DEIP

DISTRIBUTED ENERGY INTEGRATION PROGRAM

DEIP DIVE 2023

Fullerton Hotel, Sydney
26 July 2023

Table of Contents

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DISTRIBUTED ENERGY INTEGRATION PROGRAM

CHANGING WEATHER
Transforming Energy

EMPOWERING COMMUNITIES AND CHANGING THE WAY ENERGY MARKETS WORK

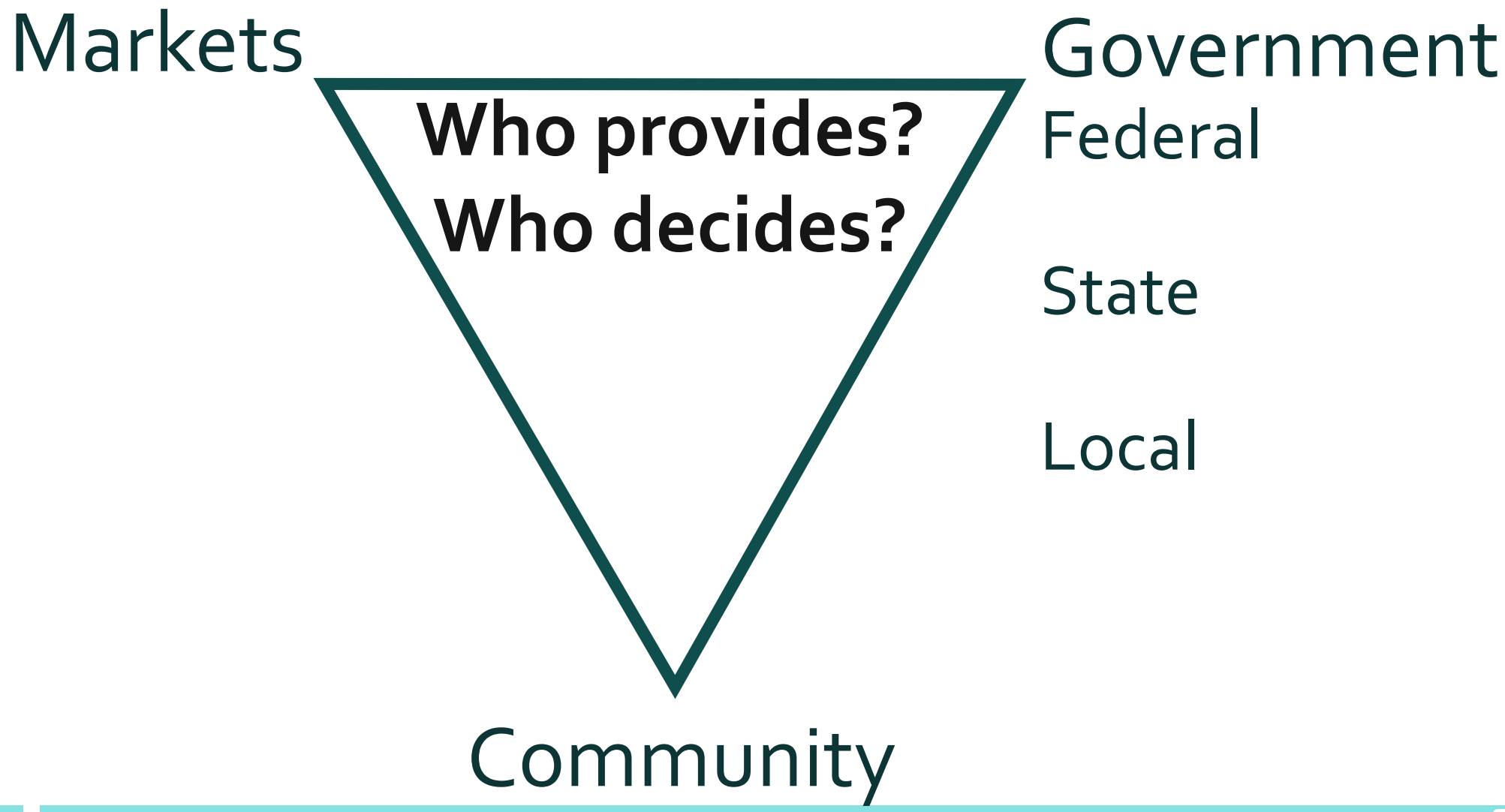
Heather Smith 26 June 2023

Energy Systems in upheaval and transition

Why travel?

Answer: context

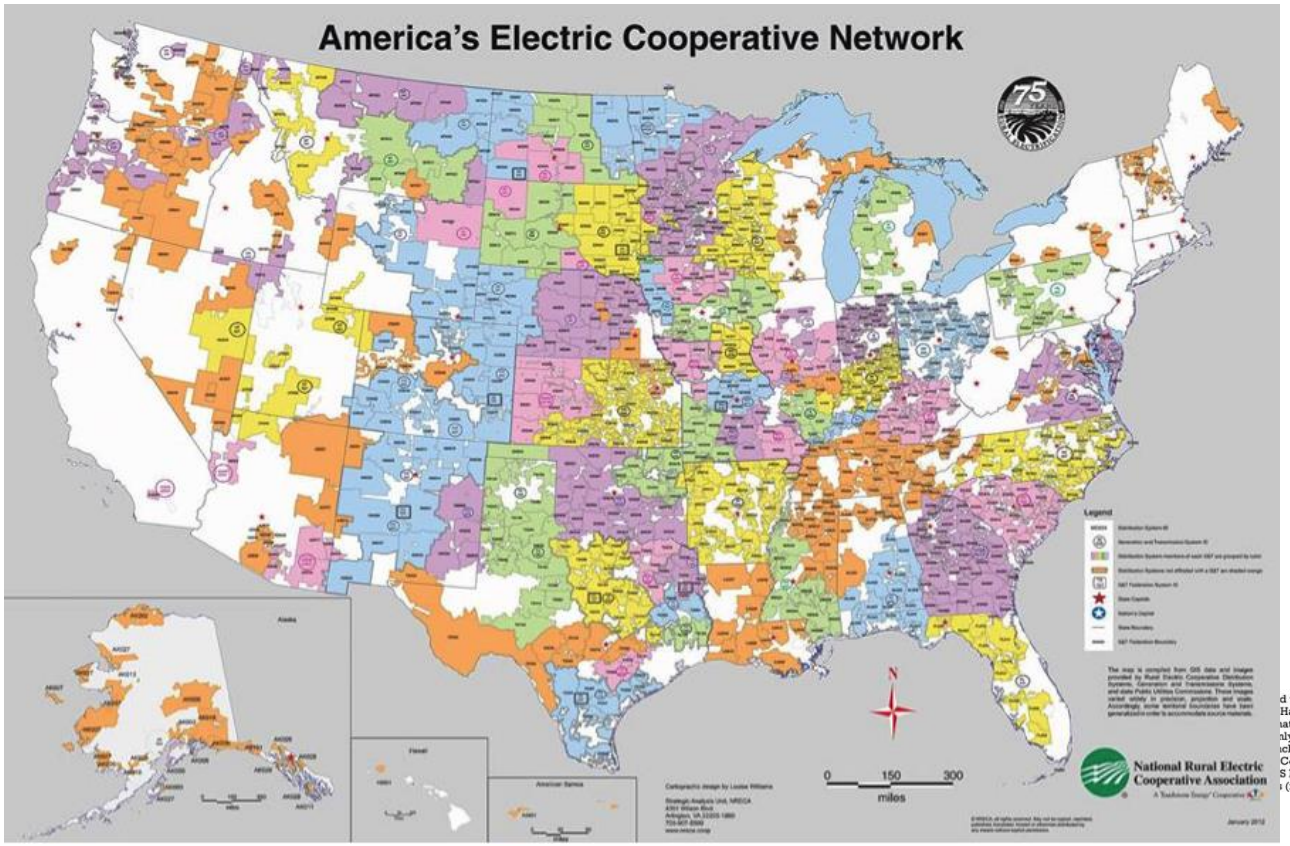
Our ability to change is tangled with our context

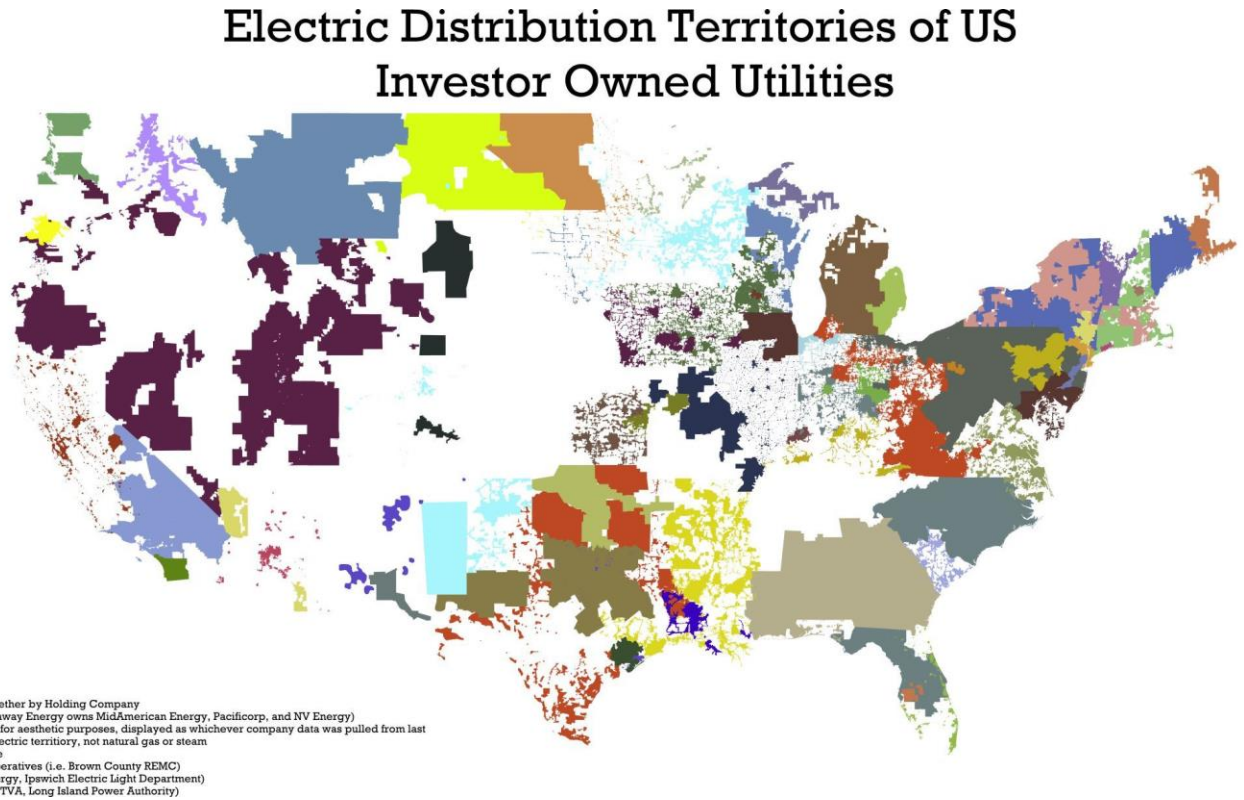



Long
shadow
of
history


Markets
Government
Community

What is community energy?
Many places govern at the local government scale





d together by Holding Company
Hathaway Energy owns MidAmerican Energy, Pacificorp, and NV Energy)
ated for aesthetic purposes, displayed as whichever company data was pulled from last
ly electric territiory, not natural gas or steam
clude
Cooperatives (i.e. Brown County REMC)
S Energy, Ipswich Electric Light Department)
(i.e. TVA, Long Island Power Authority)

Vermont has all three

- Green Mountain Power
- Burlington Electric
- Vermont Electric Coop

Local government led change:

- Burlington (popn 45,000)
- Fort Collins (popn 169,000)

Gearing for a fight: 10 years +

Community Choice Aggregation:

California (now 21 programs – 10m)

vs

PG&E

WIN

Boulder (popn 104,000)

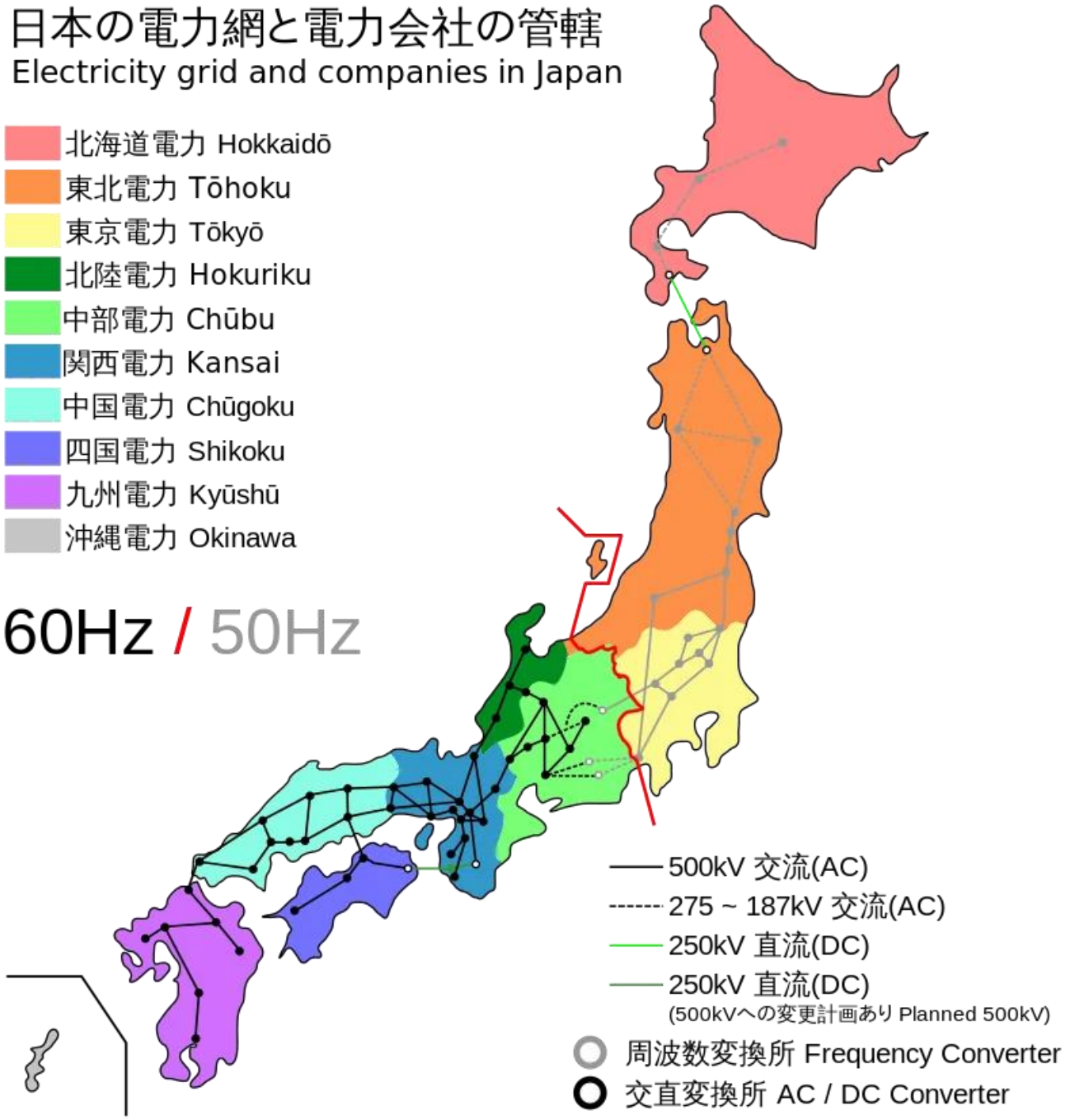
vs

Xcel

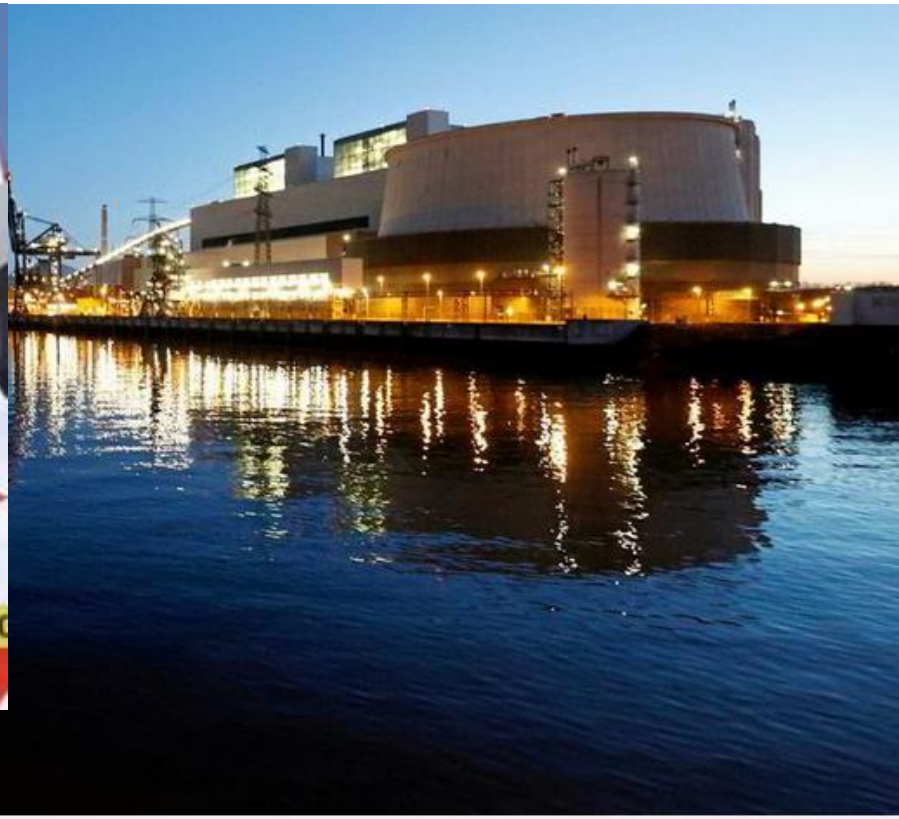
WITHDRAW

Japan

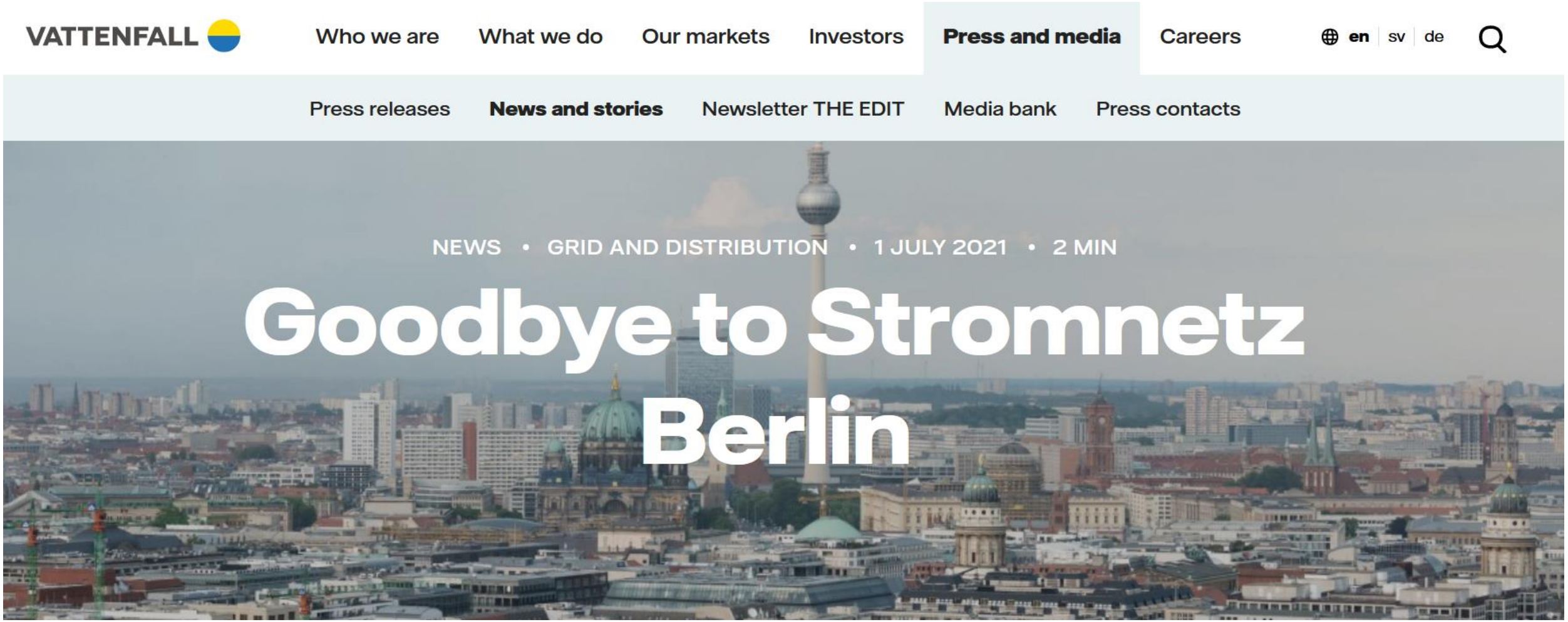
- In 2016 just turning the nuclear fleet back on for the first time
- Prefectures downwind – don't benefit but could be harmed
- History – 60Hz / 50Hz



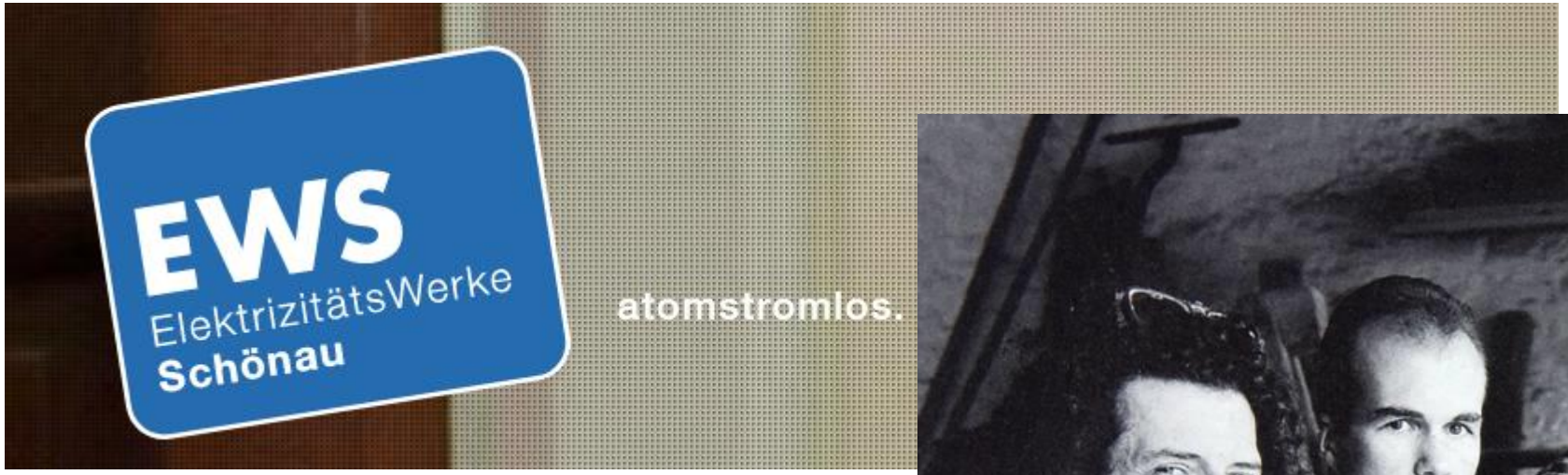
Winning the fight in Germany

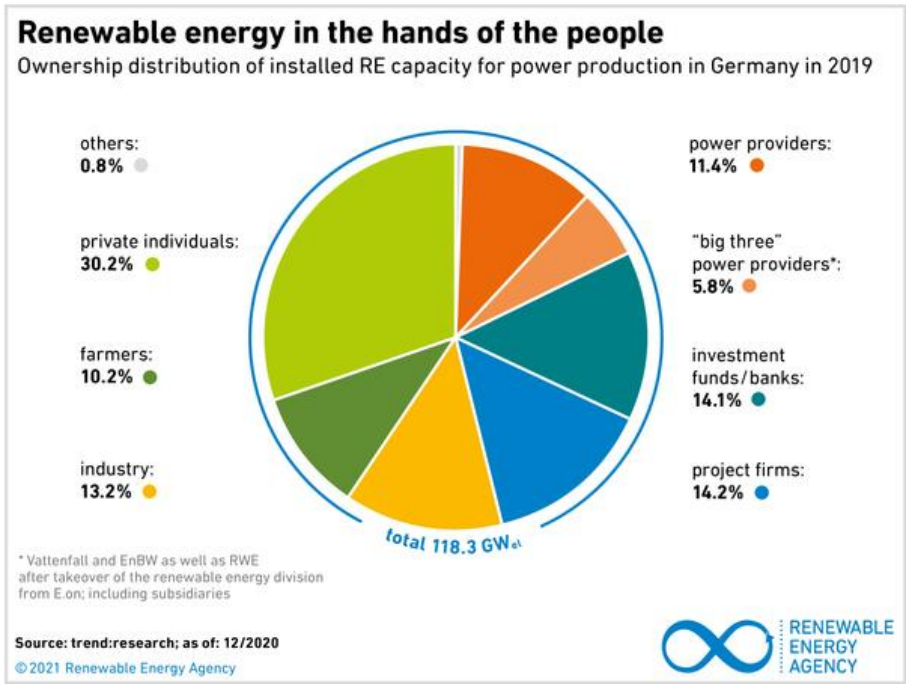


Winning the fight in Germany



Winning the fight in Germany





Culture, like history, plays its part - Denmark

Tvind Turbine

- 1978
- Built by school students and teachers
- 400 volunteers involved
- 54m
- 900kW – 2MW
- Oldest producing MW turbine in the world
- Highest performing until 2000

Samso Island – world first renewable energy island

CHANGING WEATHER

Hvide Sande

Rapid hot water and hot water storage

Large solar hot water array

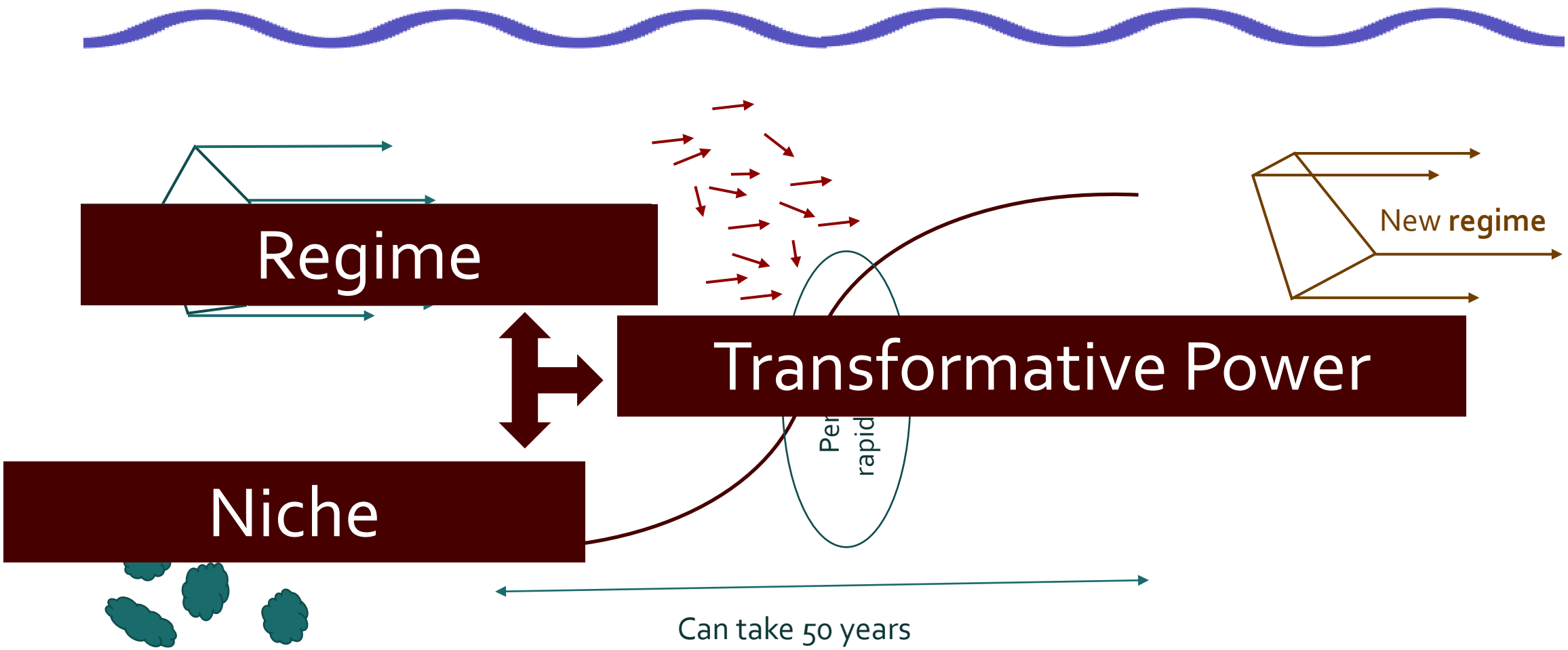
Wind turbines on the beach!

$ $ $

Funding for a new harbour

Cogeneration plant for district heating

Socio-technical transitions – when society transforms too



Lessons:

1. Every place is unique
2. We ignore citizen requests at our peril.
3. Community energy is part of the disruption.
4. What spaces help us work together?
5. Communities do politics
6. Smart grid and demand management - WIP

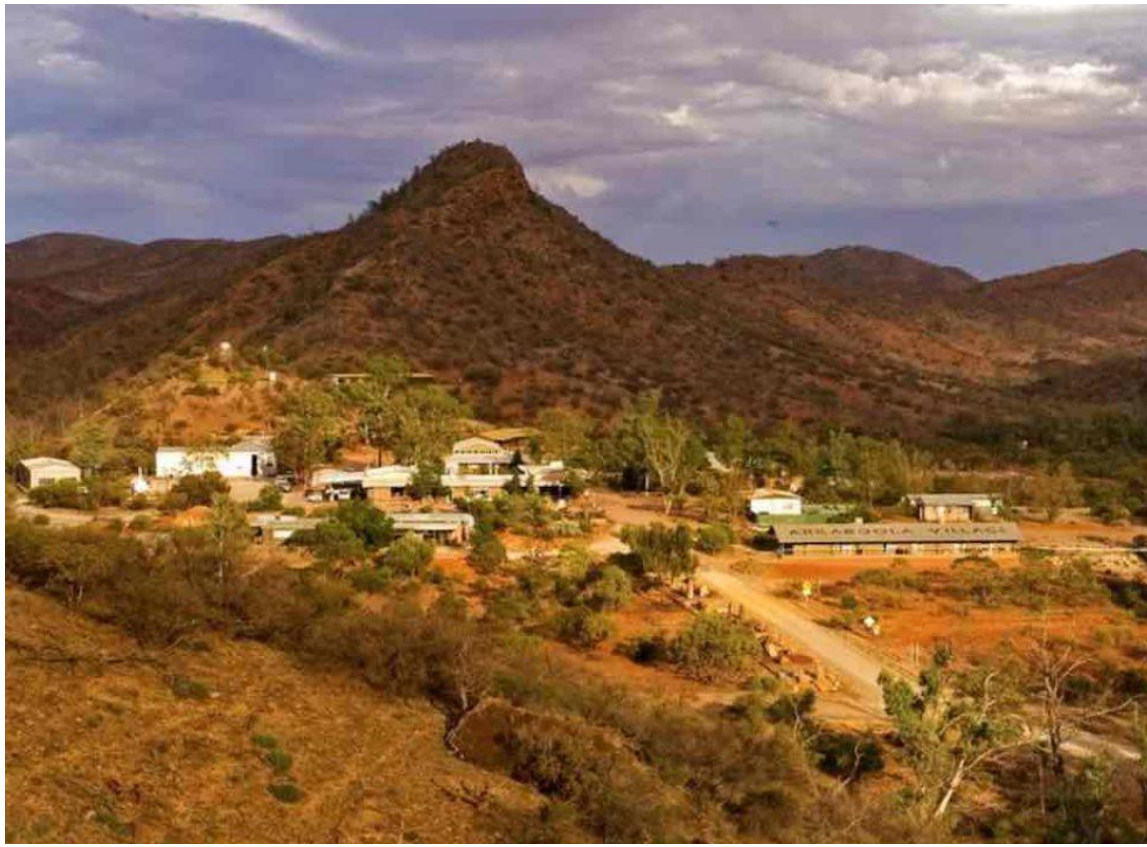
CHANGING WEATHER
Transforming Energy

COMMUNITY ENERGY
for Venus Bay?

MyTown
MICROGRID

WHAT DO WE VALUE?

- Venus Bay
- Heyfield
- Arkaroola



Microgrid definition / s

Technical

A microgrid is *a group of interconnected loads and distributed energy resources that acts as a single* controllable entity with respect to the grid…. can function autonomously

Financial

A microgrid, due to constraints, provides a *local market* that necessarily operates independently from the wholesale market at times

Regulatory

A microgrid is a part of the electricity system that *incorporates its own governance* to allow the community that it serves to optimise the use of their common resources

Reasons for local energy projects

Sharing energy	FINANCIAL
Saving money	FINANCIAL
Generating more from renewables - sustainability	TECHNICAL
Energy self-sufficiency / self-reliance	GOVERNANCE
Community resilience, or energy reliability, safety	TECHNICAL
Innovation, accelerating the energy transition	TECHNICAL
More say in energy investments	GOVERNANCE
Better outcomes for the whole community – inclusiveness, local economy, tackling energy poverty	GOVERNANCE

Energy markets

Renewable &EE markets

Contingency and reserve markets & off market

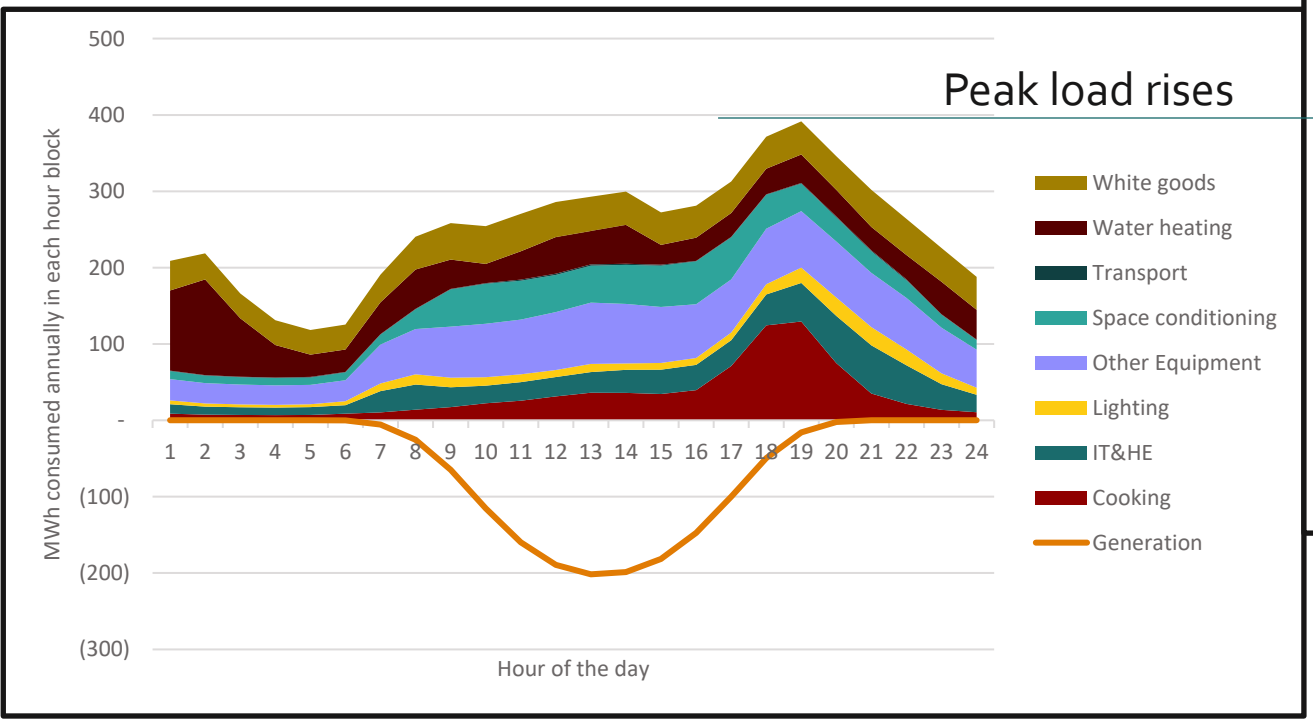
Energy markets

Renewable markets

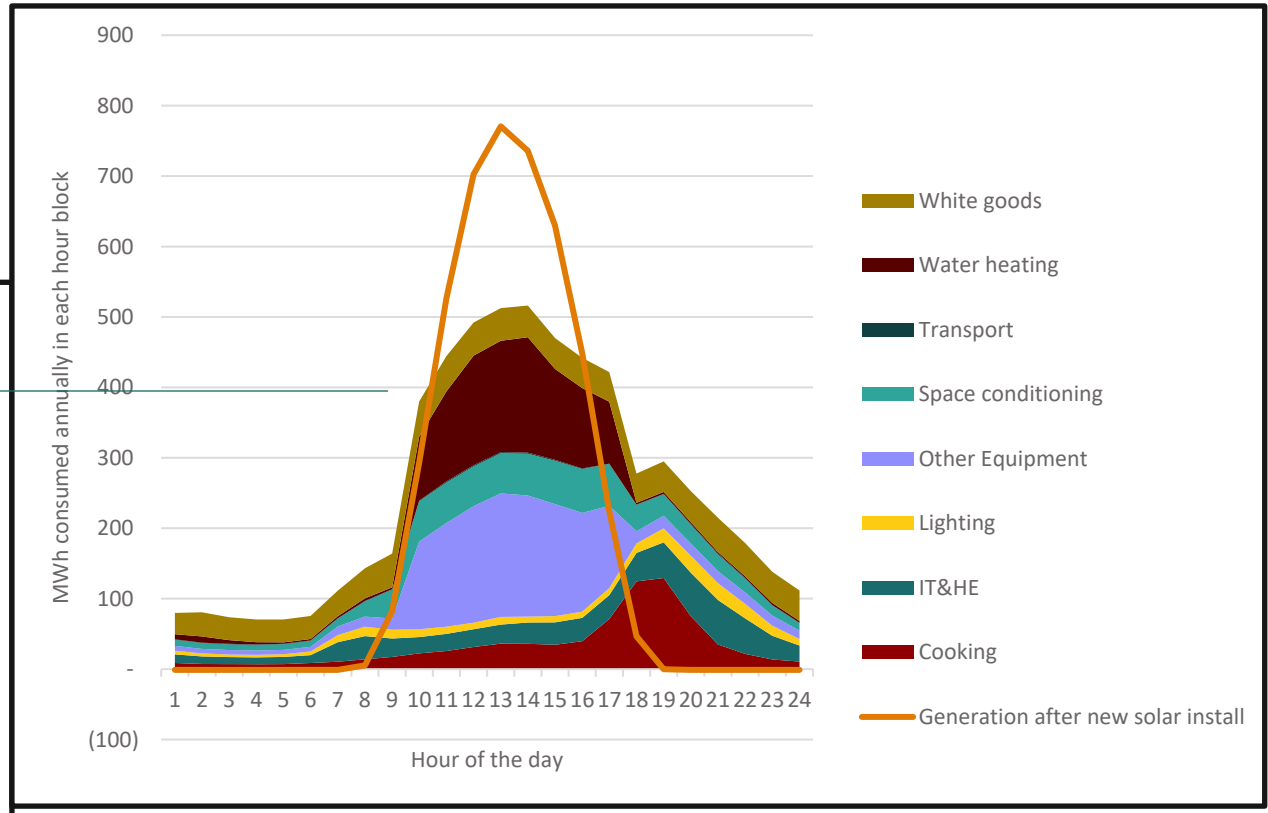
Off market

Social practices don’t change by technology alone

Today



Tomorrow



Lessons:

1. Every place is unique
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Provocations:

1. Who are we imagining the future with?
2. What do ordinary people wish energy could do for them?
3. Who will disrupt governance?
4. How can we learn to move at the speed of trust?
5. Is my narrative self-serving?
6. How can I help users experiment with technology?

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ELECTRIC VEHICLE STREAM

26 July 2023

Session 1

V2X

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enx

new energy technology, policy & strategy

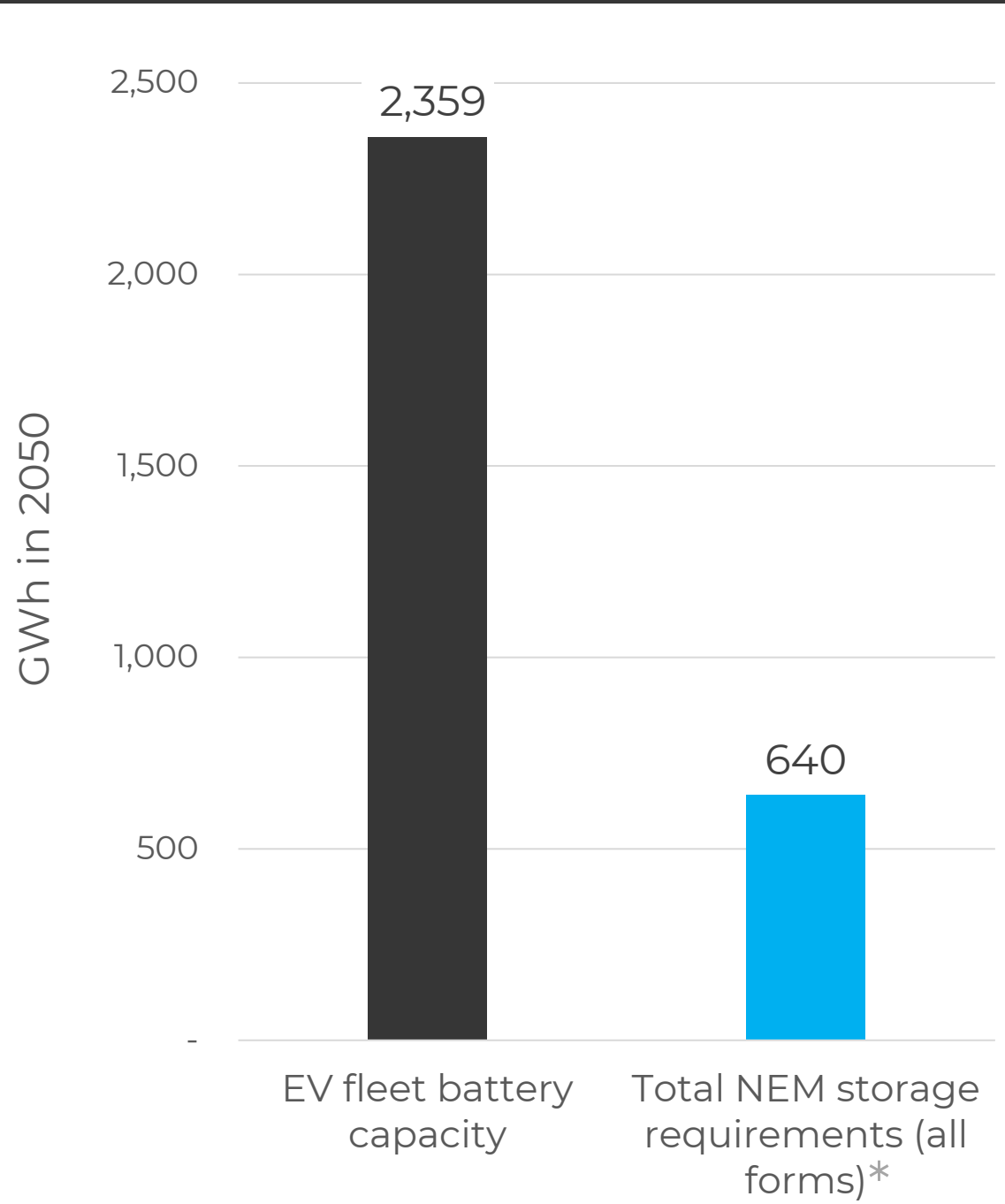
Find us at enxconsulting.au

Opportunities and Challenges for Bidirectional Charging in Australia

DEIP Dive 2023

Jon Sibley, Nicholas Gurieff

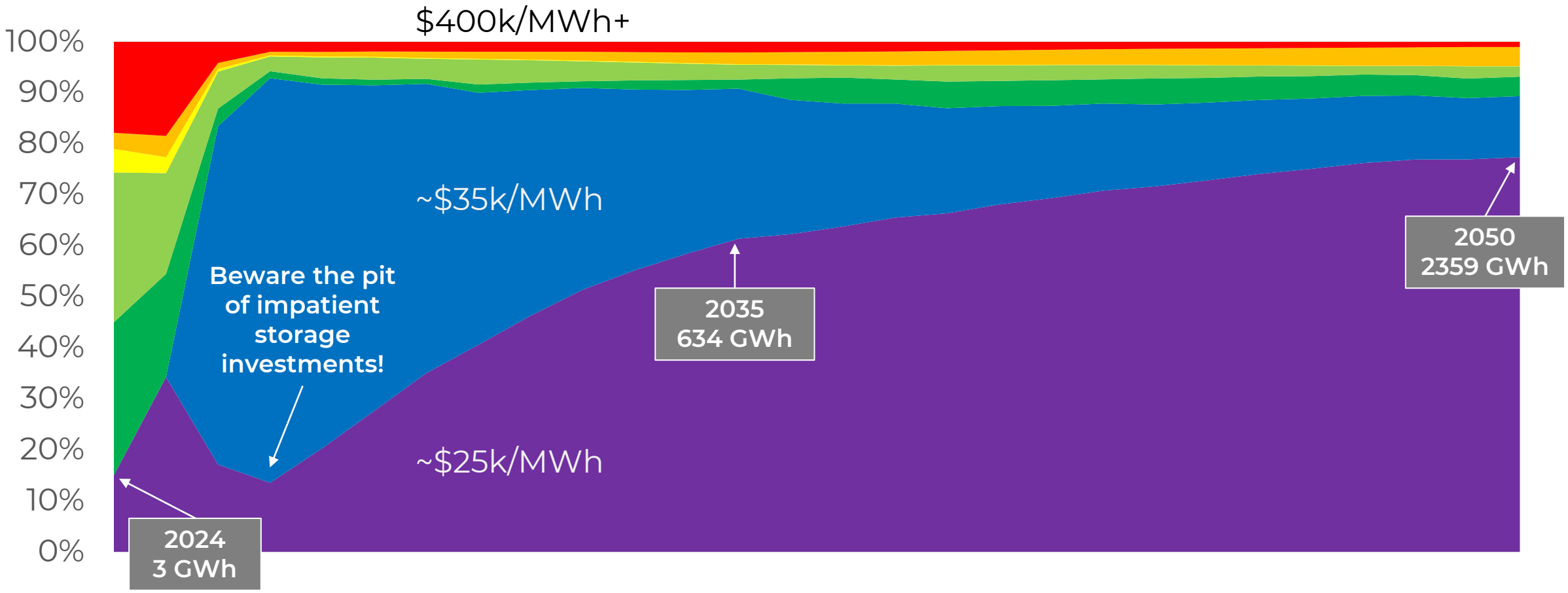
The pot of gold...



Australia's EV vehicle fleet is the largest and near-lowest cost *potential* storage resource in our energy transition.

