



CAETS 2021  
ARGENTINA

Engineering a Better World

THE FUTURE OF ENERGY

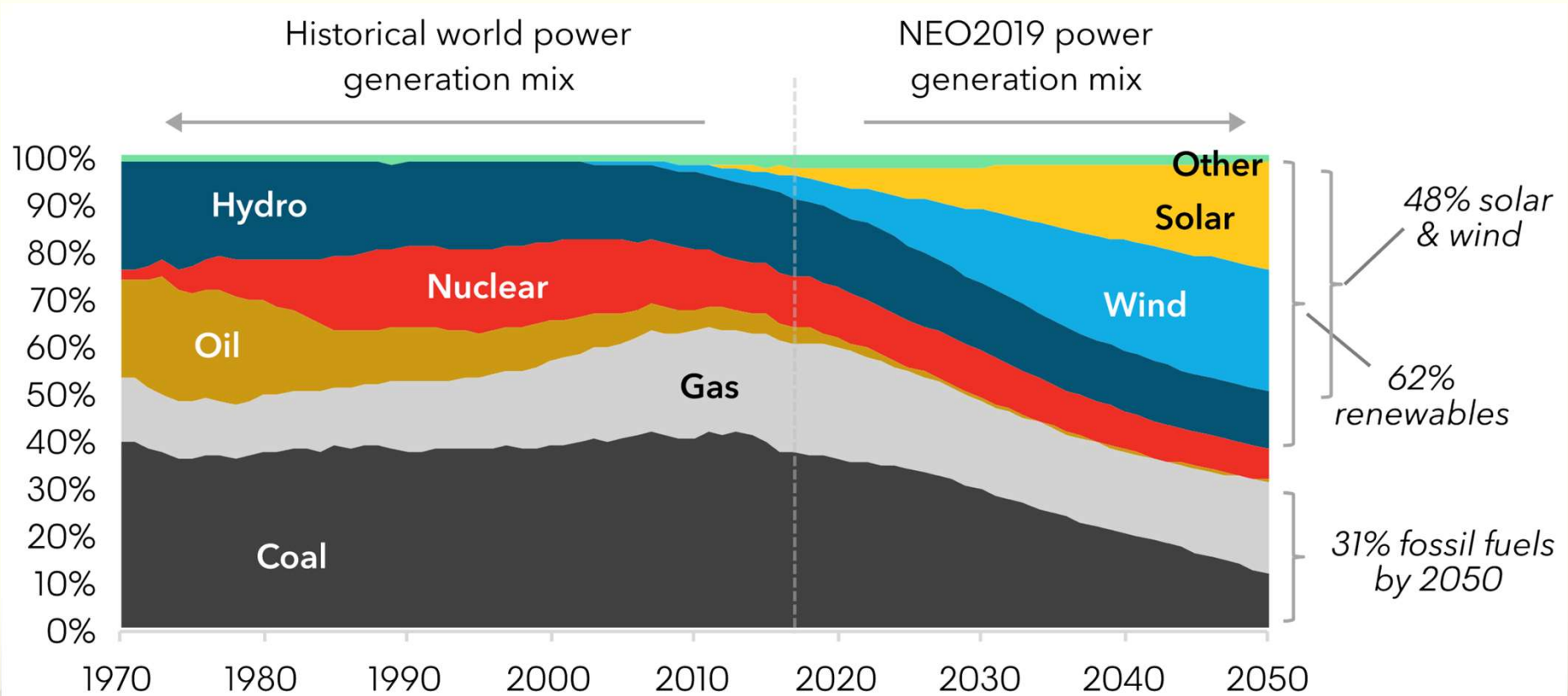


Buenos Aires, September 17-24, 2021

# Grid Edge Technology

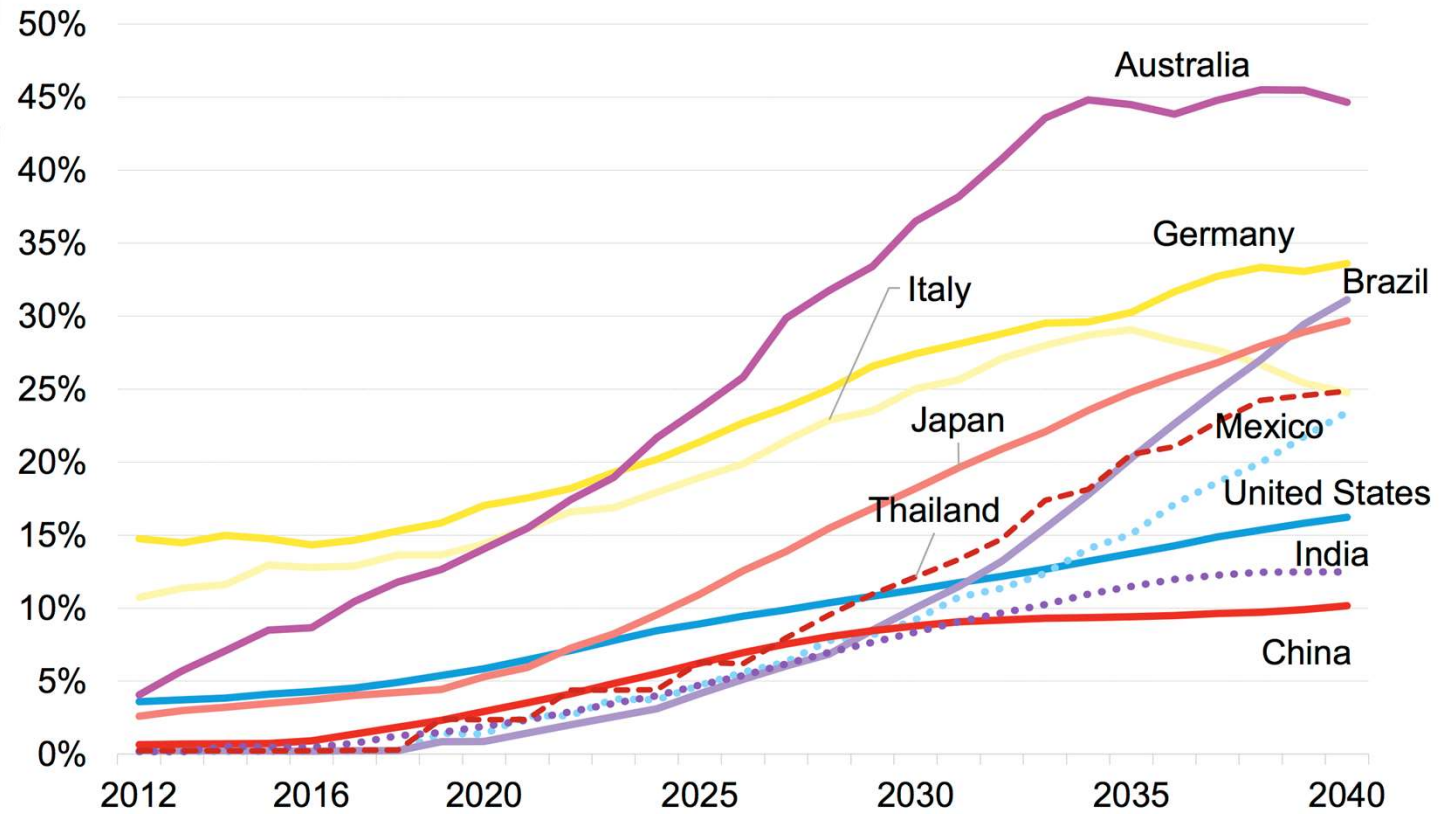
