September 2020

Current state of flexibility services in NZ

Innovation and Participation Advisory Group

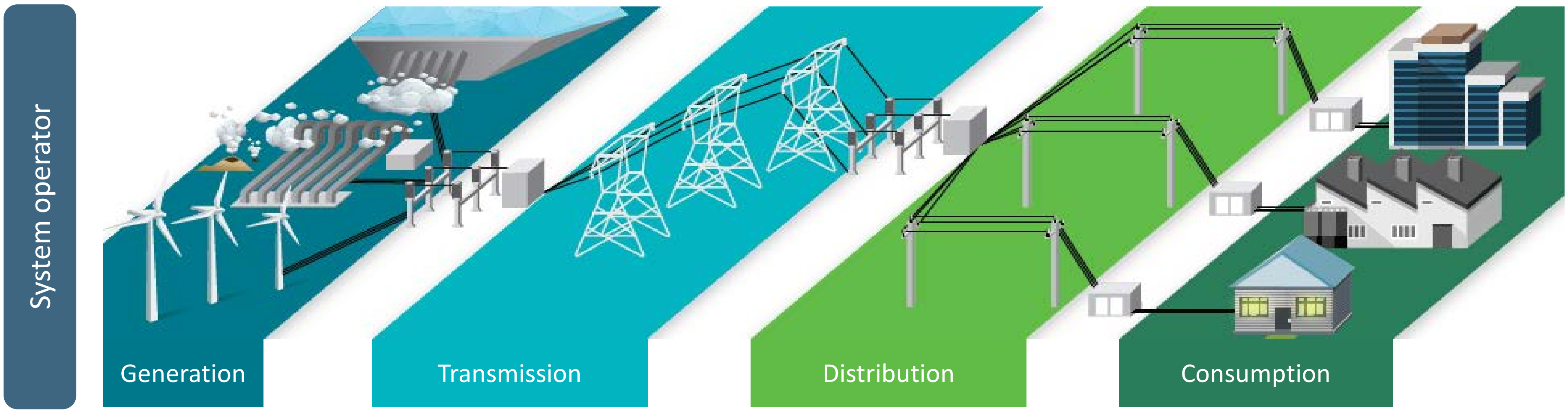
Current and future state of flexibility mechanisms in NZ

- IPAG has been asked by the Authority to provide “a summary of the current state of electricity demand response and wide flexibility mechanisms in NZ”.

- We initially based our assessment on the “wheel of benefits” diagram developed by the Rocky Mountain Institute.

- However, we’ve now considered the current state of flexibility services in the context of traditional financial and physical flows in the electricity industry.

Traditional physical flows in the electricity industry



The system operator manages the power system so there is a continuous balance between electricity supply and demand.

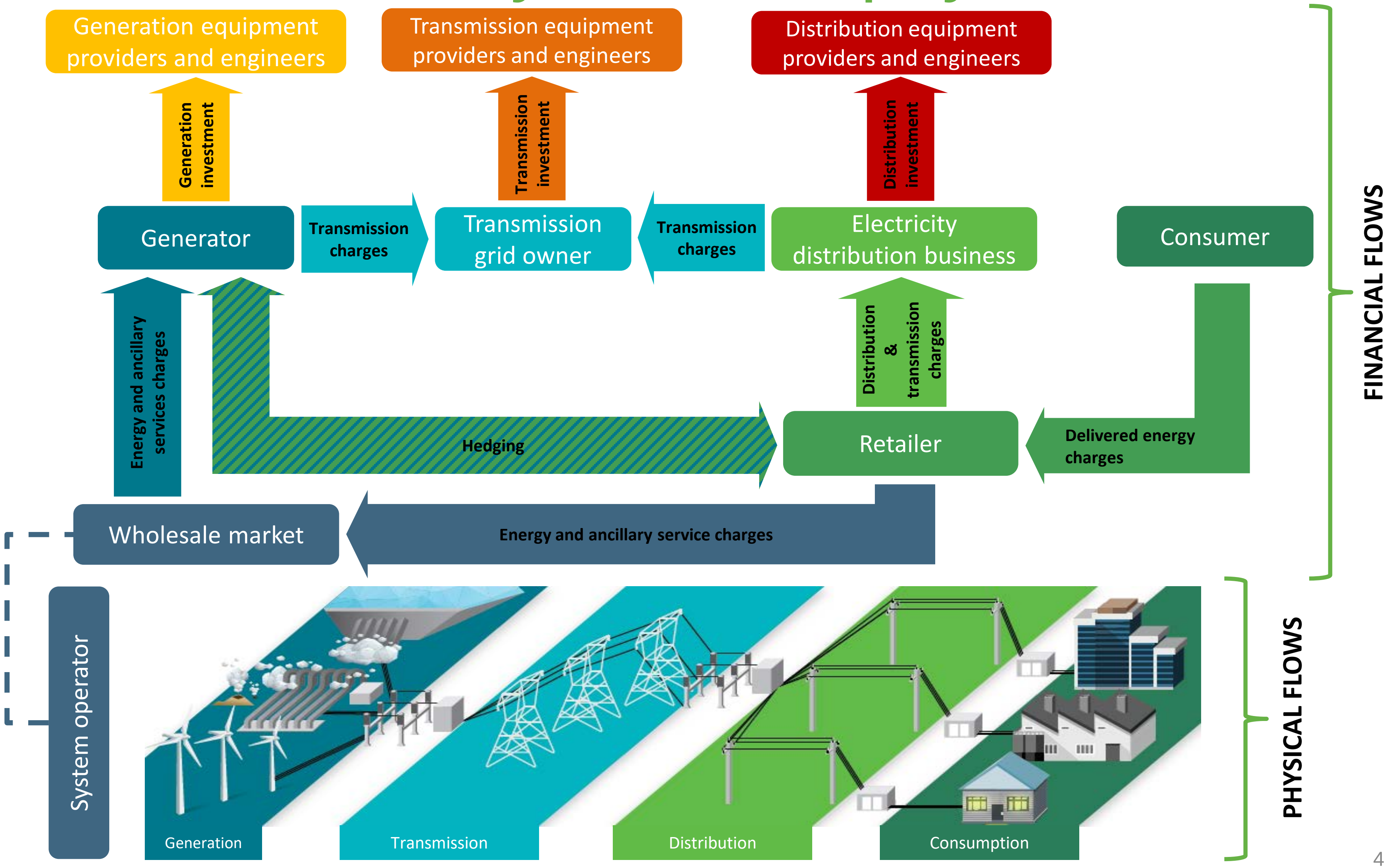
Traditionally, a generator generates electricity which then flows through the transmission and distribution networks to the electricity consumer.

