



Microgrids – on and off grid

William Grace



AR6 insights

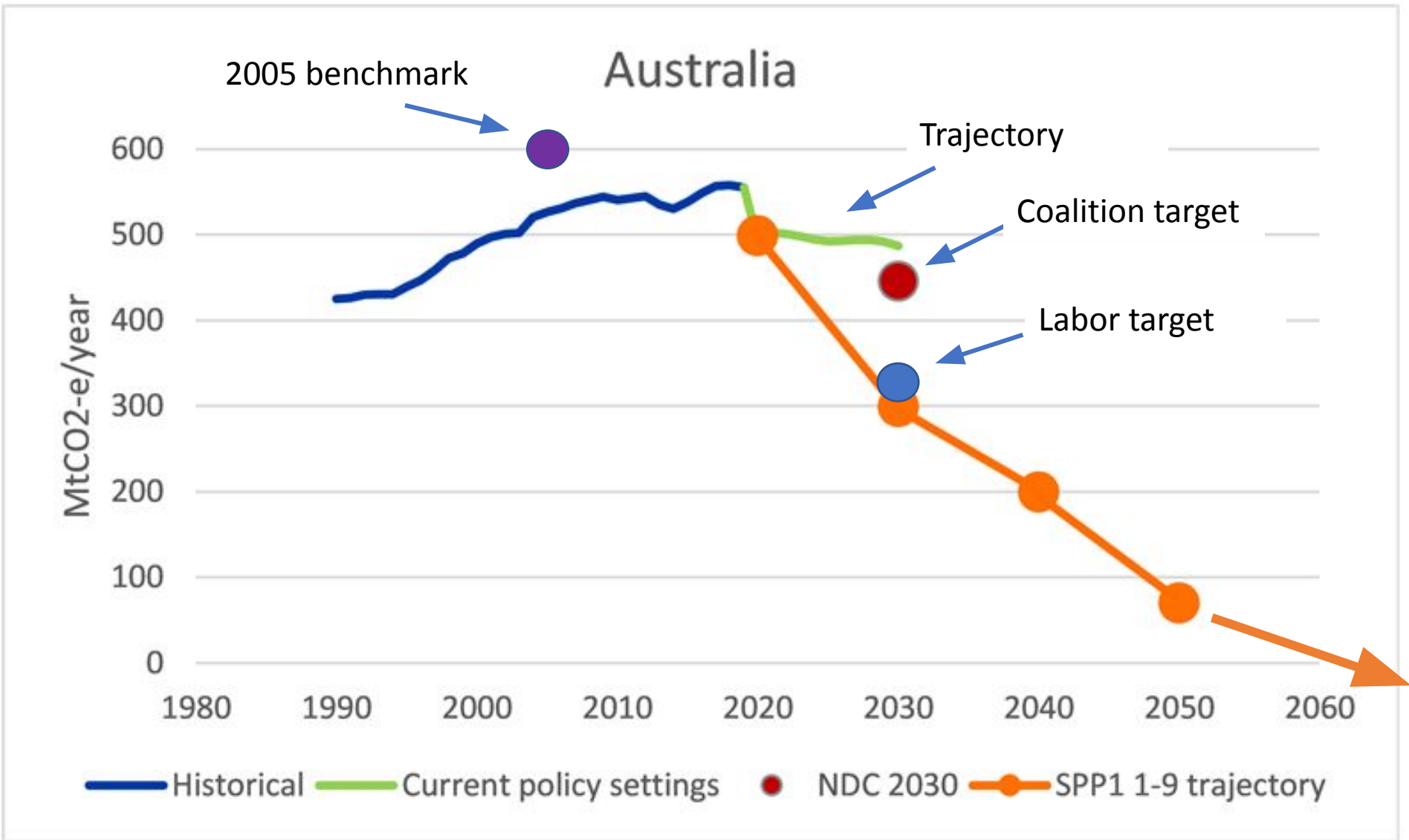
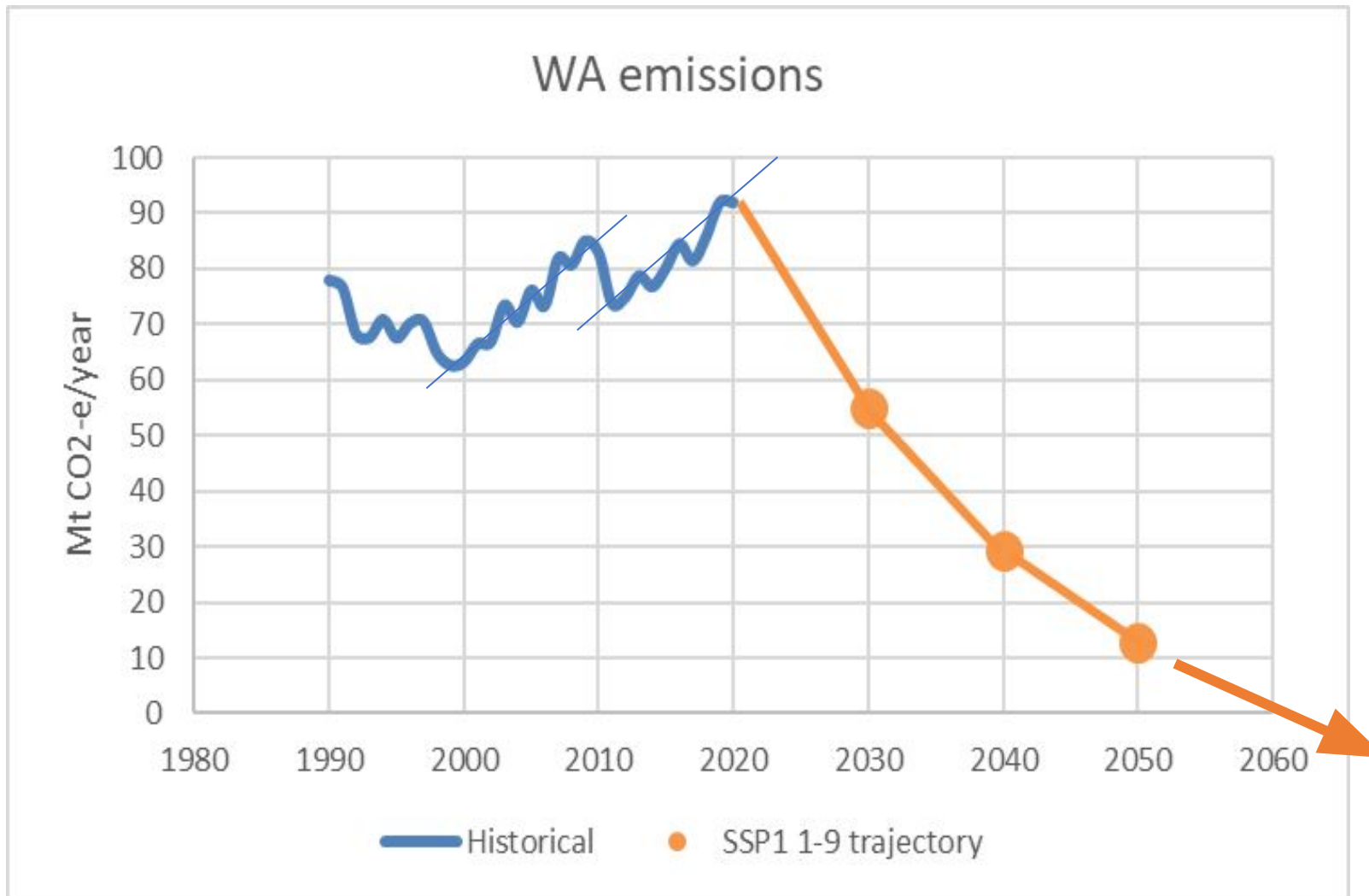


