

Annual Power Engineering Exchange (APEX)

Connecting Solar Farms to Rural Networks

September 22nd, 2020
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EEA.CO.NZ

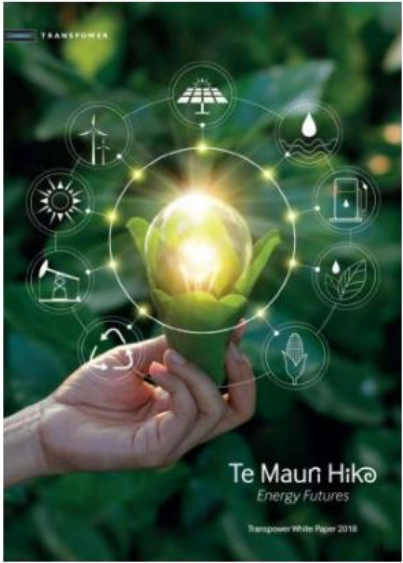


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Transitioning to Carbon Zero

- 100% renewable electricity by 2035/2030
- 22% of electricity generation to be solar by 2050
- Electricity demand to double by 2050



Kea Energy

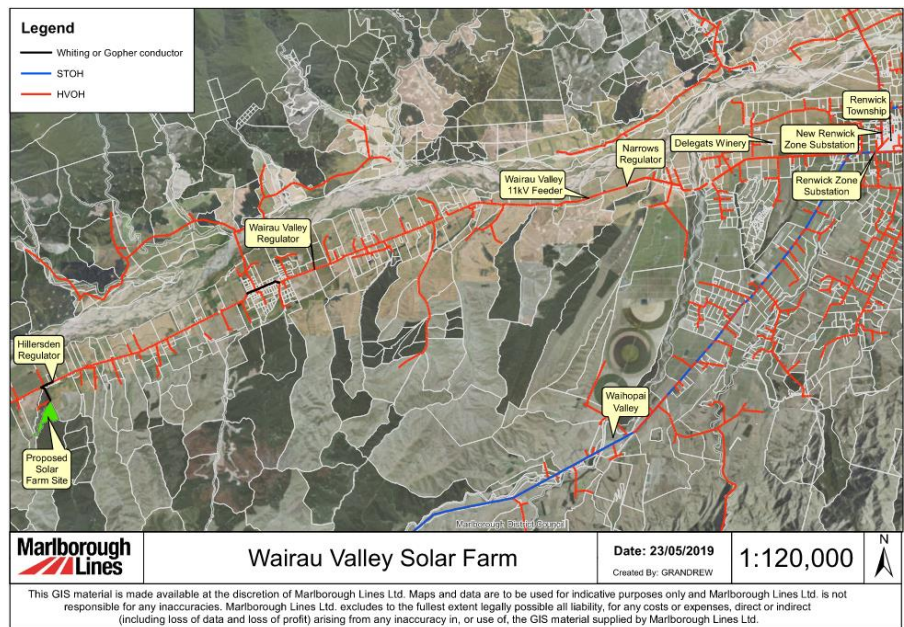


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Proposed Solar Farm

- 2MW of distributed generation
- Via a 1.3km spur line from main 11kV feeder, 35km from Renwick Substation
- Majority of the load situated within 11km of Renwick Substation



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Background- Distributed Generation

- Distributed generation (DG) can voltage regulate via active and reactive power support
- Optimum placement of DG can benefit a distribution network when placed near load
- However rural electrical networks tend to be sparse, long and weaker than urban networks.
- Must continue to ensure the quality of the power supply to these networks.



Scope for Connection Studies

Connection studies to determine:

- Voltage stability
- Dynamic stability
- Harmonic issues



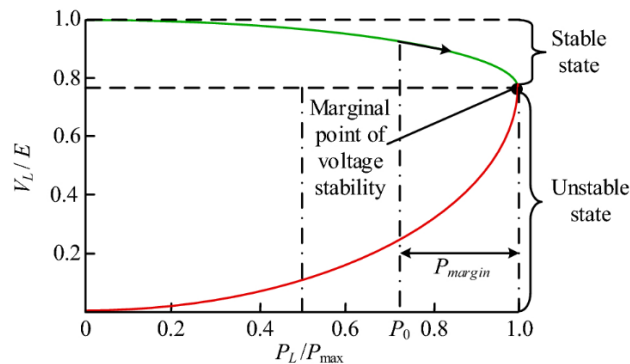
Investigation Procedure

- Undertake studies across a range of network loads and solar intensity levels through modelling in PowerFactory.
- PowerFactory model based on:
 - SLD provided by Kea Energy
 - Marlborough Lines network model
 - Transpower South Island dynamic model

