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Australian Urban Design Research Centre

Net Zero & microgrids

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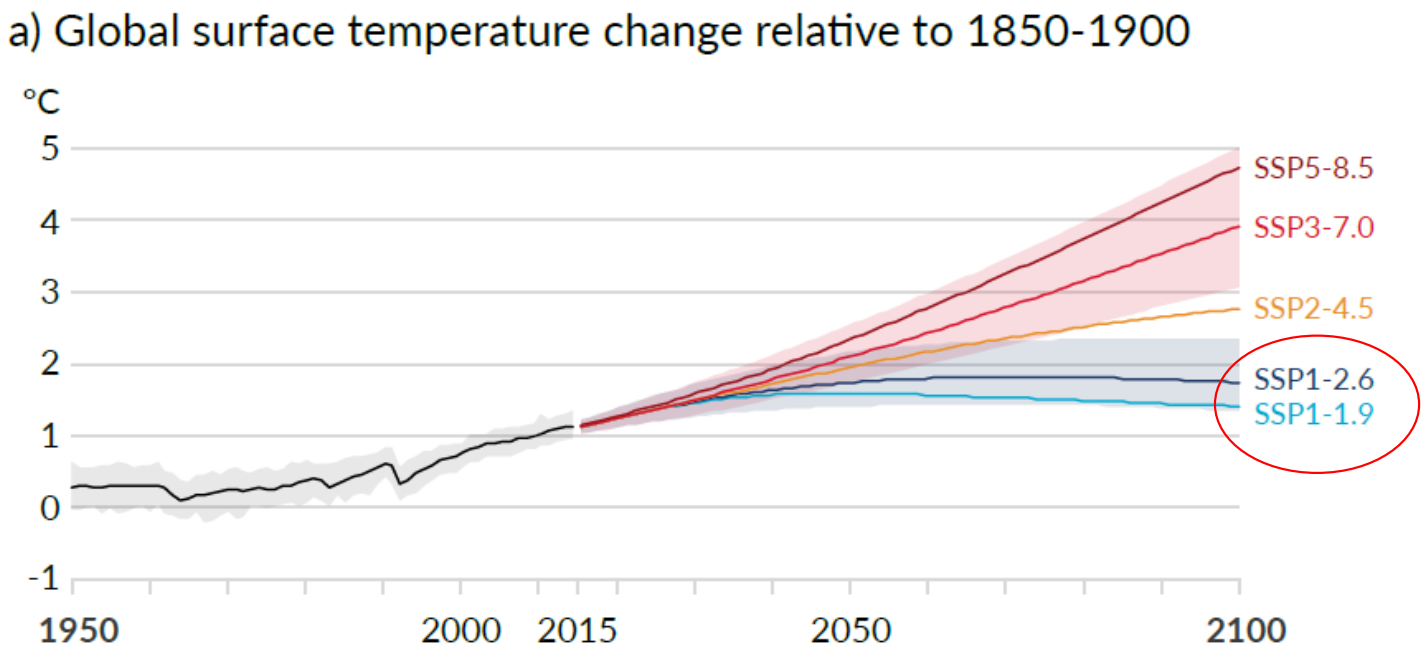
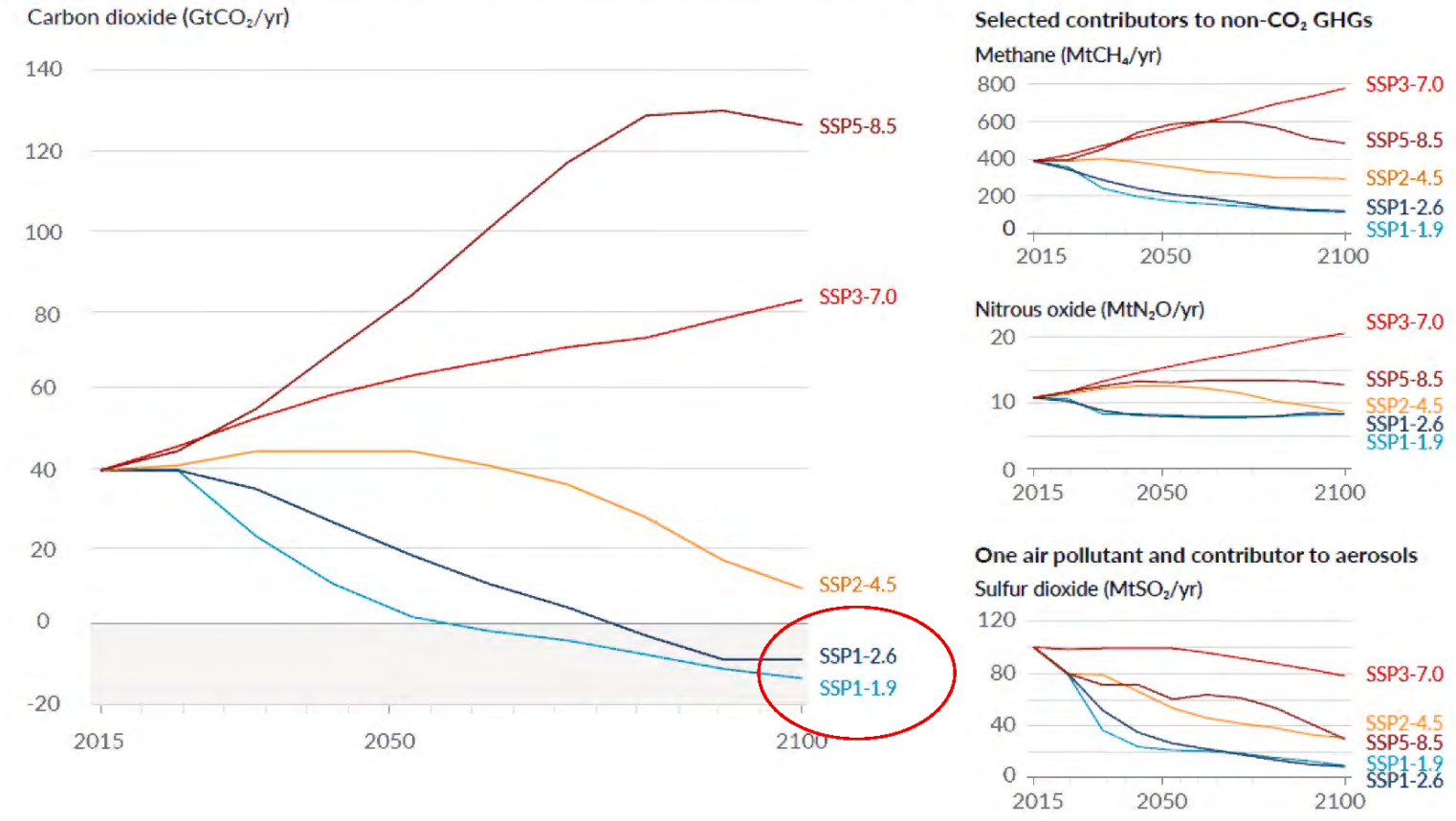
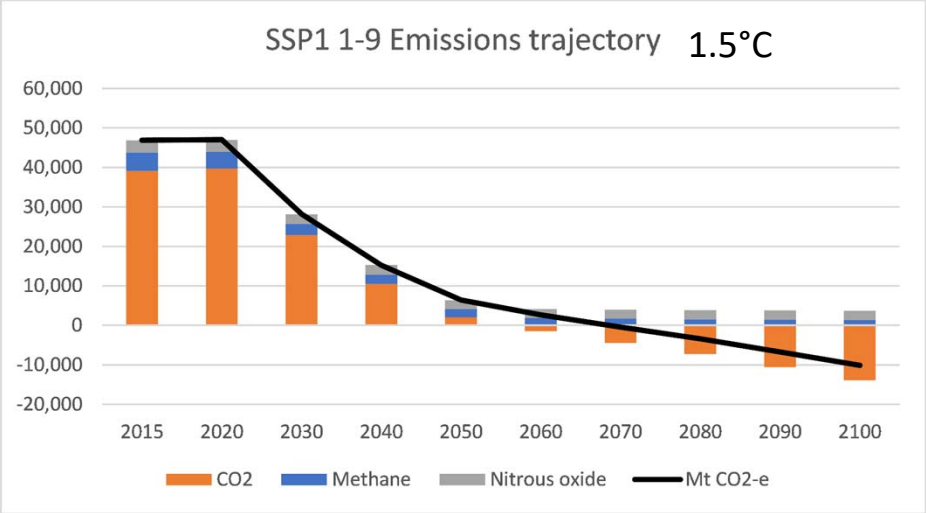
AR6 insights