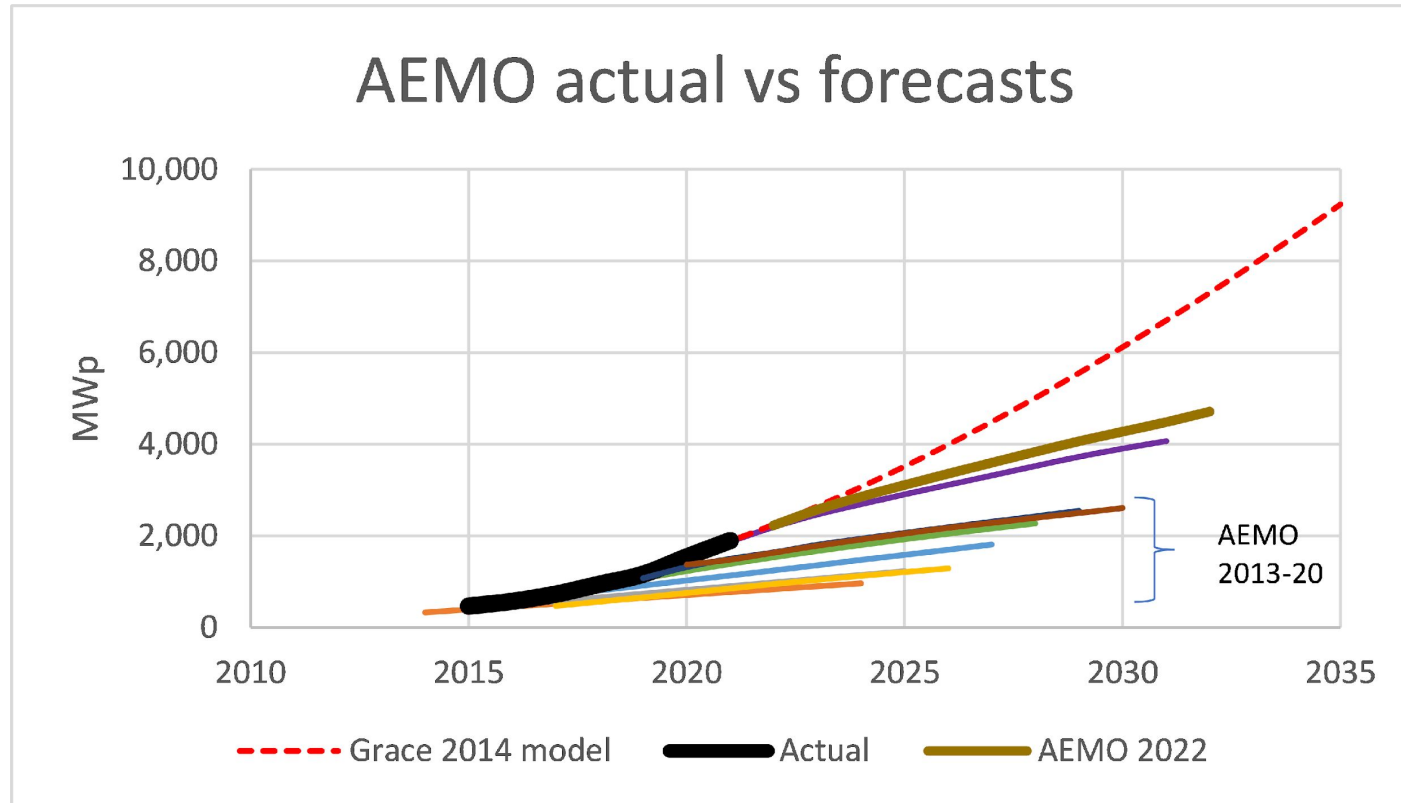
Figure 3 [Source: Derived by the author from State and Territory Greenhouse Gas Inventories 2019, Current policy settings from Climate Action Tracker Assessment for Australia, Australia's National Determined Contributions (average of range, SSP1 1-5)]

Net Zero for WA (if 1.5°C compliant)



