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Demand study for establishing EV charging infrastructure at Alholmen Industrial Park

Final report

Anders Jungar & Emil Holmberg
27.3.2025

JAKOBSTADSREGIONEN
PIETARSAAREN SEUTU

Co-funded by the European Union

Regional Council of Ostrobothnia

AIP
ALHOLMEN INDUSTRIAL PARK

Recap: Aim and Benefit of Demand study

AIM

Assess **demand to develop AIP into a pilot project for electric vehicle (EV) charging.** Aim is also to identify **key stakeholders' needs for GHG emission free transport**, which forms the basis for demand.

Ambition is to estimate the **order of magnitude EV charging capacity need in 2025, 2027** and **2030. Focus on cars, light, medium and heavy-duty trucks.**

BENEFIT

ACEP and Kempower can make a **fact-based decision on whether to develop and initiate an in-depth feasibility and business case analysis** for EV charging @ AIP **(pilot case for industrial parks).**

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Initial high-level roadmap*

Step1
Demand study

Step2
Feasibility and business case, implementation plan for AIP

Step3 ->
Implementation @ AIP + feasibility of other industrial parks in Europe

SCOPE OF THIS REPORT

Develop and initiate **new co-innovation project** within Kempower's Heavy Electric Traffic Ecosystem (HETE) Veturi program
https://hete.kempower.com/

* PBI proposal 9.12.2024, approved by AIP Board

Thank you to all company reps involved through interviews and/or providing data

- Alholmens Kraft: Björn Åkerlund, Johannes Östman
- Baltic Yachts: Pamela Honga
- Billerud: Marjo Santanen, Ella Viitiö
- Nautor Swan: Benny Brännbacka
- NCE: Markus Niemi
- OSTP: Jyrki Sironen
- Port of Pietarsaari: Juha Hakala, Johanna Heinoja
- UPM Pulp: Tomi Heikkinen, Samuli Räsänen, Juhani Seppä
- UPM Sawmill: Mika Åby
- Walki: Pasi Joki

+ Kempower experts Petri Korhonen, Ville Naumanen, Tommi Rissanen

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Company views on transport GHG emission reductions through electrification

Company plans and targets for scope-3 emission reduction specifically for operations at Alholmen

- **NOTE. On corporate level,** UPM and Billerud have targets to reduce Scope 3 emission with 25-30% by 2030, Walki Scope 3 -50% intensity reduction by 2030.
- Most companies do not have Alholmen specific plans or targets to reduce their scope-3 emissions.
- Some companies have early-stage plans without clear targets.
- Most companies measure their scope-3 emissions one way or another.

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Challenges & Opportunities highlighted by companies

Challenges

1. The early stage of electrifying heavy vehicles and lack of insufficient infrastructure.
2. High initial investment and question on who will initiate the investment.
3. Not enough space on Alholmen to support the required infrastructure.
4. What's in it for the companies? How do you make the investment financially viable for the whole value chain?

Opportunities

1. Consciousness and even requirement of lower scope-3 emissions is increasing especially among end customers from the public sector.
2. Increasing EU regulatory pressure (e.g. ETS2 for road transport in 2027)
3. All companies at Alholmen Industrial Park saw some kind of competitive advantage they could achieve by reducing scope-3 emissions. Most emphasizing the need to remain competitive as customer demand for sustainability grows.

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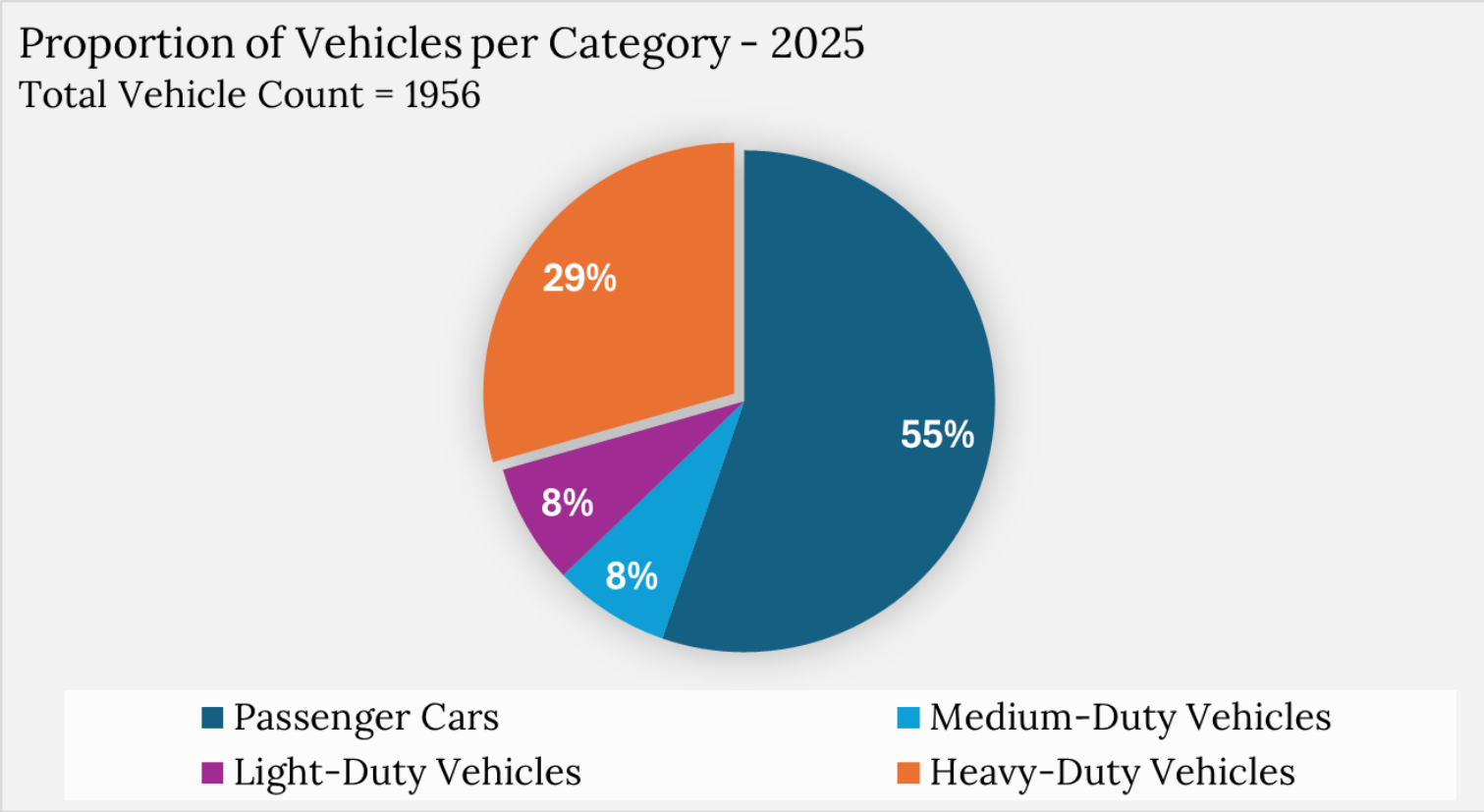
Summary of data reported by companies to estimate the EV charging demand

Proportion of Vehicles per Category – 2025



- **Approximately 2,000 vehicles pass through the area daily.**

- This distribution highlights the need for a balanced charging infrastructure consisting of a mix of fast chargers and level 2 chargers to meet the area's charging needs efficiently.

