

Transition to fewer synchronous generators

South Australian case study



South Australian Power System

Operated with > 100 % IBR generation number of hours

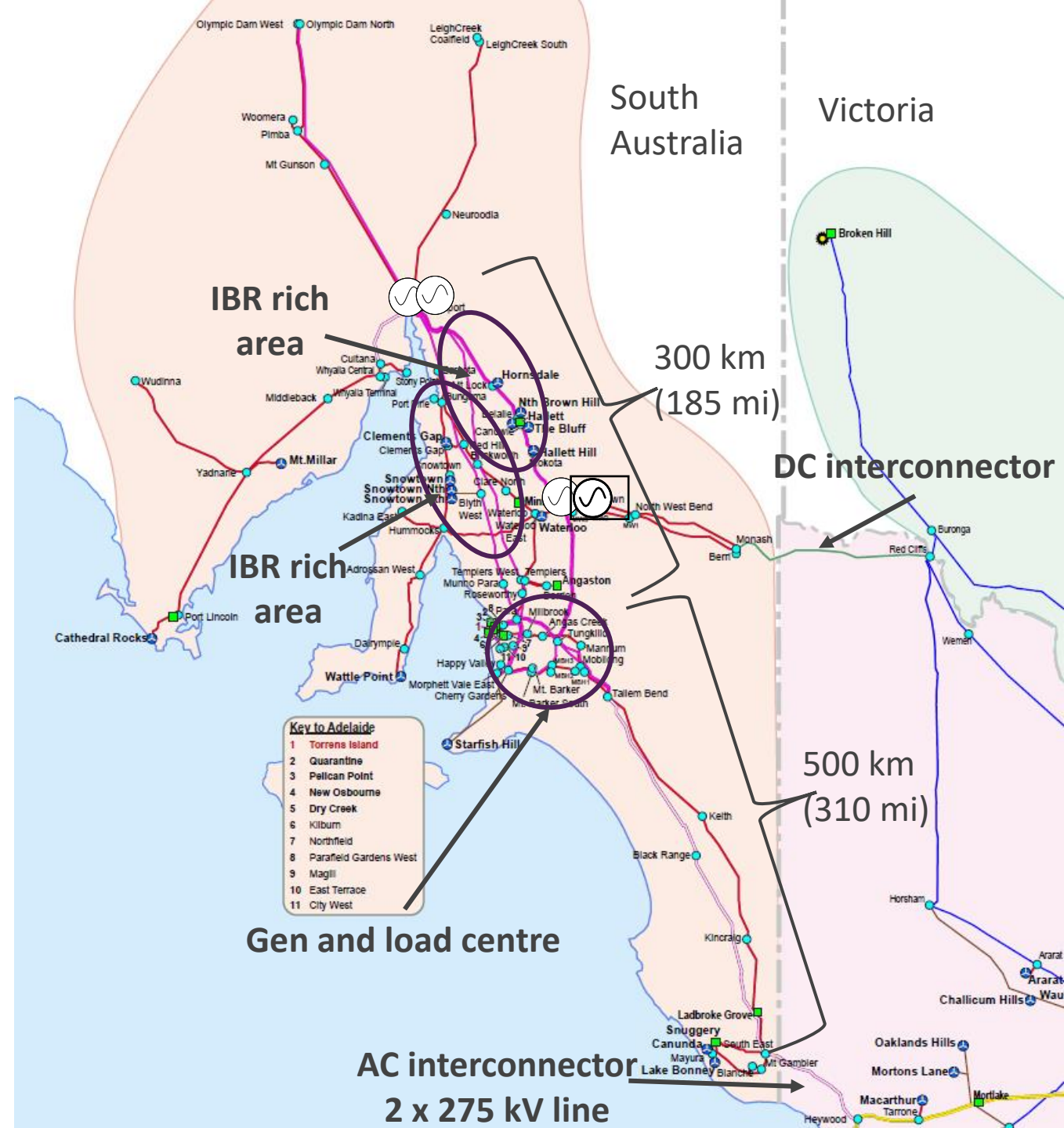
Demand: ~150 - 3,100 MW with a 1,400 MW median

Installed inverter-based generation: ~2,700 MW (incl 200 MW of BESS)