However, this representation of the physical flows is a simplification:

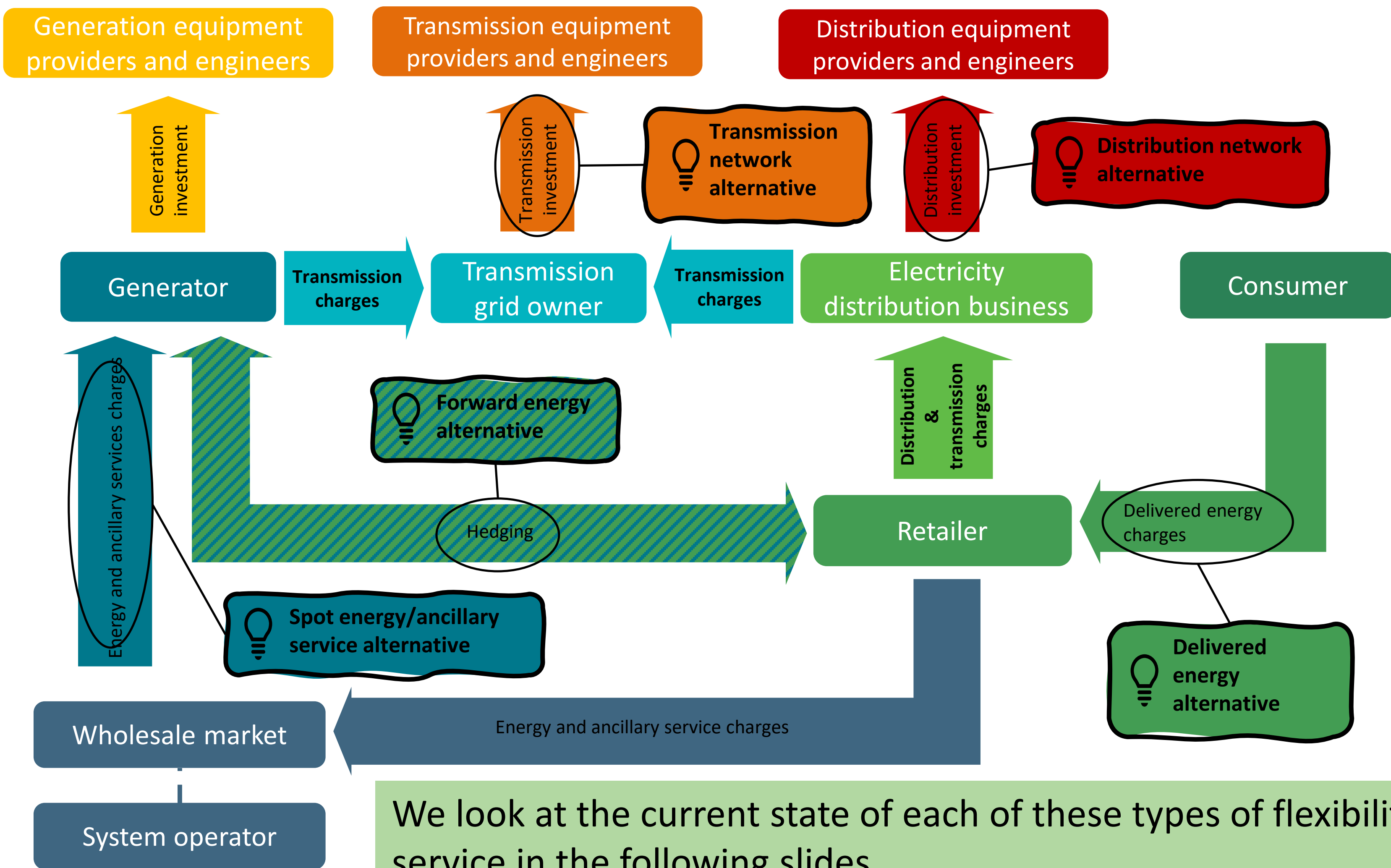
- some consumption is directly connected to the transmission system
- some generation is connected to the distribution system (rather than the transmission system) or even behind-the-meter (on a consumer’s premises).