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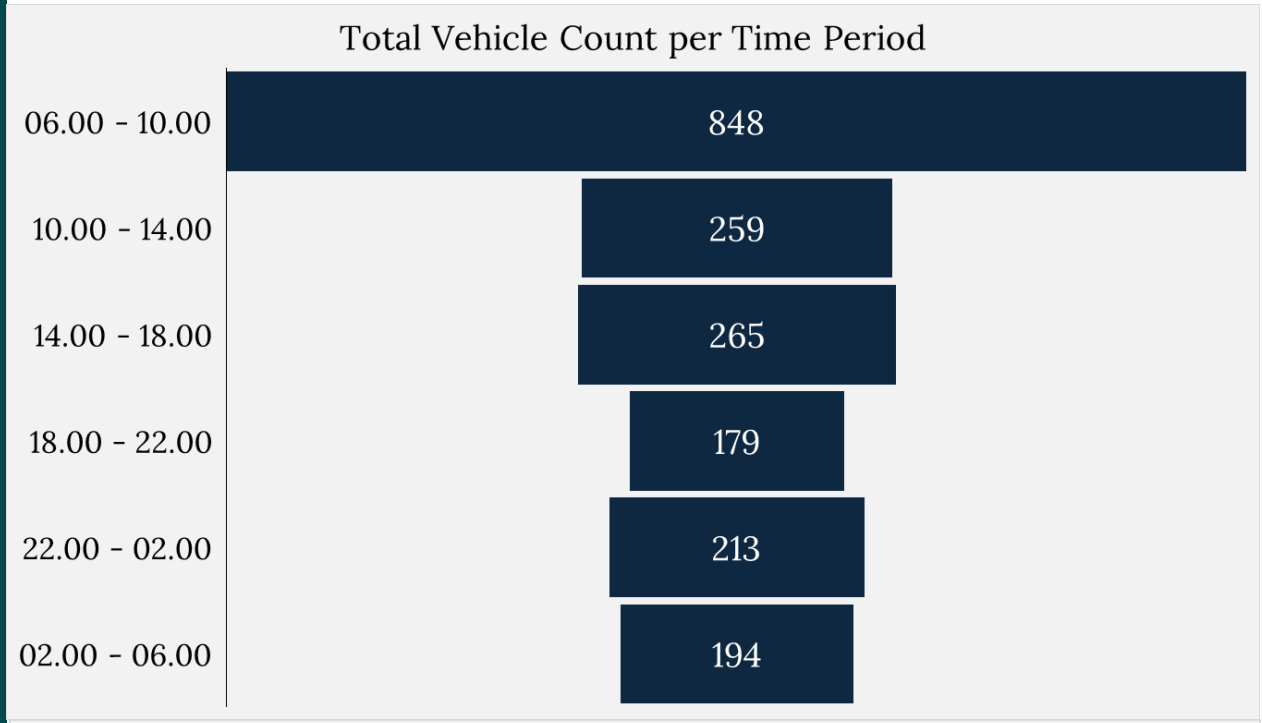

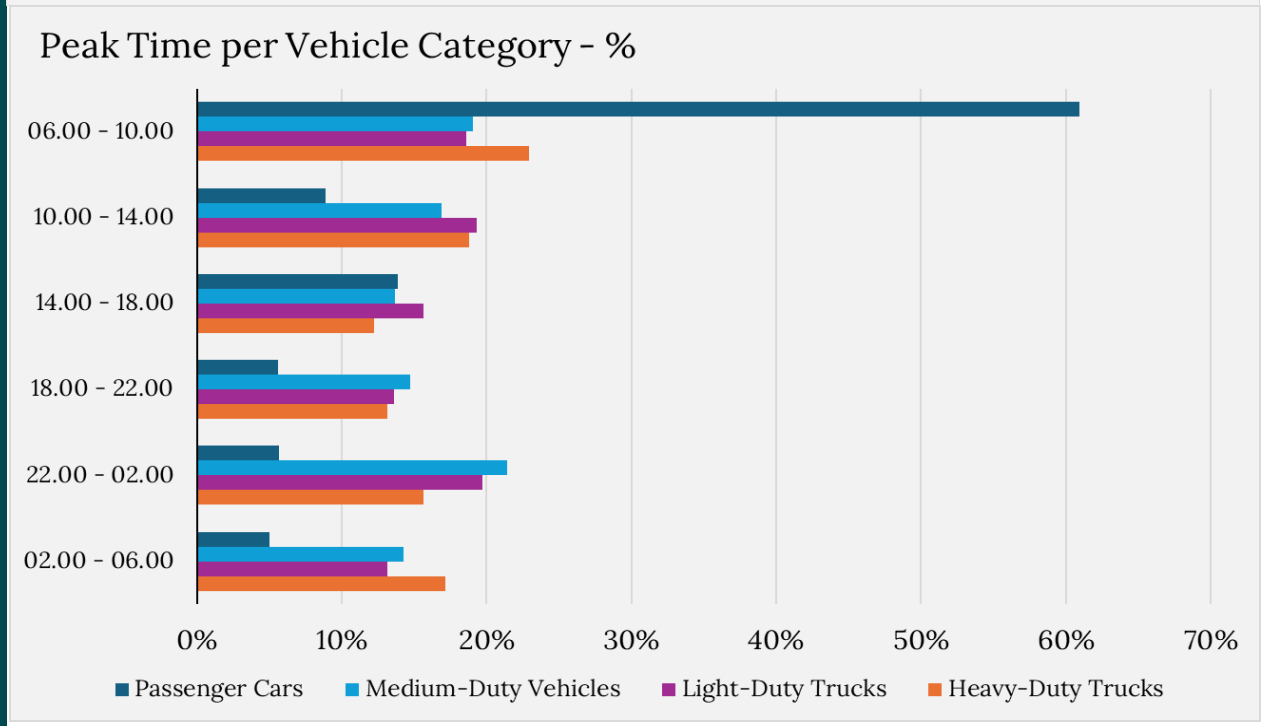

Traffic distribution during a day

- The busiest period for vehicle arrivals at Alholmen Industrial Park is between 06.00 – 10.00.
- During other time periods, the total vehicle count remains steady at around 200-250.
- Just over 60 % of all passenger cars arrive between 06.00 – 10.00.
- Heavy-duty vehicles arrive more evenly throughout the day, with the highest volume recorded between 06.00 – 10.00.

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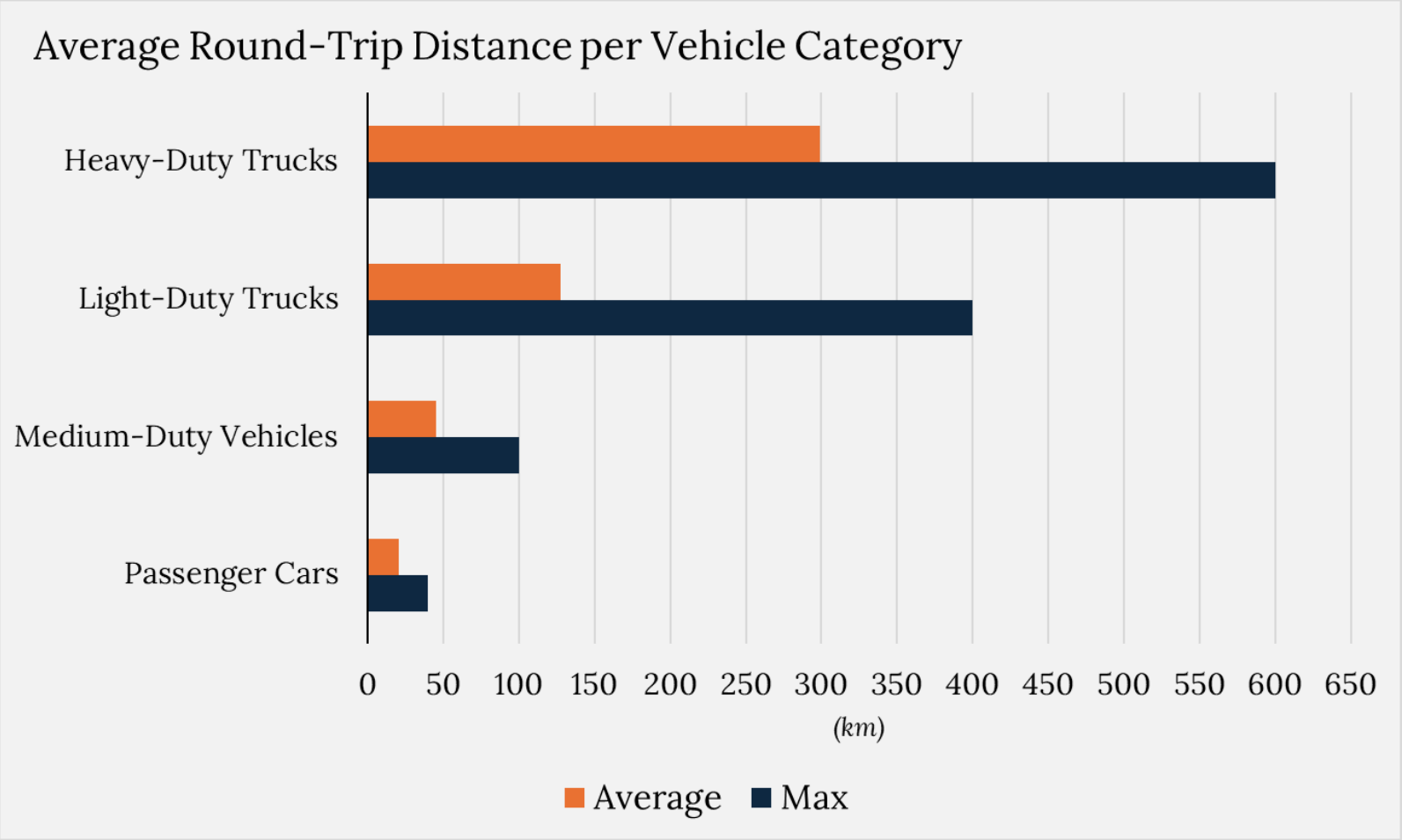
Distances travelled by vehicle category



- Heavy-duty vehicles travel significantly longer distances on average compared to other categories.
- The variation in travel distances among vehicle categories directly impacts their charging needs.
- Longer travel distances for heavy-duty vehicles mean they require higher-capacity fast chargers to minimize downtime, whereas other categories can rely on slower charging options.

