How are kerbside chargers used?

Insights from the Eastern Suburbs Charging Network

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Background

Electric vehicles (EV) reduce greenhouse gas & particulate pollution, as well as national fuel security & economic vulnerabilities.

Kerbside charging networks are critical infrastructure for EVs. They enable people who lack access to private charging (at home or work) to adopt EVs. Additionally, research consistently finds that they are vital to giving all drivers (including those with private chargers) confidence for travel and backup uses.

This report presents insights into the usage of a kerbside charging network in the Eastern Suburbs of Sydney, Australia. The data underpinning these insights is publicly available at https://doi.org/10.5281/zenodo.19233669

Disclaimer

The views expressed in this report are those of the authors alone.

As part of this research project, Waverley, Woollahra and Randwick Councils only shared usage data about the public electric vehicle chargers which they own and operate. The views expressed do not necessarily reflect the views of Waverley, Woollahra and Randwick Councils.

This project was funded by Energy Consumers Australia as part of its Grants Program to support consumer advocacy and research projects that benefit of household and small business consumers. The views expressed do not necessarily reflect the views of Energy Consumers Australia.

Reference

Teymouri, A., Kelley, S., Weinberg, A., Sturmberg, B. C. P., 2026. *Analysis of kerbside electric vehicle charging in Sydney, Australia*. University of New South Wales.

Executive summary

Kerbside charging is critical public infrastructure – for locals & visitors

What makes good kerbside charging sites?

Essential features

- Have dedicated EV parking spaces
- Are close to apartments & shops

A sweet spot

30-50kW DC chargers with **2hr dedicated EV parking restrictions appear to be ideal.** These:

- **can fully charge a typical EV in 2hrs,**
- are more convenient & more frequently used than AC,
- are cheaper than (100kW+) ultra-fast DC chargers,
- delivered on average 4 times the energy of AC sites

Next steps

Through the next phase of EV uptake, kerbside charging should be expanded to maintain ratio of 1 charging space per 70 local EVs

Research & innovation is needed to shift kerbside charging demand form grid peak hours (currently 30% of demand)

Outline

1. Introducing the Eastern Suburbs Charging Network
2. Insights from the charging data
   a) Where are drivers coming from?
   b) When is the network used?
   c) Utilisation patterns of the AC and DC charging spaces
   d) Variation between sites
   e) Factors influencing usage
3. Policy implications
4. Data description
5. Methods

Eastern Suburbs Charging Network

A council owned network

Waverley, Woollahra, Randwick councils

Eastern Suburbs Charging Network

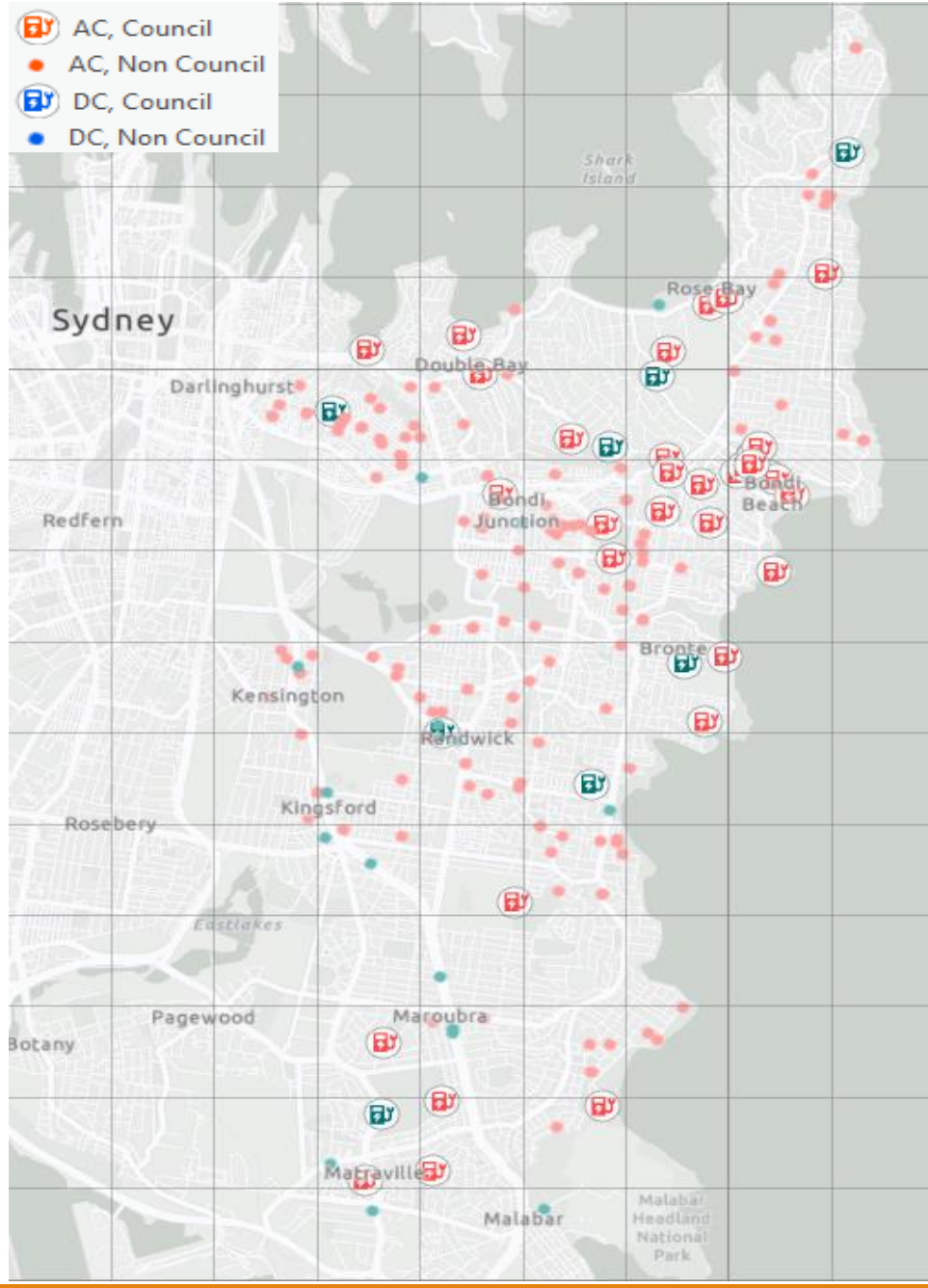
- 35 AC sites with 74 charging spaces
- 9 DC sites with 20 charging spaces
- 27,176 charging sessions in 6 months to end February 2026

Other providers in the area

- 128 AC sites
- 17 DC sites

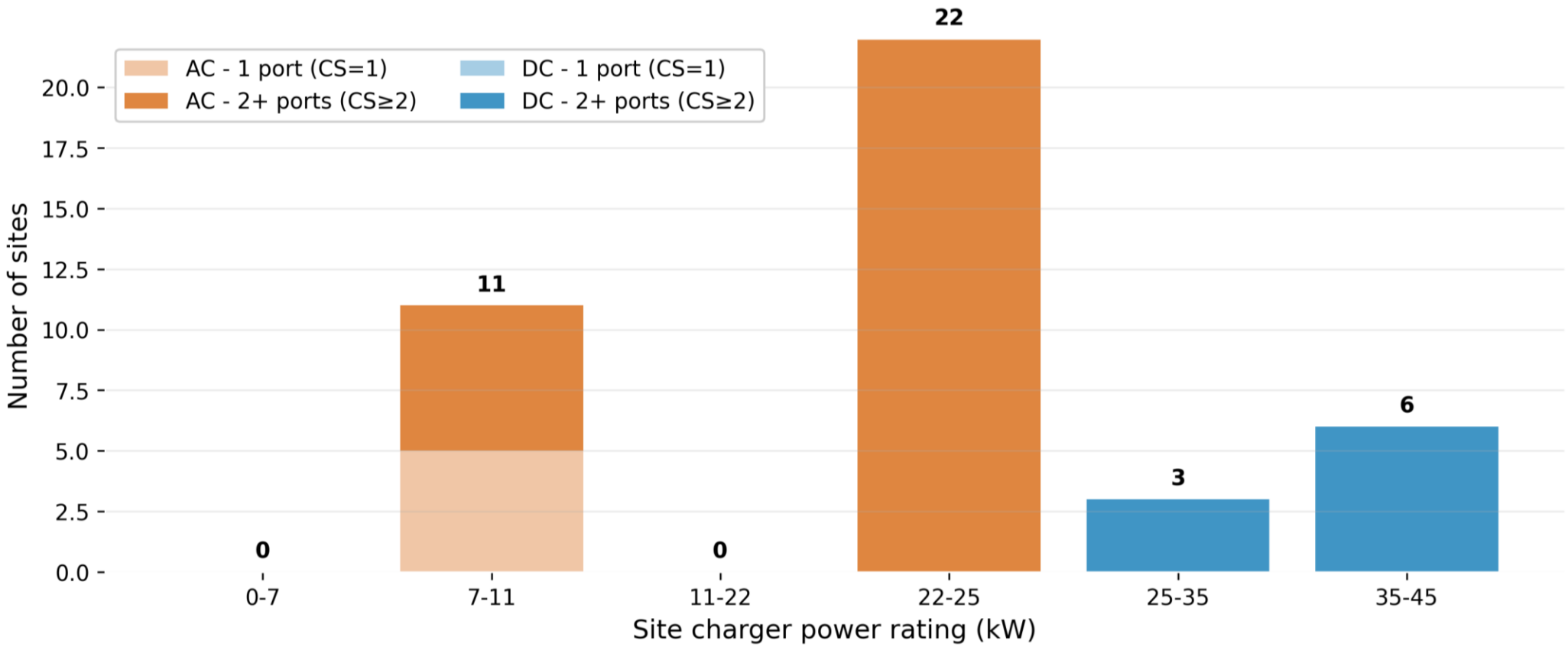
In mid-2025

- the councils added numerous DC sites and converted some AC sites to DC
- other providers also added many sites as part of the NSW Kerbside Charging Grants



The Eastern Suburbs Charging Network

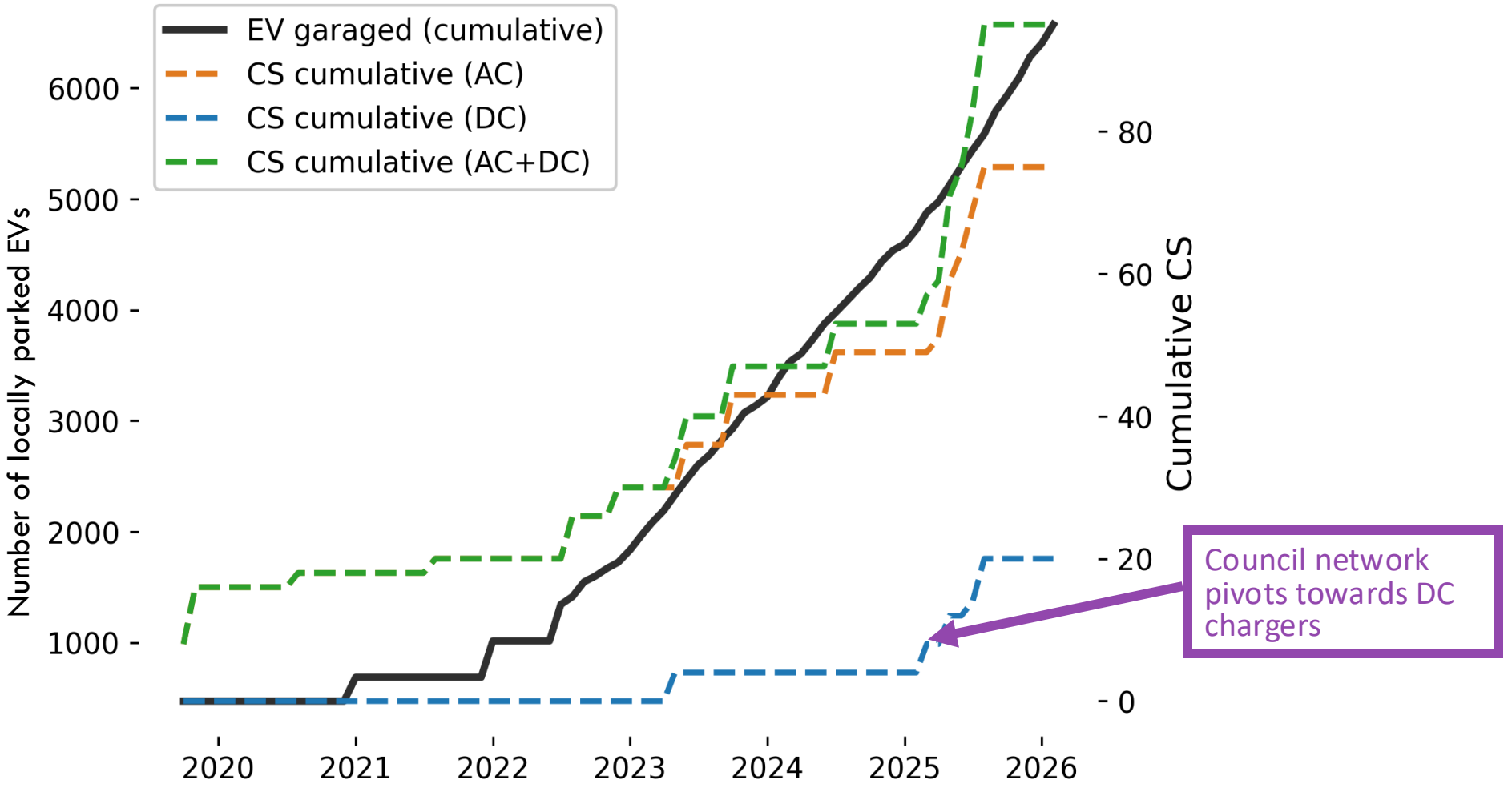
Is a mix of Level 1 & 2 chargers in a variety of charging space* configurations