Professor Lachlan Blackhall FTSE

# The Global Electricity Generation Mix

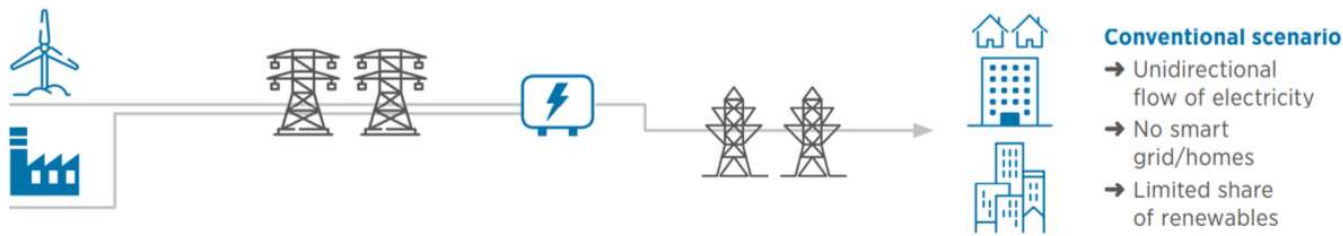


# Electricity System Decentralisation Globally

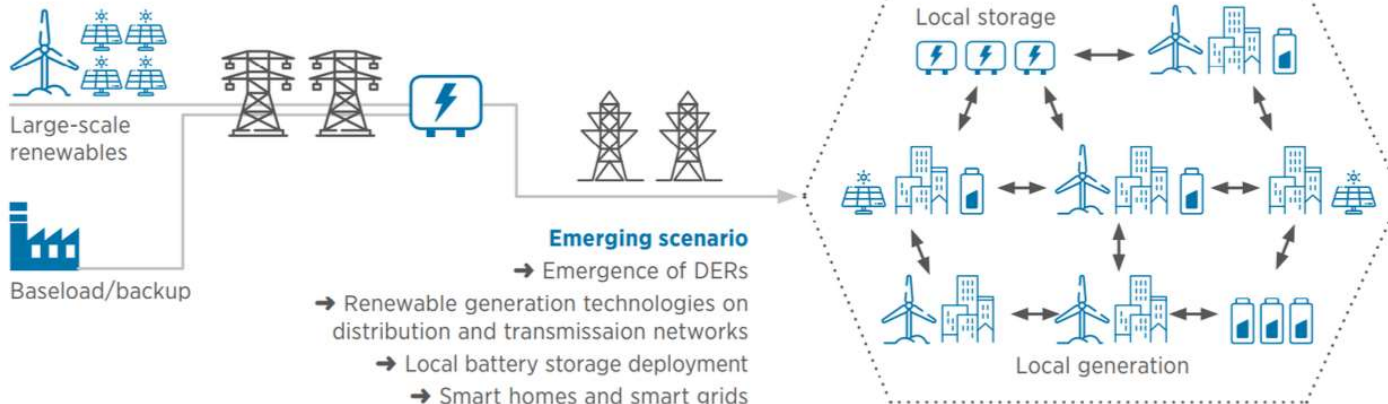
## Decentralization ratio



Source: Bloomberg New Energy Finance Note: decentralization ratio is the ratio of non-grid-scale capacity to total installed capacity.



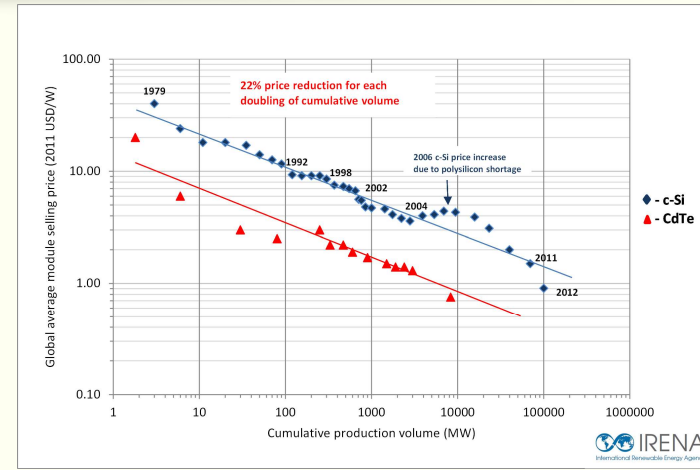
Large-scale generation → Transmission → Local distribution → End consumption



