IEGA

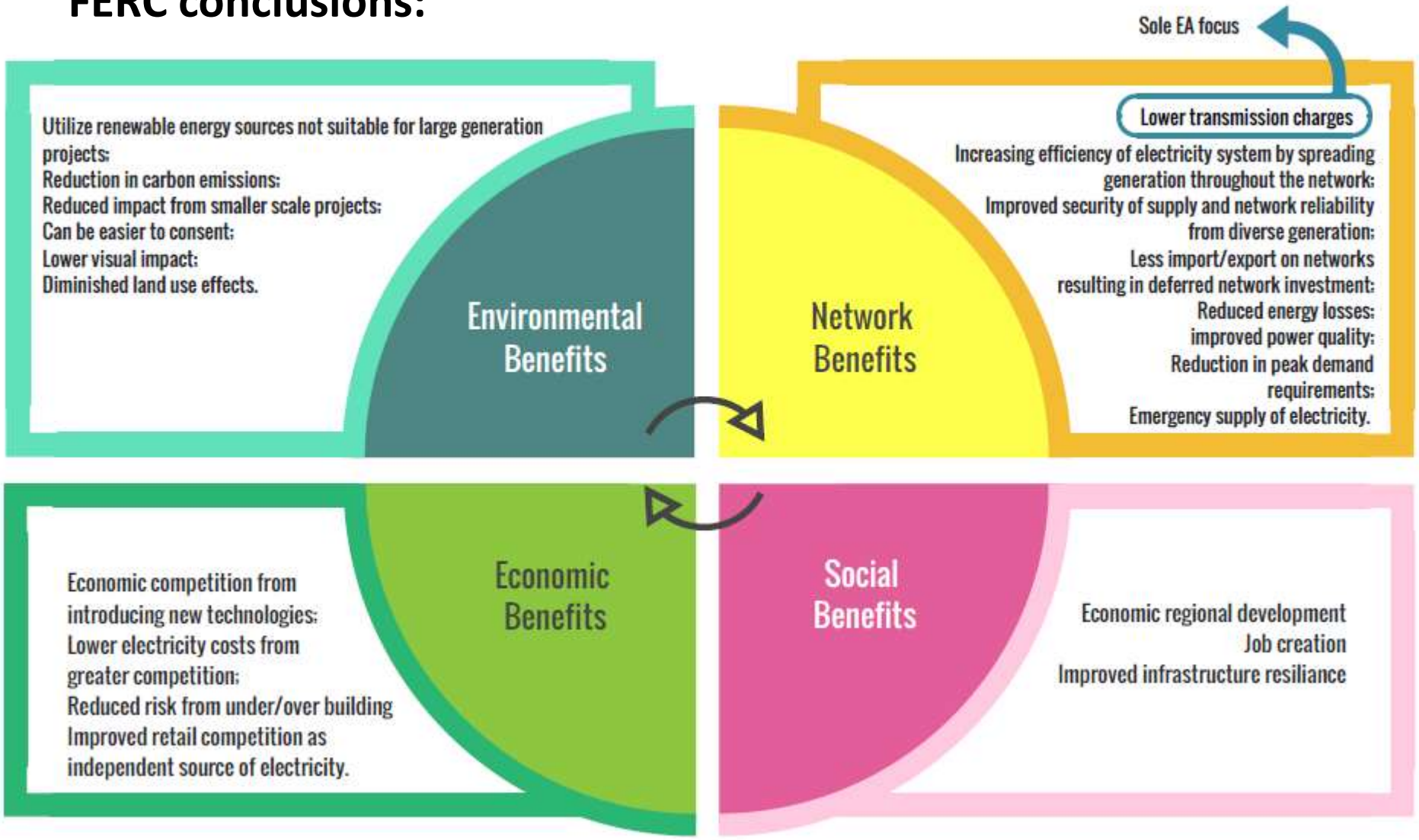
INDEPENDENT ELECTRICITY GENERATORS ASSOCIATION

Prepared for:
FlexForum

9 June 2022

Benefits of distributed generation

FERC conclusions:



DG already provides flexibility services

- One IEGA member is a participant in Transpower's DR programme
- Embedded hydro plant provides inertia and voltage support
  - KCE provides voltage support services on a network which includes absorbing reactive power
- Some plant contracted to supply black start
- KCE has provided overfrequency support services and continues to bid in this market
- Provide network support for complex lines outages, in lieu of diesel generators, including island mode services
- Improving reliability of electricity supply, for example:
  - DG at Auckland District Hospital Board's Grafton hospital provided emergency power when Vector's network was out
  - Transmission connection was lost to West Coast communities during the Fehi cyclone. Amethyst hydro station was used to black-start Hokitika's electricity supply and powered households and businesses in Hokitika and South Westland during the cyclone event
- **DG can respond quickly to network issues – it is not always restricted to a SO dispatch cycle**
- **DG is robust as it must satisfy Code standards and operating requirements**
- **DG is a large source of flexibility services from proven technology and can provide benefits without requiring complex lower voltage network monitoring**

DG reduces peak demand volumes on the transmission grid

- DG has been incentivised to generate during periods of peak demand
- And was compensated for this by some distributors
- Sentia found:
  - DG Peak output increased 56% from 544MW in 2009 to 850MW in 2015 and that non-wind and non co-gen DG showed the strongest response to winter peak load
  - The same incentive resulted in distributors using the majority of demand response in regional coincident peak demand periods (625MW out of 652MW (96%))

  Source:https://www.transpower.co.nz/sites/default/files/uncontrolled_docs/TP_TPM_Appendix_G1_Scientia_Gross_Demand_Report_26July2016.pdf
- IEGA members' have a record of responding to this incentive (since 2007)
- **DG has avoided or deferred capacity investment required in distribution and transmission assets to meet increasing peak demand**
- Transpower's latest 2024 peak demand forecast is now ~200MW and ~150MW higher than 12 months ago in the North Island and South Island respectively
  - Is there existing capacity to meet this and future increases in peak demand?

Source: https://www.transpower.co.nz/sites/default/files/bulk-upload/documents/2022%20SOSA%20-%20For%20Consultation.pdf

DG essential to transmission grid reliability

- Assessment tested if / what DG is essential for Transpower to meet its Grid Reliability Standards

- Results:
  - 100% of Upper North Island DG Winter Peak MWs is required for Transpower to meet its GRS
  - 87% of Upper South Island DG
  - 79% of Lower North Island DG
  - 71% of Lower South Island DG

- That is, **if this DG did not exist / operate during winter peaks the transmission grid would be operating below its required reliability standards**
- Additional transmission investment would be required to lift the performance of the transmission grid to its statutory reliability standards

DG is close to load

- Distributed generation is located close to load with minimal losses

- Current electricity system losses estimated at the equivalent of 40% of Genesis' average thermal generation output over the last 6 years with average annual emissions of 2,511ktCO_2

  - Based on CCC forecast 2022 generation 41,392GWh and demand 39,571GWh. Difference = 1,821GWh or losses of 4.4%

Other data:

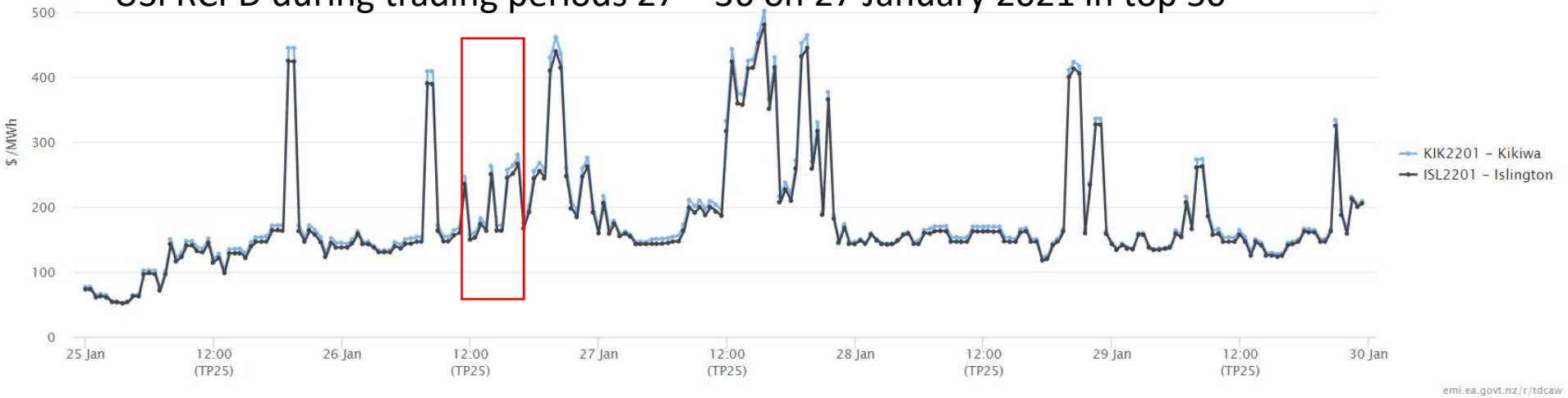
- Transmission network losses:
  - HVDC losses range from 0.23% to 9.72% (at ~1,050MW)
  - To account for the additional generation required due to AC losses, Transpower adds an additional 2.85% on to North Island demand and 3.85% on to South Island demand