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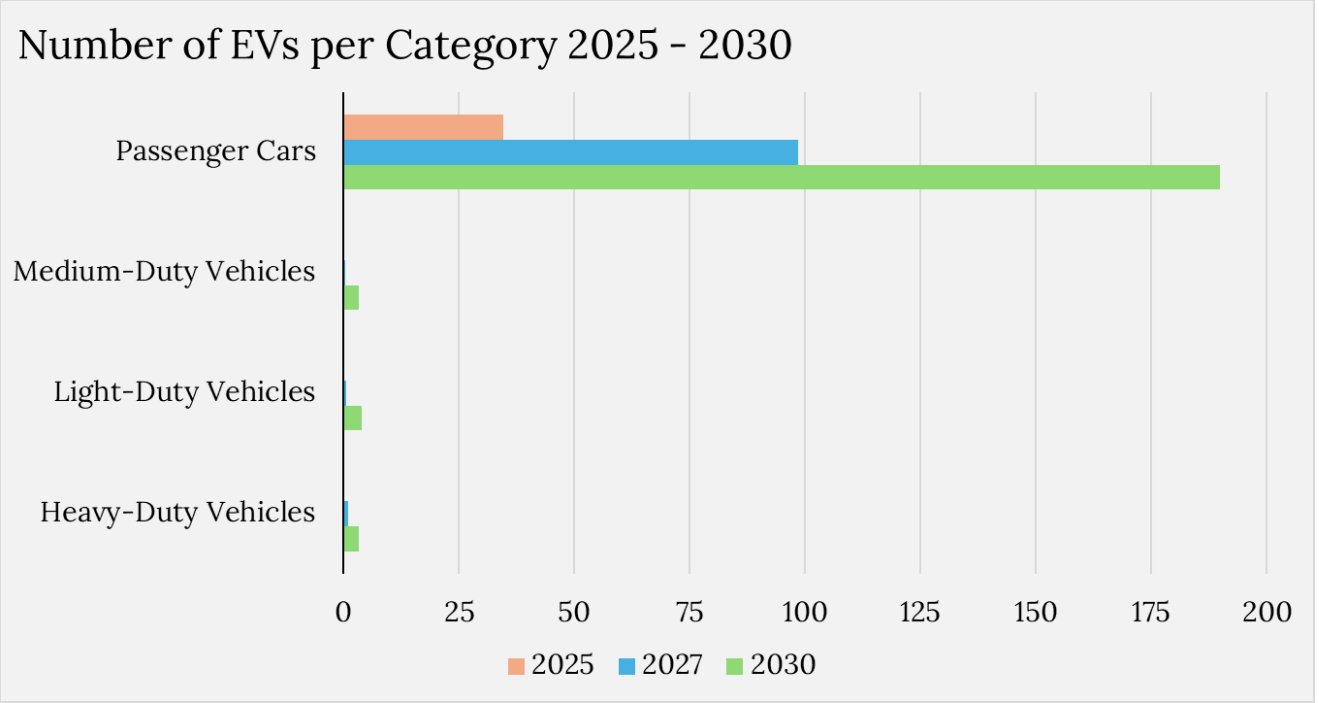

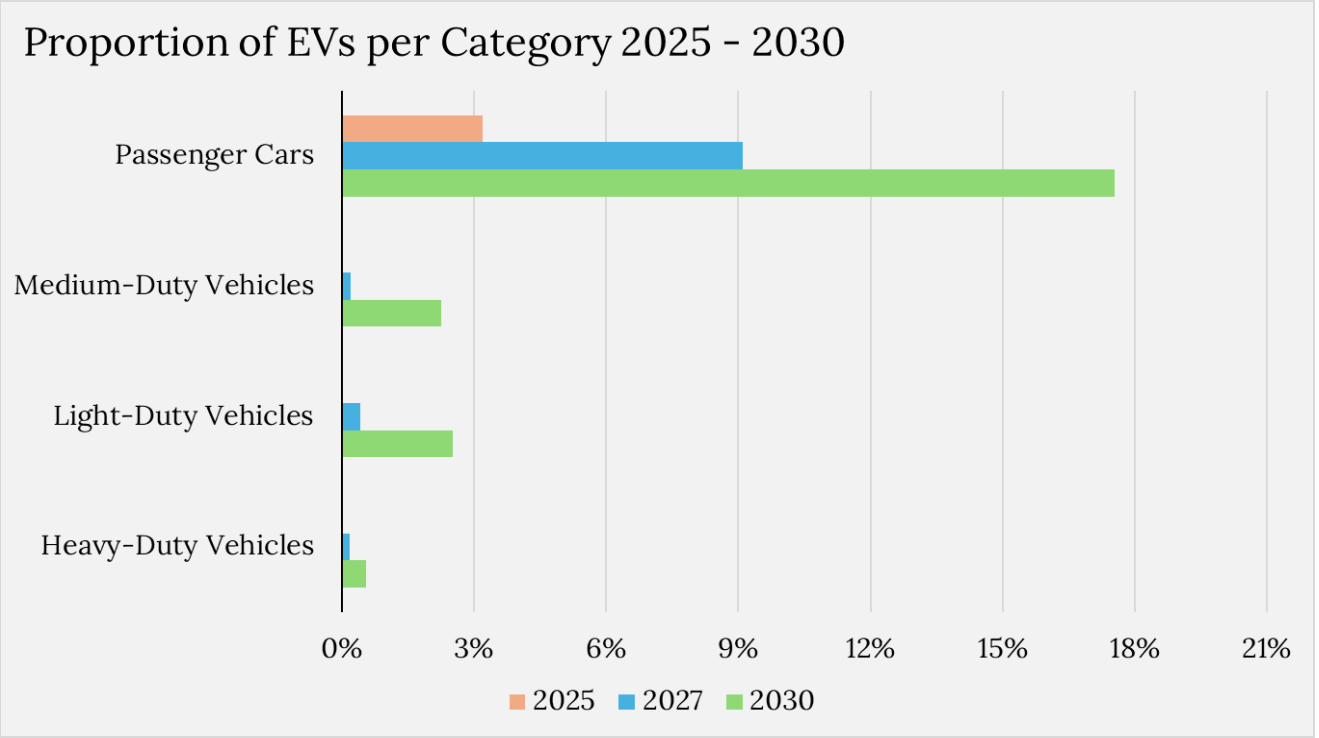

Companies' expected transition rate towards EVs 2025–2030

- The charts indicate that **companies at Alholmen Industrial Park are more optimistic about the electrification of passenger cars compared to other vehicle categories.** Over the next five years, the proportion of electric passenger cars is expected to rise from around 3 % to approximately 18 %.

- **In the heavy-duty category, 5 out of 9 companies estimated that the proportion of electric heavy-duty vehicles in 2030 will remain at zero percent**. As a result, the projected growth for heavy-duty EVs between 2025 and 2030 is expected to be minimal, reaching only about 0.5 %. **This is significantly lower than market research** shows.