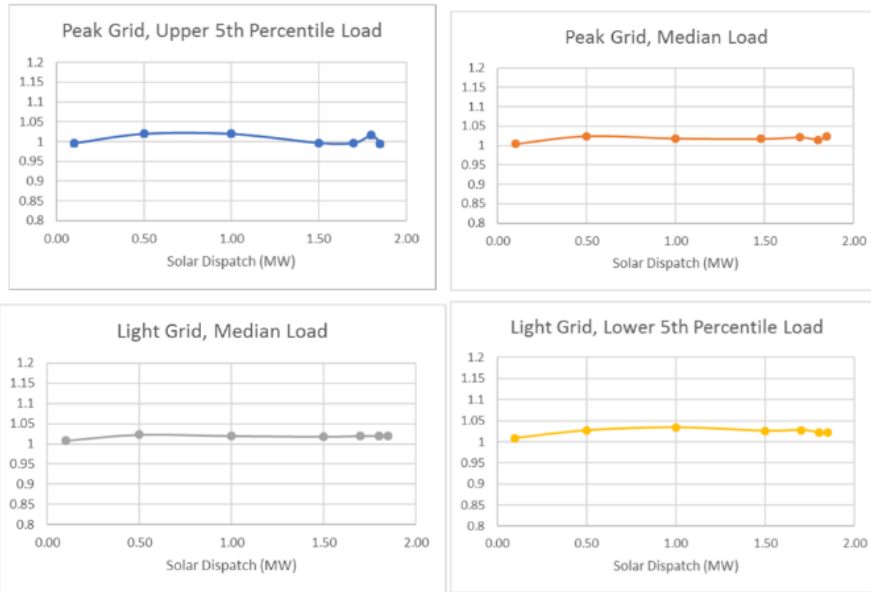


Voltage Stability

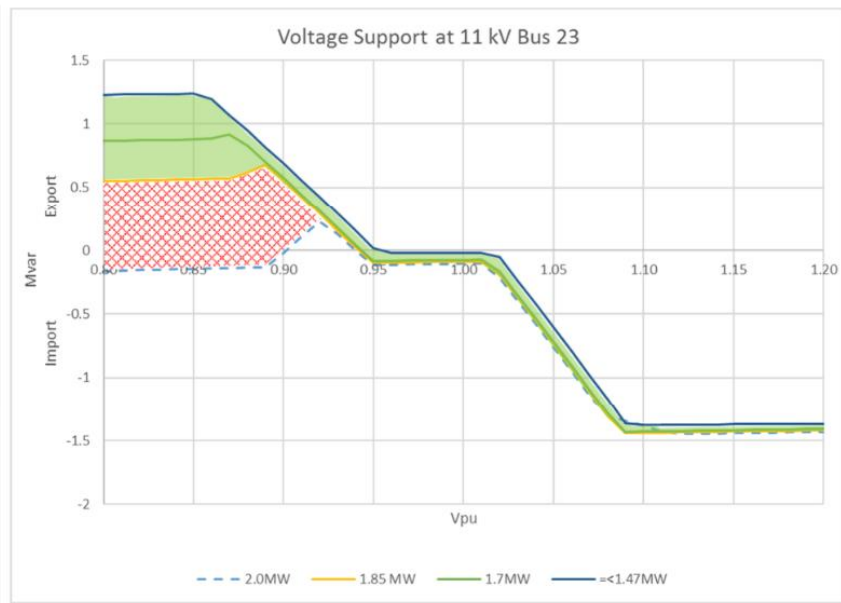
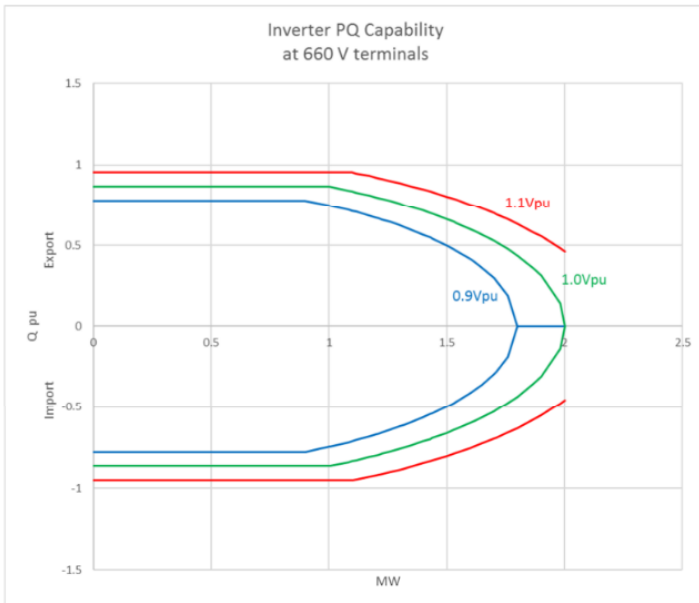
- Voltage stability is the ability of a power system to sustain $|V_i| \leq 1 \pm 0.05pu$ under standard operating conditions and with disruption



Voltage Stability



Voltage Stability



Conclusion

- Kea Energy proposed a 2MW solar farm in the Wairau Valley, Blenheim.
- Load flow studies were completed for a range of load and solar generation levels up to 1.85 MW.
- This limit was due to voltage dependent characteristics of the inverter.
- MLL accepted initial connection up to 1.85MW. With the potential to increase generation to 2MW following further testing after commissioning.



Questions?