  Source: https://www.transpower.co.nz/sites/default/files/uncontrolled_docs/Part%20B%20-%20TPM%20Assumptions%20Book%20-%20Draft%20for%20consultation%20-%20April%202022.pdf (pg16-18)
- Distribution network losses around 4-5%

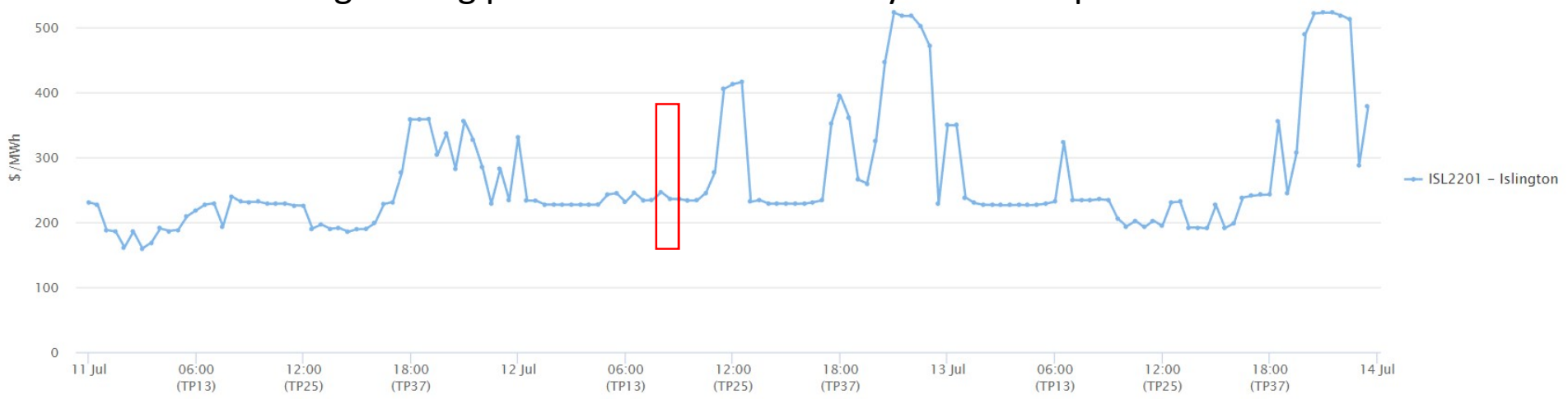
Uncertain whether future signals for action by DG will align with distribution and transmission requirements eg. high spot prices are not necessarily coincident with regional peak demand

Will wholesale market and network price signals align in the future?

USI RCPD during trading periods 27 – 36 on 27 January 2021 in top 50



USI RCPD during trading periods 17 – 19 on 12 July 2021 in top 50



Positive role for commercial scale distributed generation

- Distributed / decentralised generation can play an increasingly important role in delivering NZ's renewables and climate change targets
  - significant renewable resource available throughout NZ
  - incremental size more closely matched to demand growth
  - smaller environmental impact
  - local benefits engender local support
  - avoids or defers investment in transmission and distribution

- Commercial distributed generation can be contracted and responds to price signals providing a firm response when required

