Hogeschool van Amsterdam

Impact of battery developments on the future of charging infrastructure deployment

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Creating Tomorrow

Introduction

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URBAN TECHNOLOGY

EVS35
OSL2022

This research is part of the RAAK-SIA funded Future Charging project, led by the Research Group Energy & Innovation, Centre of Expertise Urban Technology, Faculty of Technology, at the Amsterdam University of Applied Sciences.

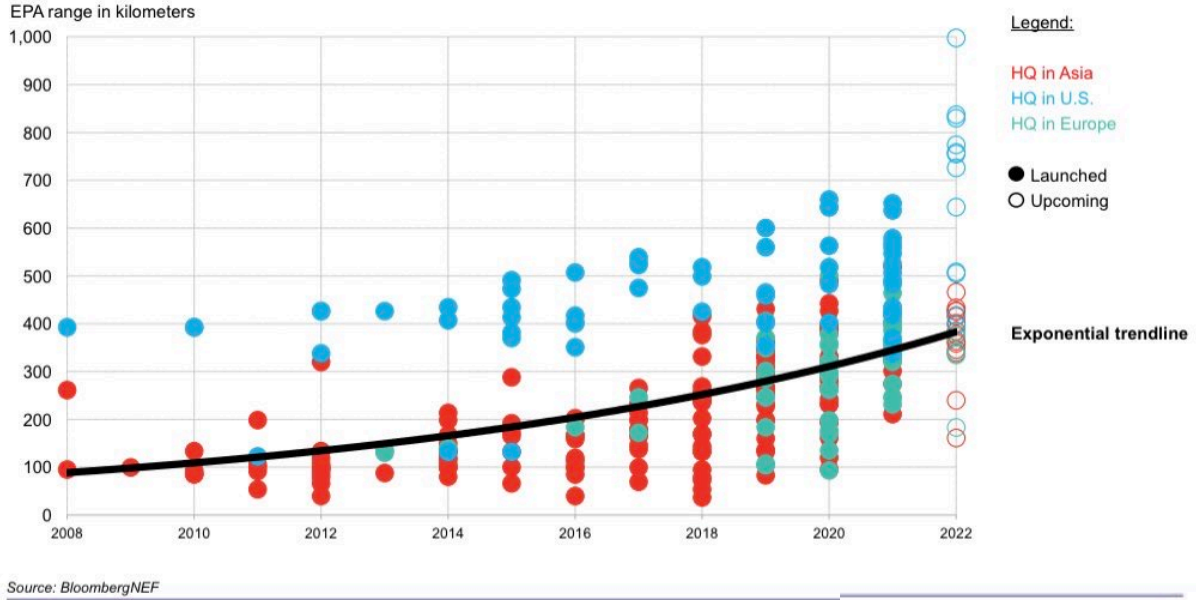
Dataset is provided by MultiTankCard

Creating Tomorrow

Developments

Model range

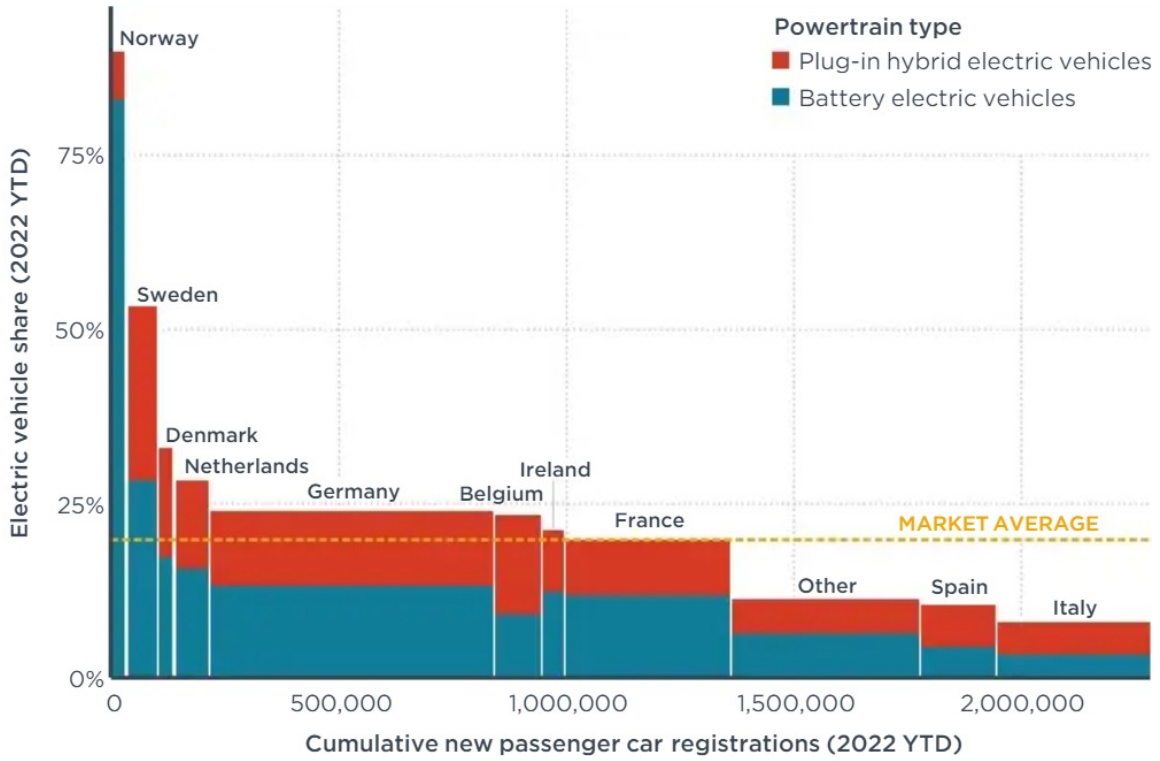
Range of launched and upcoming battery electric vehicles, by launch year