* we use charging spaces (CS), which is the lesser of the # of charging ports and # of parking spaces

Network expansion has matched EV uptake

Consistently had 1 kerbside charging spaces* per 70 locally parked EVs^



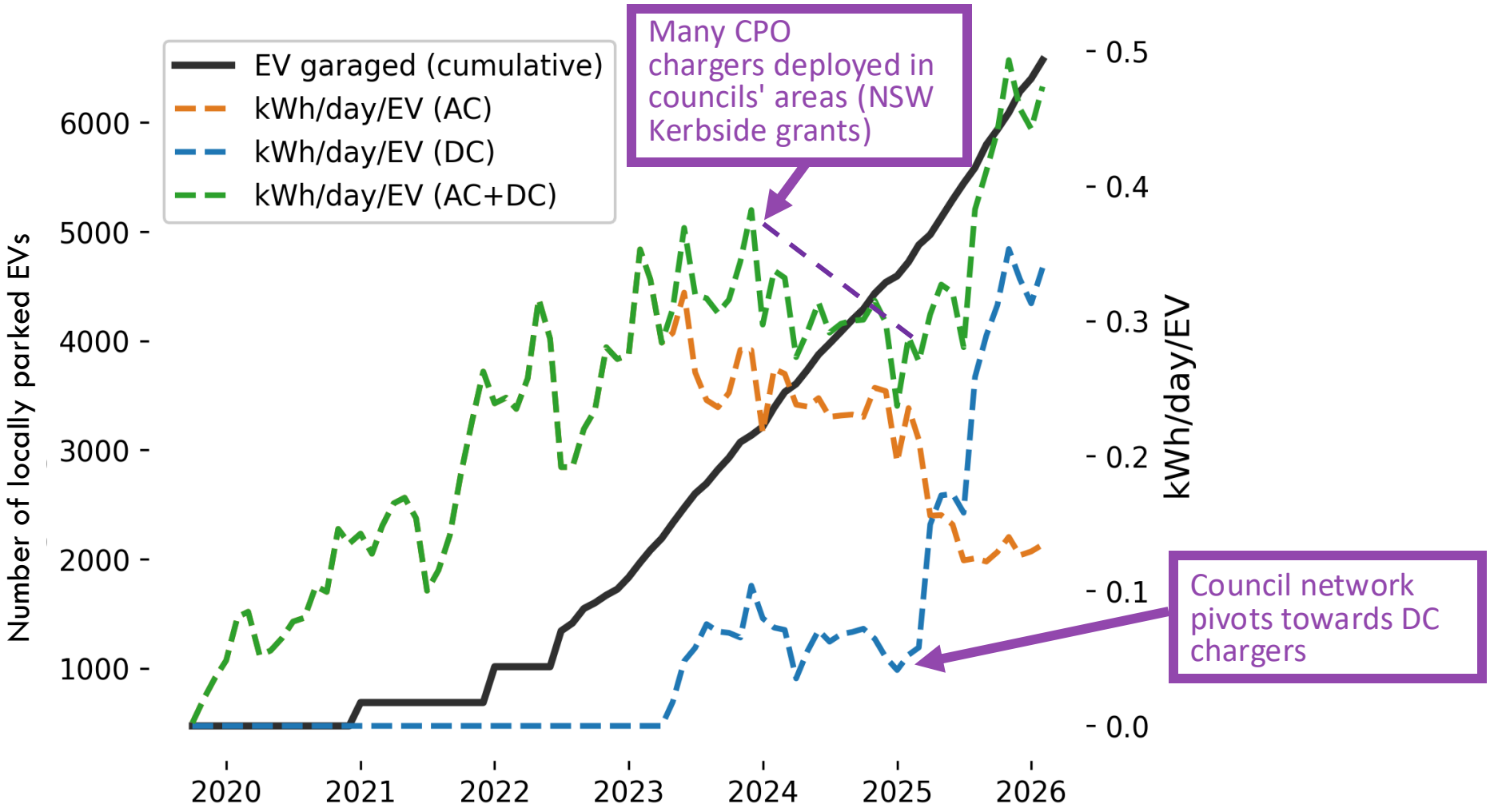
Note: 2020-mid-2022, local EV data is only available annually

* we use charging spaces, which is the lesser of the # of charging ports and # of parking spaces

^ where vehicles are parked is more relevant than where they are registered

Pivot to DC sites majorly increased energy delivery

Lifting daily usage from 0.3 to 0.5kWh/day/local EV^



Note: 2020-mid-2022, local EV data is only available annually

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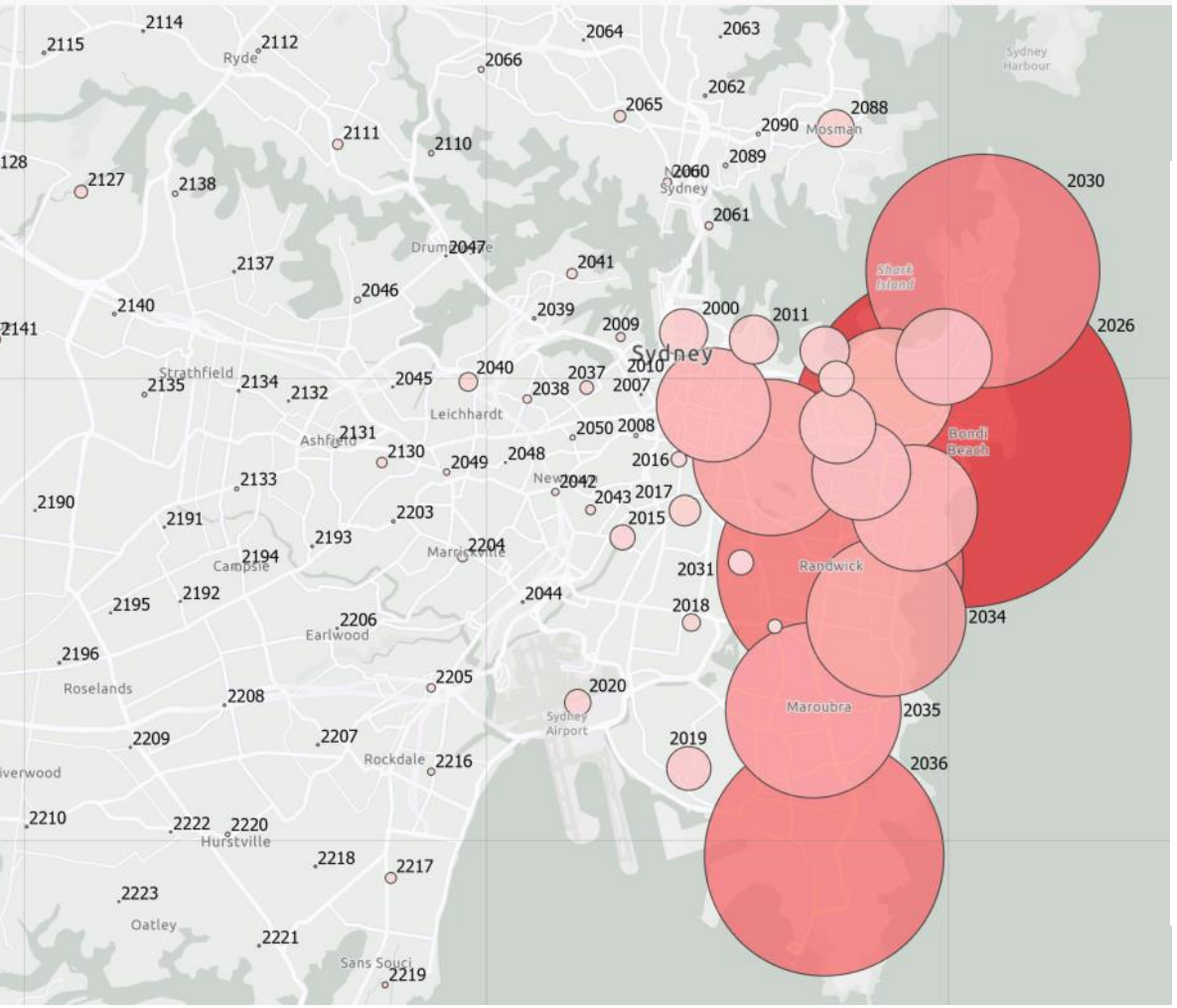
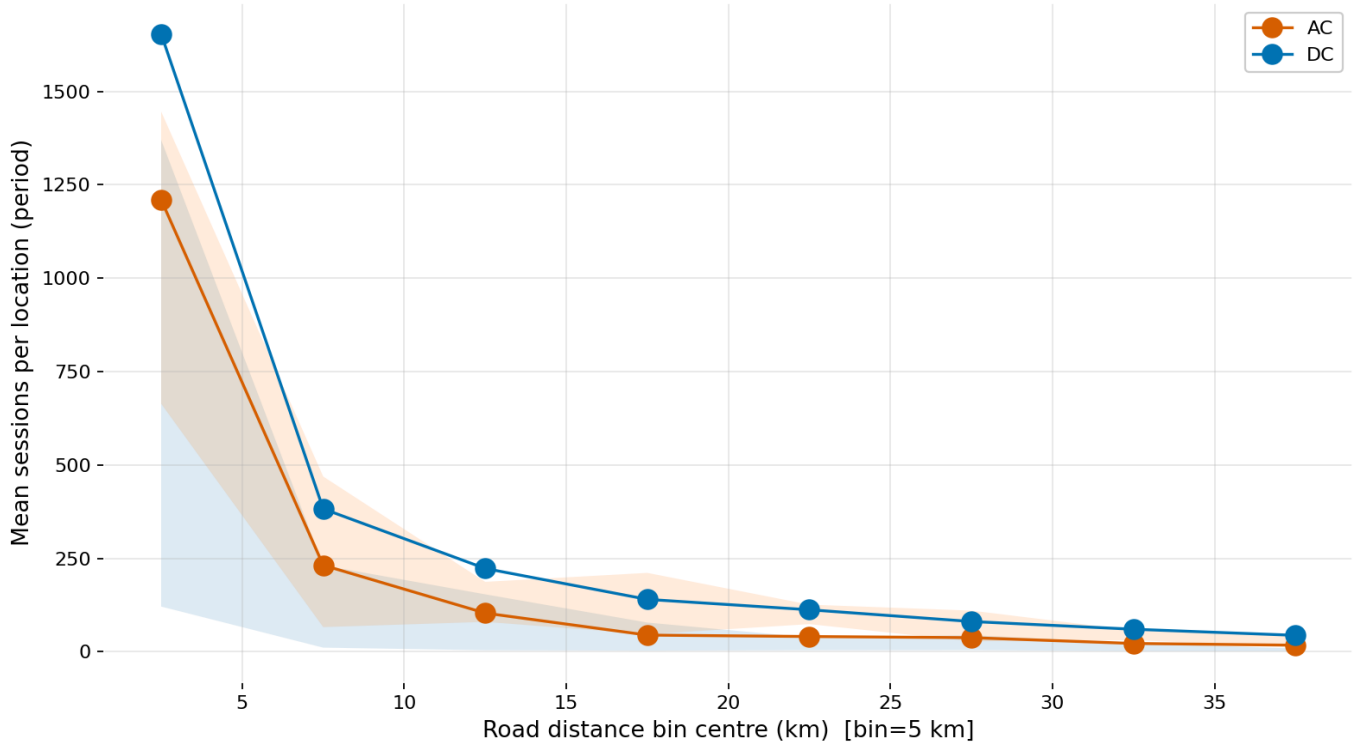
Where are drivers coming from?

