Fulcrum3D: Wind Forecasting for the NEM

LESSONS LEARNT REPORT 3

Project Details

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This Project received funding from ARENA as part of ARENA's Advancing Renewables Program - Short Term Forecasting funding round.

EXECUTIVE SUMMARY

- Our forecasting model continues to be more accurate than AWEFS such that it has passed AEMO's accuracy requirements with respect to RMSE and MAE on 5-minute power production.
- MP5F API status for the three Pacific Hydro wind farms involved in this project:
  - Clements Gap - submitting unsuppressed forecasts
  - Taralga - submitting unsuppressed forecasts in the assessment phase
  - Crowlands – registered.
- The MP5F API is increasingly robust. A secure automated (or semi-automated) system for resetting passwords would be helpful. A published API connection process with worked examples would also be helpful.
- Overall forecast refinement is ongoing.
- It was hoped that remote SCADA access would streamline the forecast process but at Taralga we found that the system did not have the availability that is required for such a real-time application (discussed further below).
- Pacific Hydro continue to be excellent project partners, we would like to acknowledge their invaluable contribution.
- The project is on track to meet its outcomes.

KEY LEARNINGS

1. Category: TECHNICAL

1.1. Objective: Demonstrate the five-minute ahead self-forecasts are more accurate than the AWEFS and ASEFS

Lesson Learnt No. 1.1.1: Remote SCADA access needs to be reliable with high availability to be useful in applications like real time forecasting.

Details:

- Pacific Hydro utilised a remote access system for SCADA data (the GOS or Global Operating System). We are using the GOS at Clements Gap (rather than our previously installed logger) to query the wind farm SCADA from our servers in Sydney.
- We were optimistic that the GOS would also provide streamlined access to real time plant data at Taralga and Crowlands and remove the need for onsite loggers. We are now re-exploring the logger option with Pacific Hydro because:
  - The Taralga GOS availability has not been high enough for this type of real time application.
  - Implementation of the Crowlands GOS has been delayed.
- We have learnt that cloud-based systems like the GOS that are not built for real time controls may not be suitable for use in these types of forecasting applications. The GOS is a plant monitoring tool so did not require (and was therefore not built with) very robust continuous communications capability.
- A useful comparison is the Kidston SCADA data integration which was trivial from a technical point of view. It used onsite hardware and a dedicated RTU and continues to run smoothly.

Lesson Learnt No. 1.1.2: SCADA integration is now the most complex part of the self-forecasting system.

Details: Real-time integration with the solar or wind farm SCADA system is critical to effective self-forecasting. The MP5F and our self-forecasting system have evolved to the extent that site-specific SCADA integration is now the most variable and complex component in the establishment of a self-forecasting system.

Lesson Learnt No. 1.1.3: Be aware that that the assessment period can take over 16 weeks if the forecast does not pass assessment in the first 8 weeks.

Details:

- AEMO assesses the MP5F forecasts for accuracy and availability over 8 weeks.
- If the forecast doesn't pass assessment in that time it is assessed for up to 16 weeks until it passes on a cumulative average. The RMSE and MAE are calculated for all weeks up to 16 weeks and must be more accurate than AWEFS 80% of the time.
- If the forecast still doesn't pass for weeks 1 to 16, then week 1 is removed and week 17 is included. The rolling 16 week performance of the forecast is assessed until the forecast passes.
- This means that if the forecast has a significant error in week 4 (for example) which is large enough to make the rolling MAE and/or RMSE worse than the AWEFS error, then the forecast will not be able to pass assessment until week 20 (when the week 4 data is no longer included).

- It is important to thoroughly test your forecast performance (including SCADA connections) before entering the assessment period.

Lesson Learnt No. 1.1.4: A secure automated (or semi-automated) system for resetting the MP5F API passwords would be useful.

Details: The MP5F API is stable and has been materially streamlined in the last 12 months. The consistent requirement for password resets every 90 days is cumbersome and reliant on the participant. This process could be improved via a secure automated (or semi-automated) system for resetting passwords.

Lesson Learnt No. 1.1.5: A rounding feature in AEMO's dispatch engine appears to make it impossible to forecast accurately when the plant is at full capacity.

Details: A setting in AEMO's system appears to round the plant capacity down to the nearest MW in the dispatch engine. This means that it is impossible to forecast accurately when the plant is permitted to produce at full capacity and is doing so.

2. Category: COMMERCIAL

2.1. Objective: Demonstrate the potential commercial benefits of wind and solar farms investing in short-term, self-forecasting solutions.

Lesson Learnt No. 2.1.1: It is possible to satisfy AEMO's accuracy requirements and achieve zero causer pays MPF at wind and solar farms via MP5F with generators operating under normal conditions.

Details: We modelled the Causer Pays market and optimised our submissions for FCAS savings. We found that we could reduce the MPF (Market Participant Factor) and resulting Causer Pays charges to as low as zero in some months.

Lesson Learnt No. 2.1.2: Significant savings can be made with SCADA only forecasts.

Details: Our analysis found that a robust power model utilising low latency persistence data and real-time plant state SCADA information can deliver significant Causer Pays savings without wind or cloud forecasting systems. systems. We expect that effective wind and cloud forecasting will be required to maximise FCAS savings as AWEFS, ASEFS and the FCAS markets evolve, or on-site self-forecasts are used for market bidding in the upcoming 5-minute market.

Lesson Learnt No. 2.1.3: We acknowledge the importance of operational safety systems and manual overrides.

Details: It is important to acknowledge that these forecasts are being used in an operational power system and must have sufficient operational checks and safety systems along with manual overrides (this could simply be a documented process utilising AEMO's existing access control system and doesn't necessarily need to be a user interface on the system itself).