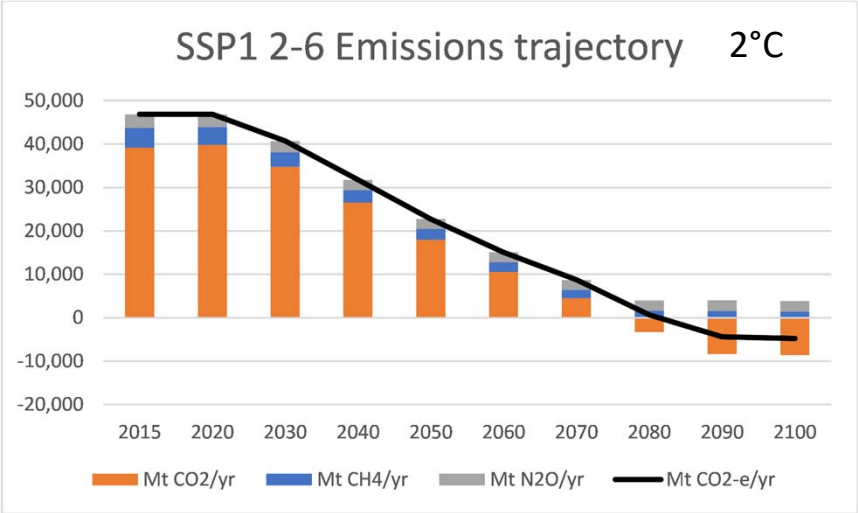
IPCC AR6


a) Global surface temperature change relative to 1850-1900
°C
5
4
3
2
1
0
-1
1950
2000
2015
2050
2100
SSP5-8.5
SSP3-7.0
SSP2-4.5
SSP1-2.6
SSP1-1.9

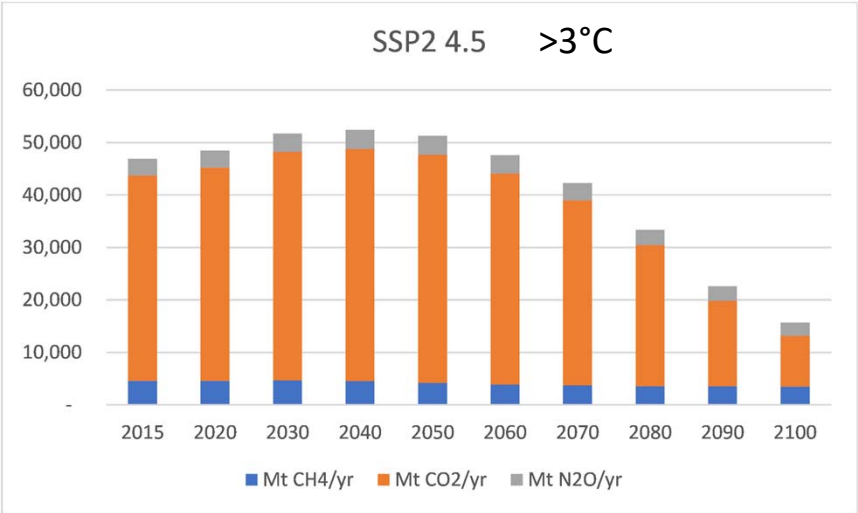
a) Future annual emissions of CO_2 (left) and of a subset of key non-CO_2 drivers (right), across five illustrative scenarios