Source: BloombergNEF

BloombergNEF

BEV/SPLIT



Source: ICCT

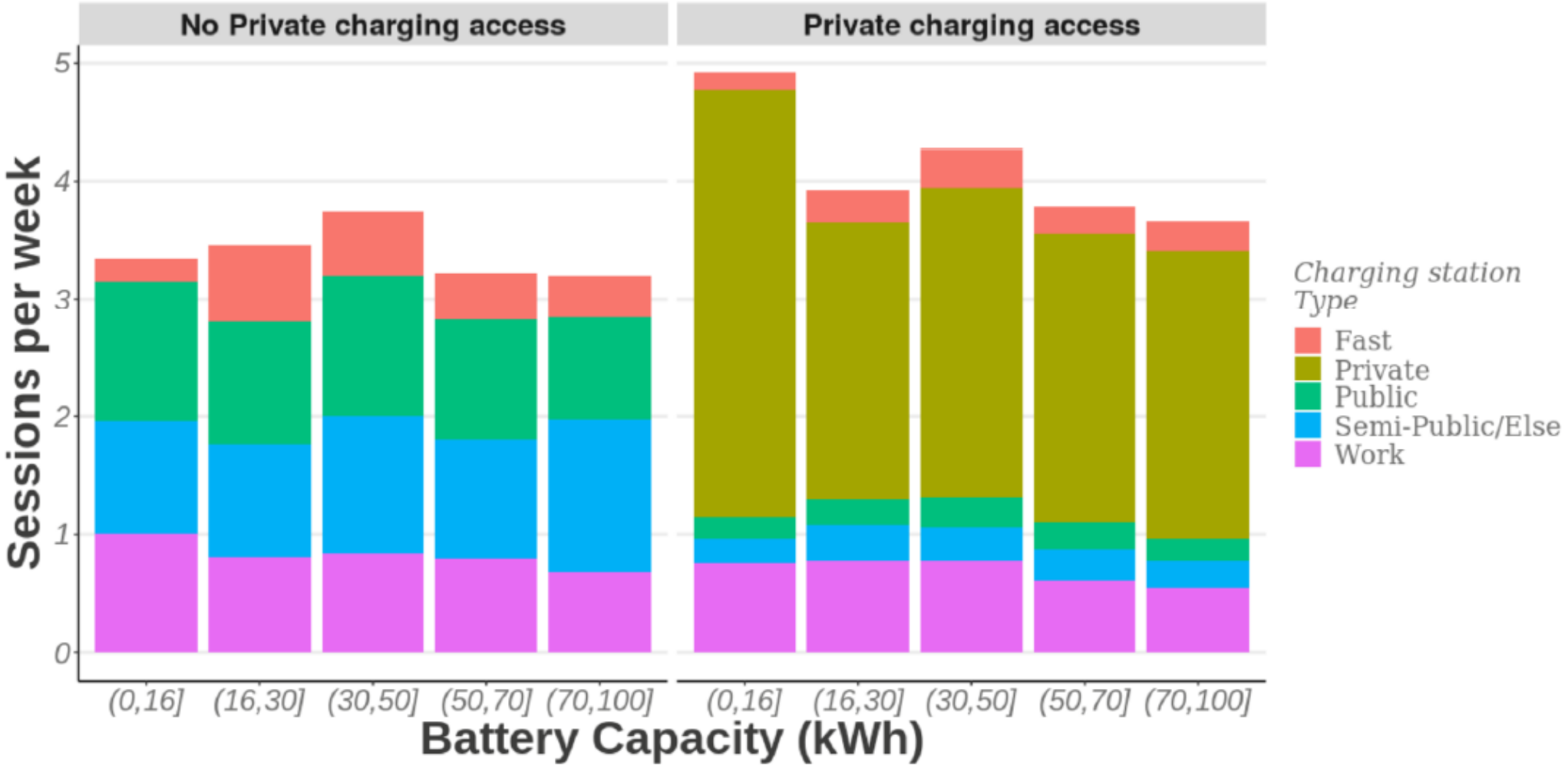
On/Off street parking/charging

Dataset

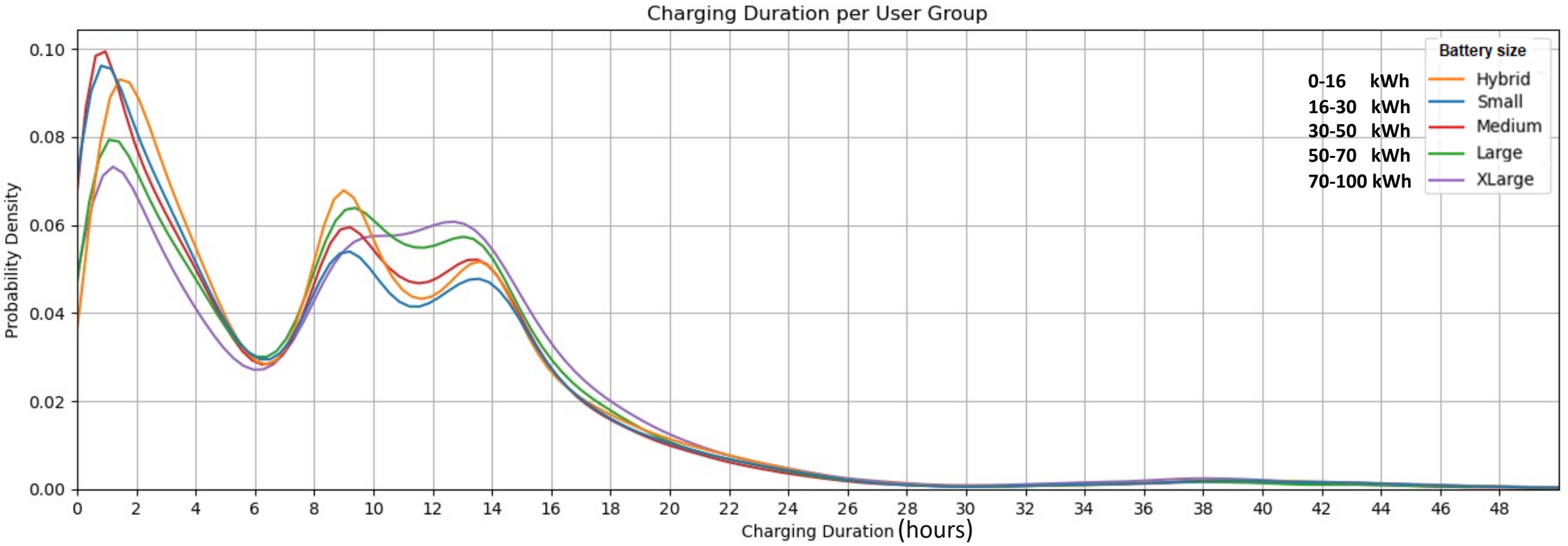
Dataset
19.420 EV drivers
2019 data
1.1 million charging sessions
Location
Charging station type
Battery size estimated on max. charging session