** AEMO ISP 2002*

… the NEM's energy storage rainbow

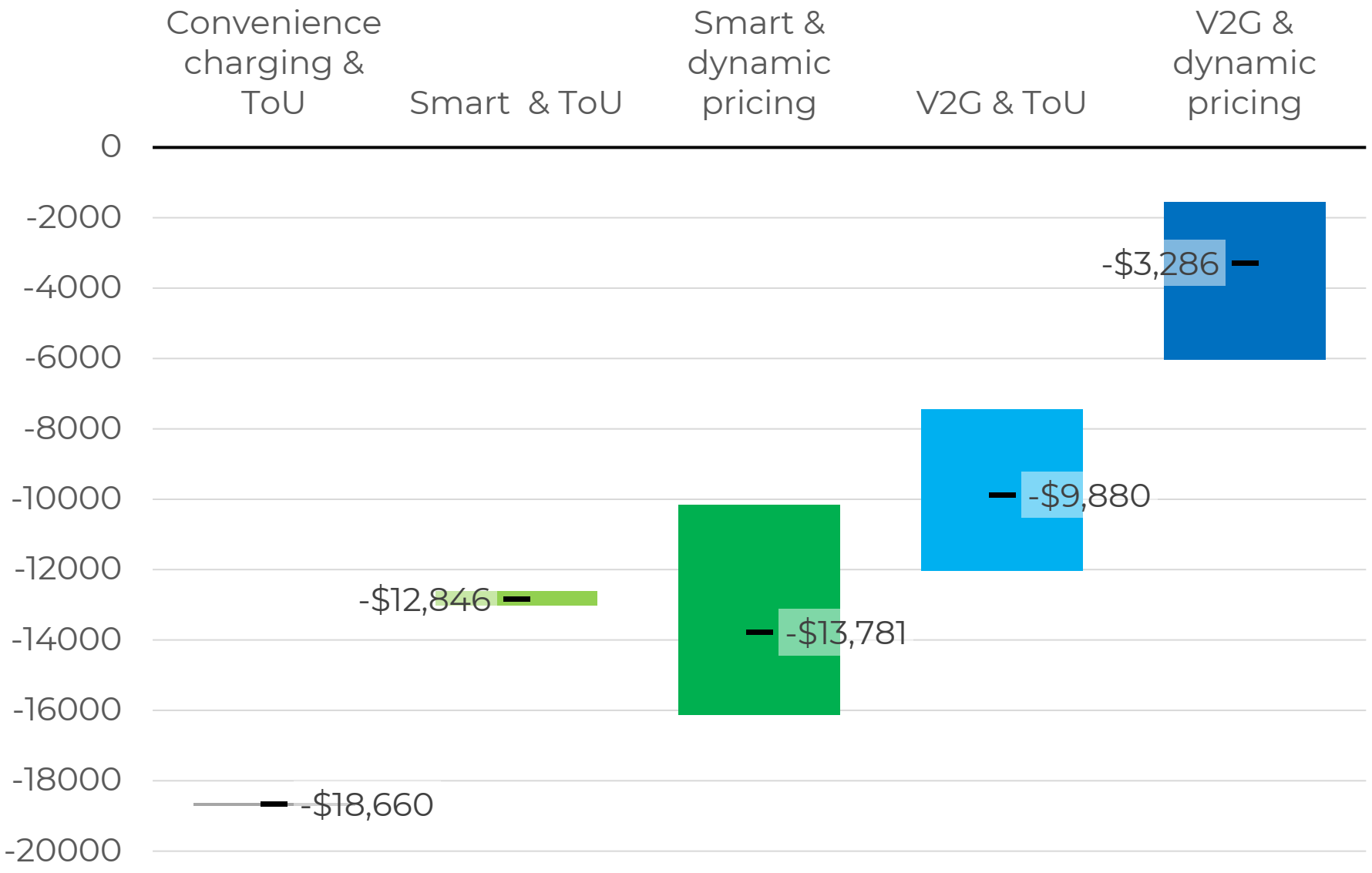


** AEMO ISP 2002, Step Change Scenario plus enX EV fleet model*

Residential case study modelling of V2G

6 NEM regions
4 load types
24 different households
3 charging modes
12 tariffs

The value to case study customers in SA



NPV of 12-year charging costs across user types *(range across the 4 user types and average)*

Average benefit of V2G relative to smart charging:

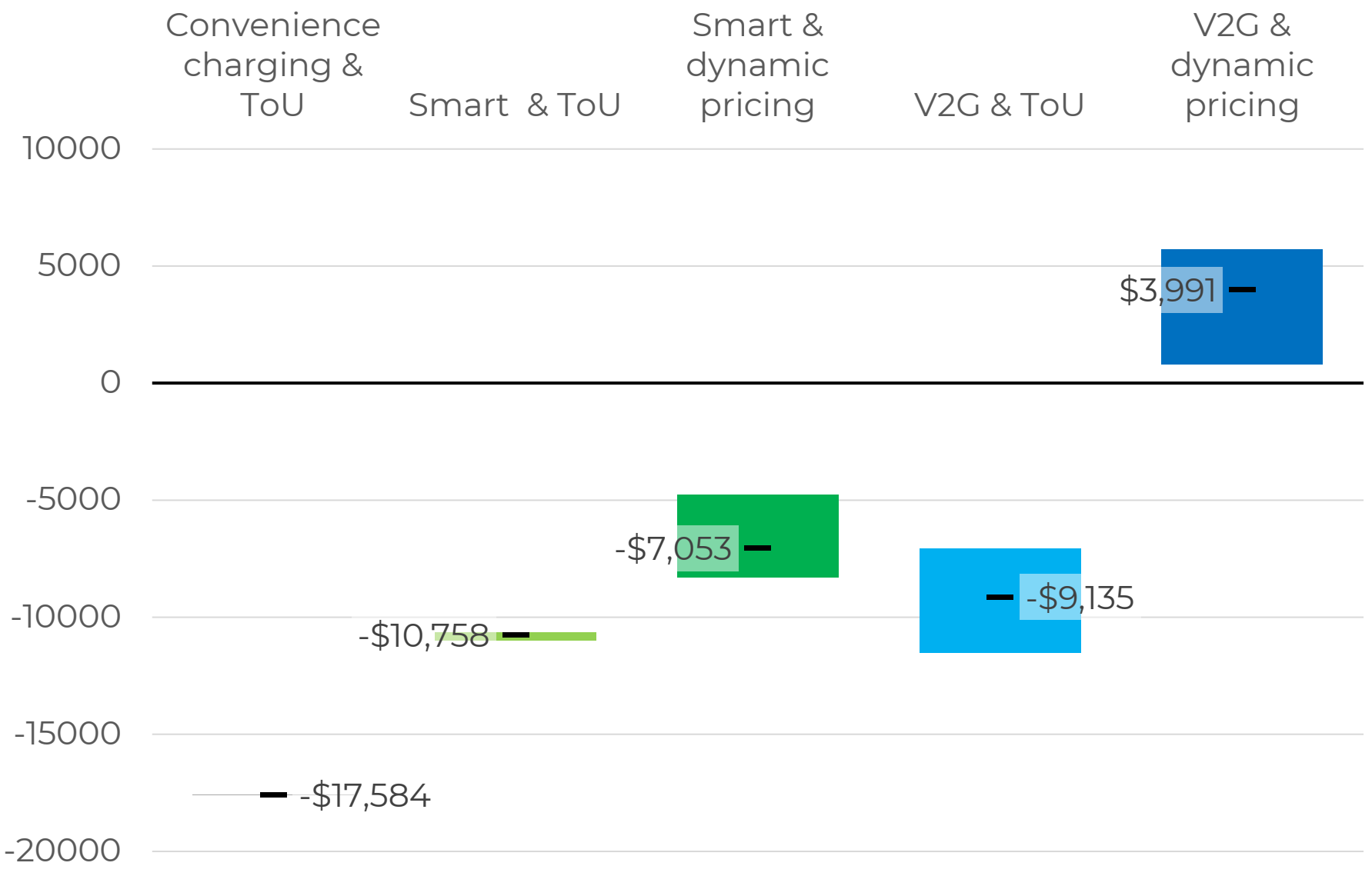
$6,329

Charging scenarios: Convenience charging vs. Smart charging vs. V2G (bidirectional)

TOU Tariff = EA's residential flexi plan (SA 5011)

Dynamic pricing = Amber + SAPN electrify two-way trial network tariff

The value to case study customers in NSW



NPV of 12-year charging costs across user types *(range across the 4 user types and average)*

Average benefit of V2G relative to smart charging:

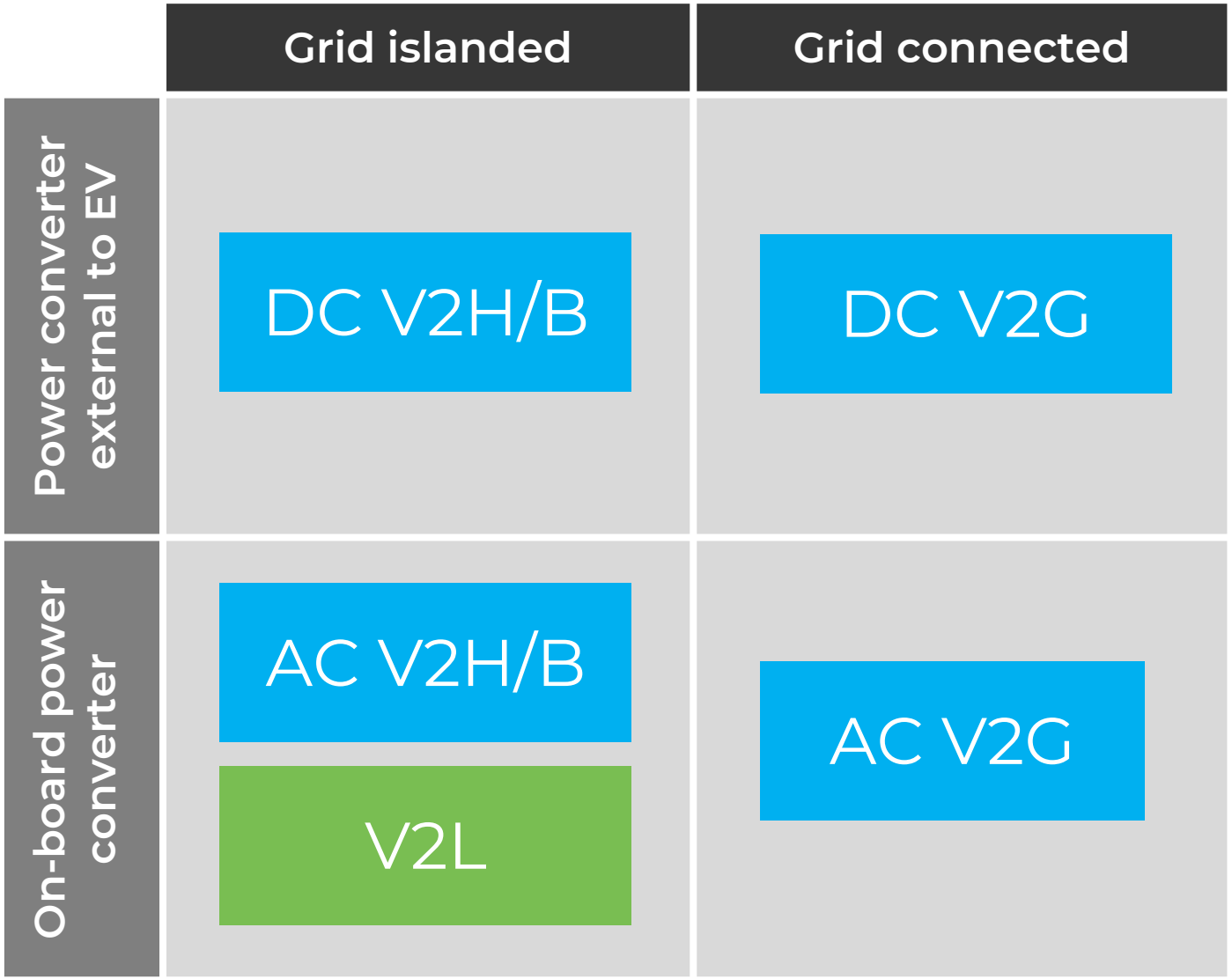
$6,728

Charging scenarios: Convenience charging vs. Smart charging vs. V2G (bidirectional)

TOU Tariff = EA's residential flexi plan (NSW 2031)

Dynamic pricing = Amber + Ausgrid EA960 two-way tariff

V2X **technology** typologies and use cases



V2H/B is where the whole electrical system is **islanded from the grid**.

V2G is **grid connected** and coupled with the prevailing AC grid frequency (e.g., 50Hz).

So, where is the market heading…?

V2G-capable vehicles ‘available or announced’ for Europe

Data source: ev-database.org (accessed 14/5/2023).

Automaker	DC V2G	AC V2G	V2L	Average V2G battery (kWh)	Average non-V2G battery (kWh)	Average V2G EV price premium
Audi	6	0	0	76.6	87.6	-38%
BYD	0	0	2	N/A	75.7	-
CUPRA	1	0	0	77.0	58.0	16%
Genesis	0	0	3	N/A	75.7	-
Hyundai	0	0	8	N/A	62.1	-
Kia	2	2	7	99.8	63.4	30%
Lucid	5	5	5	104.8	N/A	N/A
MG	0	0	8	N/A	57.9	-
Nissan	2	0	0	51.0	81.0	-62%
Polestar	2	2	4	107.0	81.5	56%
Skoda	6	0	0	77.0	56.0	34%
Volkswagen	10	0	0	77.0	56.1	27%
Volvo	2	2	2	107.0	74.7	100%
XPENG	0	0	6	N/A	85.2	-
All	**36**	**11**	**45**	**85.9**	**69.4**	**11%**

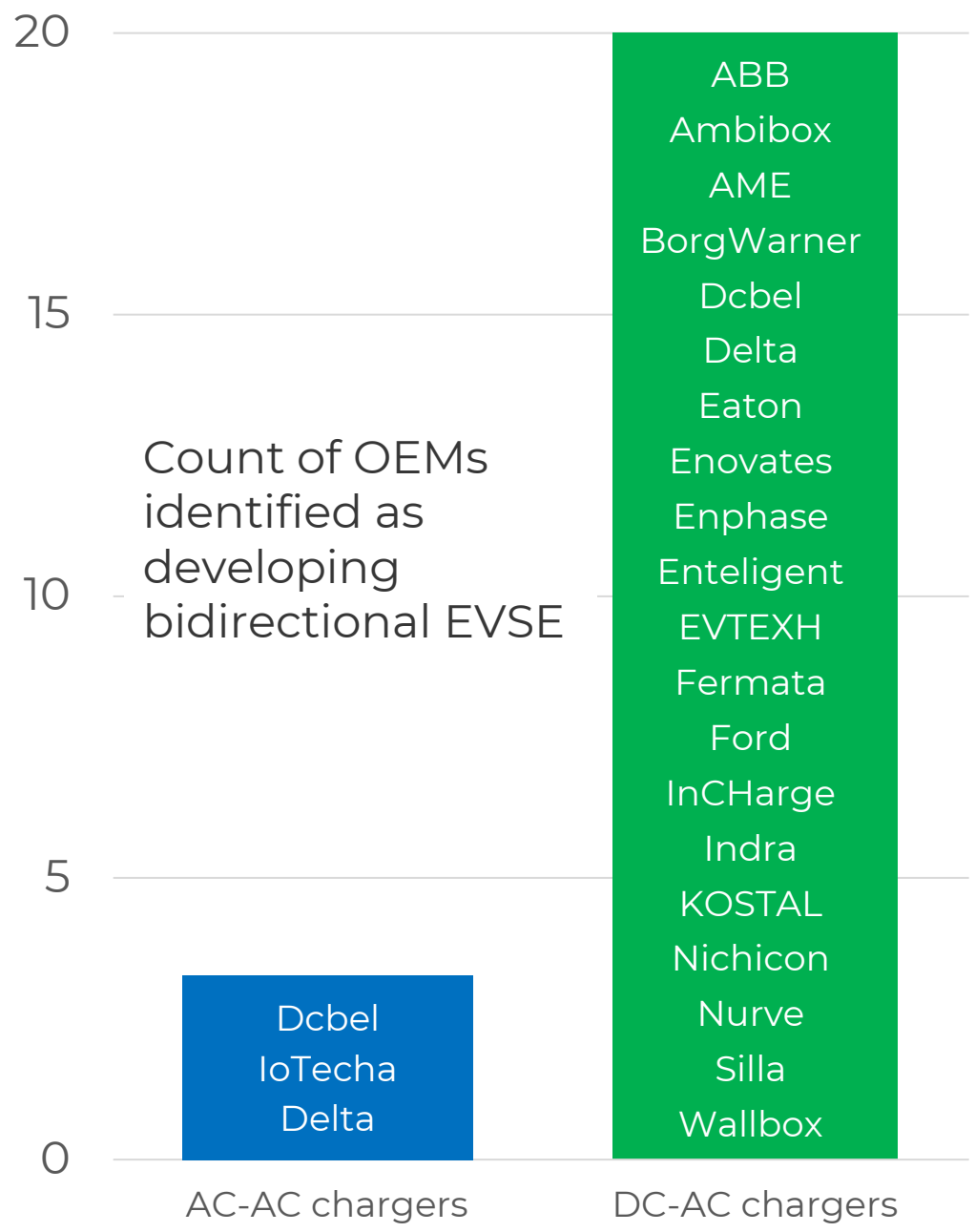
+ 3

+ 1

+ 3

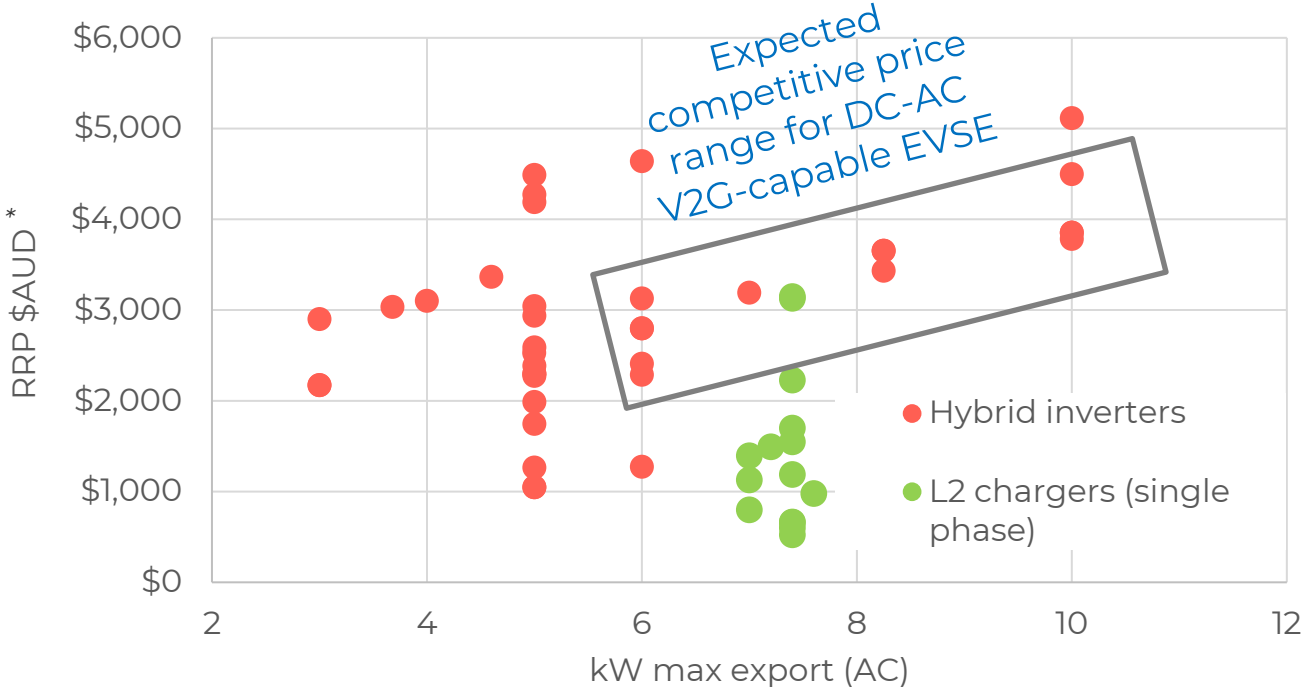
This is about marketing, not technology

V2G-capable EVSE supplies



There are over 21 international OEMs developing core technology for CCS bidirectional charging.

A 7.4kW bidirectional EVSE could be $3500 (plus installation and charge cable) by 2025.



** Data source: enX DER and electrification equipment database*

V2X requires a working confluence of several relatively independent standards families…

- **EVSE to EV communications** (e.g., ISO/IEC 15118, IEC 61851-1, CHAdeMO)
- **EVSE to controlling infrastructure** (e.g., OCPP, IEC 63110, Matter, MQTT, Modbus)
- **Smart grid interoperability standards** (e.g., IEEE 2030.5, OpenADR)
- **Inverter standards** (e.g., AS/NZS 4777.2, IEEE 1547, SAE J3072, VDE-AR-N 4100)

National Electric Vehicle Infrastructure (NEVI) technical requirements for EVSE interoperability*

Domain	Required immediately	Required in one year
EVSE to EV communications	Conform to ISO 15118-3, Hardware capable of ISO 15118-2 and **ISO 15118-20**	Conform to ISO 15118-2, Capable of 'Plug and Charge'
EVSE to CSMS communications	Conform to OCPP 1.6J	Conform to OCPP 2.0.1
CSMS to CSMS communications	-	Capable of OCPI 2.2.1

V2G ready!

* https://highways.dot.gov

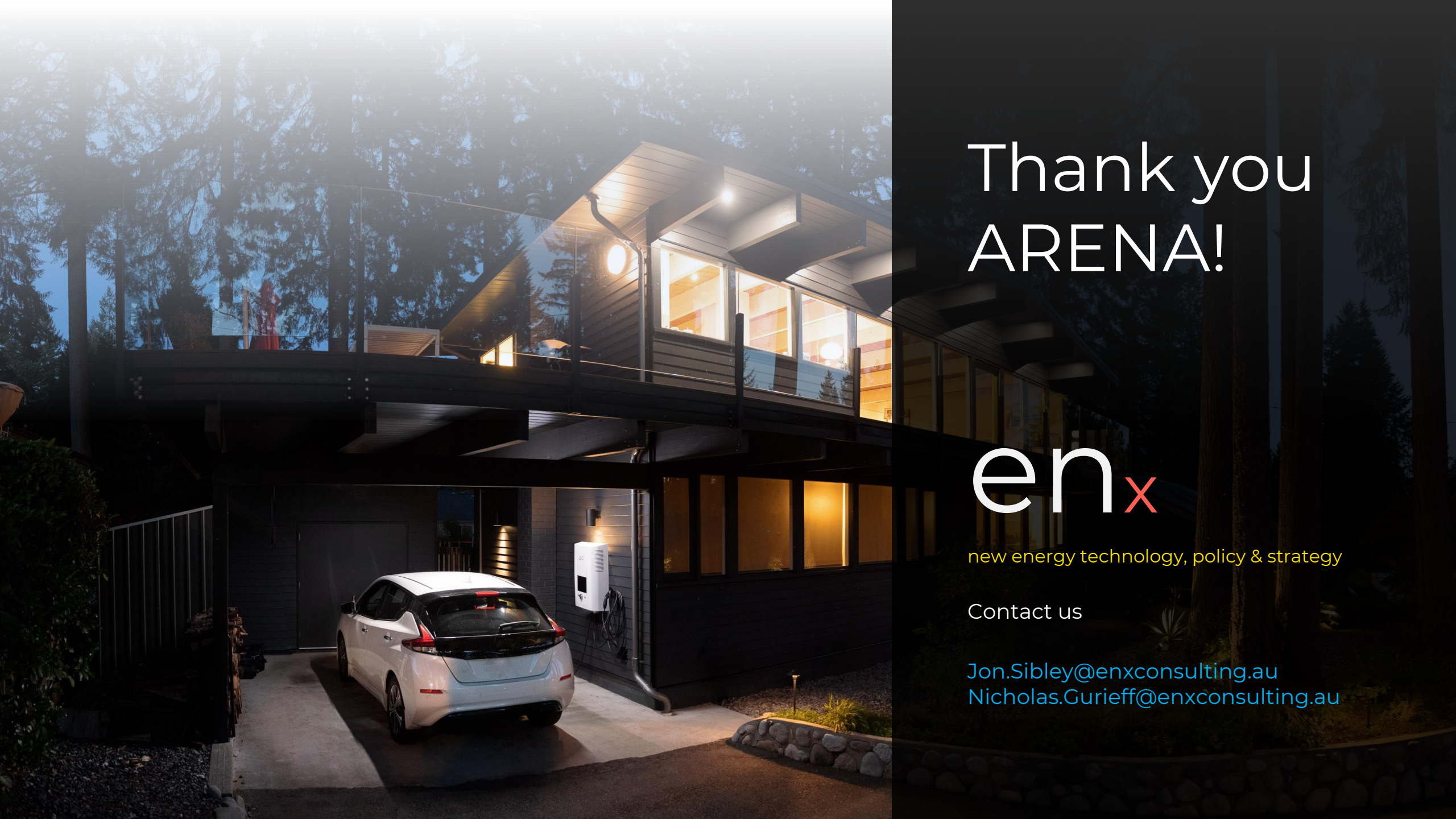
Priorities for Australia

1. Encourage equipment supplies

- Set V2G as a **national EV strategy priority**
- Develop an **Aussie test scope**
- **Actively support product homologation**
- **Chart a course** for standardisation: CCS, ISO 15118-20 and other open communication protocols (e.g., Modbus, OCPP)
- Immediate: **The CEC** should adopt an interpretation of AS4777.2 that reflects its original intent, while the standard is being revised

2. Unlock the value

- Networks should *collaborate* to **develop efficient and V2G-supportive network tariffs**
- Work towards better, more **value-reflective retail tariffs**



Thank you ARENA!

enx

new energy technology, policy & strategy

Contact us

Jon.Sibley@enxconsulting.au
Nicholas.Gurieff@enxconsulting.au

Session 2

SMART CHARGING

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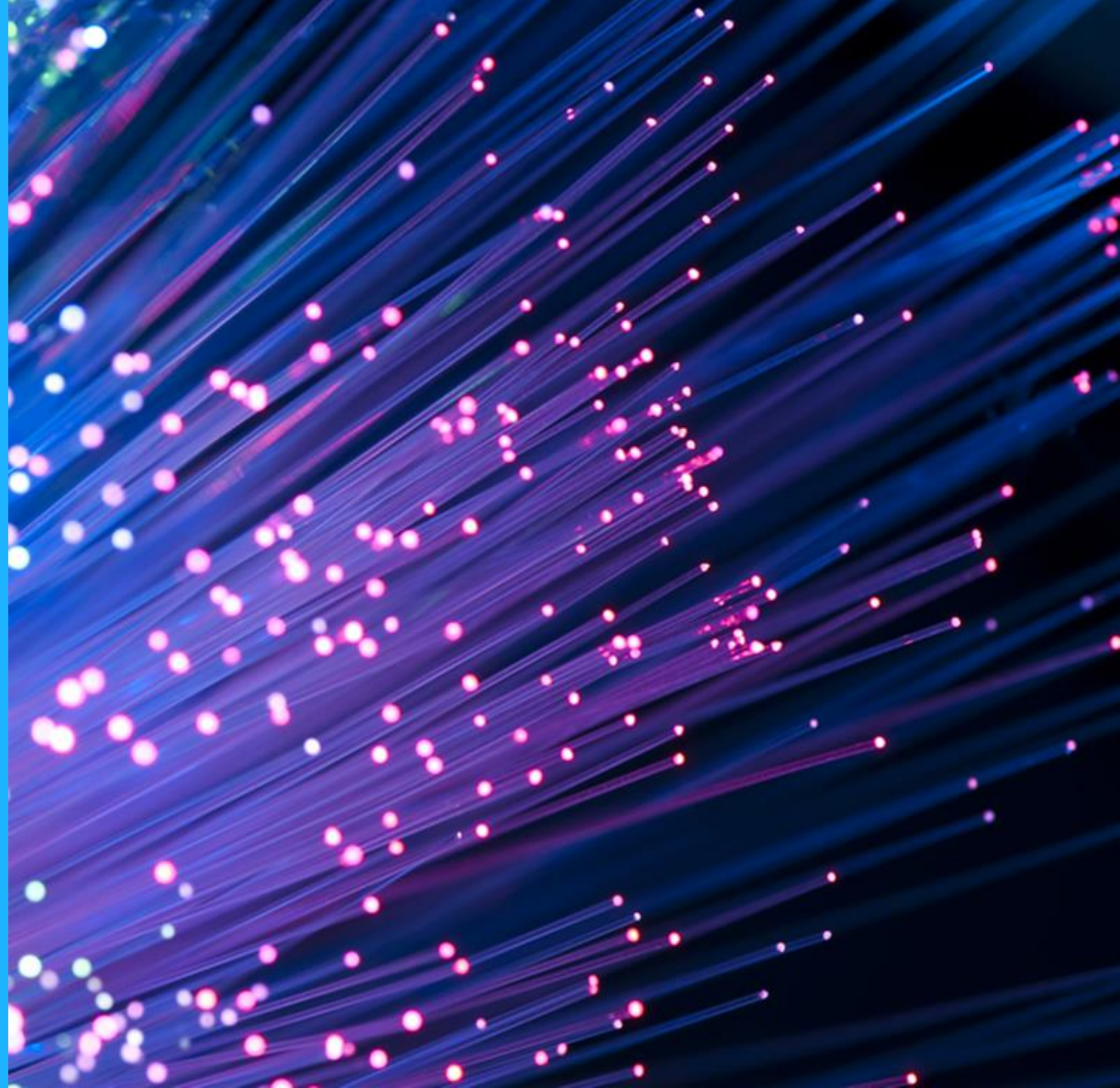
Insights from Smart Charging Trials Data (Update)



26 July 2023

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Agenda

- Project Background
- Trial Context
  - Project Summaries
  - Participant Characterisation
- Key Insights
  - Unmanaged Charging
  - Smart Charging – AGL
  - Smart Charging – EV Grid
  - Smart Charging – Origin
  - Industry Comparison

Executive Summary – Key Learnings

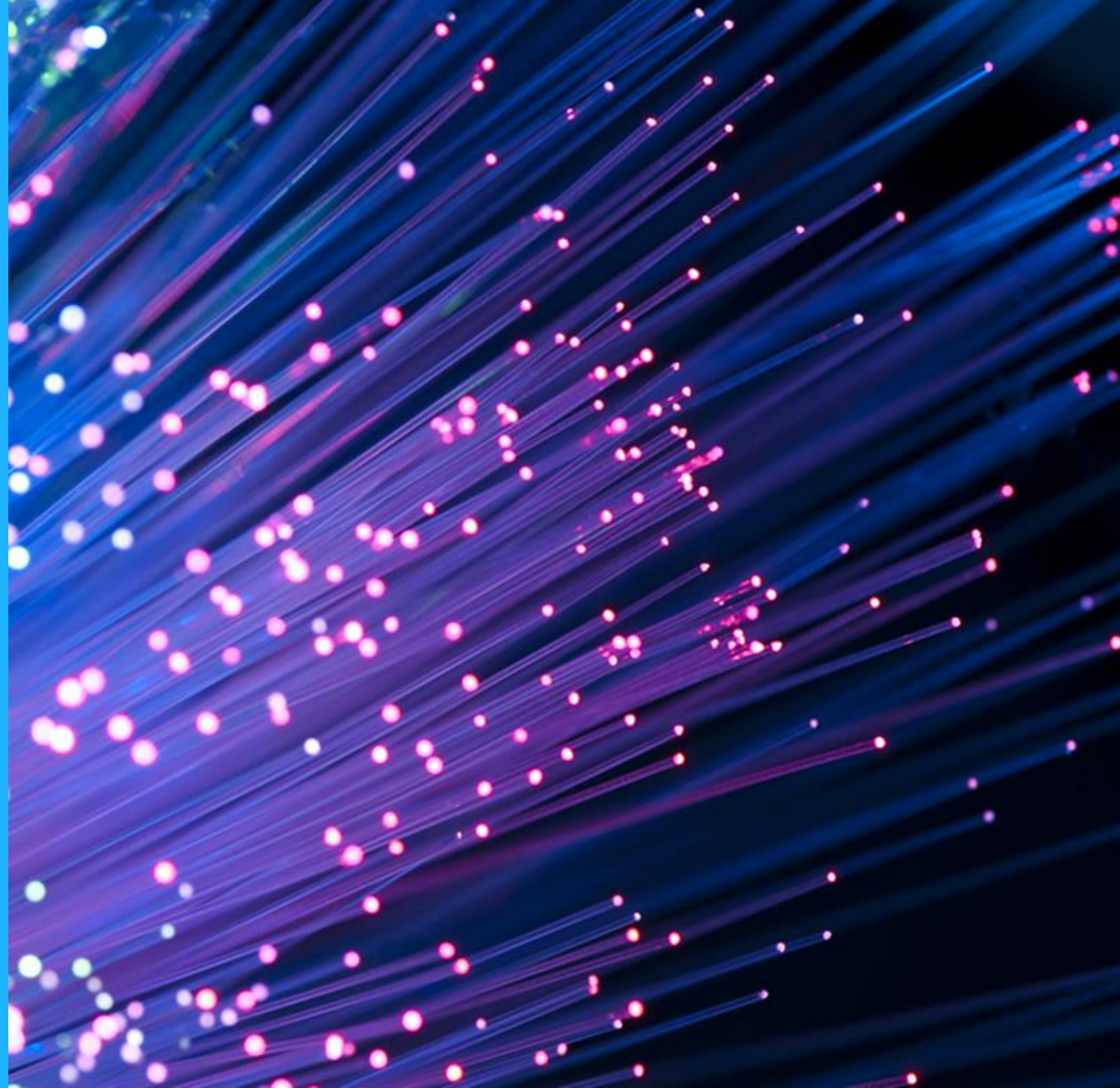
- **Unmanaged Charging Patterns – Trial participants avoid charging patterns which negatively impact the grid, potentially due to the underlying tariffs**
  - Plug-in Electric Vehicle (PEV) customer charging profiles are different from AEMO's assumed load profiles; more evenly distributed across the day with a low at 7am
  - Battery Electric Vehicle (BEV) customers typically charged overnight, did not exhibit behaviour of charging immediately when they arrive home during typical system peak hours of (3-9pm); 10am to 9pm was flat, and 11am to 1am was the peak
  - Customers with rooftop solar panels coordinate charging during solar hours
  - Regional customers have larger charging load requirements than urban dwellers
  - Large parts of the unmanaged control period were during COVID lockdowns. However, a recollection of baseline data shows that customers exhibit similar charging times
- **Smart Charging Impacts – EV charging load is flexible and responsive to incentives, both to shed demand during system peaks and shift demand to off-peak periods, overnight and during solar hours**
  - Consistent price signals to customers result in significant voluntary smart charging behaviour changes on a daily basis, even with only a modest bill discount
  - EV drivers are unlikely to opt-out of ad-hoc load control events should their vehicle be plugged-in
  - Having morning and evening control periods for smart charging still leaves customers with enough opportunity to charge their EVs during network off-peak periods
  - Smart charging-controlled limits to charging during managed charging events result in higher off-peak demand immediately after for evening peak event, less evident for morning peak event
  - Fixed incentives that require participation to provide demand response may have adverse consequences in mass-market

Background

Projects Included in this Insight

Role of the Knowledge Sharing Agent

Key Stakeholder Questions about L2 Charging



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ARENA's EV Projects Included in this Insight

Trial Commenced	Trial Concluded	Project Name	ARENA Funding	State	Lead Organisation	Summary
2021	Apr 2023	Electric Vehicle Orchestration Trial	$2.3m	NSW, QLD, VIC, SA	agl	Demonstrate a range of smart and managed charging solutions including controlled, smart and vehicle-to-grid charging
2021	Feb 2023	Dynamic Electric Vehicle Charging Trial	$1.6m	ACT, VIC, TAS	EVGRID	Demonstrate the use of hardware based smart charging directed by signals from networks as opposed to electricity retailers
2020	Dec 2022	Electric Vehicles Smart Charging Trial	$0.8m	ACT, NSW, QLD, SA, VIC	origin	Demonstrate the benefits of and barriers to controlled smart charging for residential, commercial and industrial customers

Source: ARENA

- ARENA has funded a wide range of EV projects to support the uptake of renewable energy
- Data from the above projects have fed into this analysis
- All projects have targeted insights into behind-the-meter level 2 (L2) charging and the potential for various forms of load control

The Role of the Knowledge Sharing Agent

- The ARENA Act specifies Knowledge Sharing as a function of ARENA and requires ARENA to:
  - Store and share information and knowledge about renewable energy technologies;
  - Collect, analyse, interpret and disseminate information and knowledge relating to renewable energy technologies and projects; and
  - Promote the sharing of information and knowledge about renewable energy technologies.
- Energeia, as ARENA's knowledge sharing agent for its EV portfolio, provides services including:
  - Reviewing current data arrangements from existing portfolios to maximise their value
  - Ensuring that the data requirements in future EV funding agreements can provide valuable insights for the EV portfolio
  - Coordinating data collection and storage for the whole EV portfolio
  - *Analysing data collected through individual projects to provide aggregated insights on charging performance, customer behaviour and value*
  - *Producing aggregated insights and key themes emerging from the data in a form that is digestible and relevant to the industry*.

Key Stakeholder Questions about L2 Charging

Unmanaged Charging

- How charging varies by:
  - Day type
  - Season
  - Customer Class
  - Vehicle Type
  - Location
  - Charger Power

Response to Smart[1] Charging

- How response varies by:
  - Incentives
  - Frequency
  - Customer Class
  - Vehicle Type
  - Location
  - Charger Power
- Level of opt-out
- Level of technical issues

Notes: [1] Charging managed by a third party driven by real-time data

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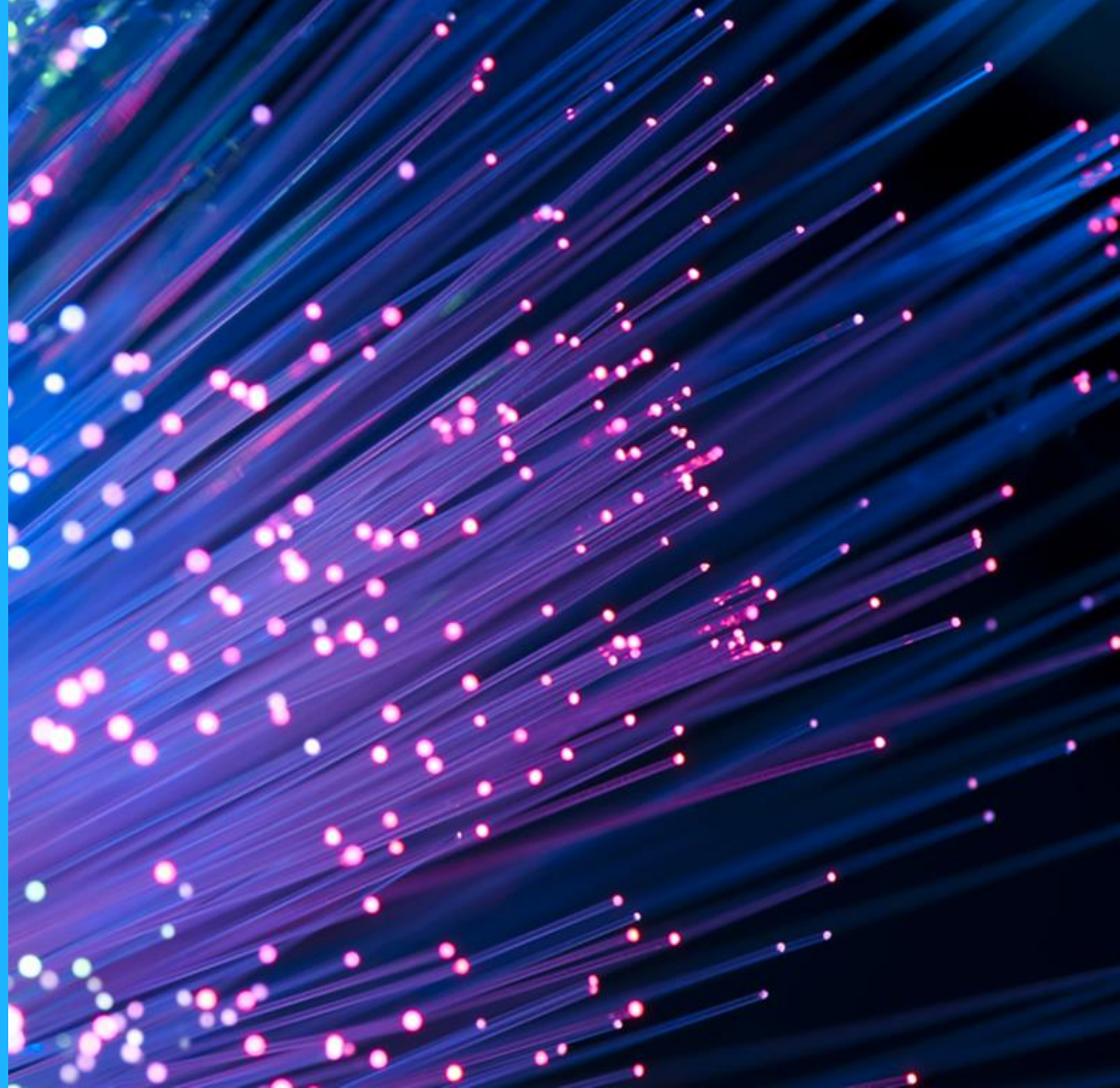
Trial Context

Summary of Charging Trials

Trial Timelines



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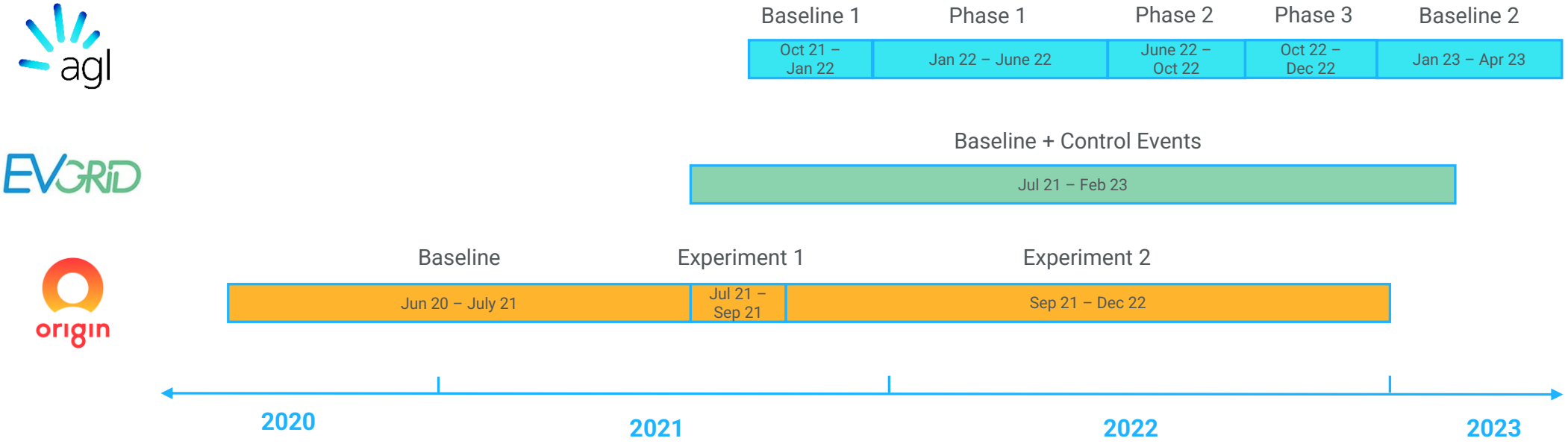
Summary of Charging Trials

Trial Component	Method	agl	EVGRID	origin
Treatments Assessed	Grid Peak Management	Fixed (varies by state) and dynamic	Dynamic[1]	Fixed (3-9pm)
	Grid Off-Peak Management	×	Dynamic	Fixed (10am - 3 pm, 9pm - 5am)
Method of Management	Incentive	✓ Fixed ($/day)	✓ Fixed[2]	✓ Time of Use
	Charging Control	✓	✓	✓
Key Control Terms	Dynamic Notification Period	Day(s) Ahead	Day(s) Ahead	×
	Dynamic Events per Year	Unlimited	10	×
	Control Opt-out	Unlimited via app	Manual, Once per Customer	Unlimited via app
Reward / Incentive for Participation	Charger and Installation	Free charger and standard installation	Free charger and standard installation	$1 charger and standard installation
	Bill Discount	Up to $200 each year + Carbon Neutral Energy Plan	×	10c/kWh for off-peak charging 25c/day for smart charging
	Monetary Bonus	×	$300 cash bonus on trial completion	×

Notes: [1] ad-hoc events, [2] Existing trial utilised fixed incentive, EV Grid to trial variable charging rates for customers

- Dynamic charging refers to the hours of an event being flexible, with customer notified beforehand
- All three providers offered participants a free charger with installation
- All trials allowed customers to override any charger control

ARENA's Smart EV Charging Trial Timelines



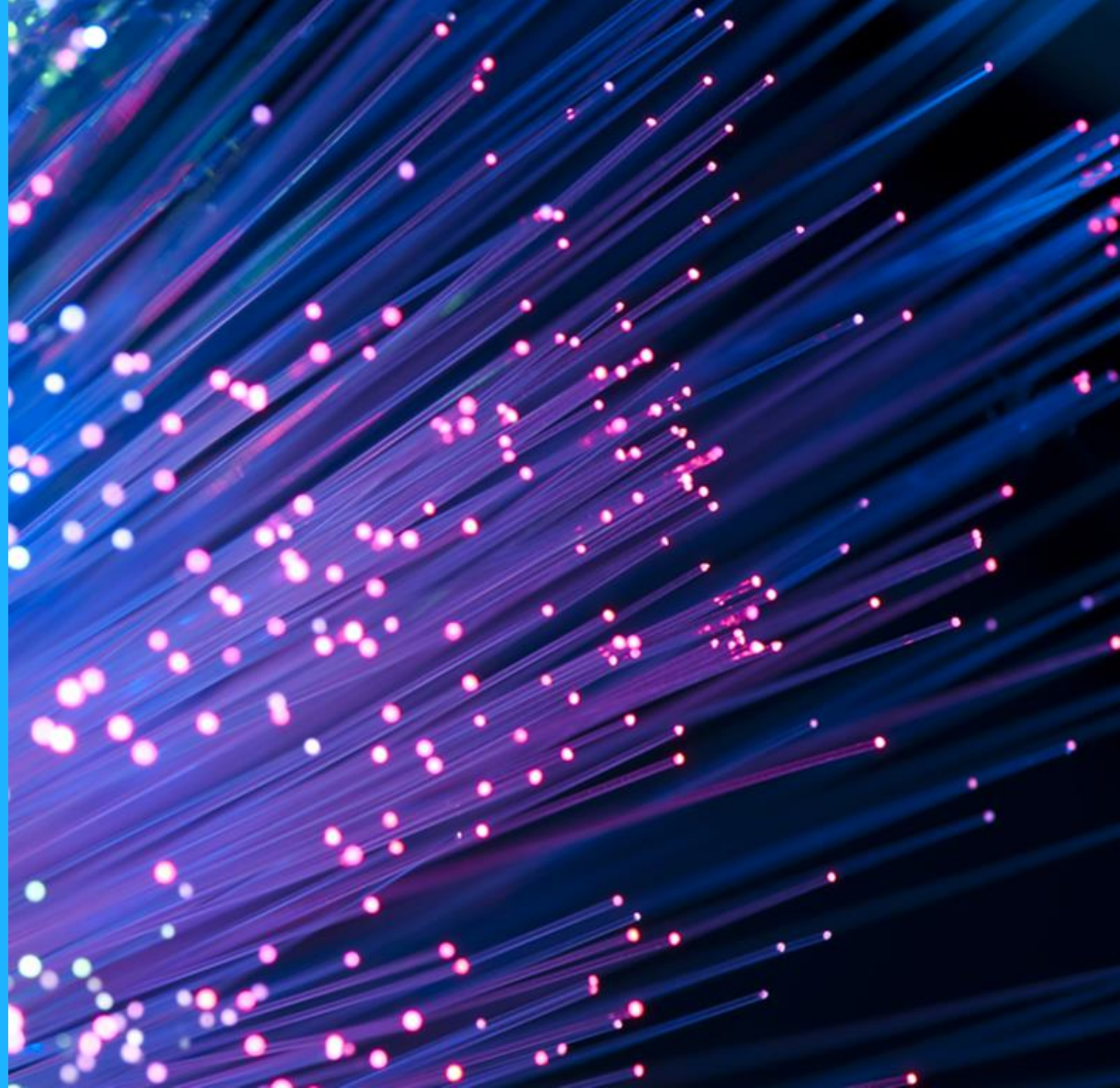
Source: AGL, EVGrid, Origin Energy

- Timelines of the trials conducted are outlined above
  - Each trial undertook a Baseline period of data collection, ahead of trial periods
  - EVGrid control events were conducted on single days throughout the trial
- COVID-19 lockdowns occurred during trials, to a varying extent
  - AGL elected to conduct a second baseline in 2023 to account for the impact

Key Insights

Unmanaged Charging

Smart Charging



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Unmanaged Charging

Unmanaged Charging by Trial

Average Profile over Time

Average Profile by Customer Characteristics

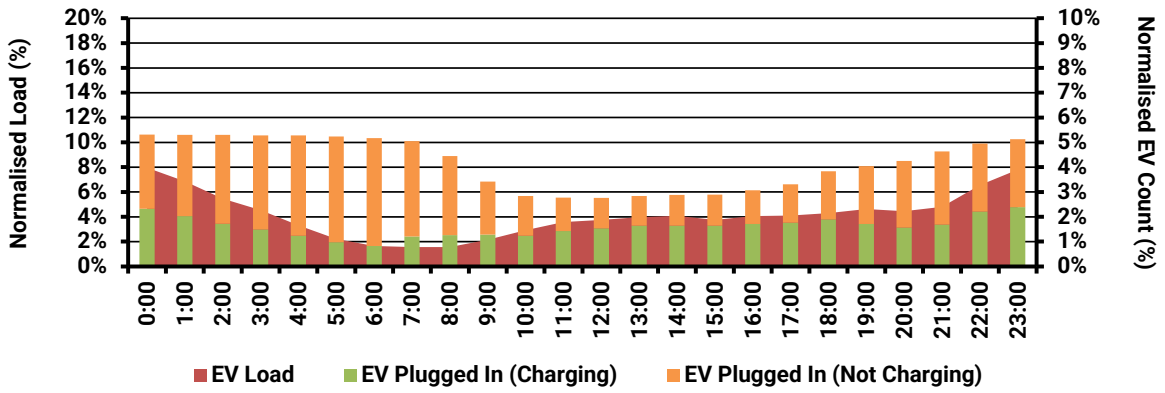
Average Profile by Vehicle and Charger Type

Impacts of COVID-19 on Unmanaged Charging

ENERGEIA

Average Unmanaged Hourly Charging Load Shape by Trial

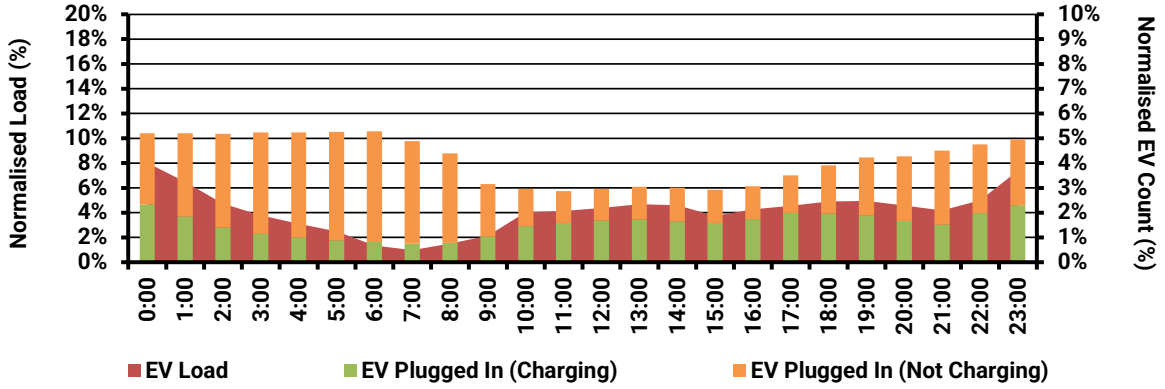
AGL



Source: AGL, Note: 125 customers

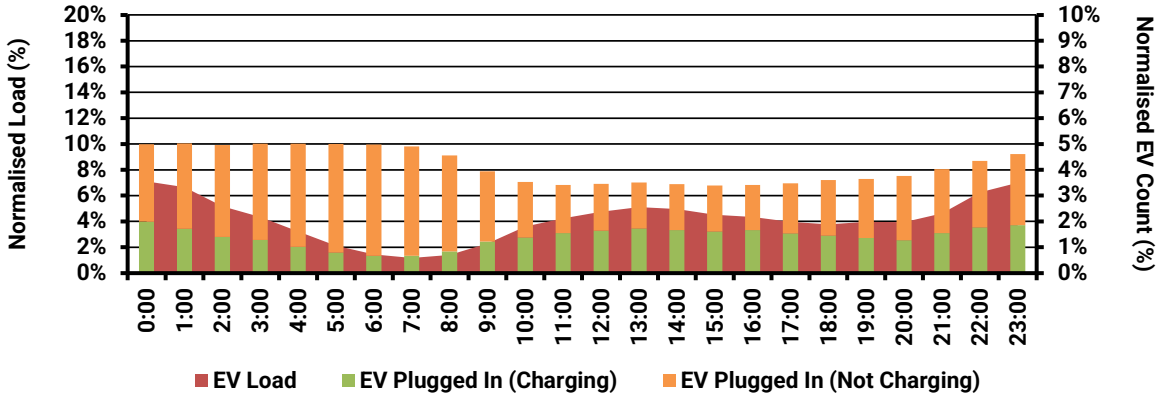
- Load normalisation on a kWh/day, count normalisation on total plug-ins/day
- Load increased when customers plug-in overnight, and is lowest in morning
- Increase in charging load in middle of the day suggests customers actively charged with solar PV
- No observable increase in load between 3-9pm, the traditional system peak time
- Note this does not include charging event load profiles

Origin



Source: Origin, Note: 67 customers (Residential Only)

EV Grid



Source: EV Grid, Note 164 customers

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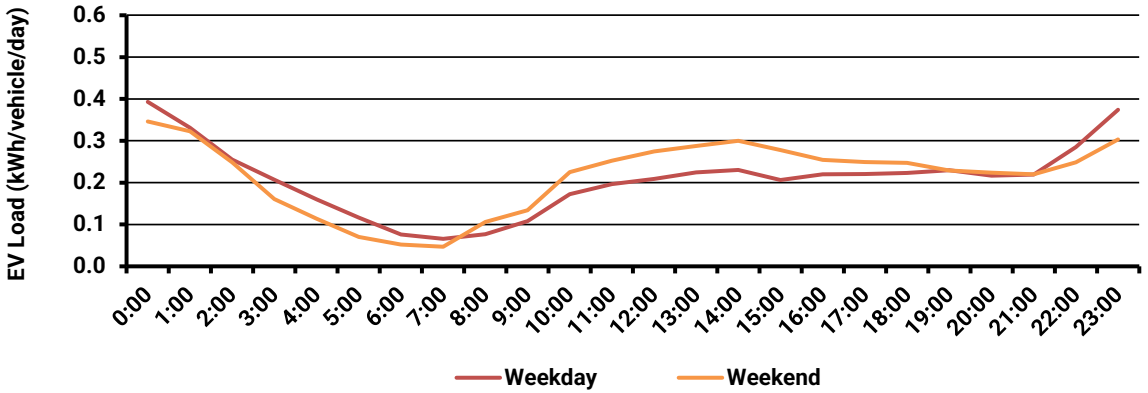
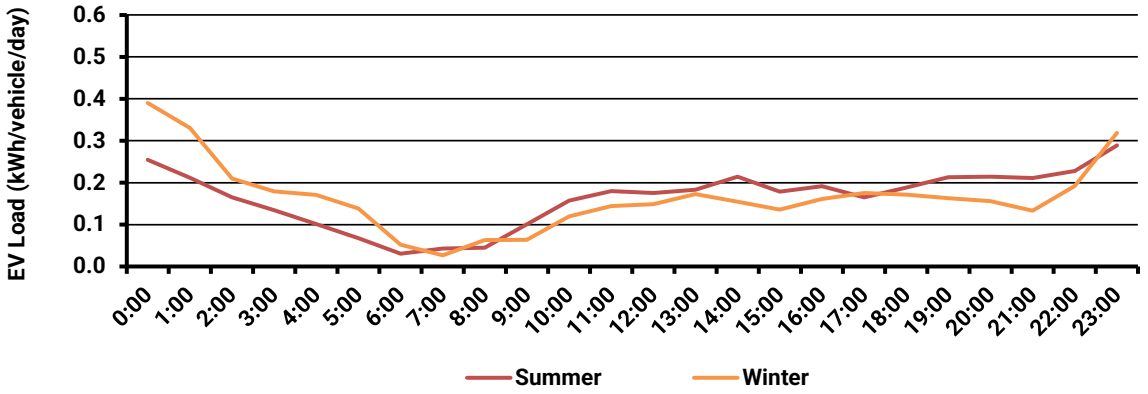
Average Hourly Charging Load – Time Variation

Weekday vs. Weekend



Source: Origin, AGL, Note: 67 Origin customers (period: Jun 20-Jul 21), 131 AGL customers (period: Jan 23-Apr 23)

Summer vs. Winter



Source: Origin, EV Grid, Note: 66 Origin customers (period: Jun 20-Jul 21)

- Load averaged on a kWh/vehicle/day basis, not charging session
  - Participating customer who does not charge their vehicle on a given day contributed 0 kWh to load
- The upper chart shows weekend vs weekday profiles over the complete data set provided
- Weekend and weekday load shapes look similar, however weekend load are slightly larger
  - Suggest sample customers drove their vehicles more on the weekends
- Summer and winter load shape and size were fairly similar

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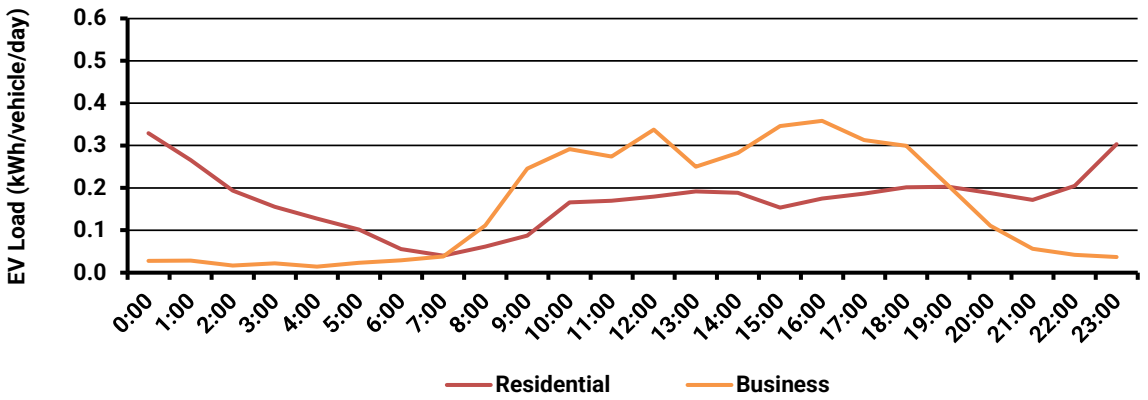
Average Charging Load Shape – Customer Variation