Net Zero by 2050 alone is insufficient to deliver < 2°C



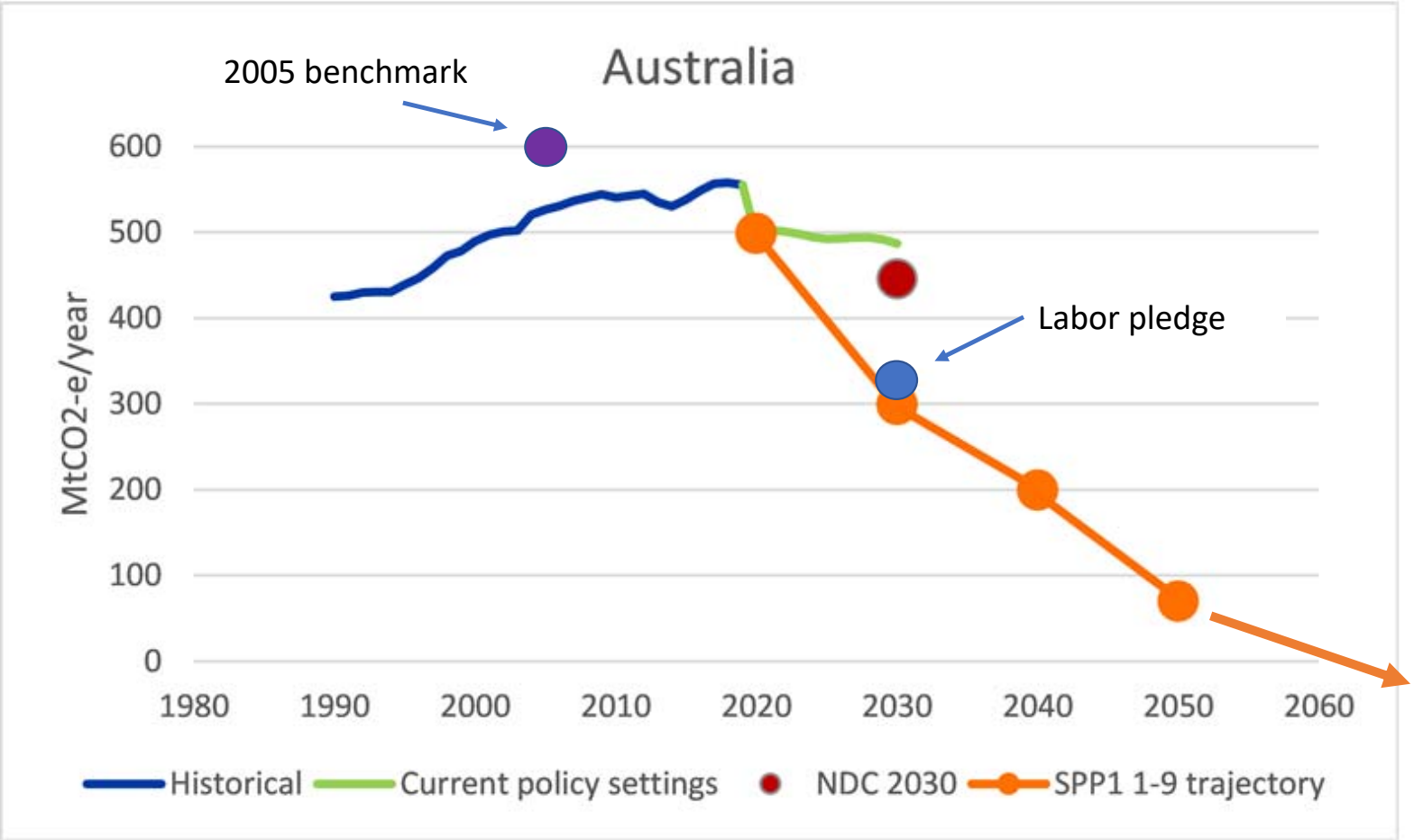
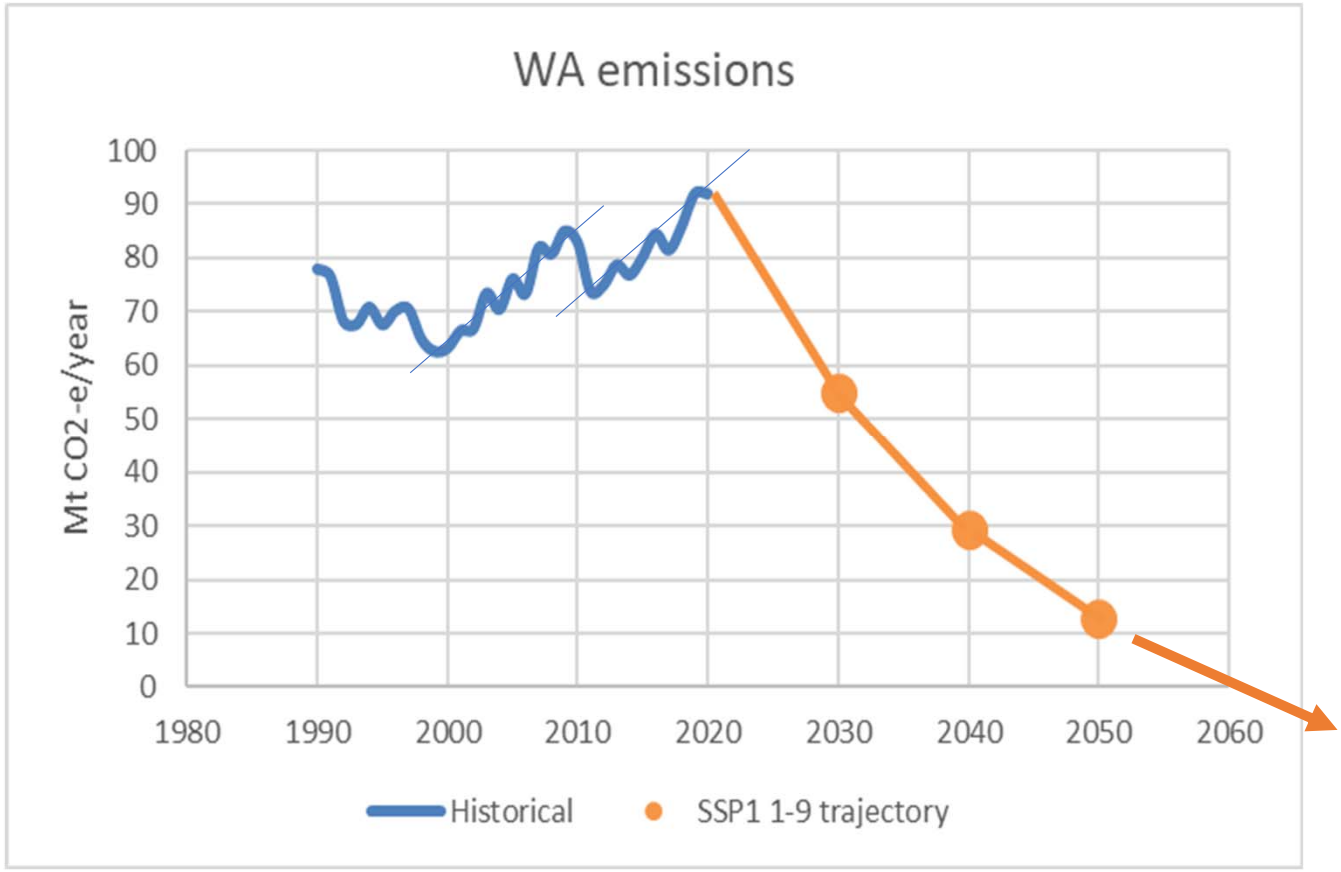


Figure 3 [Source: Derived by the author from State and Territory Greenhouse Gas Inventories 2019, Current policy settings from Climate Action Tracker Assessment for Australia, Australia's National Determined Contributions (average of range, SSP1 1-5]

Net Zero for WA (if 1.5°C compliant)