The SWIS and “Behind the
meter” solar

Distributed solar PV projections



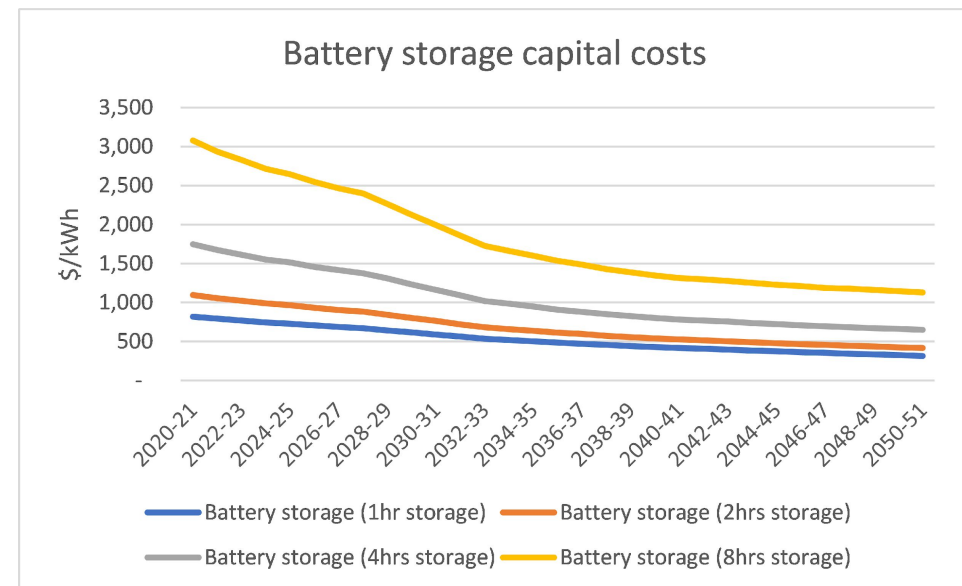
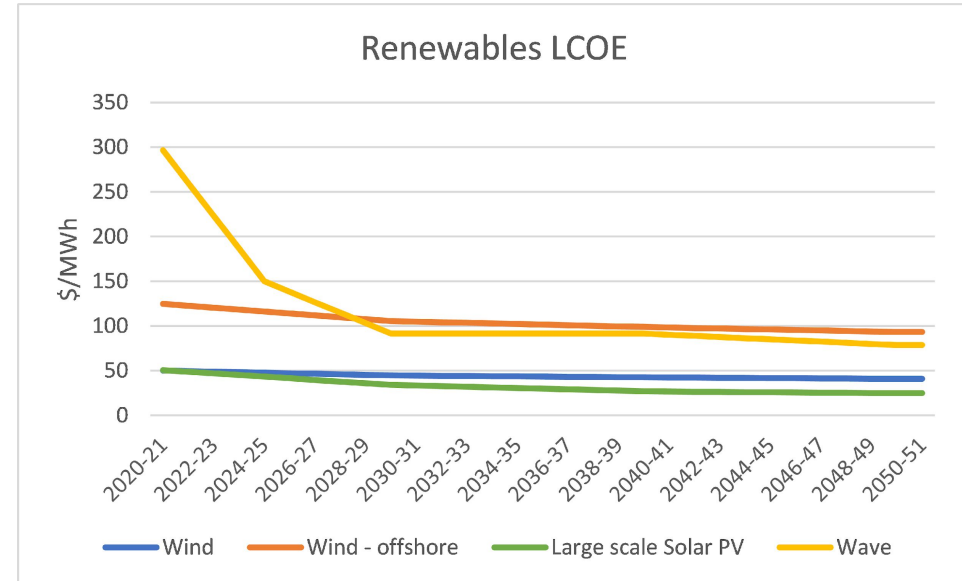
Network costs