Appendix

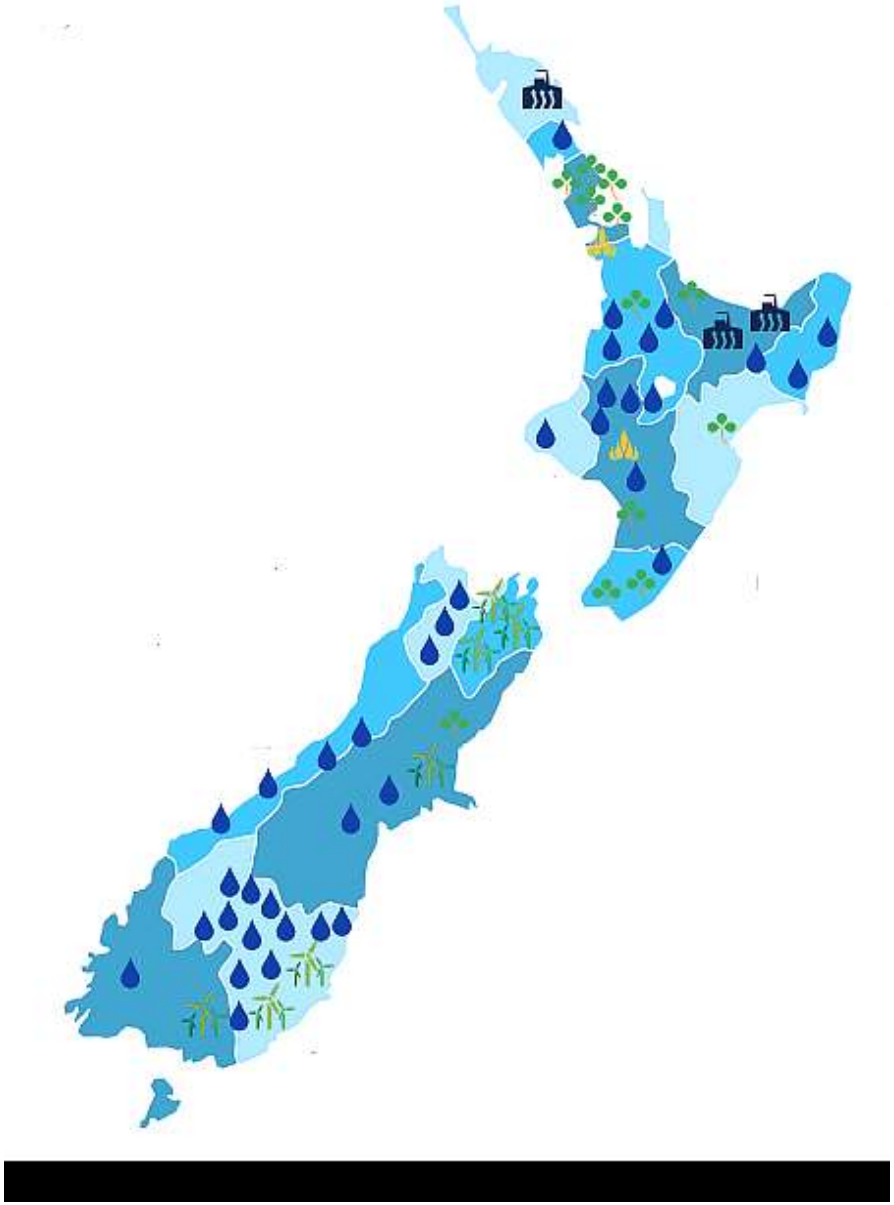
- About the IEGA
- Distributed generation in NZ

Who is the IEGA?

- IEGA = the Independent Electricity Generators Association Incorporated
- IEGA Constitution says:
  - represents the interest of developers and operators of distribution connected electricity facilities and service providers
  - aims to advocate for fair and equitable access to the electricity market that enables distributed generators to supply electricity to consumers
  - provides the distributed generation sector with a unified and cohesive voice in addressing legislative, regulatory, operational and general matters
- Commercial small-scale distributed generation - essentially the SME part of the electricity sector and as a group NZ's sixth largest generator
- Price takers – do not have the 24/7 trading desk but can programme generation to respond to price signals
- Members range in size from Pioneer Energy and King Country Energy to Pupu Springs hydro in Takaka. The largest generation plant is Mangahao at 34MW and some are les than 1MW

Distributed generation in NZ

- EMI 2018 generation database lists 163 embedded generation plant totalling ~950MW
- eg landfill gas plant, standby plant owned by distributors, combined heat and power at hospitals, hydro, wind, geothermal
- Stylised map of the location of distributed generation
- Supplying 11-12% of total demand
- Supplies over 20% of network demand in 9 networks and ~75% of electricity consumed on the West Coast



