



Evidence of Unmet Demand for Public Charging Points for Electric Vehicle Users in the United Kingdom

By Dinesh Chacko* and Monika Wahi

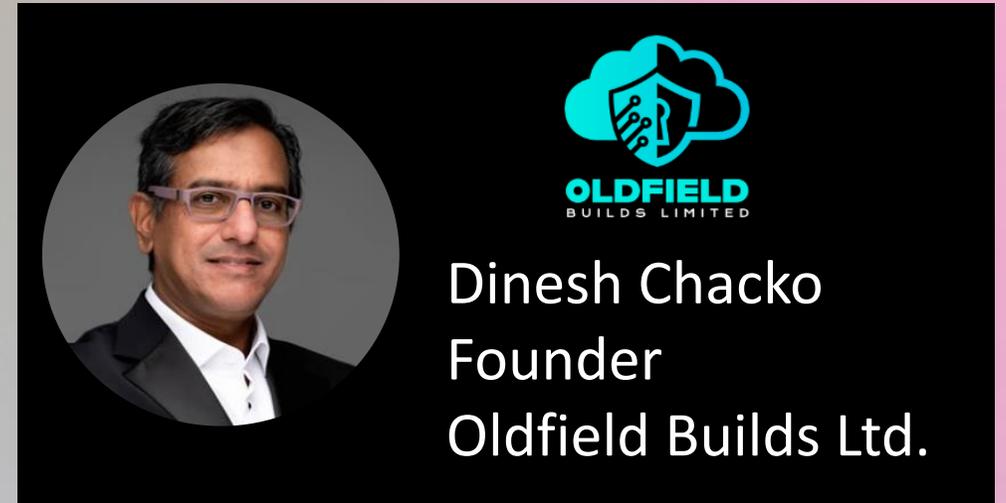
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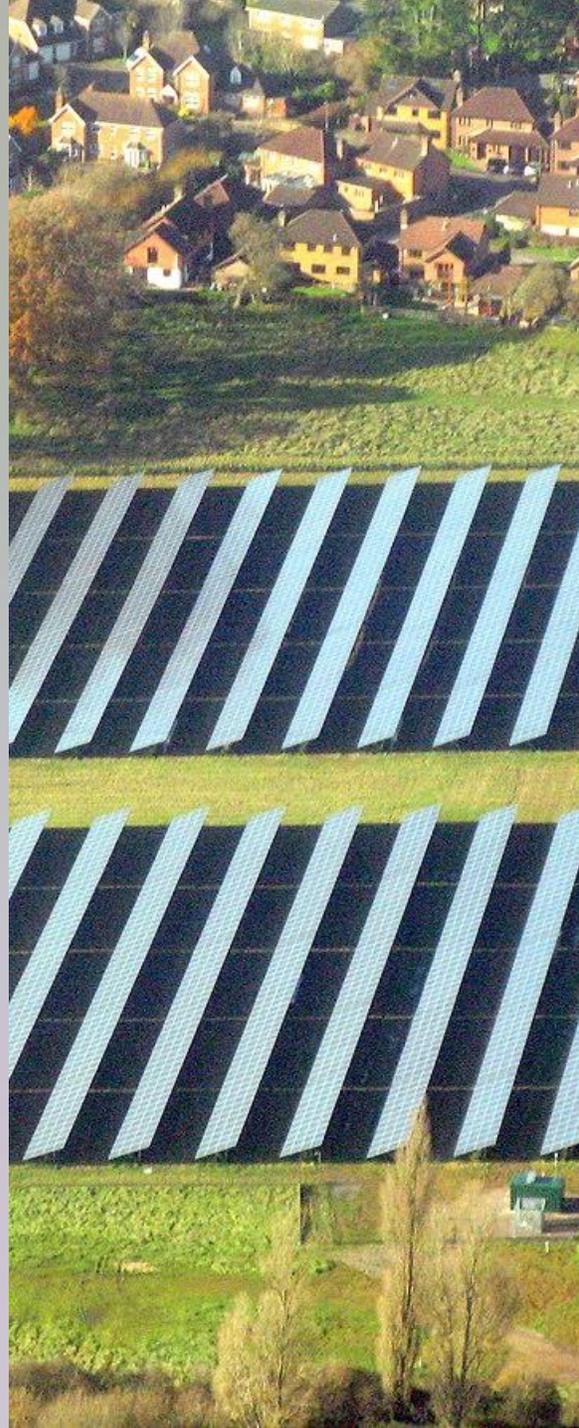
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- Domains: Banking, telecommunications, oil and gas, financial services, public institutions