* This diagram is based on a diagram used in the Authority’s publication ‘Electricity in New Zealand’ (p10) (available here: https://ea.govt.nz/about-us/media-and-publications/electricity-new-zealand/).

Financial flows in the electricity industry are traditionally linked to physical flows



Flexibility services provide an alternative to traditional financial flows



We look at the current state of each of these types of flexibility service in the following slides…

Spot energy/ancillary service alternatives

Generation equipment providers and engineers

Generation investment

Generator

Energy and ancillary services charges

Spot energy/ancillary service alternative

Service	Current state	Barriers		Possible location of flexibility mechanism	Stacking potential
1. Spot dispatch		Biggest barrier: Need to be a participant.	• Inability to aggregate across retailers and multiple GXPs.		There are some restrictions on stacking – eg, if dispatched as IR or FK can't use the same MW for other services. However, generally able to stack with minimal issues.
2. Instantaneous reserve (IR)			• Code is technology specific.		
3. Extended reserves[1]					
4. Frequency keeping (FK)			• Minimum offer size. • Code is technology specific.		
5. Voltage support[2]					
6. Black start[3]			• Need to be large, centralised and grid connected.		

[1] Extended reserves is not an active market at the DER level.
[2] Currently the SO isn't procuring any voltage support because the reactive equipment available is sufficient for it to meet its PPOs.
[3] There is potential to use DER connected at grid level to provide black start, but it will still need to be large and centralised.

Retailer

Delivered energy charges

Energy and ancillary service charges

Wholesale market

System operator

The system operator is ***incentivised*** to spend on energy and ancillary service alternatives because of the requirements set out in Part 7 of the Code including common quality and dispatch principal performance obligations (PPOs).

KEY

	Any party can provide the service directly.
	Some parties can only provide the service through an intermediary (eg, an aggregator).
	Service currently not provided using flexibility mechanisms.
	On transmission network
	On distribution network
	Behind-the-meter

Forward energy alternatives

Generation equipment providers and engineers

Generation investment

Generator

Forward energy alternative

Service	Current state	Barriers	Possible location of flexibility mechanism	Stacking potential
1. Direct substitute for a hedge		• No major barriers.		Potential to use flexibility service for other purposes in addition to as a forward energy alternative.

Distribution & transmission charges

Hedging

Retailer

Delivered energy charges

Generators and retailers are ***incentivised*** to spend on forward energy alternatives if they provide a cheaper alternative to traditional hedging. Using flexibility services to provide a forward energy alternative may also provide some freedom from relying on the hedge market to manage price risk.

Energy and ancillary service charges

System operator

KEY:

	Any party can provide the service directly.
	Some parties can only provide the service through an intermediary (eg, an aggregator).
	Service currently not provided using flexibility mechanisms.
	On transmission network
	On distribution network
	Behind-the-meter

Transmission network alternatives

Generation equipment providers and engineers

Transmission equipment providers and engineers

Distribution equipment providers and engineers

Generation investment

Transmission investment

Generator

Transmission charges

Transmission grid owner

charges

Delivered energy

Transpower is ***incentivised*** to spend on transmission network alternatives by the Part 4 regulatory regime. The regulatory regime should incentivise Transpower to spend on transmission network alternatives when this is the optimal choice (ie, lowest expected lifetime cost) because it aims to align the interests of Transpower with consumers. *How well the Part 4 regulatory regime incentivises Transpower (and EDBs) will be considered more fully later in this project.*