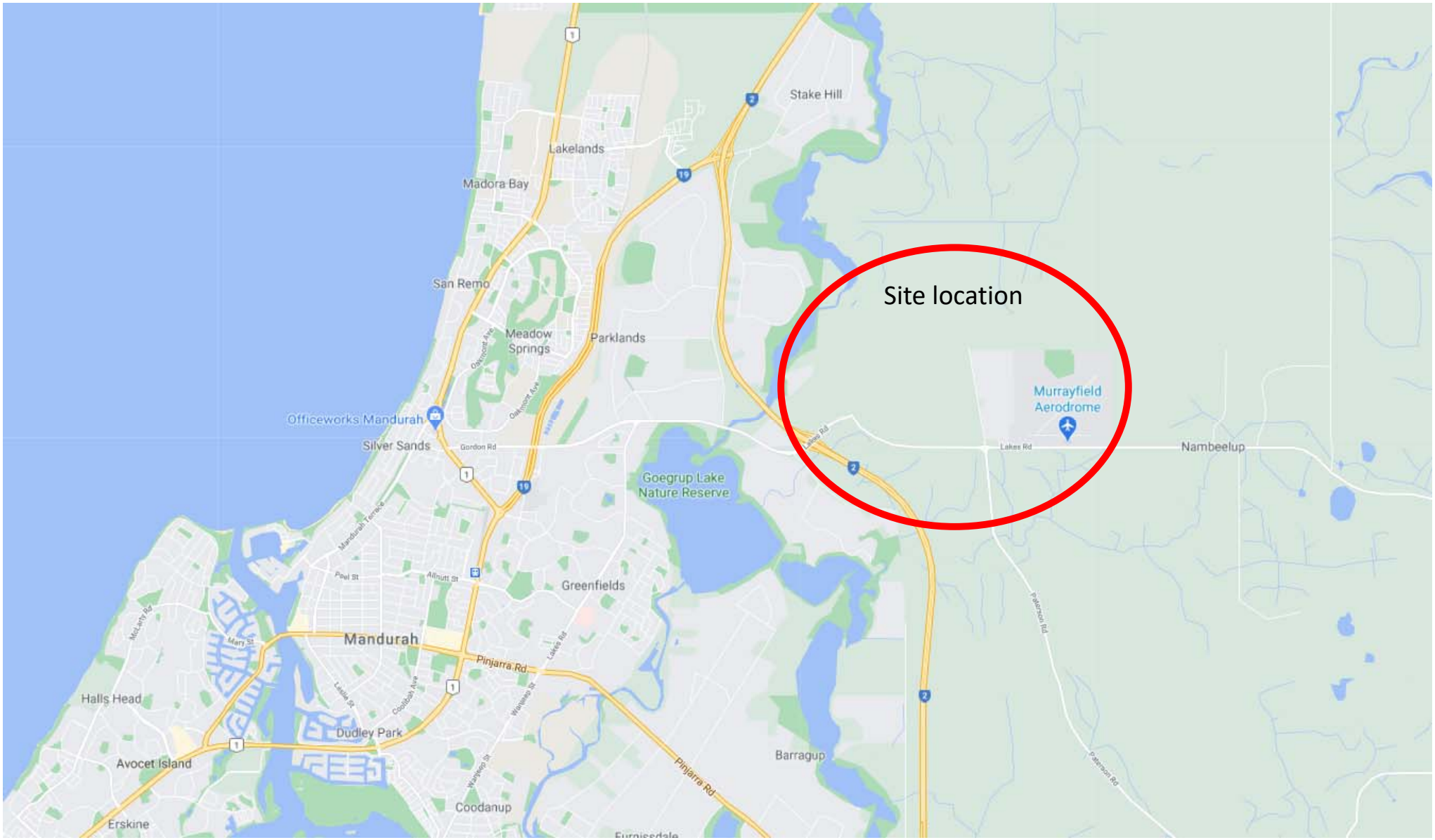


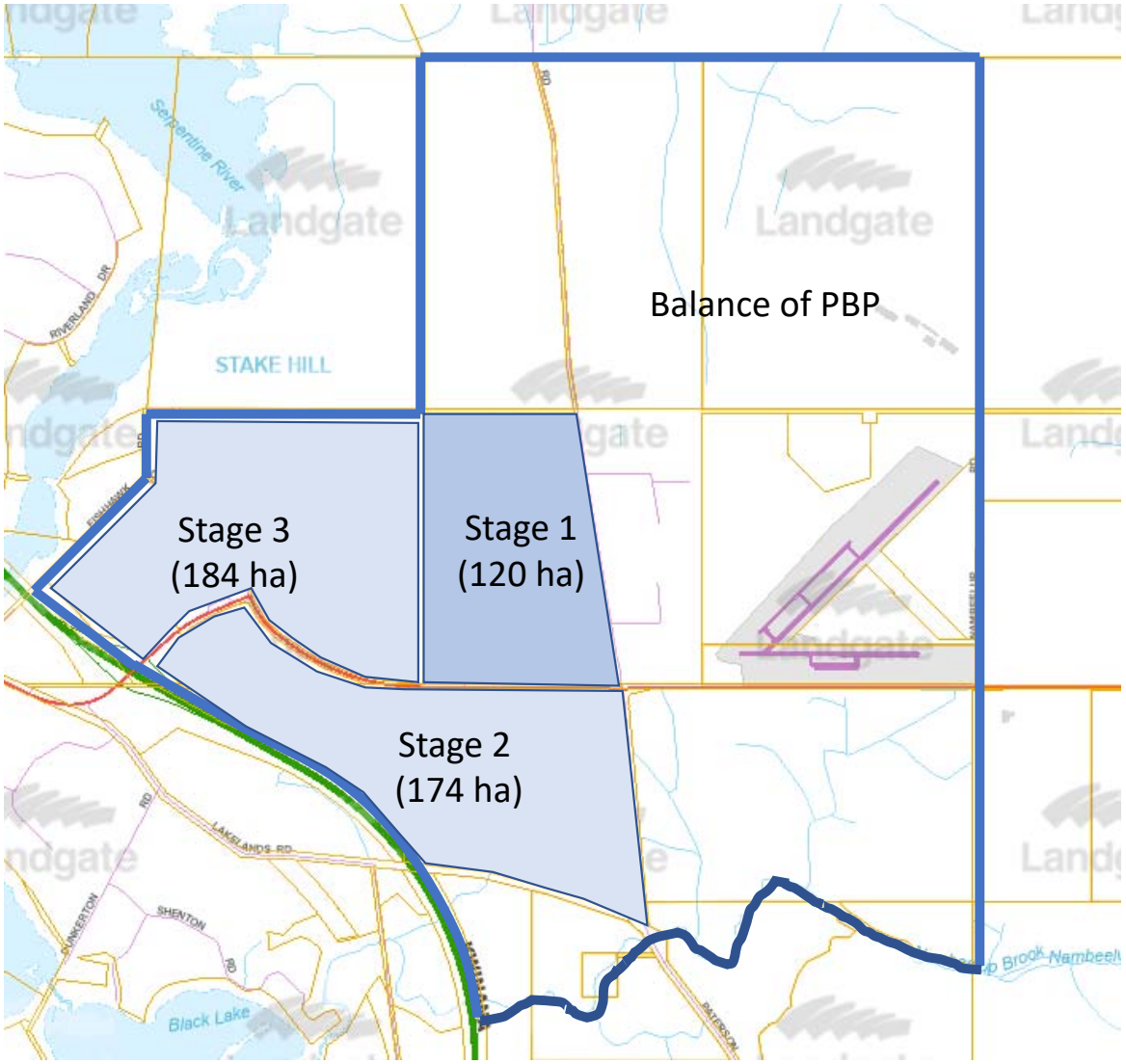
What all Net Zero planners need to know

- What will happen with the SWIS (everyone's Scope 2)
  - Whole of System Plan neglected Net Zero pledge
  - Apparently now being worked on
- What level of (real) offsets will be available through ACCUs (everyone's Scope 1&3 offsets)
  - Carbon sequestration in vegetation and soil
- Both are in the hands of government
- Without a consistent approach the individual Net Zero Plans will not add up
- In the meantime we concentrate on decarbonisation
- Electricity is the low hanging fruit

DevelopmentWA microgrids

- 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.


