# The 100MW Challenge Pilot

Are Flexibility Services a reliable and economic alternative to manage customer owned solar generation constraints?

# Background

- The 100MW challenge seeks to optimise customer owned Distributed Energy Resources (DER) through arrangements targeting contestable Commercial and Industrial organisations (either directly or through partners).

- The pilot aims to deliver 100MW of non-network support that can be reliably deployed by Western Power for future solar PV based network constraints.

- The 12 month bilateral agreements (Flexibility Services) between Western Power and contestable Commercial and Industrial organisations seek to incentivise customers to manage (or turn off) their solar PV generation or shift load to support system low events.

- Western Power is in the early stages of building its capability to manage, embrace and monetise this customer and technology led energy transformation and this pilot seeks to ensure a direct link between the required future capability outlined in the DER Roadmap to the current and medium-term business challenges.

# Understanding the DSO

(Distribution System Operator)

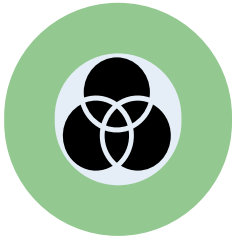
# What is a DSO?

The Distribution System Operator (DSO) is a term used to describe a set of functions that are required to take place for effective network management at the distribution network level.

For these functions to be realised, there are ‘key enablers for DSO’: material improvements to the foundational building blocks on which smart, flexible networks and DSO function delivery will rely.

These step-change enhancements **will meet user’s needs**, and are built on a number of incremental individual technology, data and engineering improvements.

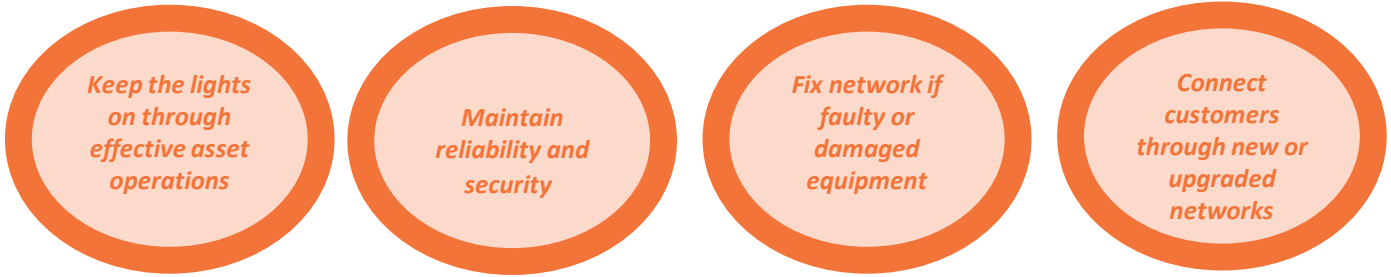
***Customer Choice ↑ for non-network solutions***