Research Interests

- Sustainable energy
- AI algorithms
- Academic projects/publishing



Introduction

- The United Kingdom (UK) has pledged to achieve net zero emissions by 2050
- Encouraging electric vehicle (EV) adoption is part of this strategy
- In 2021, one million EVs were registered in the UK (Skidmore, 2023)
- In 2022, 17% of the new cars purchased in the UK were EVs (Bayram et al., 2024)



Charging EVs

- UK's Department for Transport estimates 30% of households will be reliant on public charging (Budnitz et al., 2024)
- Residential charging not an option for households with on-street parking
- Therefore, they must rely on public charge points (CPs) to charge their vehicle
- However, availability of public CPs has not kept up with the demand of EV users in the UK



Public CP Access in Scotland

- Scotland is served by two energy networks
 - Scottish Power Energy Networks (SP Energy)
 - Scottish and Southern Energy Networks (SSEN)
- Primary substations (PSs) directly feed from high voltage networks
- Step down energy transmitted through these high voltage networks from 33 to 11 kilovolts (kV) to distribute energy to homes and businesses

The aim of this research was to

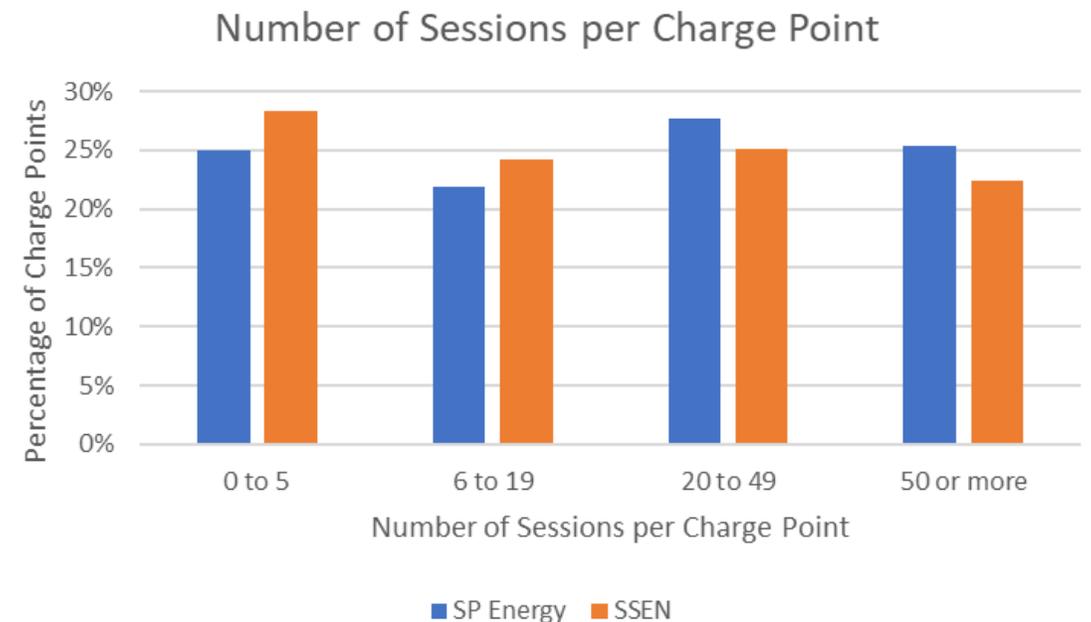
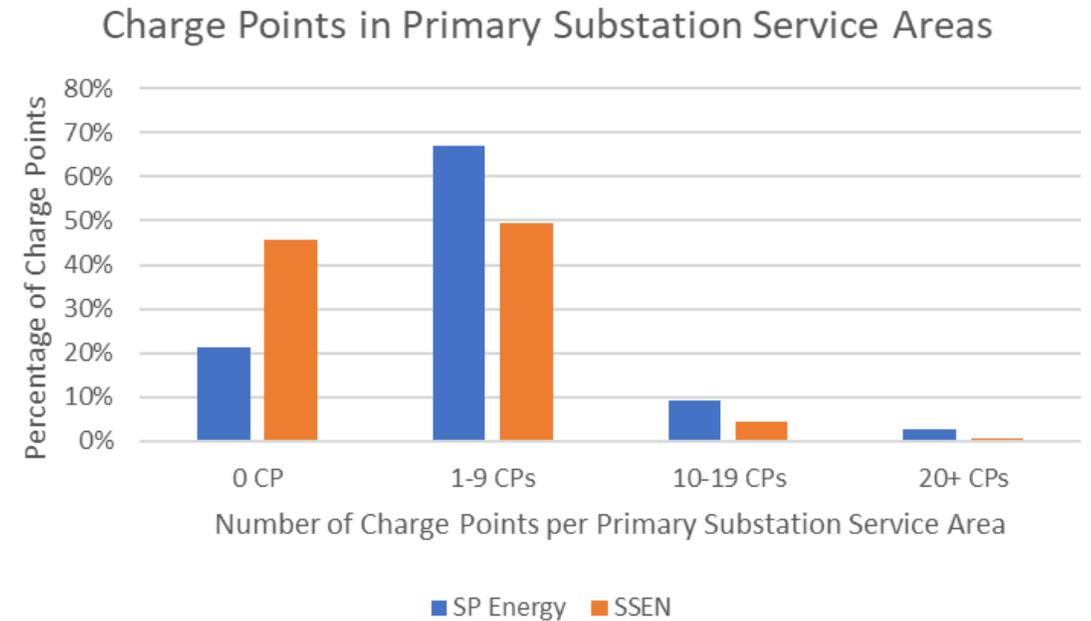
- 1) characterise the distribution of public CPs and EVs in PS service areas across the regions served by SP Energy and SSEN, and
- 2) investigate if there is evidence of unmet demand for public CPs in PS service areas in these networks with a high prevalence of EVs coupled with a low density of public CPs

Methodology

- Data about use of public CPs were obtained from ChargePlace Scotland (July through December 2024)
- Number of EVs in PS service areas for SP Energy came from the SP Energy Distribution Future Energy Scenario (DFES) forecasts on their data portal (December 2024)
- Number of EVs in PS service areas for SSEN came from DFES forecast data from the SSEN Distribution Data Portal (December 2024)
- Density of EVs and public CPs per PS service areas were mapped
- PS service areas with 100+ EVs and <10 public CPs were defined as High Demand (HD) PS service areas
- Bivariate analysis regarding HD vs. other PS service areas
- Logistic regression to find factors associated with HD PS service areas