Rooftop PV in addition: ~1,400 MW

Large synchronous generators are gas-fired

Four synchronous condensers – with flywheel



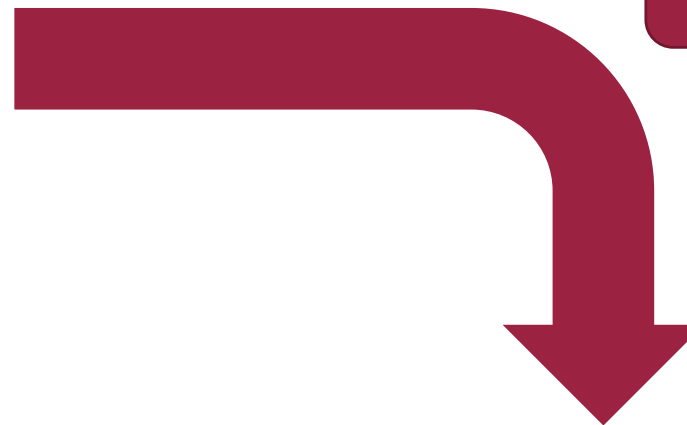
SA power system transition

System black event



Source: ABC News, <https://www.abc.net.au/news/2021-09-28/sa-statewide-blackout-anniversary-energy-impacts/100496564>