***Optimised Investment ↑ in higher voltage networks***

# From DNSP to DSO

## Current network roles



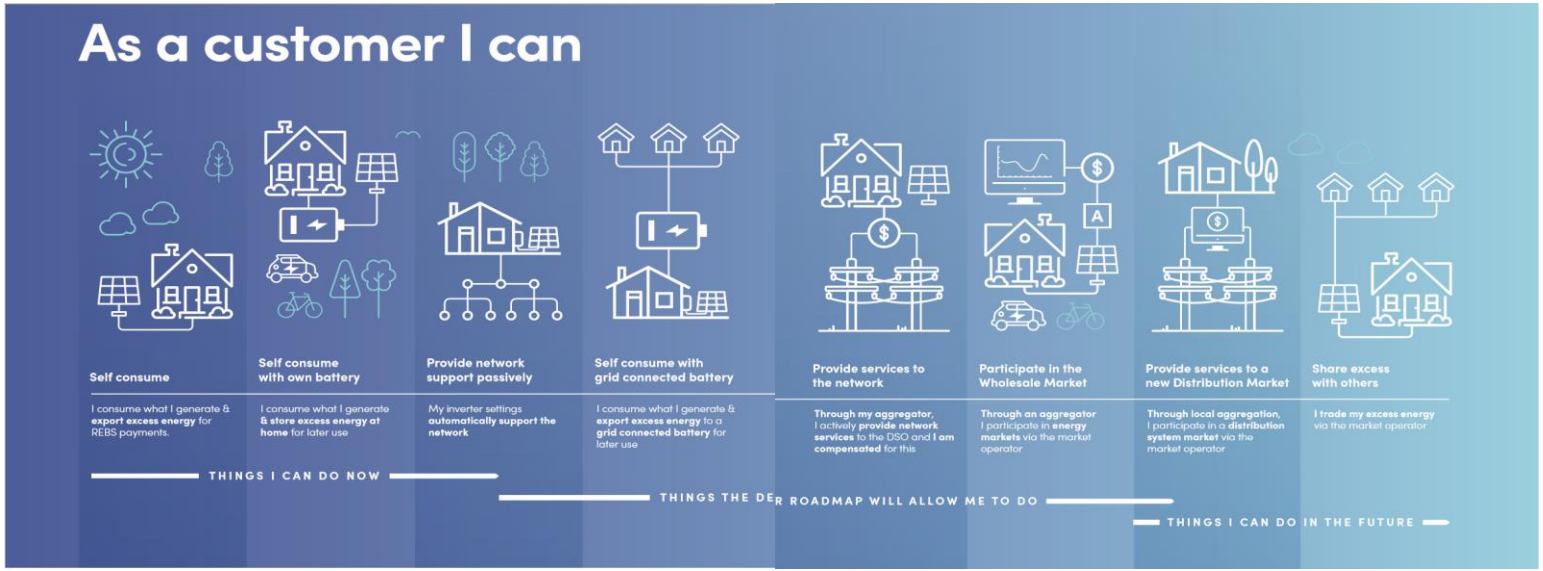

## Expanding network roles → DSO

# Why DSO?

**Enter the Customer.**

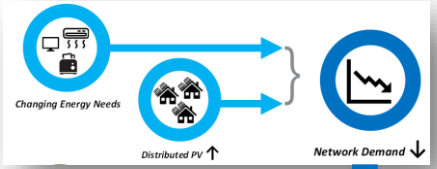
The evolution from a DNSP to a DSO is essential to driving performance and efficiency from our network and ensure it is fit for purpose and can meet future energy demands of all our customers.

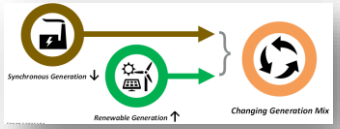
The enhanced DSO capabilities we are developing will enable customers to be both producers and consumers of energy; and will give them the freedom to access other value streams within the transitioning energy system.