# The Future Grid

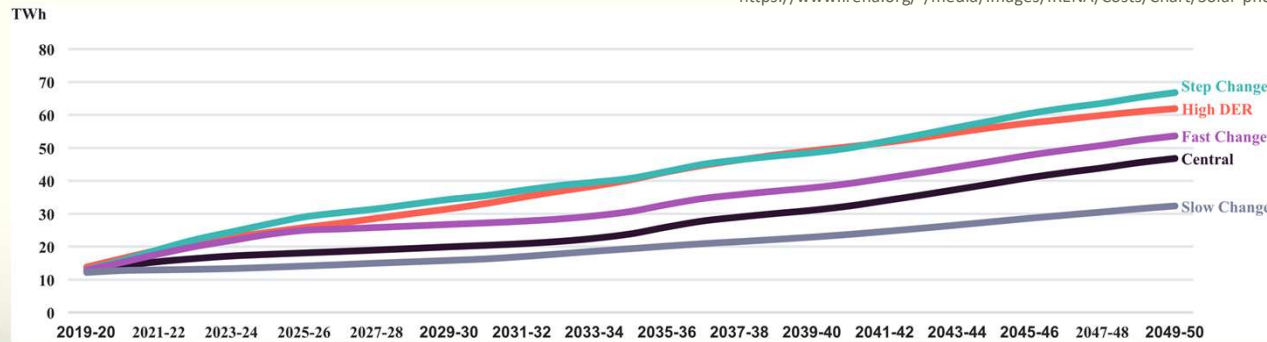
<https://www.irena.org/-/media/Images/IRENA/Infographics/2019/Feb/Innovation-Landscape---Distributed-energy.jpg>