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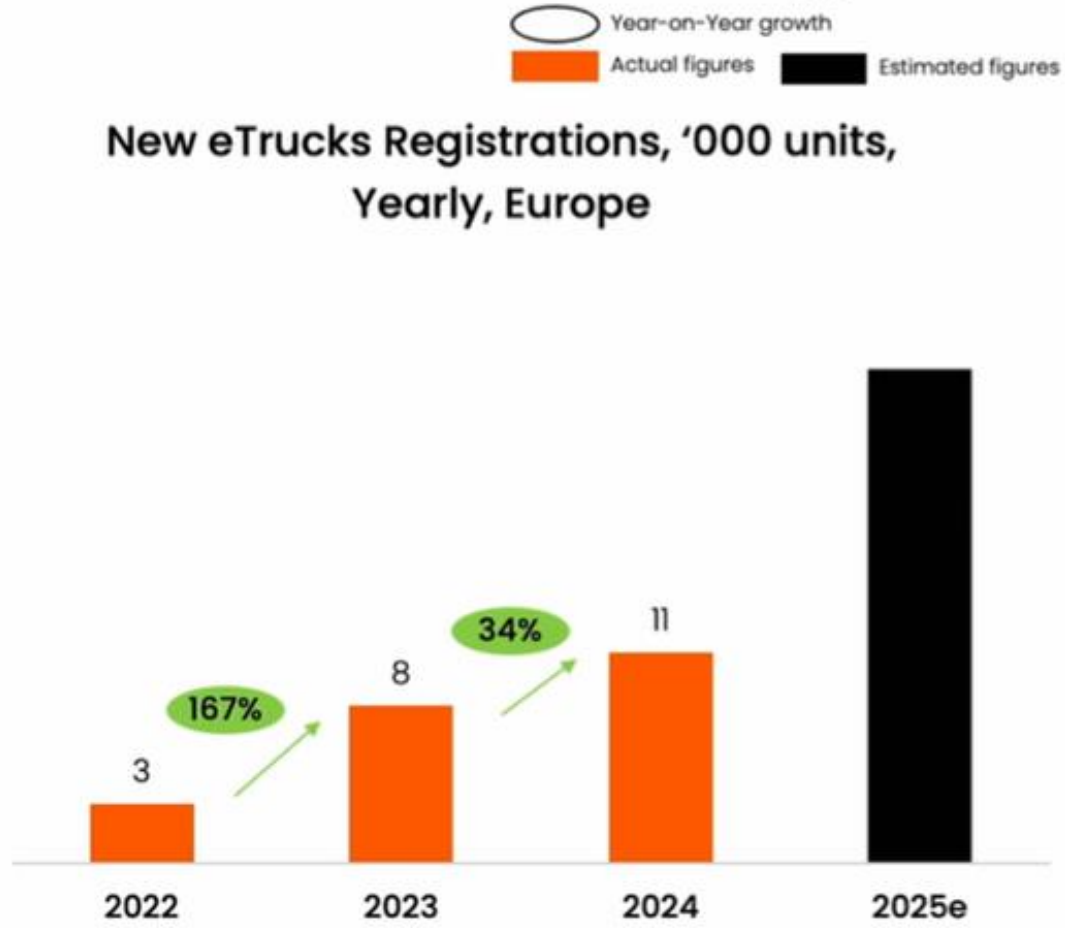
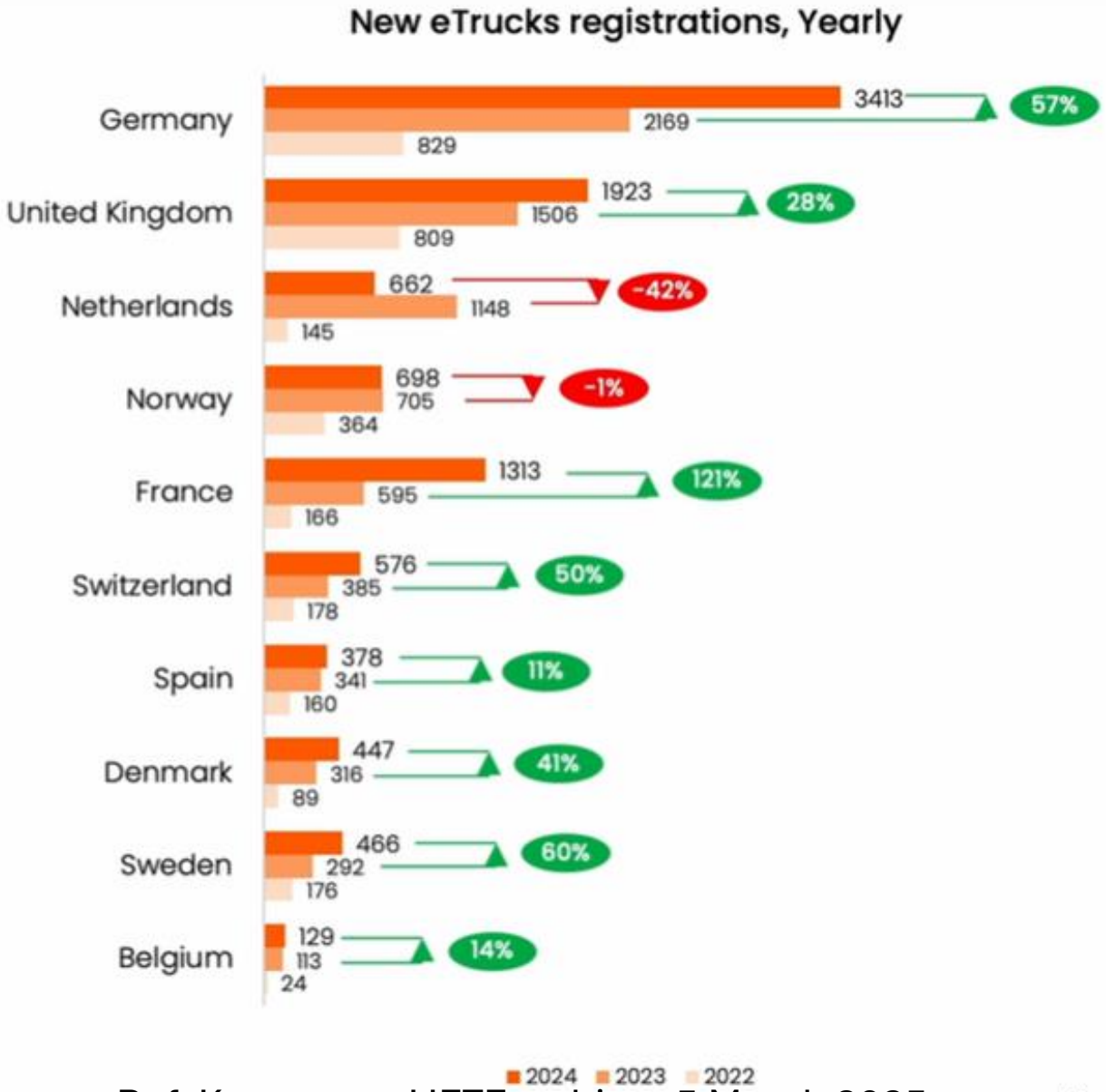
Scenario analysis

EV charging capacity need based on EV adoption rate

Europe: eTrucks set to surge

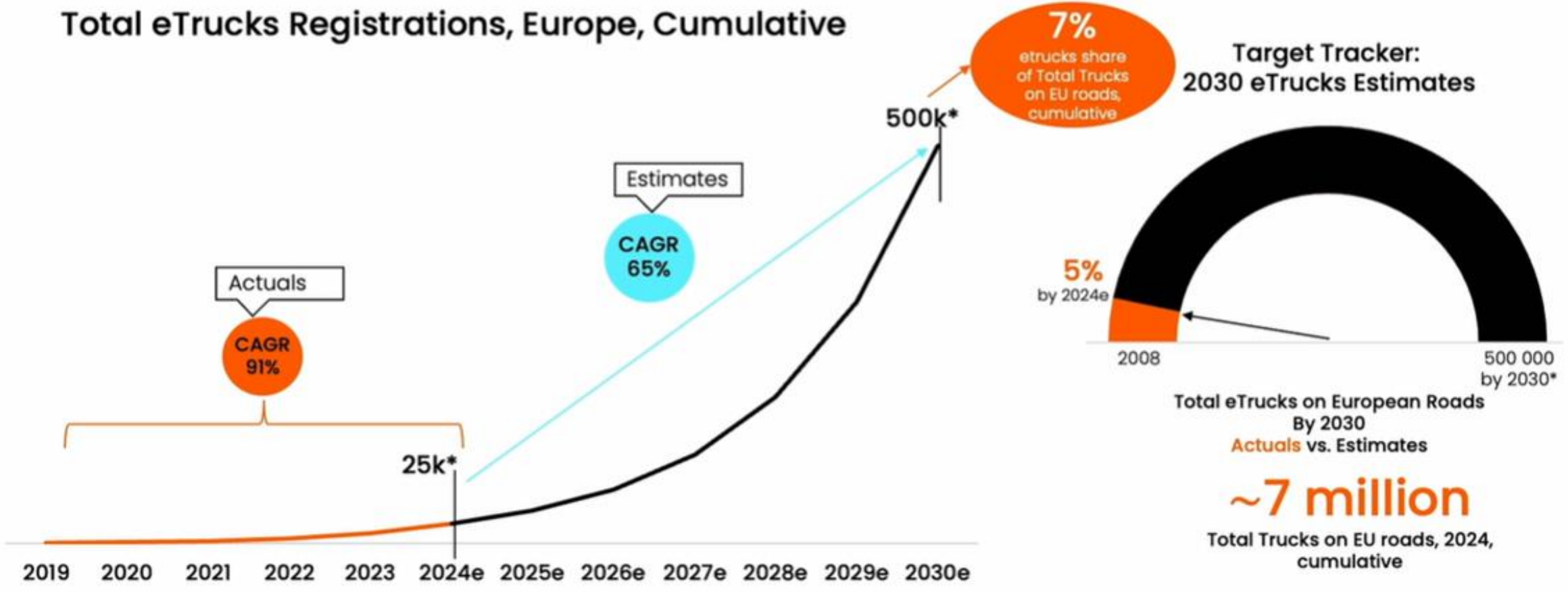


Source: European Automobile Manufacturers Association (acea); Kempower Market Research (KMR)



Ref. Kempower HETE webinar 5 March 2025

By 2030, Kempower estimates that there could be 500 000 eTrucks on the European roads



Source: European Alternative Fuel Observatory (EAFO); Kempower Market Research (KMR)

Ref. Kempower HETE webinar 5 March 2025

Kauppalehti 27.3.2025

kauppalehti.fi/uutiset/nain-raskas-liikenne-sahkoistyy-nyt-suomeen-saapuivat-sahkoiset-sailiorekat/40603f0b-88a7-4d4c-a4d6-ad754

← Etusivulle

Näin raskas liikenne sähköistyy – Nyt Suomeen saapuivat sähköiset säiliörekat

Ensimmäinen sähköllä toimiva säiliörekka otetaan käyttöön Kaakkois-Suomessa

https://www.kauppalehti.fi/uutiset/nain-raskas-liikenne-sahkoistyy-nyt-suomeen-saapuivat-sahkoiset-sailiorekat/40603f0b-88a7-4d4c-a4d6-ad7549580939

Explanation of the scenarios

- The following table showcases the number of EVs per vehicle category for each scenario including the total charging demand per time interval.