# Western Power's DSO Strategy

# System strength & stability challenges | Where does DSO fit ?



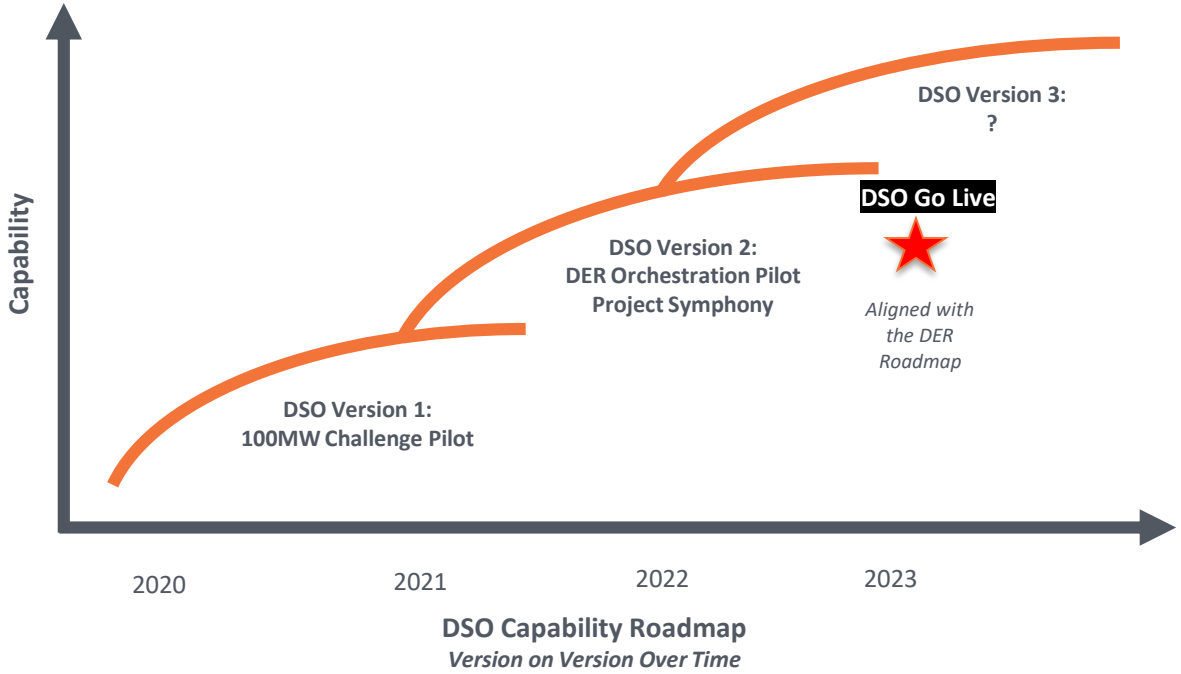

| | | 2019 | 2020 | | 2021 | | 2022 | | 2023 | | 2024 | | 2025 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Spring | Autumn | Spring | Autumn | Spring | Autumn | Spring | Autumn | Spring | Autumn | Spring | Autumn | Spring |
| Issue | Annual minimum system total MW *Forecast (90% confidence)* | 1196 | 1136 | | 1083 | | 1031 | | 1000 | | 935 | | 915 | |
| Impact | High Tx Volts | Solved | Solved | | Solved | | Solved | | Solved | | Solved | | Solved | |
| | High Dx Volts | Solved | Solved | | Solved | | Solved | | Solved | | Solved | | Solved | |
| | Excess VAR | Solved | Solved | | Solved | | Solved | | Solve | | Solved | | Solved | |
| | Frequency Stability | | | | | | | | | | Solved | | Solved | |
| Solutions | Short Term Solutions | 0 to 20 | | | | | | | | | | | | |
| | MV Reactors | - | 25 | 25 | | | | | | | | | | |
| | Terminal Reactors | - | - | 100 | 200 | | | | | | | | | |
| | PowerBanks | 0.1 | 0.2 | 1 | | | | | | | | | | |
| | VoltVAR | - | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| | DSO | | | | | | | | | | | | | |

DSO solves frequency stability, and in doing so, it also reduces occurrence of High Dx Volts

DSO is LIVE

# DSO Capability Roadmap

***Aligning with the network constraints, the DER Roadmap 2023 DSO 'Go Live'***



# The DSO's DER Management Plan

From a duck

To a platypus

**SHORT-TERM**

- Operational responses
- Trials of alternative solutions
- No-regrets investments

**MEDIUM-TERM**

- Traditional responses – reactive support and augmentation
- Larger scale pilots of alternate solutions
- Move understanding forward

**LONG-TERM**

- Optimised mix of traditional and alternative solutions
- Active control

# The DER Roadmap

The Energy Transformation Taskforce's DER Roadmap provides an integrated set of actions designed to deliver a future where DER contributes to a safe, reliable and efficient system where all customers can enjoy the benefits of DER.