Variable	Example
RFID	60DF4D78
Address (Postal Code)	3554
Start Connection Date Time	24-04-2015 13:56:00
End Connection Date Time	24-04-2019 17:14:00
Connection Time	2:18:00
Volume	6.73 kWh

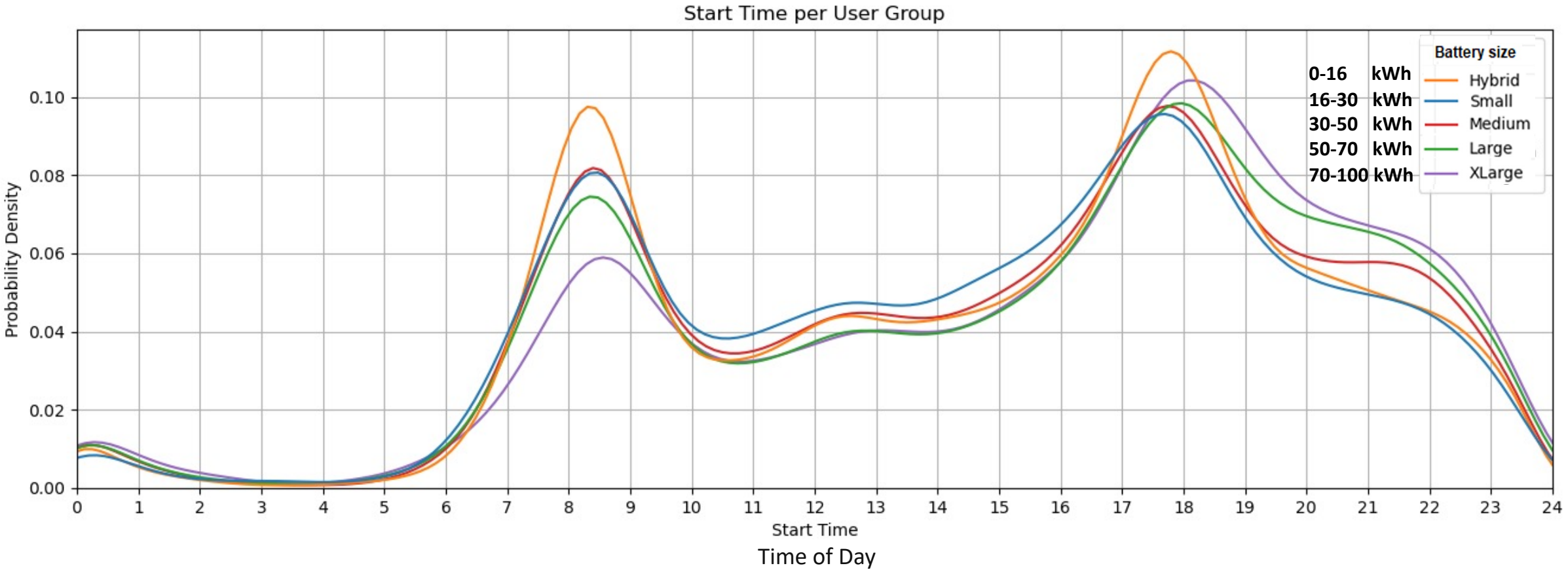
Descriptive analysis



Descriptive analysis - Duration



Descriptive analysis – Start Time

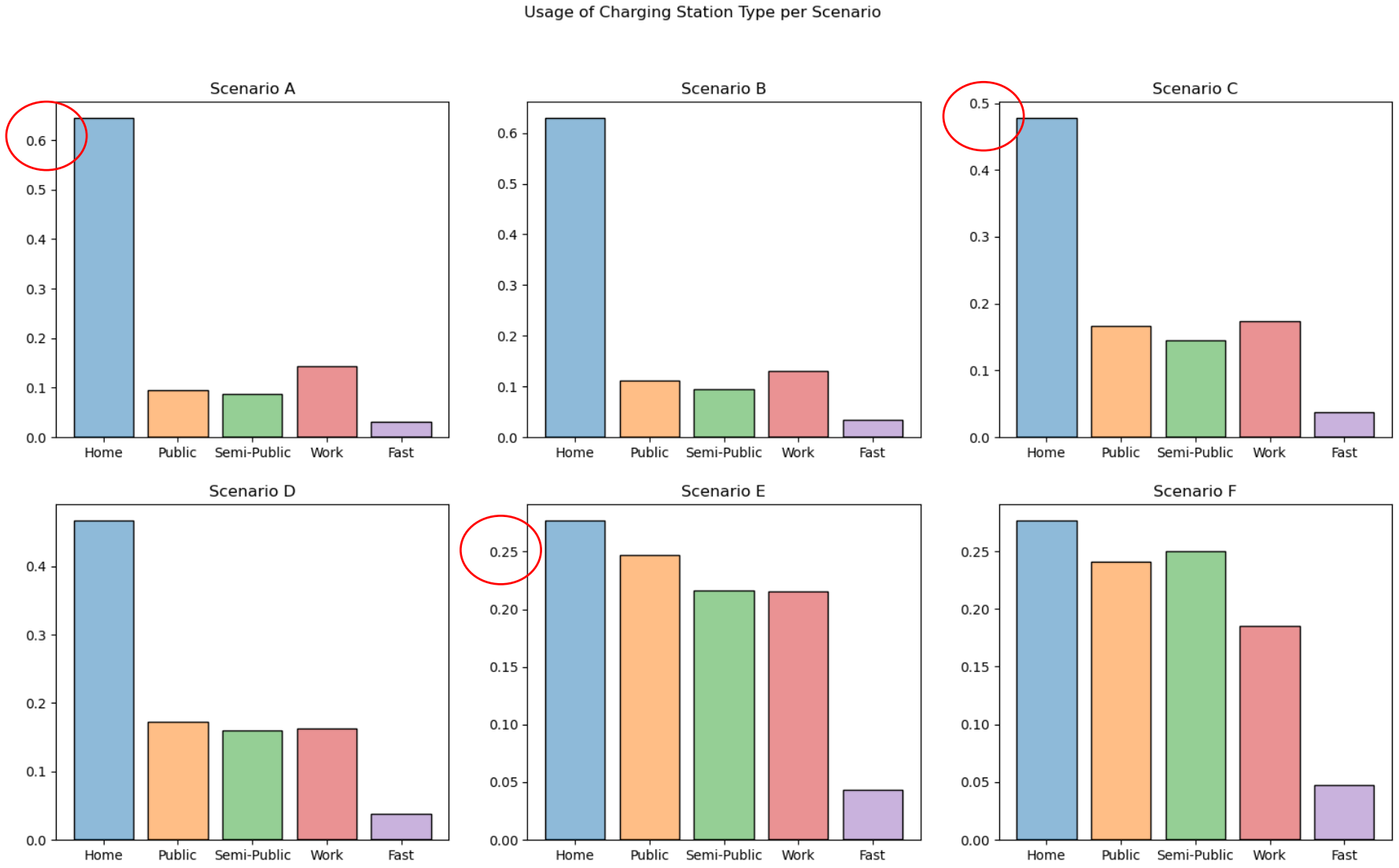


Simulation