Shortfall of
system
strength

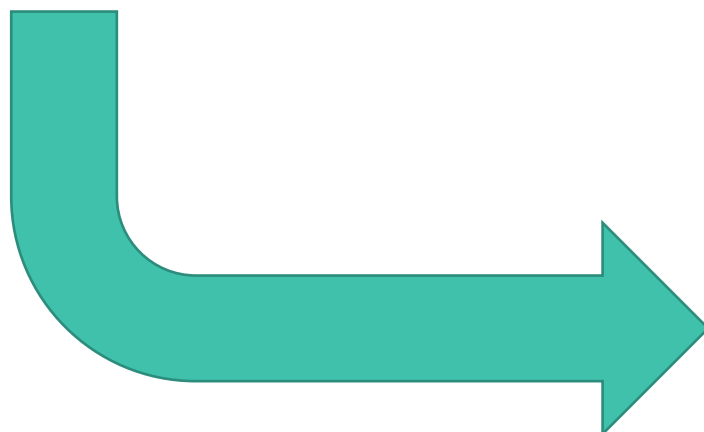


Sync cons
commissioned

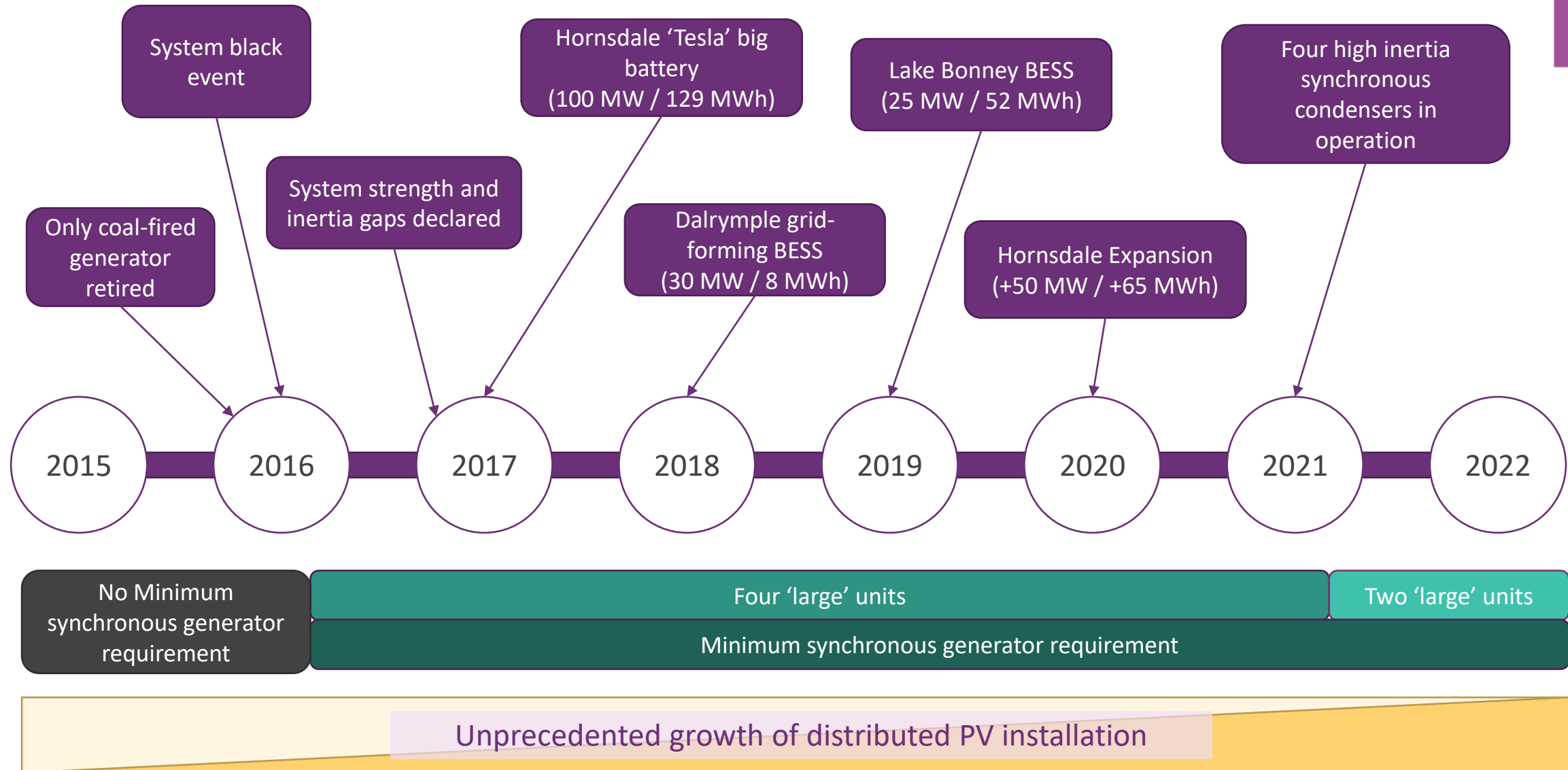


Source: ABC News, <https://www.abc.net.au/news/2021-10-26/electricity-grid-security-bolstered-by-synchronous-condensers/100567580>