## 2020

### Distribution Storage
Western Power PowerBank installations commence, providing opportunities for network and customer benefit whilst adding to power system stability

### Distribution Network Visibility
Distribution network visibility program commences to enhance the understanding of distribution network power flows and constraints

### Inverter Settings & Functionality
SWIS-specific autonomous inverter settings that provide better performance during disturbance events are enabled

### Customer Engagement
Customer engagement program commences on challenges and opportunities of the high-DER future

### DSO/DMO
DSO/DMO roles, functions, practical operations, regulatory requirements, as well as costs and benefits have been identified

### Grid Response
Investment in grid support technologies (including reactors, storage and voltage control equipment) by Western Power is contributing to maintaining system stability on low demand days

### Tariff Pilots
Pilots for alternative tariff structures have commenced, demonstrating value to consumers who can move electricity use to the middle of the day

### DER Orchestration Pilot
A comprehensive VPP technology and market participation pilot has commenced, testing the incorporation of aggregated DER into the WEM

**Technology Integration**
- Inverter Standards
- Distribution Battery Storage
- Grid Response
- Power System Operations
- Distribution Network Visibility
- Planning for EV Integration

**Tariffs and Investment Signals**
- Tariff Pilots
- DER for Tenants

**DER Participation**
- Network Investment Process
- DER Orchestration Pilot
- DSO/DMO Function Set

**Customer Protection and Engagement**
- Data
- New Business Models
- Customer Engagement

## 2021

### Distribution Storage
Western Power has identified emerging network needs and has access to network storage services from the market

### System Operations
The System Operator's dynamic system modelling adequately incorporates DER and arrangements adequately address power flows during system events

### Tariff Pilots
Learnings from tariff pilots are guiding the transition to new pricing, driving system-efficient behaviours and investment in storage that have the potential to lower energy bills

### DSO/DMO
Changes to wholesale market arrangements necessary to enable the participation of DER in the WEM via a DER aggregator are introduced

## 2022

### Customer Engagement
Customer engagement program continues

### Network Investment Process
An amended Access Code is providing increased opportunities for DER innovators to provide services to Western Power and receive revenue for doing so

## 2023

### DER Orchestration Pilot
A comprehensive VPP technology and market participation pilot has tested the incorporation of aggregated DER into the WEM (including market dispatch and settlement arrangements)

### Inverter Settings & Functionality
Communications-linked inverter standards are enabled, providing for DER orchestration and the capability to participate in multiple markets

### DSO/DMO
DSO and DMO goes live in the SWIS, with DER able to respond to meet network needs as well as be dispatched into the WEM, and be compensated appropriately

## 2024

### Distribution Storage
Distribution storage continues to be deployed under a variety of business models, and can access value across the supply chain

### DER Roadmap Complete
- DER is being leveraged for value across the supply chain, including to secure the network, and providing value to customers;
- Innovative business models with appropriate licensing are providing value to customers and the system as a whole; and
- The DSO and DMO are coordinating effectively to ensure customers can continue to connect their DER into the future

# Model A – DSO Version # 1: The 100MW Challenge

# Version 1: The 100MW Challenge– FY20

How do we verify that Flexibility Services are a viable service offering of a DSO?


- How can we engage and incentivise C&I customers to manage PV generation or shift/create load to the tune of 100MW to support network constraints?
- Can we contract 100MW worth of flexibility services with both Commercial & Industrial (C&I) customers and aggregators – via bilateral agreements?
- What processes and capability do we need to deliver this initiative within Western Power?

# DSO Version 1: The 100MW Challenge – Objectives

## How do we demonstrate capability in Version 1 to mature into Version 2?

- Does adequate customer flexibility exist to have a meaningful impact on solar generation constraints?
- Can C&I customers be incentivised to alter their behaviour to support the mitigation of distribution network constraints caused by excess embedded solar generation?
- Are Flexibility Services (FS) a reliable and economic alternative to traditional means to manage solar generation constraints?
- To what extent does the FS platform technology support and augment the operational and commercial management of FS?
- How might 'FS for network support' contribute learnings for Policy and the WEM?