# Residential Solar PV

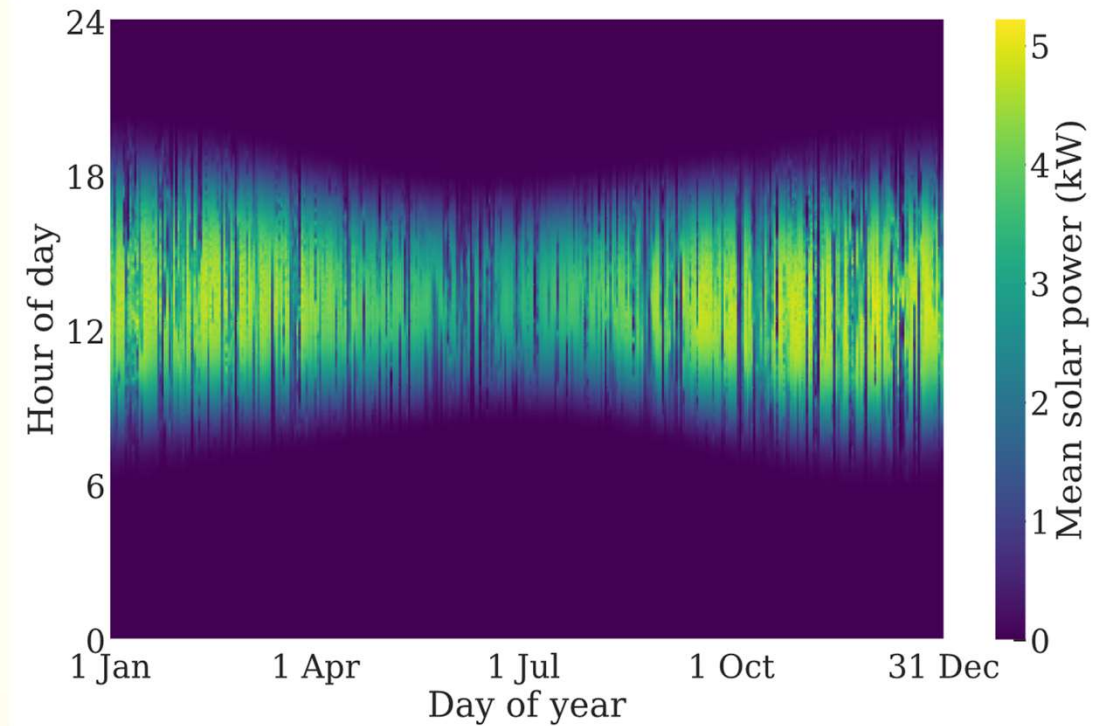
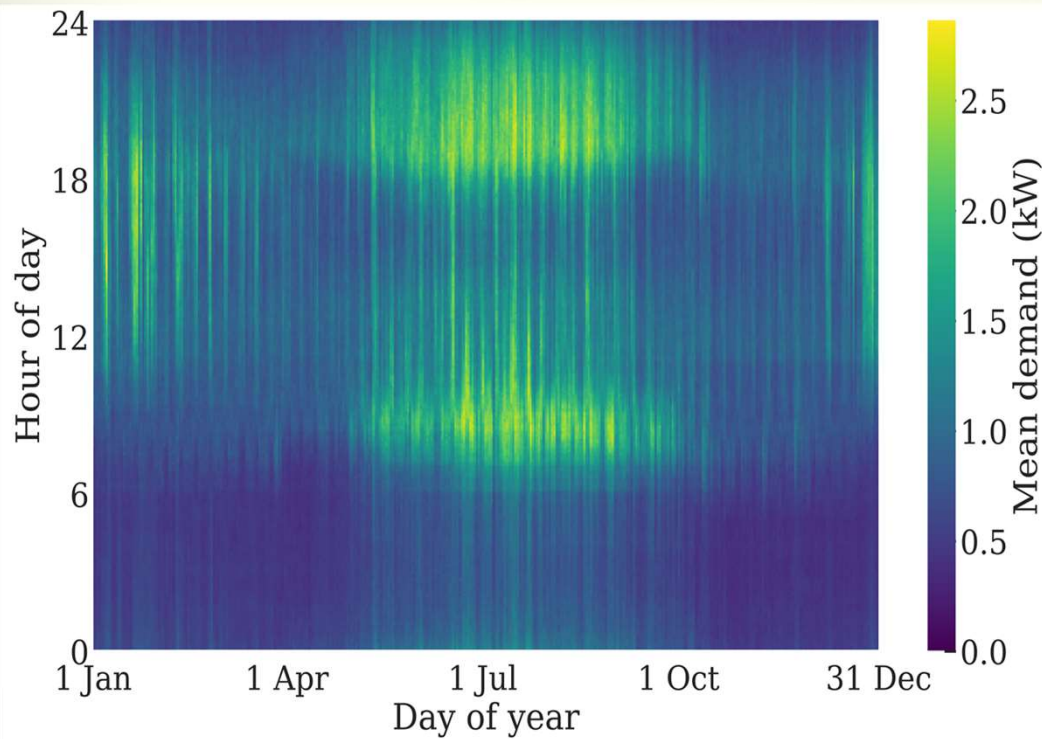


<https://www.irena.org/-/media/Images/IRENA/Costs/Chart/Solar-photovoltaic/fig-62.png>

Residential solar PV forecast from the 2020 Integrated Systems Plan (ISP) produced by the Australian Energy Market Operator (AEMO). <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp>