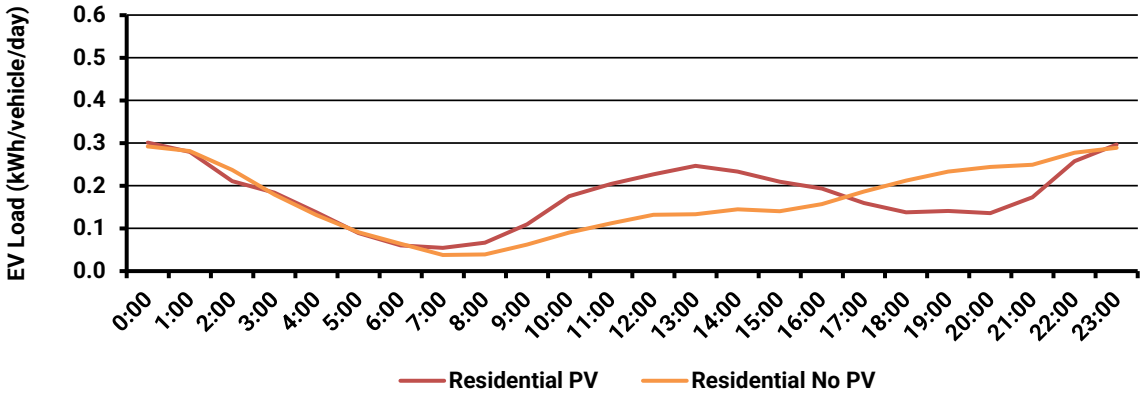
Residential vs. Business



Source: Origin, Note: 67 Residential, 25 Business Customers

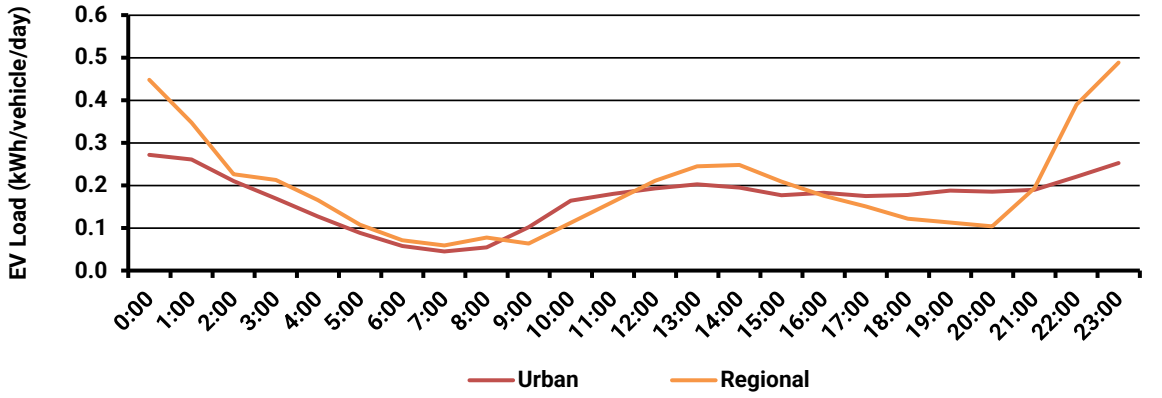
- Business participants contributed a small portion of the sample size collected, but have a distinct day time profile reflecting typical business hours
- Participants with rooftop solar PV were far more likely to charge in the daytime when solar production is highest
- Regional participant EVs had a much higher charging load than urban participants, reflective of typical driving distance

Residential w/ vs. w/out Rooftop Solar PV



Source: EV Grid, Note: 119 w/ Solar PV, 44 w/out Solar PV

Urban vs. Regional



Source: EV Grid, Origin, Energeia, Note: 190 Urban, 40 Regional Customers

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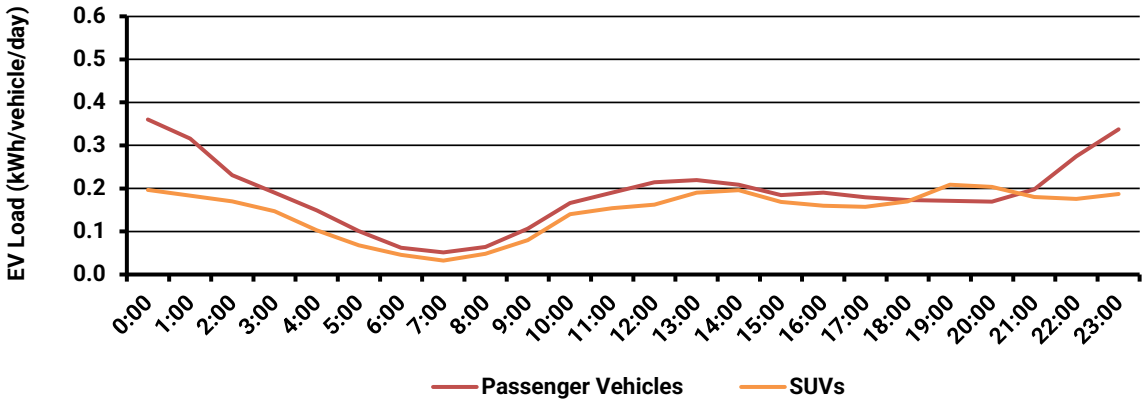
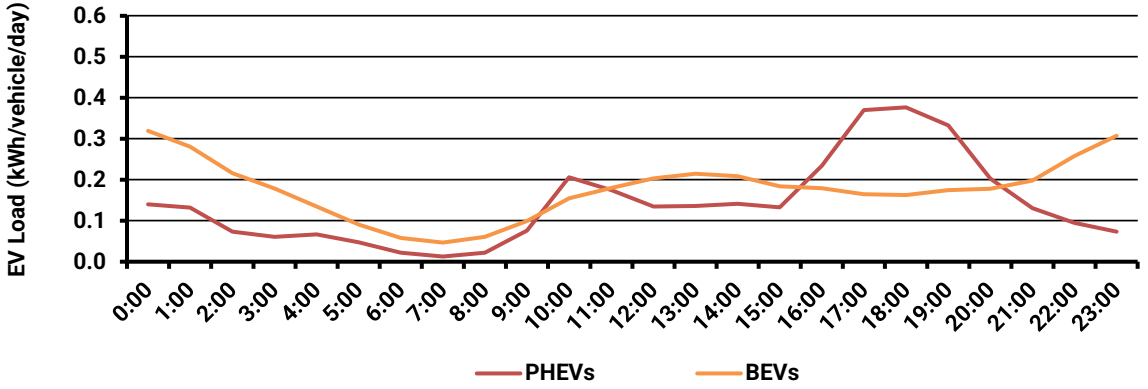
Average Charging Load Shape – Vehicle Variation

Passenger vs. SUV



Source: EV Grid, Origin. Note: 156 Passenger Vehicles, 66 SUVs

BEV vs. PHEV



Source: Origin. Note: 12 PHEVs, 218 BEVs

- SUV load shape was more skewed to middle of the day, potentially higher correlation with PV ownership
- PHEV owners tended to charge during early evening and had a lower charging load than BEVs, but very small sample size

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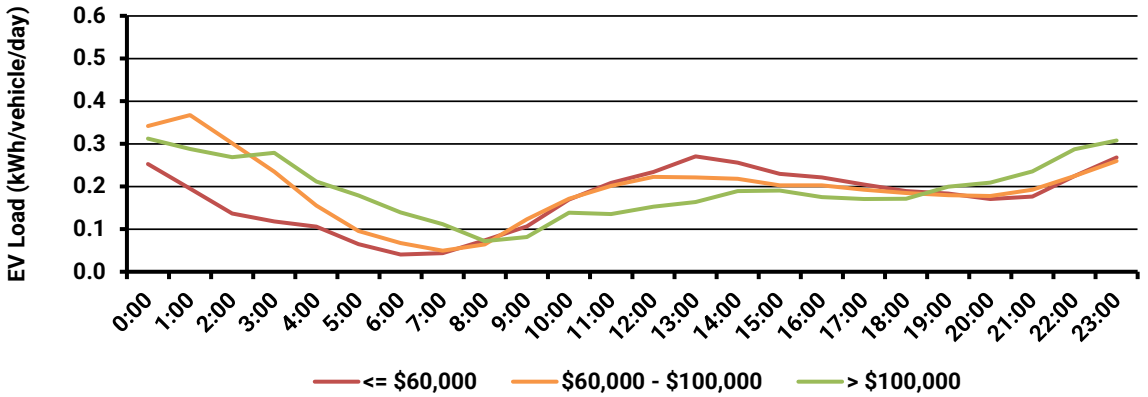
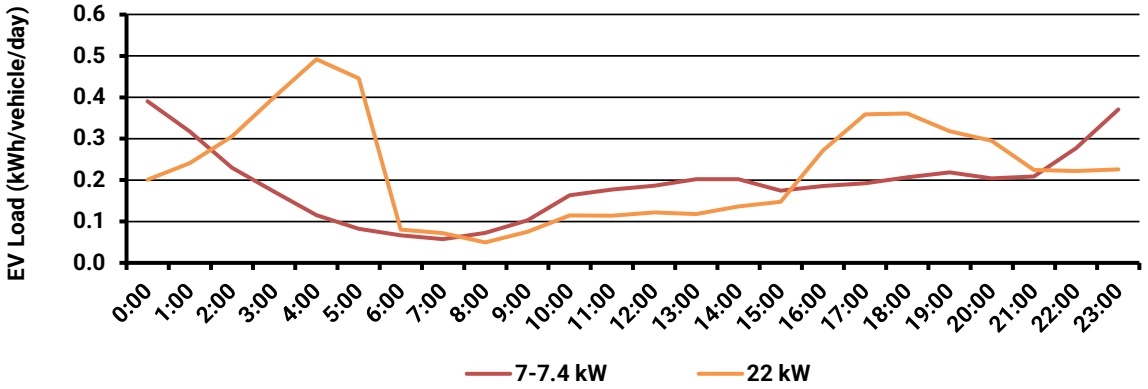
Average Charging Load Shape – Vehicle Variation

Vehicle Price Band



Source: EV Grid, Origin. Note: 108 low price band customers, 94 medium price band customers, 19 high price band customers

Vehicle Charger



Source: AGL, Origin, Note: 13 22kW chargers, 156 7-7.4 kW chargers. Early morning spike caused by single charger.

- The upper chart shows the load shape for vehicles split by price band
- The unmanaged profiles indicate that there is variation in charging times based on vehicle price
  - Higher priced vehicles appear to charge more at night
  - Lower price vehicles tended to charge more during the day
  - All have a similar charge rate during evening peak times
- The lower chart outlines charging profiles by charger power
  - 22 kW charging is predominantly from business customers, which potentially explains load shape

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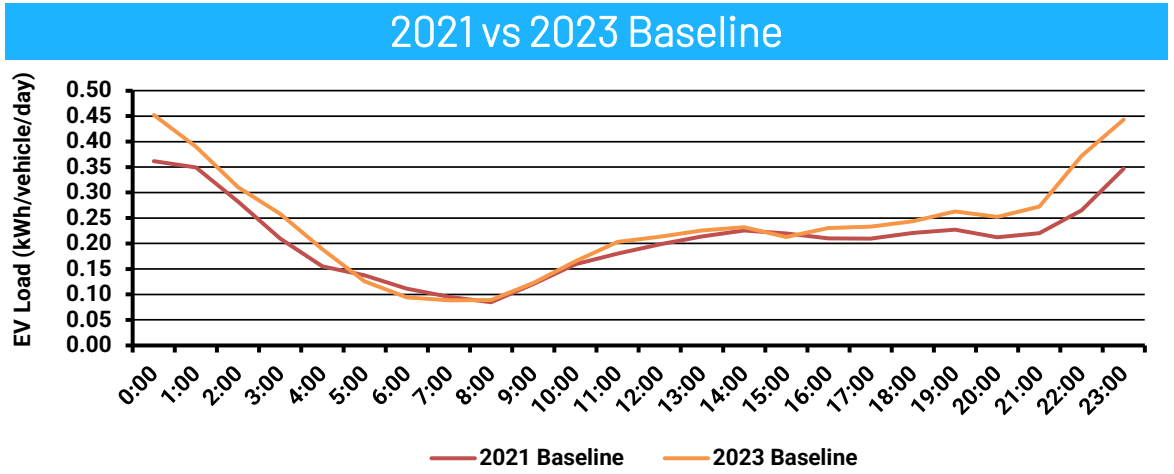
Updated BaU – AGL Baseline Data Re-Collection



Source: AGL. Note: 145 Baseline 2021 customers, 125 Baseline 2023 customers

- AGL re-collected unmanaged baseline charging data during the beginning of 2023
  - Aim was to collect baseline data not impacted by COVID-19 lockdowns
- Results show minimal difference in charge times during and after lockdowns
  - Suggests that charge time behaviours are robust against changes in frequency of vehicle usage
- Average daily EV consumption per vehicle varied during and post lockdowns with
  - 5.02 kWh per day during 2021 lockdowns
  - 5.68 kWh per day in 2023

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Smart Charging – AGL

Load Shapes

Participation

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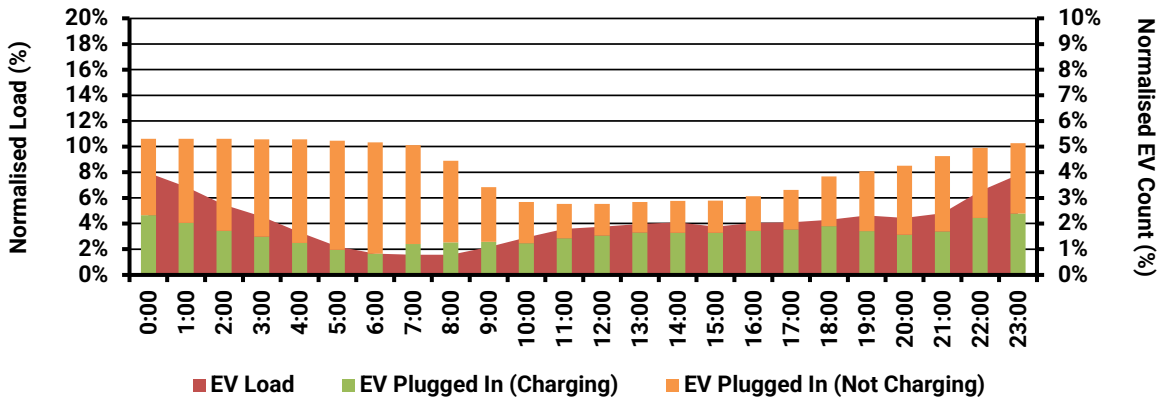
AGL – Unmanaged vs Smart Charging Profiles

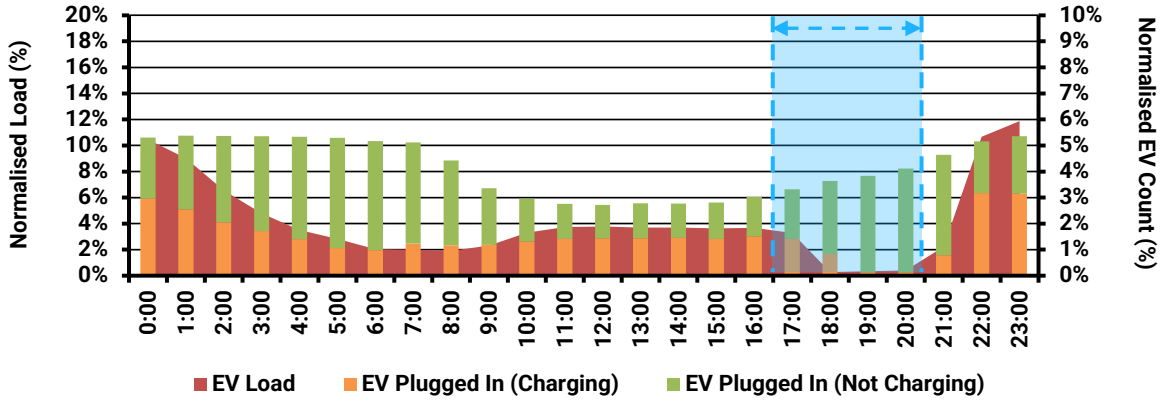
Unmanaged Profile – Weekday



Source: AGL, Energeia Analysis, Note: 125 customers

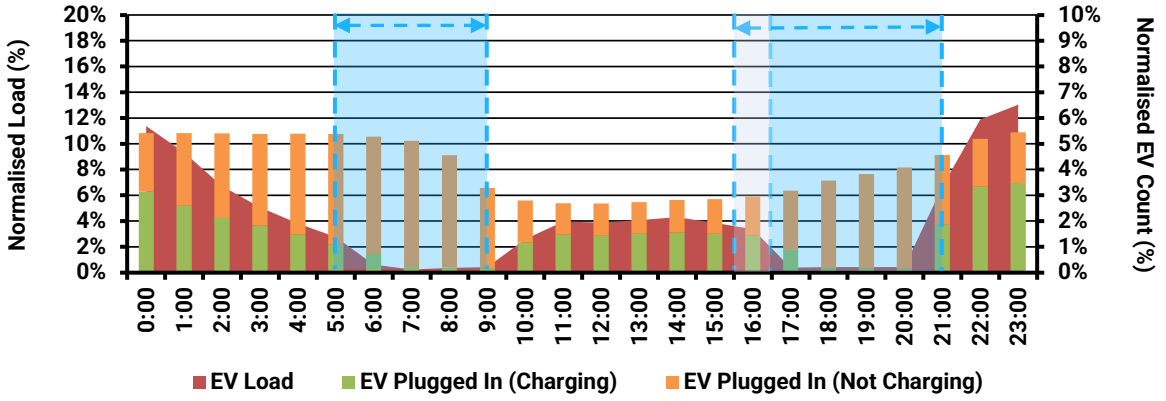
- The charts show unmanaged vs Phase 1 and Phase 2 of Smart Charging
  - **Phase 1**: Evening
  - **Phase 2 + 3**: Morning + Evening
- AGL conducted smart charging every weekday throughout the entire trial period
- Updated baseline data is used in comparison, to avoid impacts of 2021 COVID-19 lockdowns
- Post smart charging evening period much higher than unmanaged
- Interestingly, no major increase seen after the morning smart charging period during Phase 2, customers waited to charge overnight

Smart Charging – Phase 1 (Weekday)



Source: AGL, Energeia Analysis. Note: 152 customers. Period start and end time varies up to half an hour by state. Blue indicates smart charging period

Smart Charging – Phase 2 + 3 (Weekday)



Source: AGL, Energeia Analysis. Note: 148 customers. Period start and end time varies up to half an hour by state. Blue indicates smart charging period, where Phase 3 starts 1 hours earlier

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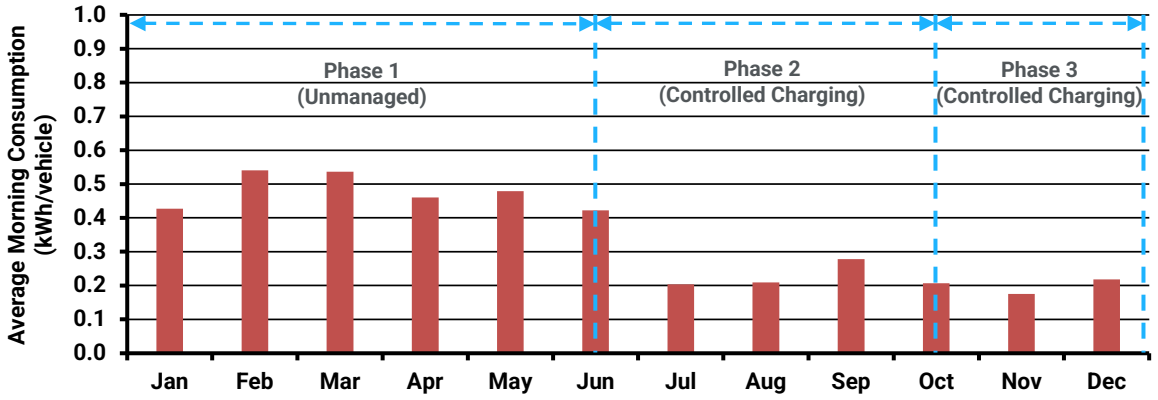
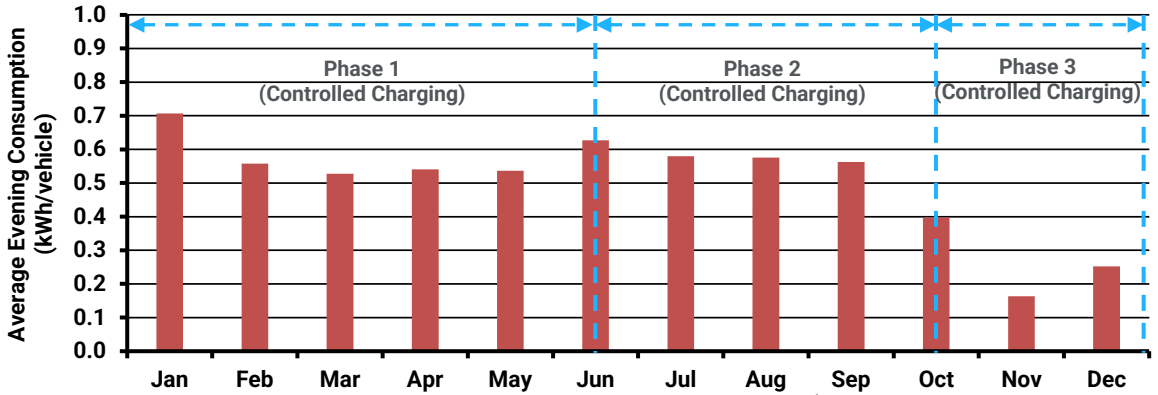
AGL – Smart Charging Opt-Out Behaviour

Morning Period Average Consumption



Source: AGL, Energeia Analysis. Note: Phase 2: Jun-Dec (5:30 AM-9:30 AM)

Evening Period Average Consumption



Source: AGL, Energeia Analysis. Note: Phase 1: Jan-Jun, Phase 2: Jun-Dec (5:30 PM-8:30 PM, to account for varying start times)

- The charts show customer average customer consumption during smart charging period across all months of the trial
  - Charts show fixed local time across all period of trial
  - Morning and evening period timing considered only hours where all states + phases overlap
- AGL trial aims to limit consumer energy consumption during the trial smart charging timeframes:
  - **Phase 1**: Jan – June, Evening
  - **Phase 2**: June – Oct, Morning + Evening
  - **Phase 3**: Oct – December, Morning + Evening (evening period shift)
- Findings show that controlling morning charging does not appear to impact how customers responded to evening charging control
- Evening control period experiences progressively lower consumption over the trial period – indicating lower opt-out rates
- Morning charging shows limited change in demand trends from the onset of control from late June onwards

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Smart Charging – EV Grid

Load Shapes

Participation

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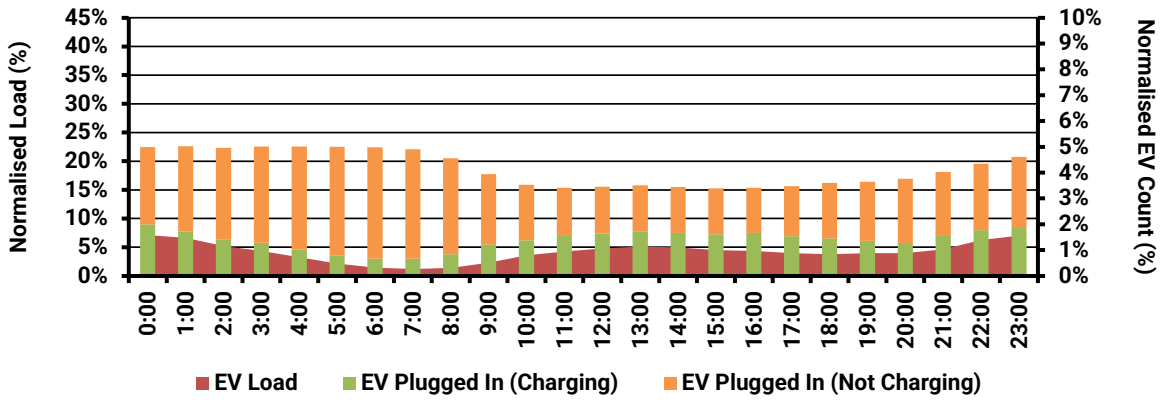
EV Grid – Unmanaged vs Smart Charging Profiles

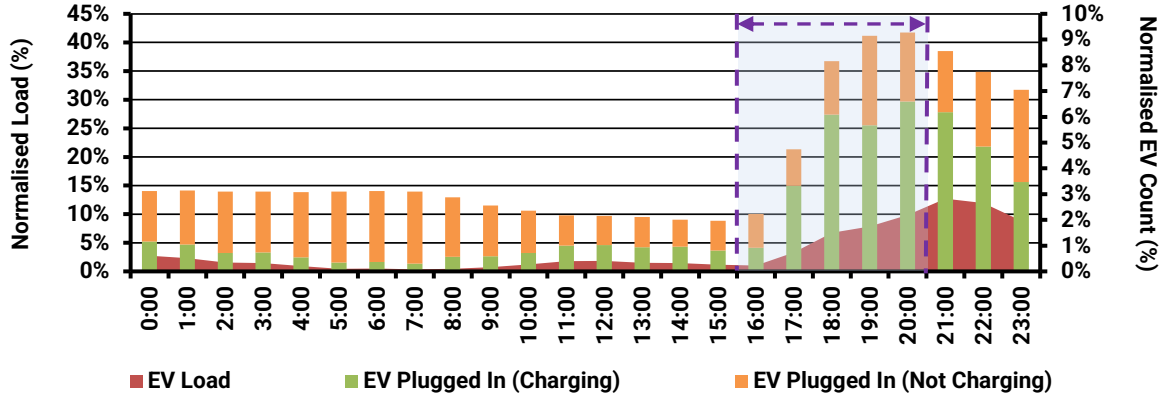
Unmanaged – Weekday



Source: EV Grid, Energeia Analysis

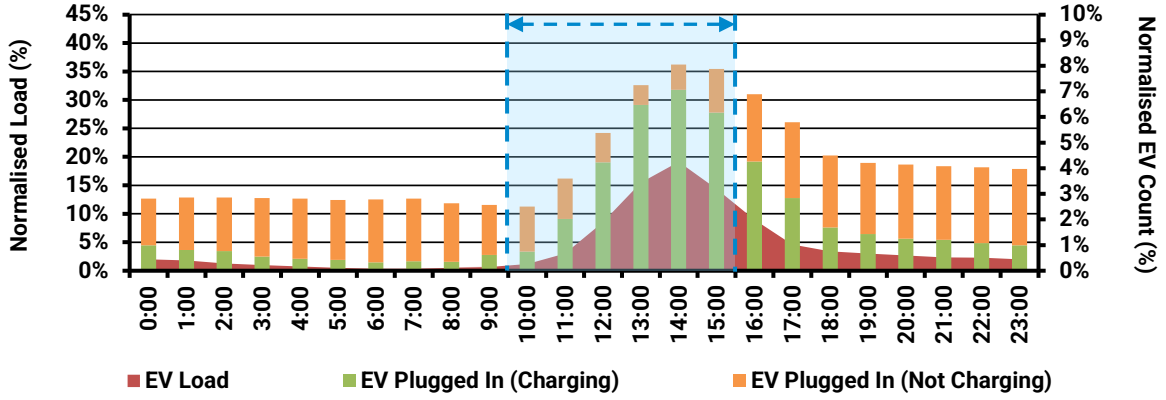
- The charts show unmanaged vs dynamic trials
  - **Demand Response**: 5 events, aimed to investigate ability to control demand in peak period
  - **Solar Soaker**: 5 events, aimed to incentivise demand during solar hours
- Trial figures contain all customers regardless of opt in/opt out
- Customers were requested to plug-in during the demand response event
  - Each DNSP set target level of output in response to local network demand during event

Demand Response – Weekday



Source: EV Grid, Energeia Analysis. Purple indicates smart charging period

Solar Soaker – Weekday



Source: EV Grid, Energeia Analysis. Note: Blue indicates incentive to charge

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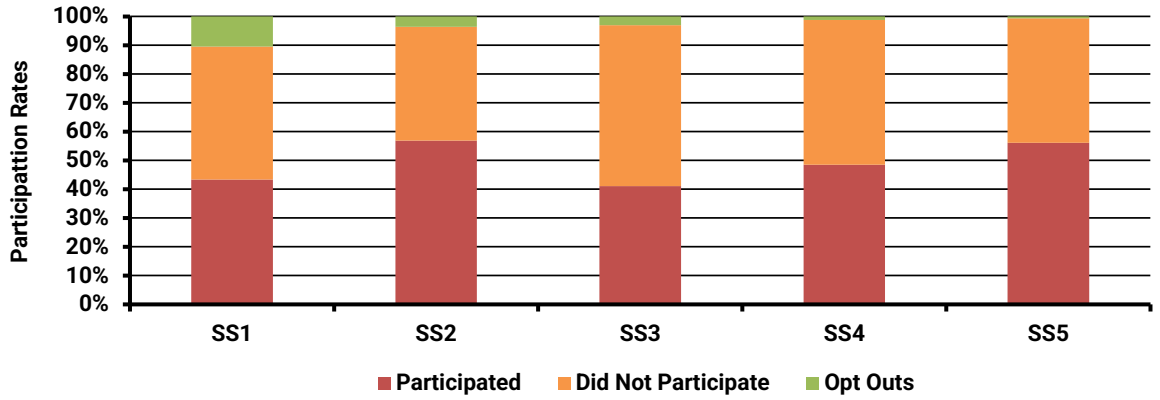
EVGRID

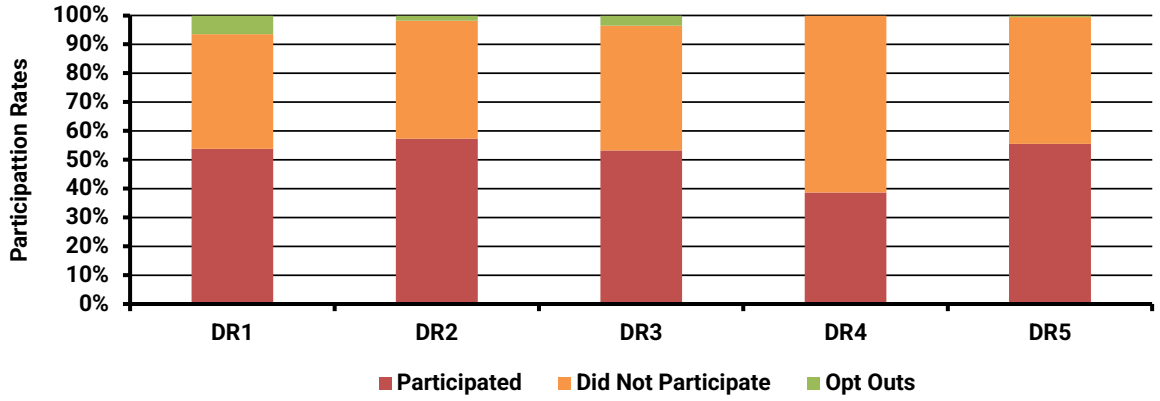
EV Grid – Smart Charging Opt-Out Behaviour

Solar Soaker Participation Rates by Event



Source: EV Grid, Energeia Analysis

Demand Response Participation Rates by Event



Source: EV Grid, Energeia Analysis

- EV Grids trials show relatively consistent participation rate over the entire trial
  - Participants were considered ‘participating’ if a vehicle was plugged into the charger at any point during the trial timeframe
- Opt-out rates where high upfront, with participants indicating that opt-out notifications where confusing
  - Opt-out rates decrease overtime with participants becoming increasingly familiar and prepared for trial process
- Around 50% of participants in each trial were offline, without opting out, with non-participation likely including:
  - Absent vehicles where opt-out process was not followed
  - Technical difficulties

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EVGRID

Smart Charging – Origin

Load Shapes

Participation

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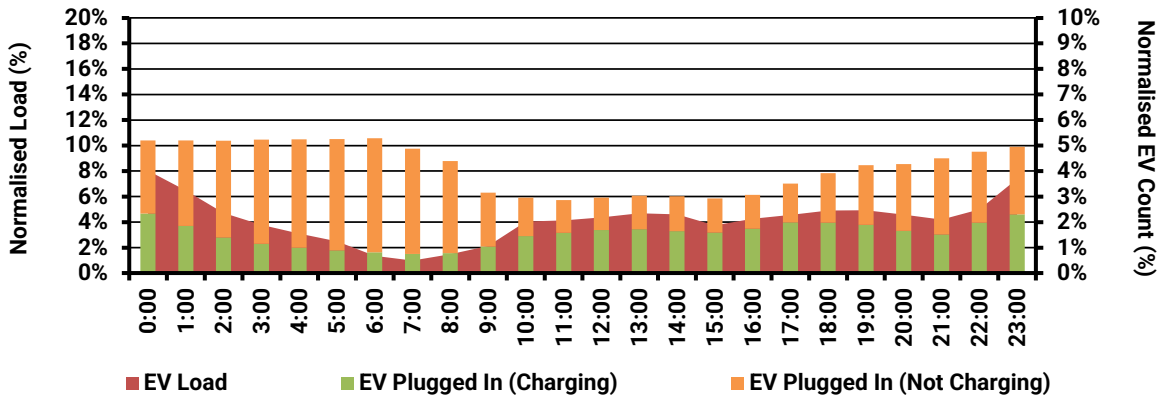
Origin – Unmanaged vs Smart Charging Profiles

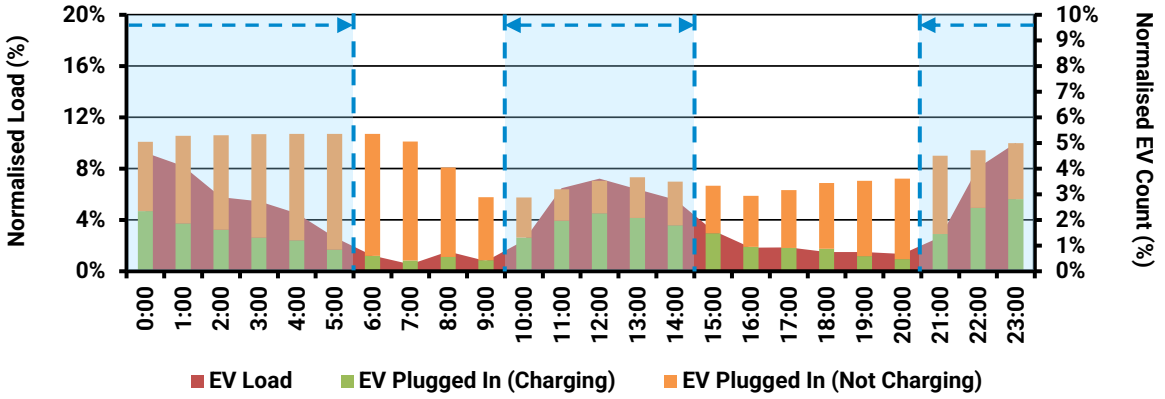
Unmanaged – Weekday



Source: Origin Energy, Energeia Analysis. Note: 67 vehicles

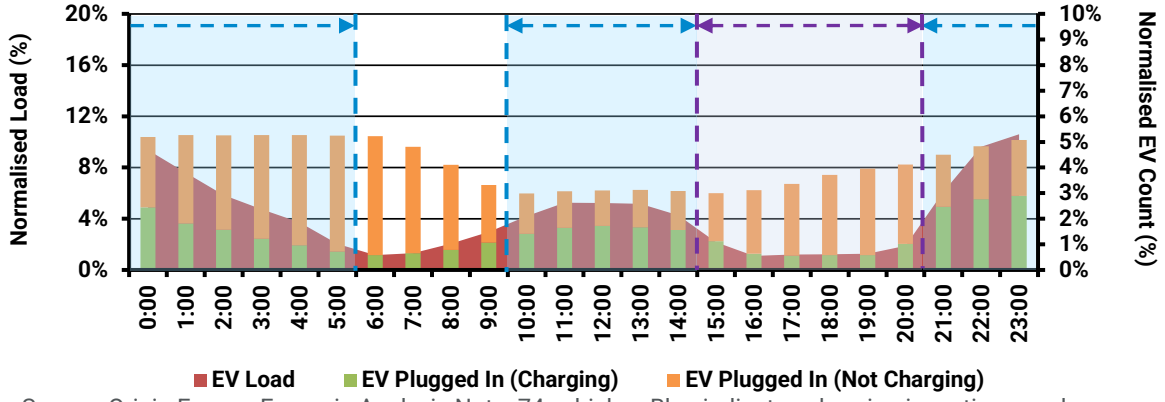
- The charts show Unmanaged vs experiments 1 and 2 across weekdays
  - **Experiment 1** – Off-peak smart charging incentive (10c/kWh midday and overnight)
  - **Experiment 2** – Additionally, a 3 - 9pm controlled smart charging period
- Impact of Experiment 1 significant, Experiment 2's impact more difficult to discern
  - Shows that voluntary incentives were effective in managing charging on their own

Experiment 1 – Weekday



Source: Origin Energy, Energeia Analysis. Note: 68 vehicles. Blue indicates charging incentive, purple indicates controlled charging (Experiment 2 only)

Experiment 2 – Weekday



Source: Origin Energy, Energeia Analysis Note: 74 vehicles. Blue indicates charging incentive, purple indicates controlled charging (Experiment 2 only)

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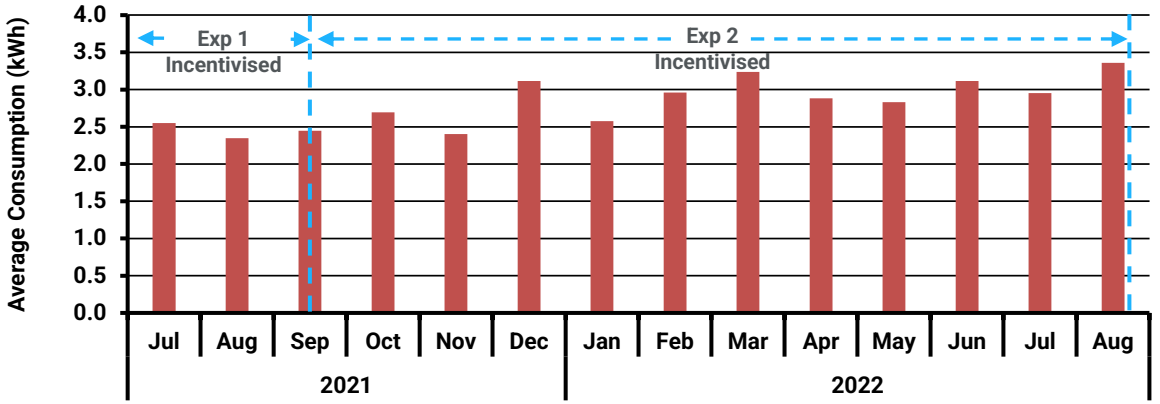
origin

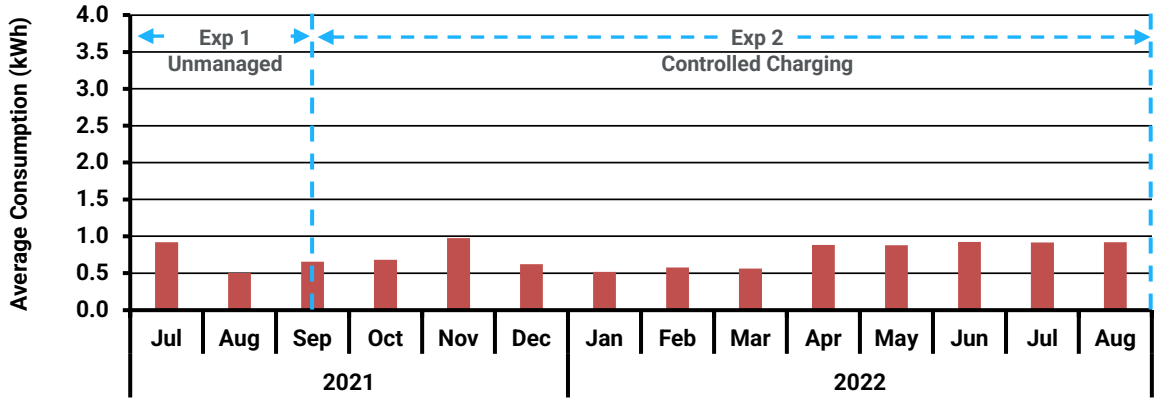
Origin – Smart Charging Opt-Out Behaviour

Avg Daily Incentive Period Consumption by Month



Source: Origin, Energeia Analysis. Note: Incentive period (10AM – 3 PM, 9PM – 5AM)

Avg Daily Control Period Consumption by Month



Source: Origin, Energeia Analysis. Note: Control period (3PM – 9PM)

- The charts show customer average customer consumption during incentive and smart charging period across all months of the trial
- Origin trial aims to both incentivise charging in off peak periods, and limit consumer energy consumption during the peak smart charging timeframes:
  - **Experiment 1**: Jul 2021– Sep 2021, Overnight and midday charging incentive
  - **Experiment 2**: Sep 2021 – Aug 2022, peak period smart charging suppression + Experiment 1 incentives
- Incentive period charging experiences a progressive growth in consumption over the trial period
- Control period charging appears to show a rebound effect, resulting in limited overall change in demand trends from the onset of control from July onwards
- Noting COVID lockdowns likely have an impact on the average charging volumes on the consumer in late 2021

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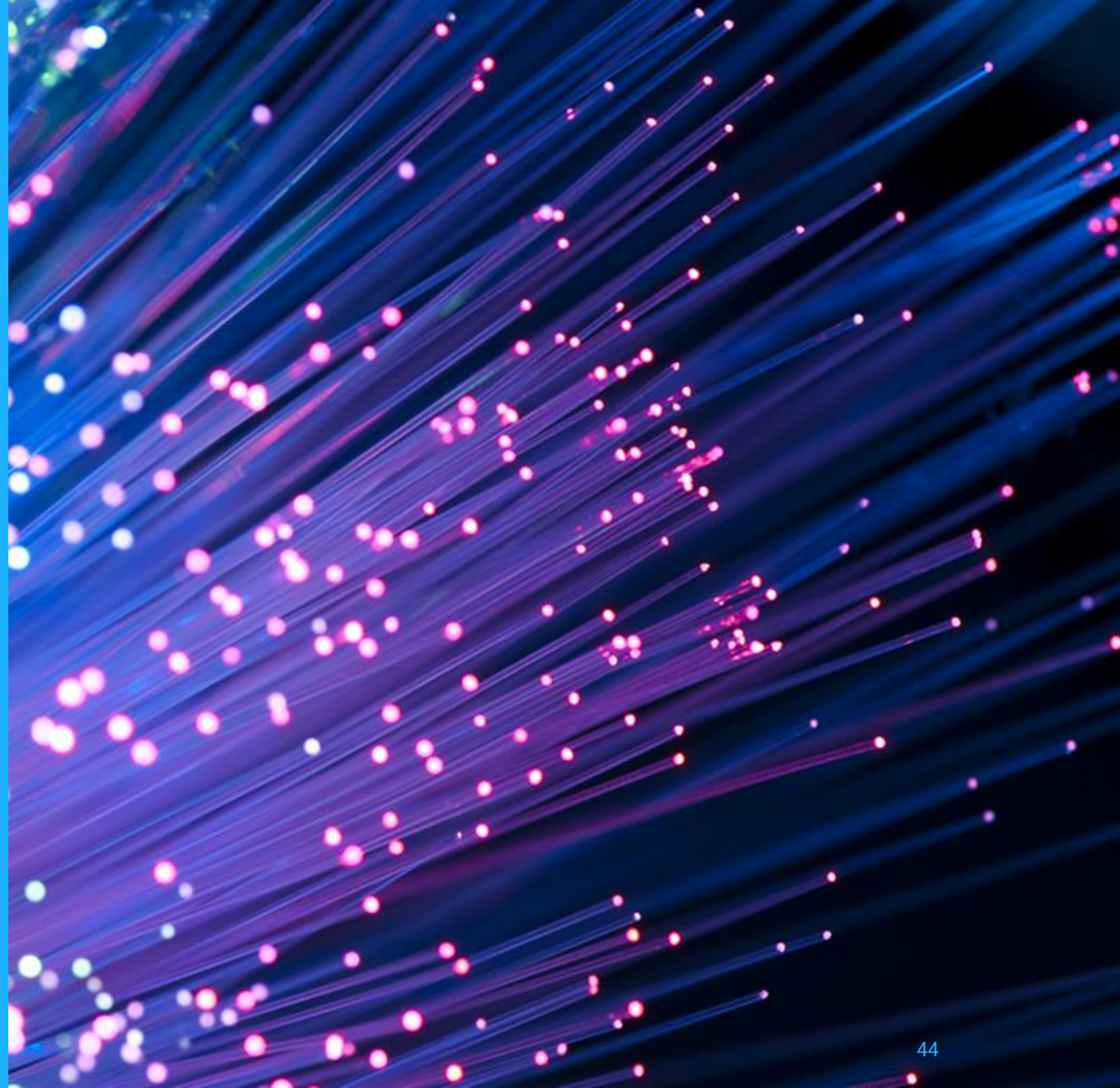
Industry Comparison



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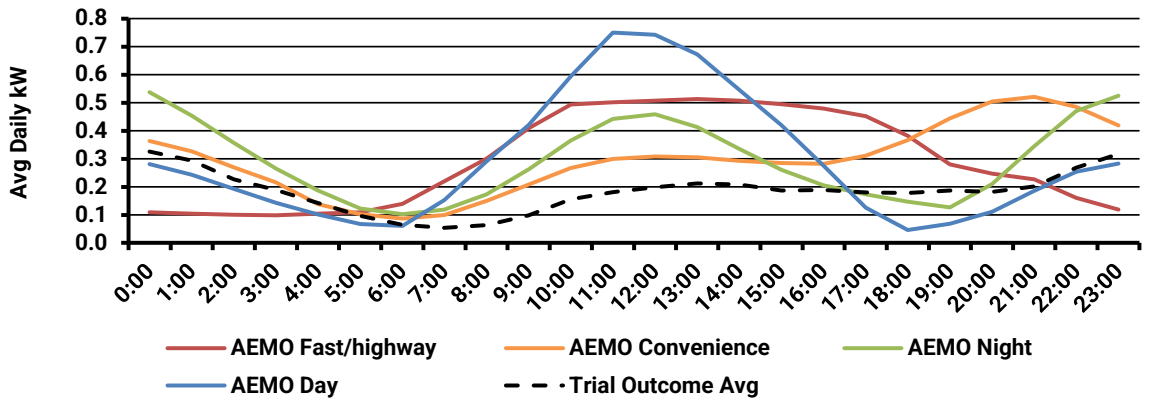
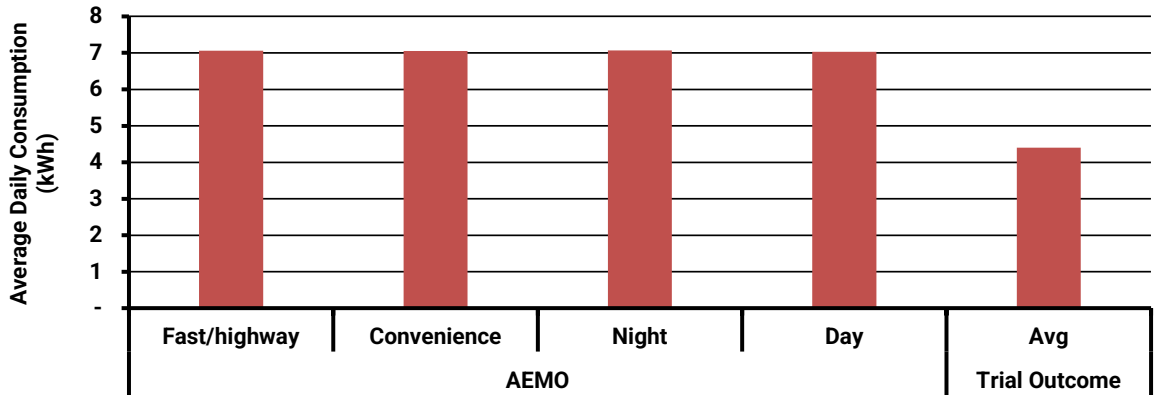
Charging Impacts

NEM ISP Modelling EV Charging Load Shape vs. Trial Data



Source: AEMO, EV Grid, Origin, AGL

NEM ISP Modelling EV Average Daily Cons vs. Trial Data



Source: CSIRO, EV Grid, Origin, AGL

- The charts show a comparison of the combined unmanaged profile of the 3 trials to the CSIRO modelling
- The trial data shows a daytime usage than the CSIRO profiles, which converges to the typical consumption of the CSIRO profiles overnight
- Comparison shows that the trial outcomes show close to half of CSIRO's modelled average daily consumption
  - The CSIRO's assumption arises from an average annual driving distance of 11,000 km/year
  - This implies that the trial vehicles do not entirely charge at home, or potentially also drive below the average annual driving distance

ENERGEIA

Thank You!

Energeia Pty Ltd
132 E Street, Suite 380
Davis, CA 95616

P +1 (530) 302-3861
energeia@energeia.com.au

energeia-usa.com

Energeia Pty Ltd
L1, 1 Sussex Street
Barangaroo NSW 2000

P +61 (0)2 8097 0070
energeia@energeia.com.au

energeia.au

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AGL EV Orchestration Trial

ARENA DEIP Forum
26 July 2023

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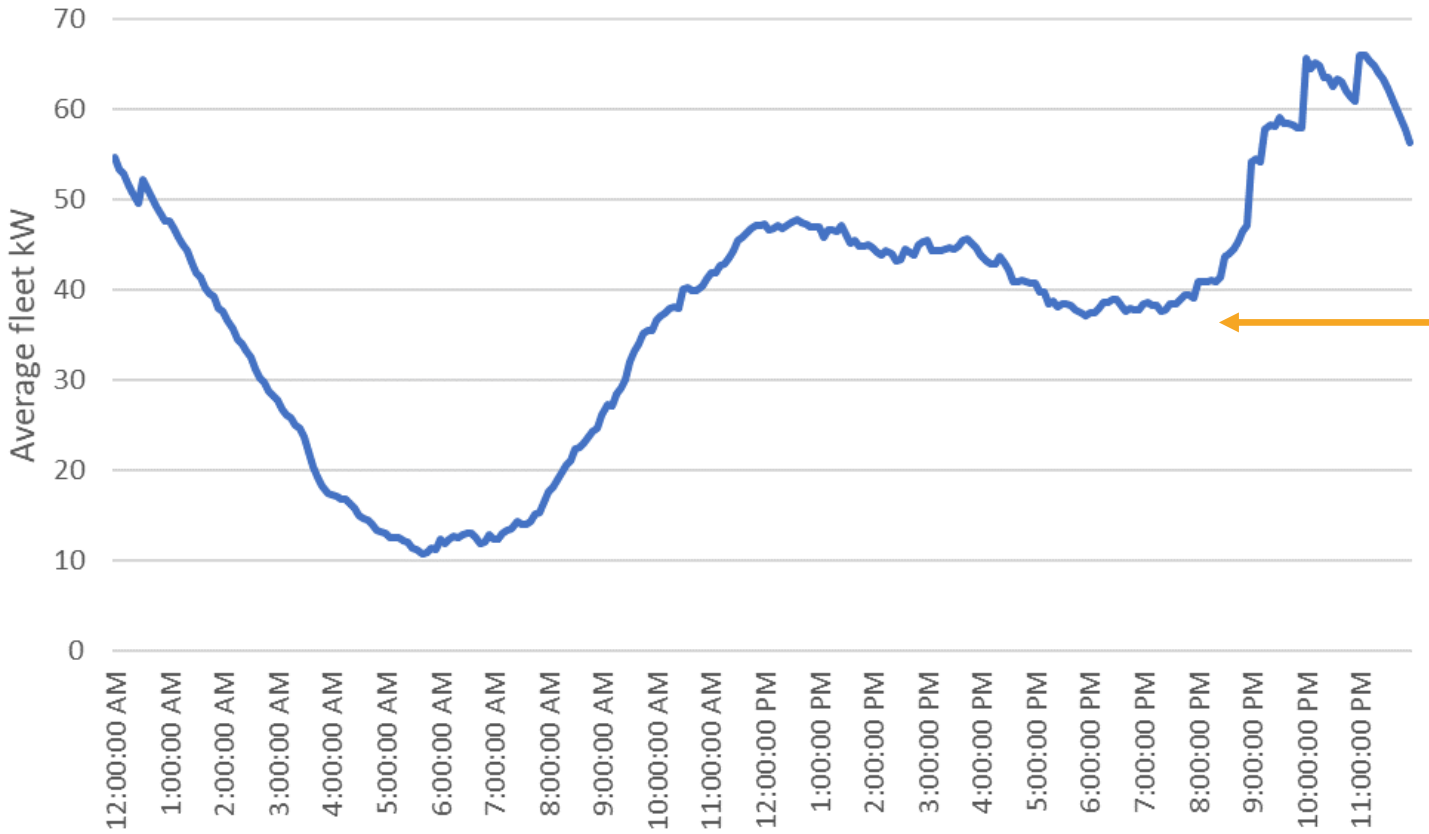
Key findings

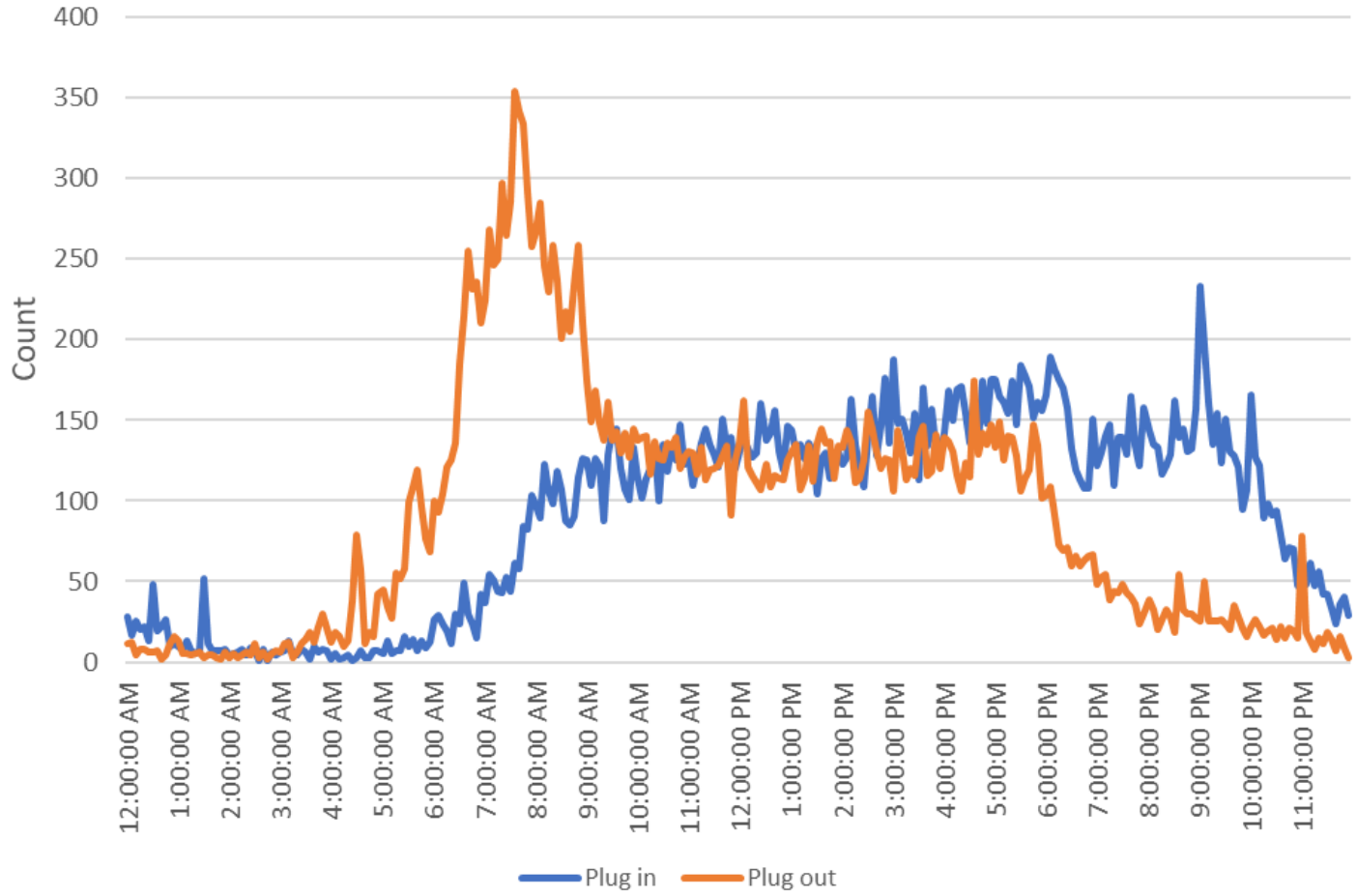
- The overall residential charging load is smaller and more diverse than expected. Only around 16% of home chargers are used every day. The expected early evening peak in charging load is absent from the baseline data.
- Most residential charging occurs overnight, particularly on weekdays.
- EV customers on time-of-use tariffs are already responding strongly to the tariff signals and moving their charging to off-peak periods.
- Charging orchestration is effective in reducing charging demand at peak times, particularly during the evening system peak.
- Customers are receptive to having their charging controlled provided they have the ability to opt out. The opt-outs are rarely used.
- Customer response to the trial was very positive, with 84% indicating they would be likely to sign up to a smart charging service.
- Vehicle API control is a promising technology that provides a high degree of visibility and control of vehicle charging, although some issues remain to be ironed out.
- V2G is at least two to three years away from being a practical reality.