The network primarily serves locals

Particularly those who live within 3km*





* the anonymised data limits the granularity with which this can be calculated but the trend is clear

The network also serves intracity visitors

1 in 5 EVs from Parramatta have used the network*

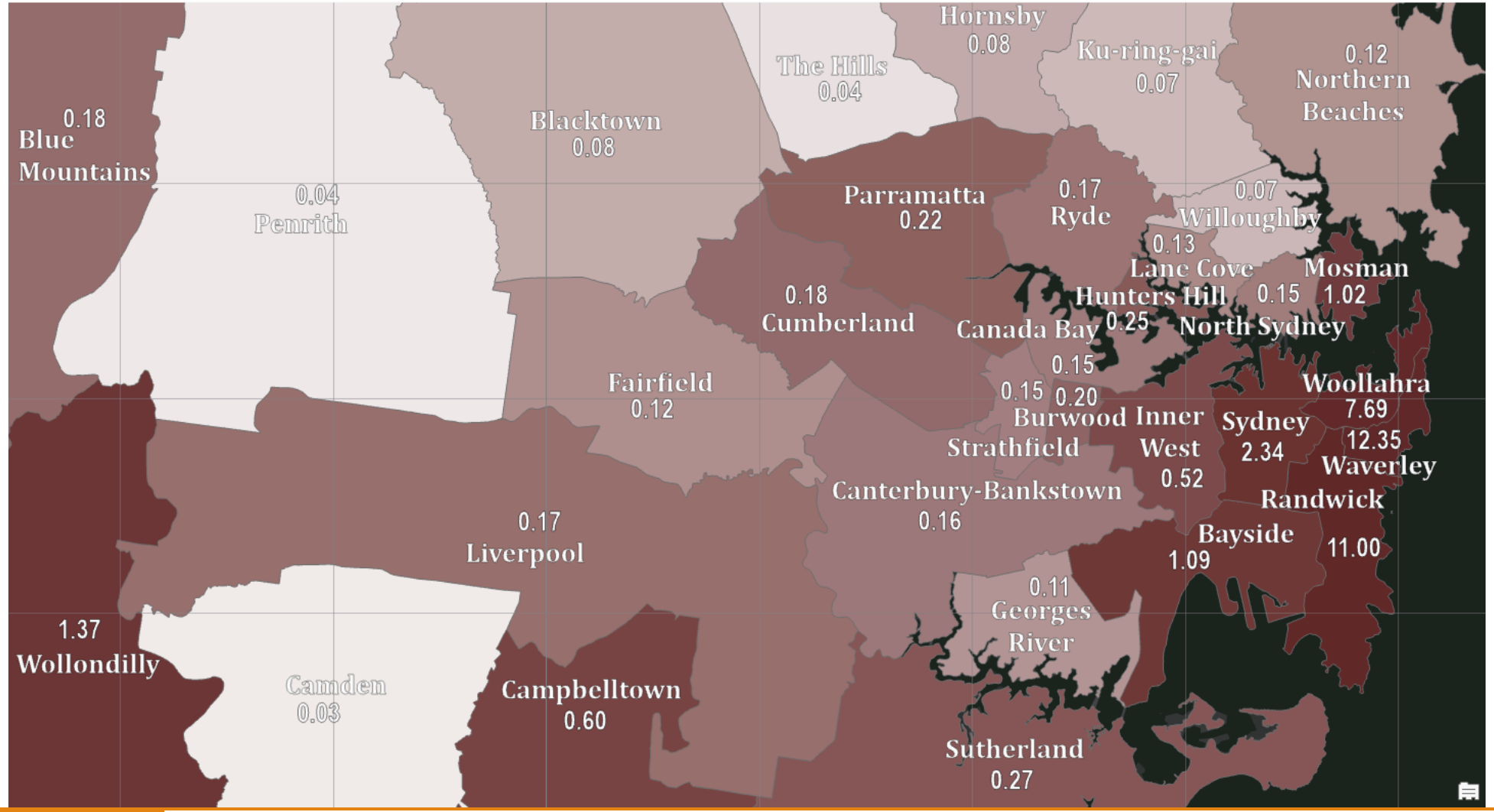


Figure shows # of sessions (since 2019) relative to # of EVs in LGA (in 2025)
* average likely skewed by a few EVs that use the network frequently, while many have never used it

The network also serves visitors from further afield

The average EV from Lithgow has used the network 3 times*

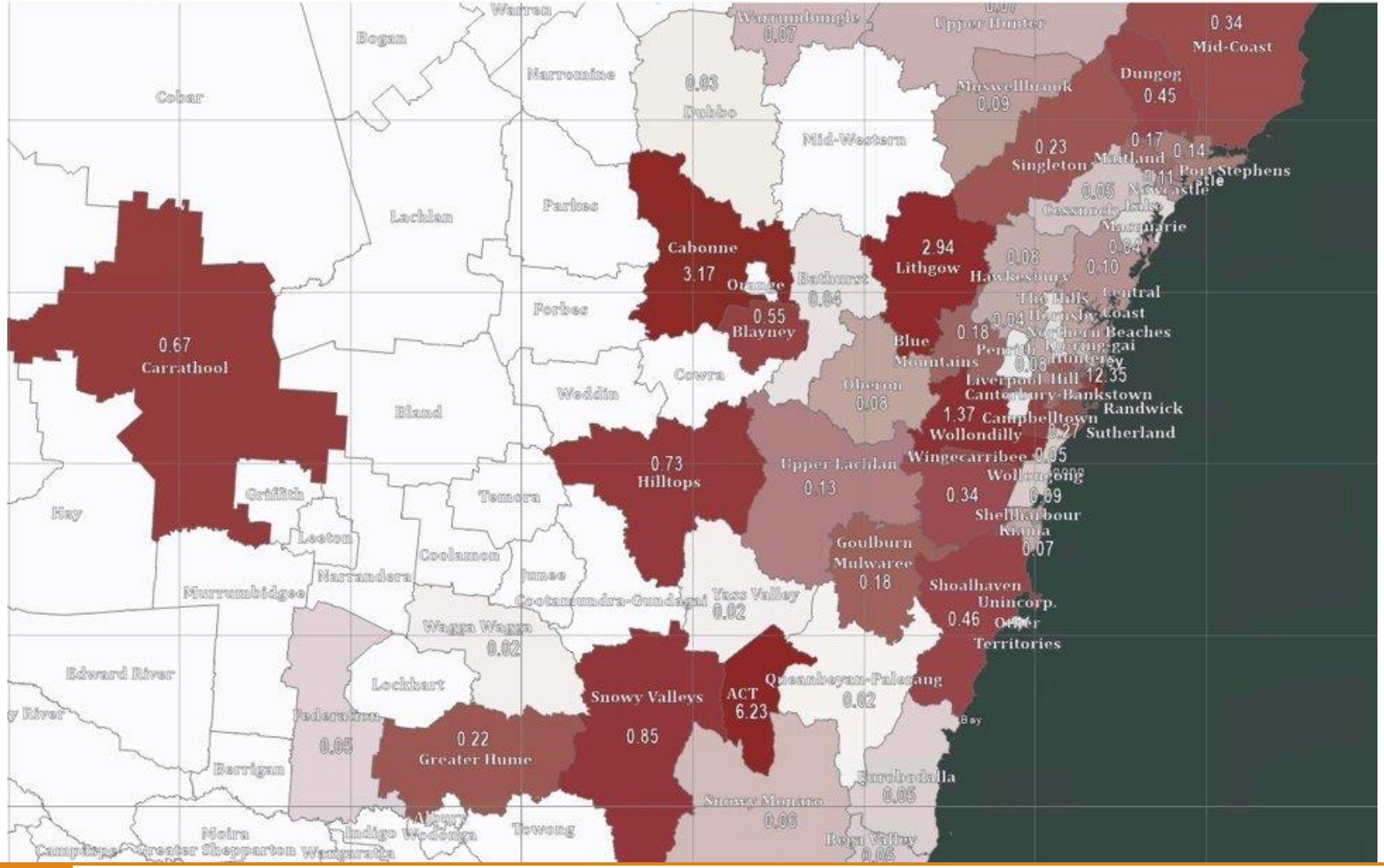


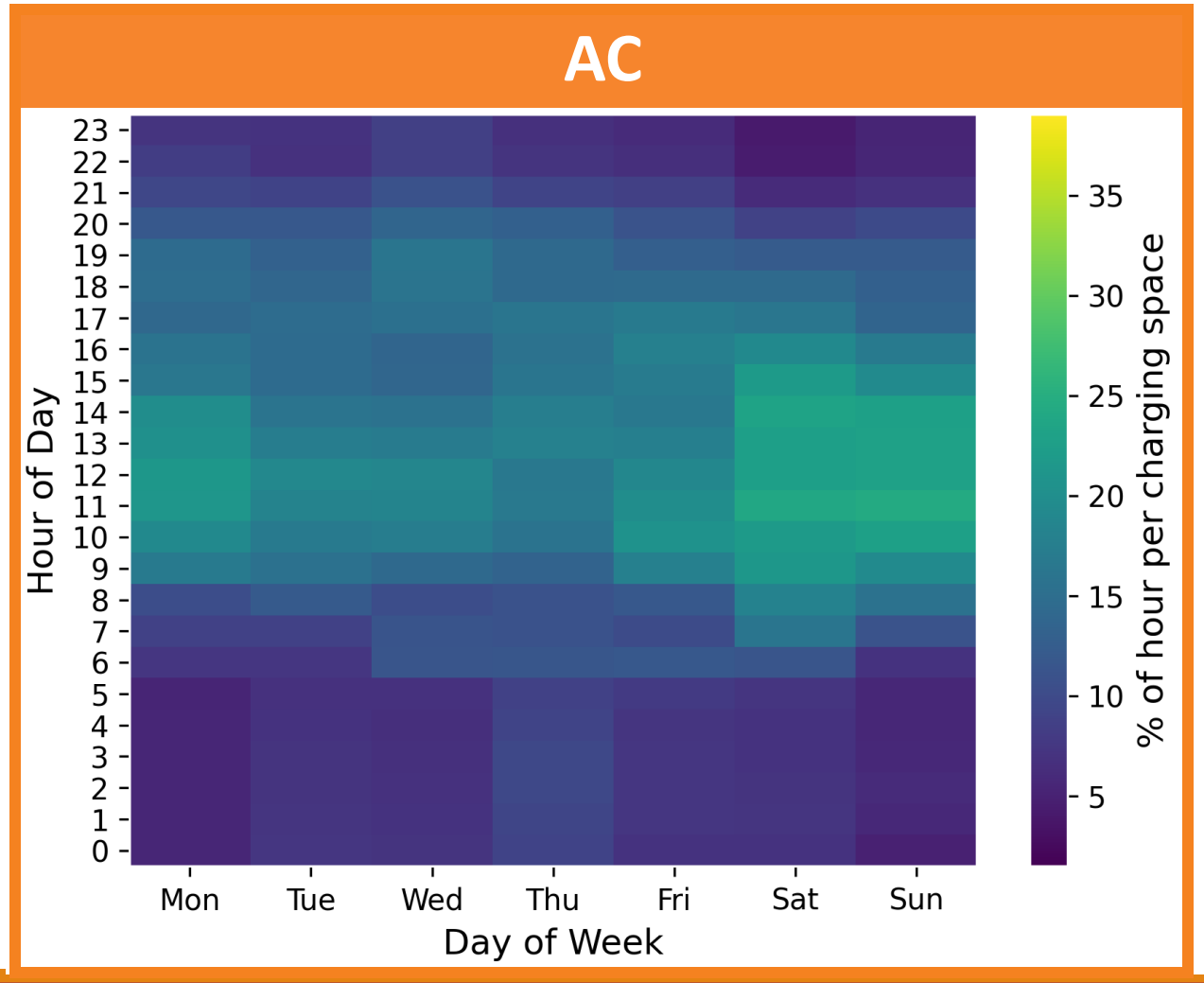
Figure shows # of sessions (since 2019) relative to # of EVs in LGA (in 2025)

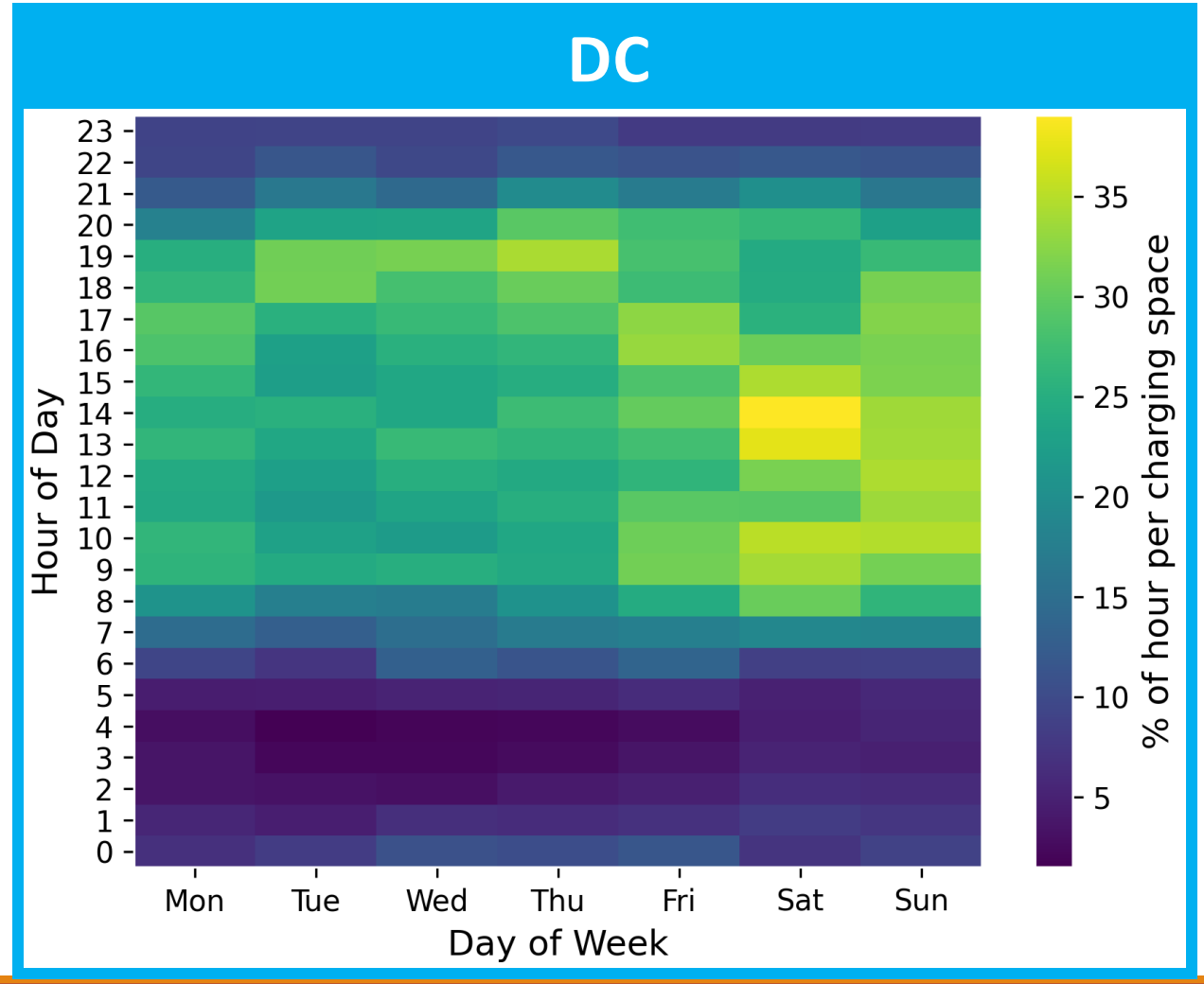
* average likely skewed by a few EVs that use the network frequently, while many have never used it

When is the network used?