GenCost 2021-22

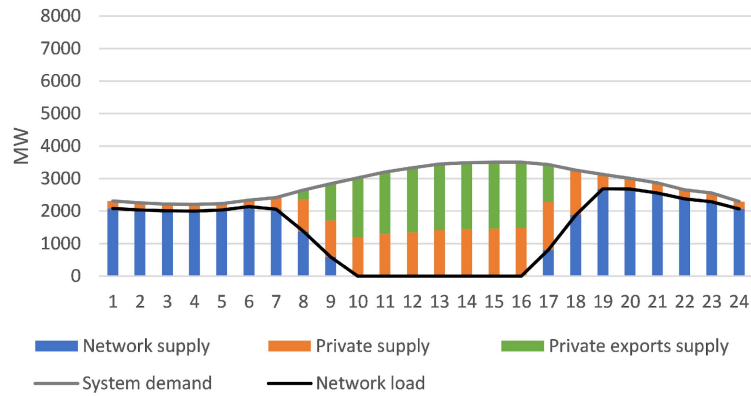
Final report

Paul Graham, Jenny Hayward, James Foster and Lisa Havas
July 2022

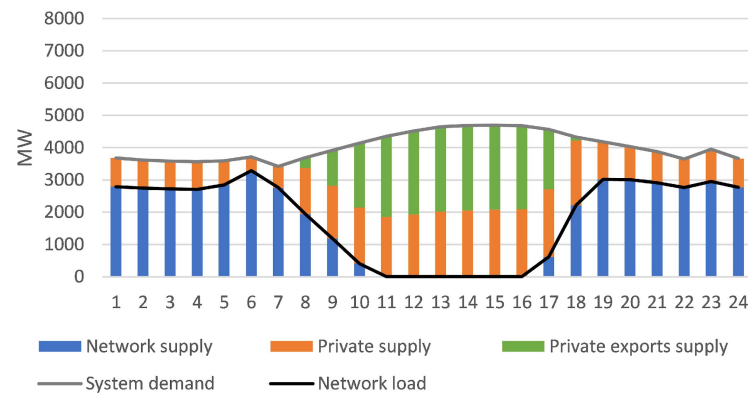


System supply

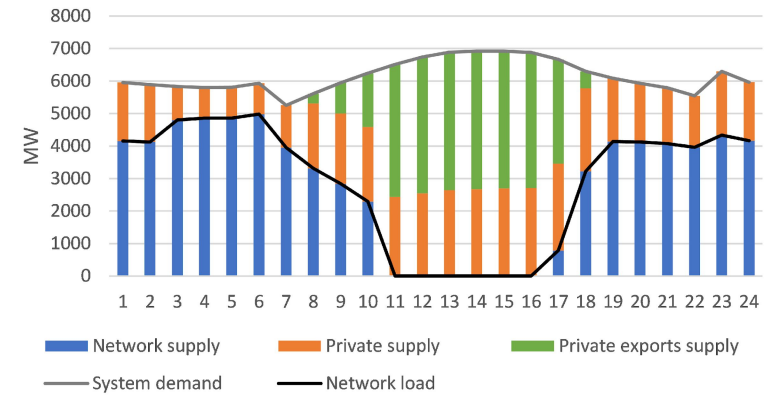
Jan 2030



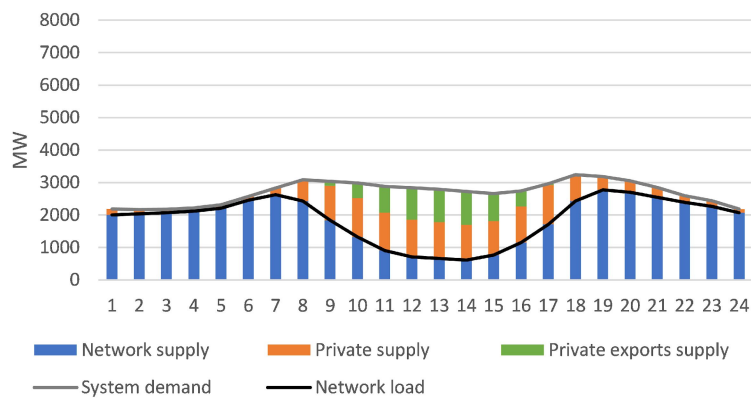
Jan 2040



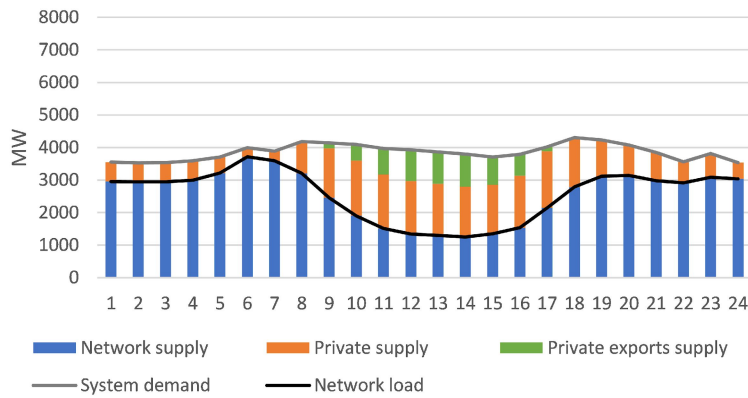
Jan 2050



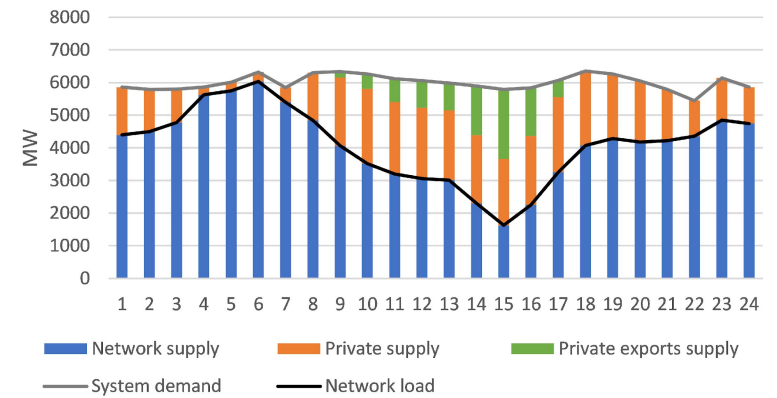
Jun 2030



Jun 2040

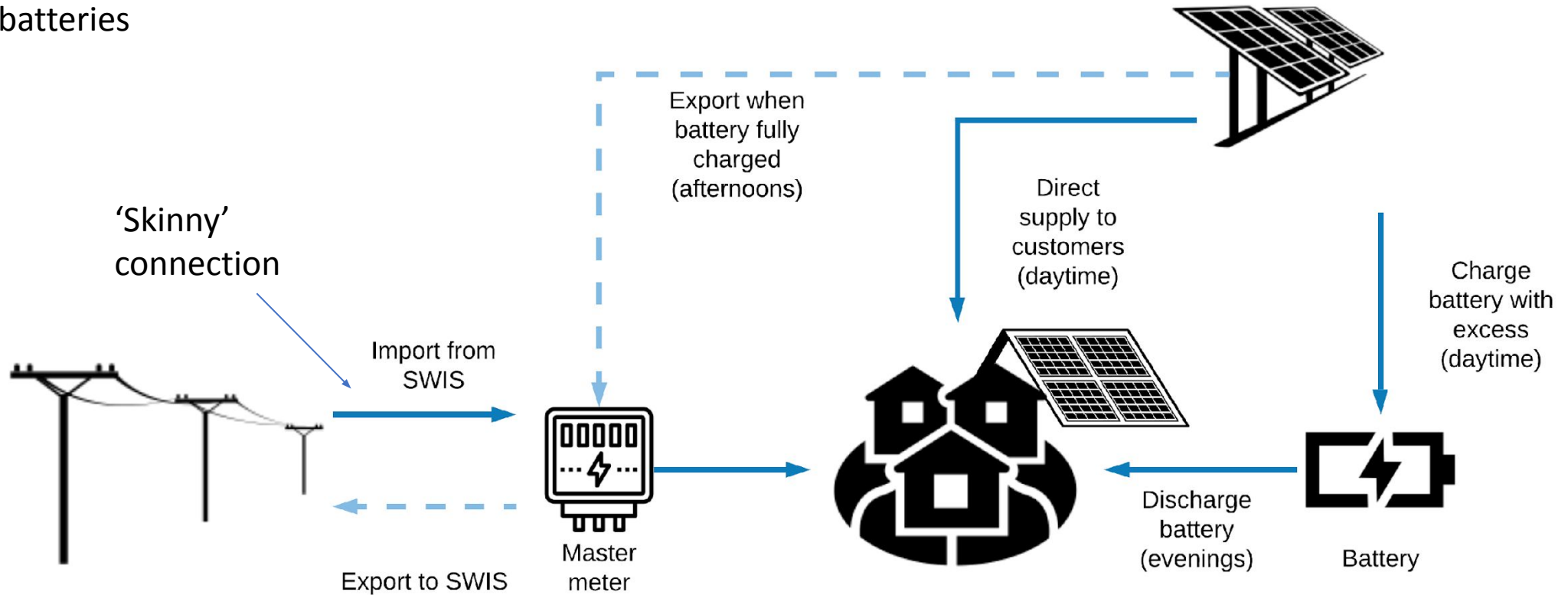


Jun 2050



Embedded network microgrid

Microgrids – solar PV and batteries



- Located 70km south of Perth in the Shire of Murray
- 10km north-east of Mandurah
- 1,000-hectare estate Business Park
- Is the first of three stages in the integrated Transform Peel initiative; encompassing:
 - the 42,000 hectare Peel Food Zone, and
 - the Peel Integrated Water initiative
- It will provide the ideal home for agri-food and agri-processing operators, as well as ancillary light, general transport and logistic industries.