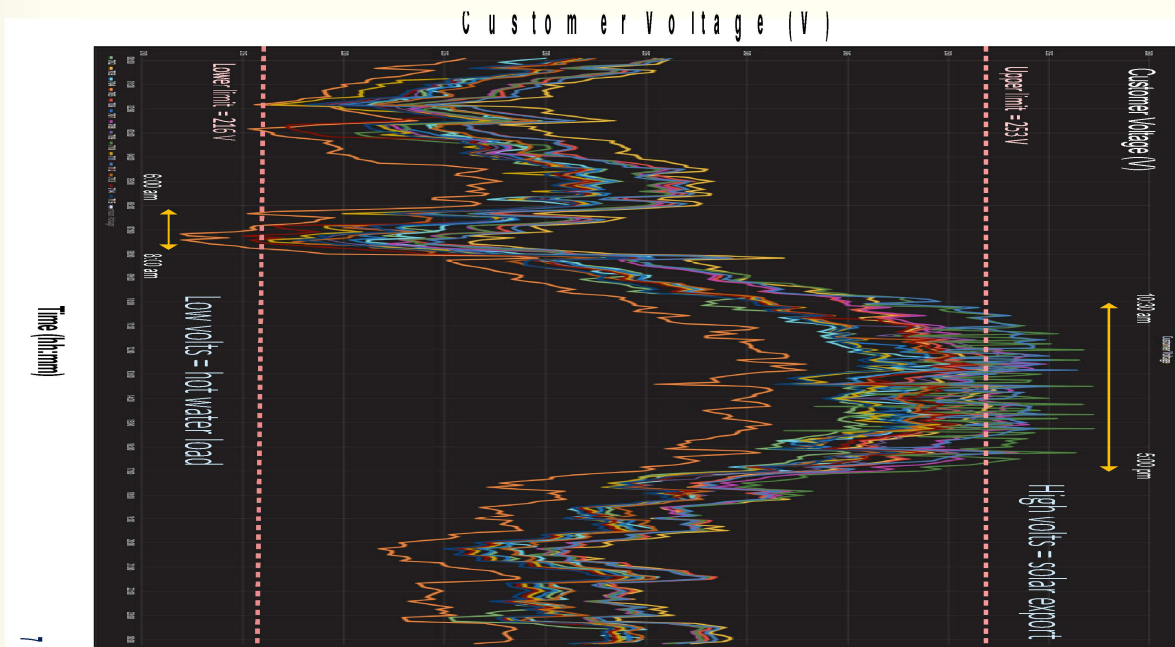


# Residential Generation / Demand Mismatch

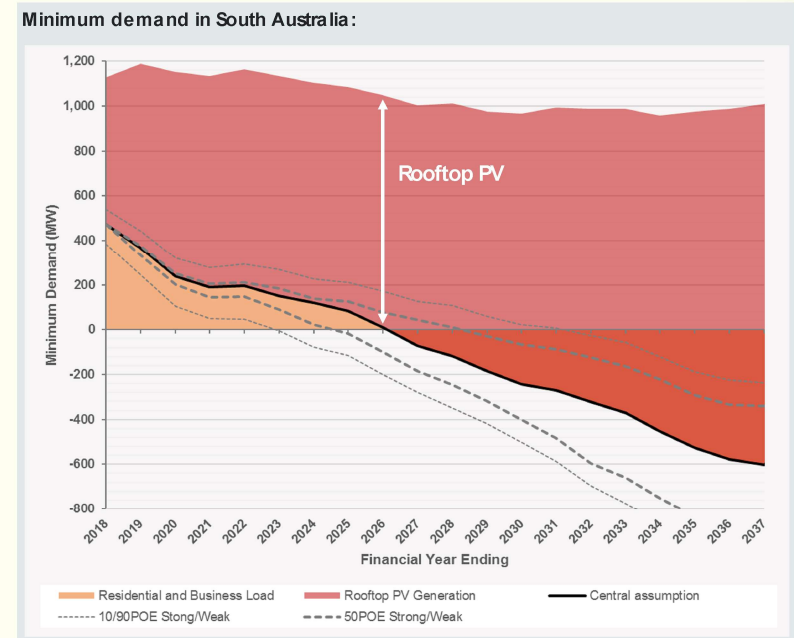


Data sourced from the ACT Government NextGen Battery Storage Program

# Network and System Challenges



Voltage observations from the Networks Renewed project in the AusNet Services network (VIC). Image supplied by AusNet Services