Mostly used in the day, mostly Friday to Monday

Slower AC charging sometimes runs over night

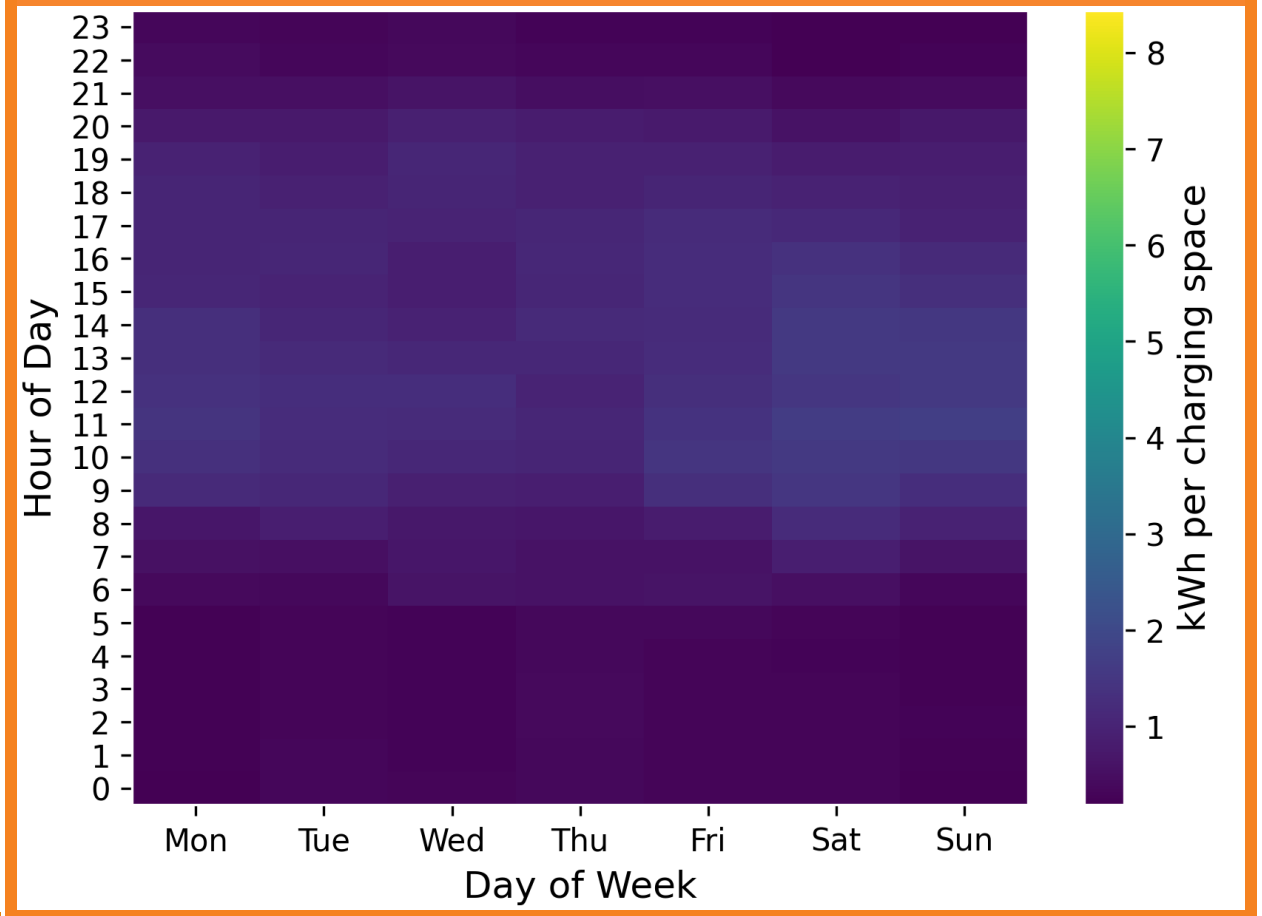




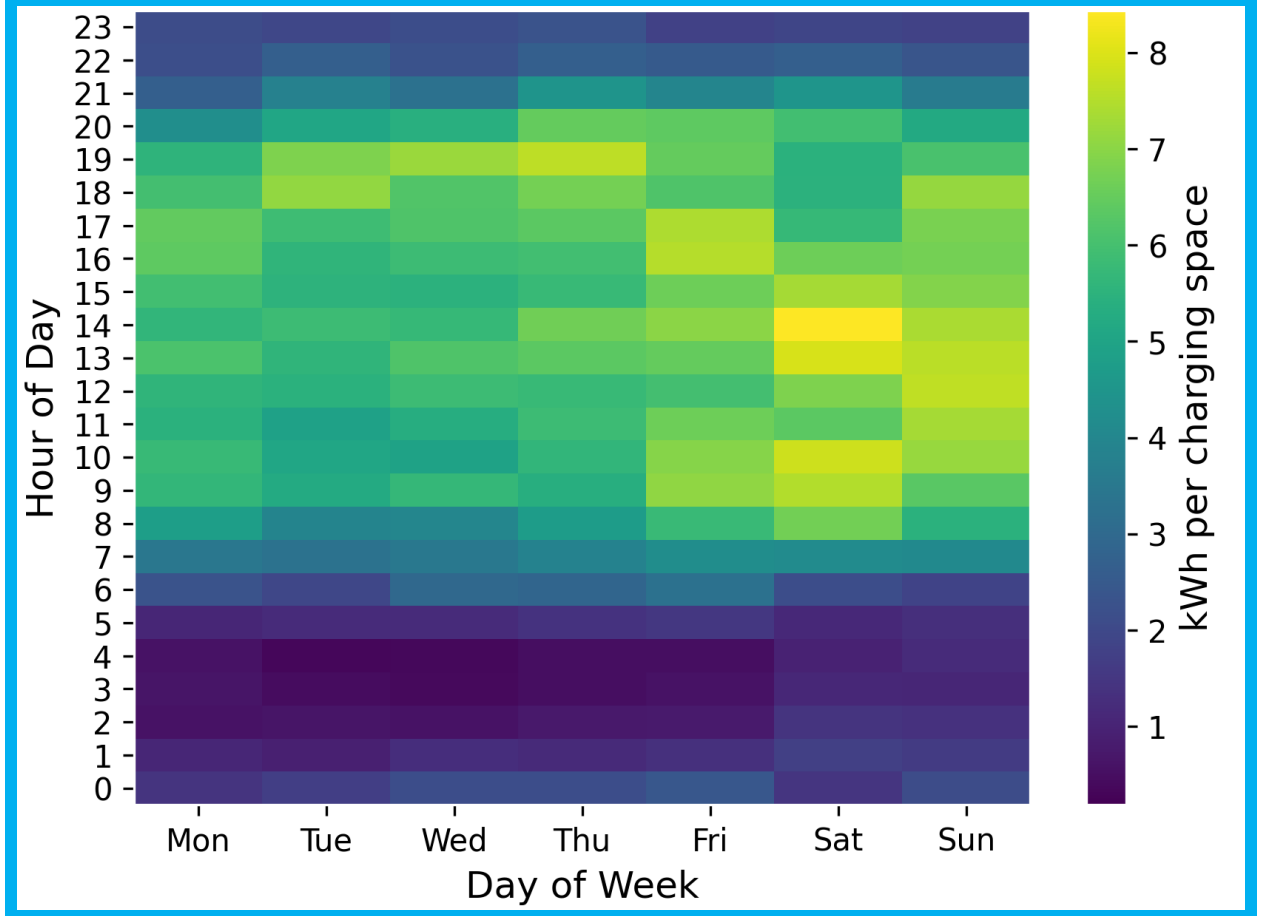
The electricity load profile is dominated by DC

AC places (comparatively) negligible load on grid

AC

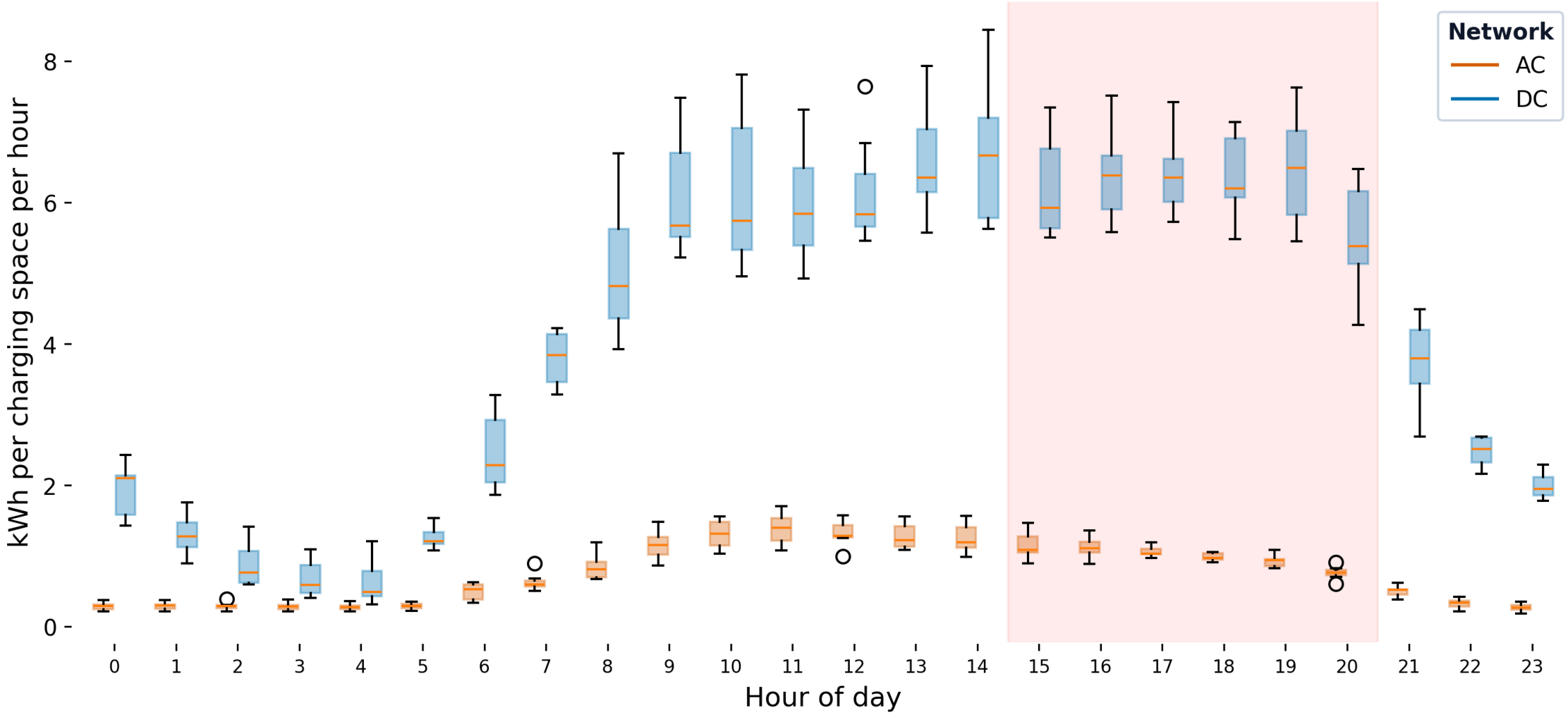


DC



Load is highly concentrated between 8:00-21:00

Mostly sunlight hours, but >30% of load is in evening peak (32% AC, 37% DC)



Utilisation patterns of AC and DC spaces

Note: biased data

This data likely presents an upper bound from region with high demand

Our quantitative analysis is based on data from a kerbside charging network in the Eastern Suburbs of Sydney (that is owned and operated by the 3 local councils).

