled generation – forecast intermittent generation
- If supply and demand does not match on a second by second basis there are security consequences for the power system – frequency can become unmanageable
- To manage the balance between 5 minute dispatches there are 8 Frequency Control Ancillary Service markets
  - Regulation raise and lower
  - 6 second raise and lower
  - 60 second raise and lower
  - 5 minute raise and lower

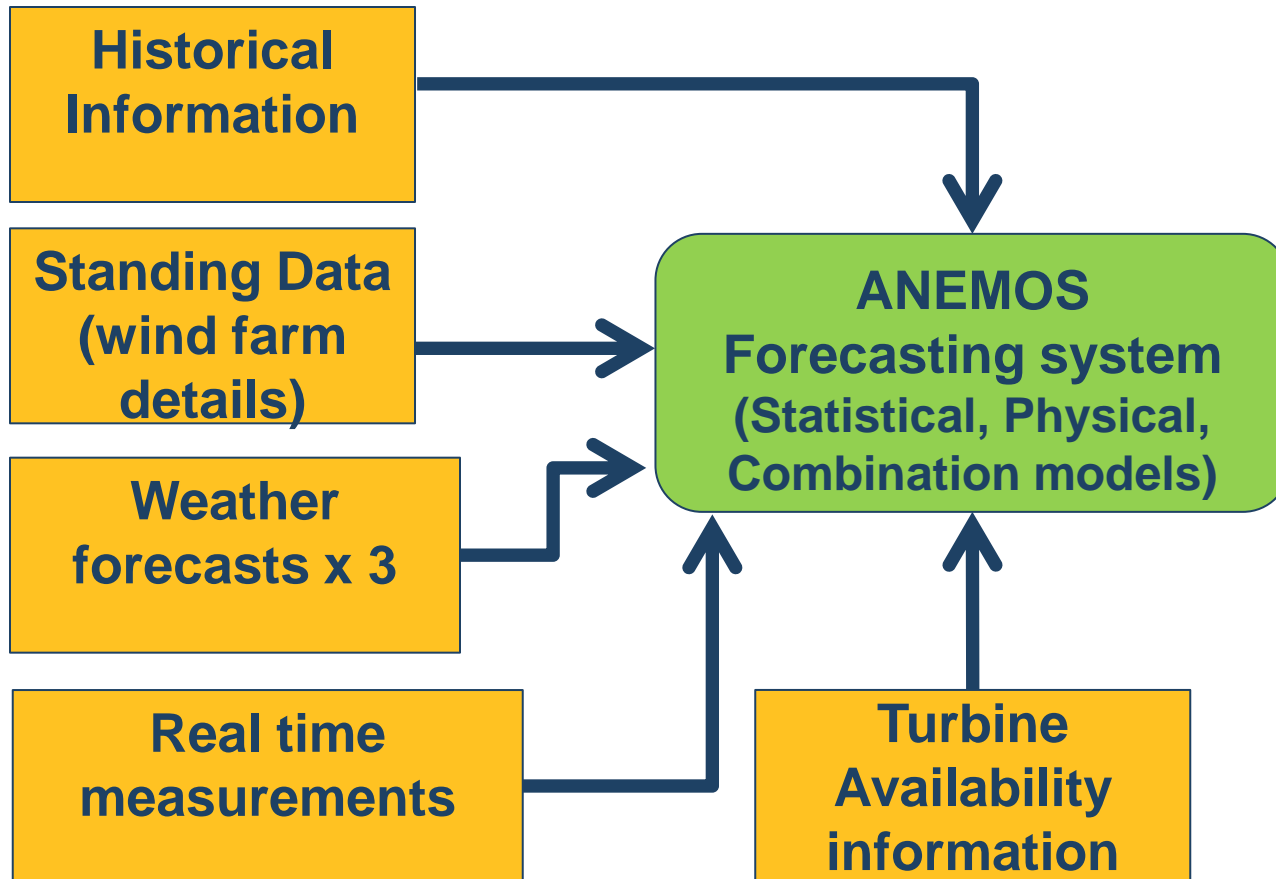
- Demand forecast error and intermittent generation forecast error have to be managed through FCAS
- AEMO will be commissioning a new demand forecasting system by the end of the year – better zonal forecasting so that network constraints can be better predicted in pre-dispatch
  - Not clear how well this will handle the estimated 1,000MW of rooftop photovoltaics distributed around the NEM
- AWEFS at present managing wind farm forecasting well

- This category of generation introduced in NEM in 2008 to manage the network constraints with intermittent generation – wind farms initially
- Required to maintain system security
- Requirement for intermittent generation above 30MW
- Requires AEMO to forecast output of generation based on an Energy Conversion Model
- Intermittent generation is involved in central dispatch process and can be constrained down due to network and other constraints
- AWEFS was introduced to forecast wind farm energy output