Background

- At 200 kVA/ha the park could require 1,000 MVA capacity
- Initial stage (DWA's Lot 600) provides a 20 MVA connection to the SWIS
- Challenge:
 - How to use local renewable energy and storage to supply power to the whole of the PBP with only a 20MVA connection?
 - How to facilitate the entry of a private utility to build, own and operate the assets?
 - How to navigate the Electricity Industry Act, WEM rules, AEMO issues, Western Power, ERA, EPWA, Local govt?
 - Can this be done on freehold land? Add WAPC to the list.
- Potential answer
 - A private microgrid, ie an embedded network with generation / storage

Process

- EoI /RfP for utility provider
- Exclusive working period with preferred respondent
- Formal agreement
 - Peel Renewable Energy (formerly Enwave Australia), Sunrise Energy Group, Synergy
- PRE obtains retail and network licences
- PRE builds first stage solar array and battery storage
- Australia's first ever renewable energy microgrid to power an industrial estate



The system

- 1 MW ground mounted single axis tracking solar array
- 2.5 MWh battery energy storage system
- Supplemented as necessary with electricity sourced from the SWIS
- As the Park grows, increased embedded generation and storage, as well as demand-side management.
- The microgrid operator will:
 - install solar panels on the roofs of businesses under lease agreements.
 - integrate this network of roof top solar panels with the ground based solar farm and battery energy storage system, supplemented as the Park grows.

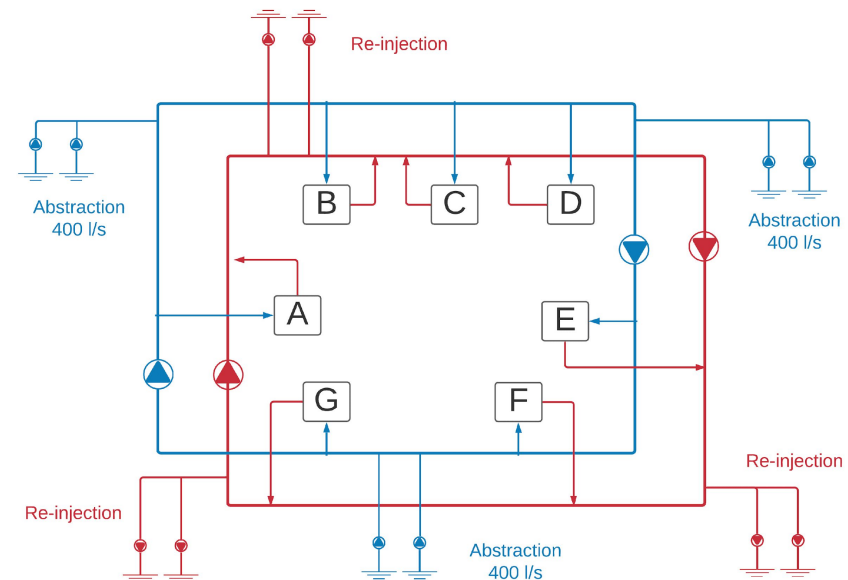
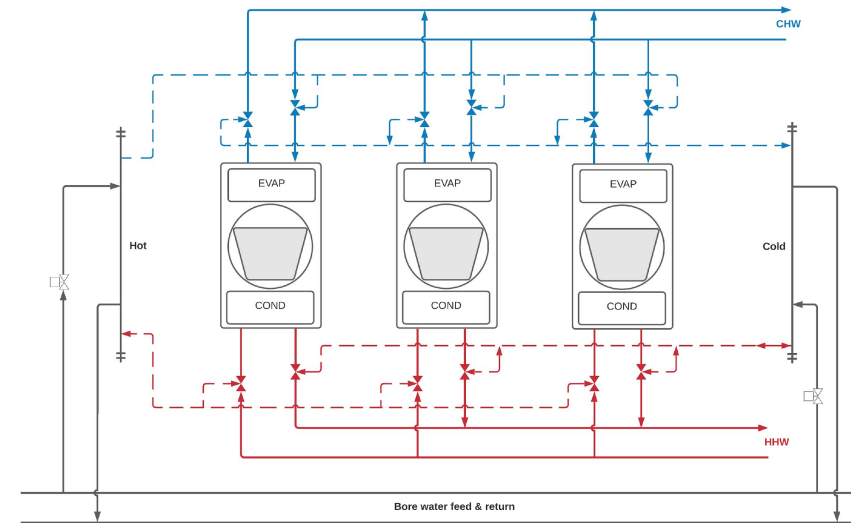


Lessons

- Where can this happen?
 - Anywhere that requires a new network
 - The developer builds and pays for the network so has the opportunity to influence who the network provider is
 - As we have now shown it can occur on either strata or freehold land projects
 - Landuse planning issues require support at WAPC and Local Govt level (in particular easements)
- Licence exemptions for embedded networks
 - Not preferred or necessary
 - Licences ensure oversight by ERA, Energy Ombudsman and full customer protections
- Contestability
 - Should / can be retained through financial swaps in the WEM
- Landowners own systems
 - Should / can be allowed with controls over connection to the network
- What if it all goes wrong?
 - Bypass the master-meter and revert to the SWIS

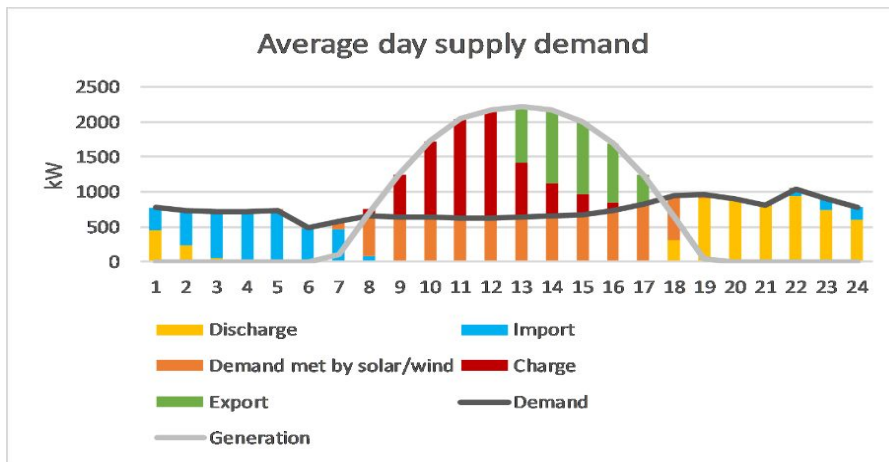
Peel geothermal study

- Ground source heat pumps for thermal loads $<100^{\circ}\text{C}$
- Deep aquifer temperature $\sim 21^{\circ}\text{C}$
- CoPs 6-12
- Powered by the microgrid
- Modular system expanded as loads increase