Baseline charger fleet load shape

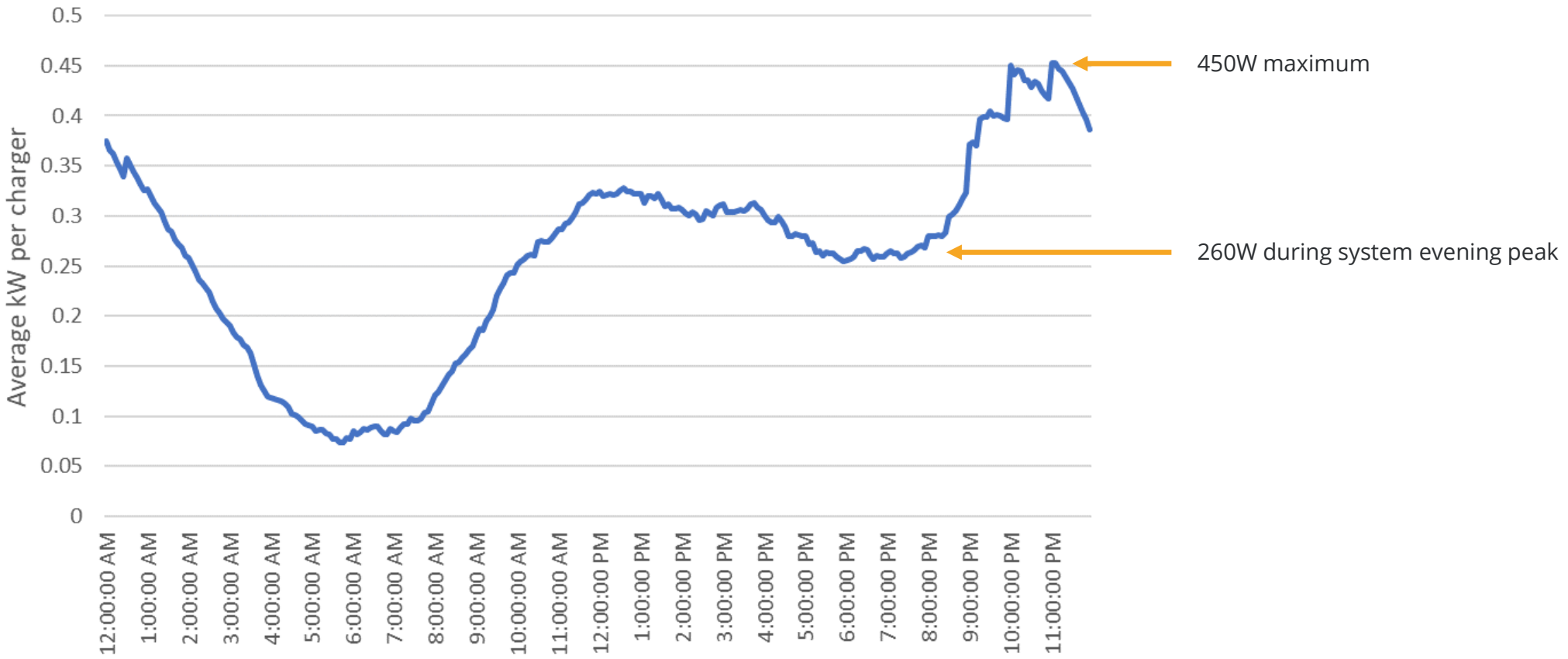


No early evening peak in charging load

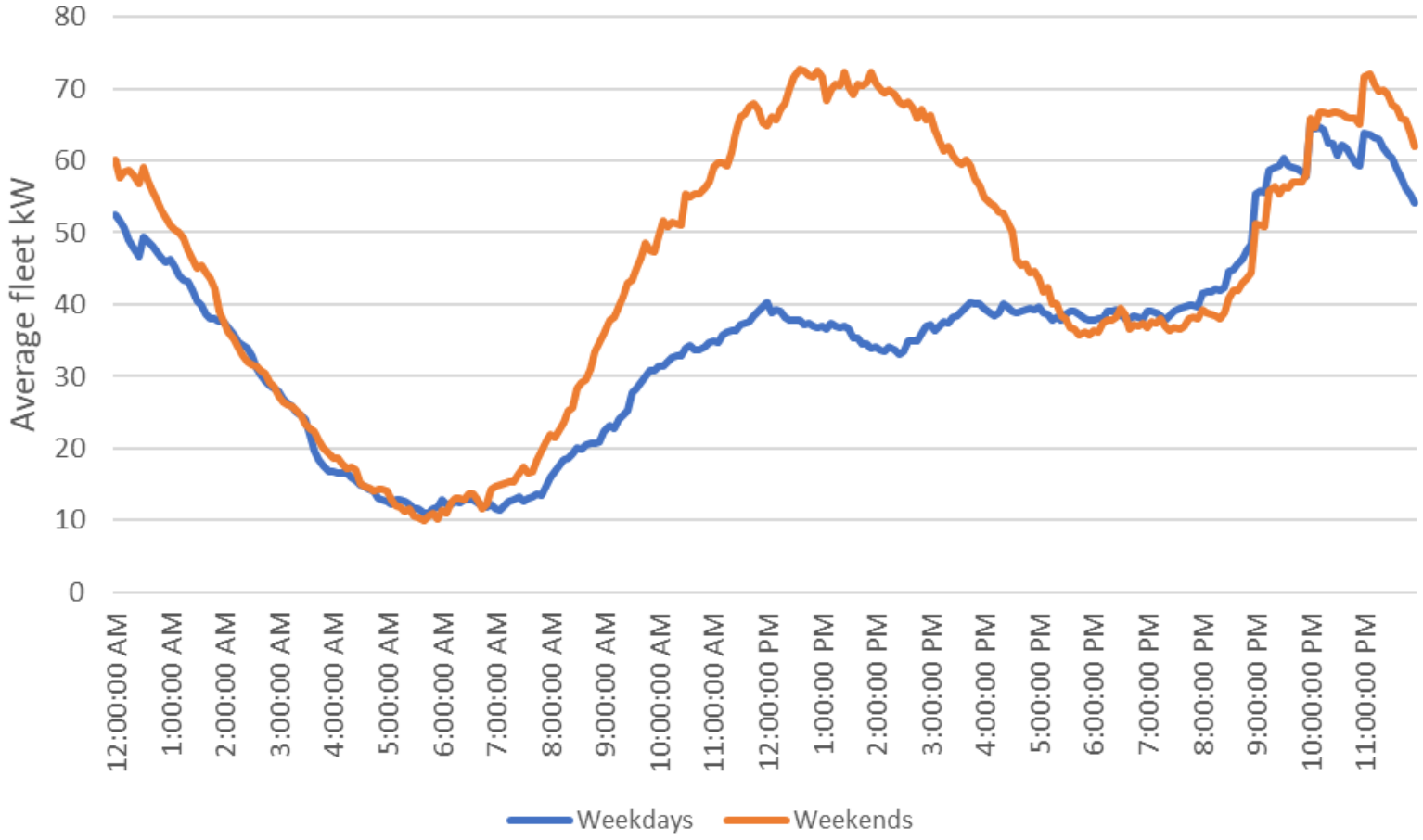
Total plug-in and plug-out count across the day (5 min intervals)



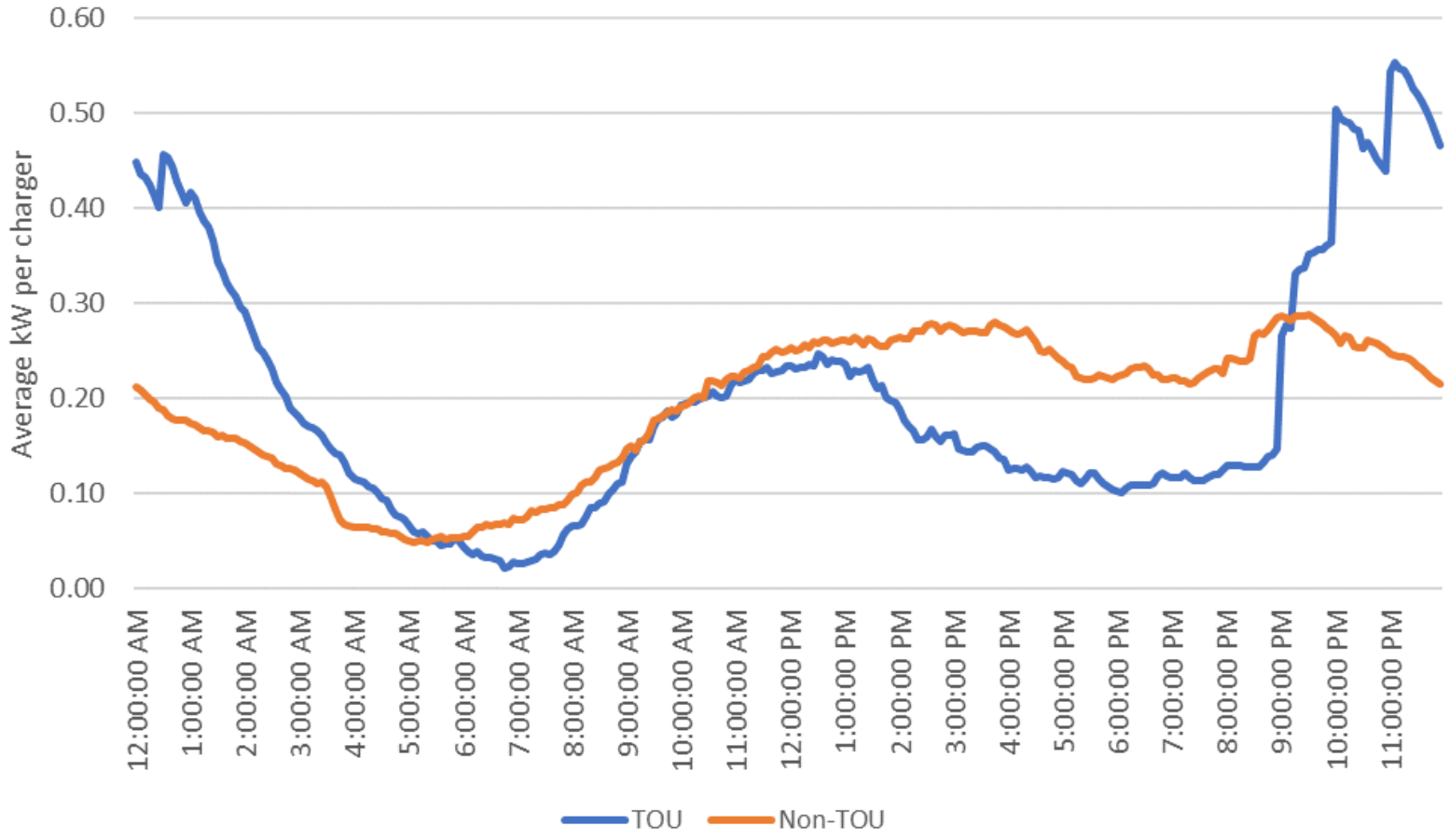
Average per-charger load across a large population is very low



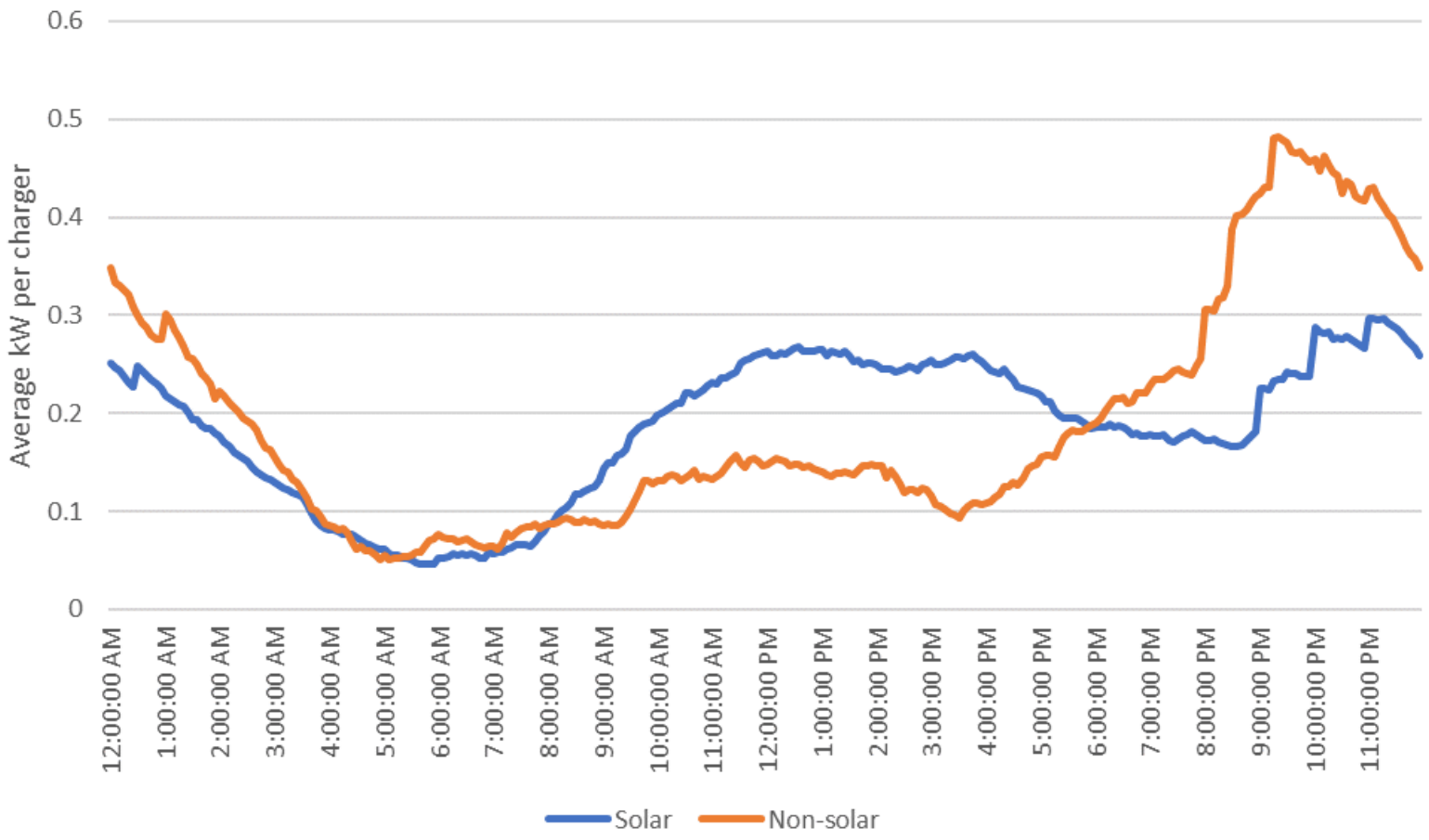
Baseline load shape – weekdays and weekends



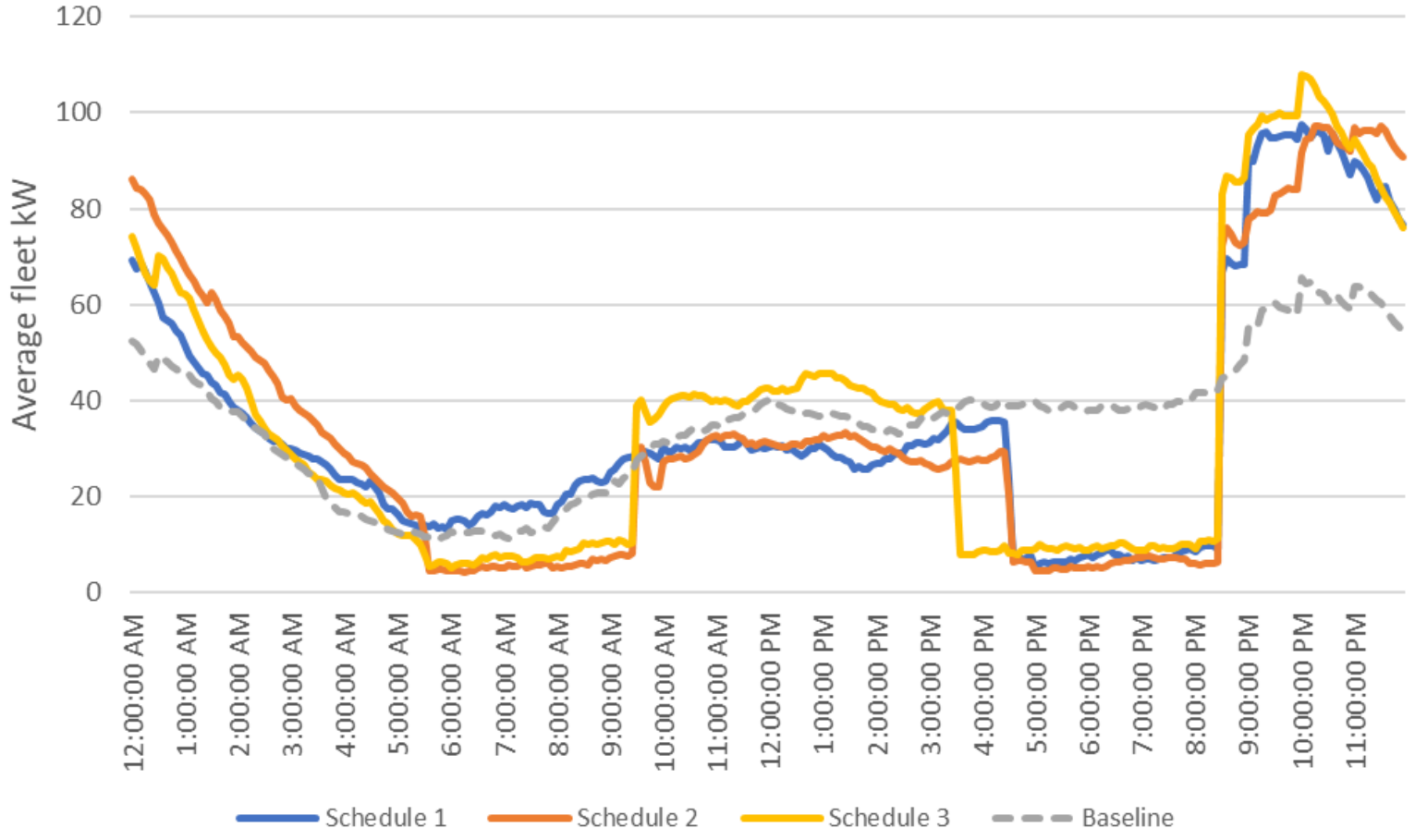
Baseline charger load shape – TOU and non-TOU customers



Baseline charger load shape – solar and non-solar customers



Charging control works to remove charging load from peak periods



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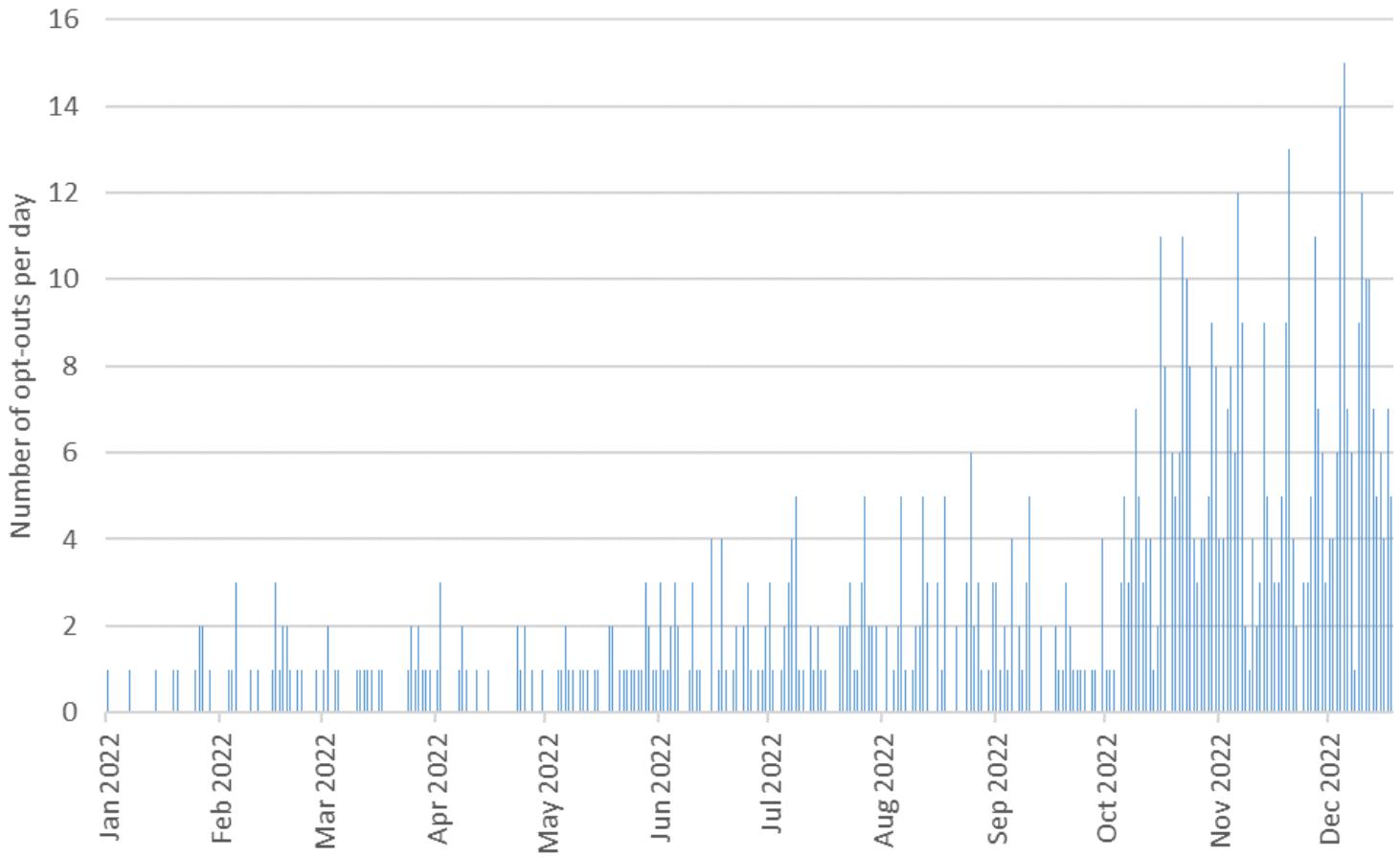
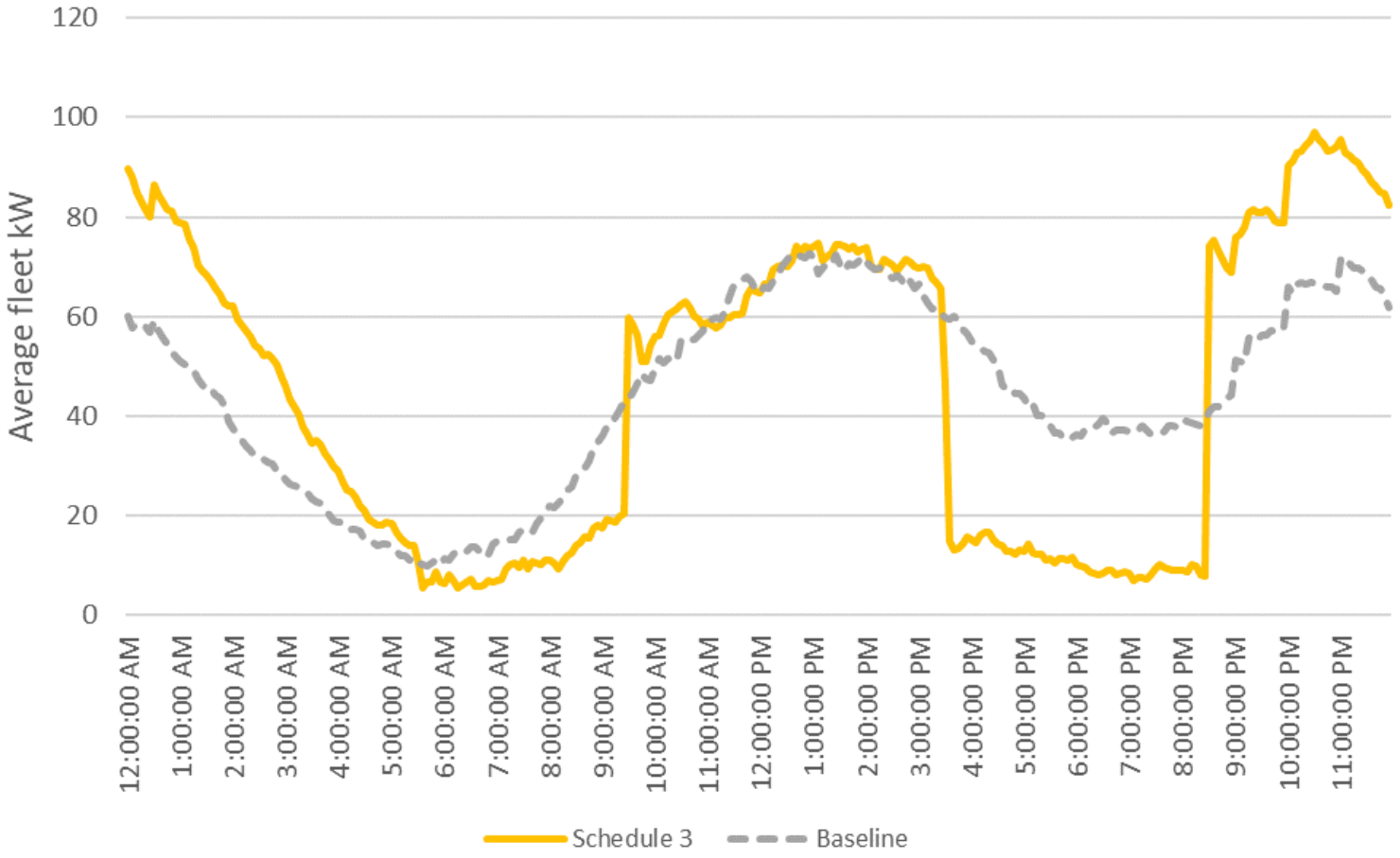
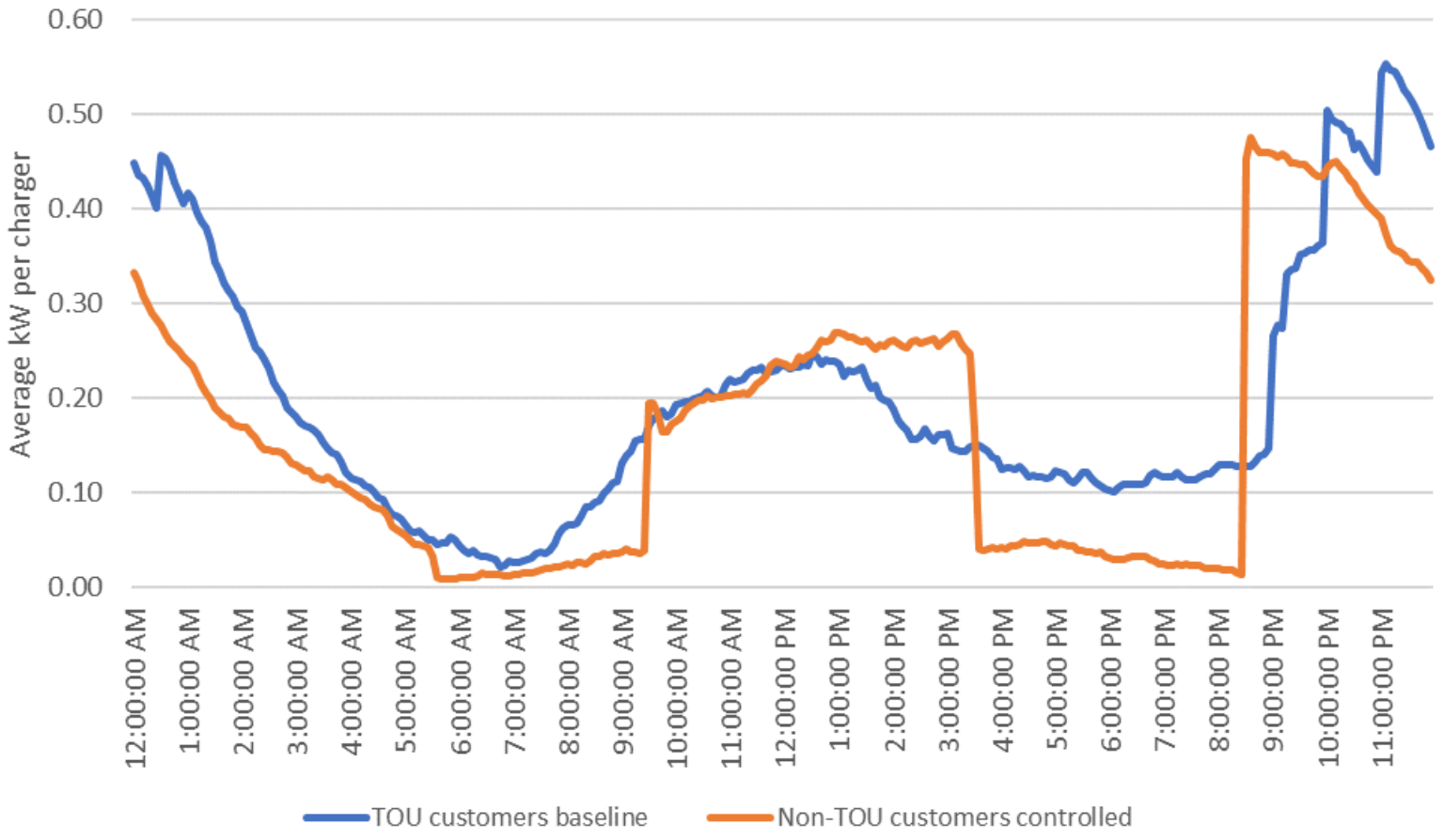
Opt-out rates are low, but increased with reduced charge time



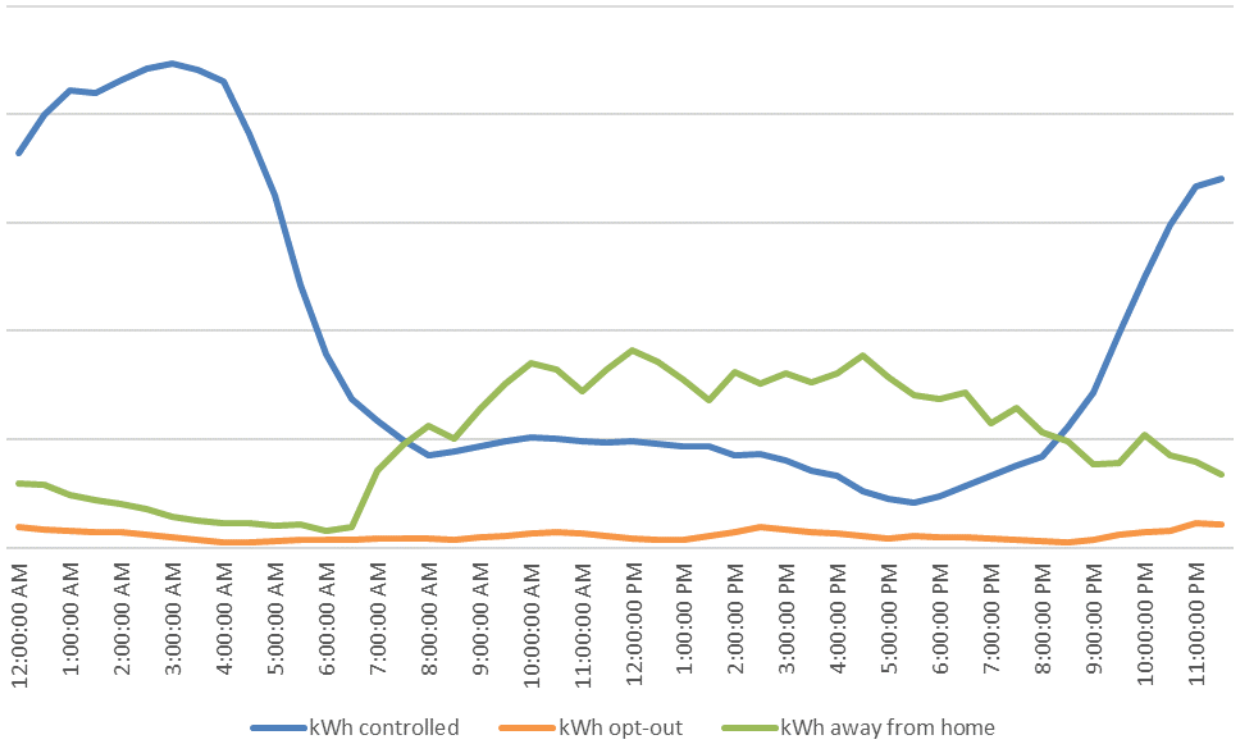
Weekend controlled load shape vs baseline

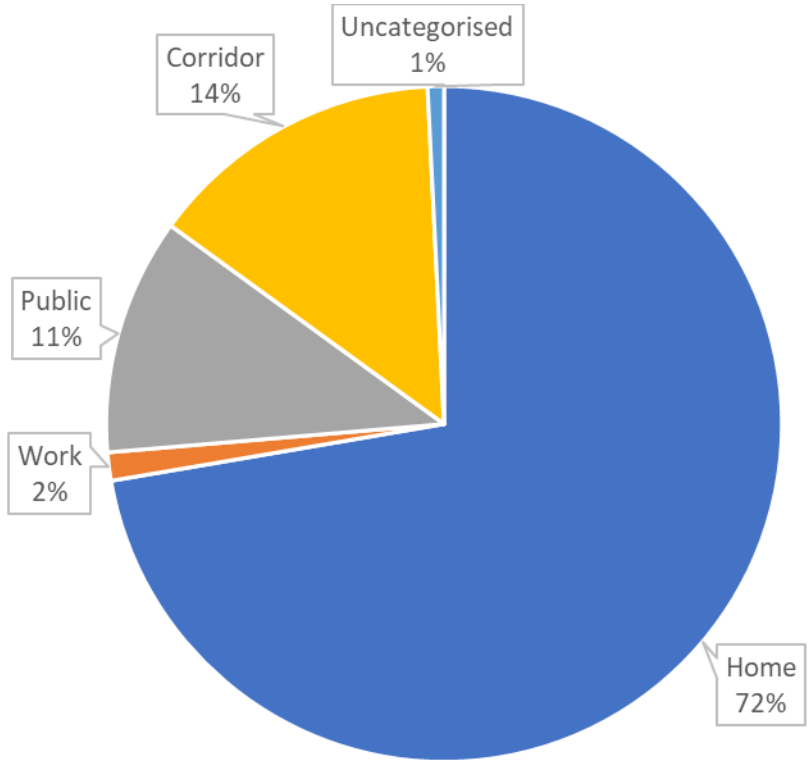


How effective is controlled charging vs a TOU tariff?



Vehicle API trial – home and away-from-home charging





Key customer research findings

- **72%** of participants found the charging control events to be **seamless and unobtrusive**
- **73% of charging** (by time) is done at **home**
- **77%** of drivers **don't charge every day**
- **84%** had **no problems** with the **charger**
- **75%** had **no problems** with the **app**
- **84% would consider** signing up to a **charging orchestration product**

Positive themes:

- Receiving the charger and having improved charging capacity and speed
- Seamless and unobtrusive charging events
- Contributing data for better decision making and problem solving
- Receiving bill credits
- Positive support experience/resolution when required
- Feeling engaged in trial, in particular connection with AGL and other trial participants through the online forum and email communications from AGL

Negative themes:

- Car hasn't charged as expected
- Not leveraging free solar production
- Faulty charger
- App issues / unclear of how to use app
- Lack of clarity on data capture and usage
- Issue with AGL energy plan
- Bill credits not applied
- Expected more intervention
- The car is woken up too often

agl Join the change

Origin Energy
Smart Charging Trial

DEIP Dive Presentation

26 July 2023

Recruitment process

Home » Origin to launch EV smart charging trial

7 AUGUST 2020

Origin to launch EV smart charging trial

Origin Energy (Origin) will launch an electric vehicle (EV) smart charging trial to gain insights to help drive the take-up of EVs in the Australian market.

Origin has received a $838,000 grant from the Australian Renewable Energy Agency (ARENA) to fund a trial to roll out 150 smart chargers to EV owners and fleets.

The smart chargers will connect to Origin's Virtual Power Plant (VPP) platform, which enables multiple devices to be orchestrated remotely using artificial intelligence with benefits for customers, such as lower running costs, as well as for wholesale energy markets and distribution networks more broadly. The objective of the trial will be to improve the economics and appeal of EVs by shifting charging from times of the day when energy is more expensive to off-peak periods and when wholesale prices are low – typically when wind and solar are generating strongly.

Origin executive general manager Future Energy and Technology,

THE DRIVEN

0 COMMENTS

Origin rolls out 150 EV smart chargers to customers in trial of future grid

AUGUST 7, 2020 · 0 COMMENTS · 3 MINUTE READ
· MICHAEL MAZENGARB

SHARE 39 TWEET

Electricity retailer Origin Energy is to roll out smart EV chargers to up to 150 customers to test the ability of electric vehicle charging to be remotely monitored, controlled and optimised to minimise impacts on the

greenflux

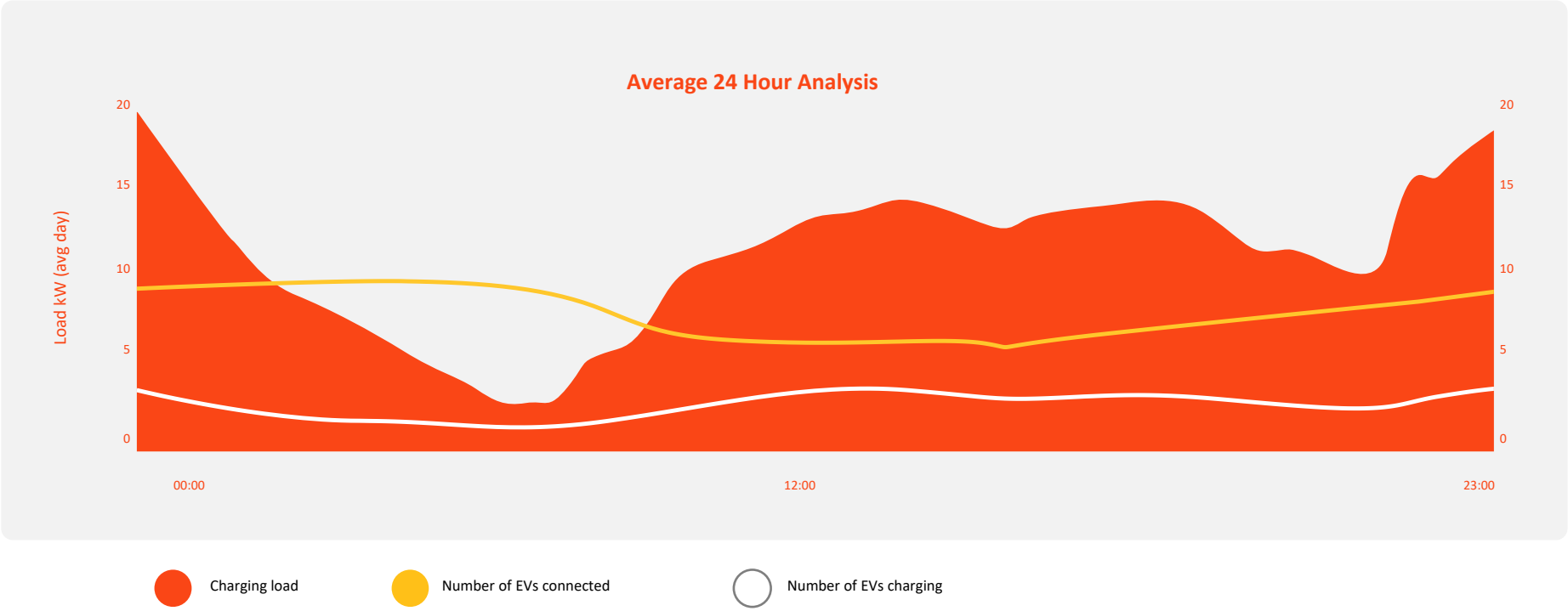
GreenFlux · News

Smart charging technology helping improve EV appeal for Australian drivers

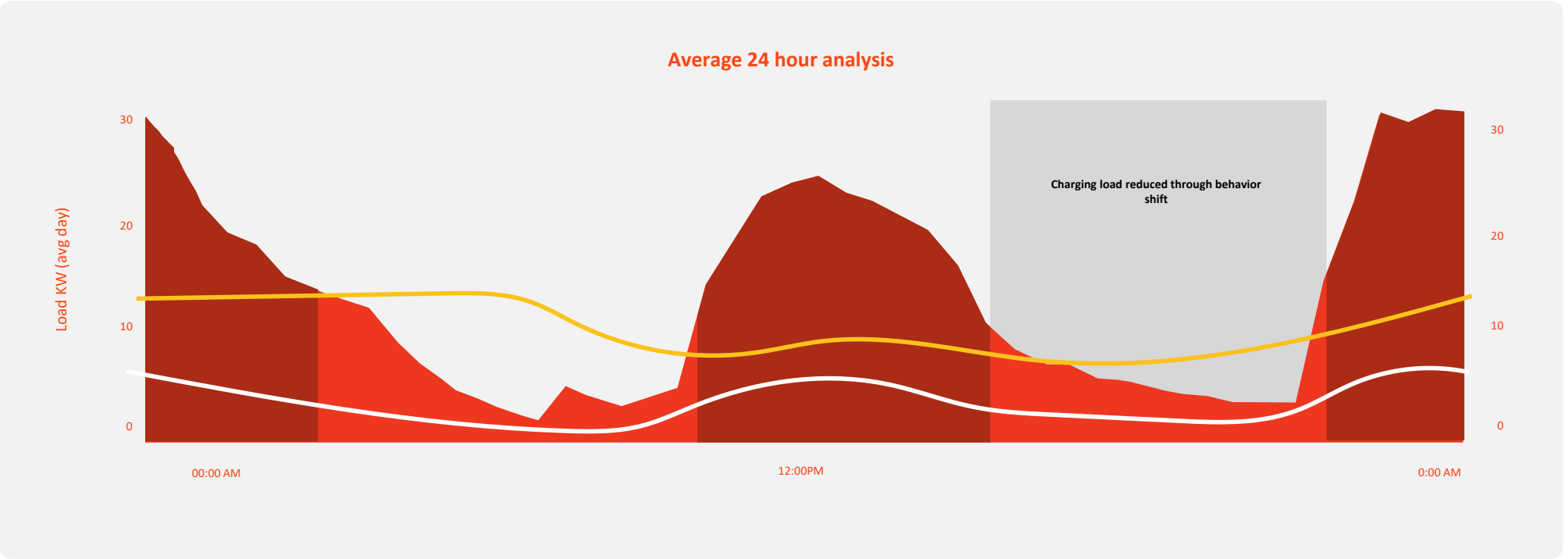
With EV adoption still relatively low in Australia (EVs represented 0.6 percent of sales in 2019 according to the Electric Vehicle Council), one of Australia's leading energy companies, Origin Energy, is launching an EV smart charging trial to gain insights to grow the EV market in Australia. The trial will provide 150 smart chargers to EV drivers and fleets, funded by a grant by the Australian Renewable Energy Agency (ARENA). The smart charging technology is provided by GreenFlux EV charging platform.

Ricky Fung, Product Development Manager eMobility at Origin

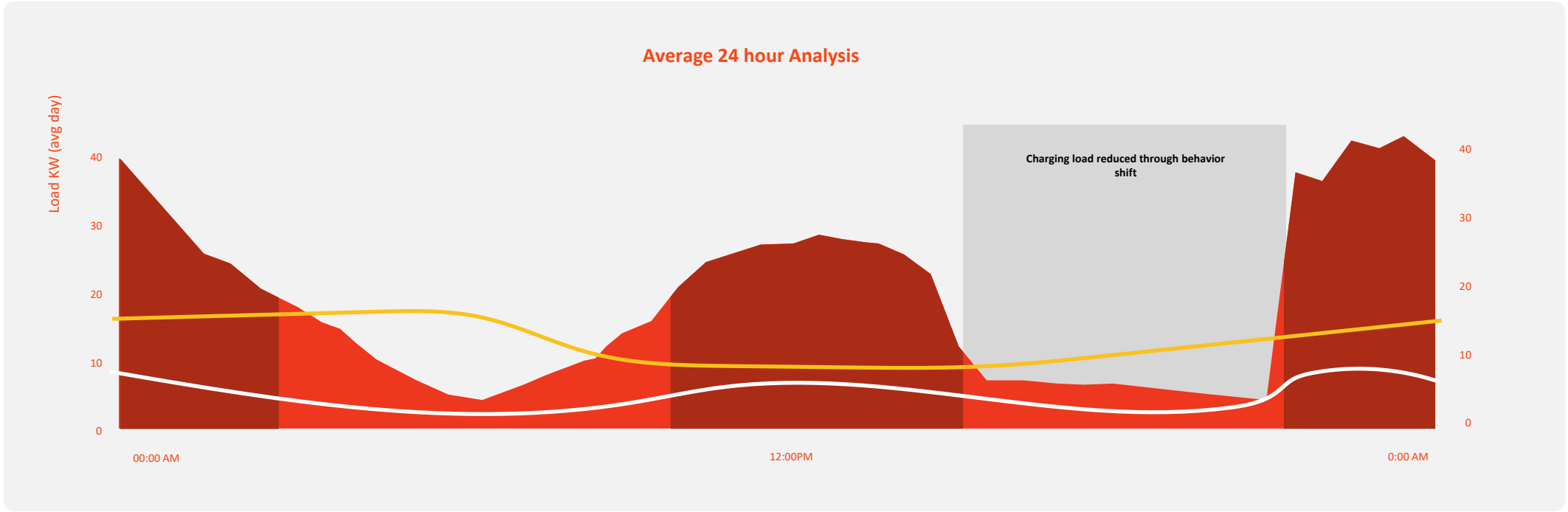
Baseline


Average 24 Hour Analysis
Load kW (avg day)
20
15
10
5
0
00:00
12:00
23:00
Charging load
Number of EVs connected
Number of EVs charging

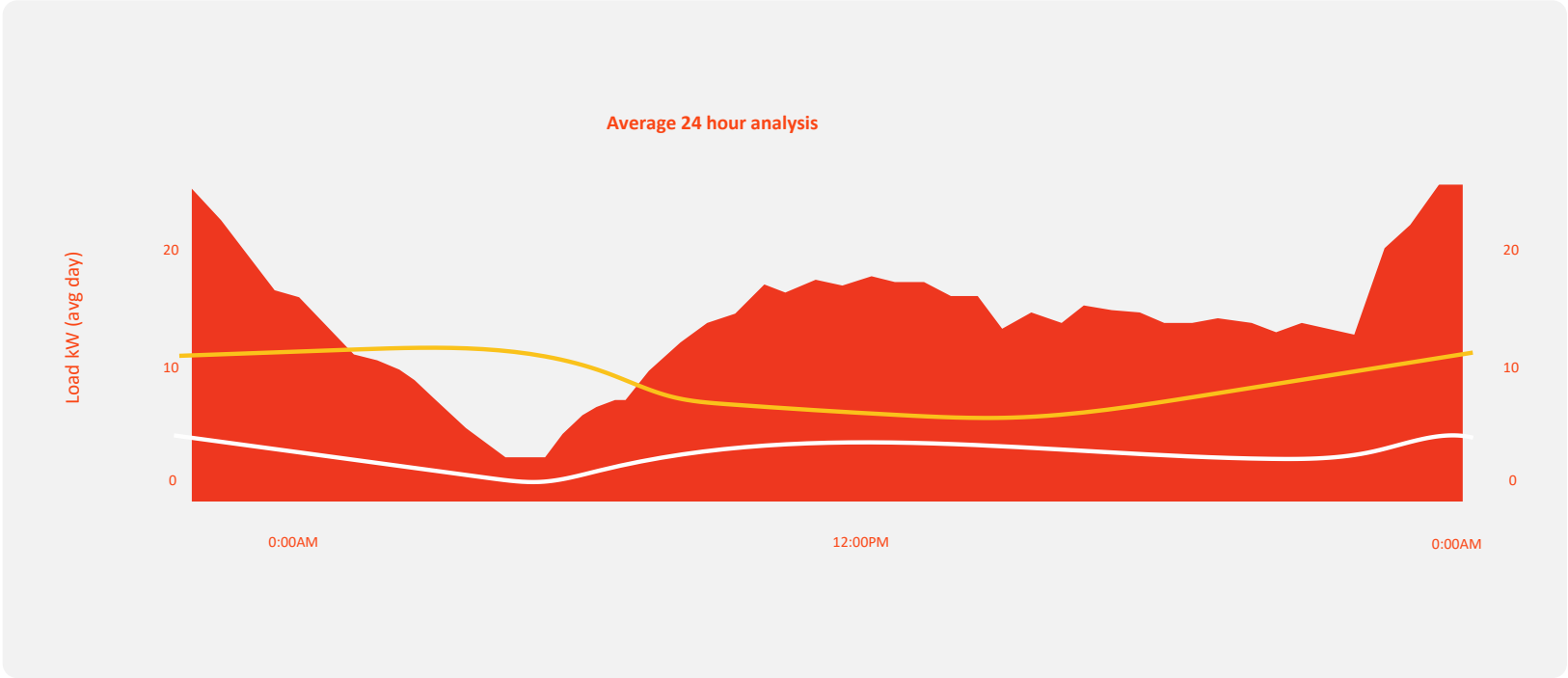
Experiment 1



Experiment 2

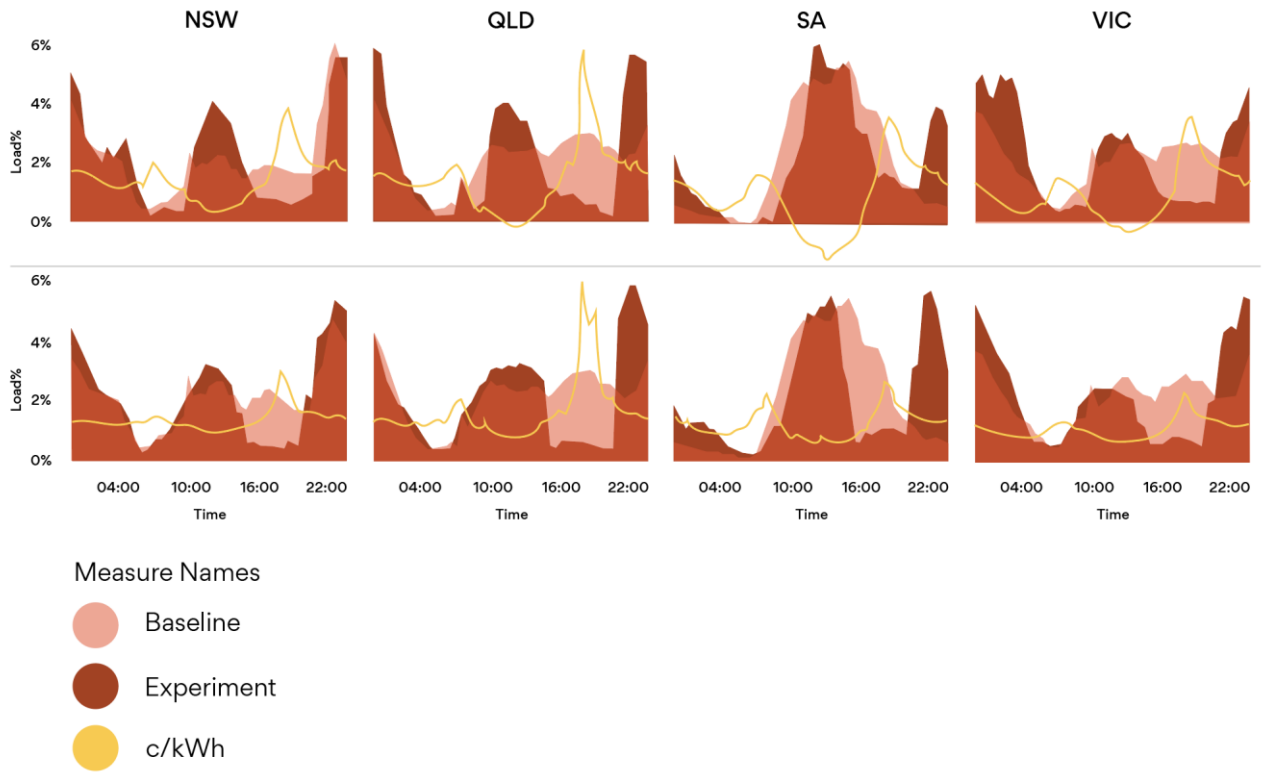


Post Experiments Baseline



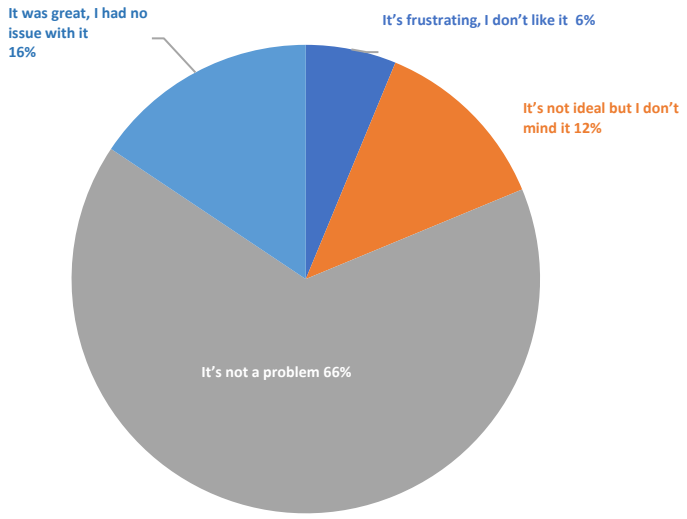
Assessing the value of Smart Charging

1. **Value to the wholesale energy markets; and**
2. **Value to the distribution networks.**

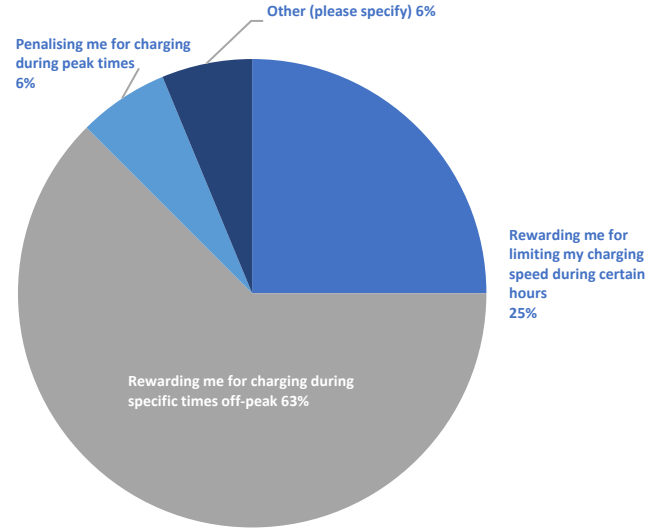


Customer sentiment & attitudes

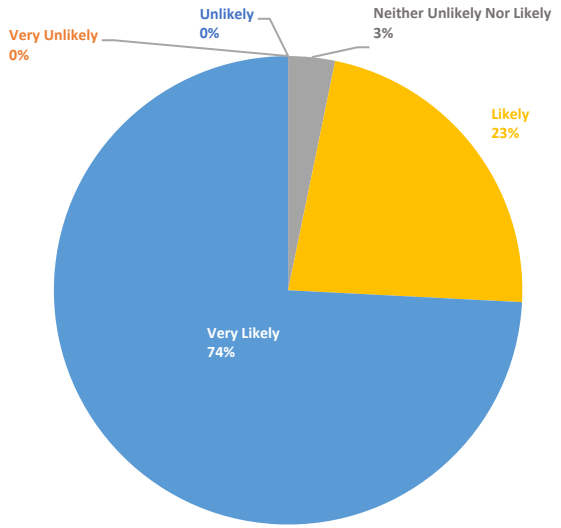
When your charging speed is being limited, how do you feel about it?