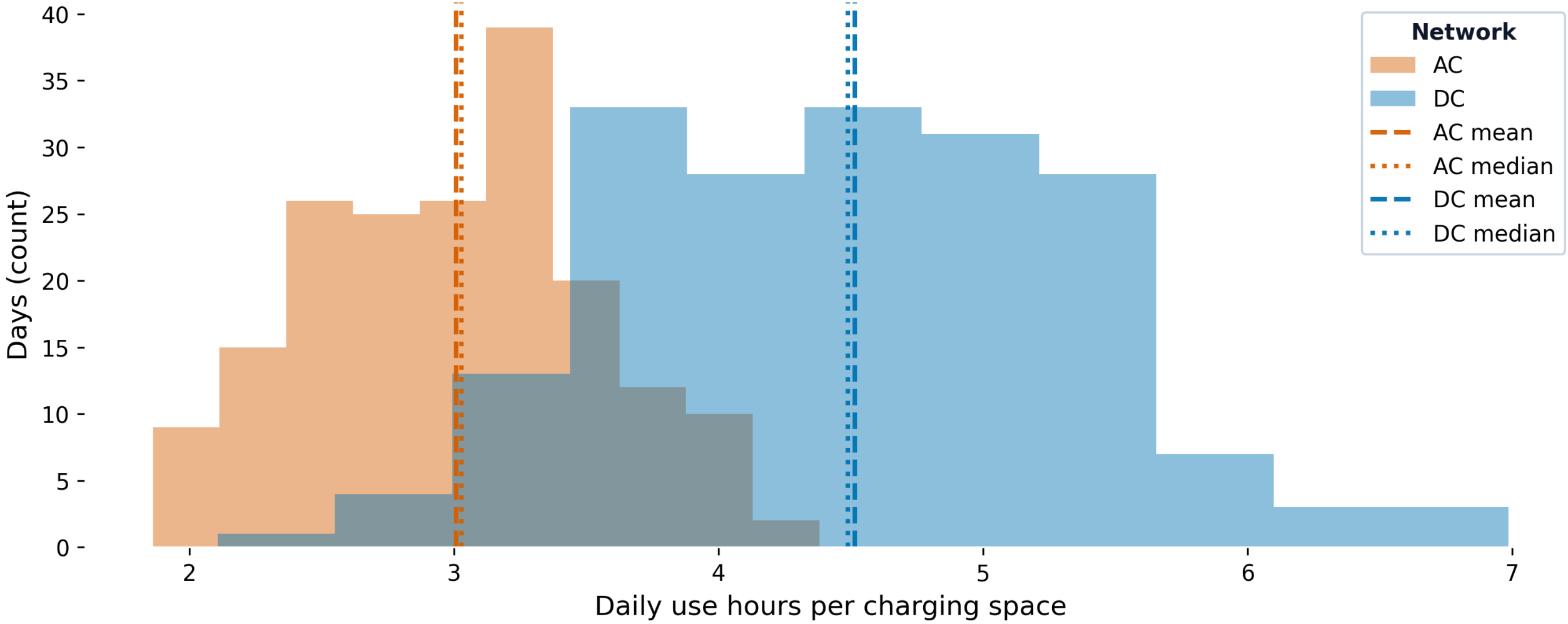
These suburbs have atypically strong demand for kerbside charging because **60% of residents live in apartments or townhouses and 50% rent**. NSW Government estimates most residents will require access to on-street charging (82% in Waverley, 52% in Woollahra, 42% in Randwick)*.

This is important to keep in mind when considering the following analysis. We suggest the **quantitative results are taken as an upper bound on the utilisation & profitability** (at least with current levels of EV uptake).

* Eastern Suburbs Electric Vehicle Infrastructure Strategy 2023 https://hdp-au-prod-app-waverley-yoursay-files.s3.ap-southeast-2.amazonaws.com/3717/0131/6461/Leading_the_Charge_-_Eastern_Suburbs_Infastructure_Strategy_2023.pdf

Daily hours of use varies significantly

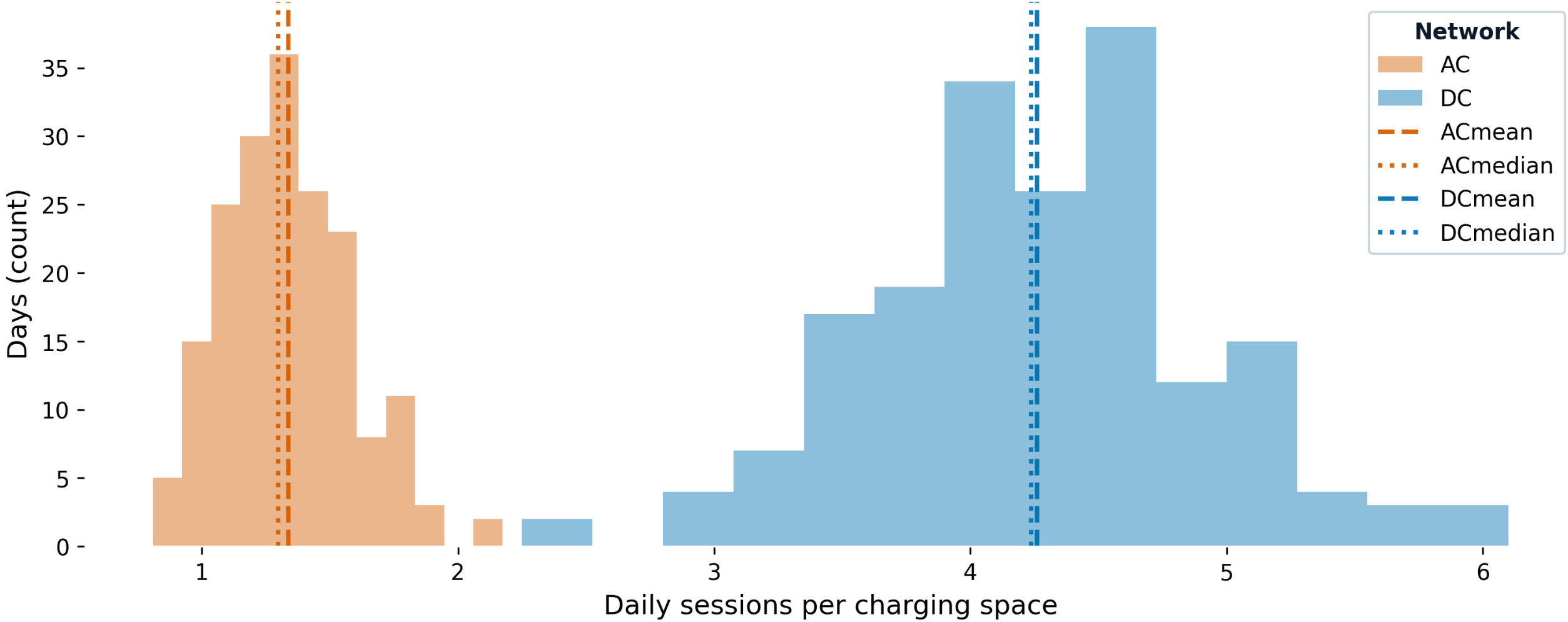
DC spaces* average 4.5hrs a day while AC spaces average 3hrs



* we focus on charging spaces, which is the lesser of the # of charging ports and # of parking spaces

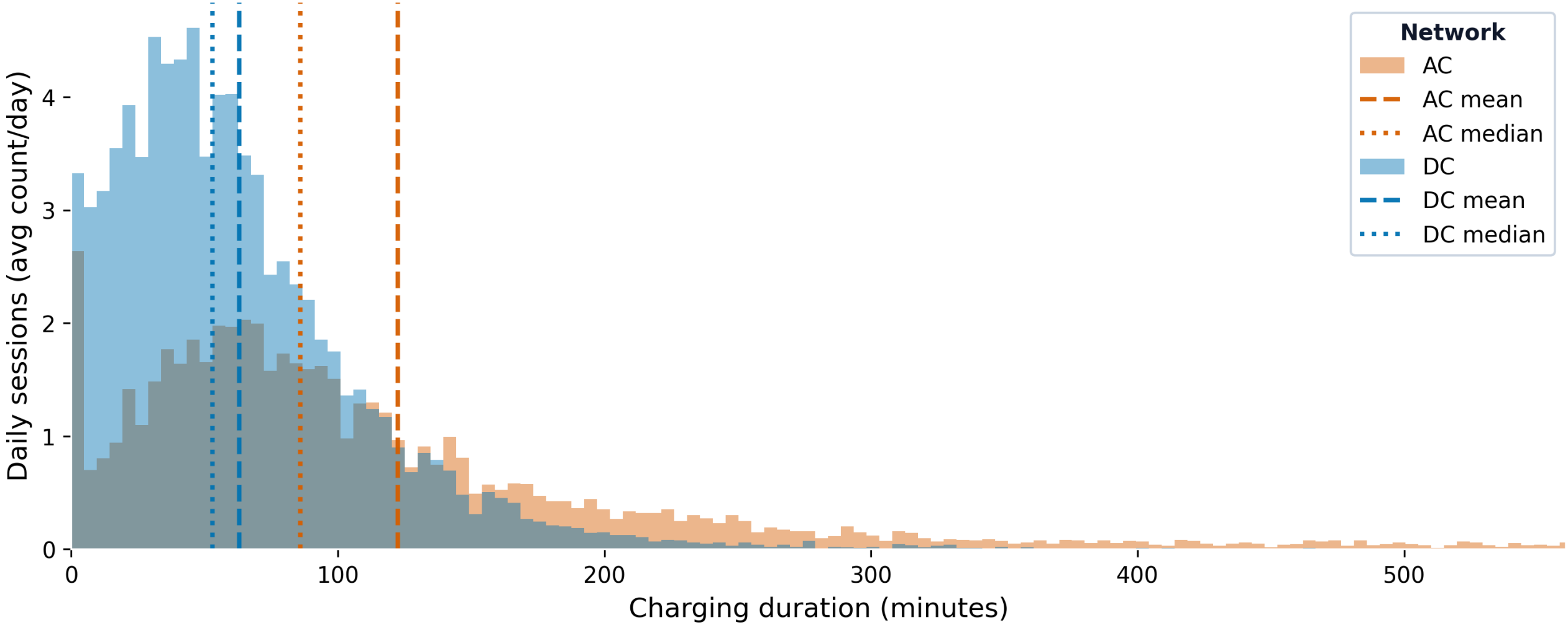
DC charging spaces are used 4 times a day

AC charging spaces are used 1.5 times a day



Average DC sessions last 1hr, AC sessions last 2hrs*

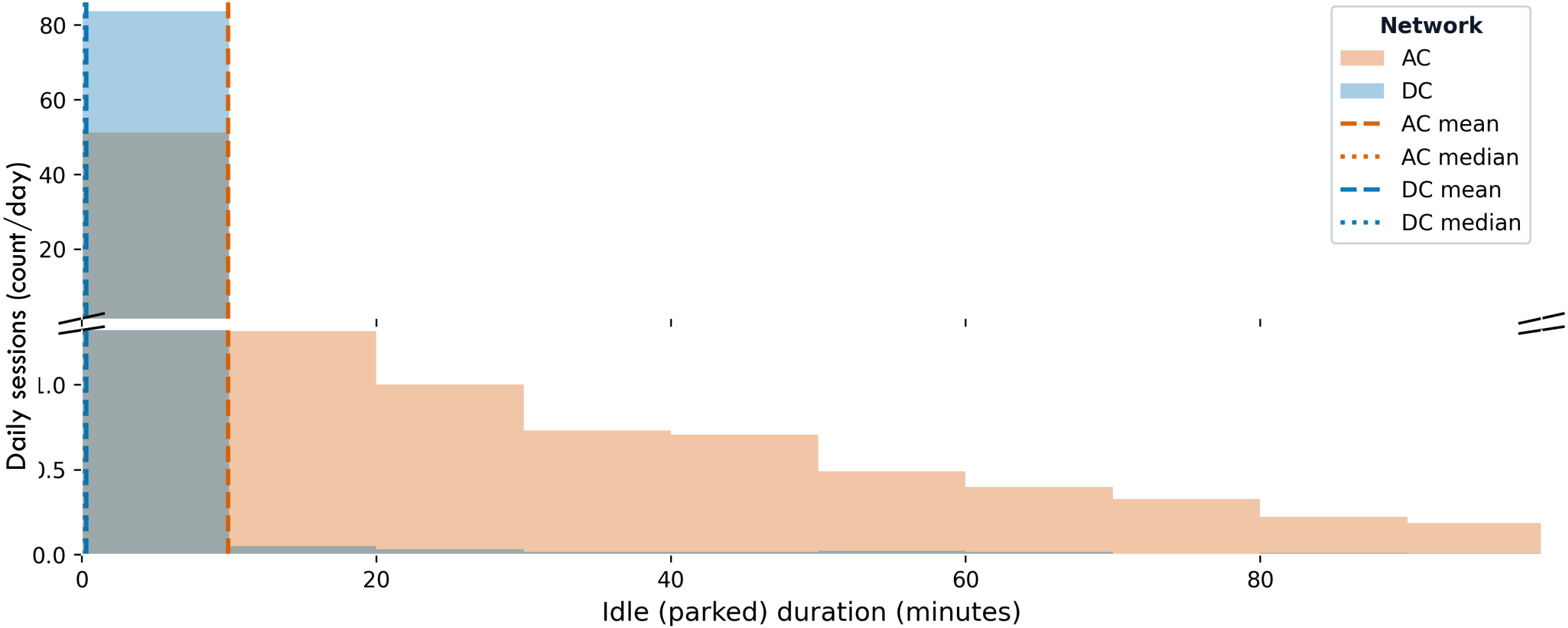
Typical (median) AC sessions are 1.5hrs; some AC sessions are 9+hrs



* many DC sites have 2hr parking restrictions; many AC sites have 4hr parking restrictions