- Sampling 1000 EV users based upon distribution

Scenario	A: Small bat. High Home	B: Large bat. High Home	C: Small bat. Medium Home	D: Large bat. Medium Home	E: Small bat. Low Home	F: Large bat. Low Home
Plug-in hybrid (0-16 kWh)	30%	10%	30%	10%	30%	10%
FEV 16-30kWh (Small)	30%	10%	30%	10%	30%	10%
FEV 30-50 kWh (Medium)	20%	20%	20%	20%	20%	20%
FEV 50-70 kWh (Large)	10%	30%	10%	30%	10%	30%
FEV 70+ kWh (XLarge)	10%	30%	10%	30%	10%	30%
Home Charging availability	**75%**	**75%**	**50%**	**50%**	**25%**	**25%**

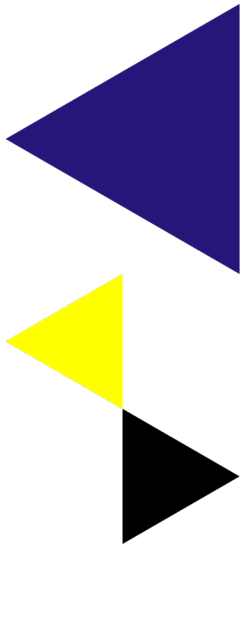
Results – Location Choice



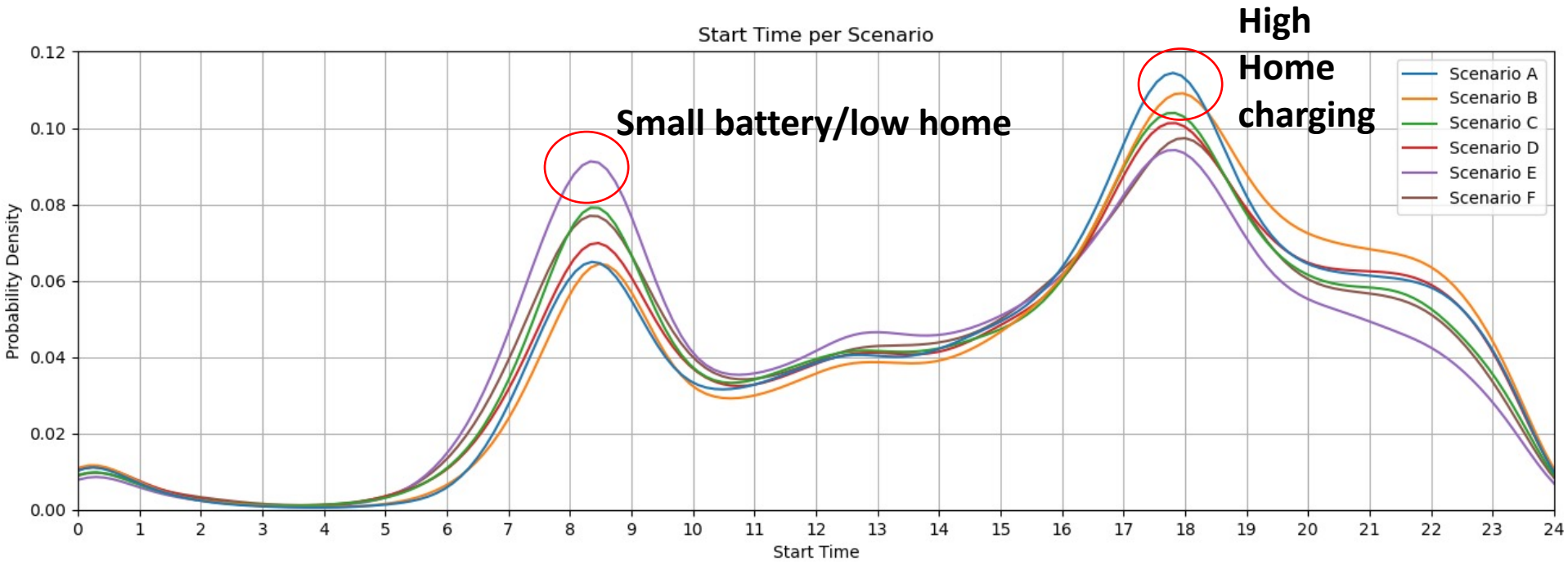
Scenario	Battery	Home charging availability
A	Small	High
B	Large	High
C	Small	Medium
D	Large	Medium
E	Small	Low
F	Large	Low