Definition of Distributed Energy Resources

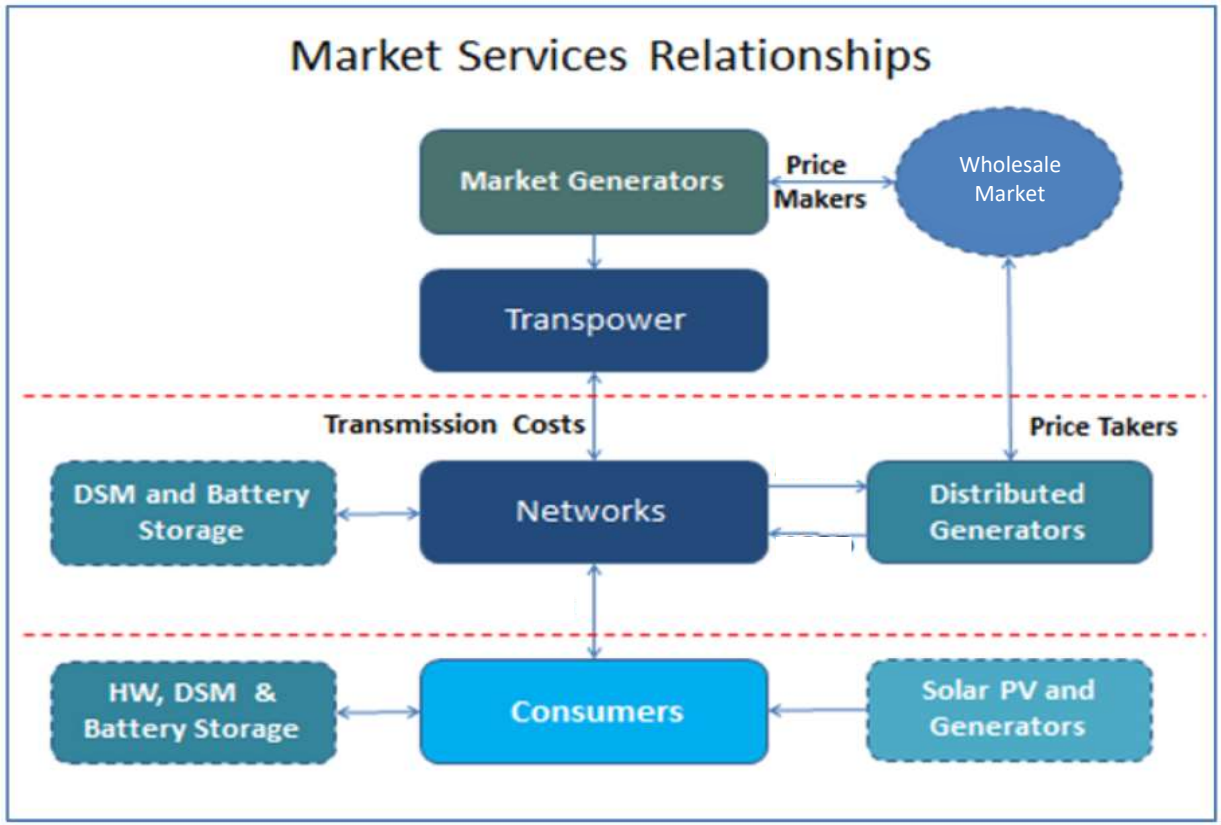
- Transpower's description of DER:

  "DER can be considered as energy systems that are connected within the distribution network, including systems located within businesses or households that are controllable and dispatchable. Some common examples of DER are rooftop solar PV, battery storage, EVs and their chargers, and home energy management systems which when aggregated can be considered as virtual power plant (VPP). **Small scale power generation and battery storage connected within a distribution network can also be considered as DER**" [emphasis added]
  https://www.ea.govt.nz/assets/dms-assets/29/02-FSR-Phase-1-draft-report-Nov-2021-v2.1332512.1.pdf

  "There is a well-documented opportunity to avoid significant transmission, distribution, and generation costs (see Distributed-energy-resources-der-report and Cost-benefit-analysis-of-distributed-energyresources-in-New-Zealand) through leveraging DER. "

Diagram of where our DG fits

- DG competes with transmission infrastructure to deliver electricity to consumers
- DG avoids and defers investment in transmission and distribution infrastructure
- Transpower and distributors are required to consider non-network alternative solutions to traditional ‘poles and wires’
- Commercial distributed generation can contract individually or as a group to provide flexibility services



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Slide 13

CF1 edit for ACOT/ACOD

Chris Fincham, 7/06/2022

Transmission grid and connections to distribution networks built for net demand

- Transpower's initial assessment of the demand it doesn't see on the transmission grid was provided in 2016
- That is, end user demand is 20% above the electricity delivered by the transmission grid

Table 4: Establishing a picture of 'gross system demand'

Scenario	Demand (MW)	% above net load
Net GXP demand	6200	0%
Net GXP + DG only	6730	9%
Net GXP + DG + DR[35]	7420	20%