Site location
Stake Hill
Lakelands
Madora Bay
San Remo
Meadow Springs
Parklands
Officeworks Mandurah
Silver Sands
Gordon Rd
Goegrup Lake Nature Reserve
Murrayfield Aerodrome
Lakes Rd
Nambeelup
Greenfields
Mandurah
Pinjarra Rd
Halls Head
Dudley Park
Avocet Island
Barragup
Coodanup
Erskine

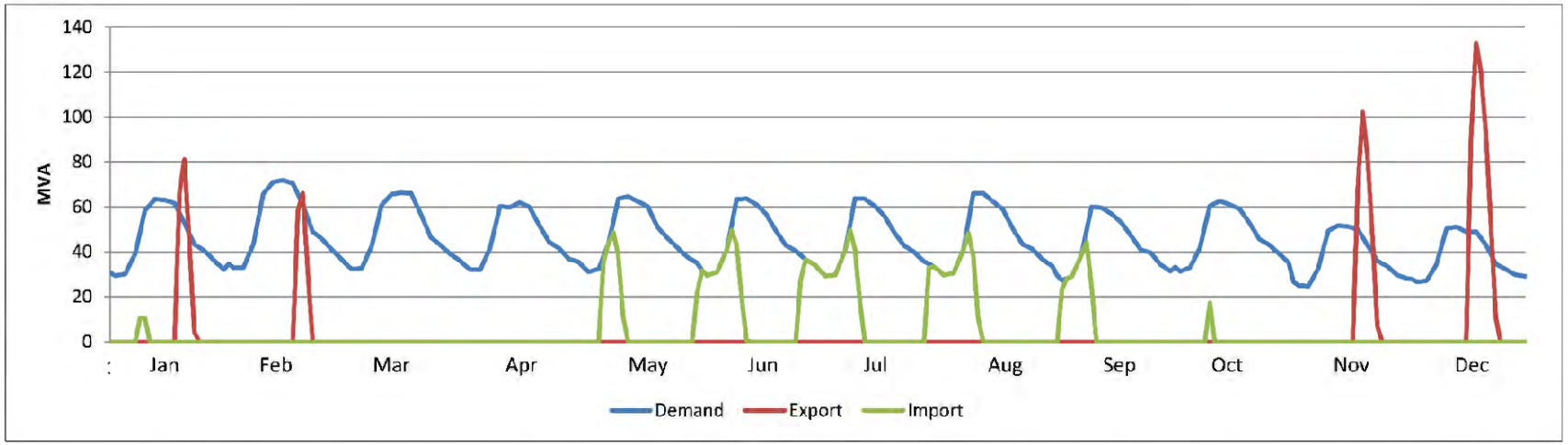

Balance of PBP
Stage 3
(184 ha)
Stage 1
(120 ha)
Stage 2
(174 ha)
STAKE HILL
Serpentine River
RIVERLAND DR
LAKELANDS RD
SHENTON RD
SUNKERTON RD
Black Lake
Landgate

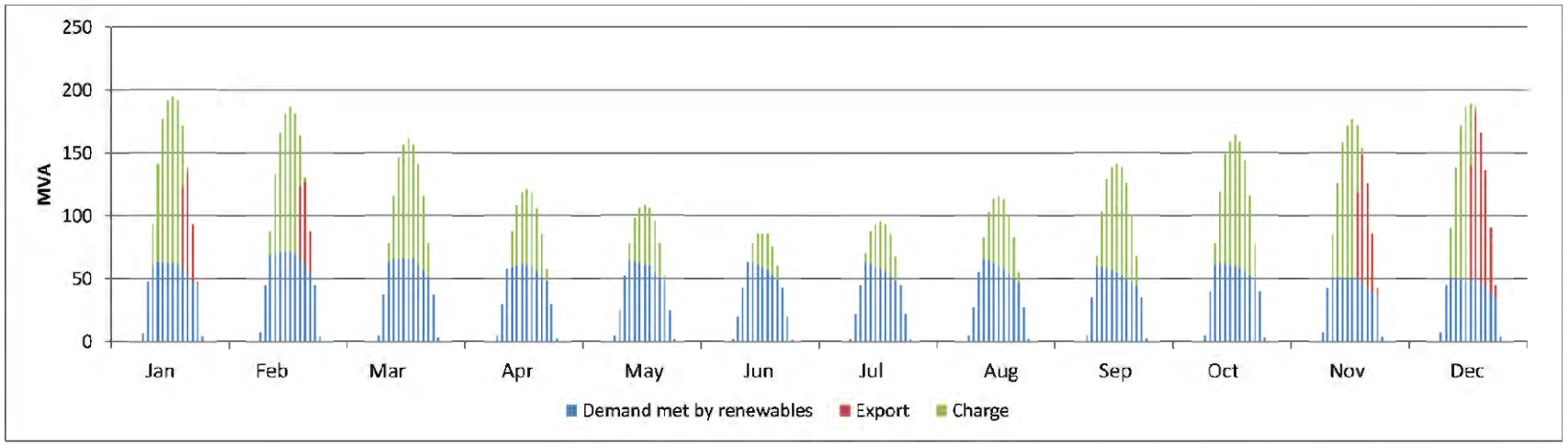
Background

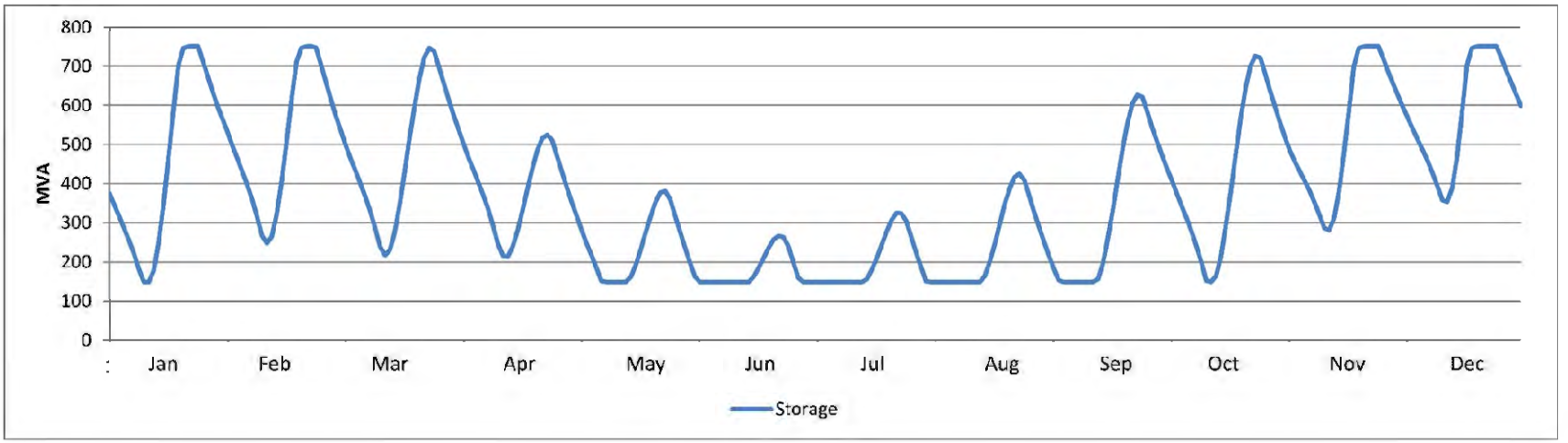
- At 200 kVA/ha the park could require 1,000 MVA capacity
- Initial stage (DWA's Lot 600) provides a 20 MVA connection to the SWIS
- Challenge:
  - How to use local renewable energy and storage to supply power to the whole of the PBP with only a 20MVA connection?
  - How to facilitate the entry of a 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