Which of these would most likely change the time when you charge?



If we continued to run Experiment 1 or 2 in an ongoing manner, how likely would you stay on it?



Fleet Baseline charging behaviour and Participation in smart charging

Baseline charging behaviour

- Pool vehicles with multiple stakeholders
- Driven during business hours and charged in the evenings
- Consideration of optimising charging spend

Participation in smart charging

- Businesses having confidence that smart charging wont impact operational requirements.
- When discussing the benefits of smart charging, one of the key challenges was identifying the best stakeholder in the business to approve proposed smart charging schedules.

The area where smart charging did have resonance

- Capacity constrained sites
- Excess solar generation
- Impacts to energy bills

Key learnings

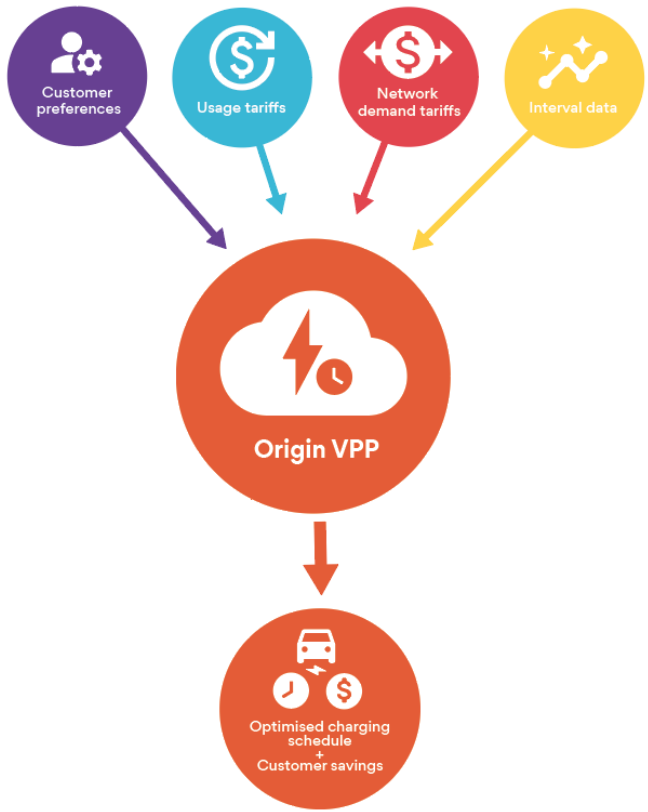
Performance of hardware and software

Technology	Pros	Cons
4G	• Connectivity not impacted by customer • Allows remote diagnostics of connectivity problems	• Relies on telco network coverage i.e., subject to blackspots • Most expensive
Wi-Fi	• Cheapest and easiest option	• Relies on customer's Wi-Fi coverage and security to the garage/carport/driveway • Connectivity breaks if network configuration changes or if customer gets a new router or if customer moves • Cannot remotely fix or diagnose connectivity problems
Ethernet	• Most stable connection once wiring has been implemented	• Relies on customer's home security • Can be expensive due to threading cables from the router to the EV charger • Cannot remotely fix or diagnose connectivity problems • Connectivity breaks if network configuration changes or if customer gets a new router or if customer moves

Incentivising the right people at the right time

1. **Convince the customer to choose a smart EV charger over a basic EV charger**
2. **Convince the customer to enrol into a smart charging incentive program**
3. **Participate in specific curtailment events**

Getting the right data



The importance of a standardised ecosystem for EV charging

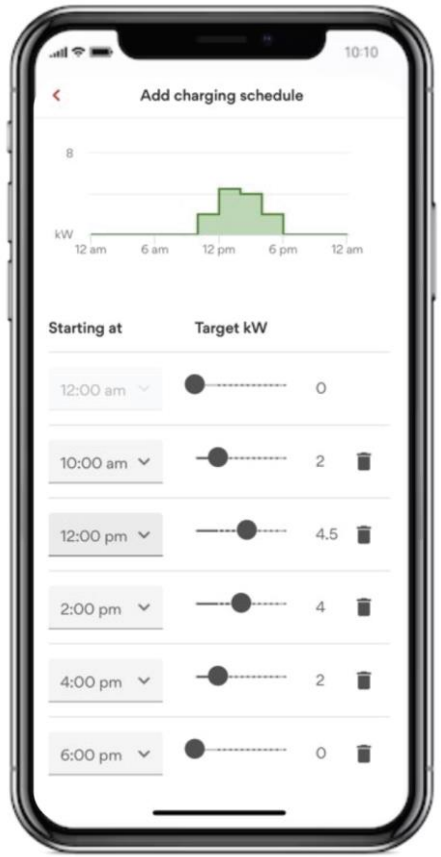
1. **Agreement on approach**
2. **Complexity increases when multiples parties with multiple communication methods**
3. **Differing smart charging requirements**

Learnings from a parallel industry - IoT & Matter

Customers installing IoT devices such as smart lights, doorbells, sensors etc bare the brunt of a fragmented eco systems. Many of these manufacturers have created an alliance to build an open interoperability standard named Matter.

Applying a similar approach between utilities, networks, devices and the market operator may help simplify the eco system.

Origin’s EV Energy Plan and Smart Charging Program




origin

Rohan Smith
Jemena Networks

Enabling Electric Vehicle friendly networks and neighbourhoods

Jemena bringing energy to life
evoenergy
AusNet
TasNetworks Delivering your power
united energy
JET CHARGE
Australian Government Australian Renewable Energy Agency
ARENA

TRIAL IN NUMBERS

600 REGISTRATIONS	170 PARTICIPANTS	12 MONTHS	$3.4m INVESTED
5 DNSPs	3 STATES	10 EVENTS	12 SURVEYS

Jemena bringing energy to life · evoenergy · AusNet · TasNetworks Delivering your power · united energy · JET CHARGE · Australian Government Australian Renewable Energy Agency · ARENA

KEY LEARNINGS

60% of participants plugged in to charge their EV during the 10 events, with no significant difference between incentives offered

74% of participants preferred managed charging over convenience charging, mostly because they want to help increase EV adoption in Australia

97% of participants said they would be willing to participate in future EV trials

52% of participants already had a charging schedule set up in their car to charge overnight, and more than 50% were on Time-of-Use (ToU) or variable rate tariffs

83% of participants had rooftop solar PV installed at their home at the end of the EV Grid trial
(compared to 72% when they joined the trial in 2021)

20% of participants had a home battery installed at their home at the end of the EV Grid trial
(compared to 17% when they joined the trial in 2021)

CHALLENGES

EARLY ADOPTERS

Participants were mostly early adopters

Very energy aware and higher income earners

Not a true representation of future mass market

CONNECTIVITY

Home Wi-Fi was used for internet connectivity

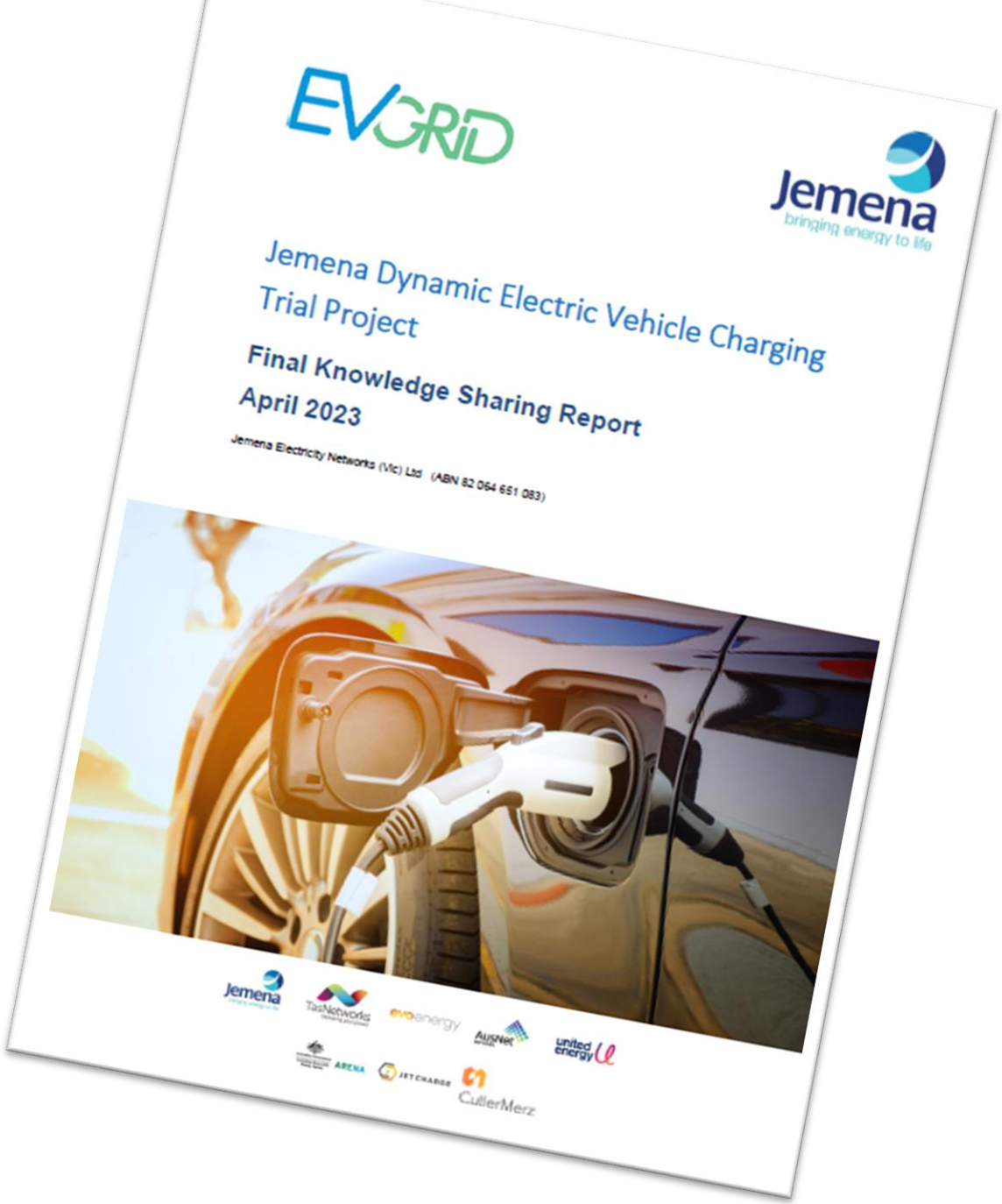
Some chargers experienced drop outs

20% turned off their EV charger when not in use

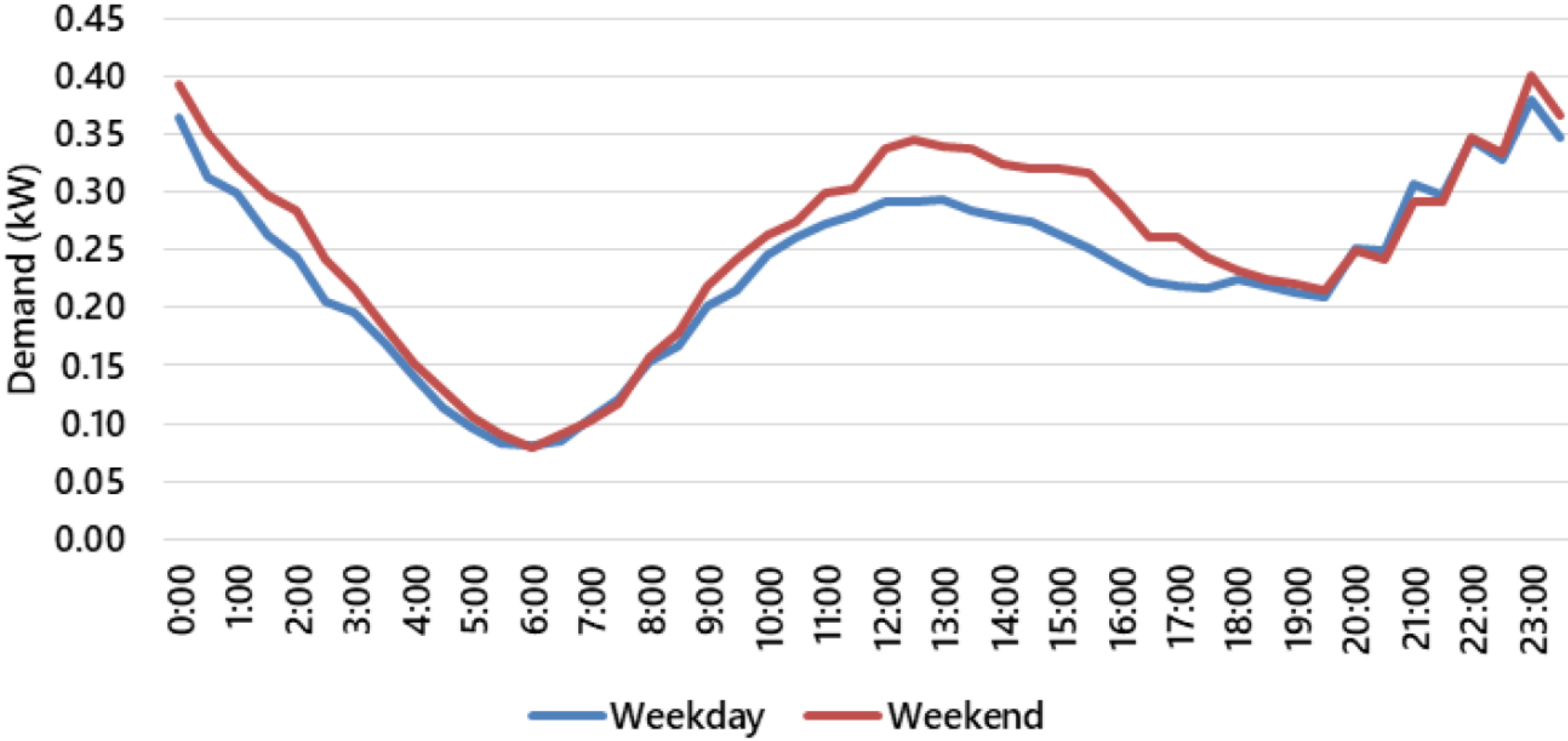
OUR FINAL REPORT

https://arena.gov.au/knowledge-bank/jemena-ev-grid-trial-knowledge-sharing-final-report/

Questions?

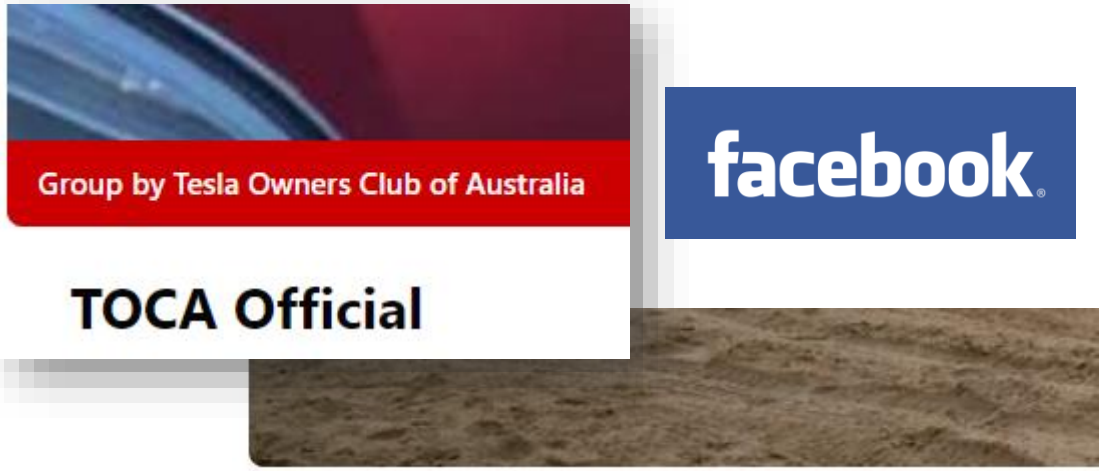


CHARGING INSIGHTS (excluding our 10 events)

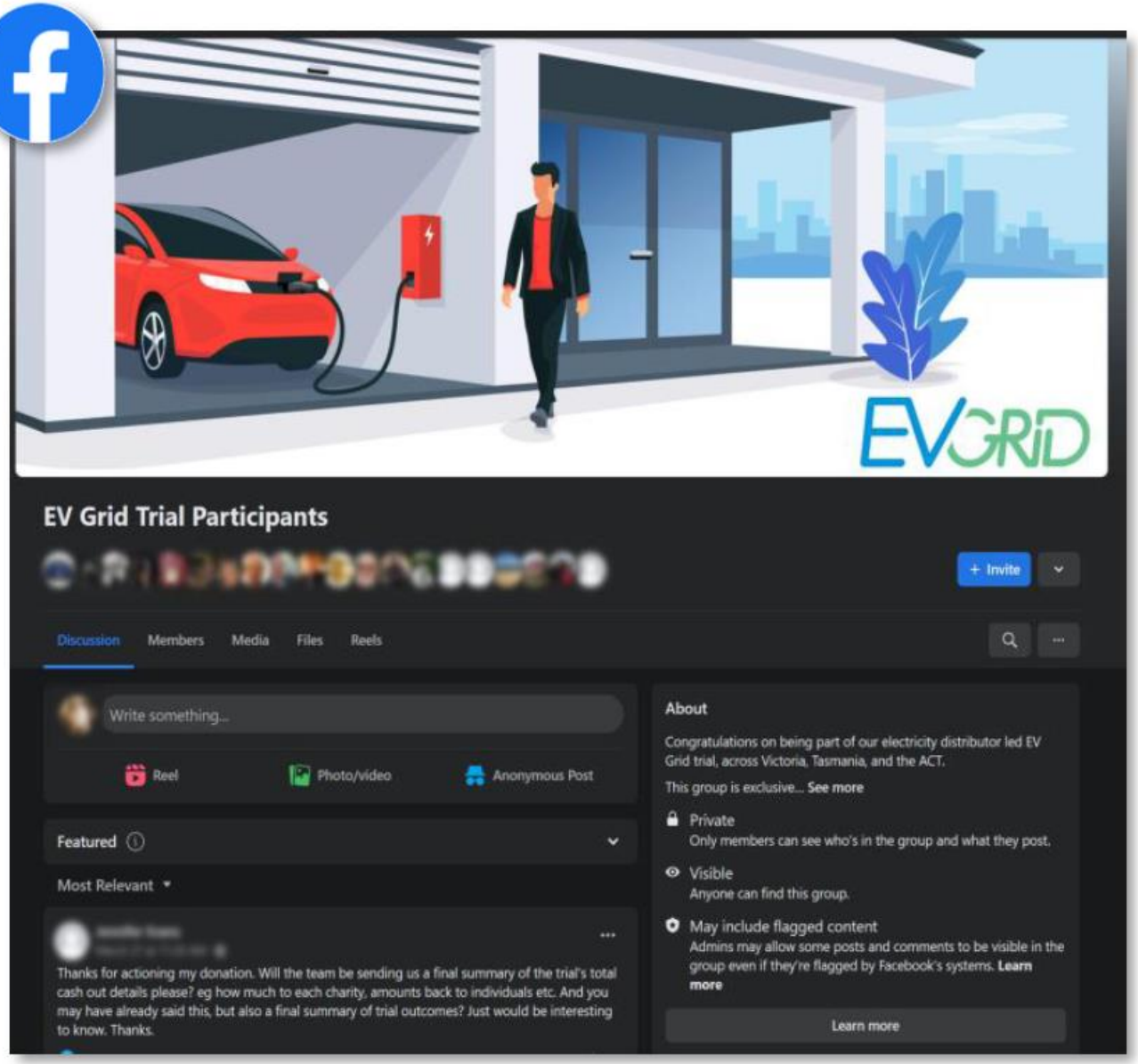


PARTICIPANT RECRUITMENT & ENGAGEMENT

60% joined our Private FB Group
(102 / 170)



facebook



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evoenergy

AusNet

TasNetworks Delivering your power

united energy

JET CHARGE

Australian Government Australian Renewable Energy Agency ARENA

Residential EV Charging

Around 80% of EV charging occurs at home

Convenience charging
- Charge any day or time
- Common for households on a single-rate tariff

Scheduled charging
- Charging periods are pre-set by the EV owner
- Common for households on a ToU tariff

Managed charging
- Charging sessions controlled by a third party
- Avoid Peak Demand periods and excess solar

Vehicle-to-Grid (V2G)
- Bi-directional DC charging
- Limited compatible vehicles

Jemena
bringing energy to life

EVGRID

Objective

Understand the impacts of EVs on the electricity system, and consumer willingness for third party control of their home charging (Managed Charging).

Scope

Recruit EV owners from VIC, TAS, and ACT to install 170 Smart EV chargers in homes that can be remotely managed by DNSPs using Dynamic Operating Envelopes (DOEs). Trial five Demand Response events and five Solar Soak events, with surveys after each.

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AusNet

TasNetworks Delivering your power

united energy

JET CHARGE

Australian Government Australian Renewable Energy Agency ARENA

Session 3

PUBLIC CHARGING

DEIP

DISTRIBUTED ENERGY INTEGRATION PROGRAM

Insights from Ultra-Fast Charging Network Data (Update)

26 July 2023

ENERGEIA

Disclaimer

This report was commissioned by the Australian Renewable Energy Agency (**ARENA**). The report presents the findings of Energeia, which was prepared to share *Insights from ARENA Ultra-Fast Charging Network Data.* The report is provided as is, without any guarantee, representation, condition or warranty of any kind, either express, implied or statutory. ARENA and Energeia do not assume any liability with respect to any reliance placed on this report by third parties. If a third party relies on the report in any way, that party assumes the entire risk as to the accuracy, currency or completeness of the information contained in the report.

To the best of ARENA and *Energeia*'s knowledge, no conflict of interest arose during the course of preparing this report. While Energeia has previously conducted reports, evaluations and other work for ARENA, Energeia has not received any grant funding from ARENA.

Table of Contents

Executive Summary

Electricity Costs

Charging Utilisation

Electricity System Impacts

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Executive Summary – Key Learnings

- **Charging Utilisation**
  - Typical site usage patterns have remained robust over time – majority of use is in the middle of the day
  - Total use of regional (highway) fast chargers has continued to increase vs. urban chargers, majority of drivers from urban areas
  - On a per site basis, urban fast chargers experience more charge time than regional chargers
  - Holiday months have significantly higher site utilisation than other times of the year
  - Both urban and regional public fast charger site utilisation has increased significantly in the last two years, ~5x more charge time in Dec 22 compared to Dec 20 – thought this would be muddied by COVID
- **Costs**
  - Energy costs decreases significantly with site utilisation, but limit in cost reduction is reached at around 60 MWh/pa
- **Electricity System Impacts**
  - Energy provided per session has increased significantly, per session time durations have remained more stable
  - Charging site demand is averaging 75% of their own peak demand during network peak demand times
  - Public EV charging patterns could provide a solution to min demand caused by solar PV

Background

ARENA’s EV Programs

ARENA’s EV Knowledge Sharing Workstream

Key Industry Questions

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ARENA's EV Projects Included in this Insight

Start Year	Project	Funding	State	Lead Organisation	Summary
2018	Chargefox Electric Vehicle Charging Network Project	$6m	NSW, QLD, SA, VIC, WA	ChargeFox	This project enables the construction of a network of 21 ultra-rapid charging stations to reduce barries for consumer uptake of EVs
2019	National Ultrafast EV Charging Infrastructure Network	$15m	National	Evie Networks	This project enables the development and construction of a network of 42 ultra-fast charging sites nationally to reduce barriers for EV uptake

- ARENA has funded a wide range of ultra-fast charging infrastructure projects to support the uptake of electric vehicles
  - All ARENA charge point locations are powered by renewable energy
- Data from the above projects have fed into this analysis

The Role of the Knowledge Sharing Agent

- The ARENA Act specifies Knowledge Sharing as a function of ARENA and requires ARENA to:
  - Store and share information and knowledge about renewable energy technologies;
  - Collect, analyse, interpret and disseminate information and knowledge relating to renewable energy technologies and projects; and
  - Promote the sharing of information and knowledge about renewable energy technologies.
- Energeia, as ARENA's knowledge sharing agent for its EV portfolio, provides services including:
  - Reviewing current data arrangements from existing portfolios to maximise their value
  - Ensuring that the data requirements in future EV funding agreements can provide valuable insights for the EV portfolio
  - Coordinating data collection and storage for the whole EV portfolio
  - *Analysing data collected through individual projects to provide aggregated insights on charging performance, customer behaviour and value*
  - *Producing aggregated insights and key themes emerging from the data in a form that is digestible and relevant to the industry.*

Table of Charger Locations and Configurations

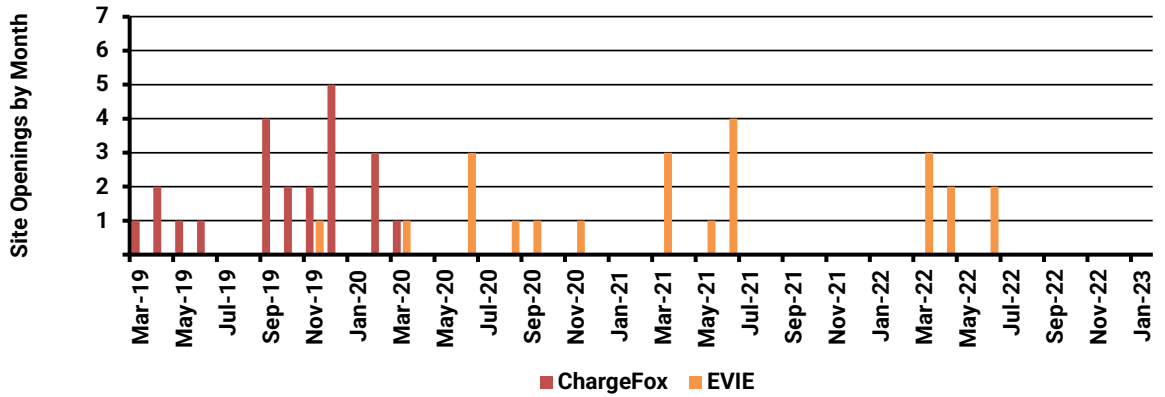
Summary Table of Charging Sites

Provider	Location	State	Power per Site kW	No of 350kW Chargepoints	No of 50kW Chargepoints	No of CC2 Hoses	No of CHAdeMO Hoses
ChargeFox	Ballina	NSW	750	2	1	3	1
ChargeFox	Coffs Harbour	NSW	700	2	0	2	2
ChargeFox	Port Macquarie	NSW	700	2	0	2	2
ChargeFox	Karuah	NSW	750	2	1	3	1
ChargeFox	Sydney	NSW	700	2	0	3	1
ChargeFox	Shell Cove	NSW	750	2	1	2	2
ChargeFox	Goulburn	NSW	750	2	1	3	3
ChargeFox	Gundagai	NSW	750	2	1	3	1
ChargeFox	Cooma	NSW	700	2	0	3	1
ChargeFox	Barnawartha North	VIC	800	2	2	4	4
ChargeFox	Euroa	VIC	800	2	2	4	4
ChargeFox	Latrobe Valley	VIC	800	2	2	4	2
ChargeFox	Torquay	VIC	800	2	2	4	4
ChargeFox	Ballarat	VIC	800	2	2	4	4
ChargeFox	Horsham	VIC	800	2	2	4	4
ChargeFox	Keith	SA	700	2	0	3	3
ChargeFox	Adelaide	SA	700	2	0	2	2
ChargeFox	Perth	WA	700	2	0	2	2
ChargeFox	Bunbury	WA	700	2	0	2	2
ChargeFox	Launceston	TAS	700	2	0	2	2
EVIE	Coochin Creek	QLD	700	2	0	2	2
EVIE	Coomera	QLD	700	2	0	2	2
EVIE	Bundamba	QLD	700	2	0	2	2
EVIE	Toowoomba	QLD	700	2	0	2	2
EVIE	Townsville	QLD	700	2	0	2	2
EVIE	Sutton Forest West	NSW	700	4	0	2	2
EVIE	Taracutta	NSW	700	2	0	2	2
EVIE	Cameron Park	NSW	700	2	0	2	2
EVIE	Taree	NSW	700	2	0	2	2
EVIE	Macksville	NSW	700	2	0	2	2
EVIE	Tyndale	NSW	700	2	0	2	2
EVIE	Jamisontown	NSW	700	2	0	2	2
EVIE	Seven Hills	NSW	700	2	0	2	2
EVIE	Northpoint	VIC	700	2	0	2	2
EVIE	Avenel	VIC	700	2	0	2	2
EVIE	Warrenheip	VIC	700	2	0	2	2
EVIE	Dandenong	VIC	700	2	0	2	2
EVIE	Taylors Lakes	VIC	700	2	0	2	2
EVIE	Tailem Bend	SA	700	2	0	2	2
EVIE	Paralowie	SA	700	2	0	2	2
EVIE	Brighton	TAS	700	2	0	2	2
EVIE	Campbell Town	TAS	700	2	0	2	2
EVIE	Westbury	TAS	700	2	0	2	2

Source: ChargeFox and Evie, Note EVIE Stations per site estimated from plugshare

- More Evie Ultrafast charging sites rolled out since last update
- EVIE has opened new sites since the conclusion of the first data update in February 21

Site Openings



Source: ChargeFox and Evie, Note: Opening date of Evie sites not available. First available bill date used as an approximation

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Key Industry Questions about Public DC Fast Charging

The analysis for this Knowledge Sharing Insight has been designed to address the key questions facing the industry **and how these insights have changed over time**

Investment and Operational Costs

- How do different tariffs impact on electricity costs?
- How does different utilisation levels impact electricity costs?

Charging Activity

- What is the daily profile of charging activity, and does it vary by day type, month, or location?
- How long do vehicles typically charge for?
- How fast is station utilisation growing over time?

Electricity Grid Impact

- How much will fast charging stations contribute to grid peak demand?
- What is the load factor of a fast-charging station?

Key Insights

Charging Session Timing

Utilisation Rates

Site Electricity Costs

Site Peak Demand Impacts

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Charging Session Times

Driver Residence

Site Location

Day Type

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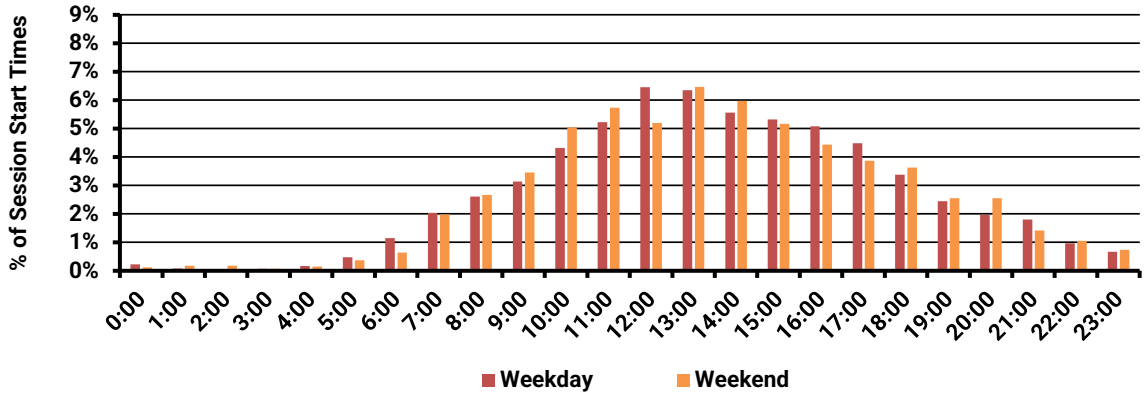
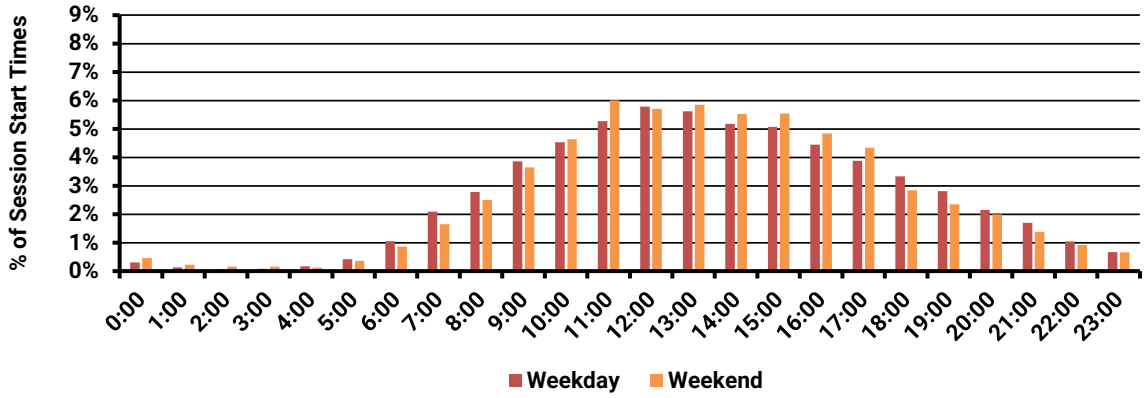
Session Start Time by Driver Residence and Day Type (1/2)

Start Time by Day Type for Urban Drivers – 2021



Source: ChargeFox, Energeia, Note: Where driver location data was available, Session Data from Oct 18 – Feb 21

Start Time by Day Type for Urban Drivers – 2023



Source: ChargeFox, Energeia, Note: Where driver location data was available, Session Data from Jan 22 – Mar 23

- The charts show normalised session start times by driver residence and day type (urban drivers only)
- The results show minimal difference in driver usage by weekday vs weekend for urban drivers
- 2023 analysis shows a slight modification of charging behaviour towards more charging in 1pm-3pm period

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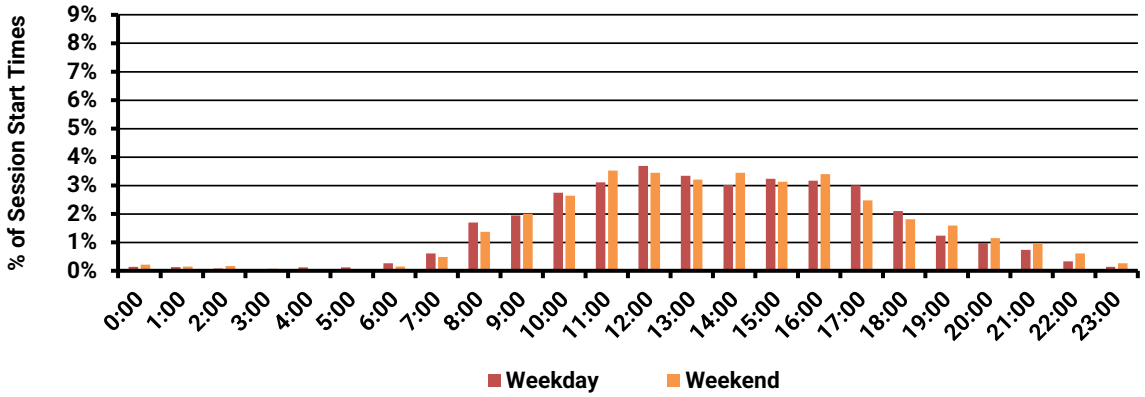
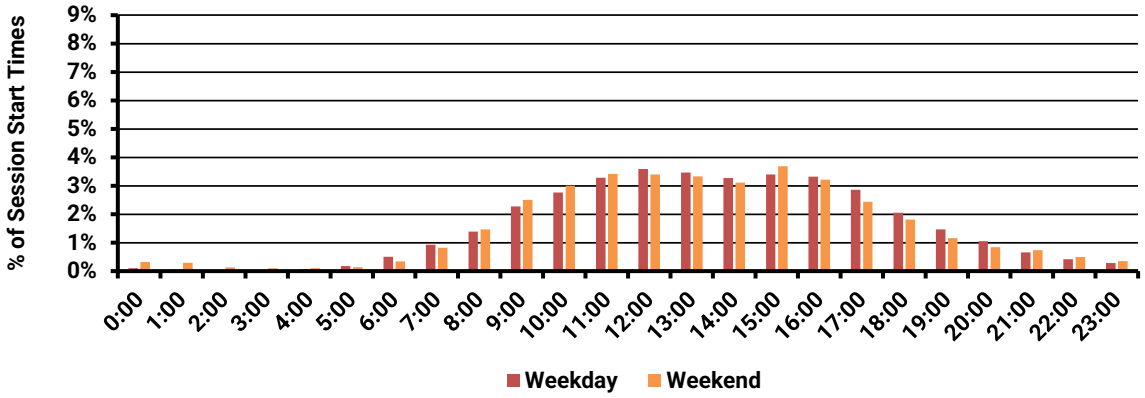
Session Start Time by Driver Residence and Day Type (2/2)

Start Time by Day Type for Regional Drivers – 2021



Source: ChargeFox, Energeia, Note: Where driver location data was available, Session Data from Oct 18 – Feb

Start Time by Day Type for Regional Drivers – 2023



Source: ChargeFox, Energeia, Note: Where driver location data was available, Session Data from Jan 22 – Mar 23

- The charts show normalised session start times by driver residence and day type (regional drivers only)
- The results reflect the lower usage rates of regional drivers
- No significant changes seen in the 2023 update

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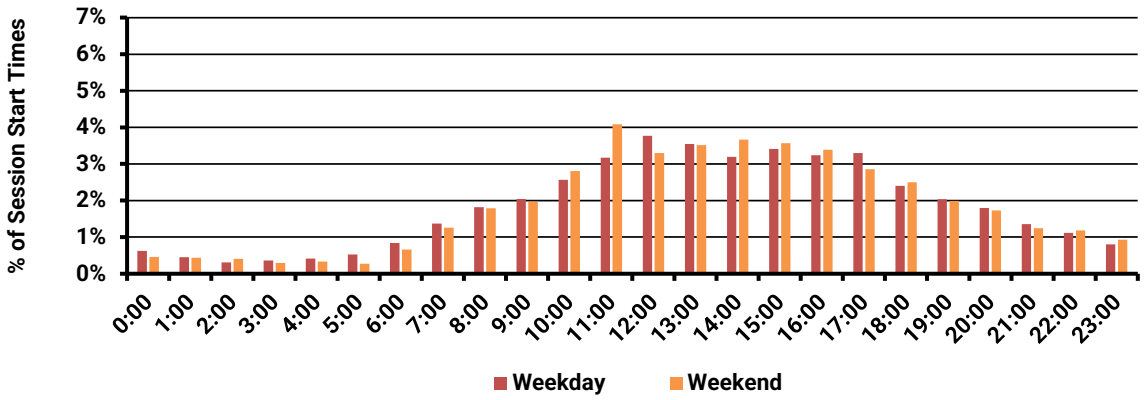
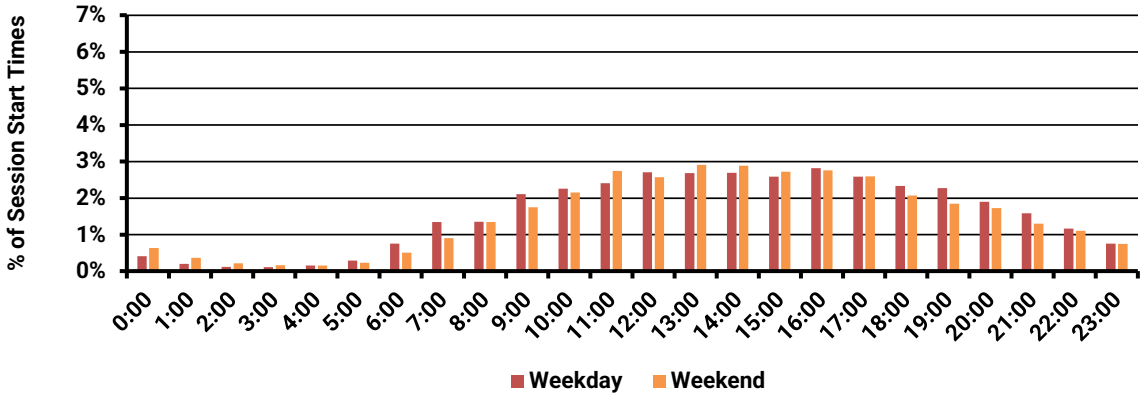
Session Start Time by Site Location and Day Type (1/2)

Start Time by Day Type for Urban Sites – 2021



Source: ChargeFox, Evie, Energeia, Note: Session Data from Oct 18 – Feb 21

Start Time by Day Type for Urban Sites – 2023



Source: ChargeFox, Evie, Energeia, Note: Session Data from Apr 22 – Mar 23

- The charts show normalised session start times by location of the site and day type (urban sites only)
- The results show the impact of commuter behaviours with higher utilisation for weekdays during 6-10pm
- The 2023 update shows relatively less charging during the 11am to 5pm period

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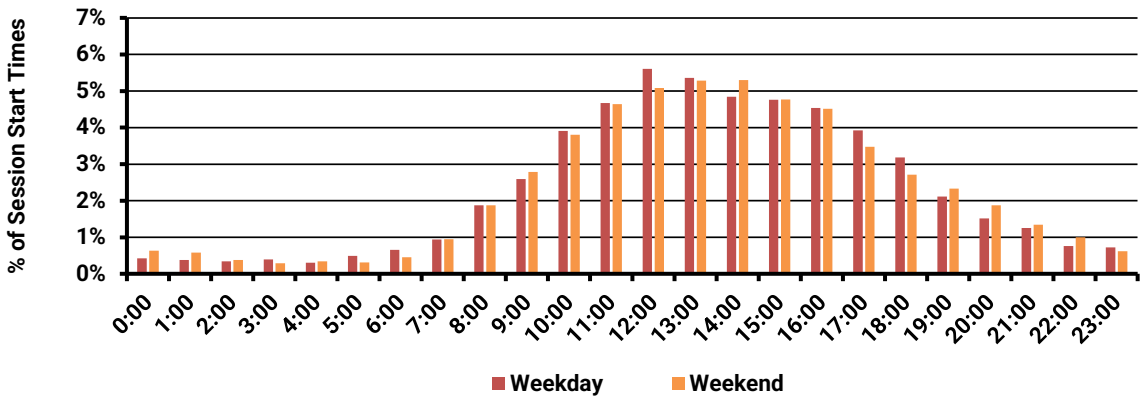
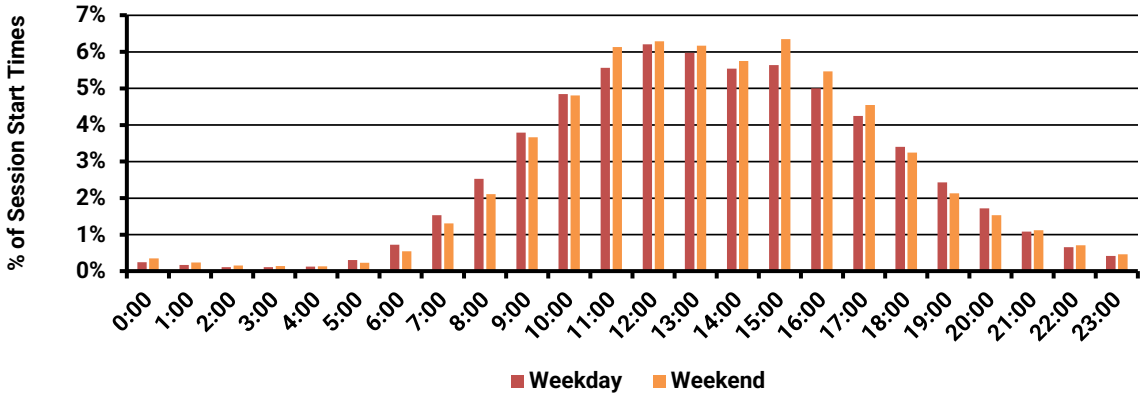
Session Start Time by Site Location and Day Type (2/2)

Start Time by Day Type for Regional Sites – 2021



Source: ChargeFox, Evie, Energeia, Note: Session Data from Oct 18 – Feb 21

Start Time by Day Type for Regional Sites – 2023



Source: ChargeFox, Evie, Energeia , Note: Session Data from Apr 22 – Mar 23

- The charts show normalised session start times by driver residence and day type (regional sites only)
- The results reflect the higher usage rates of regional drivers, noting that regional sites account from approx. 70% of installed sites
- Weekday commuter behaviours can be similar observed in regional sites
- The 2023 update shows relatively more charging in the 11am-4pm period, and less in the early morning

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Site Usage

Site Location

Day Type

Charge Time vs Energy Provided

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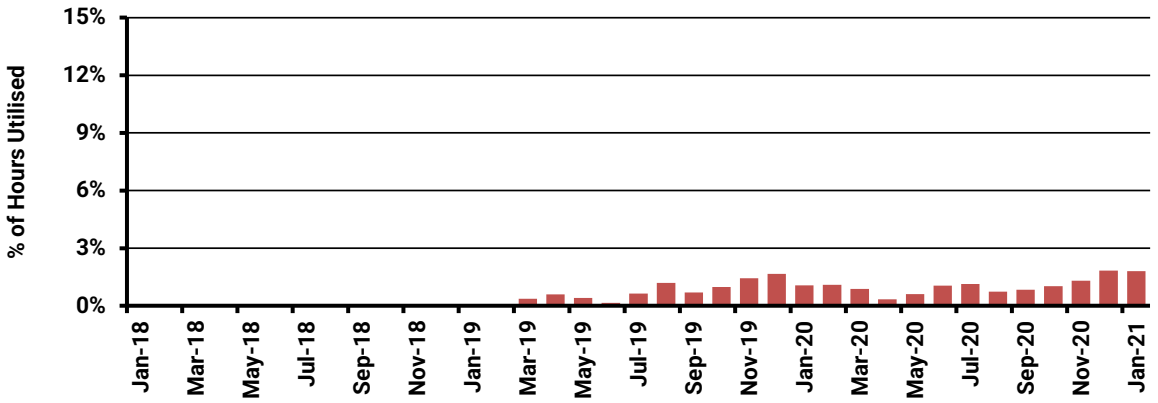
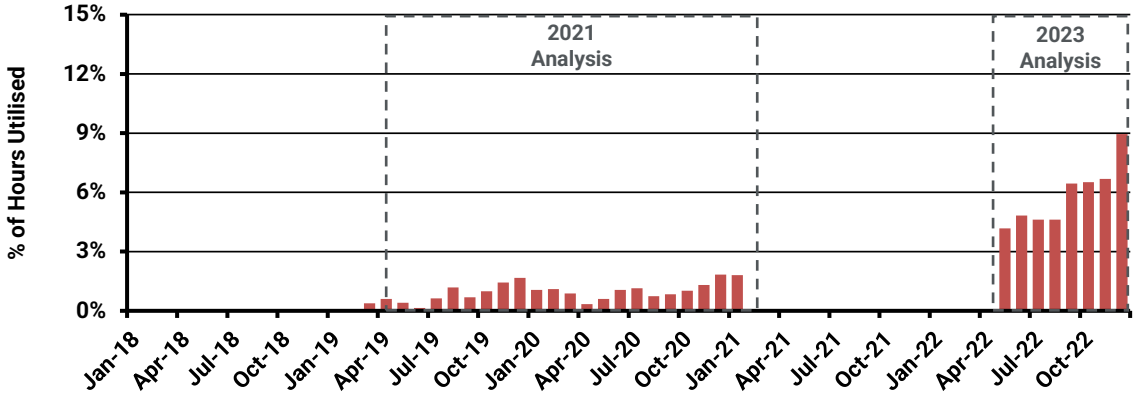
Site Usage Over Time – All