- **2025** are the actual numbers reported by the companies today.
- **2027E & 2030E** are the estimated numbers reported by the companies for the years 2027 and 2030.

- **2027 – PG & 2030 – PG** = modified numbers indicating 'positive growth' compared to reported numbers.
- **2030 – OG** = modified numbers indicating 'optimistic growth' compared to reported numbers.

Number of EVs per Vehicle Category	2025	2027E	2030E	2027 - PG	2030 - PG	2030 - OG
Passenger Cars	32	97	195	108	195	271
Medium-Duty Vehicles	0	0	3	3	7	15
Light-Duty Vehicles	0	0	5	3	8	15
Heavy-Duty Vehicles	0	0	6	6	17	40

% of EVs of Total Count per Category	2025	2027E	2030E	2027 - PG	2030 - PG	2030 - OG
Passenger Cars	3%	9%	18%	10%	18%	25%
Medium-Duty Vehicles	0%	0%	2%	2%	5%	10%
Light-Duty Vehicles	0%	0%	3%	2%	5%	10%
Heavy-Duty Vehicles	0%	0%	1%	1%	3%	7%

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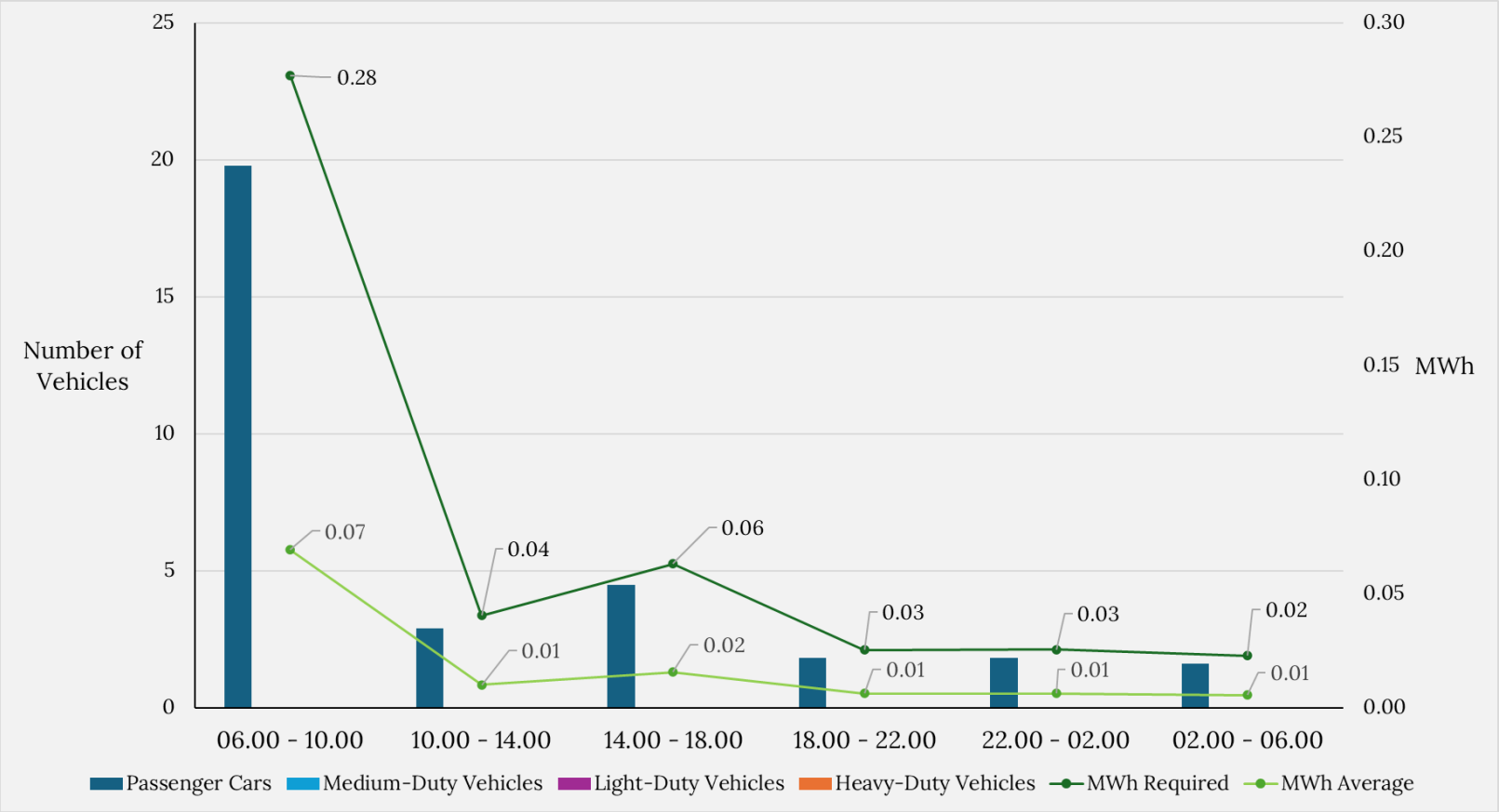
Scenario 0 – Situation right now
Charging capacity need during day



- The situation right now at Alholmen Industrial Park has the following distribution:

Passenger cars	3%
MD-vehicles	0%
LD-vehicles	0%
HD-vehicles	0%

- **Peak charging demand ~0.28 MWh during morning (6-10)**

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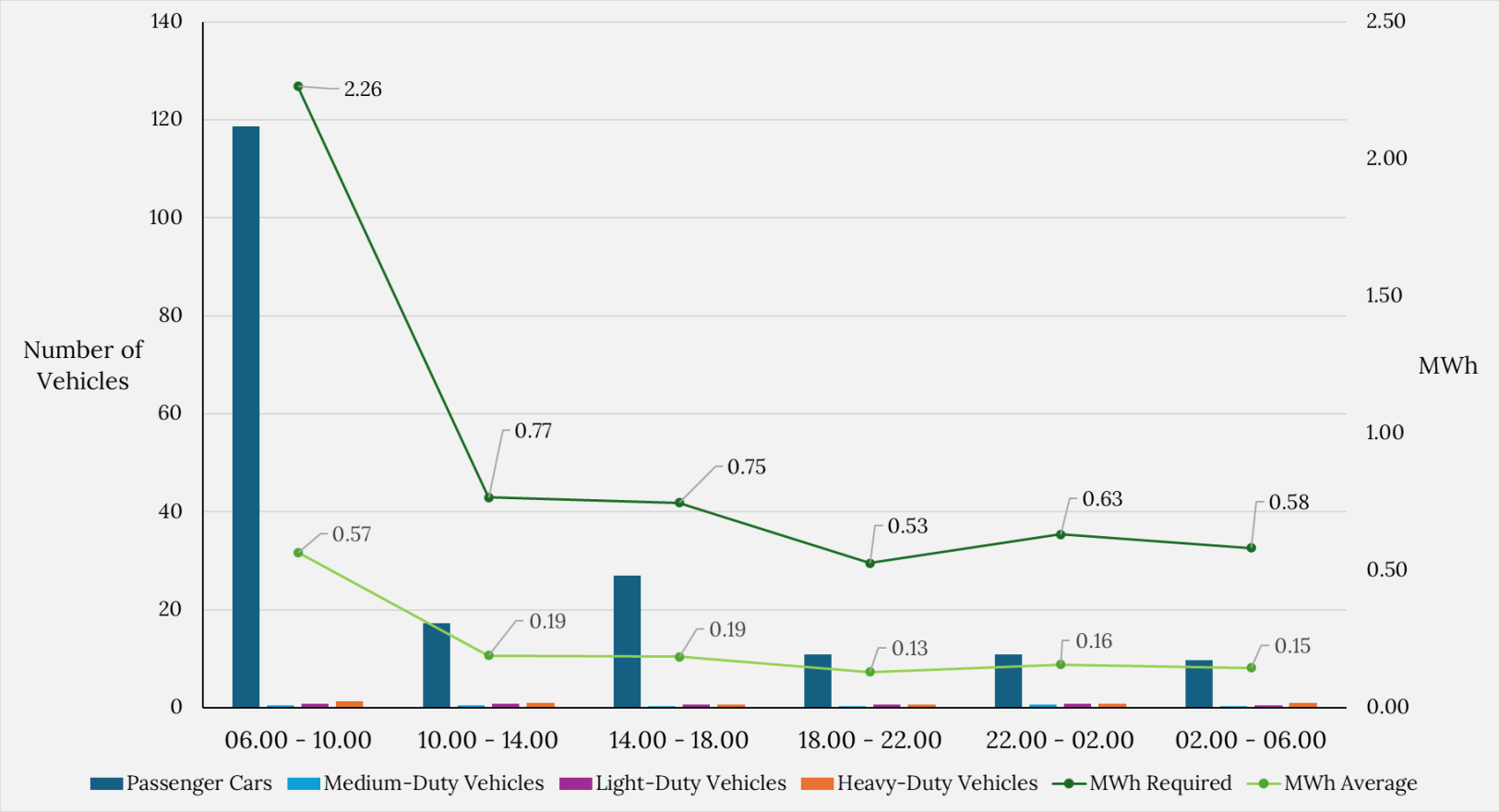
Scenario 2030E – Company estimates for 2030