Delivering The 100MW Challenge via

# Flexibility Services

# Flexibility Services Explained

**Owners of DER will be able to alter their behaviour to minimise conflicts on the network and maximise their potential revenues**

1. Energy users and PV generators will sign up for voluntary increases in energy usage, in return for payment by Western Power. Through this model, Western Power will receive the support services it needs to help balance supply and demand and stabilise the distribution grid

2. Western Power are the ‘customer’ and are buying ‘flexibility services’ from Commercial and Industrial (C&I) organisations, and channel partners who may represent groups of these organisations

3. Flexibility Services are in the form of load offerings (such as a manufacturing plant, that needs lots of power ‘load’ to run the plant and can create more load when required) or solar PV offerings - a company solar PV generation that can be managed when required (a site that’s producing lots of solar power)

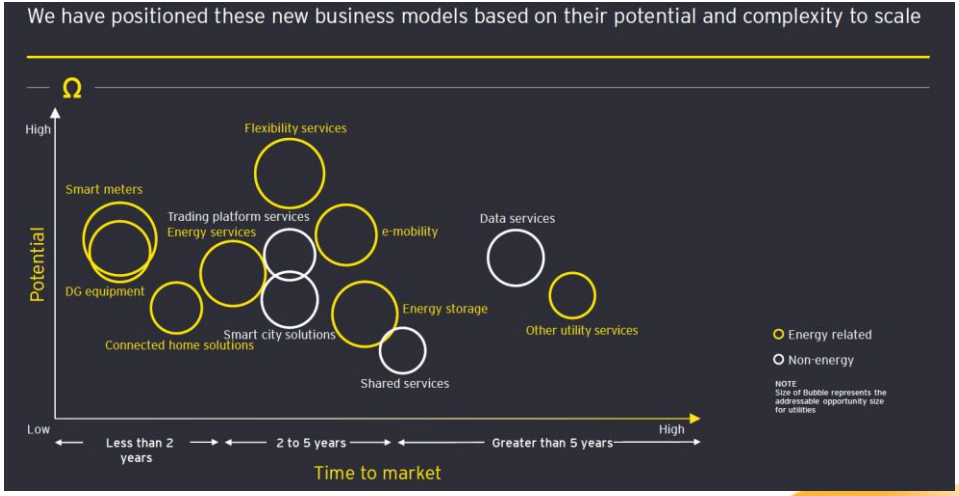
# Why Flexibility Services?

Flexibility services can help distribution system operators run more efficiently through controlling power and energy flows across network infrastructure.

As electricity generation becomes much more distributed, much more flexibility will be needed across the distribution network.

This ‘flexibility gap’ will need to be covered by new flexibility options, some of which will be facilitated by a DSO.

## Flexibility Services – A Global Context




Credit: EY, Dec 2019

# DSO Version 1: The 100MW Challenge

## Engaging owners of DER to deliver flexibility to the network

### Flexibility Services Explained…

**STEP 1**

DER owners sign up to 'flexibility services'- a voluntary increase energy usage or solar PV management in times of reduced electricity demand

**STEP 2**

During certain times, electricity demand reduces to the point that the grid can become unstable

**STEP 3**

DER owners increase their grid energy demand or manage their solar PV production to compensate

**STEP 4**

Increased demand and solar PV generation helps balance supply and demand and stabilises the grid

**STEP 5**

DER owners are paid for the provision of flexibility services

**Western Power are the 'customer', buying 'flexibility services' from owners or aggregators of Commercial and Industrial (C&I) Distributed Energy Resources (DER).**

# How do we price Flexibility Services?

# Pricing Flexibility Services

## Comparative Analysis – Benchmarking & Modelling Customer Complexity **for Trial Only

<u>International Flexibility Programs</u>

- Western Power Distribution UK's flexibility services market (UK)
- Pacific Gas & Electric's demand management program (USA)

<u>National Flexibility Programs</u>

- SA Power Networks DSO capability build
- Energy Queensland
- Endeavour Energy
- Ausnet Services

