

## MARCH 2016 - THREE PHASE FAULT CREDIBLE CONTINGENCY

### Issue 1:

No evidence has been provided that the proposed change will result in improved efficiency of investment in Western Power's infrastructure.

### Issue 2:

No evidence has been provided that the proposed change will provide acceptable margin of safety. If implemented, the safety margins would be reduced below an acceptable level.

1. When proposing changes to the Technical Rules (TR) and seeking exemptions from compliance, the TR Users and the Network Service Provider (NSP) should be held to the same standard of accountability and burden of proof. One such a standard, Western Power's "Guideline for Users Seeking Technical Rules Exemptions", is available on:  
<http://www.westernpower.com.au/documents/customer-technical-rules-exemption-request-guidelines-and-form.pdf>.

It requires applicants to:

- State all assumptions
- Attach all documents referred to
- Ensure that opinions are not presented as facts

Western Power's submission dated 2 March 2016 does not fulfill these requirements and it does not justify the case for the proposed change.

2. The submission is silent on the arguments presented to the Technical Rules Committee and public at the time Western Power justified all differences between the TR for the South West Interconnected System (SWIS) and the National Electricity Rules (NER) for the National Electricity Market (NEM).

We therefore disagree with the opinion that "... *the NER are an accepted best practice industry benchmark in Australia*", because each power system is unique and has unique history to its present state.

3. We disagree with the opinion that "*This amendment would mean that Western Power's technical requirements are better aligned with the national requirements*", because, among other things, Transmission Network Service Providers (TNSP) in NSW, VIC and SA have an agreement to simulate two-phase faults (instead of three phase faults) for transmission lines 275kV and above. At voltage levels below 275kV, three-phase to earth faults are simulated (due to historically weak interconnectors between the states and relatively strong power systems within each state). Two important characteristics of the SWIS are that it is an isolated power system of the 'load point type', where major transmission corridors supply one main load center – Perth load area. In case of an emergency in the SWIS, there are no neighboring power systems that could provide assistance.
4. We disagree with the opinion that "*System transfer capability .... is limited according to definition of the credible contingency which must be considered*", because it does not account for other factors which must be considered simultaneously. These include, but are not limited to, accuracy of the computer models for loads and generators, protection clearance times and safety margins. Protection clearance times are much shorter in the NER (see Table S5.1a2) that those in the SWIS (see Table 2.10 and Table 2.11), and NER has

much better generator models, due to regular and extensive verification of computer models and dynamic performance. Finally, three stability safety margins were removed from the TR-2007: Transient Voltage Dip (TVD), Transient Voltage Recovery (TVR) and 180 degrees rotor angle stability criterion, as over-conservative.

5. We disagree with the opinion that “ ... *the interlocking design of the circuit breakers and earth switches further minimize the possibility of such [XX: three-phase] faults occurring*”, because the interlocking prevents faults due to human errors only. The interlocking design did not prevent three blackouts in 1994 and 2006 in the SWIS, neither the largest blackout in Europe in 2006.

The authors of the submission may have overlooked that the “three-phase fault” (without connection to earth) was deliberately NOT included in the list of credible contingencies for brevity: in terms of the power transfer capability all three-phase faults are equivalent – zero MW for the duration of the fault.

6. Reference to “pole-slip protection relays” is counterproductive for the argument; their operation has detrimental effect on power system security and reliability, as it disconnects generators and aggravates blackout situations.
7. We cannot agree with the opinion, to the effect of, that “*the proposed change, if implemented, may have beneficial impact on the power transfer capability of the 220kV transmission to Eastern Goldfields (EGF)*”. One has to review the results used to set the current power transfer limit. Given the extreme length of that line, it is much more likely that voltage stability, rather than rotor angle stability, determined the 155MW power transfer limit. If so, then the proposed change would have no effect to increase the power transfer limit on the EGF line. This could explain the reported apparent lack of interest in this topic Newmont Mining and BHP Nickel West expressed to Western Power during stakeholder engagement.
9. Finally, there is a possibility that the power transfer limit on the EGF line may be increased at no cost if it was found that the application of the TVD or TVR criterion, abandoned in TR-2007 as over-conservative, set the current 155MW limit. Such a document may have been already submitted to the ERA/IMO.