



IMPROVING FREQUENCY CONTROL TO BUILD NETWORK STABILITY

INSIGHTS FROM PACIFIC HYDRO



Over the past six months there has been an increasing focus on how to improve the frequency controls of power grids across Australia, as the industry grapples with how to keep energy supply and demand in check.

When it comes to frequency control, Australia is unique in its approach. Rather than managing controls through fixed services with a level of mandated requirements, Australia has created a real-time market for the provision of all of its frequency control.

According to Kate Summers, Manager of Electrical Engineering at Pacific Hydro, this approach needs to be revised in order to ensure Australia's power systems are able to withstand major events and secure energy supply for the future.

"The frequency market framework at present has allowed a situation to develop where the control of the synchronous units are now suboptimal. These units, which are made up of thermal, gas and hydro power, need to be very carefully coordinated in terms of the way they are controlled," she says.

So what steps can the industry take to improve frequency control of the power system? And, more importantly, what strategies can be used to ensure new generation systems are created without deteriorating power system control to ensure a stable energy supply in the coming years?

To answer these questions we recently caught up with Kate Summers ahead of the **Power Grid Resilience Summit 2017**. Below, Kate shares her tips for establishing good frequency control practices and the steps Pacific Hydro is taking to provide greater grid stability and improve management of peaks in energy demand.



INVESTIGATING MARKET FRAMEWORKS FOR FREQUENCY CONTROL: WHAT NEEDS TO CHANGE?

“The current market framework appears unsuited to managing the eastern seaboard frequency control and has as a result, allowed the frequency control to deteriorate.

While the current framework is meeting the prescribed standards, the normal operating band is quite unique and is not consistent with international practice. As an industry, we have detuned our focus of being able to control frequency at 50 hertz and we have spread this across the whole area of the normal operating band which means the frequency is suboptimal.

This suboptimal approach leads to expensive outcomes. These issues could be mitigated by reverting to good primary control practice. Strategies to investigate and improve current market frameworks goes back to good engineering practice which involves improving the steps taken to control the speed of a single generating unit – which is not something we are doing at the moment. We effectively need to revisit fundamental control practice.”





ESTABLISHING GOOD CONTROL PRACTICES

“When we think about a power system, it should be designed and operated to provide three things: constant frequency, constant voltage and reliability. There is evidence to suggest the market itself is now a destabilising contributing factor.

The market is meant to operate within a security constrained dispatch, but the evidence shows the market dispatch is interfering with power system control in a detrimental manner. We need to go back and re-establish control practices in order for the power system to return to being efficient and stable.

Good control practices are based around engineering. A lot of the discussion and debate around energy supply and demand is around policy, economics and the market. What we’re missing in the conversation, which is a major contributing factor, is whether or not we’re getting the engineering right.

The engineering of a power system is very specific and a very important factor in improving energy stability. We are displacing the engineering practices by expecting the market to solve all things and the market is stepping a bit outside of its realm of what it can and can’t do.

To get the power system to a standard so it can withstand major events, we need to go back to what is good control practice. The frequency market framework at present has allowed a situation to develop where the control of the synchronous units are now suboptimal. These units which are made up of thermal, gas and hydro power need to be very carefully coordinated in terms of the way they are controlled.

At the moment, we're seeing a little interplay between the energy dispatch and frequency dispatch. This is affecting how units are controlled in the power system. There is evidence to show where the stability problem lies, and it can be proven that it is not caused by renewable energy plants. While the renewable energy plants may displace some synchronous units and the existing inertia, it means that the other controls need to be even better than they were. Right now, they are not as good as when we started in the market."

CREATING NEW GENERATION SYSTEMS THAT DON'T DETERIORATE FREQUENCY CONTROL

"The new generating systems such as solar and wind, need good control systems to be able to contribute to the characteristics the power system needs. These systems need to be able to contribute to frequency control, good voltage control and also have reliable design. When you are designing a new solar or wind farm, it is important there is some form of redundancy in the design.

For example, a lot of the locations where these new plants are being built only have single connection points or singular transformers. This means there is a lack of redundancy in capability and this is not viable for the long term power system.



Good forecasting systems that can be integrated into the market systems are also important. At the moment, the Australian wind energy forecasting system is not as good as it could be, especially for the dispatch period. It is the short term forward forecast that impacts the most on dispatch and this is the area we need to improve.

Ultimately, power systems have to be controlled in accordance with physics. If we coordinate all of the controls of the units in the system, that is how we can achieve efficient delivery of energy.

At present, some market frameworks have made certain assumptions that are now driving the power system in a way that is not efficient. It has taken about a decade and a half for this problem to develop and while there has been a number of different things that have occurred, in the last four to five years it has become very evident that this deterioration is significant and it is present."

MAINTAINING THE RIGHT SKILLS

"The key tools for good power system resilience are maintaining the right engineering skills within the industry. Power system control engineering is one area of concern. At the moment we have got good control engineers are working individually at stations and are addressing individual requirements.

But ultimately we should have a body of engineers who are looking to ensure the power system is achieving what it is meant to be. For example, questioning if the units are behaving in the power system in the collective manner that they are expected to? There needs to be more focus on this area in the future."