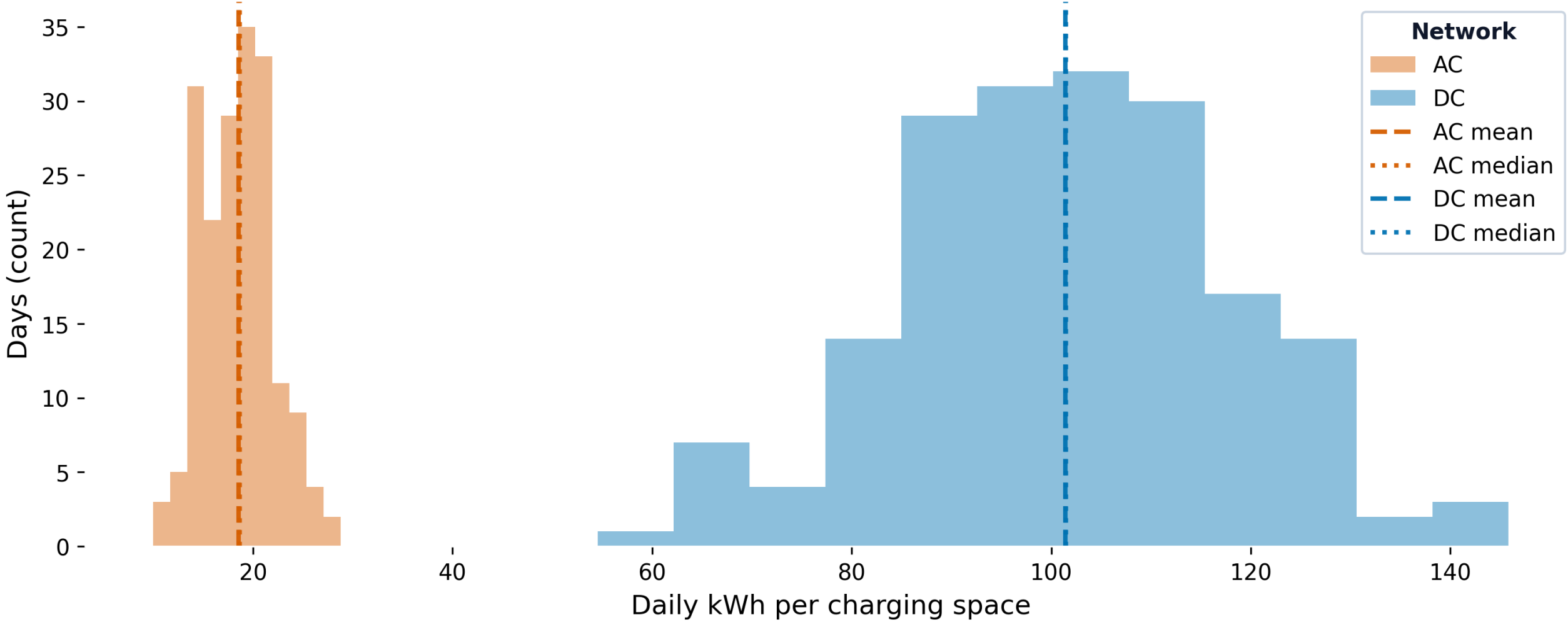
DC sites see minimal idle times

Vehicles charge throughout the session and then move on



DC charging spaces deliver 80-130kWh a day

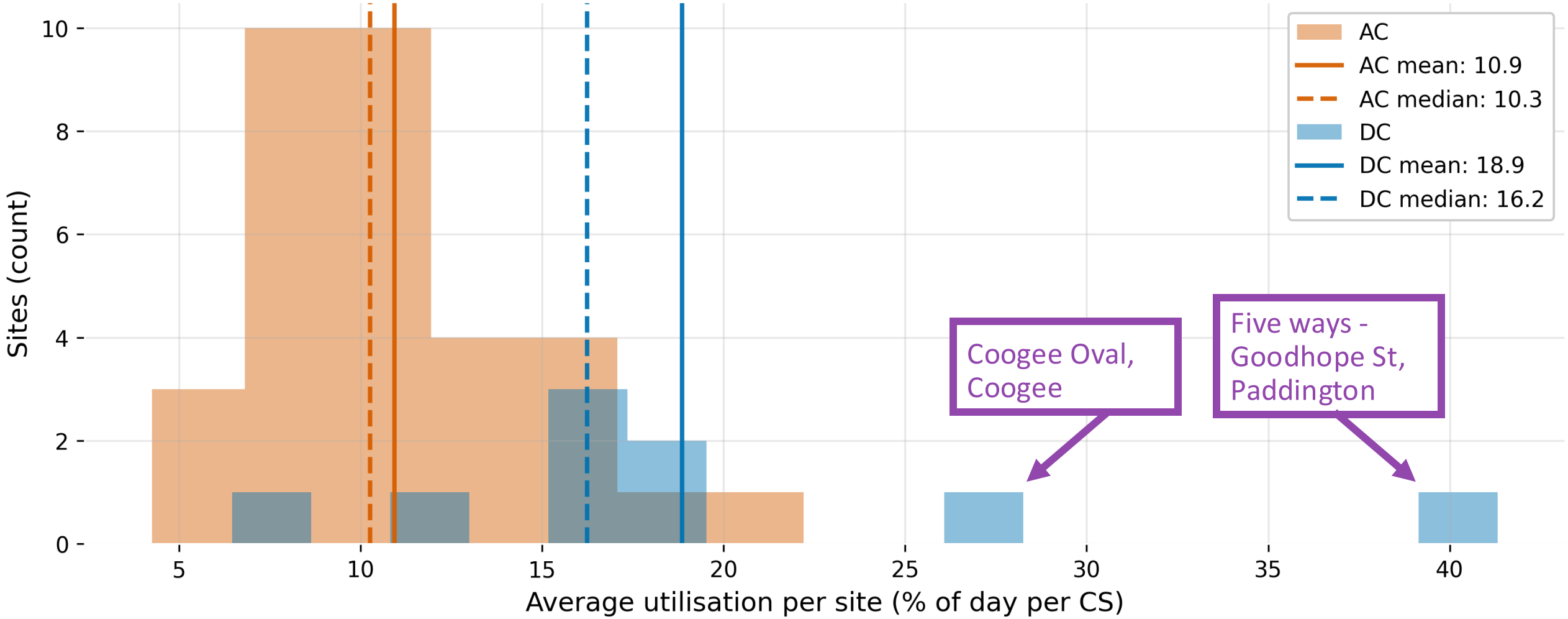
AC charging spaces deliver 10-25kWh a day



Variation between sites

Between sites, usage time varies significantly

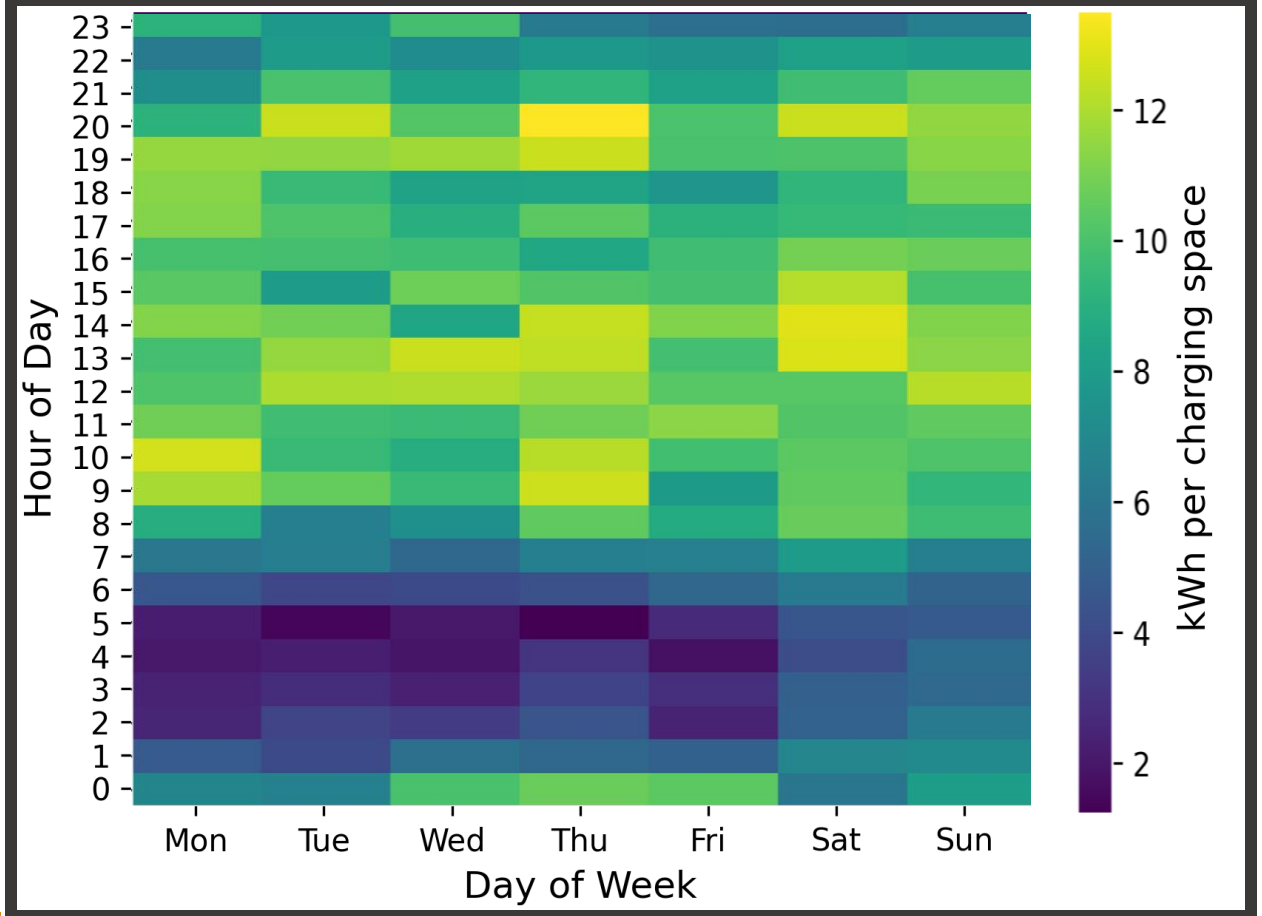
Most DC sites average 19% use per day, some reach 41%; AC average 11%



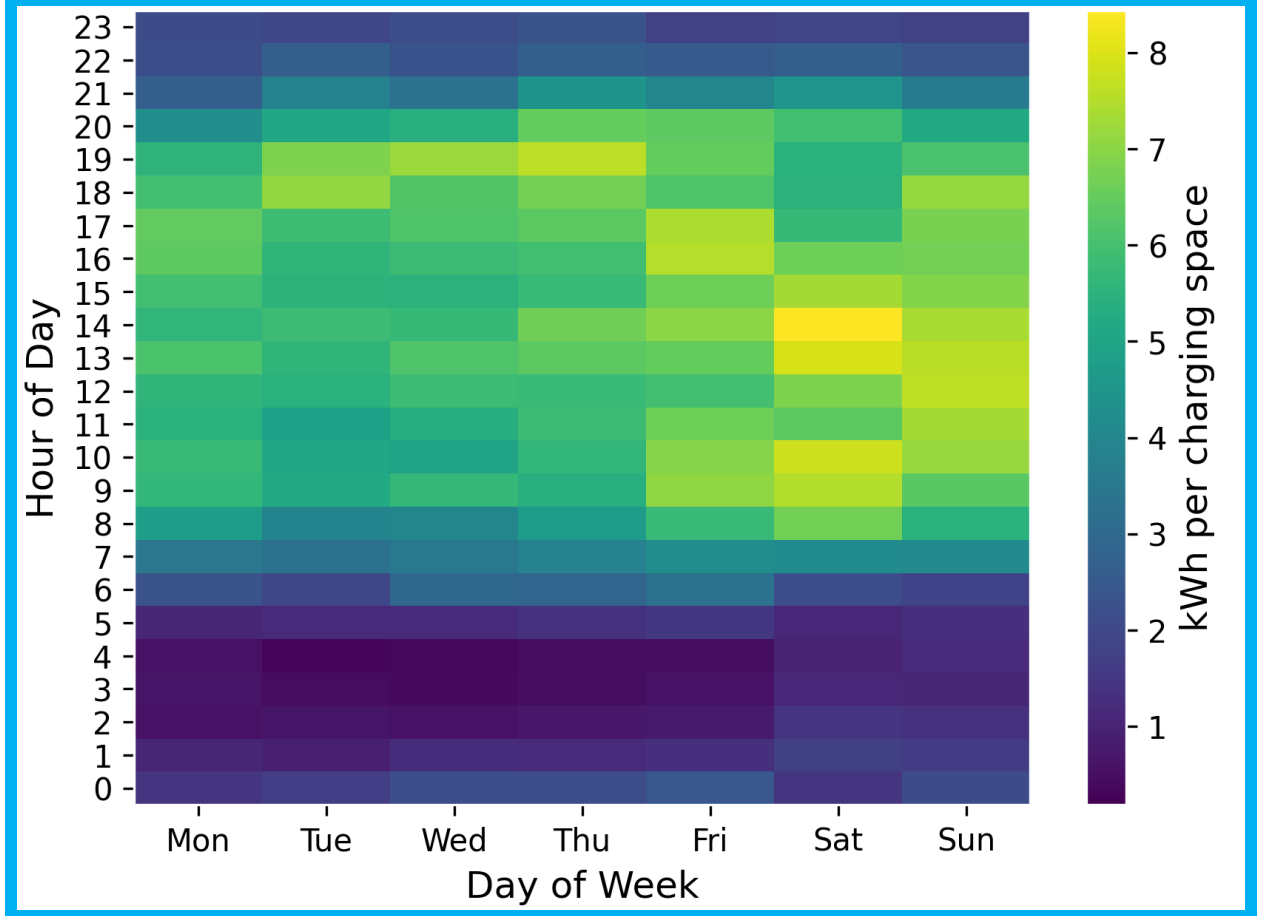
Highest usage site is used more consistently