- Estimated numbers for 2030 at Alholmen Industrial Park has the following distribution:

Passenger cars	18%
MD-vehicles	2%
LD-vehicles	3%
HD-vehicles	1%

- **Peak charging demand ~ 2.26 MWh during morning (6-10)**

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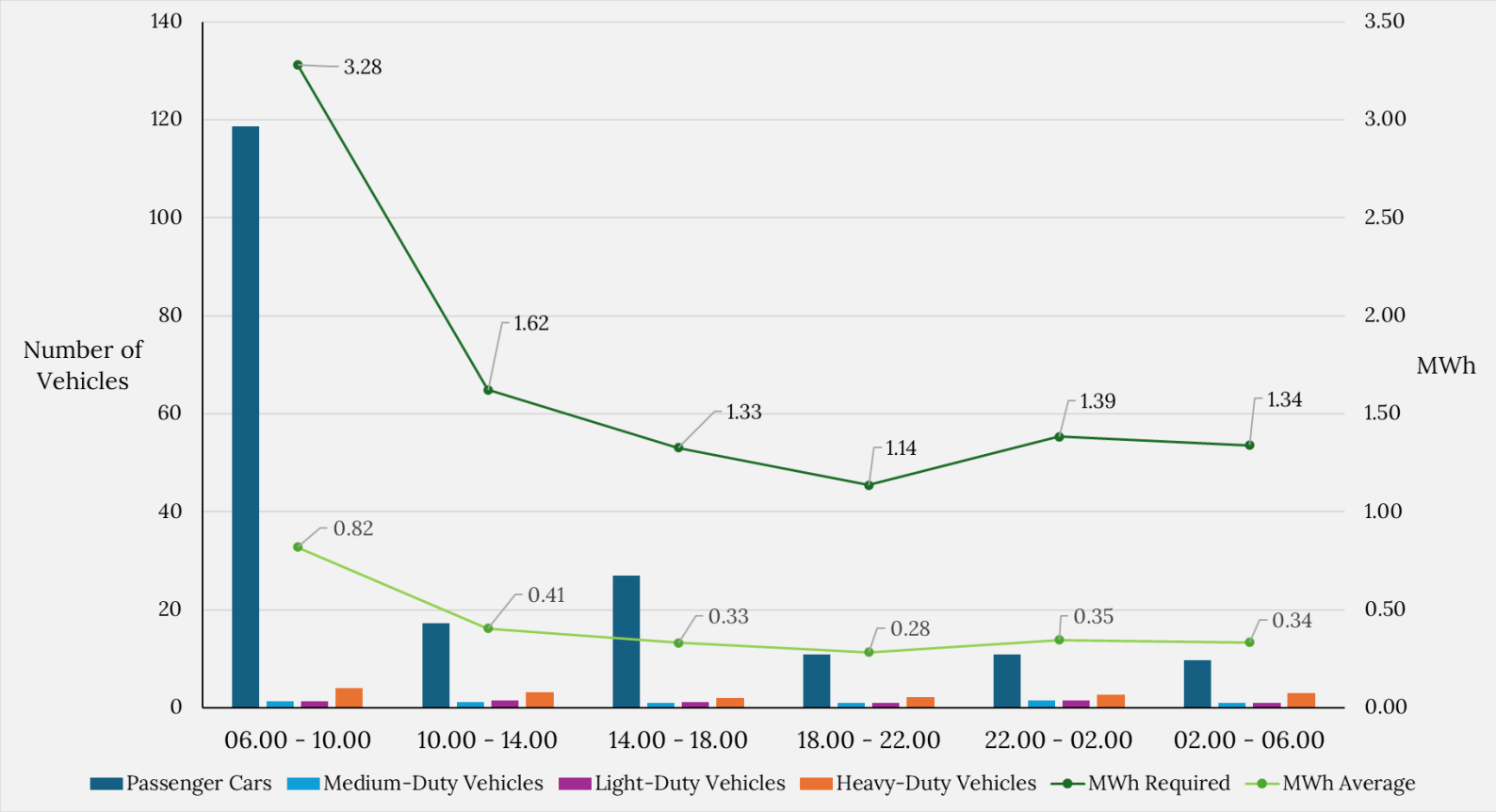
Scenario 2 – Positive Growth 2030



- Estimated positive growth scenario for 2030 with the following distribution of EVs among vehicle categories:

Passenger cars	18%	(+ 0%)
MD-vehicles	5%	(+ 3%)
LD-vehicles	5%	(+ 2%)
HD-vehicles	3%	(+ 2%)

+% is the percentage point increase compared to the actual estimates reported by the companies for the same time period.

- **Peak charging demand ~ 3.28 MWh during morning (6-10)**

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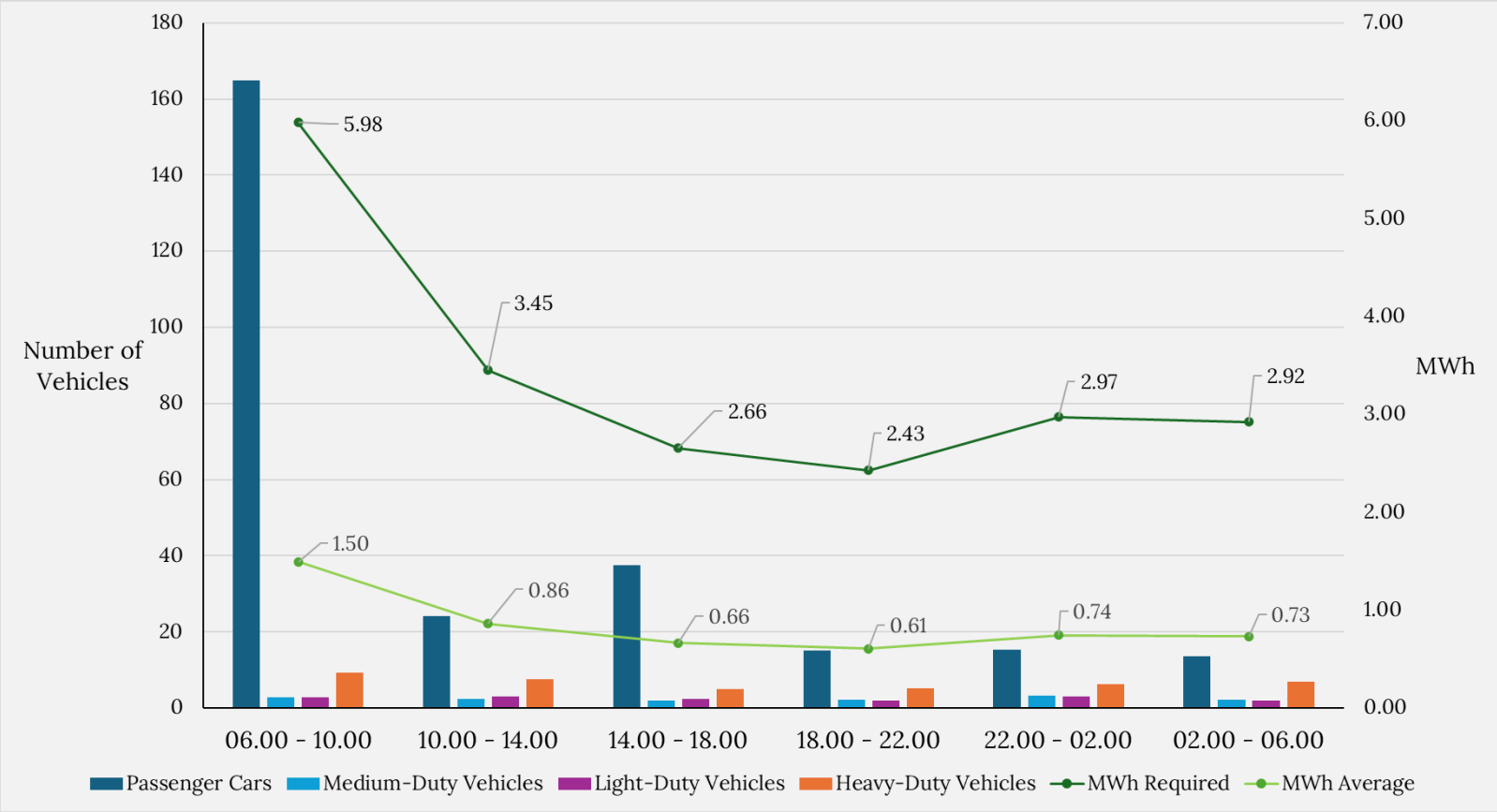
Scenario 3 – Optimistic Growth 2030