Up next – Ocean Reef Marina

- Mixed use residential, commercial, retail and marina
- In negotiations with a preferred provider
- Smart City applications

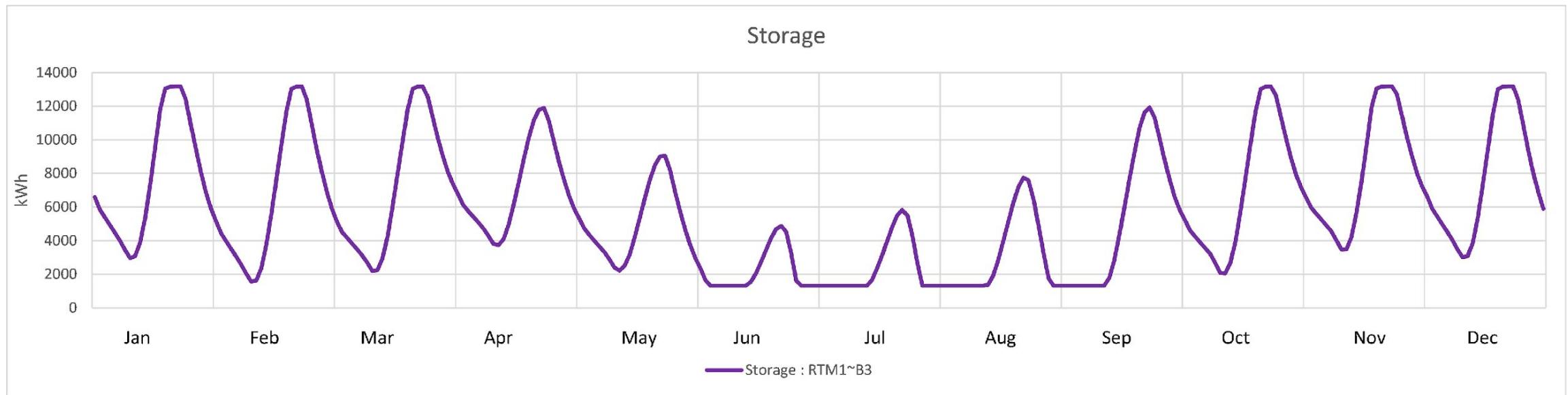
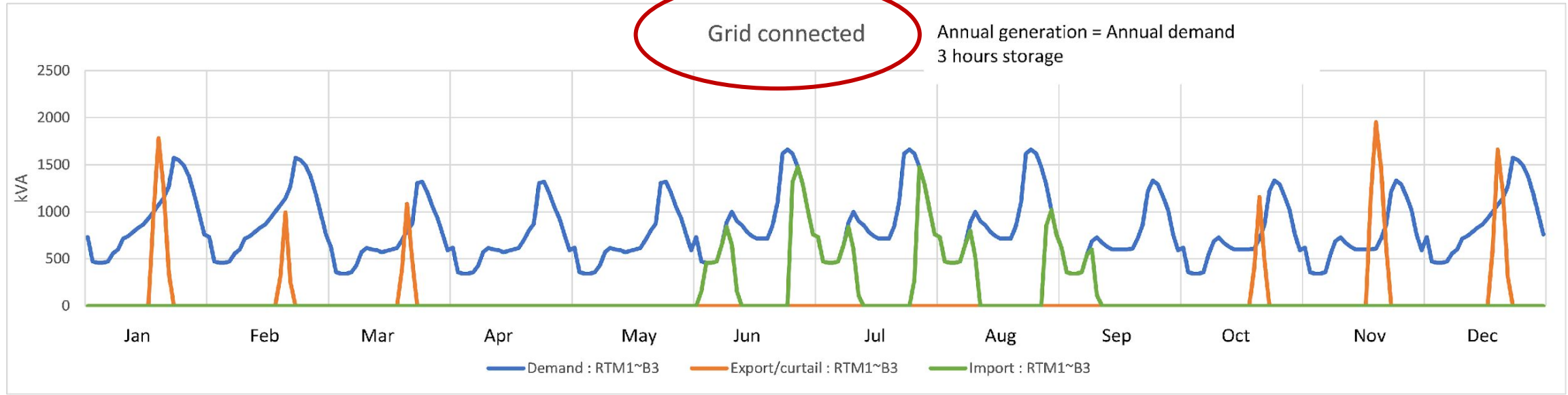