# HOW DO WE FORECAST WIND GENERATION ? ANEMOS DATA FLOWS



## Inputs

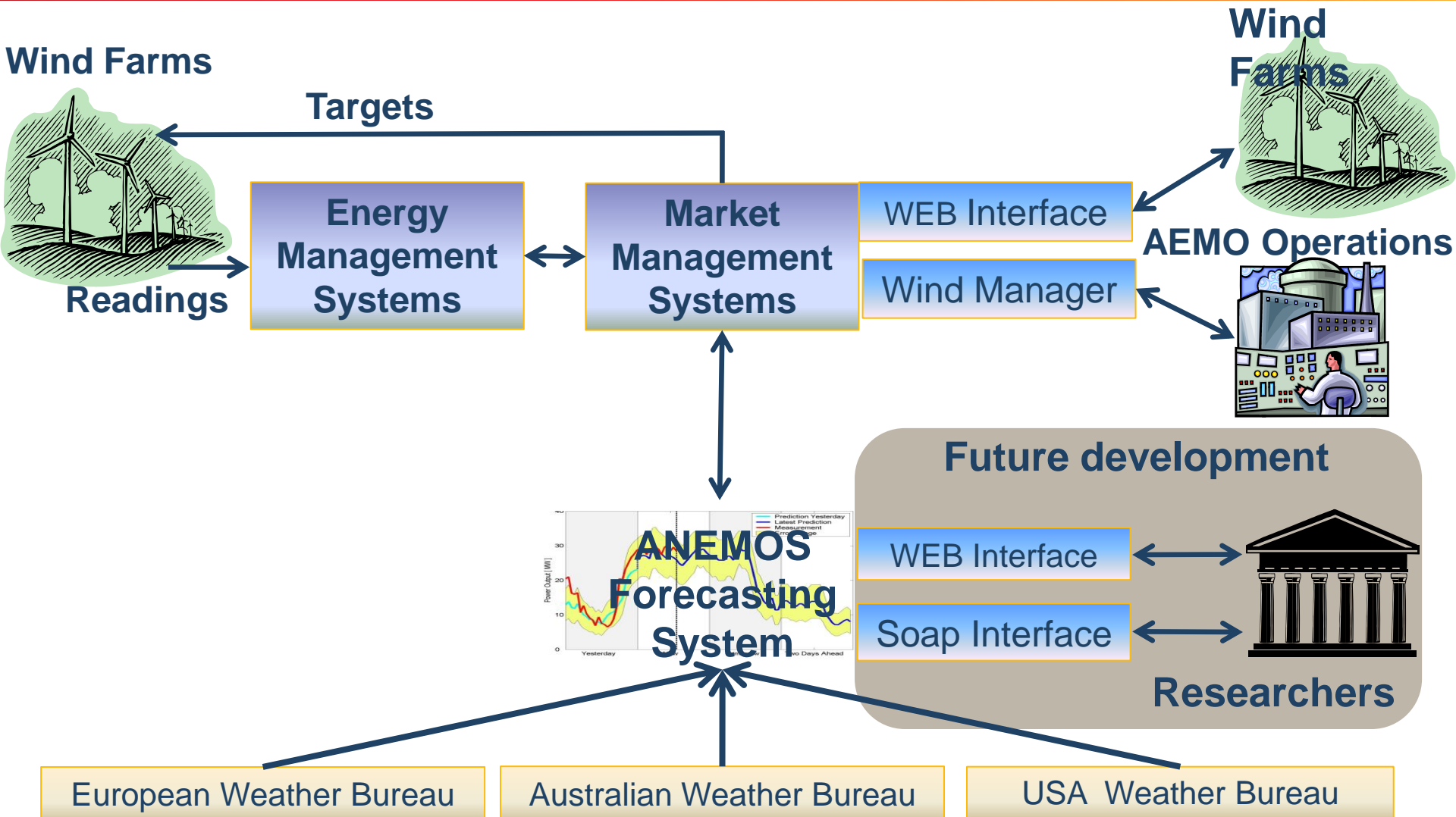


## Output

For NEM Regions, aggregations, and wind farms: with uncertainty levels



# ANEMOS INTEGRATION INTO NEM SYSTEMS



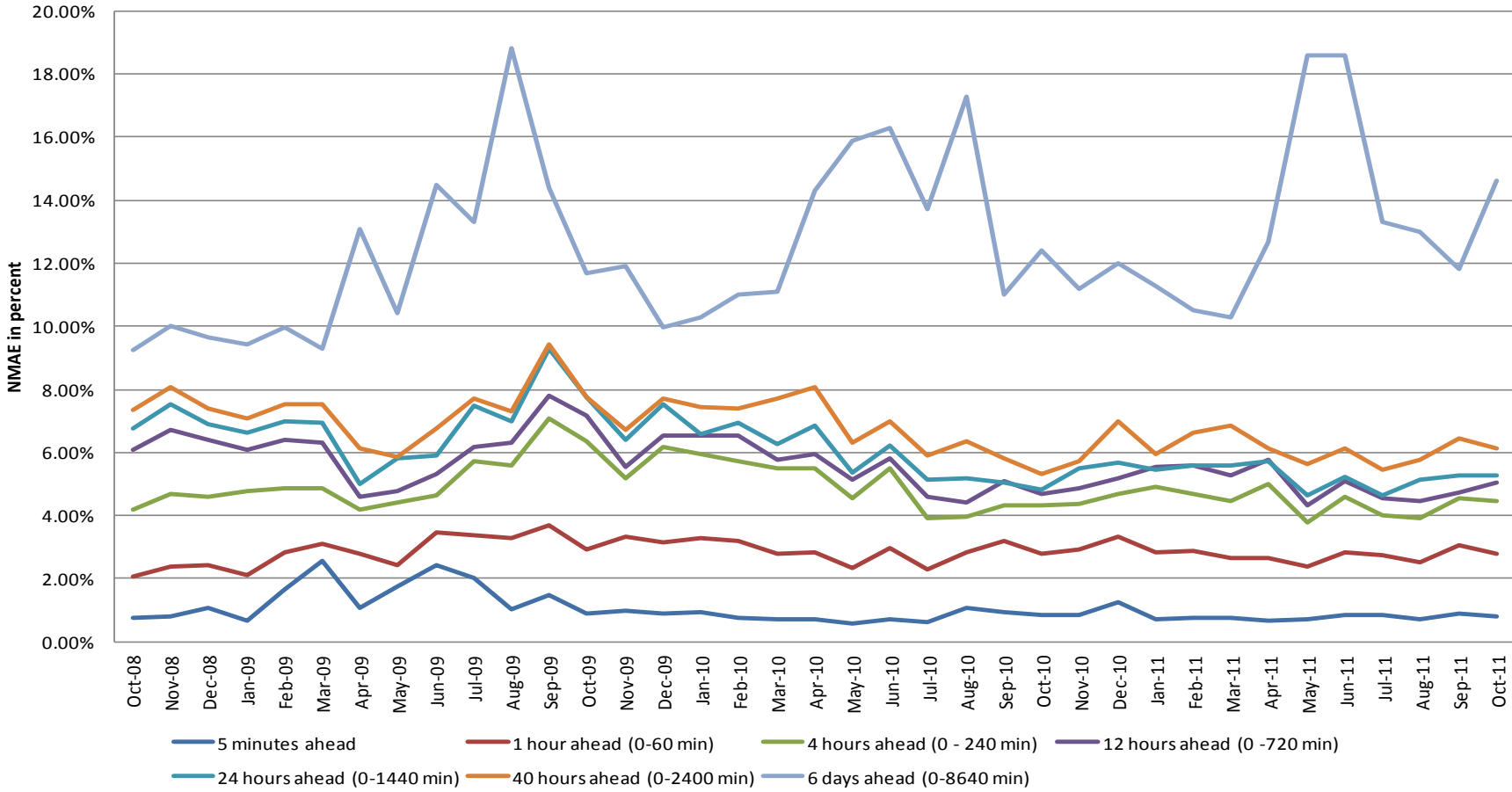


# FORECAST PERFORMANCE ACCURACY – NORMALISED MEAN ABSOLUTE ERROR

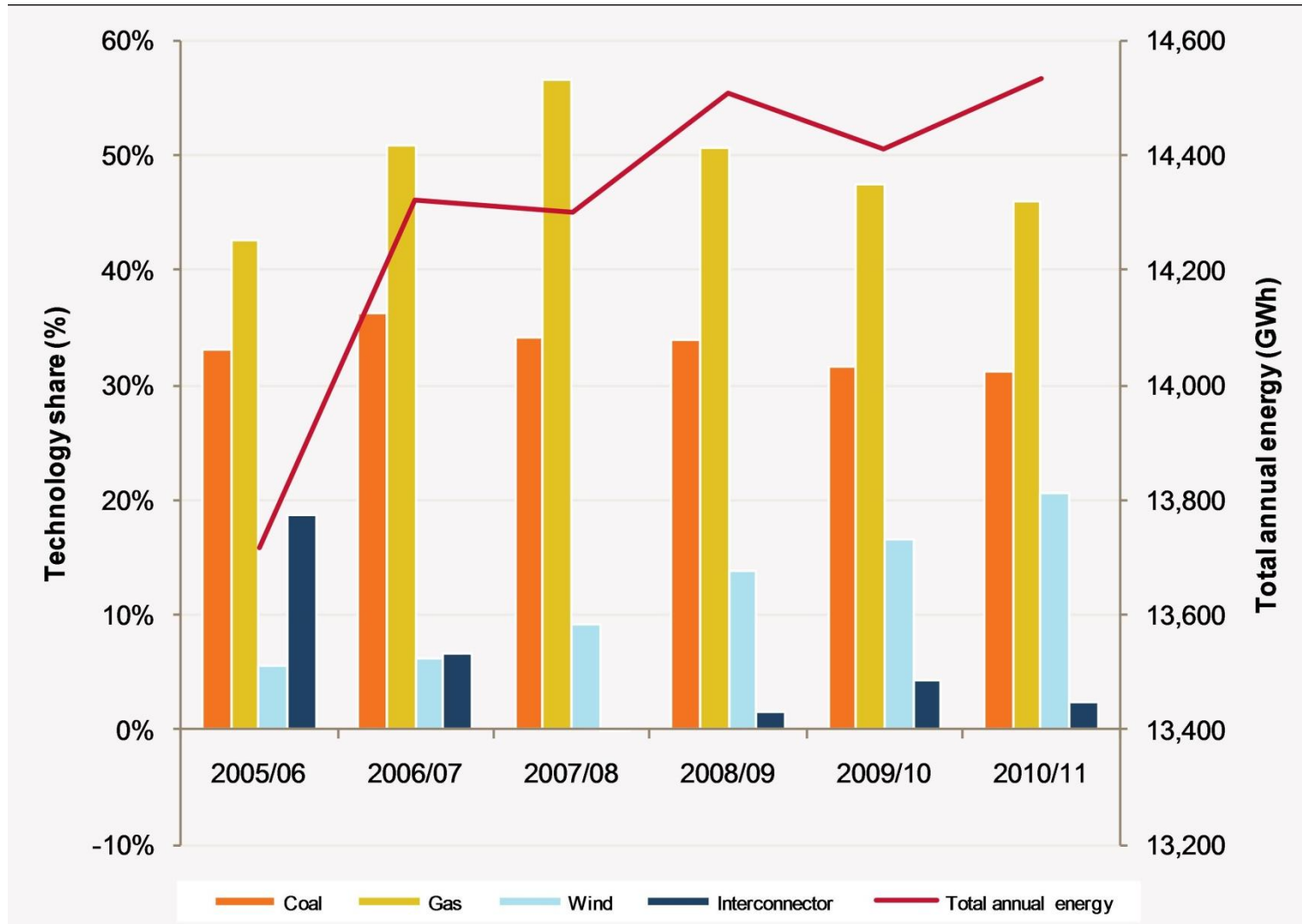


**NEM wide AWEFS forecast accuracy Oct-08 to Oct-11**  
**NMAE Normalised Mean Absolute Error**

Prediction Accuracy



# SA ENERGY MIX



- Use AWEFS structure to add solar forecasting into the dispatch system
- With AWEFS there is the ability for researchers to test and validate their own models off-site but the production models, due to security and integrity requirements, need to be within AEMO production environment on-site – this will also be a requirement of ASEFS