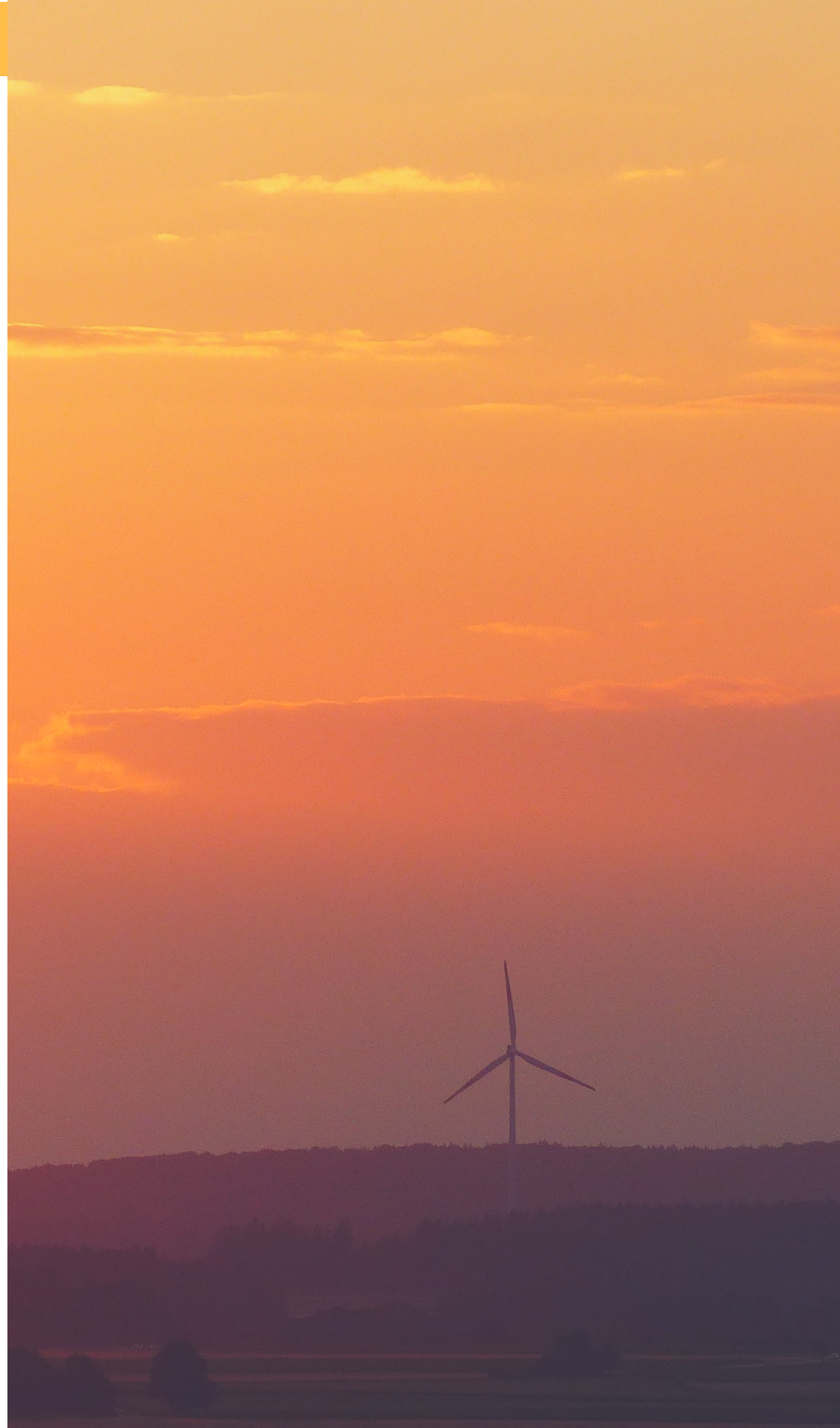


THE PACIFIC HYDRO APPROACH: STRATEGIC PLANNING TO IMPROVE GRID STABILITY

“When Pacific Hydro designs a new project we are looking to deliver the features and functions that will contribute to grid performance over the life of project.

This means we undertake a review of our operating assets and investigate additional controls that would provide improved control to contribute to better grid management.

For example, within some of our older plants we want to ensure the information and forecasts on those plants are available to the market systems in a more accurate manner than what has been done in the past.”



INTERESTED IN LEARNING MORE?

Join Kate at the **Power Grid Resilience Summit** taking place on the 23-25 August in Melbourne where she will further explore:

- Assessing the market structure and its influence on the deterioration in the frequency control of the power system
- Delivering a system that doesn't sacrifice control systems
- Investigating the market frameworks for frequency control

For more information visit <http://powergridresilience.iqpc.com.au> or call +61 2 9229 1000 or email enquire@iqpc.com.au

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“The value of attending Power Grid Resilience 2017 is the opportunity to gain a deeper understanding of other underlying issues which contribute to power system security and possible solutions that lead to more stable and efficient grids.”

Kate Summers

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