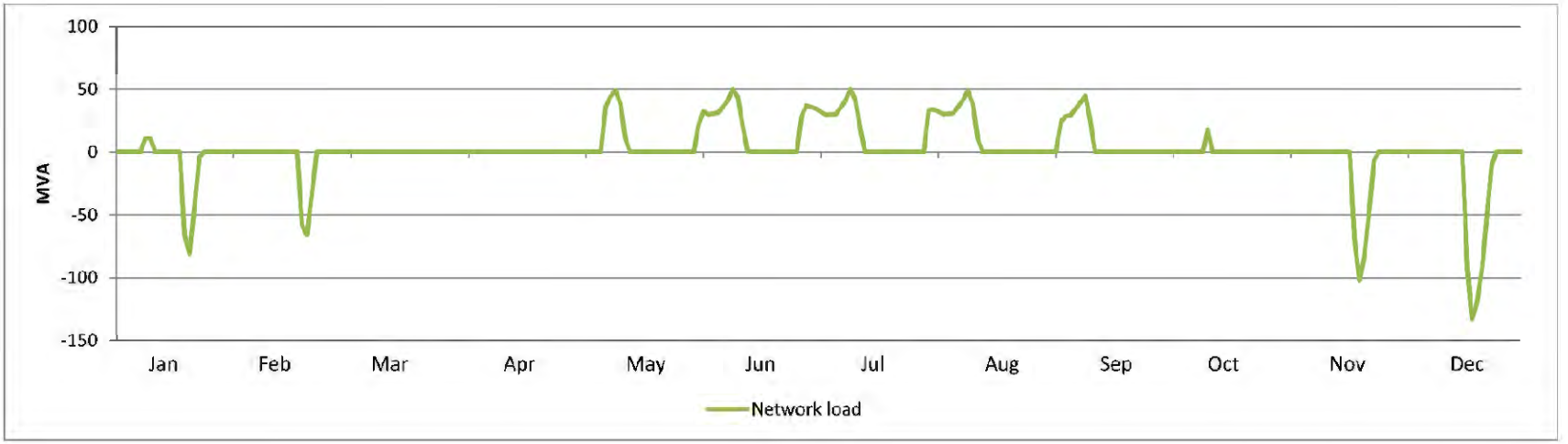
Steps

- Is there a business case for a utility?
- Are there providers interested?
- Can we deliver savings to customers?
- Can we navigate the regulatory maze?


140
120
100
80
60
40
20
0
MVA
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Demand
Export
Import


250
200
150
100
50
0
MVA
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Demand met by renewables
Export
Charge


800
700
600
500
400
300
200
100
0
MVA
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Storage


100
50
0
-50
-100
-150
MVA
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Network load

Answers

- Is there a business case for a utility?
  - Yes with progressive increase in renewable capacity and % over time as prices for solar and batteries reduce
- Are there providers interested?
  - Yes but not many with credentials
- Can we deliver savings to customers?
  - Yes ~ 30% over Synergy tariffs modelled and delivered
- Can we navigate the regulatory maze?
  - Yes – requires consideration of electricity regulation and landuse planning rules

Process

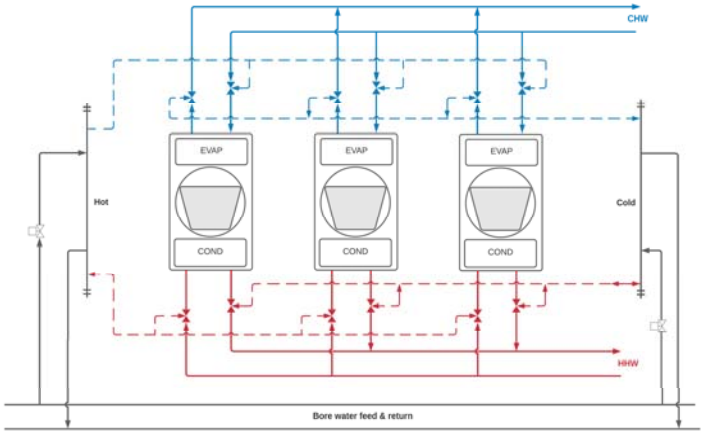
- EoI /RfP for utility provider
- Exclusive working period with preferred respondent
- Formal agreement
  - Peel Renewable Energy (formerly Enwave Australia), Sunrise Energy Group, Synergy
- PRE obtains retail and network licences
- PRE builds first stage solar array and battery storage
- Australia's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

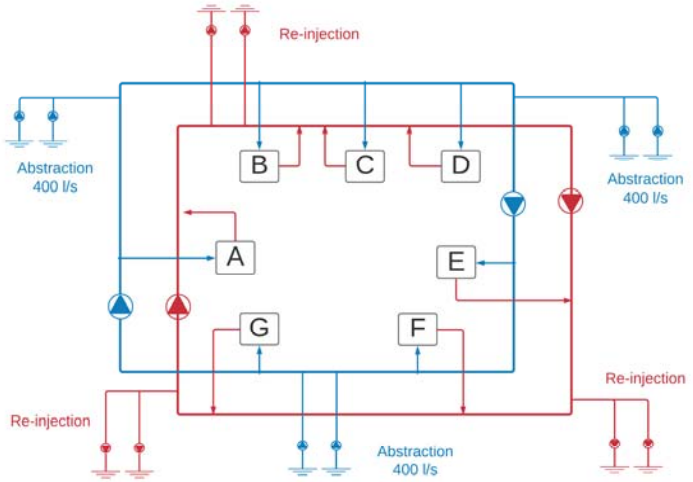
The system

- 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.

Peel geothermal study

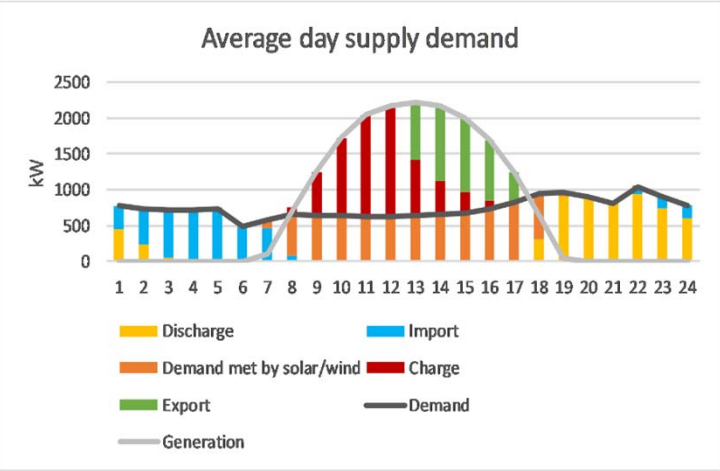
- Ground source heat pumps for thermal loads <100°C
- Deep aquifer temperature ~21°C
- CoPs 6-12
- Powered by the microgrid
- Modular system expanded as loads increase