Shortfall of
inertia

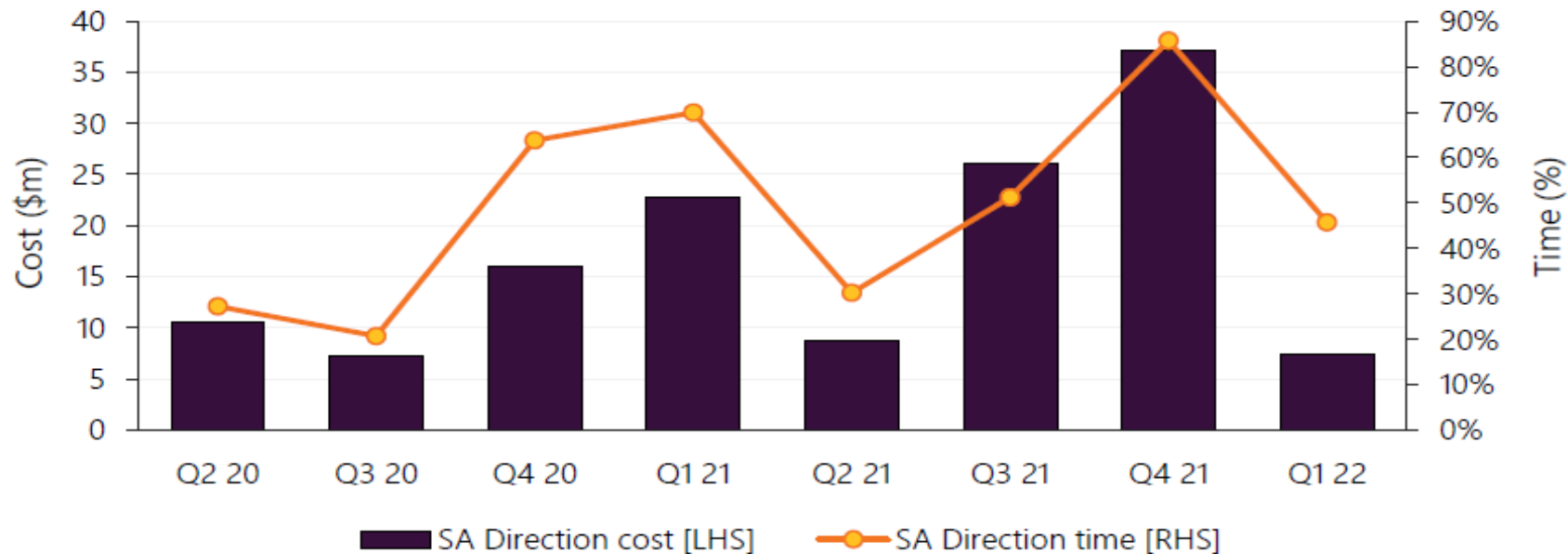


SA power system transition

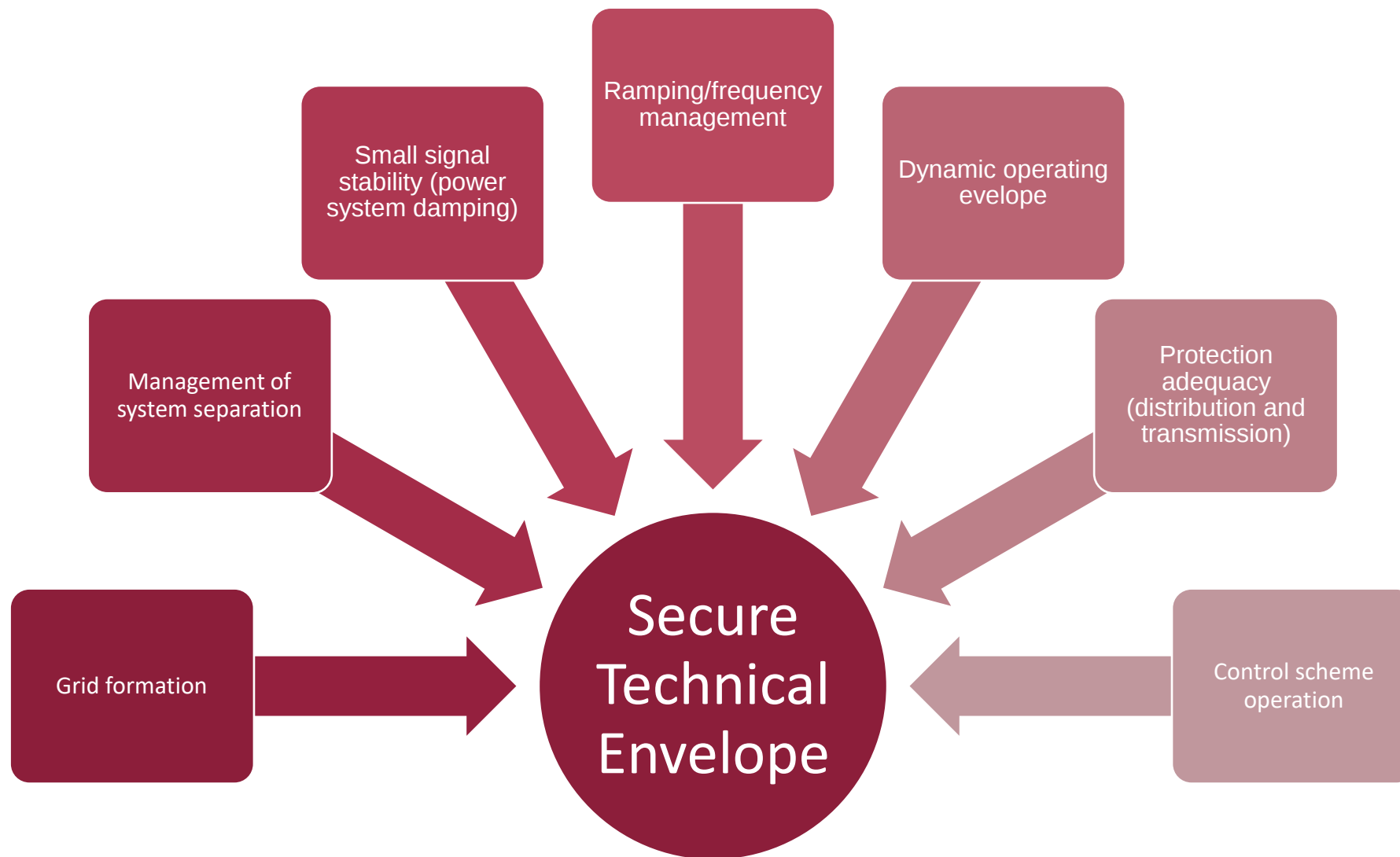


Current status

- Current requirement for SA: 4 synchronous condensers and 2 synchronous generator minimum.
 - 2 units still required to ensure system security can be maintained
 - Reduction in requirement has reduced market intervention costs



Understanding limits of operation beyond 2-unit requirement



Next steps

Grid formation could be ok? But more work needed

- Initial desktop studies for grid formation and grid reference show SA system could be theoretically capable of ‘holding together’ without synchronous generators. Further desktop studies and real time tests required as this is world-first operation.

Redefine system limits

- Changes in the operating envelope for SA, including VRE and DER growth, are increasing complexity in operating the region.

Testing

- Because operating a power system in this manner is a world first, real-time controlled system tests may be required once desktop studies are complete.



For more information visit

aemo.com.au