Results – Location Choice

Scenario	Battery	Home charging availability	Sessions/week/user	Share of sessions at most used station
A	**Small**	**High**	2.02	74.3%
B	**Large**	**High**	1.81	72.7%
C	**Small**	**Medium**	1.78	68.5%
D	**Large**	**Medium**	1.66	66.4%
E	**Small**	**Low**	1.59	59.9%
F	**Large**	**Low**	1.53	61.4%

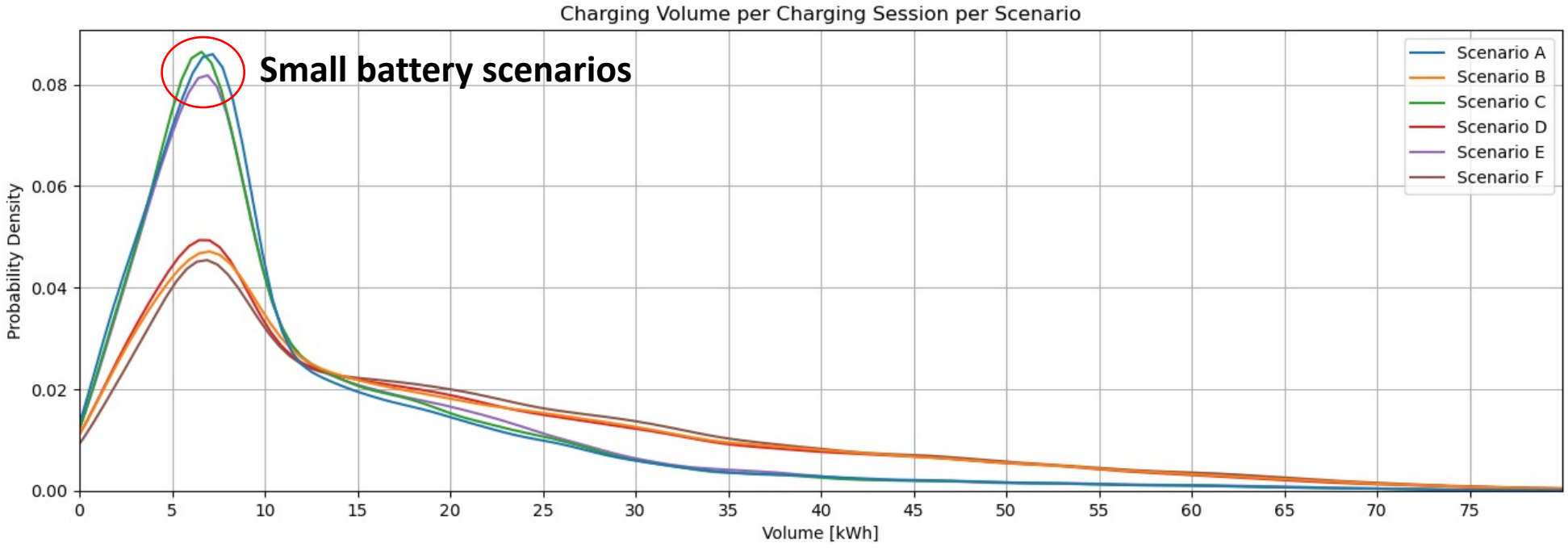


Results – Timing



Scenario	Battery	Home charging availability
A	Small	High
B	Large	High
C	Small	Medium
D	Large	Medium
E	Small	Low
F	Large	Low