- Several other industrial projects on the drawing board



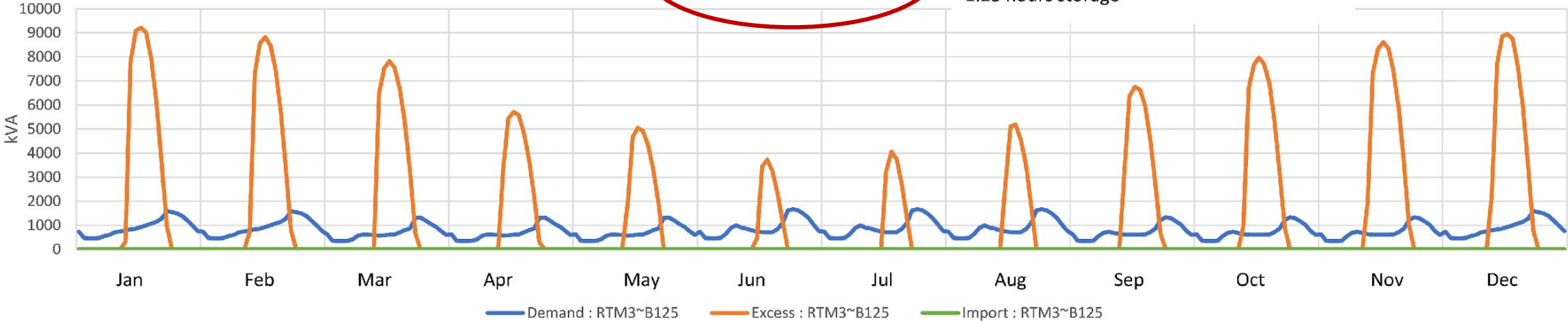
Islanded microgrids

1000 home residential precinct

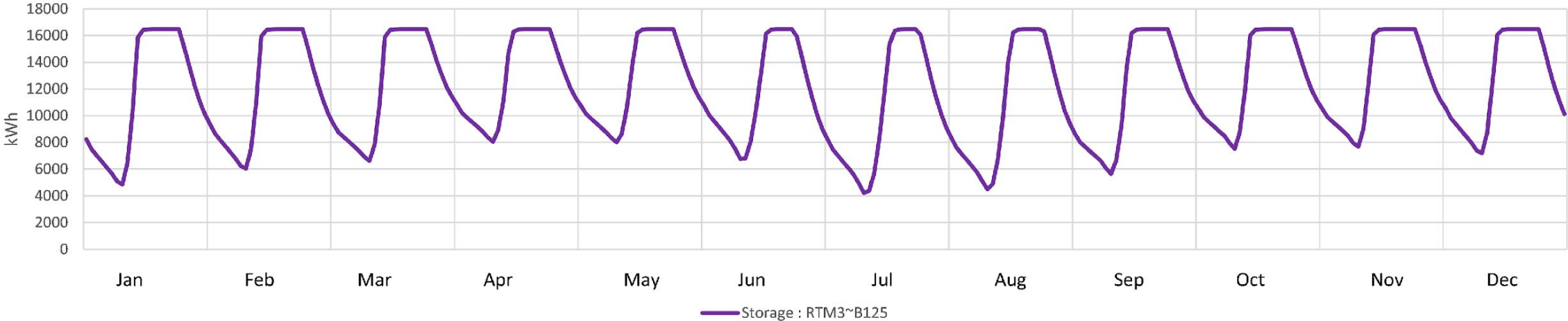


Islanded

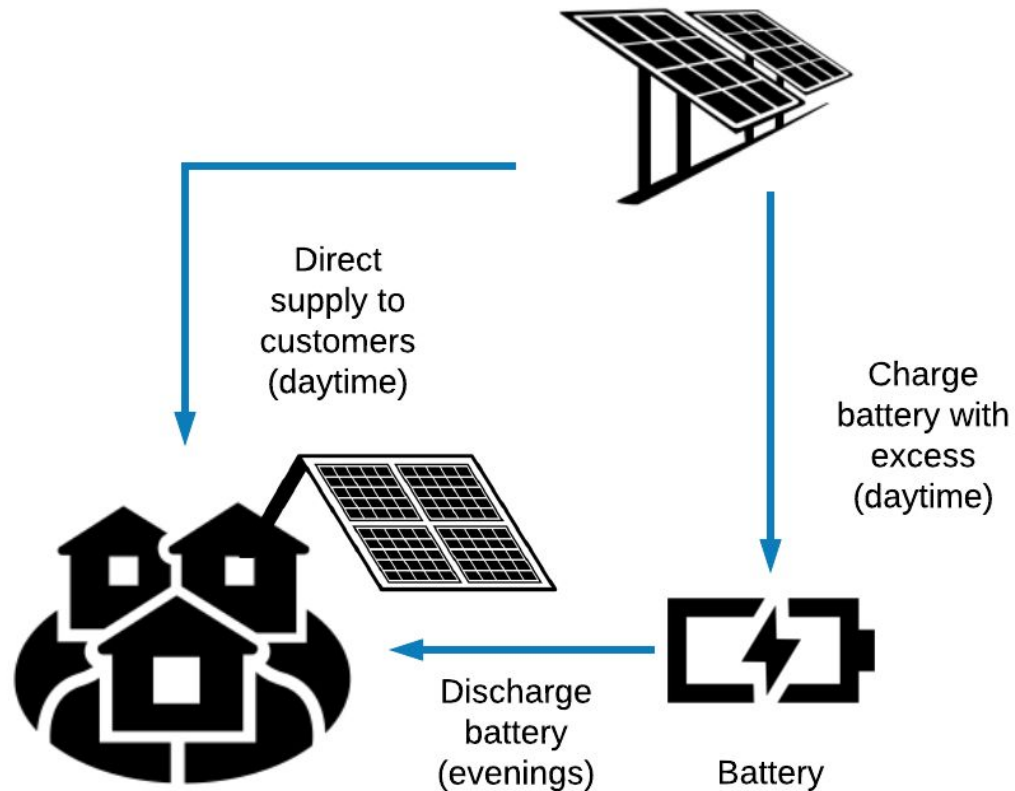
Annual generation = 3 x Annual demand
1.25 hours storage