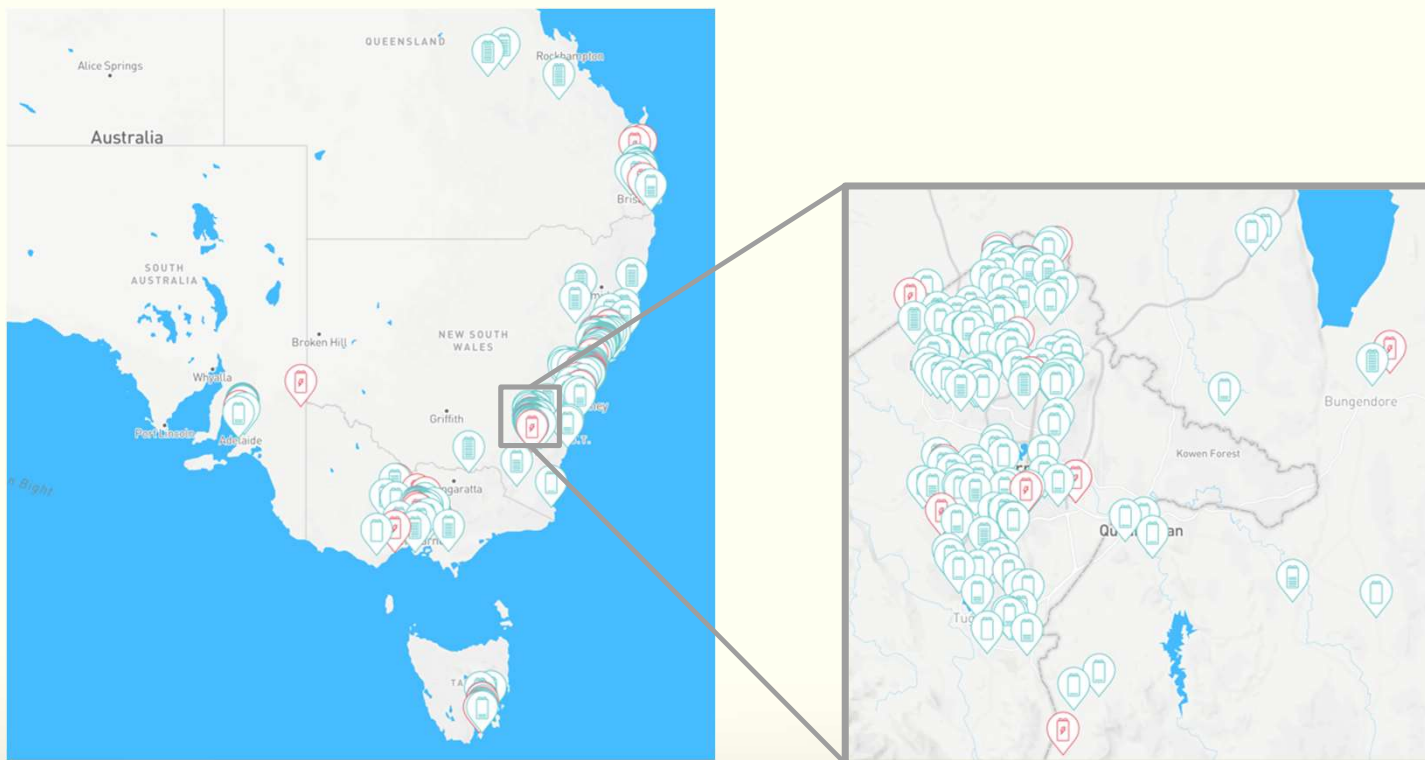
Riesz, Integration of DER – Operational Impacts, Future Electricity Markets Summit, 2019

# Residential and Community Battery Storage





# Virtual Power Plants and Algorithms



# People and Community

- Energy is a socio-techno-economic system so it is vital to include social scientists in R&D activities.
- Customers have a preference for local energy models.
- We need to recognize that customer preferences are always rational, perhaps not from an economists perspective however!!!