User Frequency Over Time – 2021



Source: ChargeFox and Evie

User Frequency Over Time – 2023



Source: ChargeFox and Evie

- The figures indicate the change in utilisation over time
  - Utilisation is calculated as the percent of available hours where a site is in use
- 2021 analysis showed significant seasonal variation, with a gradual rise in utilisation year on year, impacted significantly by the onset of COVID-19
- 2023 data shows recovery as well as a jump in year-on-year growth
  - Utilisation is ~5x higher in Dec 22 compared to Dec 20
  - Most of this change a reflection of significant EV uptake in that time

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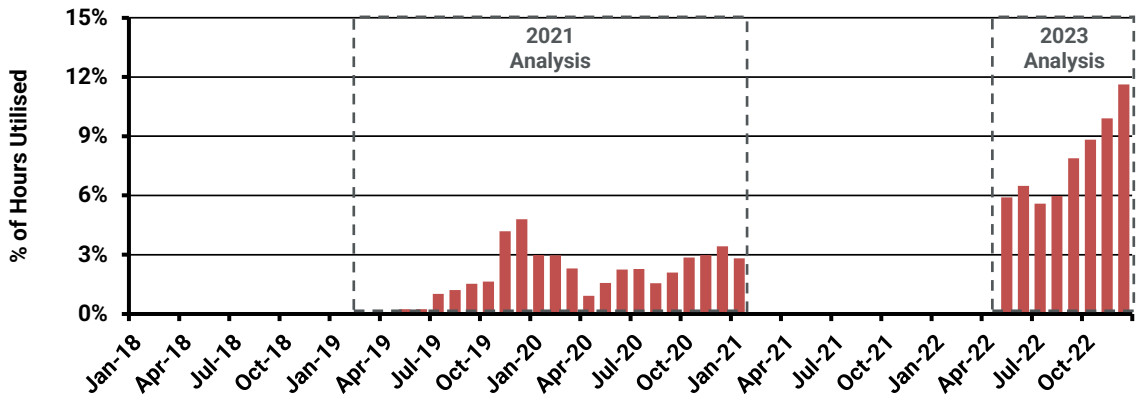
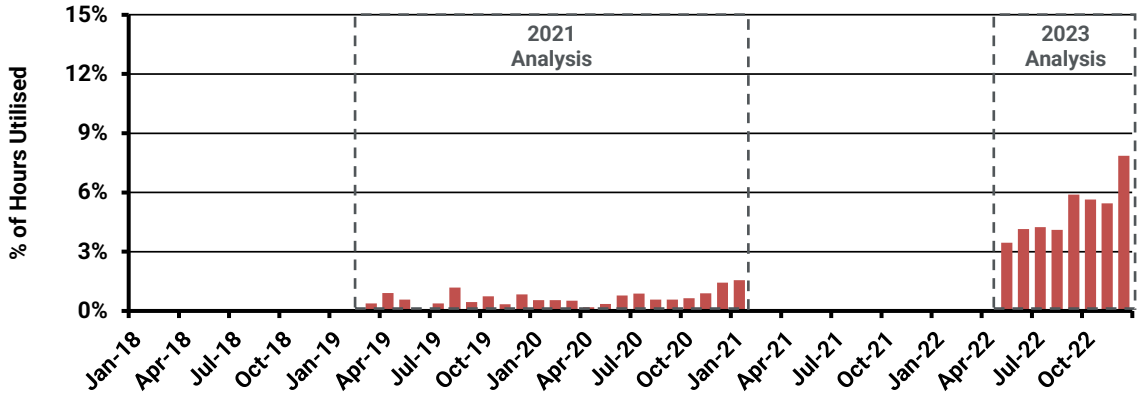
Per Site Usage Over Time – by Site Location

User Frequency Over Time – Urban



Source: ChargeFox and Evie

User Frequency Over Time – Regional



Source: ChargeFox and Evie

- Actual utilisation rates are shown on a per chargepoint basis by location
  - The results indicate that urban sites have a higher usage rate than regional sites
- Urban sites appear to benefit from:
  - Convenient locations
  - High road traffic, including local traffic
- Actual data provides a different perspective on urban vs. rural charging as time-based utilisation
  - Earlier analysis showed drivers having a higher usage of regional sites, with the highest session counts

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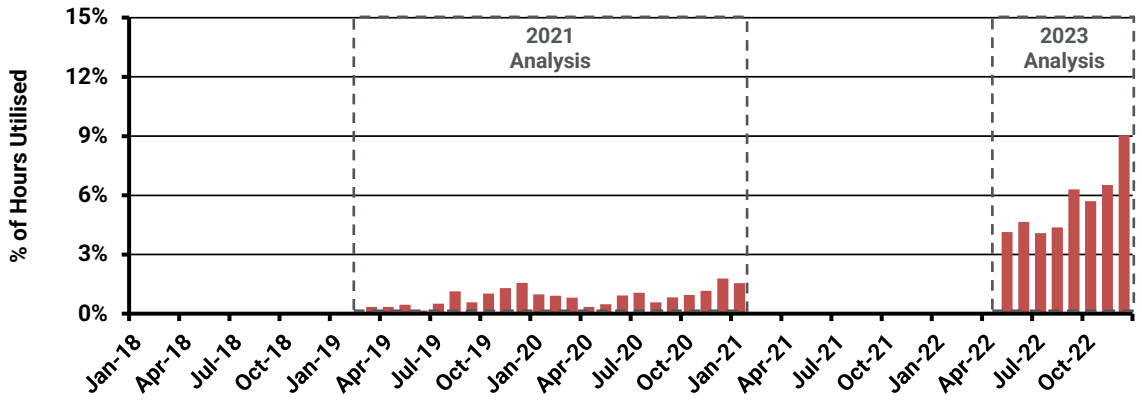
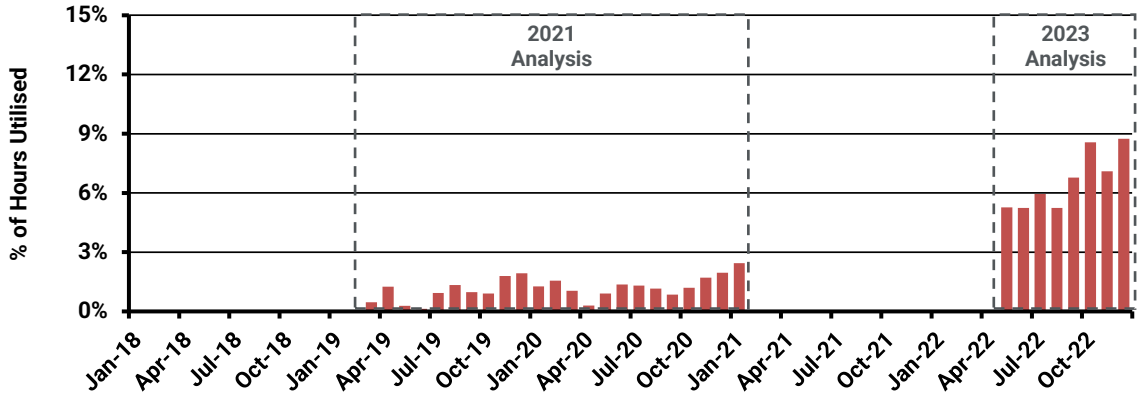
Per Site Usage Over Time – by Day Type

User Frequency Over Time – Weekday



Source: ChargeFox and Evie

User Frequency Over Time – Weekend



Source: ChargeFox and Evie

- Actual utilisation rates are shown on a per chargepoint basis by day type
- The results indicate that day type has a small impact on utilisation rate, with weekends marginally higher in non-holiday months
- Highway utilisation is dependent on commuter vs visitor behaviours
  - These splits vary by road, and connected urban and regional hubs

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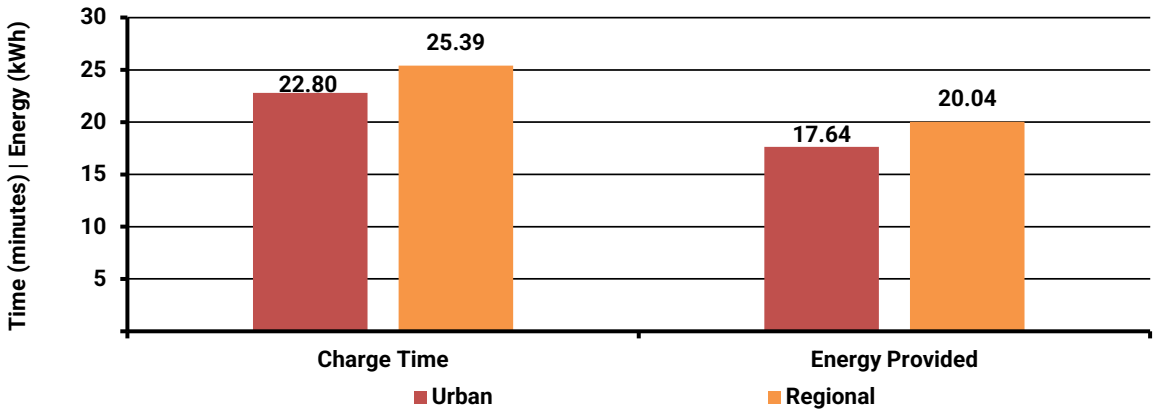
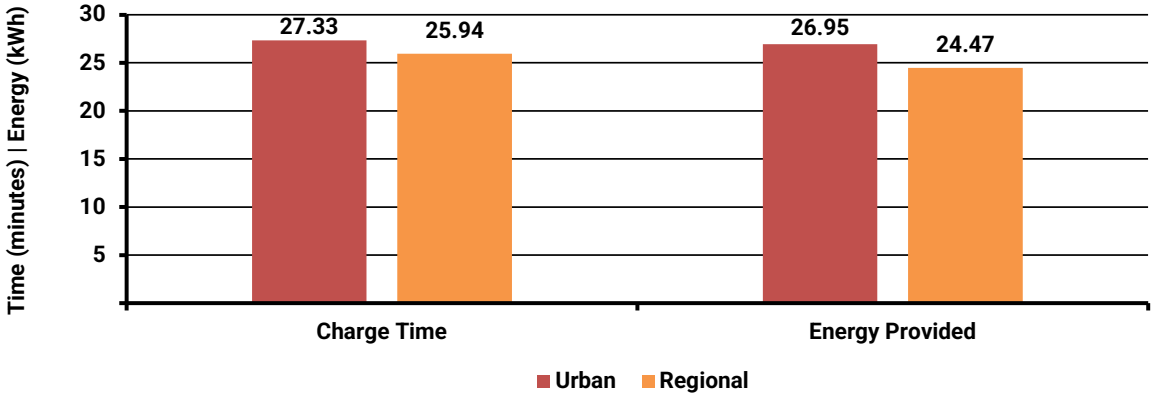
Session Duration Breakdown

Average Charge Time vs. Energy Provided – 2021



Source: ChargeFox, Evie, Note: Where driver location data was available, Session Data from Oct 18 – Feb 21

Average Charge Time vs. Energy Provided – 2023



Source: ChargeFox, Evie, Note: Contains session data from Apr 22 – Dec 22

- Updated data shows that there is less of a contrast between urban and regional charging sessions in terms of duration or energy provided
  - Regional was higher before due to greater average distances travelled
- Energy provided per session has increased significantly
  - Probably due to larger batteries

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Public Charging Electricity Costs

Site Tariff Type

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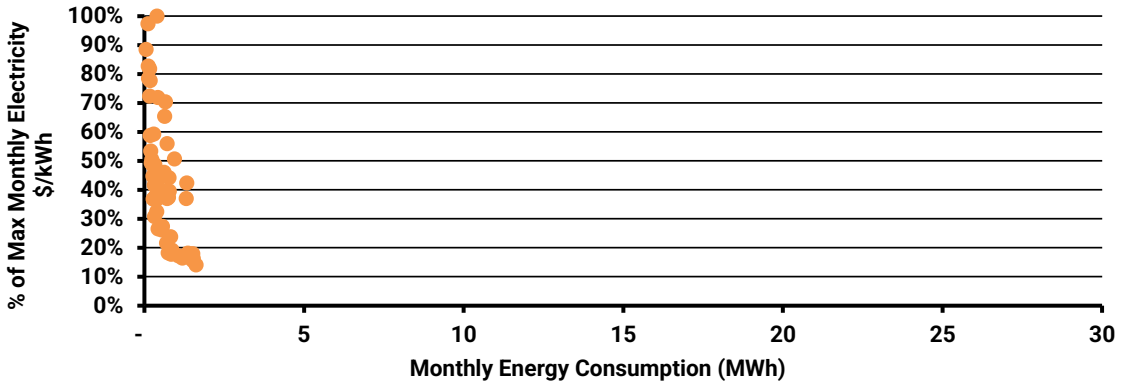
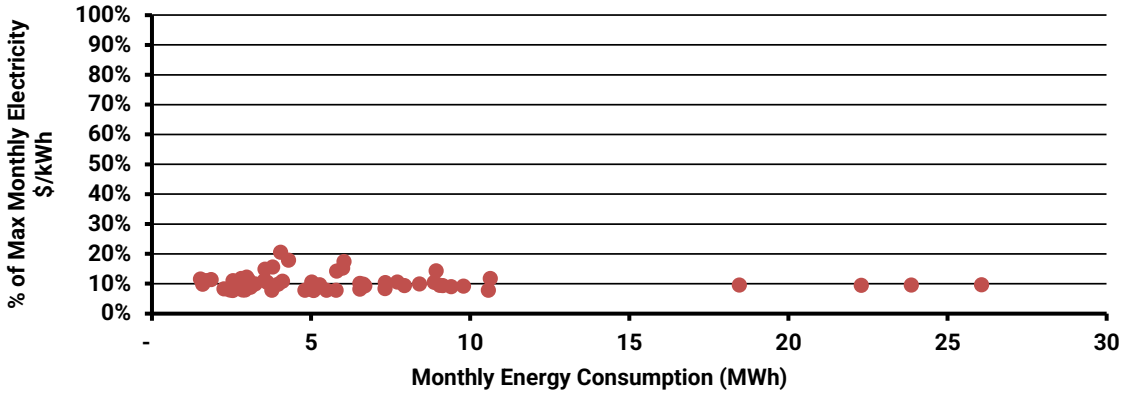
Site Energy Cost Breakdown

Monthly Site Electricity $/kWh by Energy Consumption (2021)



Source: Evie Networks, Note: Where bill and consumption values were available

Monthly Site Electricity $/kWh by Energy Consumption (2023)



Source: Evie Networks

- Charts show all monthly energy bills where the maximum monthly bill over both studies = 100%
- Analysis shows that cost per kWh falls on average with higher kWhs per site per month
  - Utilisation is the key for keeping net running costs low
  - Energy costs flattened on a per kWh basis against the initial analysis, as predicted

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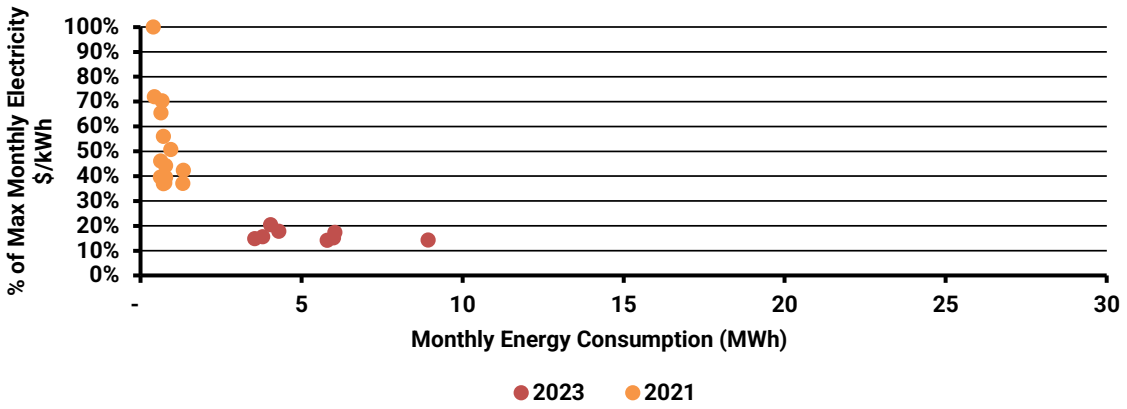
Site Energy Cost Breakdown – By Tariff

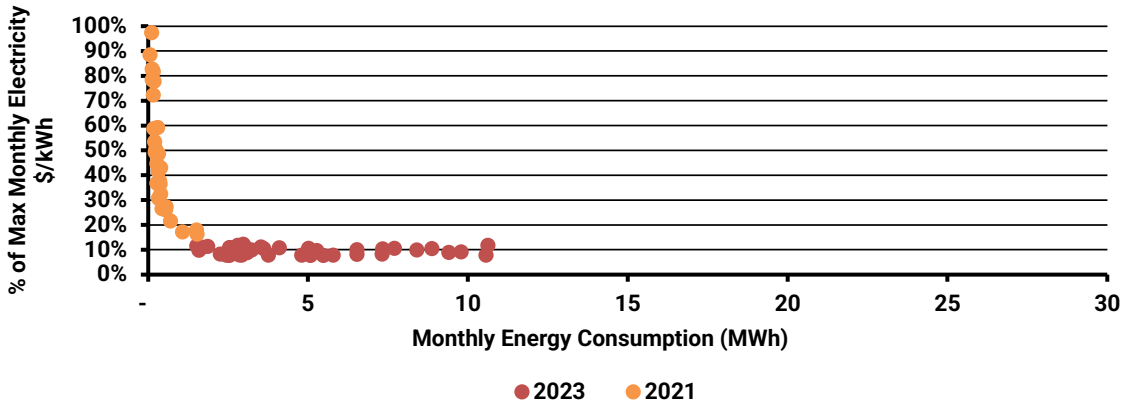
MD Tariff - Electricity $/kWh by Energy Consumption



Source: Evie Networks

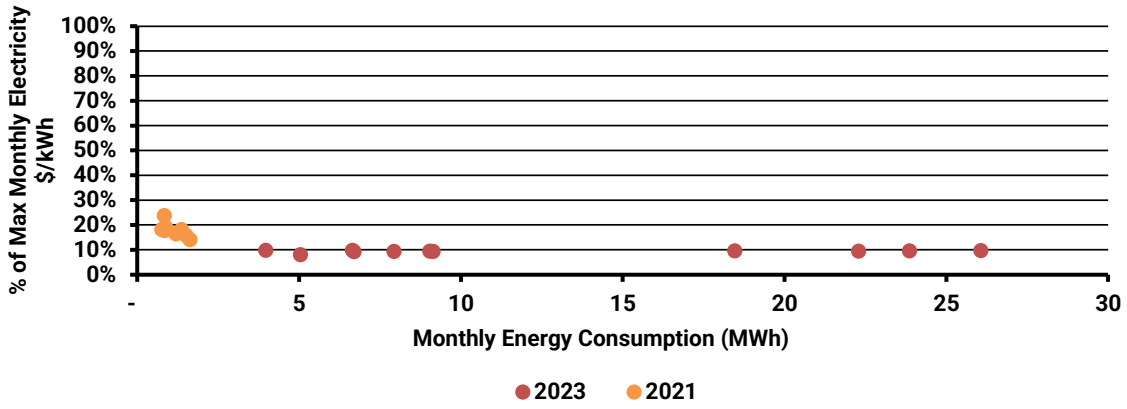
- Costs have generally fallen on a per kWh basis, indicating higher utilisation
- MD costs have also fallen as consumption rises, but is higher than other tariffs for equivalent consumption
- ToU bills are higher on a per kWh basis than the flat bills, however costs appear converge at higher kWhs
- Flat $/kWh lowest of all, potentially a result of differences in distribution network cost structures between those offering flat vs. ToU or MD rates

ToU Tariff - Electricity $/kWh by Energy Consumption



Source: Evie Networks

Flat/BT Tariff - $/kWh by Energy Consumption



Source: Evie Networks

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Site Peak Demand Impacts

Contribution to System Peak Demand

Load Factor

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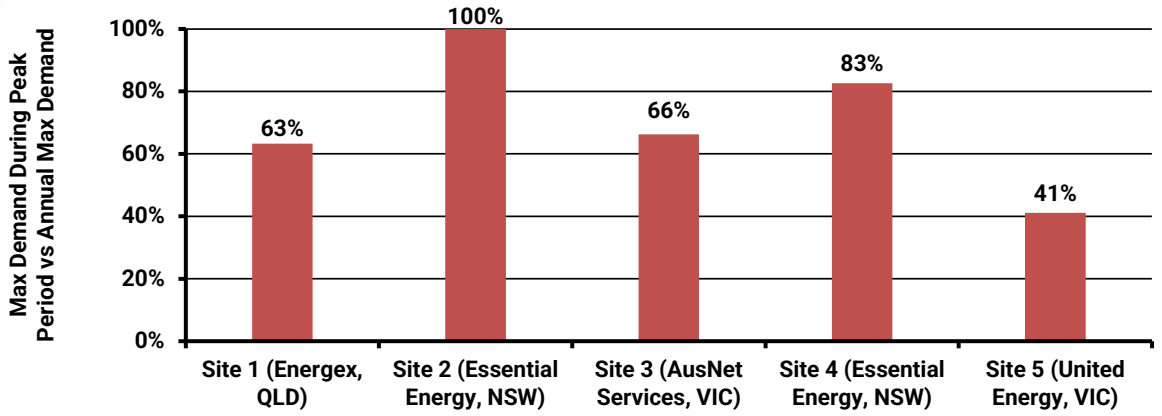
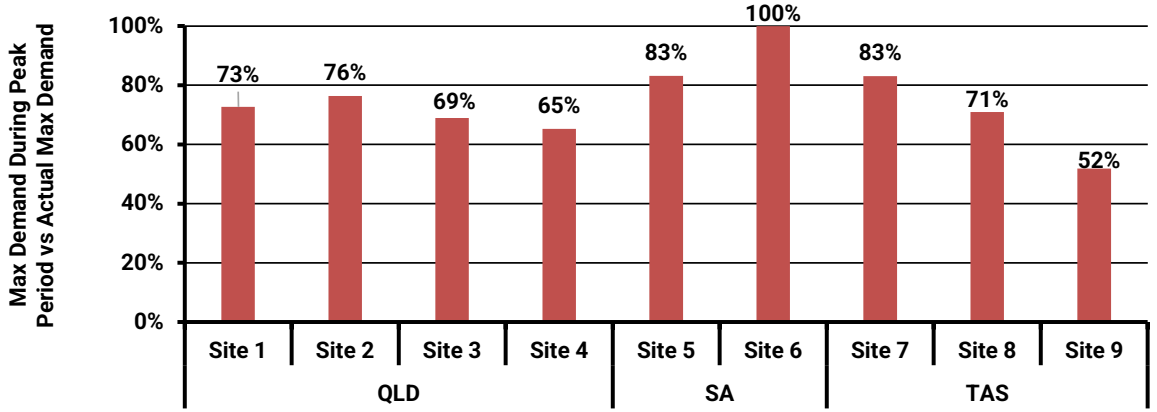
Electricity System Impacts

Contribution to System Peak Demand per kW by Station – 2021



Source: Evie Meter Data

Contribution to System Peak Demand per kW by Station – 2023



Source: Evie Meter Data

- Public charging has the potential to drive significant upstream network upgrades if not managed correctly
- 1 out of the 5 old stations observed peaked during the peak network time, assumed to be 3-9pm on summer weeknights as a simplification
  - 1 out of the 9 new stations observed this in the 2023 analysis
- The 9 new sites have an average peak demand correlation of 75%

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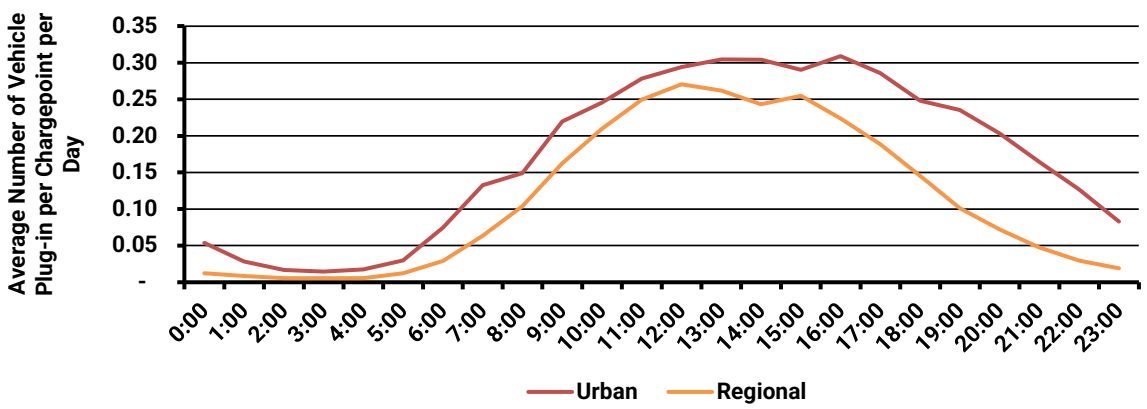
Electricity System Impacts

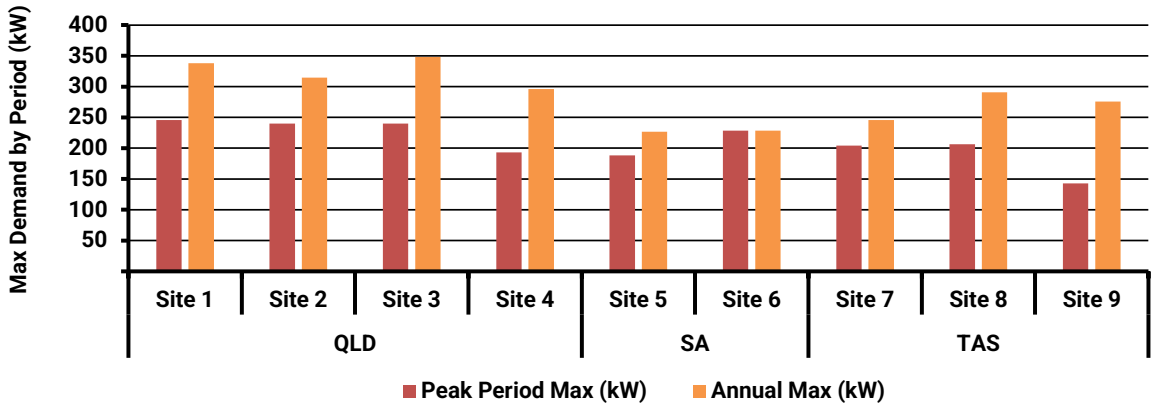
Typical Plug in Volume by Hour and Location - 2023



Source: ChargeFox and Evie

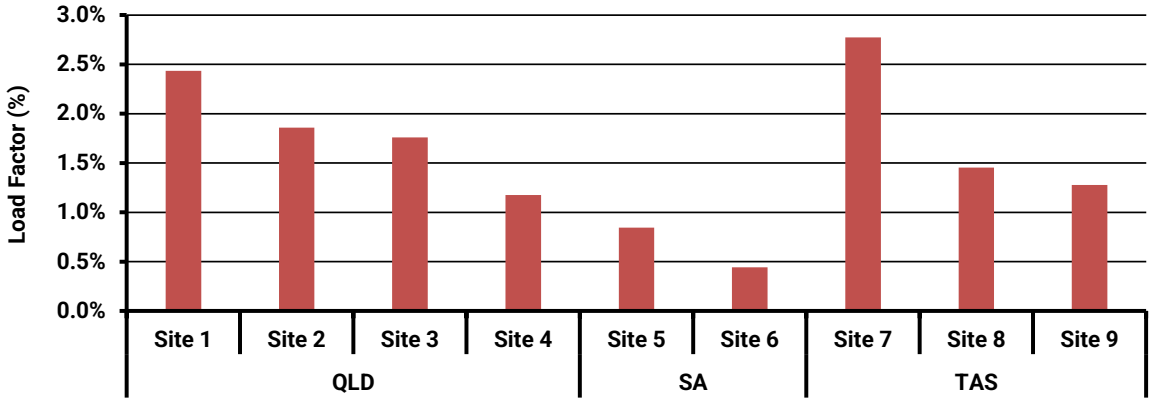
- Urban sites have higher utilisation, occurring later into the evening
  - This utilisation results in greater contribution to peak demand
- Most sites provided showed that charging stations don't charge at rated capacity
  - Ability to charge at charger rated capacity is limited by the maximum rate of the vehicle
  - Kia EV6 and Hyundai Ioniq 5 are capable of charging at 350 kW

Contribution to System Peak Demand per kW by Station – 2023



Source: Evie Meter Data

Load Factor by Site – 2023



Source: Evie Meter Data

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Thank You!

Energeia Pty Ltd
132 E Street, Suite 380
Davis, CA 95616

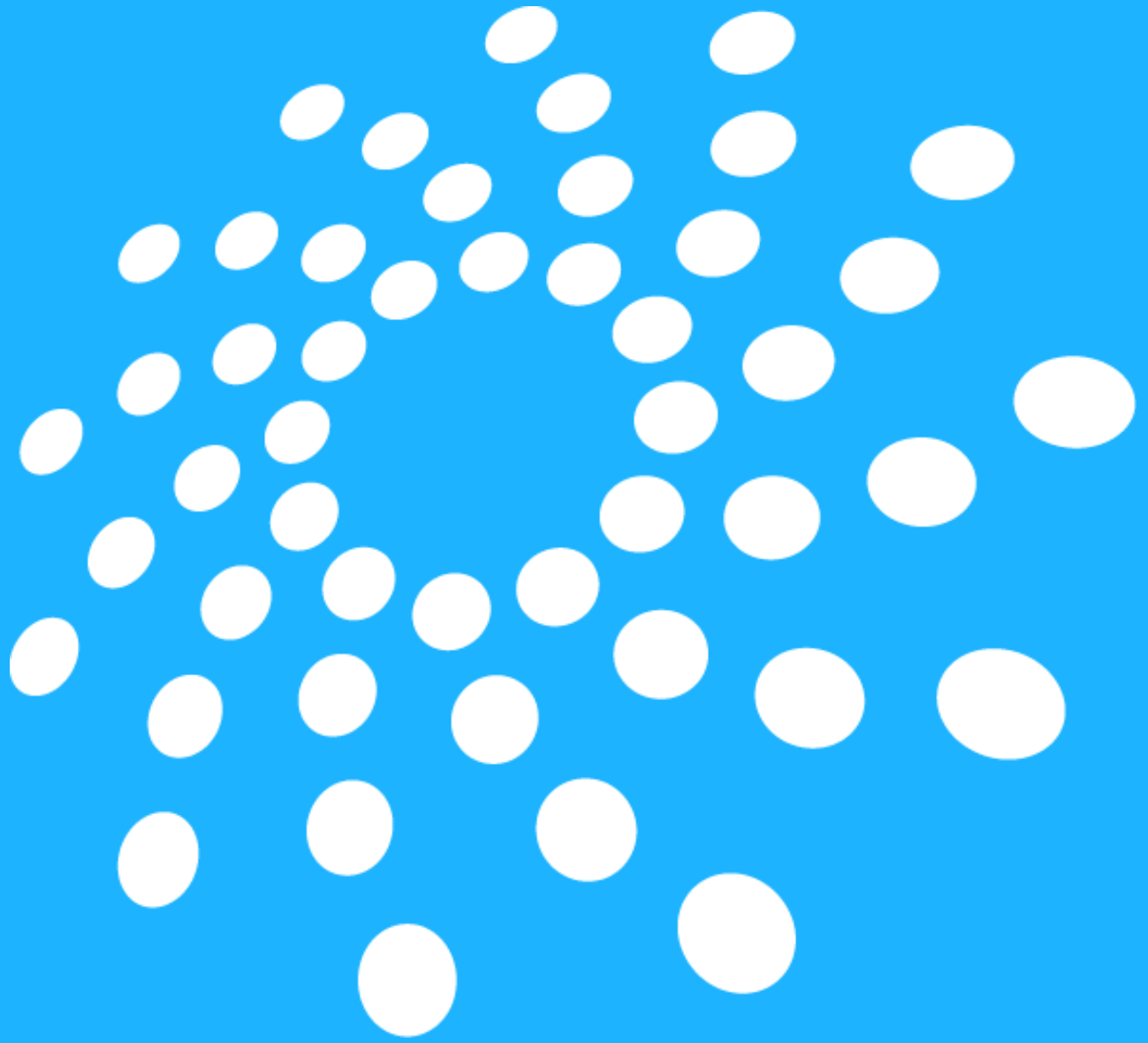
P +1 (530) 302-3861
energeia@energeia-usa.com

energeia-usa.com

Energeia Pty Ltd
L1, 1 Sussex Street
Barangaroo NSW 2000

P +61 (0)2 8097 0070
energeia@energeia.com.au

energeia.au



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DEIP DIVE 2023

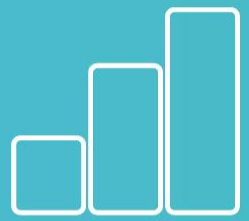
ENGIE Australia & New Zealand

Accelerating the transition to a carbon-neutral world

Renewable Projects

In Australia, ENGIE is developing the energy portfolio of the future, with more than 2,000 MW of wind, solar and industrial-scale battery storage capacity projects under development.

1996
ENGIE established in Australia



$2 Billion
annual revenue

1,000MW
of renewable and low-carbon energy capacity

360
team members

2,000MW
renewable energy under development

Simply energy® by ENGIE

730,000
customers

ENGIE ANZ GREEN MOBILITY ECO SYSTEM

Public Rapid charging

- 103 charging sites announced with ARENA funding, with more recently secured and under development.
- International experience with large DC charging networks
- Integration with loyalty & reward programs

Fleet charging

- Energy as a Service (EaaS + V2G) with Flinders University
- Charge as a Service (CaaS)
- Smart charging, V2G and home charging options
- Bundled charging offer including home, work and public charging.

Workplace and commuter charging

- 70 AC charging station trial in NSW
- Novel payment options for users
- Parking management options to stop ICEing
- International experience including deploying 1/3 of Netherlands AC charging network

Smart charging and V2G

- Smart charging / V2G trial underway with Flinders University fleet
- Integration with Virtual Power Stations (VPP)
- Revenue generated via FCAS or other grid services

Home charging via Simply Energy (ENGIE)

- Specific EV tariff's
- ARENA funded Virtual Power Station (VPP) project in SA
- V2H trials with Nissan and Sunverge

Electric heavy vehicle recharging

- Zero Emission Bus (electric) charging trial in Victoria
- Existing relationships with heavy vehicle OEM's
- International experience with heavy vehicle charging

Hydrogen heavy vehicle refuelling

- 2 Green hydrogen production projects in Australia
- Heavy vehicle hydrogen refuelling trials under development
- International experience in Bus, train and truck refuelling

System Integration

- Company fleet charging with integration to
  - DC Rapid network
  - Home charging billing (reimbursement).
- Load & demand management
- EV Charging, BTM Battery & Solar, Green PPA optimization.

Public Rapid Charging Network

Network overview

- ENGIE is building an extensive national EV rapid charging network
- The first stage of the roll out is 120+ sites (including 103 under Future Fuels Program) across mainly metropolitan areas within QLD, NSW, VIC & SA.
- This network will include over 250 DC charge points including 6 large charging hubs

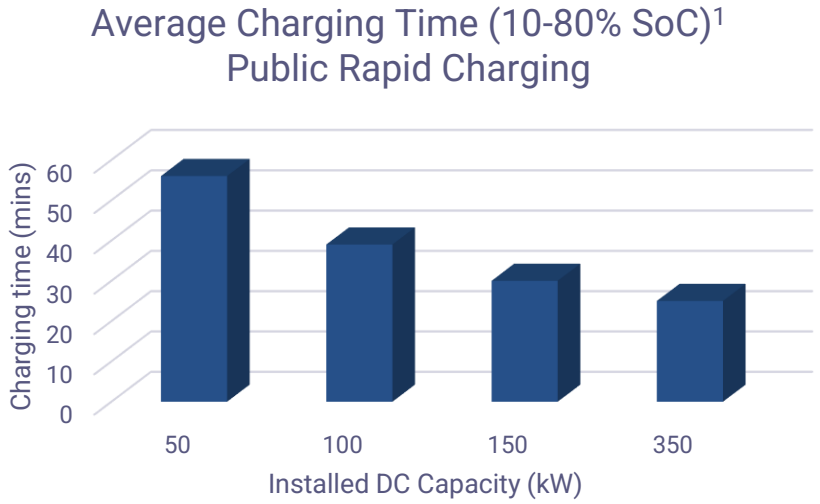
Key insights from our public charging roll-out so far...

1. Selecting the right charging hardware

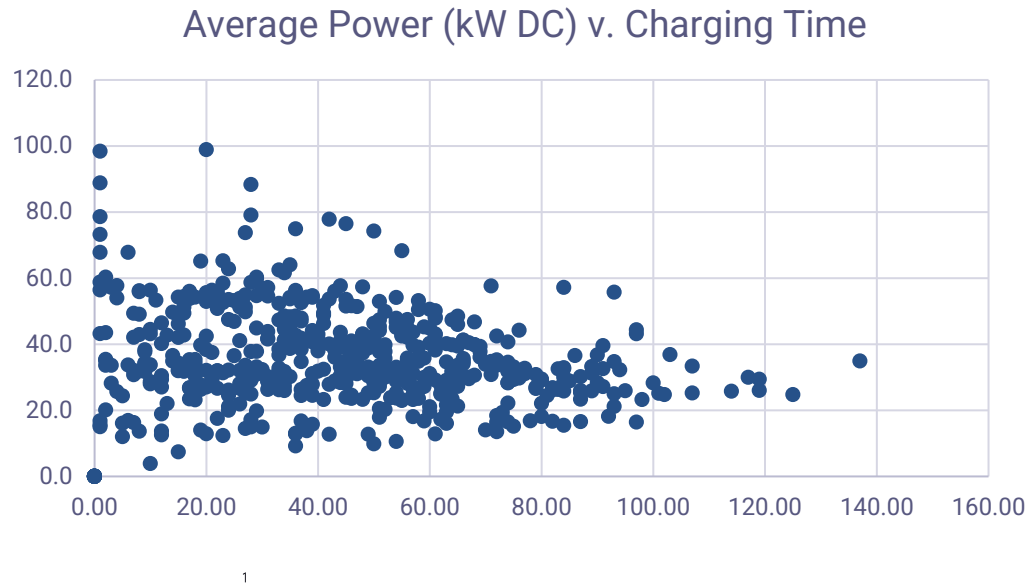
2. Designing a positive user experience

3. Addressing building requirements

Selecting the right charging hardware



[1] Based on real world charging time report from ev-database.org and averaged across sample of most common 400V EVs purchased in Australia.



1

- Charging time decreases at higher DC output but the rate of decrease reduces from 100kW and above.
- Install DC capacity between 100-150kW DC aligns with typical dwell times for rapid (destination) charging (30-60 minutes).
- Installation cost ($/kW installed) for DC systems with installed capacity above 200kW increases significantly.
- ENGIE rapid charger installed capacity ranges between 100-120kW currently with the ability to upgrade and scale quickly in the future.

Selecting the right charging hardware

- ENGIE is technology agnostic with access to a range of hardware solutions across AC & DC charging platforms.
- Selected a mix of DC charging hardware to manage supply chain risk and select charging solution that are best suited for the specific site and use case.
- Continue to monitor charging performance and reliability with a focus to work with our key partners and suppliers to improve the resilience of local supply chains for EV charging, inc. equipment stock holdings, critical spares and implementing continuous improvements.
- The hardware mix is expected to evolve in the future as the market change and technology improves.

KEMPOWER

ZEROVA

ABB

TRITIUM

Designing a positive user experience

- How users charge and interact with their EVs is proving to be very different to ICE vehicles. It is important to redefine at the user story from start to end.
- Some key UX elements that are incorporated into design and development process of rapid charging stations:
  - Site location and convenance
  - Charging performance / rate (and alignment with dwell time)
  - Safety and security
  - **Accessibility**
  - **Ease of use**

Designing a positive user experience

- **Accessibility:**
  - Currently there are no standards in Australia to assist in ensuring EV charging installations are accessible and inclusive.
  - In the absence of standards, there are measures that can taken to improve accessibility for users, where these are reasonable and practical:

Provide a continuous accessible path of travel between the accessible EV parking space and the EV charger

Install EV charger on firm, stable, level and slip resistant ground surface in wet and dry conditions

Position EV charger for unobstructed front and side approach

Clear ground space in front of charger for ease of access and approach.

Designing a positive user experience

- **Ease of Use:**

Accessible position of components to be grasped, turned and pushed

DC cable management systems (also aids in establishing proper connection between charger and EV)

Lights for positive charging status indication

Simple messaging to guide user through set up and usage of charging session

Mobile app and credit card payment

24/7 Customer support helpline

Addressing building requirements

- Rapid chargers can deliver improved amenity and value to building users and/or its customers but increasingly building managers and landlords are raising concerns around the risks associated with installing EV charging, in particular:
  - EV charging loads contributing to peak building demand
  - Increase in fire risk of EV and charging infrastructure

- For rapid charging network to expand at scale charge points will need to be controllable in a dynamic way either via grid / network constraints (i.e. demand limits) or at the building level (i.e. BMS). ENGIE has implemented load and demand-side management systems on its public rapid chargers.

- EV charger with demand side management can also benefit the building and network by increasing demand during periods of high renewable generation and limiting demand during peak events.

ENGIE Australia & New Zealand
Level 33, Rialto South Tower
525 Collins Street, Melbourne
Victoria 3000, Australia

enquiries.au@engie.com

ENGIE Australia & New Zealand

DEIP

DISTRIBUTED ENERGY INTEGRATION PROGRAM

DEIP DIVE

MARKET INTEGRATION STREAM

Session 1
CONSUMER INSIGHTS

DEIP
DISTRIBUTED ENERGY INTEGRATION PROGRAM

Project EDGE
5 customer insights

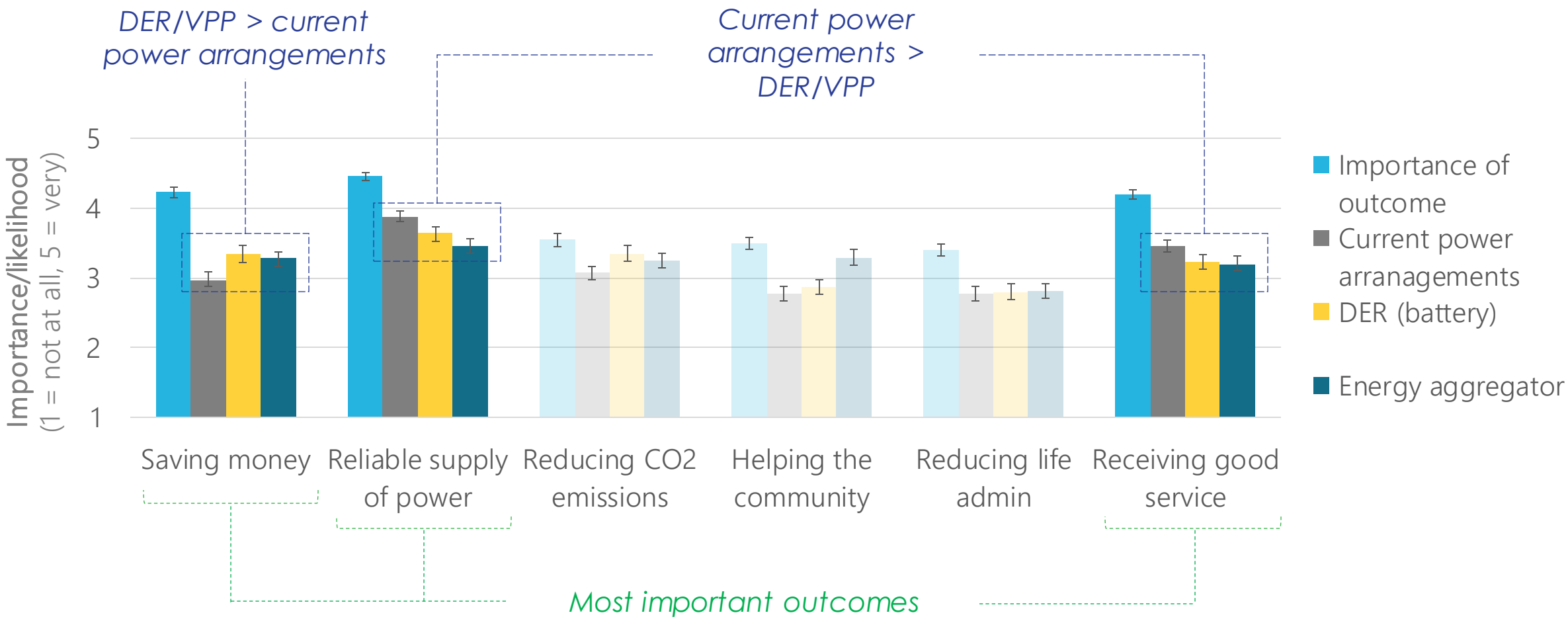
A/Prof Josh Newton

Better Consumption Lab, Deakin University

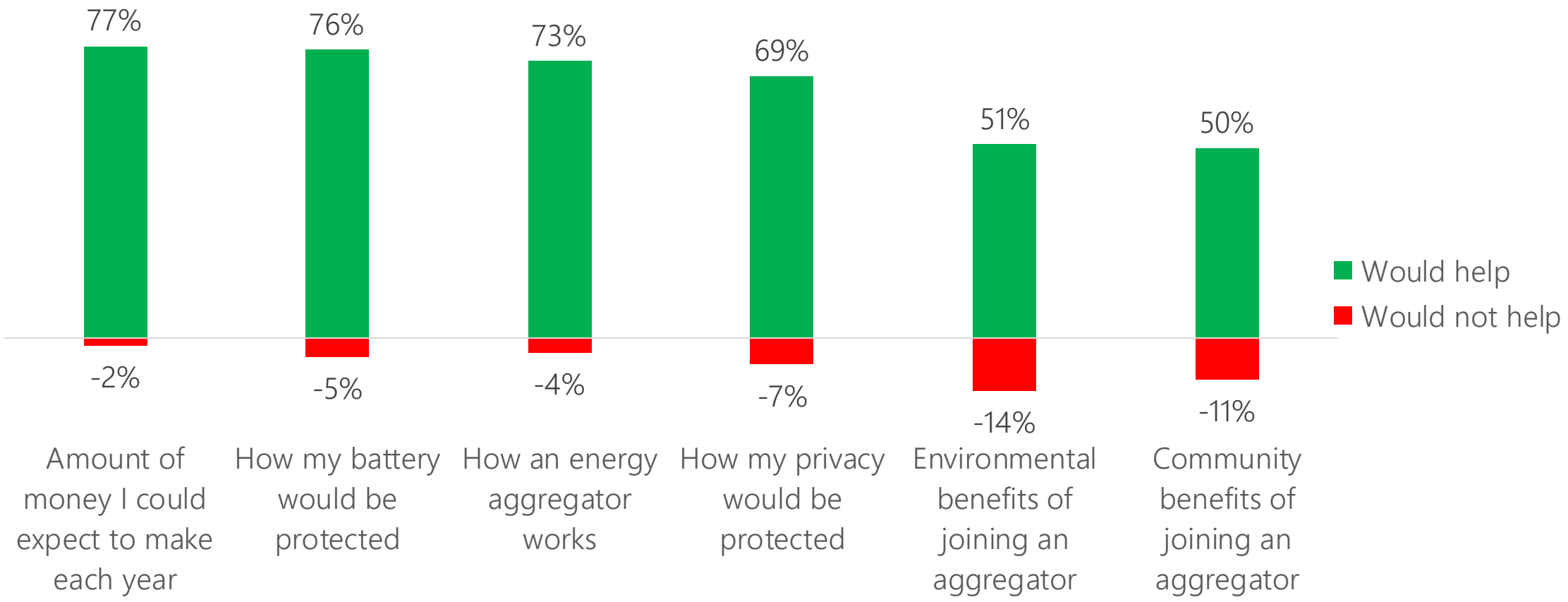
This research has been conducted with the support of:

AEMO mondo AusNet DEAKIN UNIVERSITY

Potential customers: See VPPs as saving money



Potential customers: Want to know whether joining a VPP will leave them better off overall



Potential customers: Building trust is key to getting beyond the early adopters

Trust aggregator?	Innovator / early adopter	Early majority	Late majority	Laggard
No	12%	**11%**	12%	**44%**
Unsure	**49%**	**65%**	66%	**48%**
Yes	**40%**	25%	23%	**7%**

Potential customers: Building trust is key to getting beyond the early adopters

Trust aggregator?	Innovator / early adopter	Early majority	Late majority	Laggard
No	12%	**11%**	12%	**44%**
Unsure	**49%**	**65%**	66%	**48%**
Yes	**40%**	25%	23%	**7%**

Strategy for enhancing trust in an aggregator	Innovator / early adopter	Early majority	Late majority	Laggard
Guaranteed earnings	59%	**70%**	68%	**42%**
Consumers control how much power is exported	64%	**71%**	65%	**47%**
Consumers control when power is exported	59%	67%	60%	55%

Current customers: Want a slightly more transparent 'black box'

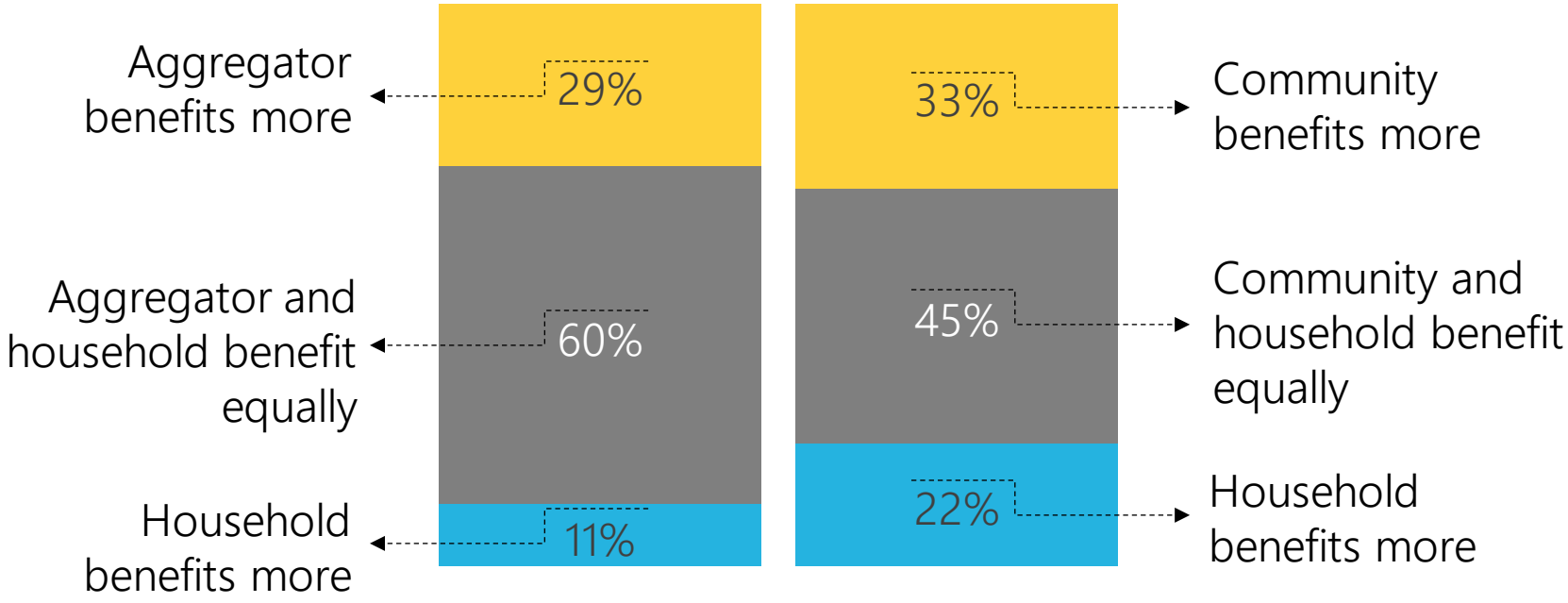
Most VPP activity was **automated**, whether by design or by choice

As a result, the VPP remained a 'black box' for many customers in that they were not always aware of when – or even if – active management of their DER asset was occurring

Customer suggestions for improving their comfort with the VPP included:

- **Real-time information** about VPP activity
- **Forewarning** of VPP activity wherever possible

Current customers: Want a greater share of VPP benefits



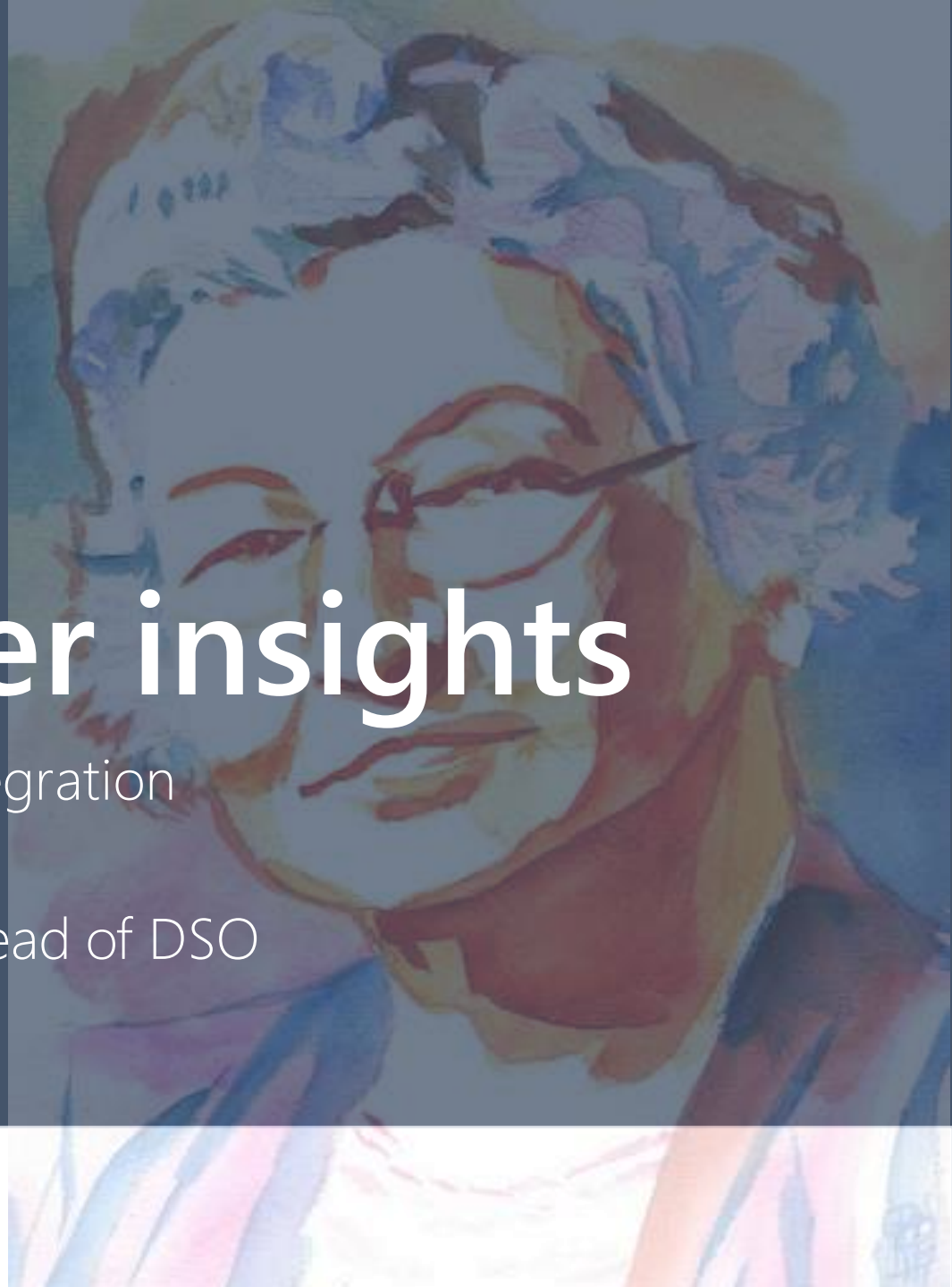
Summary report

Edith – Customer insights

DEIP Dive – Market Integration

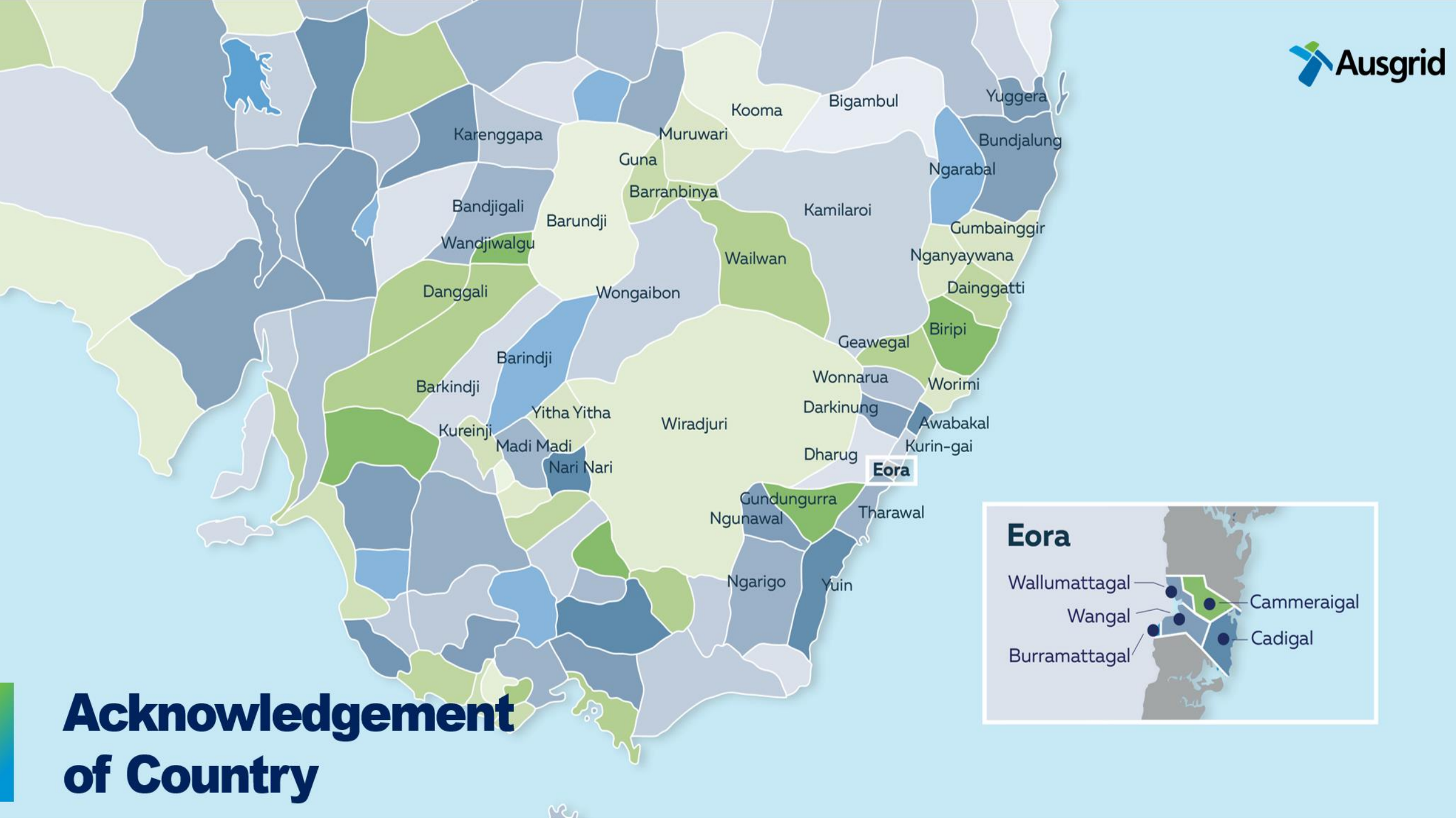
July 2023

Jonathon Dore – Acting Head of DSO

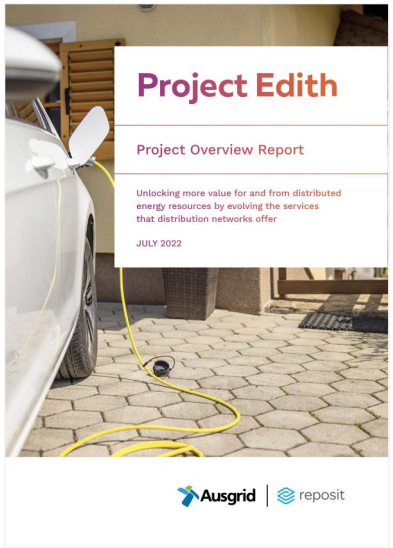


Ausgrid

Acknowledgement of Country

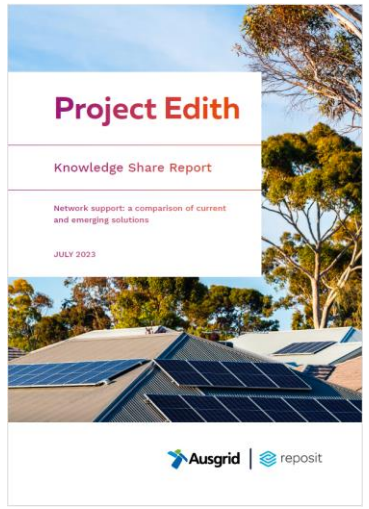


What is Project Edith?