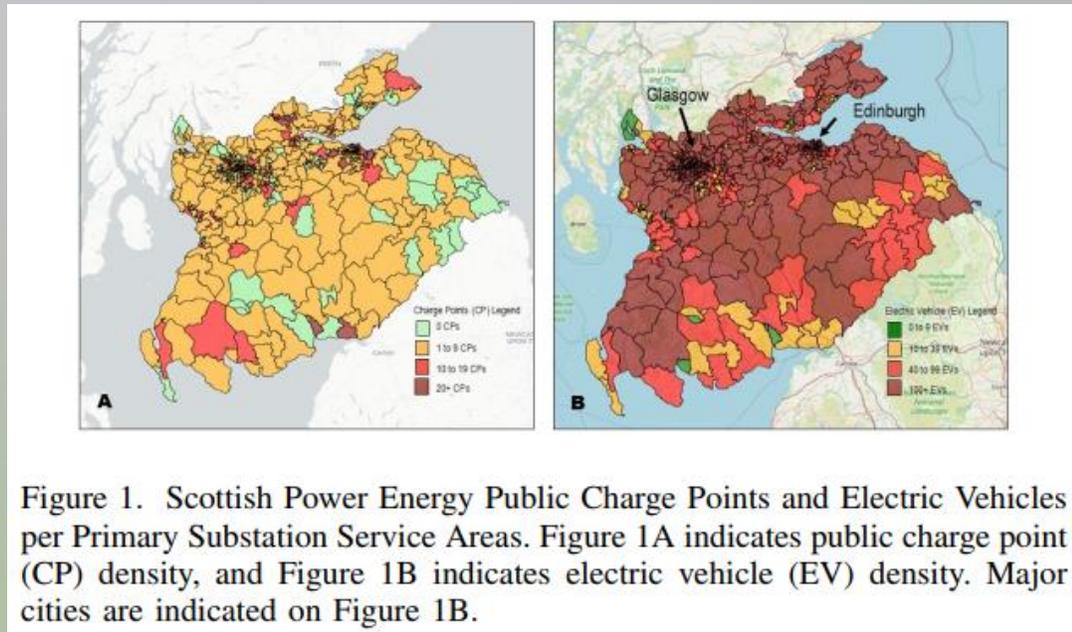
Descriptive Analysis

- Of the 820 PS service areas analysed, 48% were in SP Energy.
- 2,810 public CPs were analysed, and 67% fell in SP Energy.
- 34% of PS service areas had 0 public CPs.
- 41% of SP Energy PS service areas contained 100 or more EVs, compared to only 14% in SSEN.
- SP Energy had a greater percentage of CPs with 50+ sessions (25%) than SSEN (22%).