# Microgrids

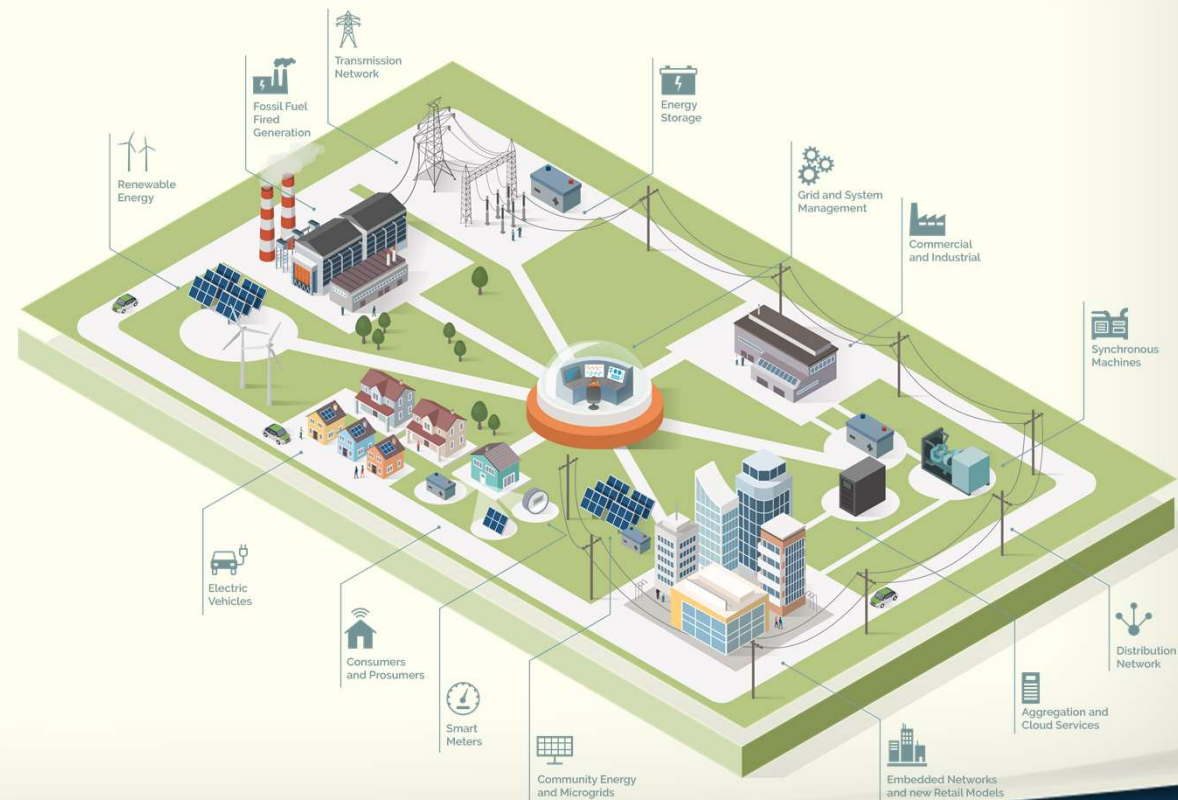


<https://www.pv-magazine.com/wp-content/uploads/2021/06/Horizon-Power-Onslow-microgrid-1200x799.jpg>

- Many regions in the world do not have traditional centralised grid infrastructure.
- Opportunities abound for microgrids, minigrids, remote area and stand alone power systems.
- In many parts of the world, these new systems will be DC, not AC.

# The Future is ... Electrification and Integration

- Electrification begins at the grid edge.
- Electrification of transport is a crucial step to decarbonization and will operate at the grid edge.
- Grid integration capabilities are needed to ensure that all grid edge technologies collectively deliver energy reliability and security.



# The Future is ... Decarbonised, Decentralised, Digitised and Democratised





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# THANK YOU

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