- Estimated optimistic growth scenario for 2030 with the following distribution of EVs among vehicle categories:

Passenger Cars	25%	(+ 7%)
MD-Vehicles	10%	(+ 8%)
LD-Vehicles	10%	(+ 7%)
HD-Vehicles	7%	(+ 6%)

+% is the percentage point increase compared to the actual estimates reported by the companies for the same time period.

- **Peak charging demand ~ 5.98 MWh during morning (6-10)**

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Executive Summary

- This report summarizes the **demand for developing Alholmen Industry Park into a pilot project for electric vehicle (EV) charging**. The study **identified strategic targets and plans for GHG emission free transport (scope-3 emissions) based on EVs for cargo owners with operations at Alholmen**. The study estimated the EV charging capacity need in 2025, 2027 and 2030, with a focus on passenger cars, medium, light, and heavy-duty trucks. The demand study is **part of the ACEP's project Work Package 2**, task 2.3 (' *An implementation plan 2024-2030 for the development of electric vehicle infrastructure in the area is to be developed*').
- The results indicate **high inbound/outbound traffic volumes,** presenting a **strong potential for electrification**, while **companies' perspectives on transitioning to electric transport remain mixed**.
- Most companies have taken **significant actions to reduce their scope-1 and scope-2 emissions, leaving scope-3 emissions in the shadows**. Namely, 8 out of 9 actors do not have specific targets for reducing their scope-3 emissions at Alholmen, while 1 out of 9 actors have targets without a specific roadmap on how to achieve said targets. However, most actors are aware of their scope-3 emissions in detail.
- The **most notable challenges** shared among the companies was the lack of infrastructure supporting the transition, high initial investments, and financial viability of the investment.
- As a result, while **passenger EV adoption is expected to grow substantially**, **companies expect the electrification of heavy-duty vehicles to remain very limited**, leading to only a modest increase in estimated EV charging capacity demand by 2030. This is in sharp contrast to EV market research.
- **Based on the demand study, Kempower is interested to initiate a co-innovation project** within their HETE Veturi program with AIP as pilot case.

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Contact for more information about this report

Anders Jungar

anders.jungar@pbi.fi

+358 40 77 57 918

www.pbi.fi

Emil Holmberg

emil.holmberg@pbi.fi

+358 40 595 2012

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Appendix on following pages

Key assumptions for estimating charging demand

- State of Charge (SOC) for all vehicle types from 20% to 80%, except passenger cars where we assume SOC of 60% to 80%.
- All EVs are connected to chargers at same time within one time window (e.g. 6am-10am)
- Battery capacities for different vehicle categories
  - Passenger cars 70 kWh
  - Medium-size van 120 kWh
  - Light-duty truck 250 kWh
  - Heavy-duty truck 550 kWh

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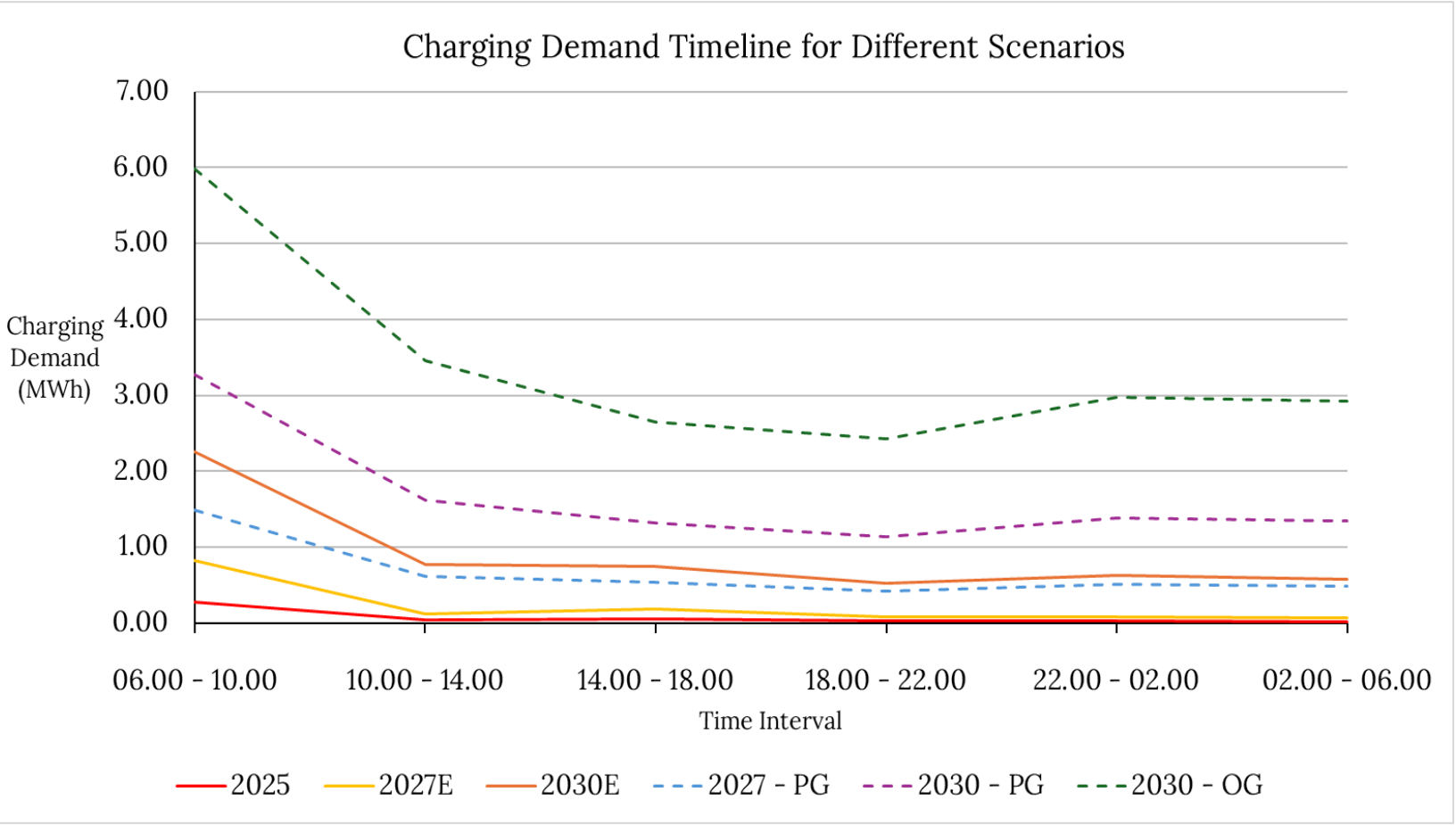

Charging Demand Timeline

The following chart showcases the timeline of the charging demand for each scenario. The **intact lines are the scenarios reported by the companies**, while the **dashed lines are forecasted scenarios** with positive and optimistic growth.

2025	Gr.Today	2027E	Gr.Today	2030E	
3%	6%	9%	15%	18%	Passenger Cars
0%	0%	0%	2%	2%	Medium-Duty Vehicles
0%	0%	0%	3%	3%	Light-Duty Vehicles
0%	0%	0%	1%	1%	Heavy-Duty Vehicles

	Gr.Today	2027 - PG	Gr.Today	2030 - PG	Gr.Today	2030 - OG
	7%	10%	15%	18%	22%	25%
	2%	2%	5%	5%	10%	10%
	2%	2%	5%	5%	10%	10%
	1%	1%	3%	3%	7%	7%

Gr.Today = Growth from today (year 2025).