Lack of Public CPs for EV Users

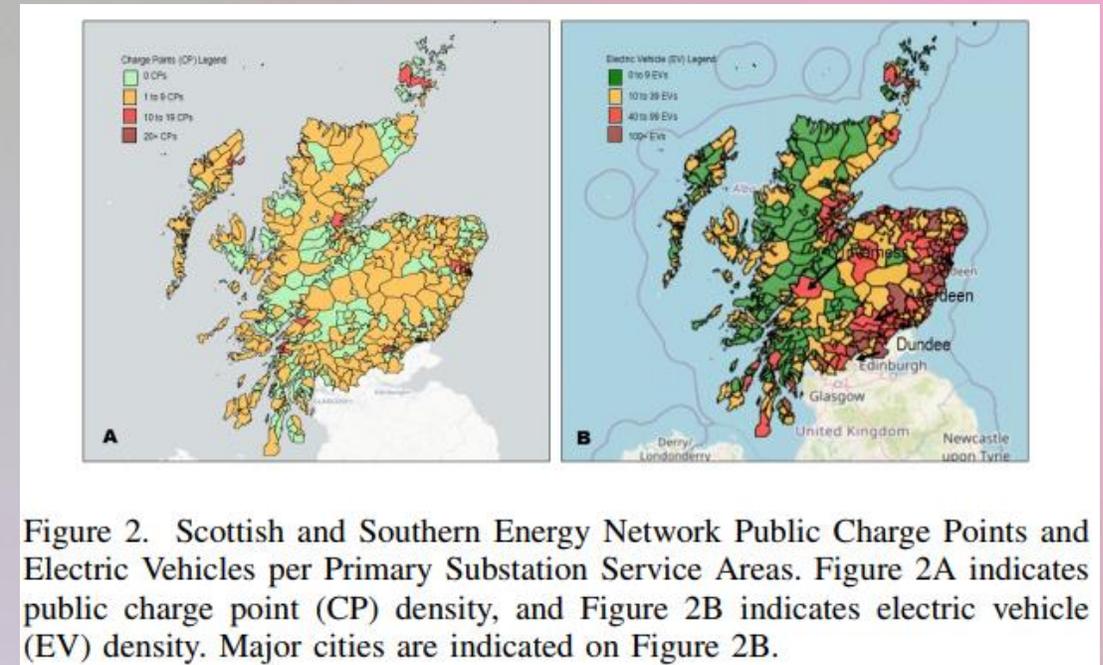
SP Energy Service Area



Public CP Density

EV Density

SSEN Service Area



Public CP Density

EV Density

TABLE II
BIVARIATE ANALYSIS OF PUBLIC ELECTRIC VEHICLE CHARGE POINTS IN
SCOTTISH POWER ENERGY, HIGH DEMAND VS. OTHER PRIMARY
SUBSTATION SERVICE AREAS, DECEMBER 2024.

Category	Level	All n, %	High De- mand* n, %	All Others n, %
All	All	1,877, 100%	528, 28%	1,349, 72%
Number of Sessions	0 to 5	469, 25%	106, 20%	363, 27%
	6 to 19	410, 22%	107, 20%	303, 22%
	20 to 49	521, 28%	151, 29%	370, 27%
	50 or more	477, 25%	164, 31%	313, 23%
Power Drawn (kilowatt hours)	0 to < 75	435, 23%	102, 19%	333, 25%
	75 to <400	440, 23%	96, 18%	344, 26%
	400 to <1,000	476, 25%	148, 28%	328, 24%
	1,000 or more	526, 28%	182, 34%	344, 26%
	0	1,317, 70%	354, 67%	963, 71%
Number of Faults	1	318, 17%	103, 20%	215, 16%
	2 or more	242, 13%	71, 13%	171, 13%
Uptime	100%	1,407, 75%	393, 74%	1014, 75%
	<100%	470, 25%	135, 26%	335, 25%
Number of Connectors	1	65, 3%	11, 2%	54, 4%
	2	1,377, 73%	395, 75%	982, 73%
	3 or more	284, 15%	77, 15%	207, 15%
	Unknown	151, 8%	45, 9%	106, 8%

Note: First row has row percentages, and the rest are column percentages. *High demand refers to charge points in primary substation service areas where there are 100 or more electric vehicles but < 10 charge points.

Charging in SP Energy: HD vs. Other PS Service Areas

- SP Energy had 1,877 public CPs, and 28% fell in HD areas.
- We analysed 579,294 sessions from SP Energy (July-December, 2024).
- Compared to other CPs, high demand CPs were more likely to have 50 or more sessions (31% vs. 23%) and sessions delivering 1,000 kWh or more (34% vs. 26%).
- Faults (outages), uptime, and number of connectors were not materially different from HD vs. all other CPs.