<u>Western Power Programs</u>

- Western Power's internal NCS contracts eg (Water Corp, Synergy)
- The National Demand Response Market
- The Community Power Bank Model
- Load Bank Investments
- Traditional Network Reinforcement

# Pricing Model - Approach

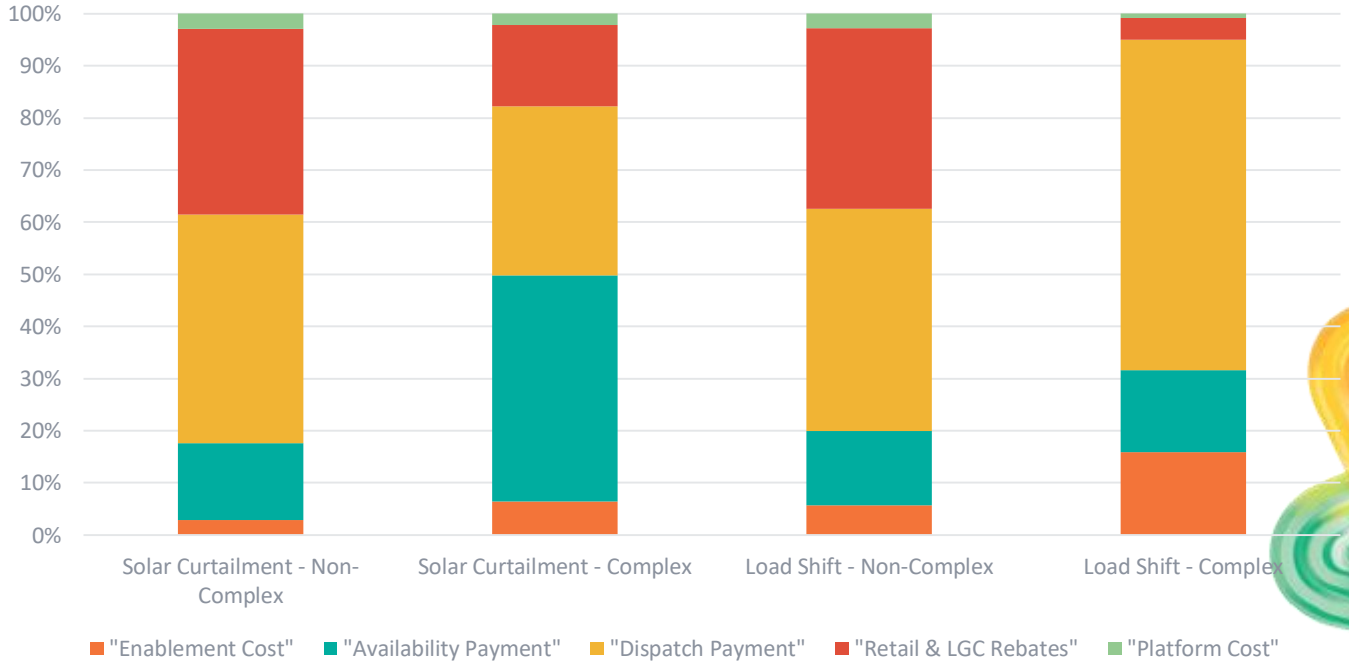
**Model Context**

- Initial starting point
- Help frame customer complexity, price sensitivities and willingness to engage
- Customer types A and B –different price points - to allow for flexibility in pricing options
- For trial purposes only - to learn where the costs and value lie


**Model Options**

1. **PV Curtailment – Non-Complex** – Customers with more simple configuration requirements eg one inverter and minimal metering and comms complexity
2. **PV Curtailment – Complex** - Customers with more complex configuration requirements eg inverter manager and multiple meters'
3. **Load Shift – Non-Complex** – Customers with simple load shift requirements eg Abattoirs capable of generating load (pre-heating/cooling) at altered timeframes through simple BMS control system configuration changes
4. **Load Shift – Complex** – Customers with more complex systems eg Brickworks who will require shifting production to weekends for specified time frames, including staffing