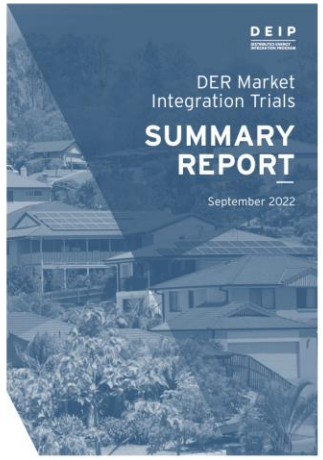


Project Edith is testing how dynamic network pricing can be used to:

- manage distribution capacity in a decentralised manner and
- reward customers for network support



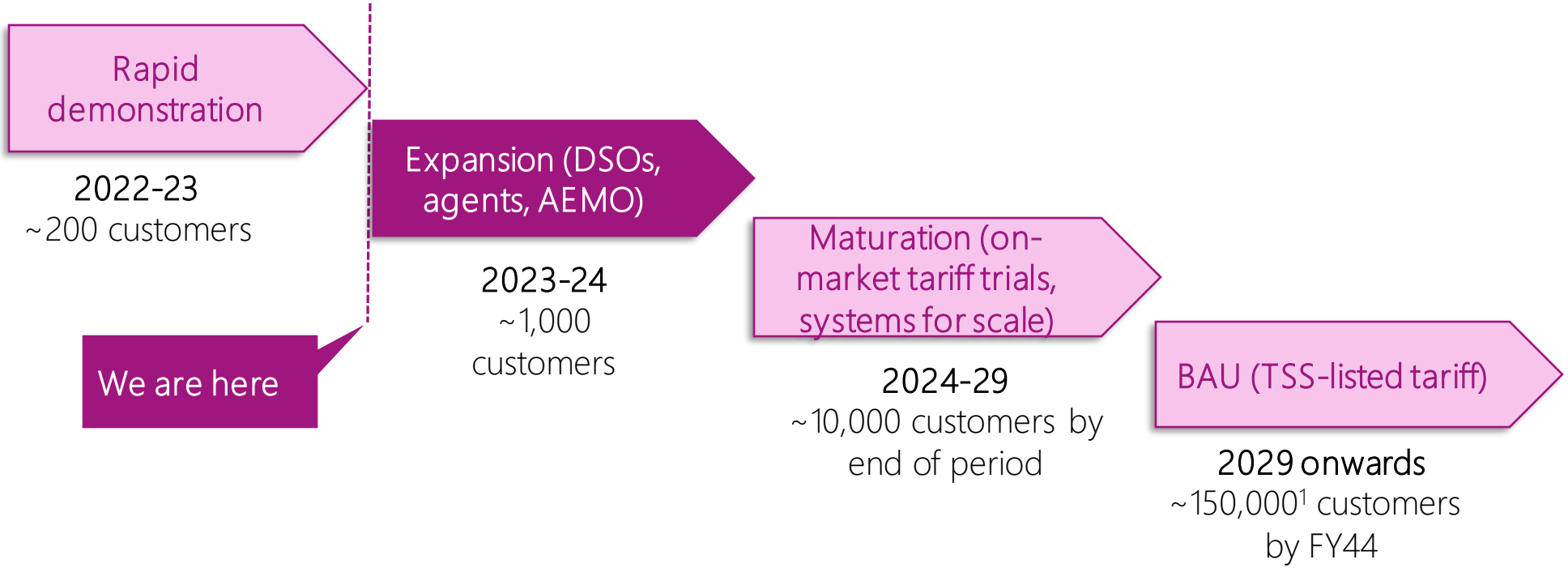
The project is one of several initiatives underway to facilitate the participation of consumer energy resources (CER) in the energy and services market.



Ausgrid

Further info: https://www.ausgrid.com.au/About-Us/Future-Grid/Project-Edith

Path to implementation



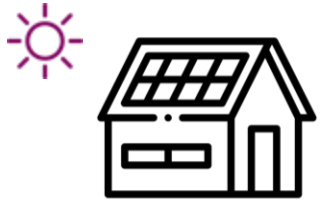
[1] *Based on 50% take-up amongst 'co-ordinated DER storage' owners as defined and forecast in AEMO's Integrated System Plan*

Evolution to dynamic network pricing

Current network pricing

- Averaged across regions – **'postage stamp pricing'**
- Do not fully differentiate available network capacity by time and location – do not reflect enough what is happening **'on the ground'**

Weather: rain and clouds
PV production: low / zero
Usage charge: $$

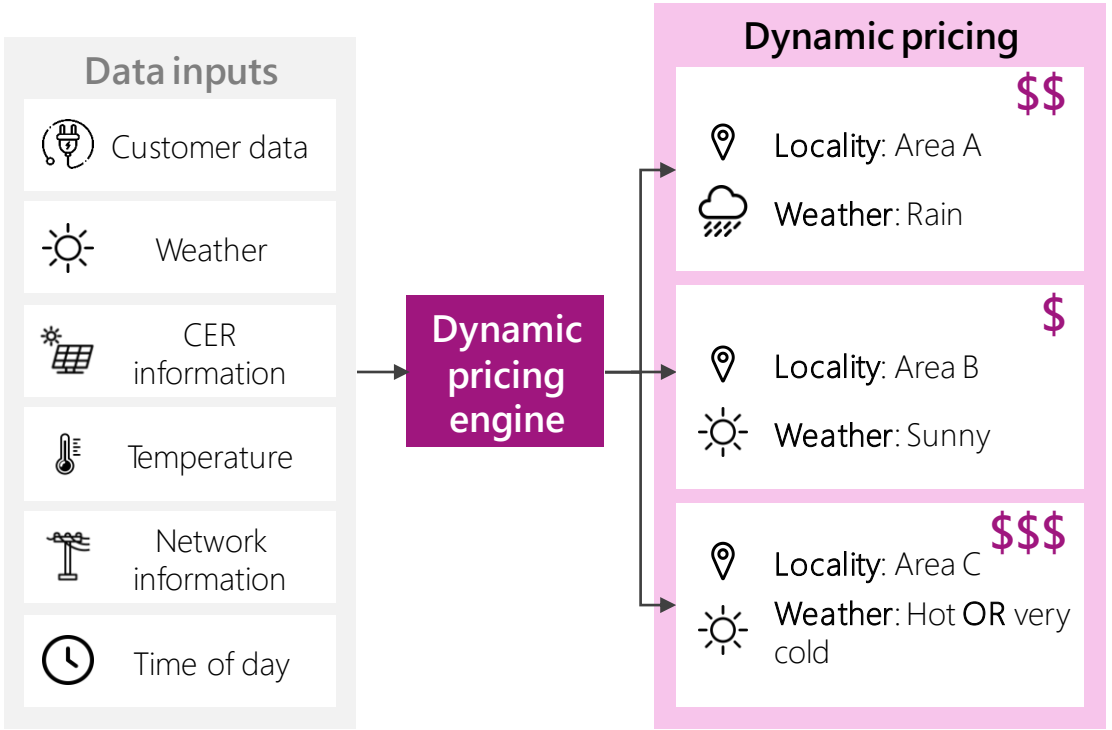


Weather: sunny
PV production: high
Usage charge: $$

Customers face the same usage charge, regardless of real-time conditions (e.g., weather)

Dynamic network pricing

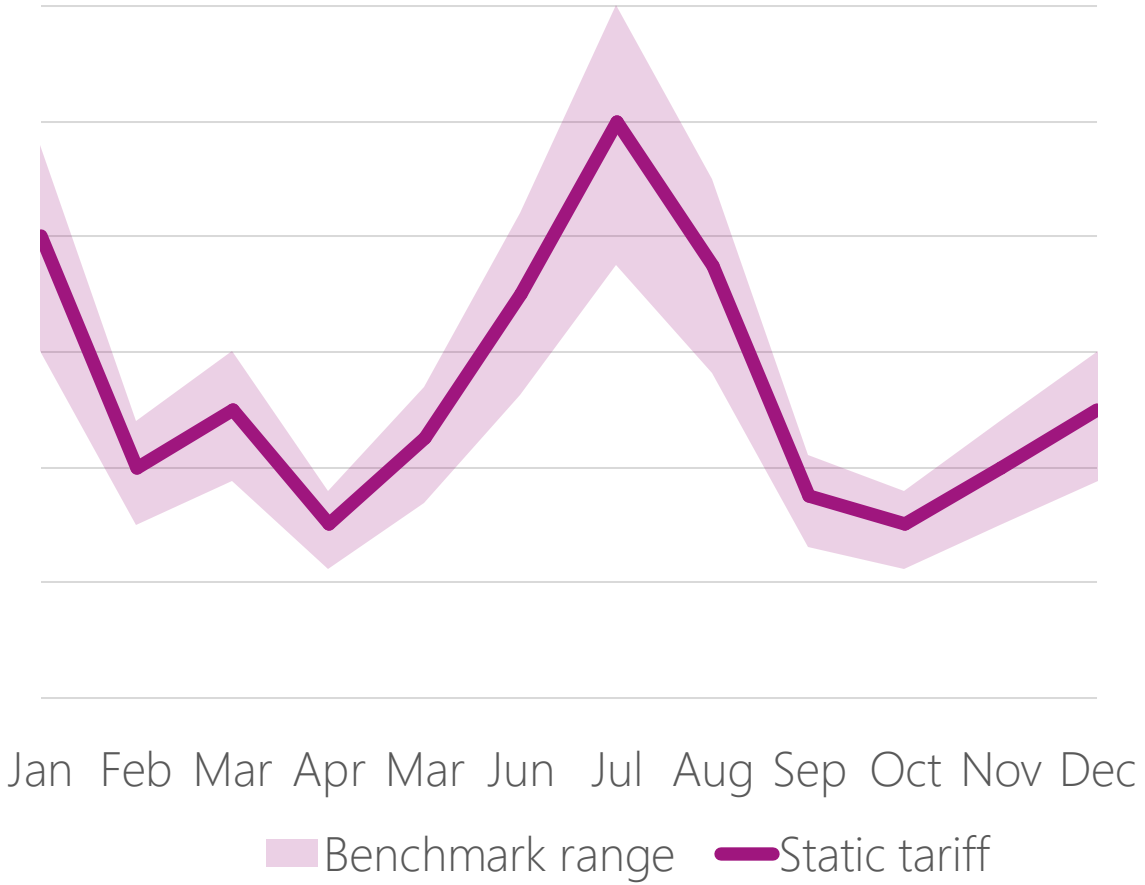
- **What?** Considers the cost to serve customers and operate the network, based on operational conditions
- **How?** Using time and location-specific incentives to make unused network capacity available to CER



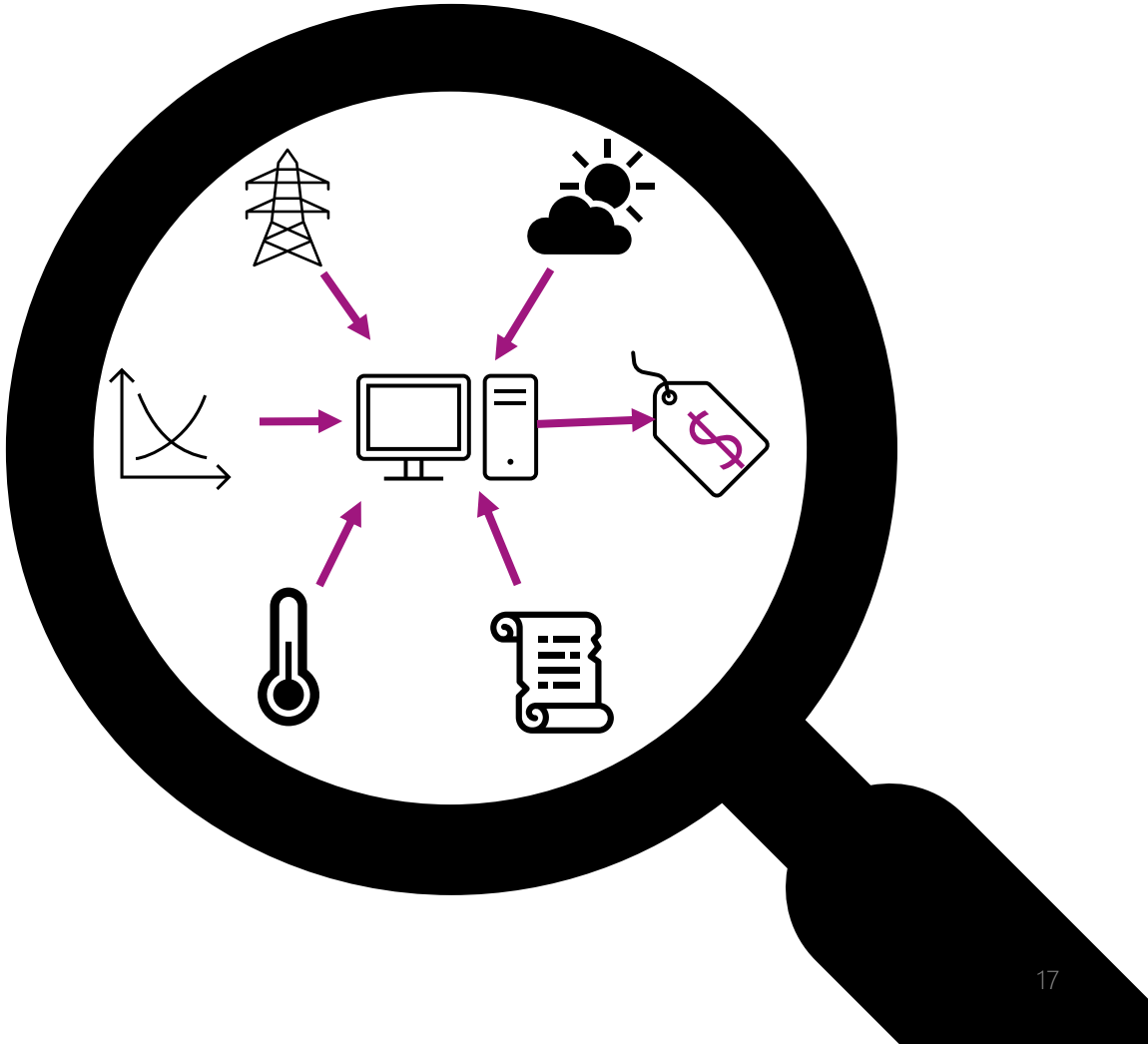
Note: dynamic network pricing can include both positive and negative prices.

Managing customer impacts

Short term: benchmarks and caps



Long-term: visibility



Customer research opportunities

If dynamic network pricing increases opportunities for market participation, how will customers respond to retail products that take advantage of that?

What is the right balance of equity and efficiency with regard to:

- Locational pricing
- Cost saving opportunities across different customer segments

Project Symphony

Our energy future

MARKET STREAM

Project Symphony: Consumers DEIP Dive

July 2023

Presented by: Anna Brandsma

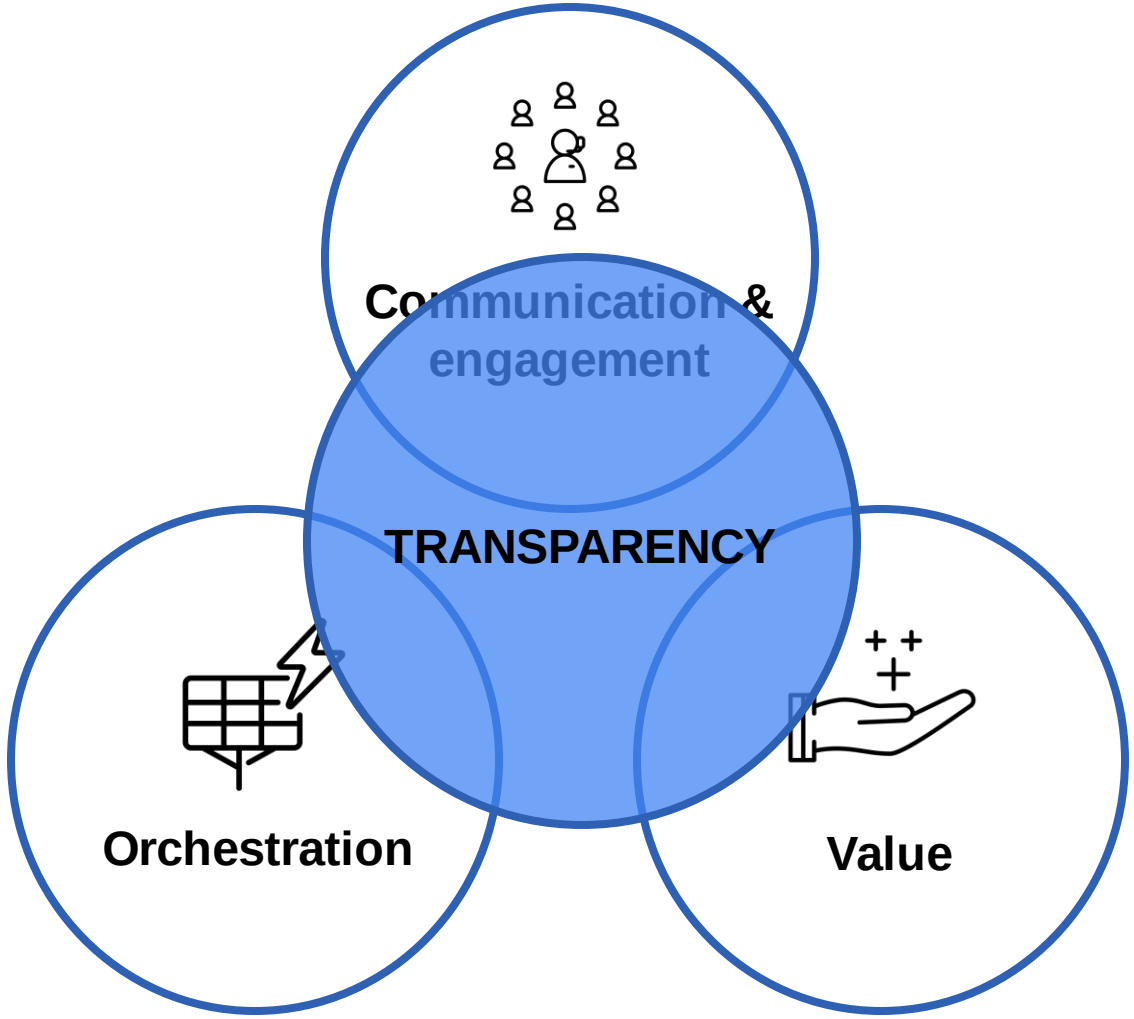
In partnership with:

western power synergy AEMO GOVERNMENT OF WESTERN AUSTRALIA Energy Policy WA

Acknowledgement of Country

We acknowledge the Traditional Owners of the land on which we meet, the Gadigal of the Eora Nation and we also acknowledge the Traditional Owners of the land on which the project will operate the Whadjuk people and recognise their continuing connection to lands, waters, and communities. We also pay our respects to Elders past, present and emerging.

What are our customers telling us?



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Our energy future

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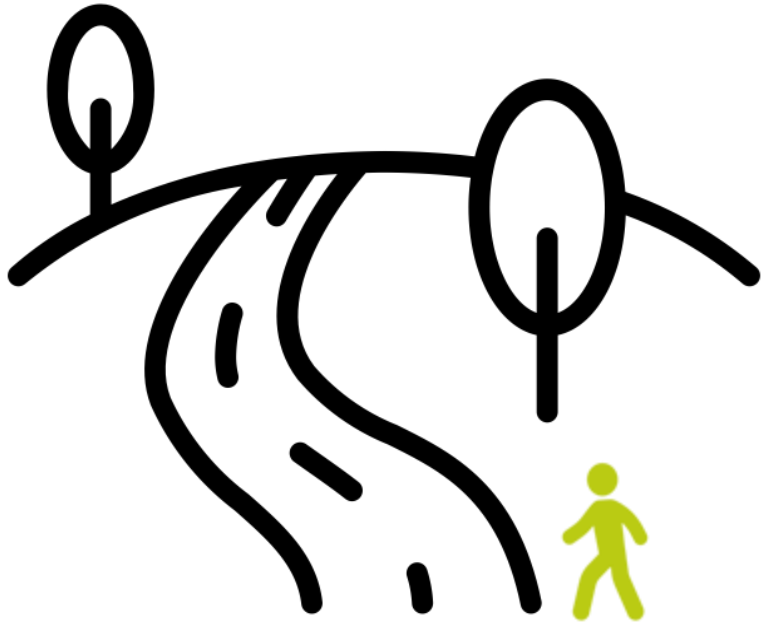
Energy Policy WA

An iterative approach



“Paving the road as we walk it”

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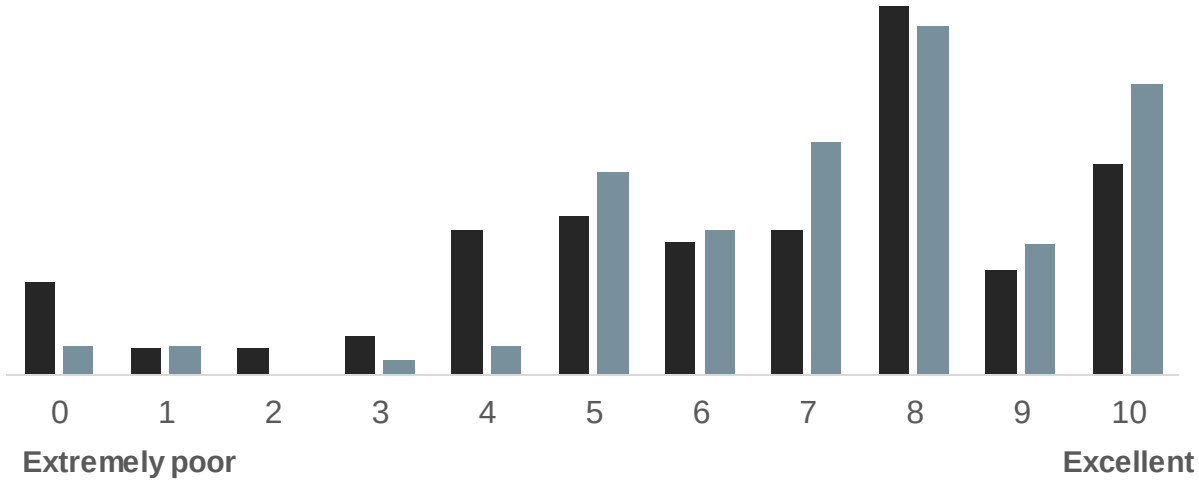
AEMO
Government of Western Australia
Energy Policy WA

Shifting participant sentiment

- Revisited of our engagement approach with a focus on transparency
- Created a customer update email with dedicated landing page
- Introduced the option to register for a call-back

Overall experience with pilot (0 – 10 rating) by Orchestration phase



	Low (0 – 4)	**Med** (5 – 7)	**High** (8 – 10)
Phase 1	**23%**	30%	47%
Phase 2	6%	**40%**	**54%**

Q: How are you finding the Project Symphony pilot so far? *'0' is 'extremely poor' and '10' is 'excellent'.*

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Energy Policy WA

Bringing customers along the DER journey

What have we done well?

What could we have done better?

There are people behind the assets

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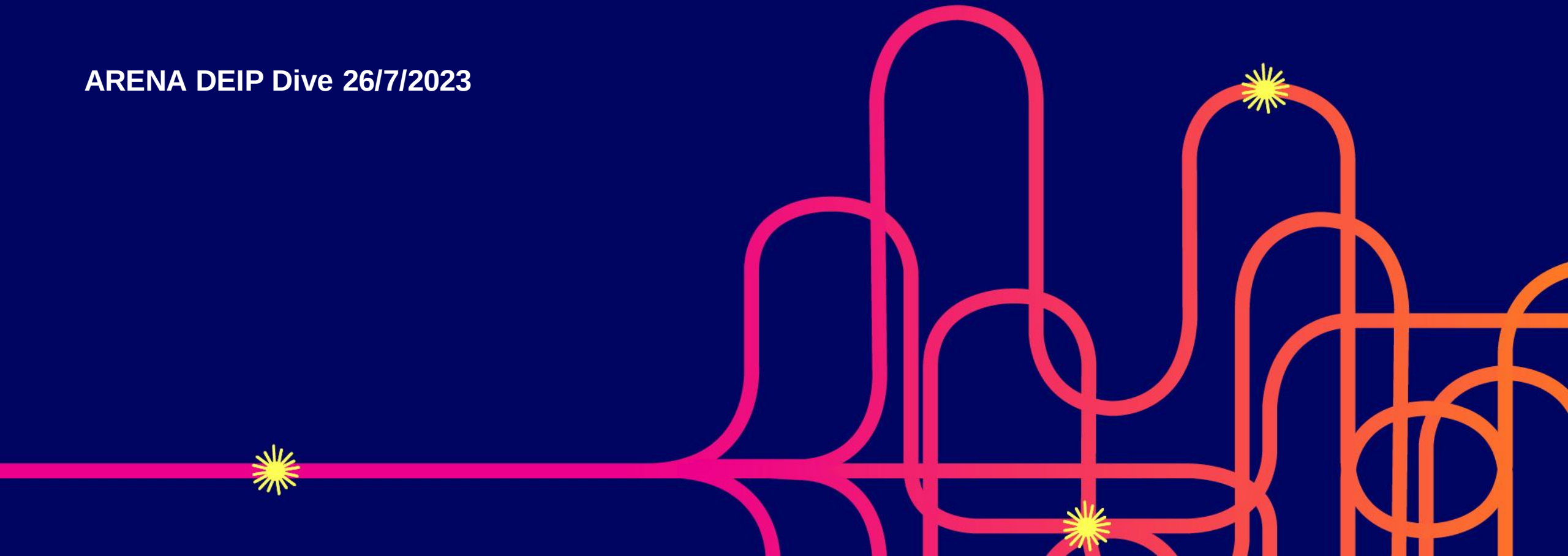
Project Converge

Market Stream Consumer Insight Report

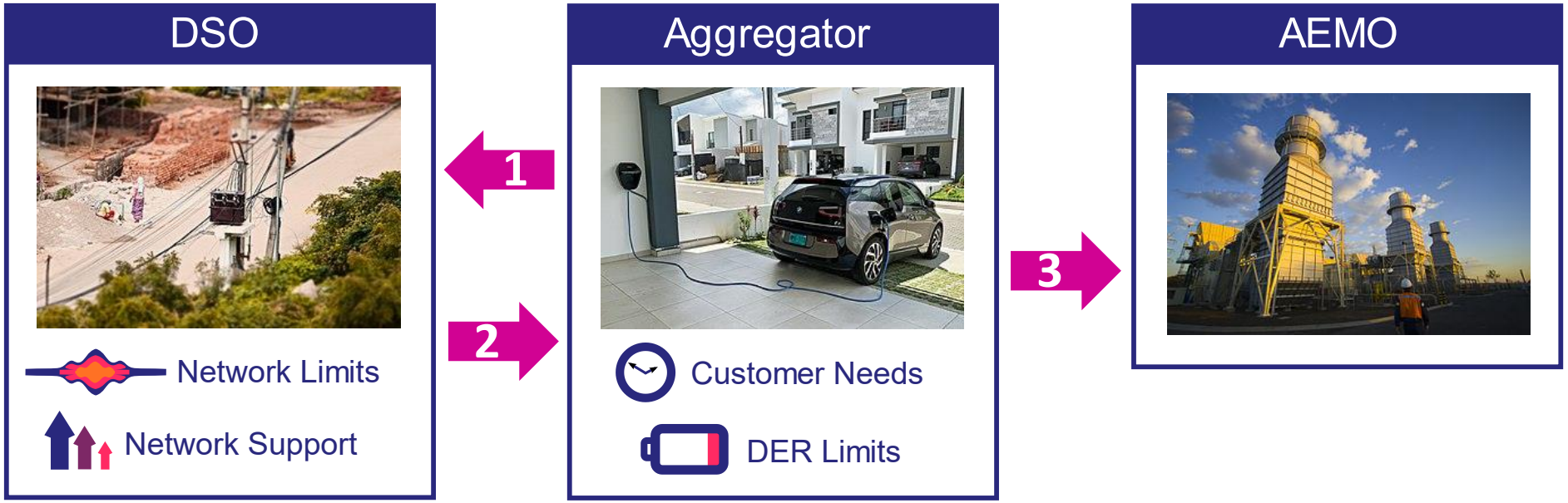
ARENA DEIP Dive 26/7/2023



What are SOE’s and how do they differ from DOE’s?

CONVERGE

SOE's and DOE's are…



CONVERGE /SOE framework (steps 1,2,3):

1. Aggregators send their bids and network support availability to the DSO.
2. SOEs and network support requests are calculated and sent back to aggregators.
3. Aggregators readjust their bids based on SOEs and submit bids to the wholesale market.

DOE framework (steps 2,3):

2. DOEs are calculated and sent back to aggregators.
3. Aggregators compute their bids constrained by DOEs and submit them to the wholesale market.

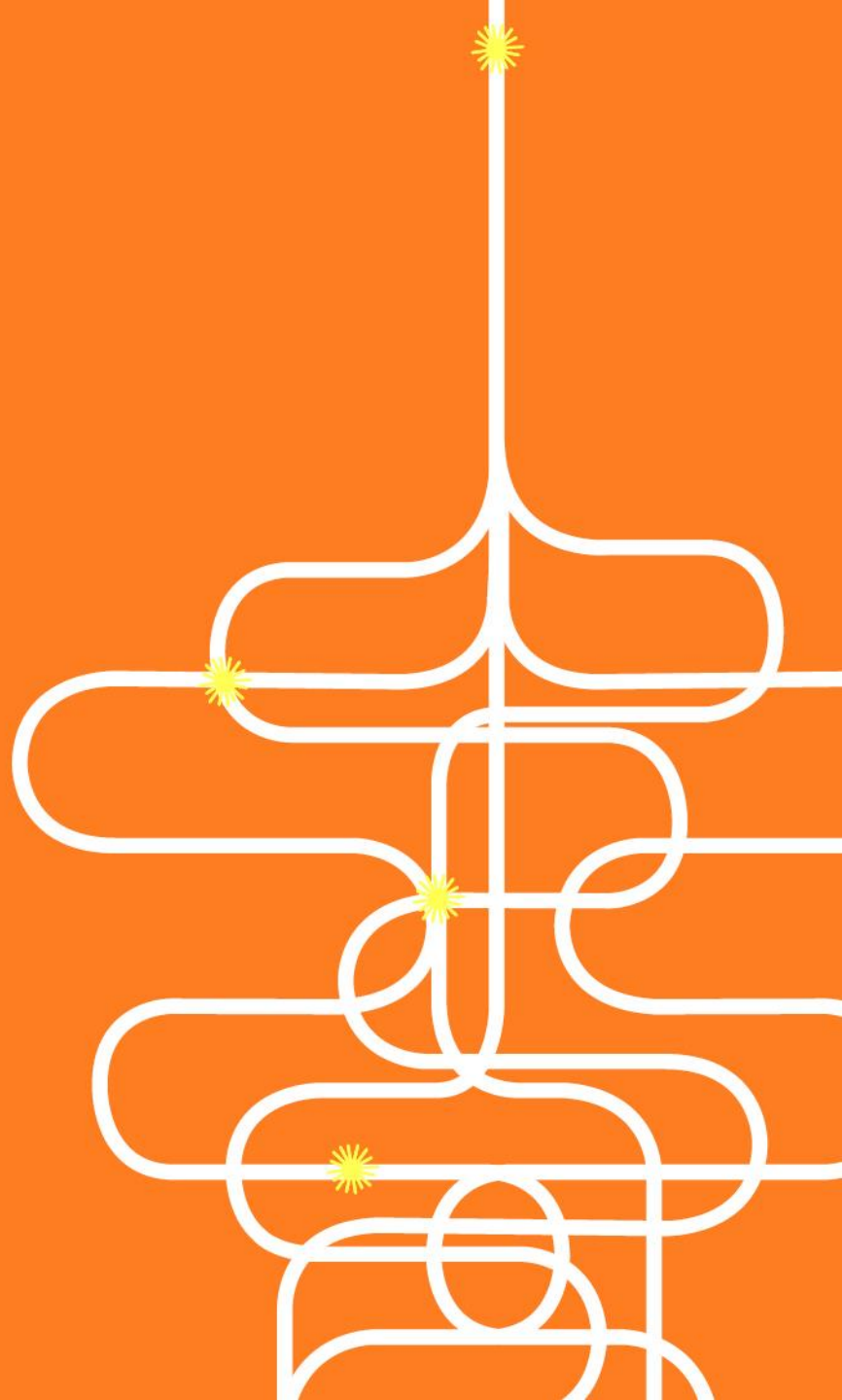
Converge features:

- The Converge framework computes OEs knowing aggregators' bids and network support availability (power and price for both), which allows it to better allocate network capacity to customers. In contrast, DOEs are computed based on "fairness metrics" or "maximum throughput considerations", i.e., without considering the aggregators' intentions/plans.

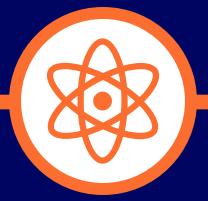
Benefits:

- SOEs enable more DER capacity and value to reach the market compared to DOEs.

Now the Social Science!



Today I am going to briefly talk about.



Professional Stakeholder /Intermediaries

Professional stakeholders who are intermediaries of the system we are designing for.

Customers for SOE's

Customers for the SOE product.

Consumers who are affected by DOE/SOE

Consumers who may be affected by application of DOEs and SOEs.

CONVERGE

Thank you.

Session 2

RETAILERS & AGGREGATORS

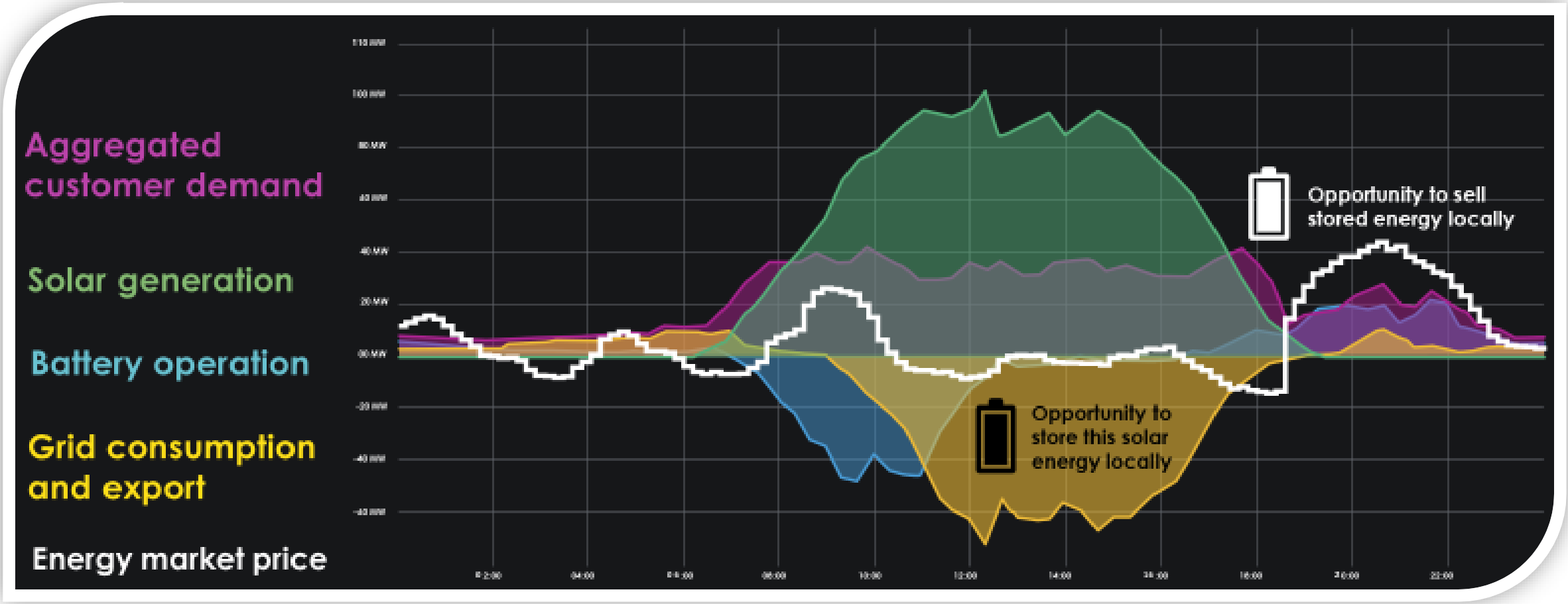
DEIP

DISTRIBUTED ENERGY INTEGRATION PROGRAM

EDGE Aggregator Takeaways

- Customers needs and expectations are key – social license is paramount.
- It is feasible for aggregators to forecast and bid in fleet capacity of hundreds of discreet devices in accordance with NEM dispatch intervals.
- Aggregators can ensure that their bidding and dispatch are undertaken while conforming to the export and import limits that apply at each NMI in the fleet.
- Forecasting DER behavior at the NMI level is computationally expensive, and scalability of the arrangement depends on efficient forecasting approaches. One approach is to mix fleet forecasts when no constraints apply with NMI forecasts when constrained. Alternatively, use fleet forecasts but de-rate bids to account for the error this introduces.
- NEM dispatchable unit ramping and telemetry requirements will need to be adapted for DER aggregators to avoid excessive implementation costs - traditional SCADA standards may not be suitable or feasible for DER devices connected via residential Wi-Fi or mobile data networks in terms of resilience, latency or costs.
- Where Aggregators manage the site at the connection point, they can control installed DER to maintain operating limit conformance at that connection point. Under EDGE this was the arrangement when testing Net NMI bidding and Flex bidding. An arrangement such as that suggested by the Flexible Trading Arrangement where the aggregator may not be responsible for connection point compliance with DOE when dispatching will require further assessment.

NEM DER Integration In Practice



DEIP Dive
Market Stream - Retailers & Aggregators

Alan Reid - Head of Operations Reposit Power

Where are we?

- Lots of activity in DER/VPP space, but ultimately it is the job of the aggregator/retailer to solve two classes of problems:
  - Technical/architectural stuff
    - Centralised vs Decentralised control 🕹
    - Dynamic Operating Envelopes ✉
    - 5-minute price responsivity 💸
  - Customer things
    - Product complexity 🤔
    - Value proposition 💵
    - Experience 😎

How are we all going?

- Technical: Pretty good! All of the projects you'll hear from today have viable solutions that are being tested

- Customer: Ok, but we can do better.

What have we learned from our customers?

- Along with Technological innovation, we mustn't forget product innovation.
- Simplicity of product is key
  - Early adopters may have wanted to lift the hood, mass market does not.
- Uncertainty on value is the enemy of simplicity
- Product innovation is underpinned by investment certainty

Key takeaways:

- An outcome of technological innovation must be:
  - All entities in the value chain are left better off - the net benefit of a thing must be positive!
  - The value for each needs to be concrete (as much as possible)

- The above must drive VPP product innovation

- Products needs to be simple, accessible and valuable

Project Symphony

Our energy future

MARKET STREAM

Project Symphony: Retailers & Aggregators DEIP Dive

July 2023

Presented by: James Giblin

In partnership with:

western power synergy AEMO GOVERNMENT OF WESTERN AUSTRALIA Energy Policy WA

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Synergy

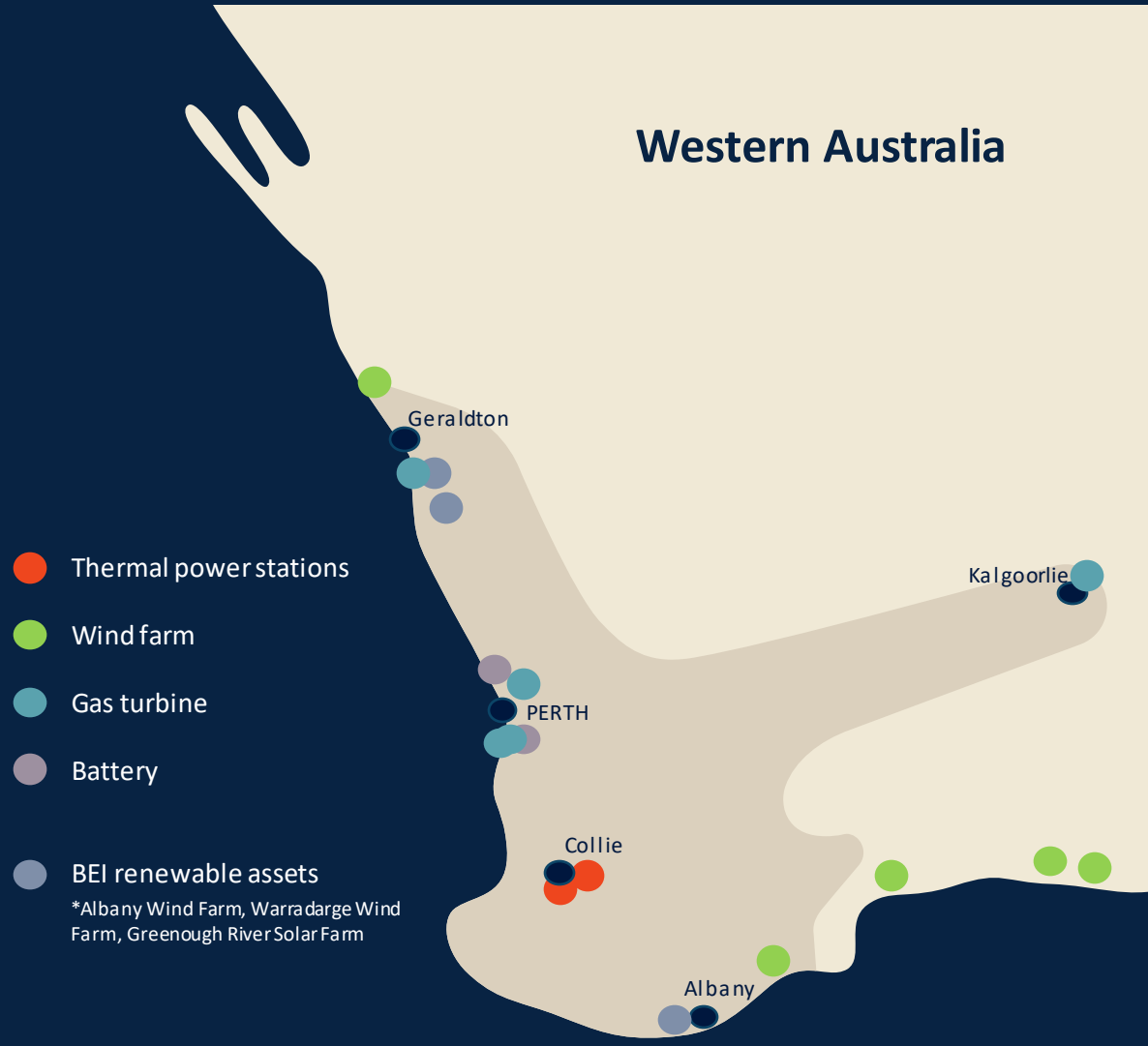
Leading Western Australians to their intelligent energy future

Supply 66%
of the electricity to homes and business

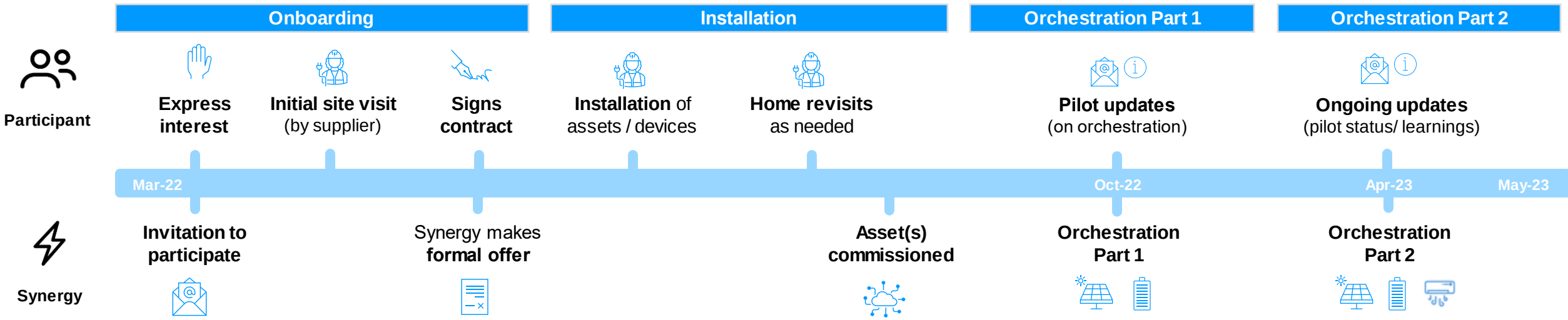
6,696 GWh
of electricity generation

1000+
employees

1.1 million +
residential and business customers



Overview of the participant journey



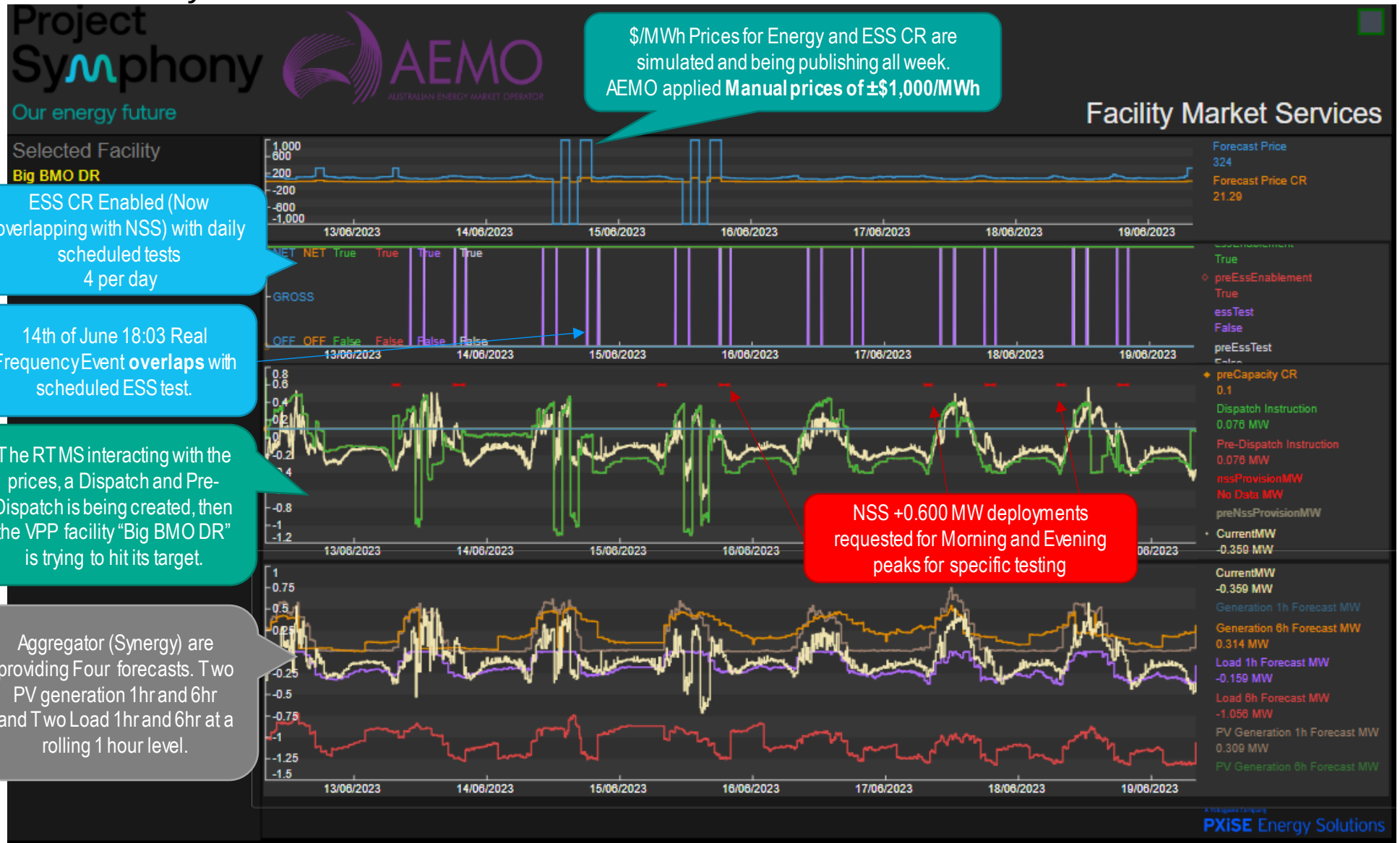
Note: This is an example of a participant journey. Individual experiences can vary.