Throughout each day and the days of the week

Five ways – Goodhope St

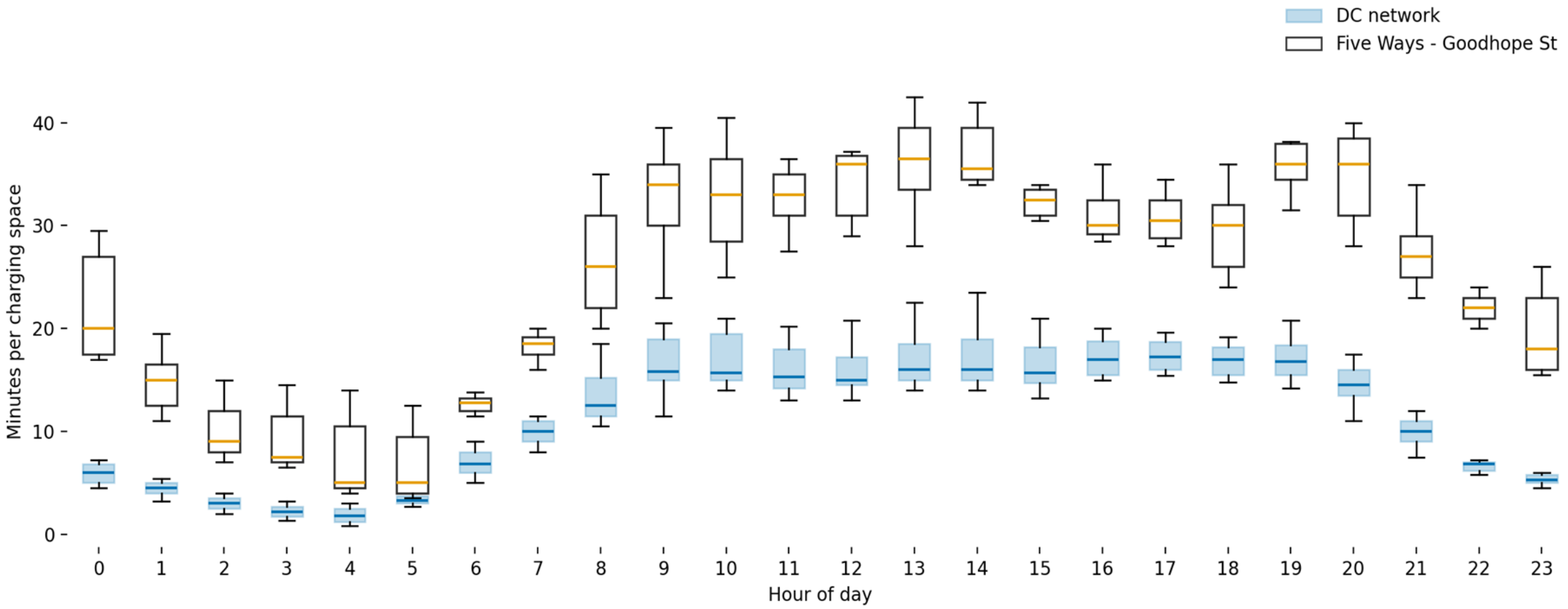


DC network



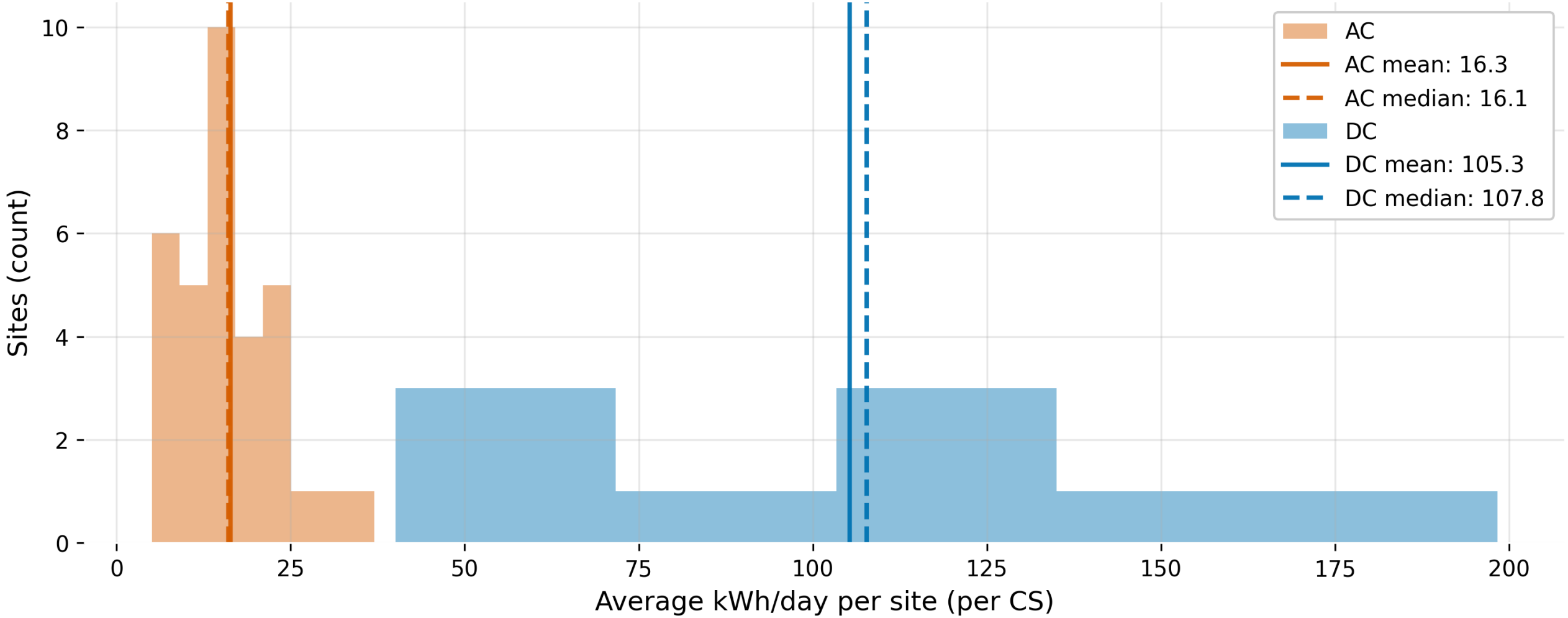
Highest usage site is used later into the evening

Site is well-known, close apartments & shops, & Woollahra has high EV uptake



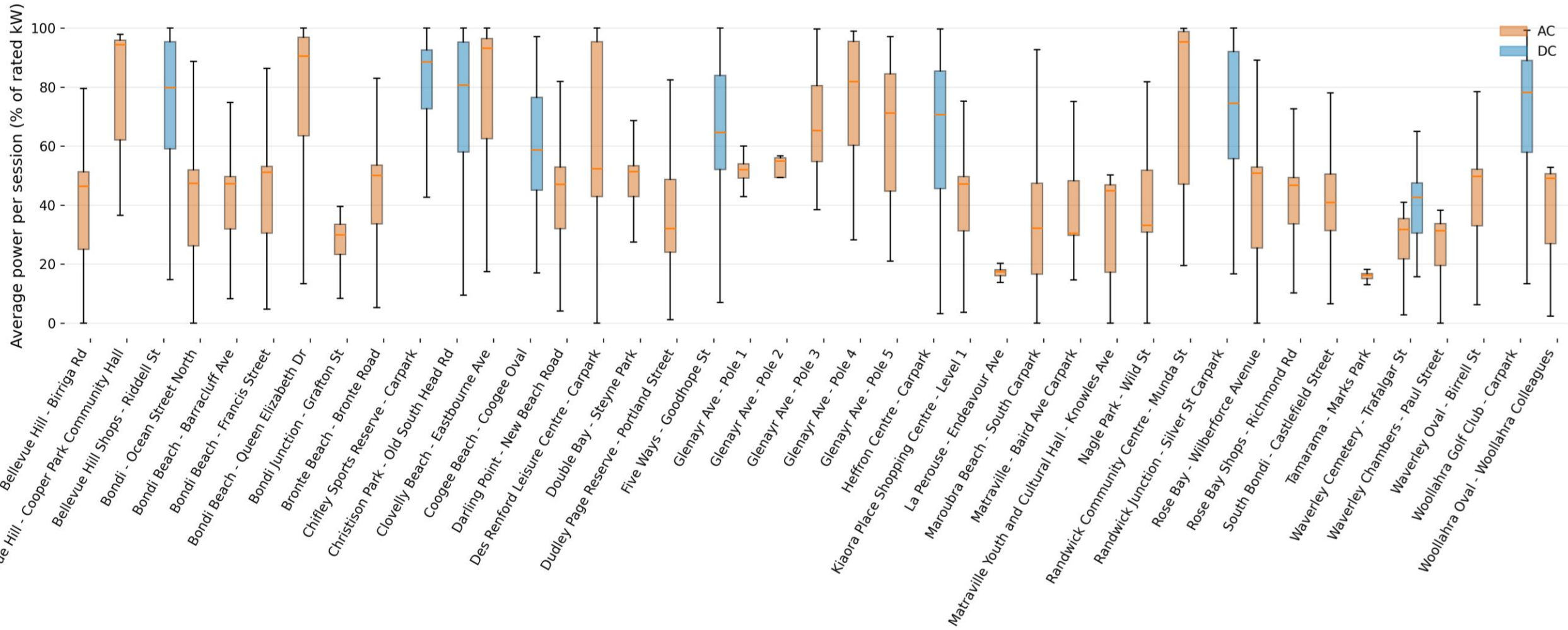
Between sites, energy delivered varies significantly

Close to 400% variation between DC sites



Charging rates vary (& are far below rated capacity)