Charging Times

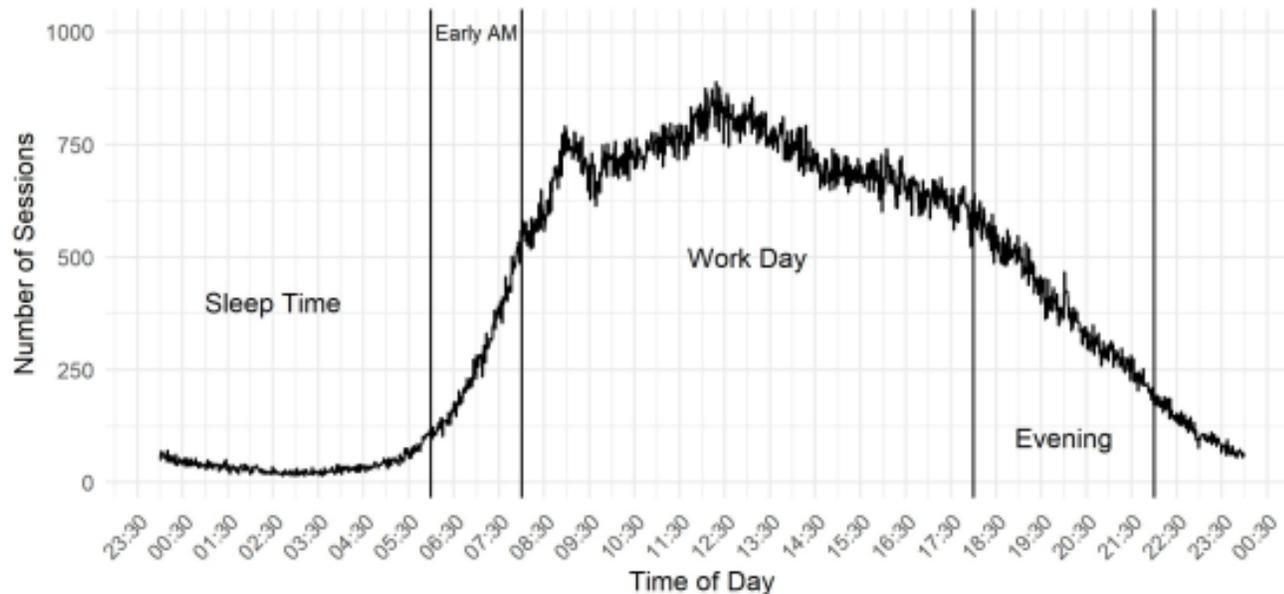


Figure 3. Time Series Plot of Start Time of Day for Sessions from Scottish and Southern Energy Network Public Charge Points, July through December 2024

- Most sessions were during work day (8:00 to 18:00)
- Fewer sessions during early AM (6:00 to 8:00) and evening (18:00 to 22:00)
- Fewest during sleep time (22:00 to 6:00)

Factors Associated Positively with HD public CPs: SP Energy

$$\log \left(\frac{p(\text{HD})}{1 - p(\text{HD})} \right) = 0.19110 + 0.8399_{30\text{MIN-1HR}} + 1.0675_{1-2\text{HRS}} + 1.6598_{2+\text{HRS}} + 1.1667_{\text{EVE}} + 1.0893_{\text{SLEEP}} + 0.9262_{\text{EARLYAM}} + 1.0235_{\text{AUG}} + 1.0712_{\text{SEP}} + 1.1040_{\text{OCT}} + 1.0512_{\text{NOV}} + 1.0532_{\text{DEC}}$$

- Charging sessions longer than 30 minutes
 - Highest was for 2+ hours
- Charging during non-work hours
 - Highest was for evening (18:00 to 22:00)
- All months vs. July were associated
 - Highest estimates for September, November, and December

Discussion

- EV uptake is high in Scotland, especially in areas served by SP Energy.
- Number of public CPs available to serve EV owners appears to be inadequate, especially in SP Energy.
- In SP Energy, factors associated with HD charge points included longer charging session duration, charging at less convenient times.

Mirror > Lifestyle > Motoring > Electric Cars

I drove 242-miles from UK seaside town in an electric car and it was hell

Keir Starmer wants electric vehicles to dominate the UK's motoring industry by 2030 - but much work must be done before this is achievable as my latest experience found



Comments 11

LIFESTYLE By [Victoria Chessum](#) Discover Editor

06:00, 24 May 2025

- Long wait times
- CPs were inoperable or needed a reset
- Payment function did not work
- Connectors were slow

Conclusion

- We speculate that EV users at HD charge points were forced to wait for less convenient times to charge their EVs due to demand, and once they started charging, endeavored to charge their vehicle completely instead of just “topping it off”
- Policymakers should focus on ensuring adequate number of public CPs in areas with a high density of EVs, and offer more and faster charging connectors.
- Updated survey of EV owners in the UK to better understand their need for public CPs, and set an optimal target for public CP density.



**Policymakers en route to meeting with public
at Ayr Town Hall, November 4, 2024.**

Selected References

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