Storage



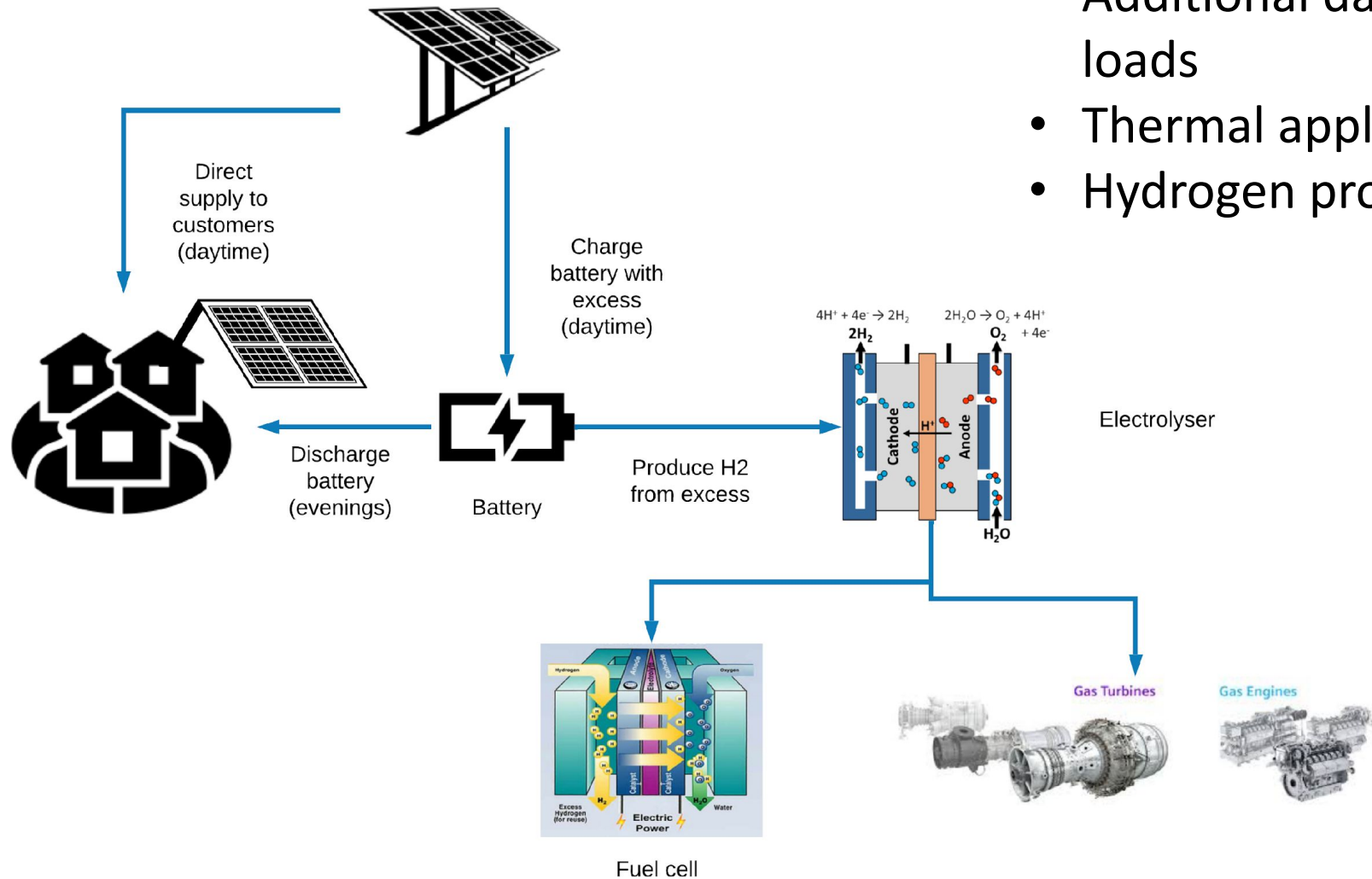
Islanded microgrid



Higher capex but avoids Western Power network upgrade costs

What can we do with all that excess energy?

Islanded microgrid

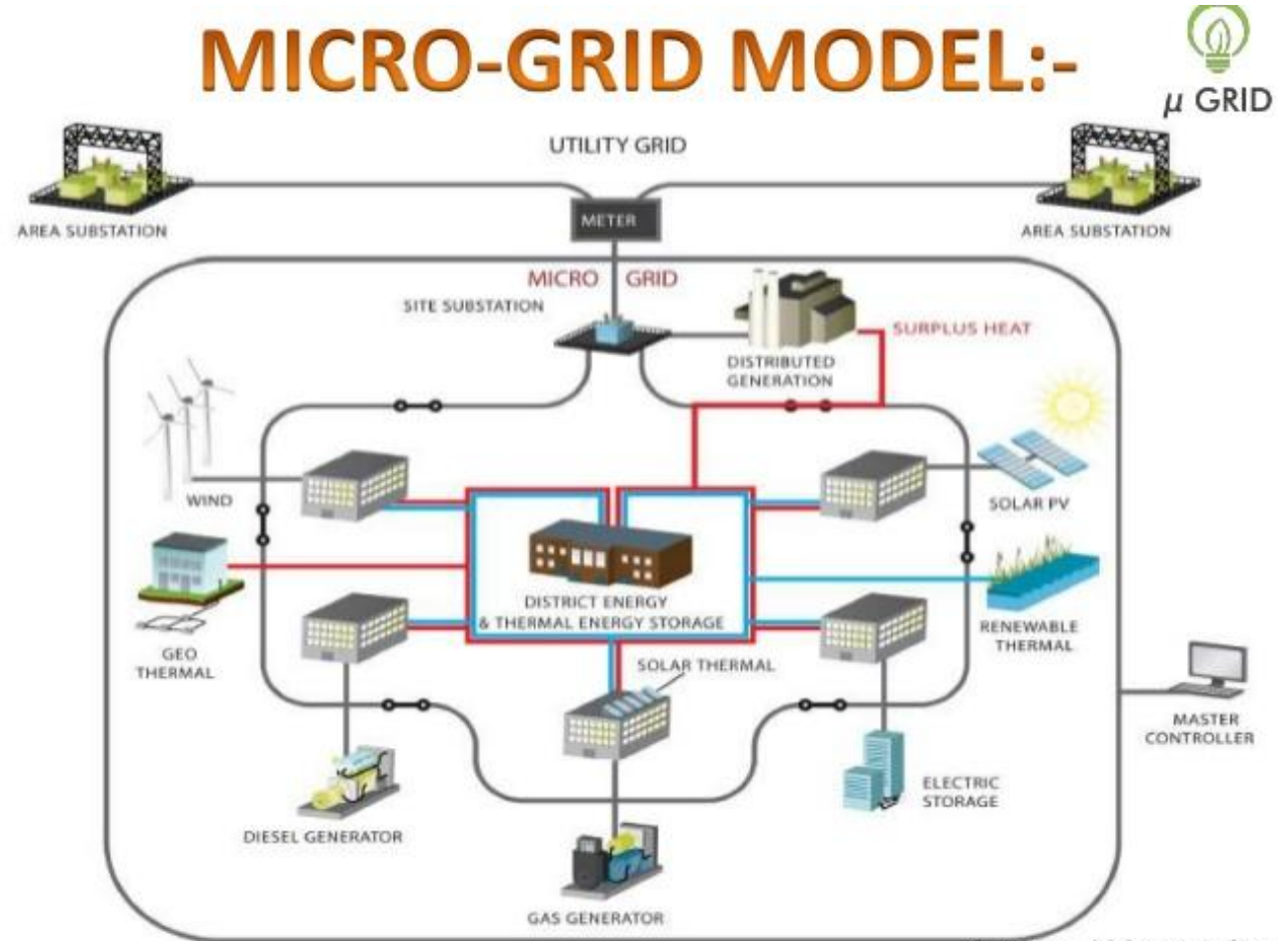


- Additional daytime electrical loads
- Thermal applications / storage
- Hydrogen production

Microgrids are key to Net Zero

- The synergies between renewable energy / storage and smart technology
- The opportunity to electrify thermal loads
- Declining costs of generation and storage
- The cost of transporting electricity from centralised sources (whether or not renewable)

MICRO-GRID MODEL:-



Source:- ABB magazine



Q&A