Transmission network alternative

Service	Current state	Barriers	Possible location of flexibility mechanism	Stacking potential
1. Transmission investment deferral[1]		• DER generally more expensive than Special Protection Schemes.		Potential to be stacked with other services (particularly distribution network alternatives).
2. Planned outage backup power				
3. Unplanned outage restoration				

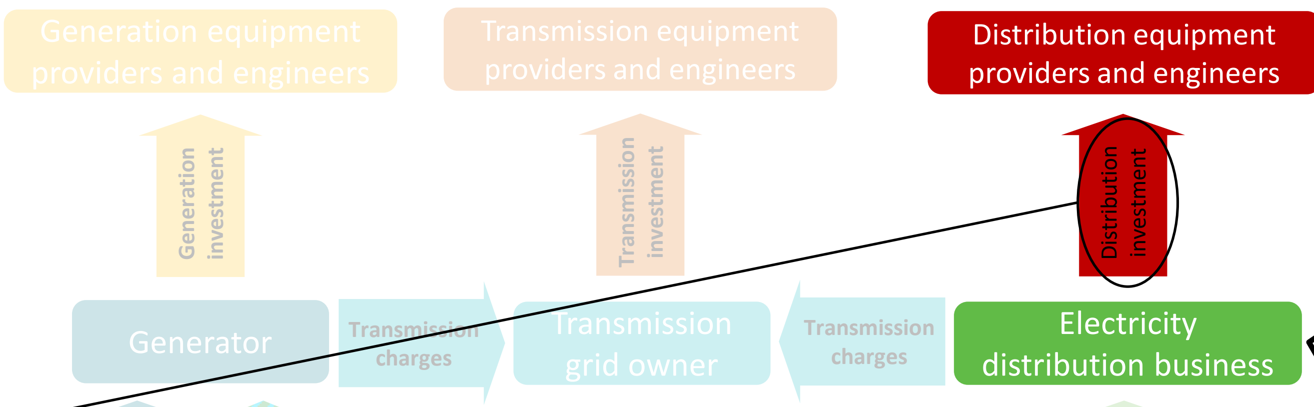
[1] This service could be provided by any party signed up to Transpower's DR programme. However, so far it has not been cost-effective to use Transpower's DR programme to defer transmission investment.

System operator

KEY:

	Any party can provide the service directly.
	Some parties can only provide the service through an intermediary (eg, an aggregator).
	Service currently not provided using flexibility mechanisms.
	On transmission network
	On distribution network
	Behind-the-meter

Distribution network alternatives



EDBs are ***incentivised*** to spend on distribution network alternatives by the Part 4 regulatory regime. All EDBs face information disclosure requirements, while EDBs that aren't consumer owned also face price-quality control. EDBs generally have more latitude than Transpower on what they can invest in. *How well the Part 4 regulatory regime incentivises EDBs (and Transpower) will be considered more fully later in this project.*

Service	Current state	Barriers	Possible location of flexibility mechanism	Stacking potential
1. Distribution investment deferral	TBD	• Regulatory approach was not designed to encourage the use of flexibility services and is very concise on what is expected from EDBs on quality.	On distribution network; Behind-the-meter	Potential to be stacked with other services (particularly transmission network alternatives).
2. Planned outage backup power	TBD			
3. Unplanned outage restoration	TBD			

Current state is expected to vary by EDB. Responses to the Authority's request to EDBs for information on flexibility services should provide further information.

KEY:

Green	Any party can provide the service directly.
Amber	Some parties can only provide the service through an intermediary (eg, an aggregator).
Red	Service currently not provided using flexibility mechanisms.
	On transmission network
	On distribution network
	Behind-the-meter

Delivered energy alternatives

May include increased PV self consumption and/or time-of-use bill management.

Delivered energy alternative

Service	Current state	Barriers	Possible location of flexibility mechanism	Stacking potential
1. Avoiding/ reducing payment to retailer		• Weak retail competition in some areas reduces range of pricing options available to consumers. • Consumers lack information and education. • Don't avoid fixed costs of transmission and distribution connection unless you go completely off grid.		Consumer can use flexibility mechanisms to provide other services at the same time.
2. Reliability/ resilience		• Consumers lack information and education.		May not be able to be stacked (eg, if a consumer uses a battery to provide backup power then it can't be used to provide other services).

eg, backup power.

Consumers are ***incentivised*** to spend on delivered energy alternatives to get <u>freedom from the national grid</u> and obtain <u>potential financial savings</u>.

Consumer

Delivered energy charges

Retailer

Hedging

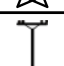
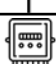
Energy an

Wholesale market

Energy and ancillary service charges

System operator

KEY:

	Any party can provide the service directly.
	Some parties can only provide the service through an intermediary (eg, an aggregator).
	Service currently not provided using flexibility mechanisms.
	On transmission network
	On distribution network
	Behind-the-meter