Project Symphony
Our energy future

Weekly view Facility Value Stacking – BMO, ESS and NSS

Big BMO DR VPP Facility reacting well to price signals at timed and dispatching to meet BMO, conduct ESS CR test events, with mixed results on Peak NSS deployments. Aggregator publishing both Generation and Load Forecast to AEMO every hour.

Symphony Scenario
BMO
NSS
CTZ (not tested)
ESS CR



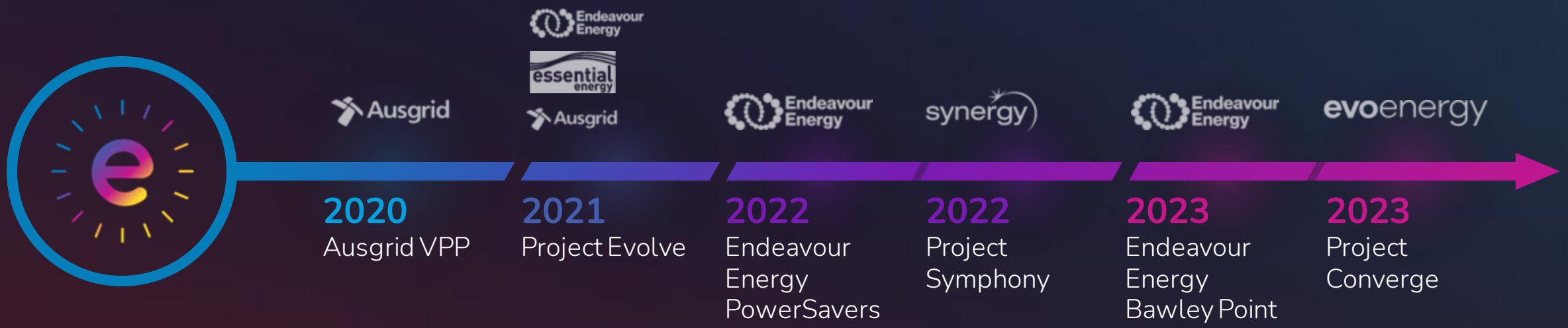
Project Symphony
Our energy future

Aggregation

Richard Vowles - Head of Sales ANZ

26/07/2023

Evergen and Network Programs



evergen

Project Converge Insights (State of Play)

29% Conversion Rate

1207 selected consumers contacted via email
350 registrations

High interest and great uptake in network projects

Trial Incentives

Upfront benefit + Monthly incentives

Trial incentives help customers answer the ‘why’ in participation

Consumer Demand

People have the DER and many are now looking for ways to contribute

Customers are happy to participate in trials + the ACT is hungry for trials

Future Opportunities

Greater Retailer Involvement

Extracting value for DER participation alone very difficult at present. Need to integrate with a broad product strategy.

Greater Interoperability and Connectivity

Smart Meters and the hyperscalers eg. (Google, Amazon) are becoming aggregation points for DER.

Alignment Challenges

Network and Retailer business models and priorities are not well aligned.

Thank you

Richard Vowles, Head of Sales ANZ
richard.vowles@evergen.energy

Session 3

WHAT'S NEXT

DEIP

DISTRIBUTED ENERGY INTEGRATION PROGRAM

Project EDGE and next steps

DEIP Dive | July 2023

Luke Barlow – Manager DER Reform Delivery (AEMO)

ARENA ACKNOWLEDGEMENT AND DISCLAIMER

This Project received funding from ARENA as part of ARENA's Advancing Renewables Program. The views expressed herein are not necessarily the views of the Australian Government, and the Australian Government does not accept responsibility for any information or advice contained herein.

Project EDGE and Related inflight NEM reforms

Project Edge

- Cost-Benefit Analysis Report - September 2023
- Final Knowledge Sharing - September 2023

In-Flight NEM Reforms

- **Integration of Energy Storage Systems –In Implementation**
  - Frequency Control Ancillary Services for Small Generator Aggregators - March 2023
  - Scheduled Bi-directional units in central dispatch - June 2024
  - Consistent approach to bi-directional energy flows in non-energy cost recovery – June 2024
- **Scheduled Lite Mechanism – Proposed Rule Change**
  - A model for aggregated resources to participate in the energy scheduling in a "Visibility" or "Dispatch" model.
- **Unlocking CER benefits through flexible trading -Proposed Rule Change**
  - A model to allow for participation of flexible CER in wholesale markets, to provide additional value streams for individual customers and increase competition in the wholesale

What Next

Flexible Exports / Dynamic Operating Envelopes and Backstops

- Flexible Exports
  - Progressive adoption across distribution networks
  - Flexible Exports report from Energy Security Board / AER
- Victoria's emergency backstop mechanism for solar

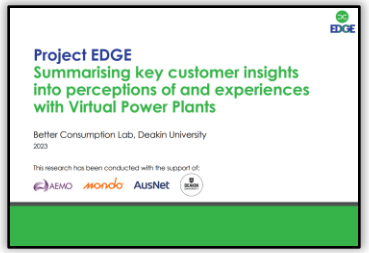
DER Data Exchange

- **Project EDGE recommended that secure, standardised and reliable data sharing is key to unlocking the potential of value of DER participation**
- What are the next steps to support near term objectives
  - Flexible Exports
  - Retailers and aggregator opportunities to avoid backstops at a better return for consumers
  - Recognises that different parts of industry are moving at a different pace based on individual circumstances
  - Provides opportunities to emerging parties such as Customer Agents or OEMs to exchange data

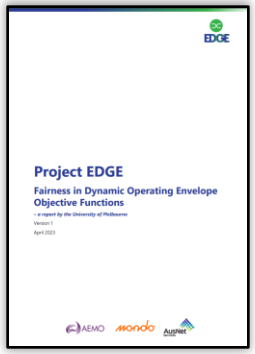
Project EDGE Publications

For any questions, comments or feedback please contact: **EDGE@aemo.com.au**

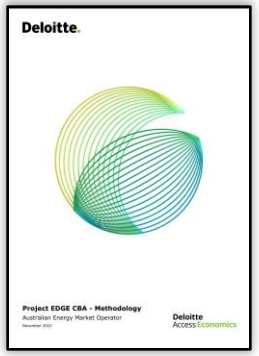
Knowledge Sharing Reports



Customer Insights Study Summary

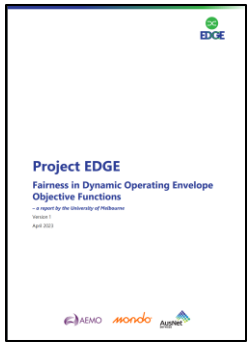


Fairness in Dynamic Operating Envelope Objective Functions



Cost Benefit Analysis Methodology

Lesson Learnt #2



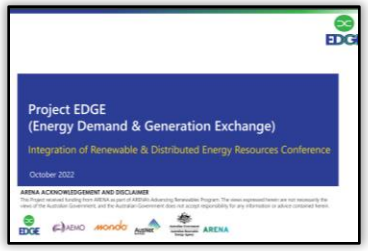
Fairness in DOE Objective Functions

DER Data Hub Lessons Learnt

Technology and Cyber Security Assessment

Customer Insights: Qualitative Insights of Customers in EDGE

Conferences



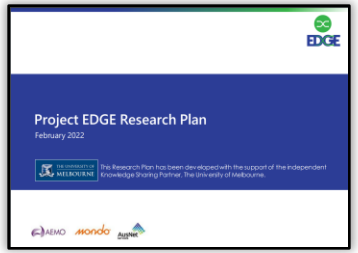
Energy Systems Integration Conference

DEIP Dive DER Market Integration Conference

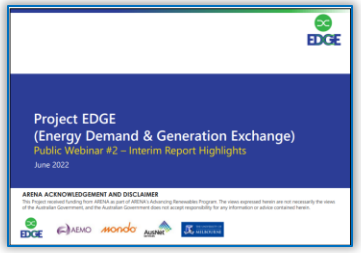
Renewable and Distributed Resources International Conference

Public Webinars

Research Plan



Webinar #1



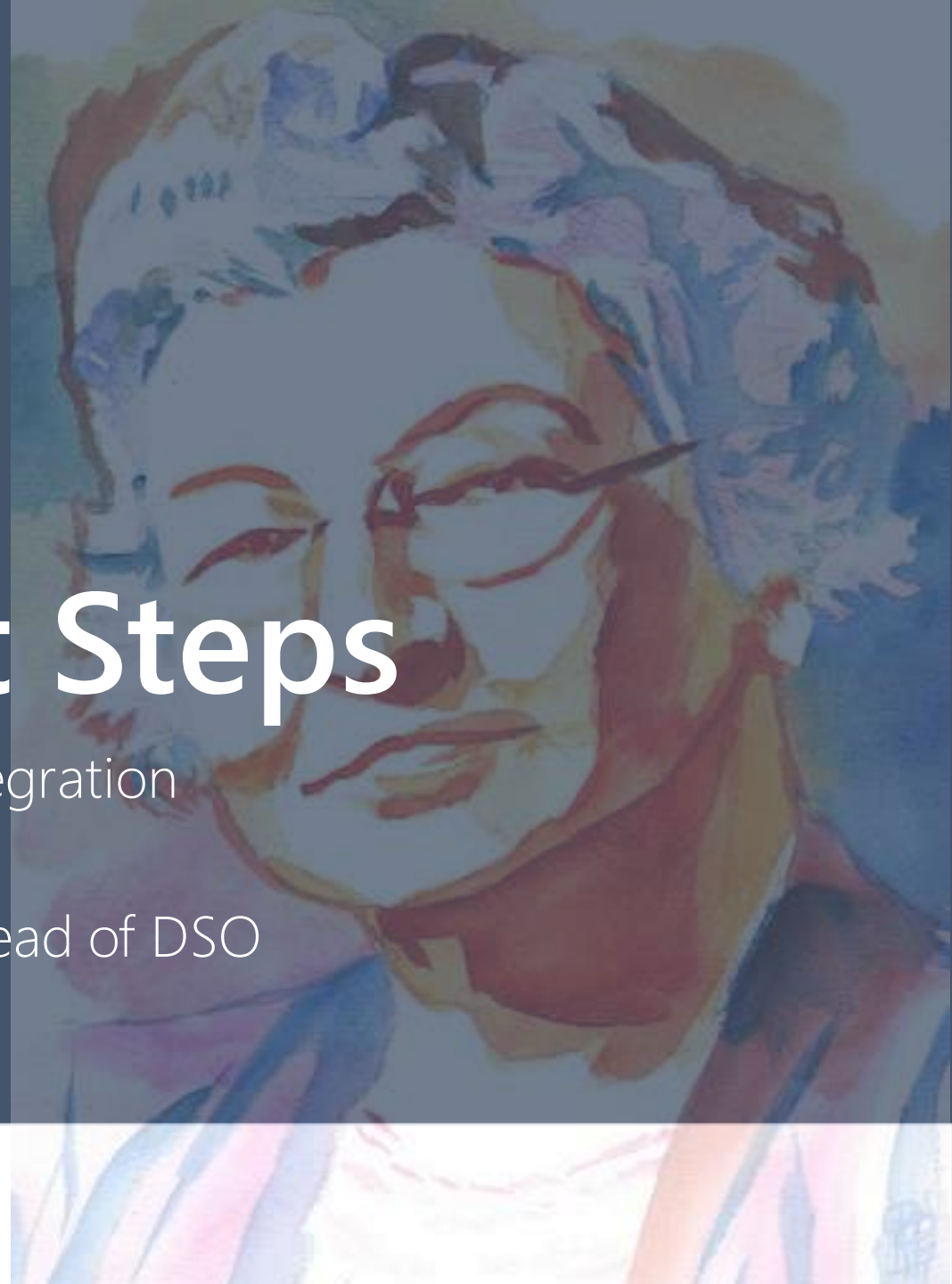
Public Interim Report Webinar

Edith – Next Steps

DEIP Dive – Market Integration

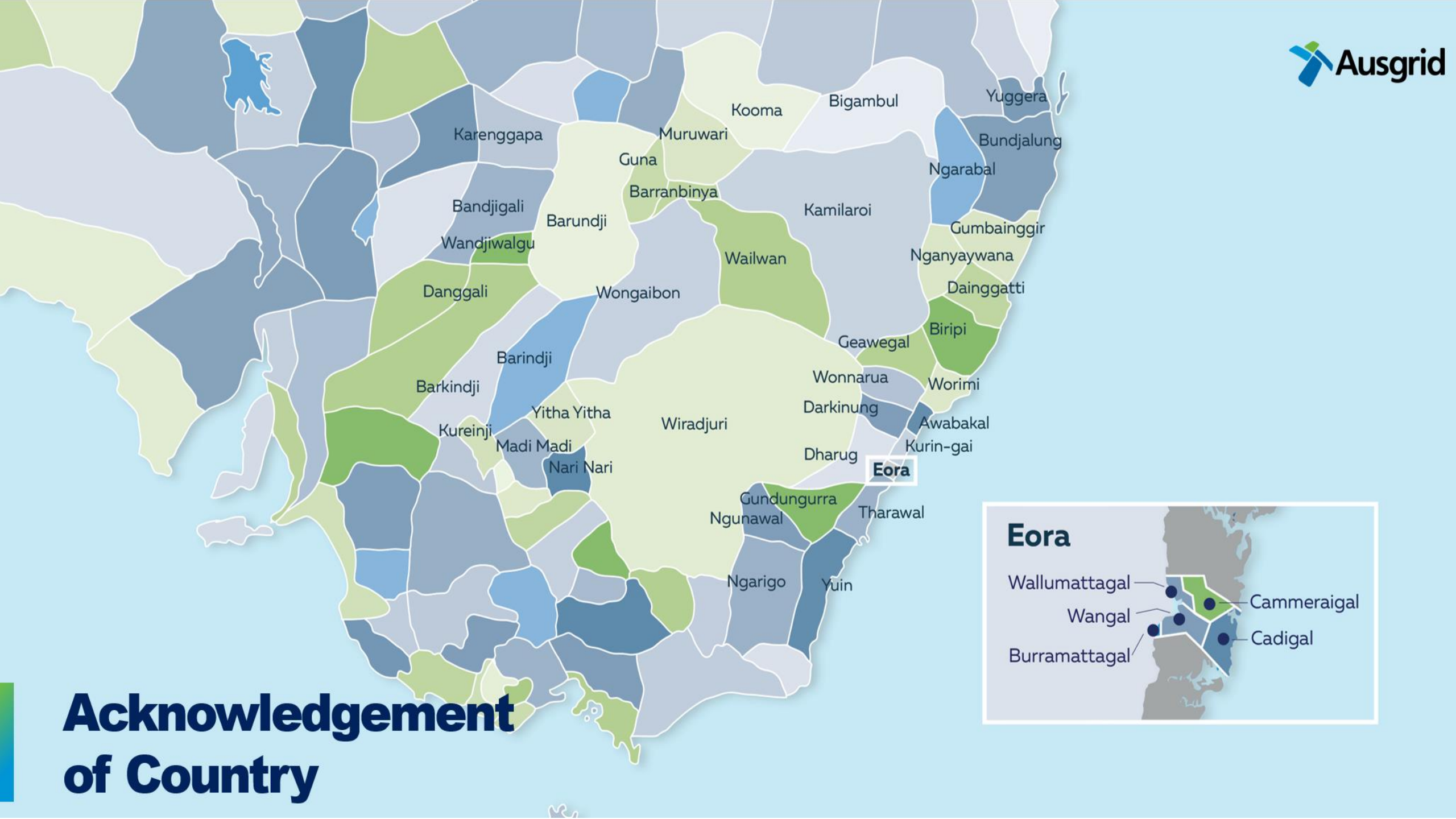
July 2023

Jonathon Dore – Acting Head of DSO



Ausgrid

Acknowledgement of Country



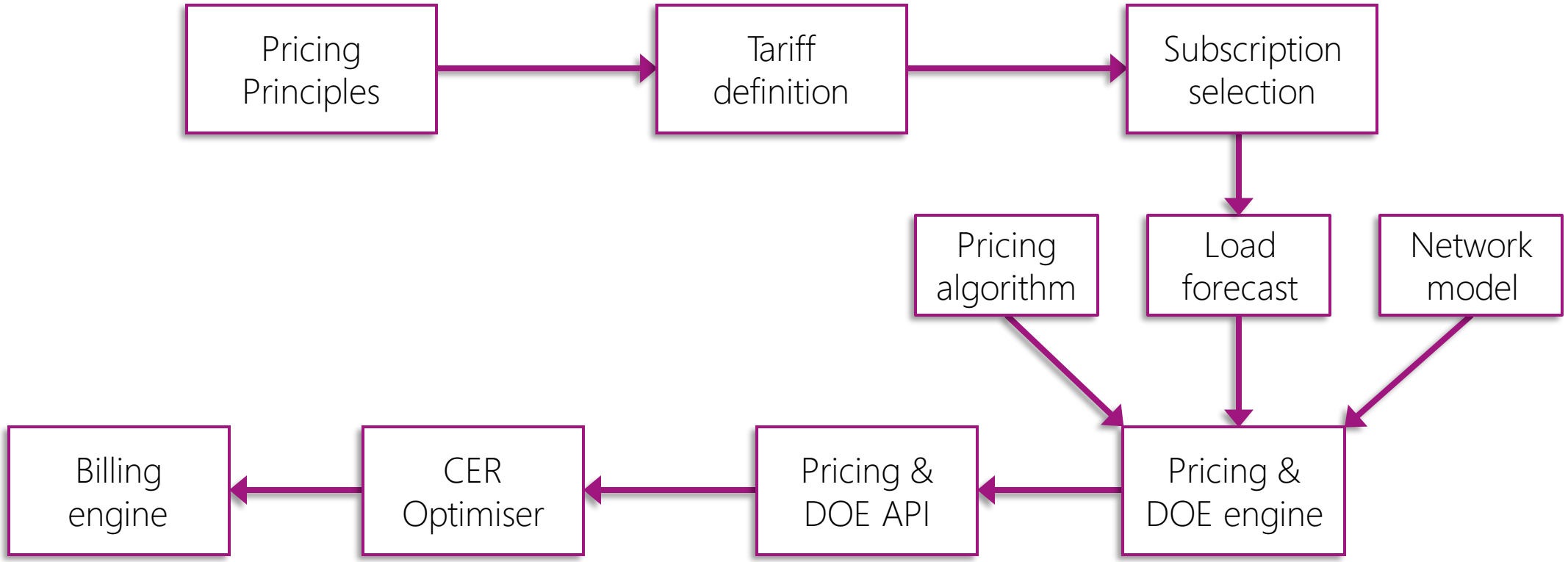
Objectives of Edith

To test and demonstrate the effectiveness of managing network capacity through dynamic network pricing in a growing two-sided market.

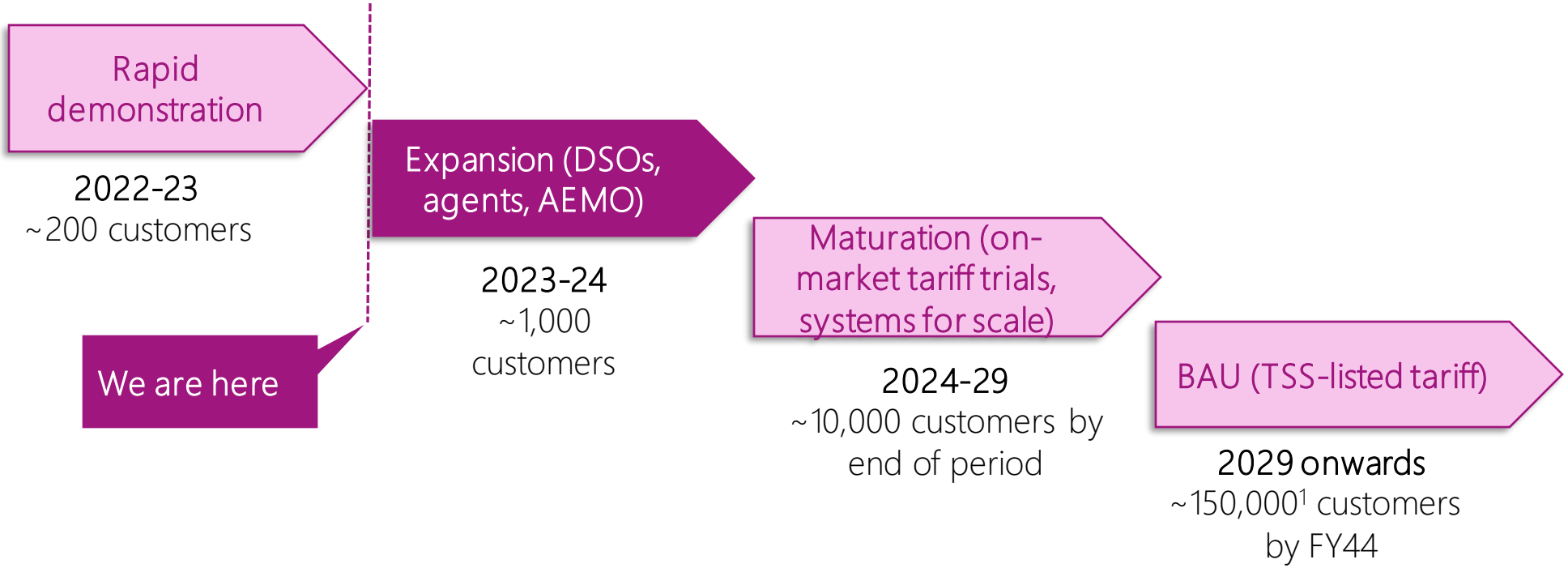
To highlight and inform key areas in operationalising this model, such as interaction with operating envelopes, appropriate pricing principles and associated regulatory reform.

To engage and share insights within industry and to work together to deliver efficient electricity services to customers.

Lifecycle of a dynamic price



Path to implementation



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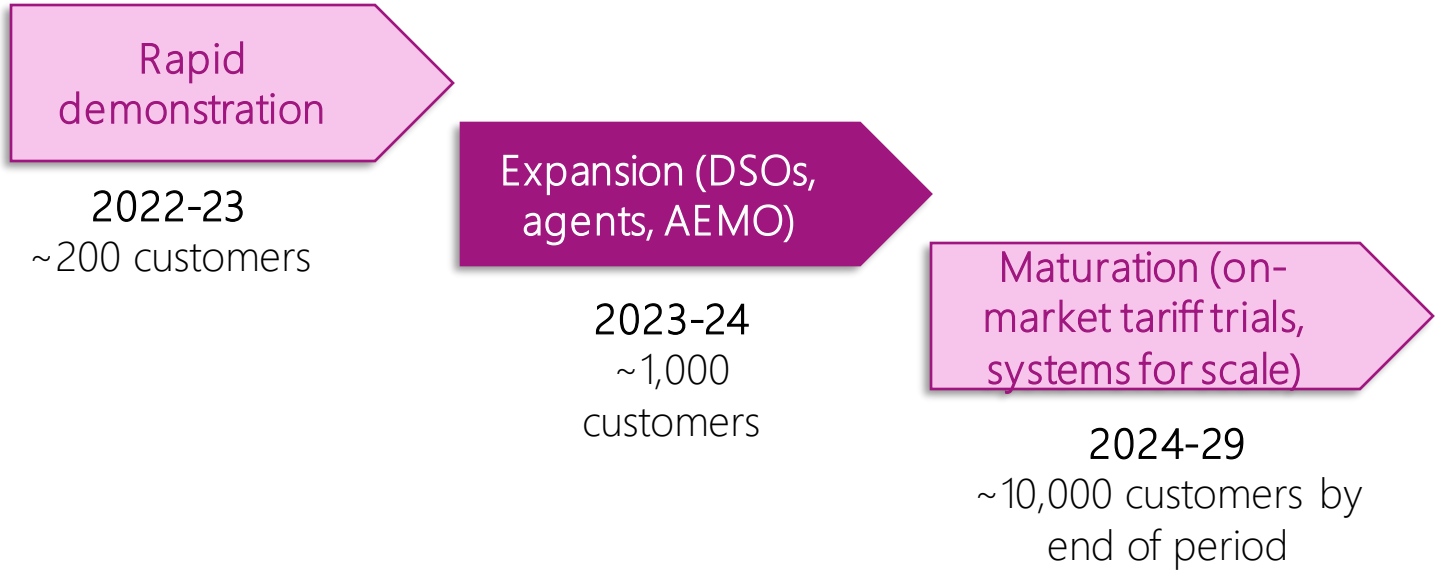
Path to implementation



What are we trying to learn?

Rapid demonstration

2022-23

- ✓ Can dynamic pricing be supported by modest adaptions of **existing systems?**
- ✓ Will **stakeholders support** the concept and encourage us to pursue it further?

Expansion (DSOs, agents, AEMO)

2023-24

- Can we **scale** the concept?
- Do we have **'product-market fit'?**
- Can we **build consensus** around the **preferred approach** to market integration of CER?

Maturation (on-market tariff trials, systems for scale)

2024-29

Can we create:

- an end-to-end dynamic pricing system facilitating customer flex, **sufficient for investment planners to rely upon?**
- Where the pricing is **equitable** (accepted by customers) and **supported** by updated **regulations** (rule change + guideline)

Ausgrid

Key activities

Expansion (DSOs, agents, AEMO)

2023-24

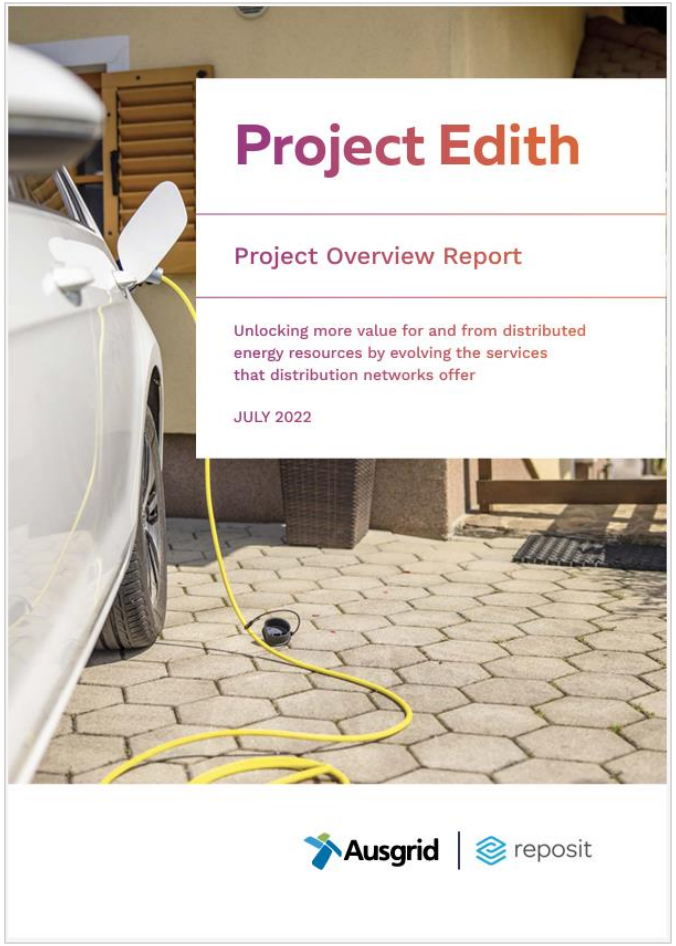
- ✓ > 10 expressions of interest from customer agents
- Progressing to contract with a selection representing > 1000 customers
- Discussions with other networks
- Scoping potential customer research activity

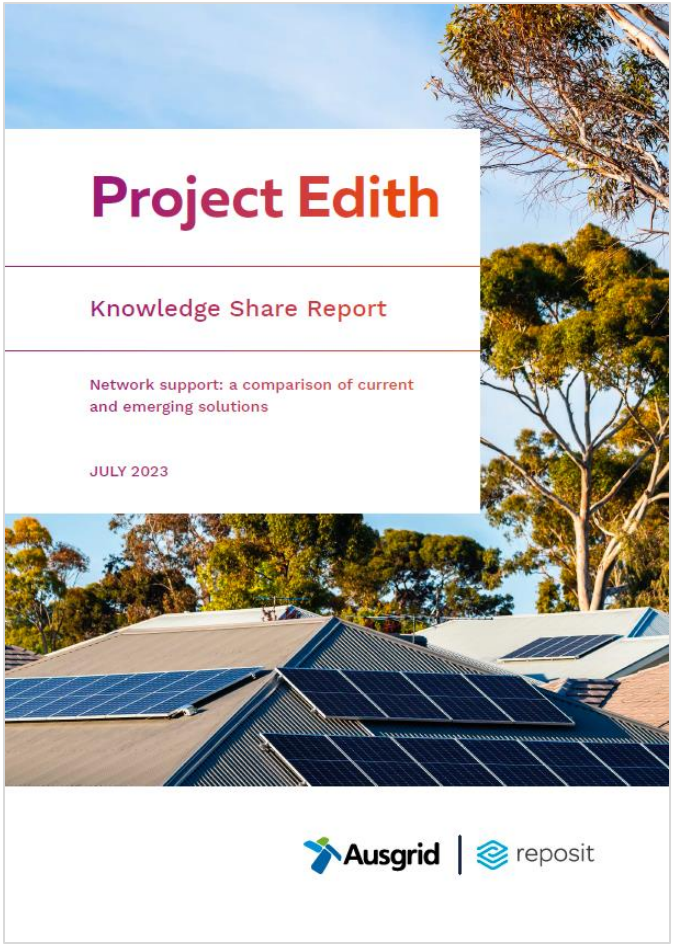
Maturation (on-market tariff trials, systems for scale)

2024-29

- Investment of core dynamic services as per 2024-2029 regulatory proposal
- Pursue required rule change and regulatory guidelines

Knowledge sharing





Ausgrid

Further info: https://www.ausgrid.com.au/About-Us/Future-Grid/Project-Edith

Project Symphony

Our energy future

MARKET STREAM

Project Symphony: What's next

DEIP Dive

July 2023

Presented by: Andrew Blaver

In partnership with:

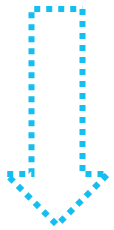
western power synergy AEMO GOVERNMENT OF WESTERN AUSTRALIA Energy Policy WA

Acknowledgement of Country

We acknowledge the Traditional Owners of the land on which we meet, the Gadigal of the Eora Nation and we also acknowledge the Traditional Owners of the land on which the project will operate the Whadjuk people and recognise their continuing connection to lands, waters, and communities. We also pay our respects to Elders past, present and emerging.

Project Symphony: “the pilot to end all trials”

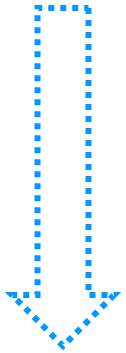
Feasibility



~18 months

- Technically feasible
- Barriers to accessing and distributing value persist
- A step change in the customer journey is required

Viability



~2027

- “Team SWIS”
- Lessons learnt (and implemented!)
- Technical: interoperable, available & reliable
- Quantify, communicate and reduce barriers to actual value of orchestration for all participants
- Customer: “it takes a village”
- Policy: side by side

Scalability

- Customers participating in multi-services
- Technical: mature and consolidated
- Financially sustainable

Project Symphony
Our energy future

In partnership with:
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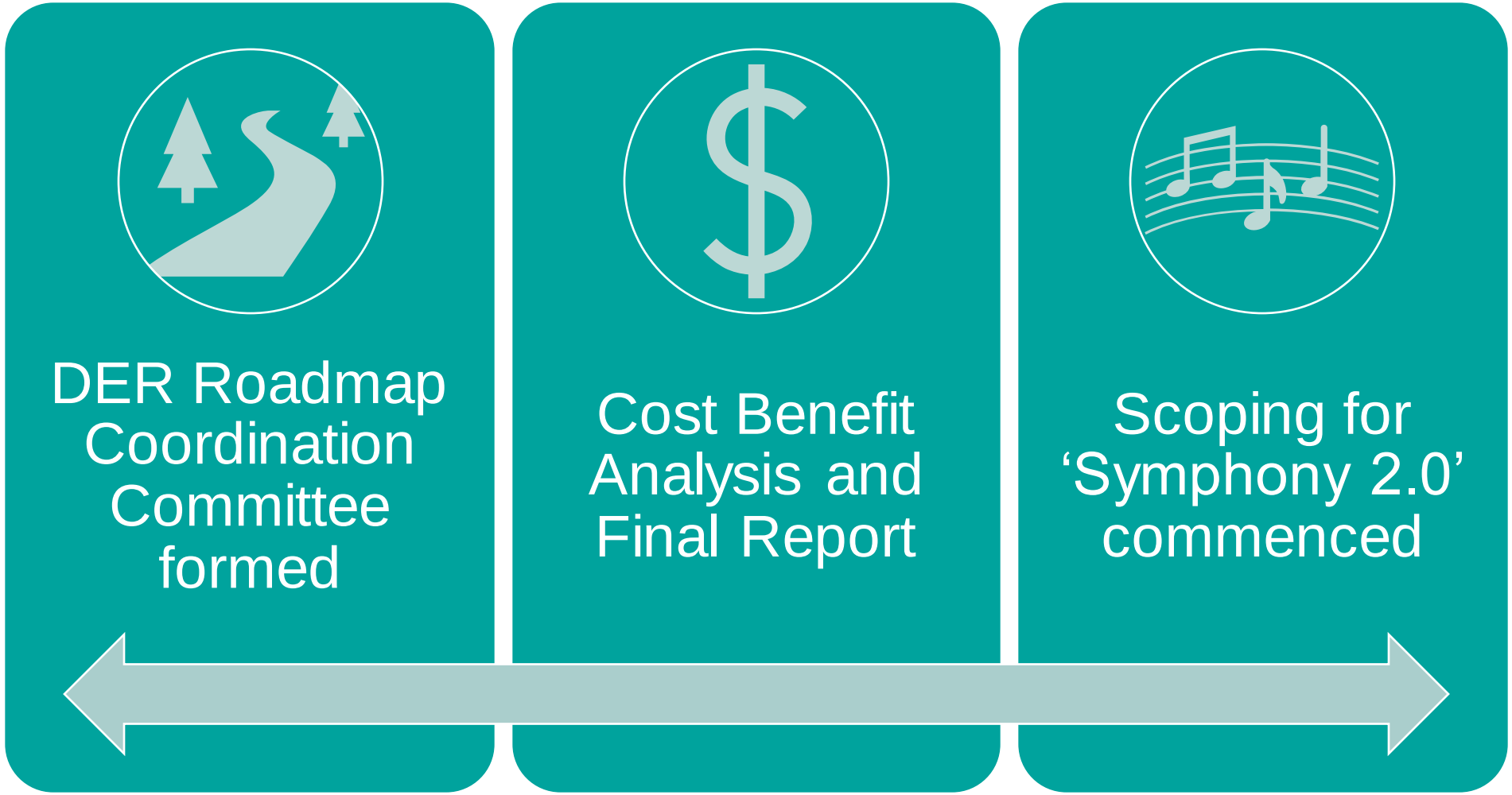
synergy
AEMO
Government of Western Australia
Energy Policy WA

Project Symphony: The ‘Encore’®



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Energy Policy WA

Project Converge

Eddie Thanavelil
Future Network Portfolio Lead, Evoenergy

Project converge

Enables network efficiency by allocating dynamic (5min increment) network capacity to individual generating customers.

In comparison with the Static Operating Limit which allocates fixed maximum limits.

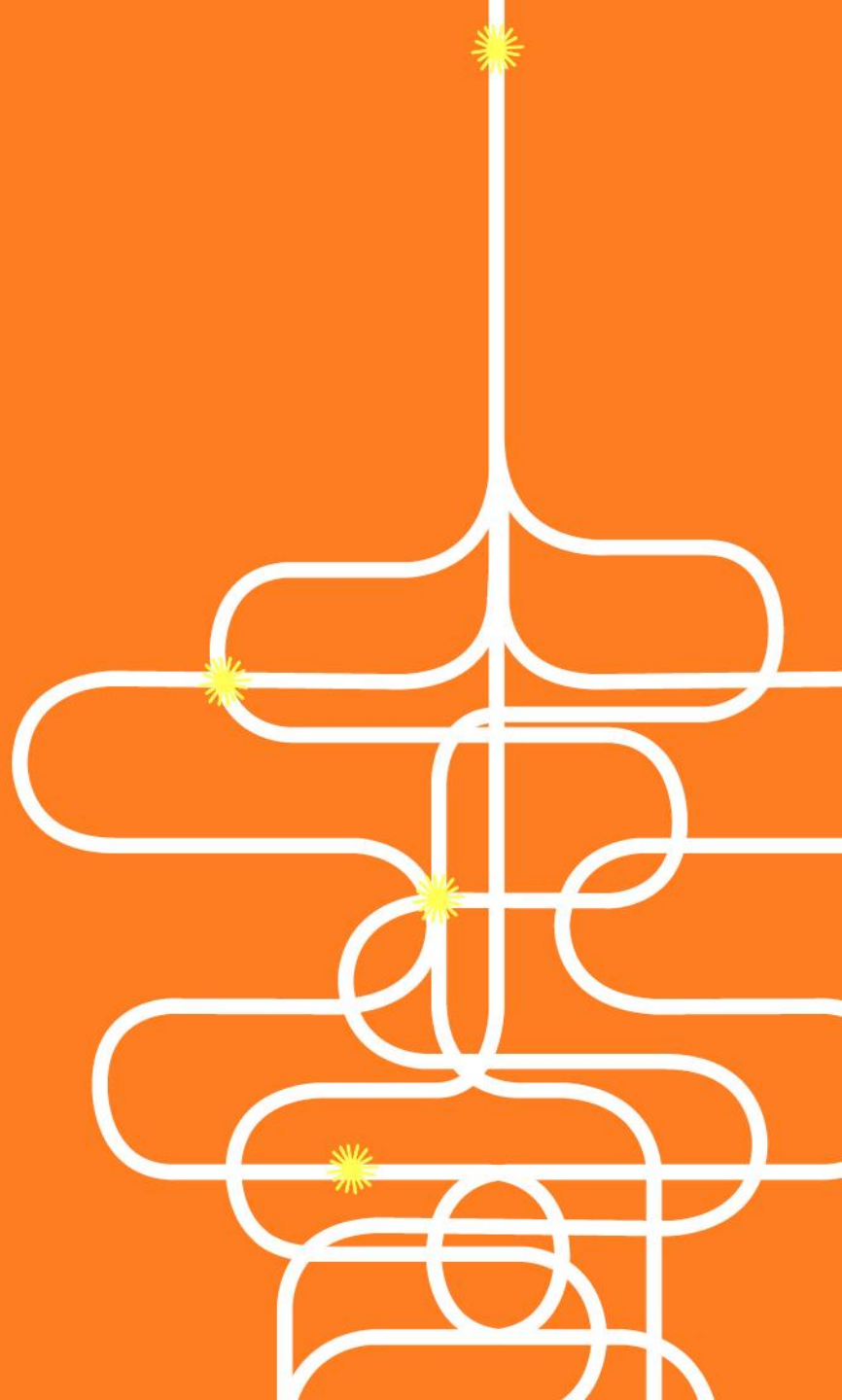
Merit order based operating envelopes – Shaped Operating Envelopes (SoEs).

Offsets network augmentation and drives down electricity prices.

Next Steps

CONVERGE

Network Decision Frameworks



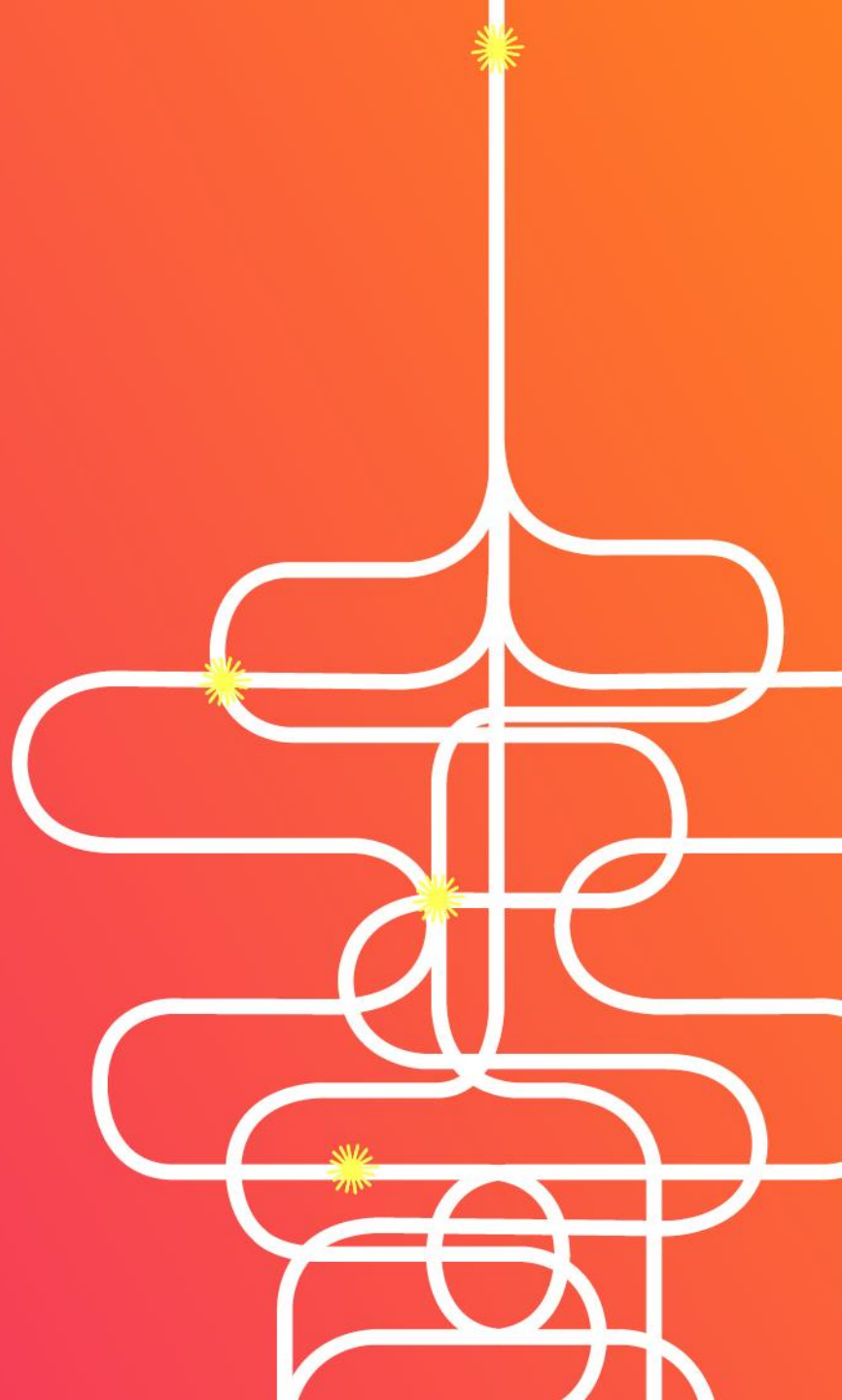
Real Time Investment Decisions

- Learn from the RIT-D principles and frameworks
- Existing DER capabilities are factored in the network investment
- Forecast network constraints – potentially a year to month ahead
- Forecast likely response from DER (under the operation of SOEs) and then identify any residual constraints
- DSO Planning Capability – people and tools, embedded into processes

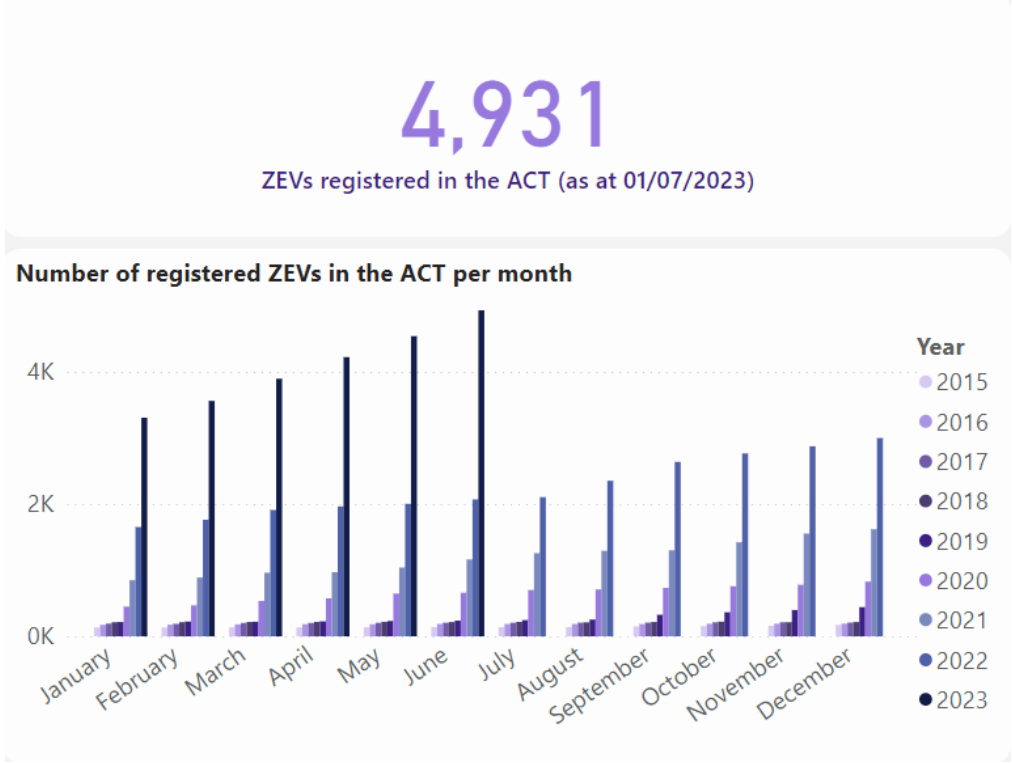
What have we learned

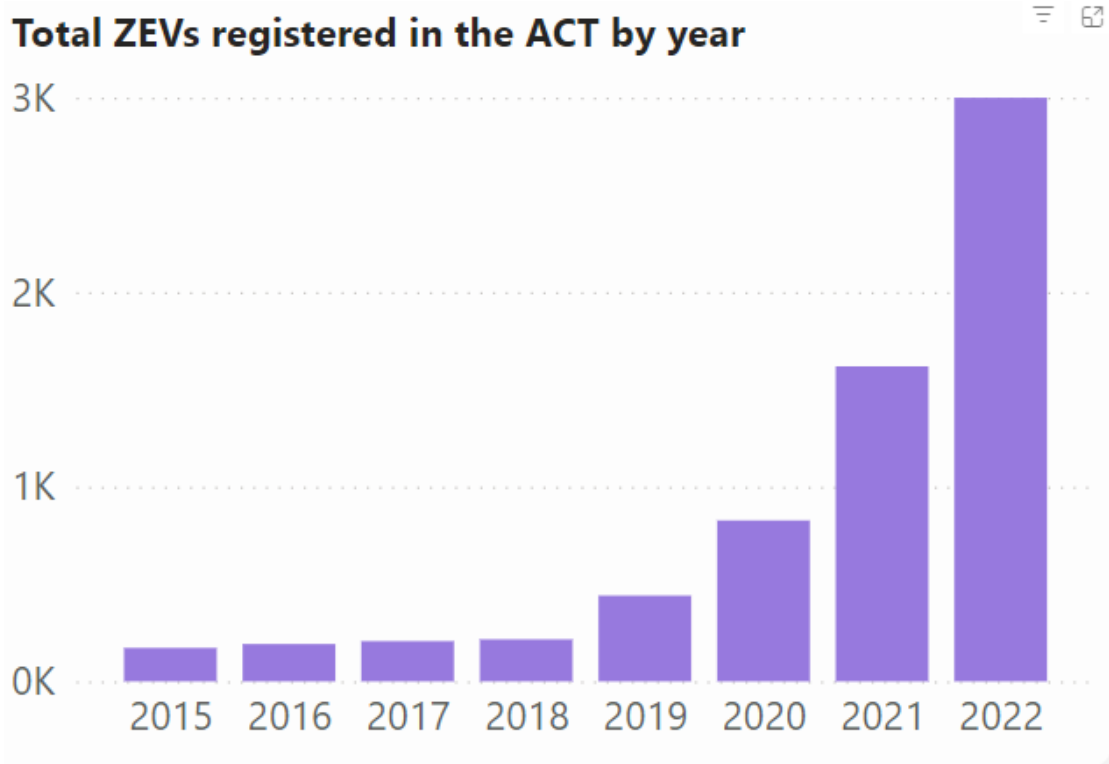
Learnings

- CER/DER Agents are the target audience as much as the consumer/prosumer
- Many ways to skin a cat. Pricing, tariffs, optimising with sentient AI etc
- Fairness and equity – lower energy prices.



ACT EV up-take higher than expected

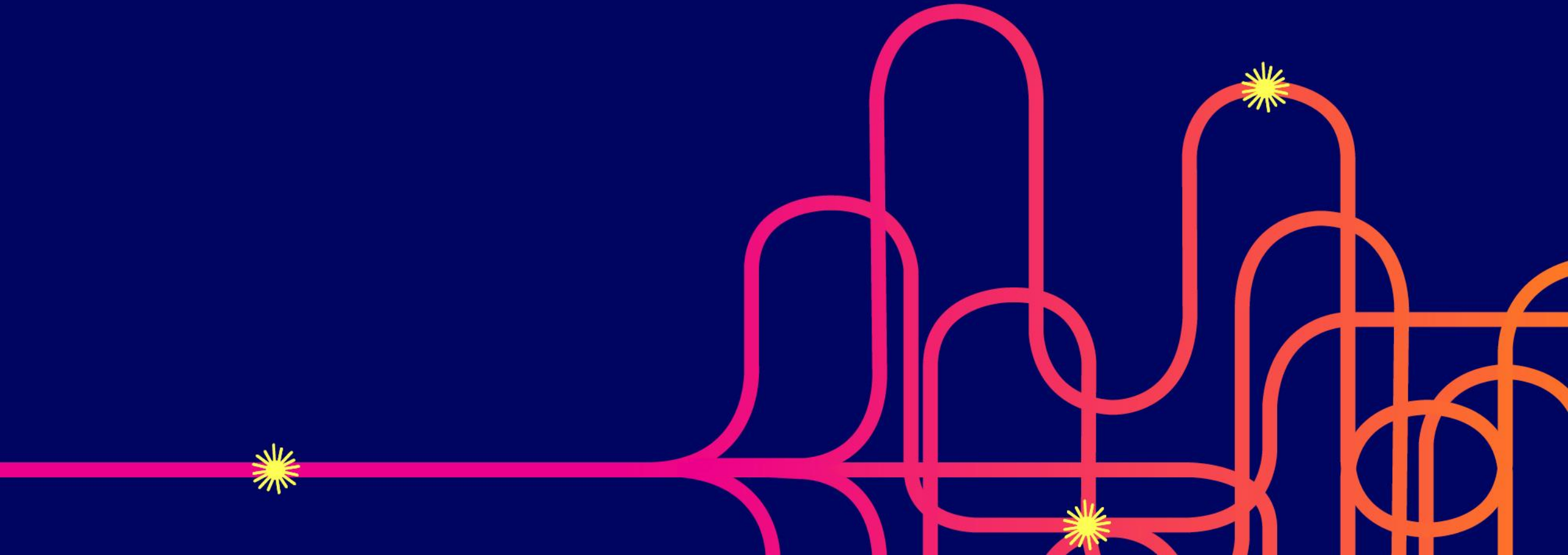




https://www.climatechoices.act.gov.au/transport-and-travel/cars-and-vehicles

CONVERGE

Thank you.



Thank you

DEIP

DISTRIBUTED ENERGY INTEGRATION PROGRAM