  - Some commercial day ahead forecast systems are being achieved with off-site satellite analysis and data feeds
- Energy Conversion Models (resource to energy output) for PV solar appear to be reasonably straight forward but for solar thermal generation, particularly with partial gas firing, the problem is complex

- Need to develop forecast models with same timeframe as AWEFS
  - Short - 5 minute interval, 2 hour horizon, every 5 minutes (50% probability required)
  - Medium - 30 minute interval, 8 day horizon, every 30 minutes (10%,50%,90% POE)
  - Long - 30 minute interval, 2 year horizon, every day (10%,50%,90% POE)
  - This covers our dispatch, pre-dispatch, short-term projected assessment of system adequacy (STPASA) and MTPASA forecasts

- First priority is to develop a system which will provide basic forecasts for the solar flagship projects of Solar Dawn and Moree Solar when they reach >30MW output
- Second priority is to develop forecast for distributed solar rooftop PV systems

- Large scale solar projects will require AEMO to forecast their output as a semi-scheduled generator so that the system security is maintained
- We recognise that models may not be accurate at the start but also realise that to get higher penetration of solar this forecasting needs to get to accuracy levels approaching those now being achieved by the AWEFS
- The proposal will allow wide access to data and test bed systems so that other parties can engage in research and development apart from the primary deliverers of the system



# AEMO

AUSTRALIAN ENERGY MARKET OPERATOR

QUESTIONS?