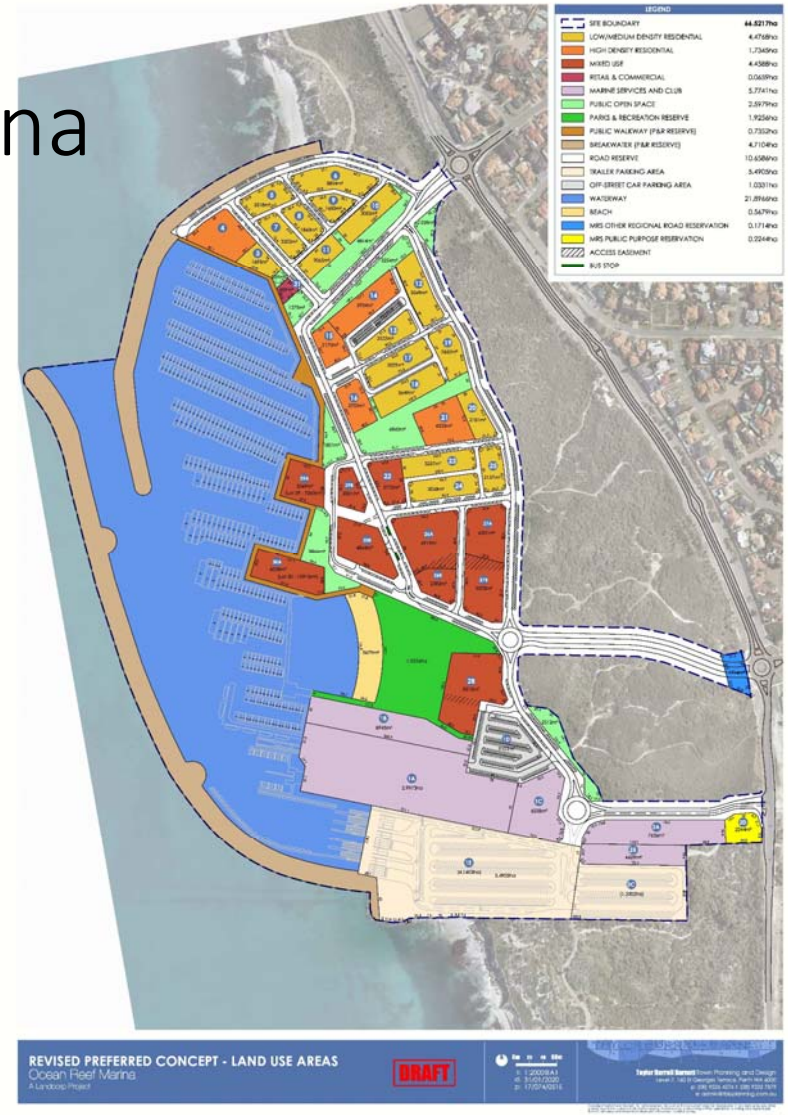




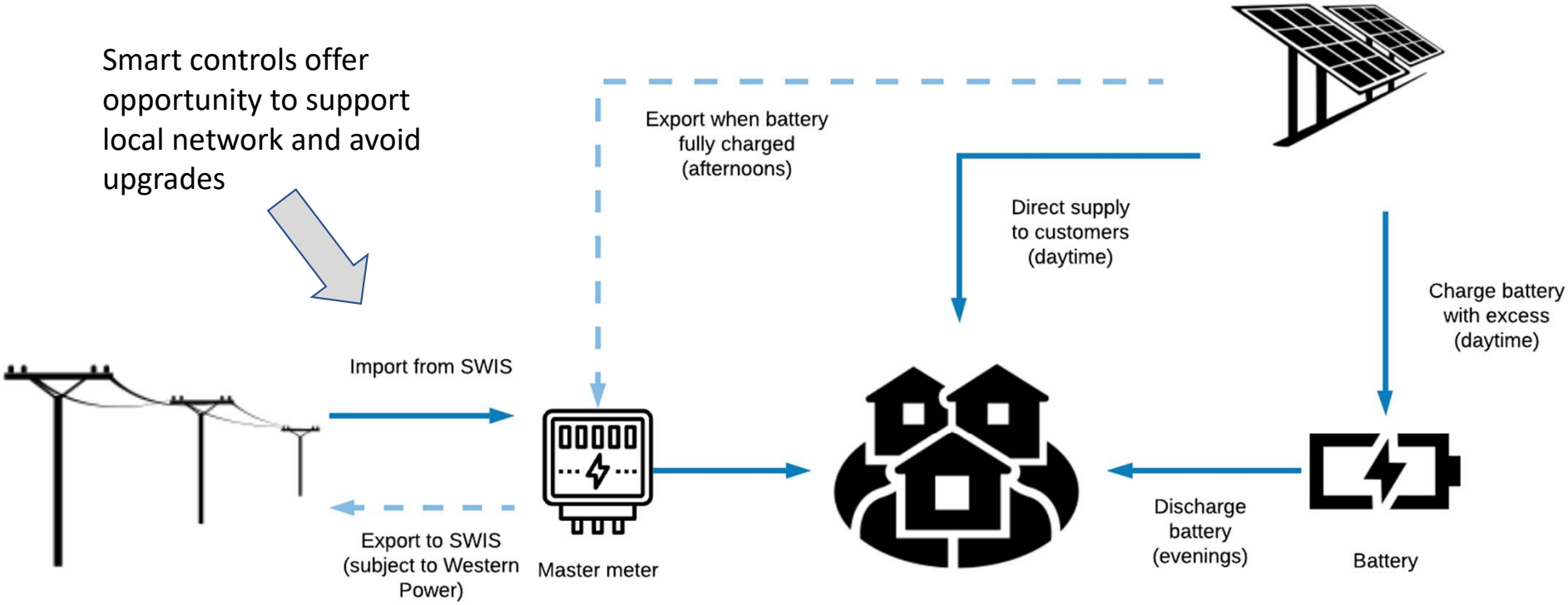
Up next – Ocean Reef Marina

- Mixed use residential, commercial, retail and marina
- Integrated Utility Provider
- In negotiations with a preferred provider:
  - Renewable microgrid
  - Smart City applications