This is due to vehicle BMS & chargers (at times) serving multiple vehicles

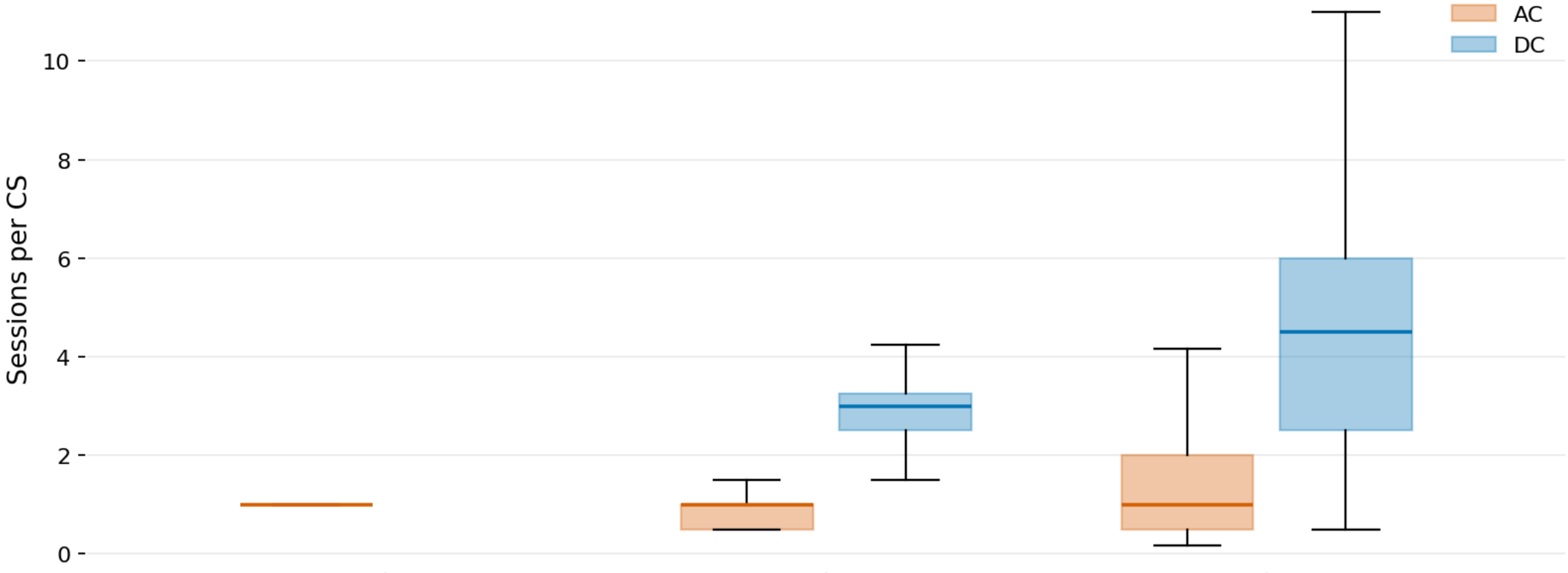


DC average 68% of rated capacity; AC average 50%

Factors influencing usage

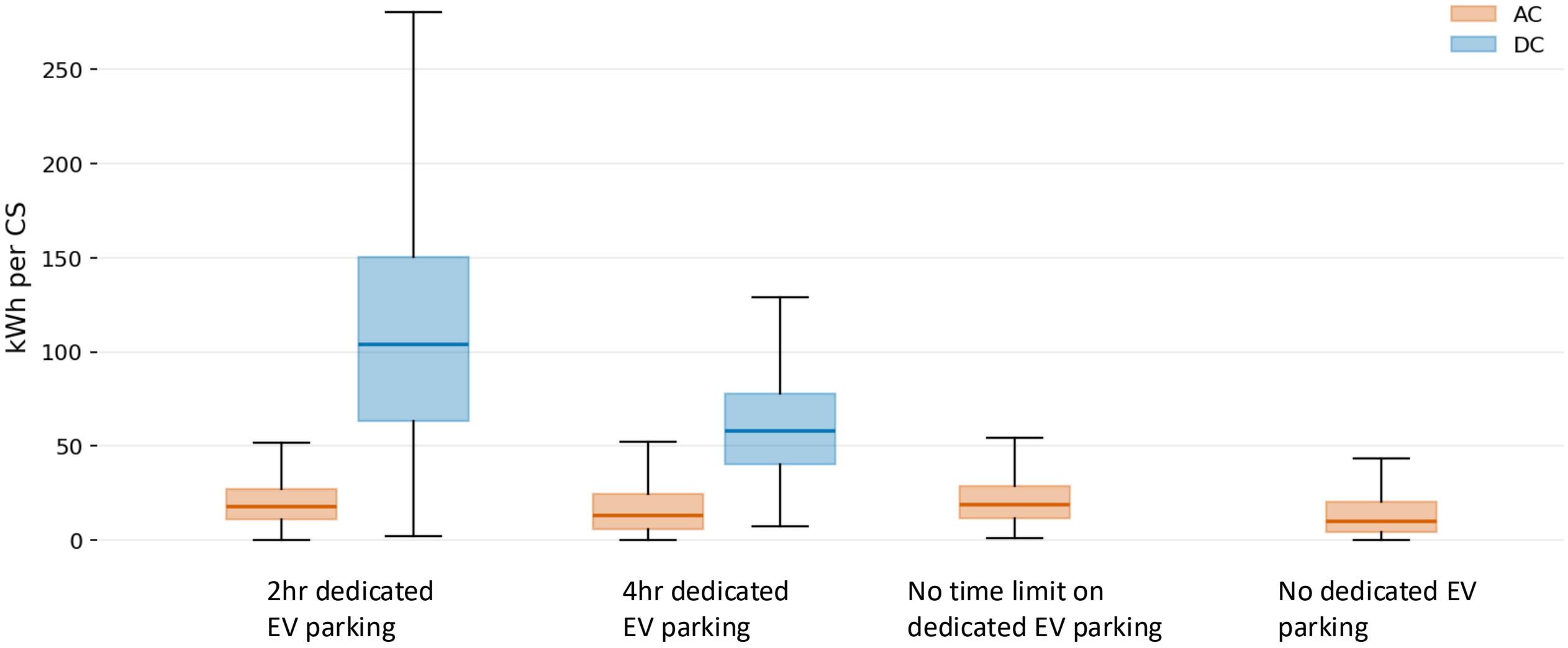
A dedicated parking space per charging port is vital

This increases the number of sessions by 229%



Shorter parking times increase energy delivery

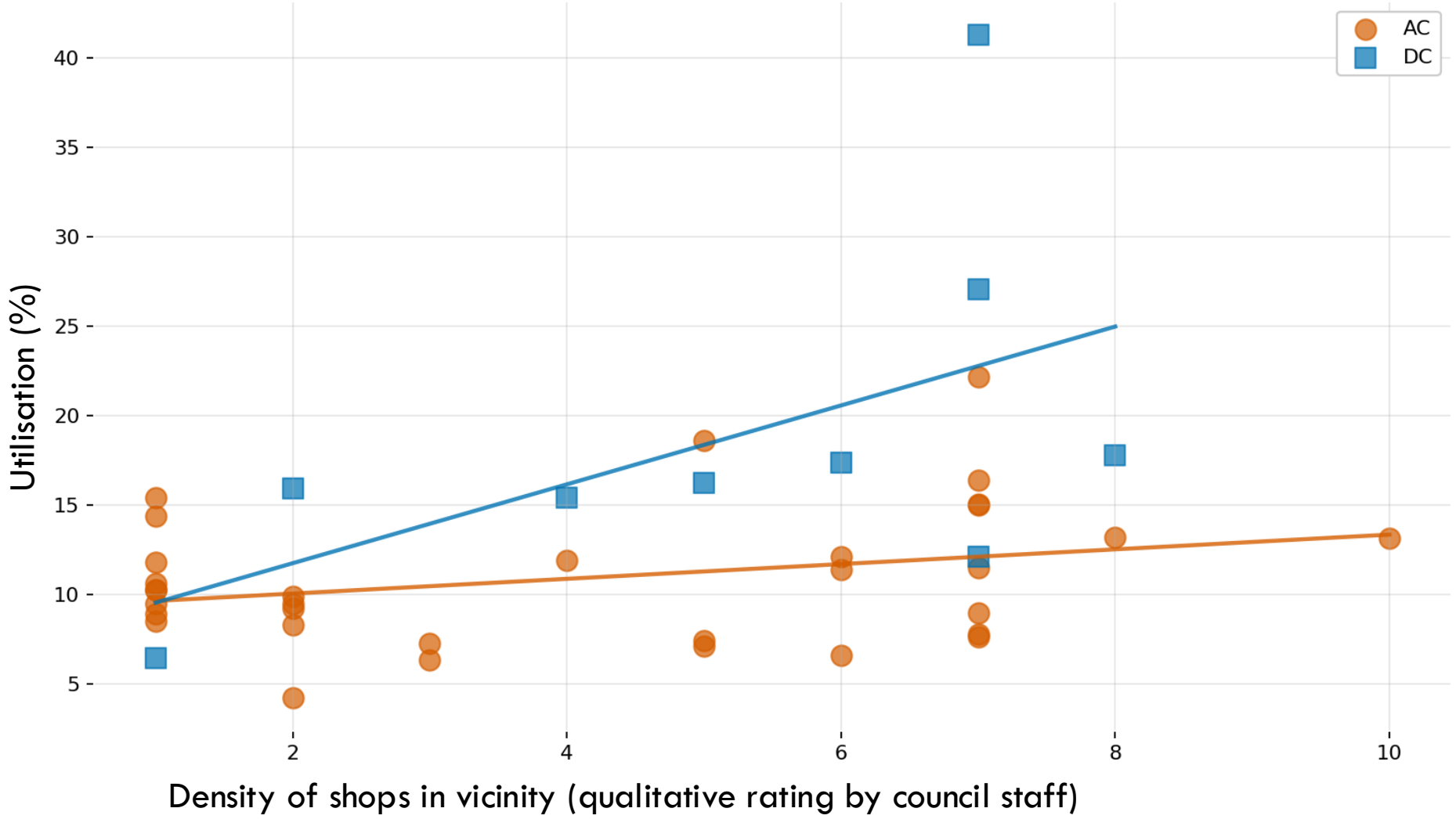
In 2hrs, a 35kW DC charger fills a typical EV*



* delivering 70kWh in theory & 48kWh in practice, applying the observed derating (slide 27)

Proximity to shops drives usage

Particularly for DC chargers



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Policy implications

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Kerbside charging is critical public infrastructure – for locals & visitors

What makes good kerbside charging sites?

Essential features

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- Are close to apartments & shops

A sweet spot

30-50kW DC chargers with **2hr dedicated EV parking restrictions appear to be ideal.** These:

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Research & innovation is needed to shift kerbside charging demand form grid peak hours (currently 30% of demand)

Data description

Data files

The dataset is comprised of 3 files:

1. Sessions data: 27175 charging sessions from 1 Sep 2025 to 28 Feb 2026.
2. Site metrics: results from analysis conducted in this project
3. Site metadata: details of the charging sites

The variables included in each file are presented in the following slides.

The dataset is available at https://doi.org/10.5281/zenodo.19233669

Data file: Session data

Variable	Description
Start	Timestamp indicating when the charging session began (local time).
Stop	Timestamp indicating when the charging session ended (local time).
Location	Name of the charging site where the session occurred.
First time site used	Date when the site first recorded a charging session in the dataset.
Address	Physical address of the charging site.
Network	Charger type classification (AC or DC).
Charging Spaces (CS)	Number of charging bays available at the site.
Ports	Number of physical connectors available.
Rated Power (kW)	Maximum rated charging power of the charger.

Variable	Description
Energy (kWh)	Total energy delivered during the session.
Charging duration (h)	Time spent actively charging during the session.
Parking duration (h)	Total time the vehicle remained connected (including idle time).
Utilisation (%)	Ratio of actual charging power to rated power during the session.
Day	Calendar date of the session.
Month	Month of the session (used for aggregation).
Year	Year of the session.
Postcode	Postcode corresponding to the site location.
LGA	Local Government Area of the charging site.

Data file: Site metrics

Variable	Description
Location	Name of the charging site.
Network	Charger type classification (AC or DC).
First session date	Earliest recorded session date for the site.
Last session date	Most recent session date for the site.
Active days	Number of days between first and last session with activity.
Charging Spaces (CS)	Number of charging bays at the site.
Ports	Number of connectors available at the site.
Rated Power (kW)	Maximum rated charging power at the site.
Total sessions	Total number of charging sessions recorded at the site.
Total energy (kWh)	Total energy delivered across all sessions at the site.
Total charging hours	Total time spent charging across all sessions.
Total parking hours	Total time vehicles were connected (including idle time).
Avg daily sessions	Average number of sessions per day.

Variable	Description
Avg daily energy (kWh/day)	Average energy delivered per day.
Avg daily energy per CS (kWh/day/CS)	Daily energy normalised by number of charging spaces.
Avg daily use hours per CS	Daily charging duration normalised by charging spaces.
Median daily energy per CS	Median of daily energy per charging space.
Median daily use hours per CS	Median of daily charging duration per charging space.
Mean utilisation (%)	Average utilisation relative to rated power.
Median utilisation (%)	Median utilisation relative to rated power.
Parking restriction	Type of parking control (e.g., time-limited, unrestricted).
Designated parking	Whether the charger is in a designated EV-only space.
Distance to nearest charger (m)	Road-based distance to the nearest alternative charging site.
Nearby services score	Composite score reflecting proximity to amenities (shops, cafes, etc.).
Residential density score	Indicator of surrounding residential density.

Data file: Site metadata

Variable	Description
Location	Name of the charging site.
Address	Physical address of the site.
Latitude	Geographic latitude of the site.
Longitude	Geographic longitude of the site.
Network	Charger type classification (AC or DC).
Operator	Charging Point Operator (CPO) responsible for the site.
Charging Spaces (CS)	Number of charging bays at the site.
Ports	Number of connectors available.
Rated Power (kW)	Maximum rated charging capacity.
Installation date	Date the charger became operational (if available).
Parking restriction	Applicable parking rules (e.g., time limits, fees).
Designated EV parking	Indicates if the bay is reserved exclusively for EV charging.
Suburb	Suburb where the site is located.
Postcode	Postcode of the site.
LGA	Local Government Area.
Accessibility	Public access type (e.g., 24/7, restricted hours).
Notes	Additional comments or site-specific information.

Methods

GIS distance calculations

Data & Inputs

- ABS postcode boundaries & population data
- EV charging sessions (AC / DC / All)
- EV registration/garaged in LGA from NSW government
- Charger station locations (Latitude and Longitude)

Processing Workflow

- Standardised spatial data (GDA2020)
- Created **population-weighted postcode centroids**
- Cleaned session data (unique Session ID, postcode validation)

Analysis

- Distance calculation:
  - Postcode → charger
  - Charger → charger
- Aggregated per postcode:
  - Sessions, kWh, CO_2, time, revenue
- Summed to **LGA level**

Normalisation

- Metrics per EV:
  - Sessions / EV
  - kWh / EV
  - CO_2 / EV

Outputs (ArcGIS Pro)

- LGA choropleth maps (AC vs DC vs All)
- Postcode/LGA demand distribution
- Distance vs usage trends

Charging rates (as fraction of rated power)

Charging rate (real-world performance, including vehicle limits and charger tapering):
kWh delivered ÷ charging time (hours) for each session

Rated power (site capacity) comes from charger metadata:
Nameplate capacity (kW) provided by network data (Chargefox / council dataset)

- Rated power represents the maximum possible output under ideal conditions
- For multi-port sites, rated power is defined per charging space (CS) or per plug

Percentage of rated power is calculated as: (actual charging rate ÷ rated power) × 100

- This metric shows how intensively the asset is being used relative to its capability

Note: Actual charging is typically below rated power due to:
→ vehicle charging limits
→ battery state-of-charge tapering
→ shared power across ports (especially DC)

Proximity to apartments & shops

Method:
Site utilisation (avg daily hours per CS) analysed against proximity scores, heuristically allocated by Council :
→ Apartments (residential density), Shops (retail activity), Parks/Beaches (leisure)

Apartments (APT score):
• Clear **positive correlation** with utilisation (stronger for DC)
• Indicates higher demand where **off-street charging is limited**

Shops (Shop score):
• **Strong positive relationship**, especially for DC
• Reflects **opportunistic / top-up charging during short trips**

Parks / Beaches (Park score):
• **Weak or negative correlation** with utilisation
• Usage is **irregular and event-driven**, not daily demand

Key insight:
• **Demand is driven by daily-use locations (apartments + shops)**
• **Leisure locations contribute less consistent utilisation**

Network implication:
• DC chargers are **more sensitive to location quality**
• Optimal siting = **dense residential + retail proximity**, not just open space availability