Results – Energy



Scenario	Battery	Home charging availability
A	Small	High
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D	Large	Medium
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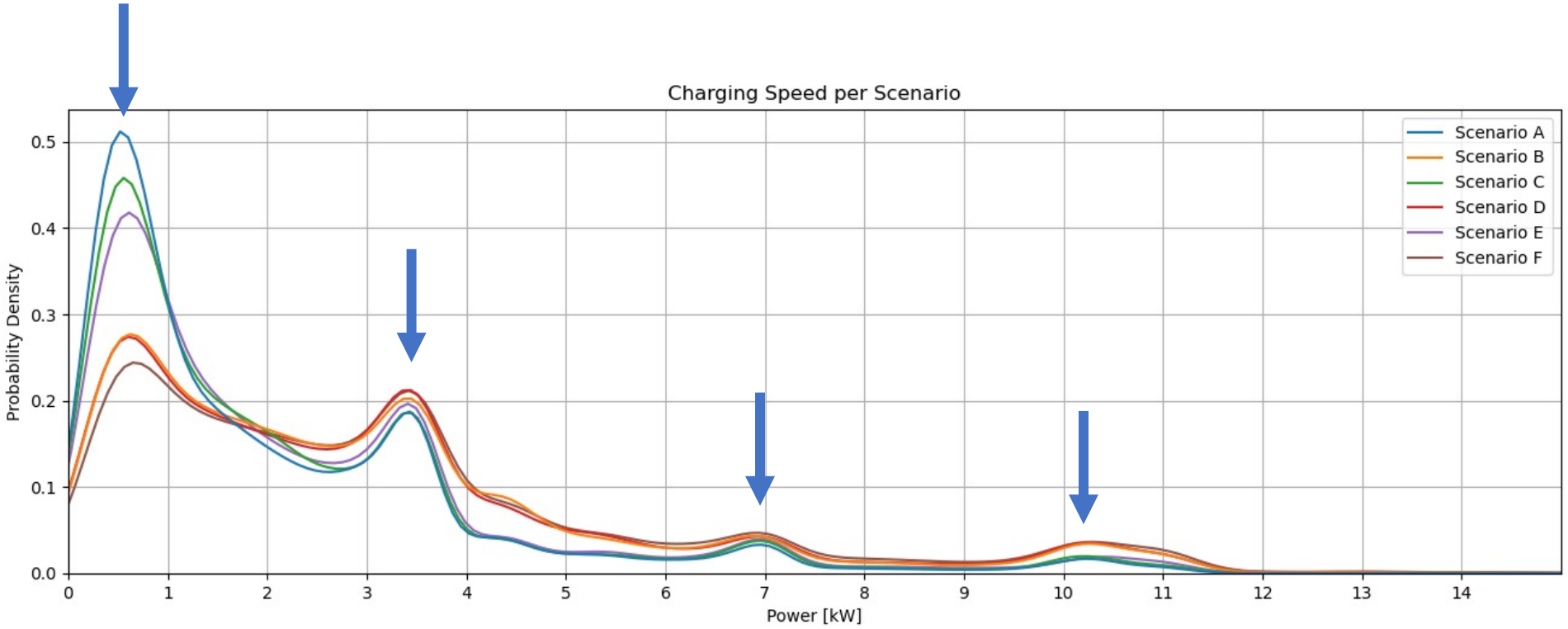
Results – Power



Scenario	Battery	Home charging availability
A	Small	High
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Key take-aways

Design

- Shift away from workplace
- (Semi-)Public a good substitute for home charging
- On-street charging also increases need for fast charging
- Large range cars rely less on fast charging

Business case

- Larger transactions with increased battery size
- Connection times remain similar with increased battery size
- Shift from small and medium sized BEVs to large BEVs decreases business case opportunities for fast charging

Grid operator

- Fewer PHEVs leads to higher evening peak load due to:
- Timing of charging sessions
- Power per vehicle (shift from 3.7kW to 11kW)
- Reduced opportunities for smart charging

Policy

- Design purchase policies alongside charging infrastructure design
- Examples include exclusion of PHEVs or budget caps for subsidies