

From: Malcolm Park [REDACTED]
Sent: Thursday, 13 February 2020 5:17 PM
To: Andrew Kingsmill [REDACTED]; Sean McGoldrick
[REDACTED] >
Subject: HumeLink PADR Forum

Sean and Andrew,

I did enjoy the presentations made by you both and by Ann and Ian at the Forum yesterday.

I totally agree with your **preferred Option 3C** as the new system connections that need to be made to increase the capacity of this section of the NSW main transmission system to cope with increased supply coming from planned and expected additional wind, solar and Snowy 2 generation over the next few years. I also agree with the expected timetable that this development will be needed.

Justification for Proposing Two Single-circuit Line

As I said at the Forum I have some concerns with the **justification of proposing two single circuit lines** (each needing a 90m wide easement) where a double-circuit line (of one 70m wide easement) would suffice – particularly in the section from Bannaby to near Yass and also maybe on the line exists from the Maragle substation.

My concerns are primarily based on the need to acquire the significantly additional easements (around 250% more area) could jeopardise the EIS process and the timing for completing the project due to community objections. This proposal also increases the cost of these works probably unnecessarily.

Consistent with my comments at the Forum, the NSW main system has been extremely reliable over many years. Whether reliability is measured by the number of “system minutes” lost as a result of unplanned outages or by the fact that no major state-wide system disturbance has occurred in NSW over the last 56 years. Clearly the reliability of the NSW system not only exceeds the reliability of all other states in Australia but it is also the envy of most major power systems around the world.

Also consistent with my comments at the Forum, every additional major generation (of say 1000MW or more) developed in NSW over the last 50 years has been connected to the system by **one double-circuit line**:

- Munmorah 1400MW – by a 330kV D/C line, Central Coast to Sydney.
- Liddell 2000MW – by a D/C 330kV line, Hunter Valley to Sydney.
- Wallerawang 1000MW – by a D/C 330kV line, Wallerawang to Sydney.
- Vales Point 1320MW – by a D/C 330kV line, Vales Point to Newcastle.
- Eraring 2640MW – by a D/C 500kV line, Central Coast to Sydney.
- Bayswater 2640MW – by a 500kV line, Bayswater to Mt. Piper site.
- Mt. Piper 1320MW – by a 500kV line, Mt. Piper to Marulan.

All of these power stations commenced operation at a high capacity factor (70% to 90%), and most are still operational at a high capacity factor.

By comparison virtually all of the new wind or solar generation, planned to be connected from south-west NSW, will be operating at significantly lower capacity factors (20% to 30%) and the Snowy 2 development will reduce the capacity factor of Snowy's overall operations from about 15% to a generation capacity factor of probably less than 10%.

Consequently, the periods of high flow on this part of the NSW power system is likely to be only for a very low number of hours per year.

There are a small number of hours each year that, due to specific system conditions or environmental conditions, any of the double-circuit lines in NSW have been and will continue to be declared a "single contingency". This can result in the rescheduling of generation around the system for short periods of time and even, in the extreme, may require some "load reductions" in specific areas for a short period.

It appears to me that there exist many parts of the network already that are subjected to this type of constraint and those parts, at times, are certainly more heavily loaded than the duty that will be required by the HumeLink system upgrade.

I strongly suggest that as part of the HumeLink development, you review the need for two new single-circuit lines in sections where one double-circuit line is enough.

Transient Stability Assessment

There are presently about 1,400MW of pumping capacity in the NEM (T3, Shoalhaven, Wivenhoe and Jindabyne). It took many years to fully understand what system limitations needed to be applied when running pumps, particularly at Tumut 3, due to the need to fully understanding how synchronous pumps react at times of a close-up system fault and the modelling of such.

The addition of another about 2,000MW of pumps at Snowy 2 will clearly make a huge change to the dynamic performance of the interconnected system during and immediately after a close-up system fault when major pumping loads are in-service. This maybe particularly unknown having regard that half of the machines at Snowy 2 are proposed to synchronous machines and half are proposed to be ass-synchronous machines.

At this stage, I am not aware if the technical characteristics of such machines are yet fully available or also, is there a strong confidence in the model representing those characteristics being used to fully understand the power system transient stability performance when pumps operate.

Future Option 4 Comments

Although not presently part of the recommended HumeLink proposal, it is clear to me that probably not too many years after the Option 3C is underway that constraints on the system between Wollongong and Sydney will be recognised and require additional transmission capacity to be provided across that part of the network. Your Option 4C appears to show a single-circuit 500kV line may be needed.

I would be horrified if that valuable easement was not used for a double-circuit 500kV line to ensure the very long-term needs of supply to Sydney from the south is secured. We build

these assets using around a 25-year horizon but as we all know these assets easily live for 50 + years and beyond.

I hope my comments may be helpful to TranGrid.

Kind regards, **Mal Park**