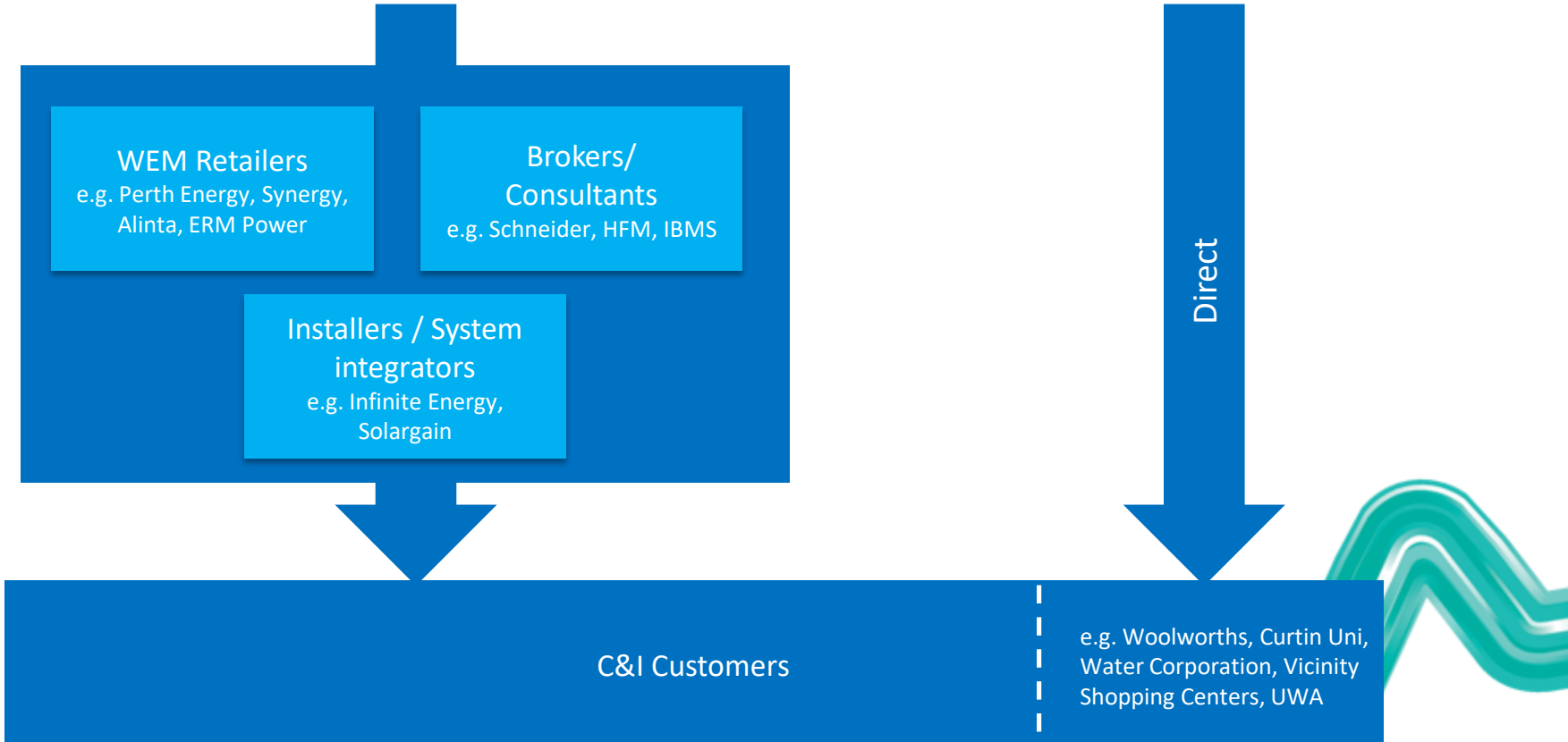
# Pricing Model - Cost Stack Example



# Engaging customers

# Two-pronged approach to engagement

## Leveraging partner relationships with some direct engagement with customers



# Customer Pipeline Breakdown (May 2020)