Smart controls offer opportunity to support local network and avoid upgrades

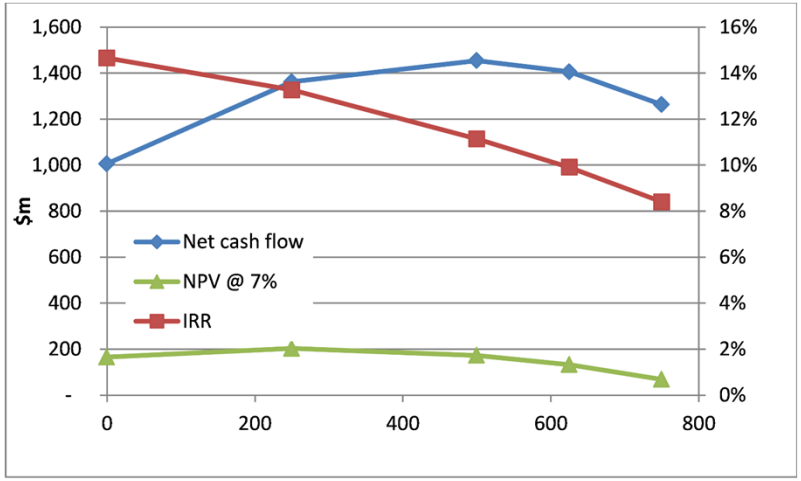


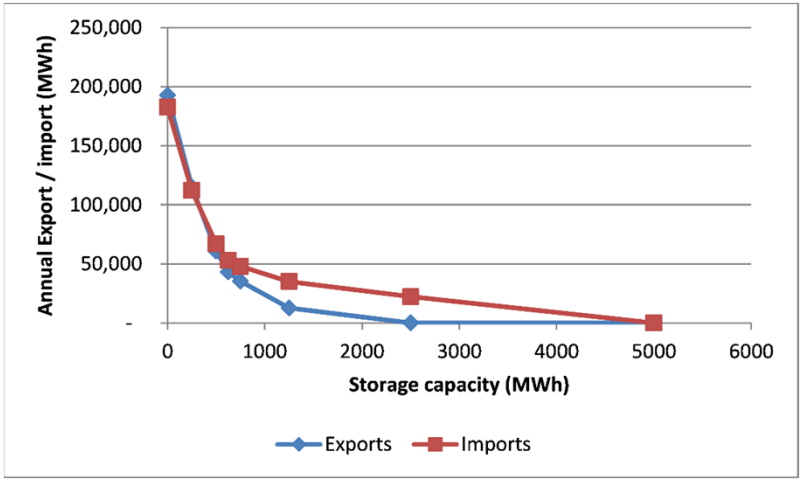
Lessons

- 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

Issues to resolve

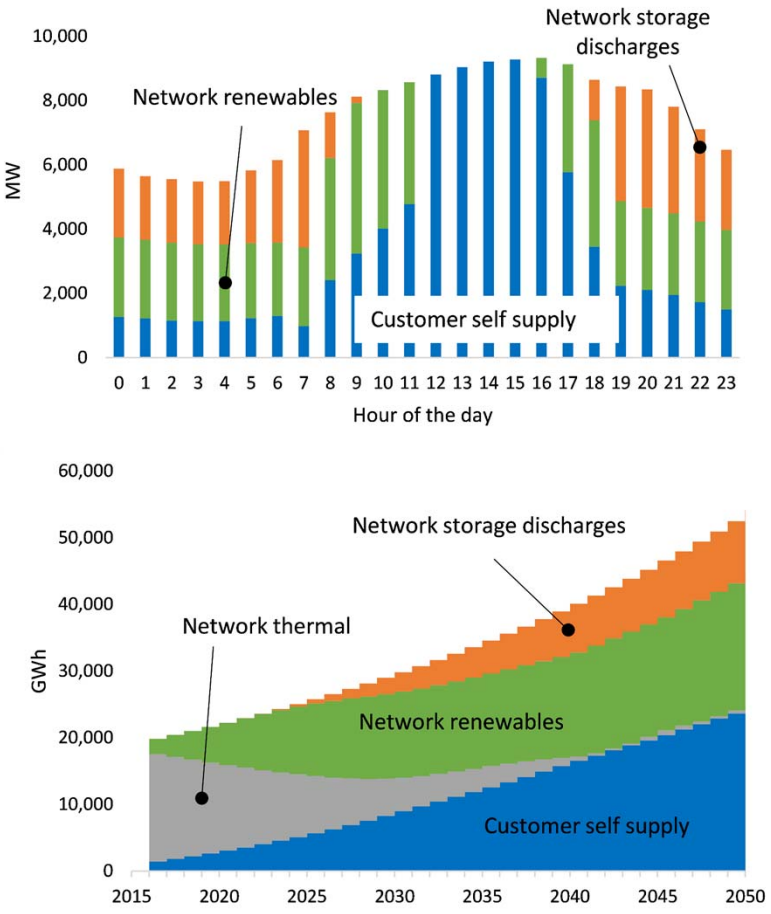
- Storage
  - Rapidly increasing costs and diminishing benefits above 2-3 hours (x Gen capacity)
- Electric vehicles
  - How quickly will they arrive?
  - When will they be charged?
  - 1 car at home / 1 at work?
  - Fast charging at home means upgrading networks?
  - Can we have enough fast chargers in public locations?
  - Will we learn to live with slow charge?





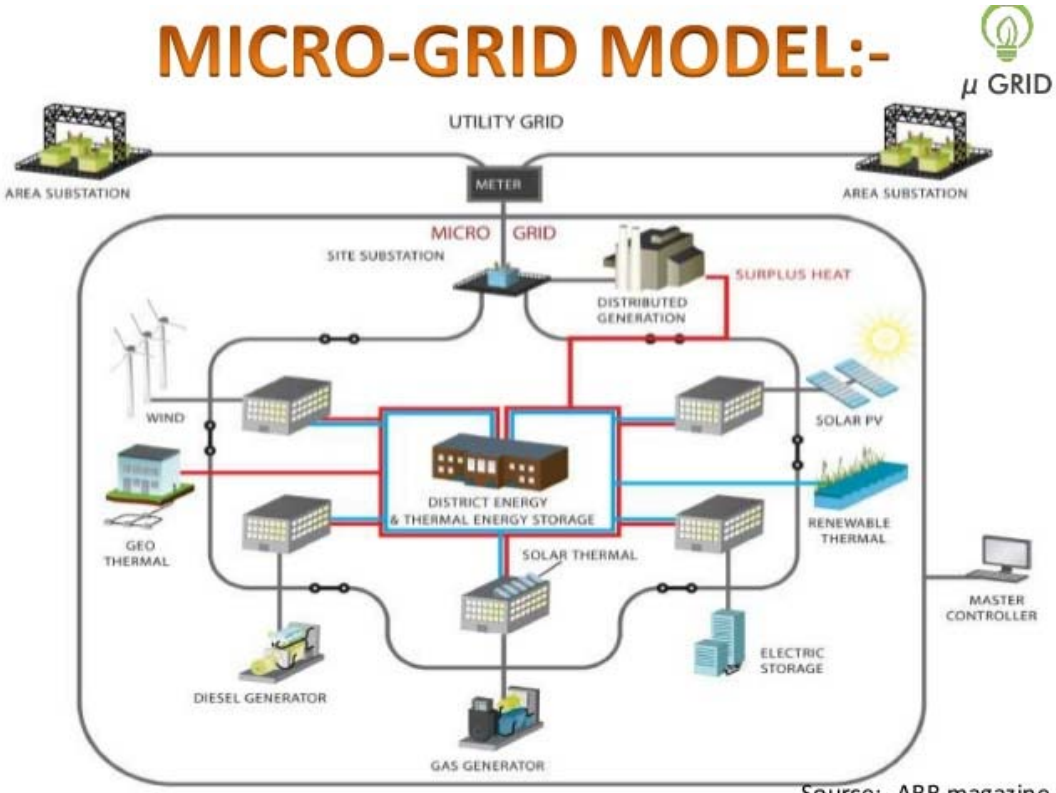
Back to the SWIS

- Will eventually supply a diminishing fraction of demand due to distributed solar and batteries (self supply)
  - Some in individual premises
  - Some in microgrids
- Some residual thermal generation will be required to avoid huge storages
  - OCGTs fuelled by hydrogen?
  - Biogas is cheaper and feedstock abundant



Microgrids are key to Net Zero

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



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Q&A

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