- From the table different EV adoption rates can be compared between scenarios.

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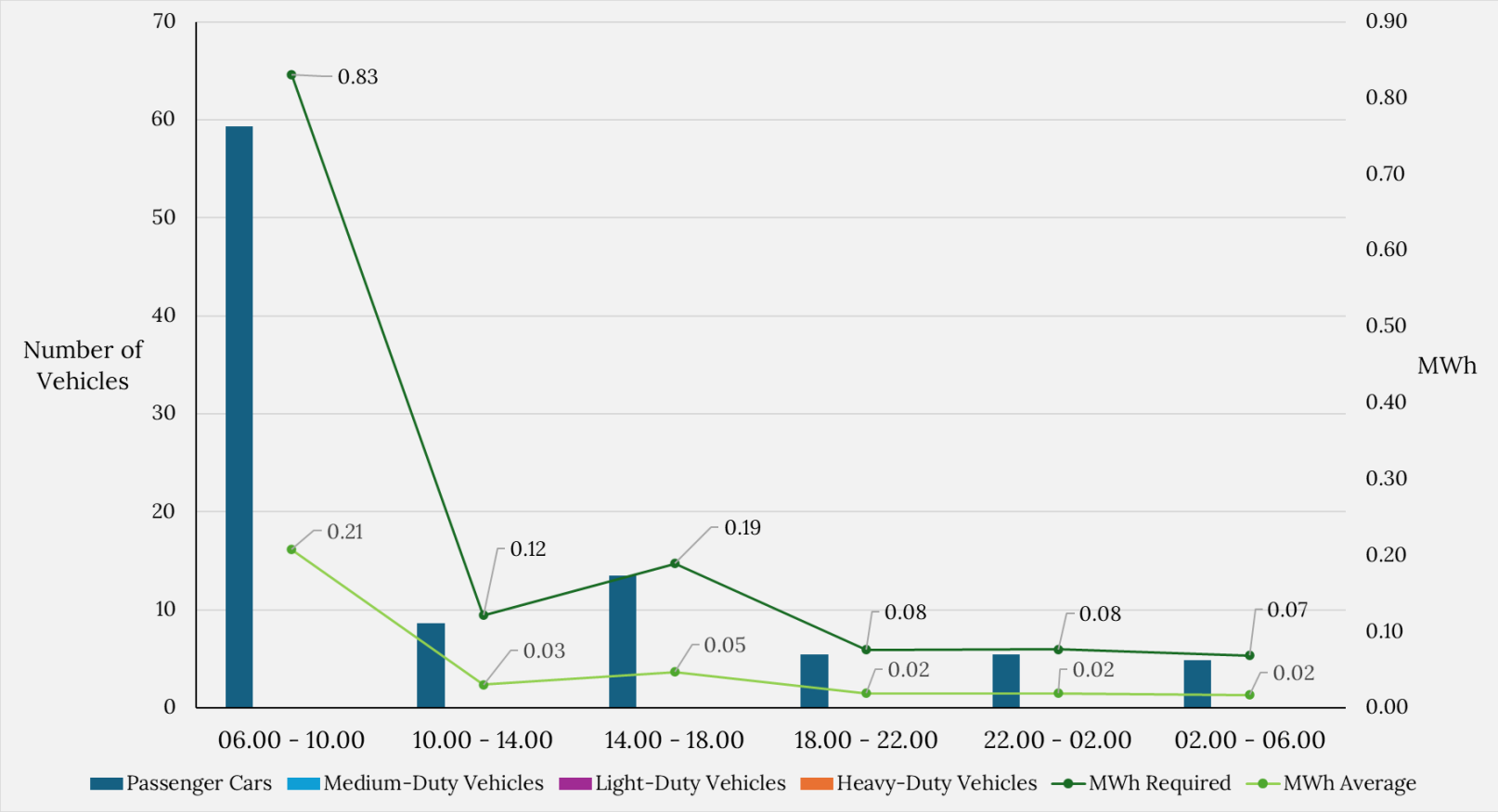
Scenario 2027E – Company estimates for 2027



- Estimated numbers for 2027 at Alholmen Industrial Park has the following distribution:

Passenger cars	9%
MD-vehicles	0%
LD-vehicles	0%
HD-vehicles	0%

- **Peak charging demand ~ 0.83 MWh during morning (6-10)**

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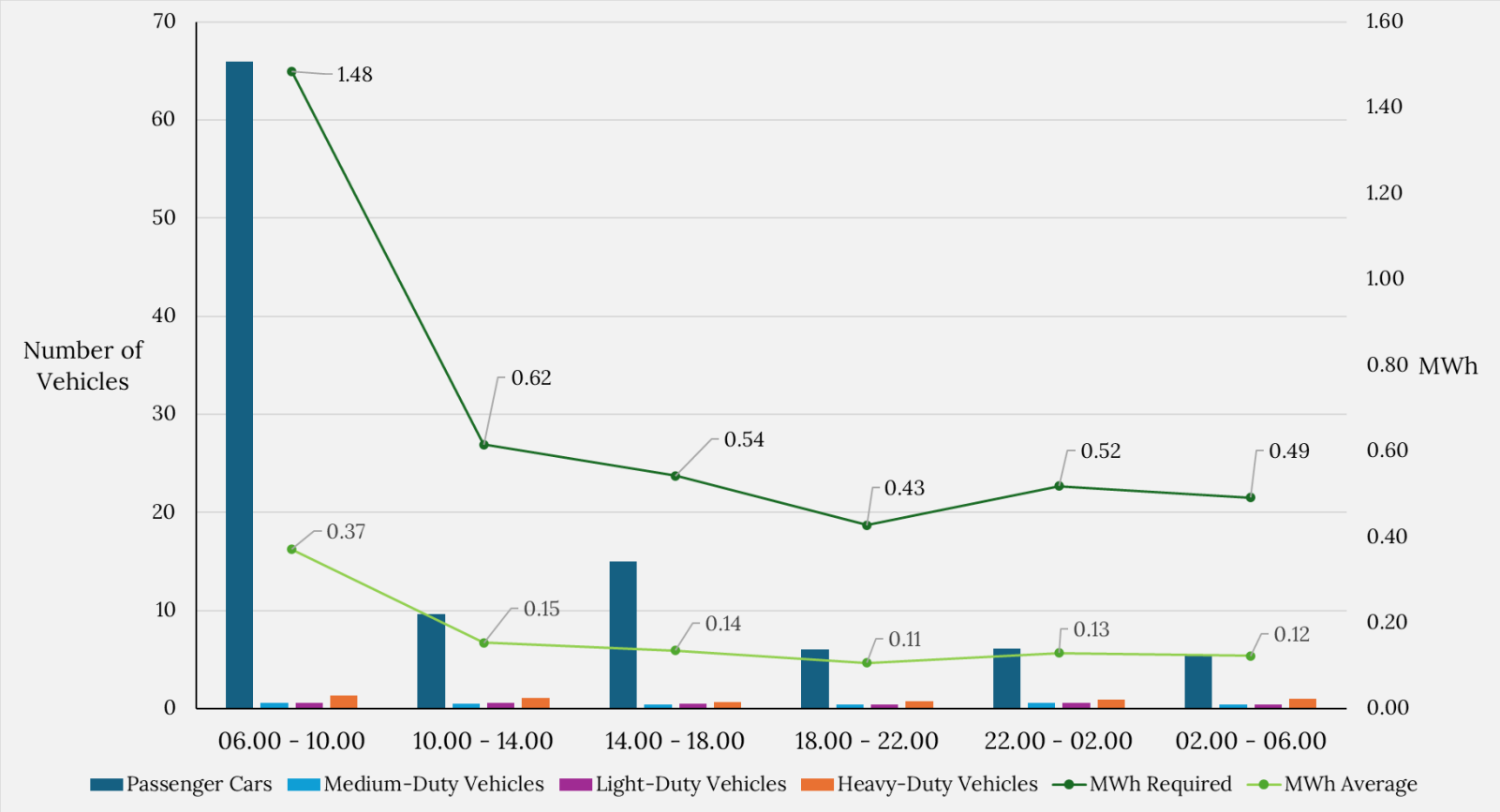
Scenario 1 – Positive Growth 2027



- Estimated positive growth scenario for 2027 with the following distribution of EVs among vehicle categories:

Passenger cars	10%	(+ 1%)
MD-vehicles	2%	(+ 2%)
LD-vehicles	2%	(+ 2%)
HD-vehicles	1%	(+ 1%)

+% is the percentage increase compared to the actual estimates reported by the companies for the same time period.

- **Peak charging demand ~ 1.48 MWh during morning (6-10)**

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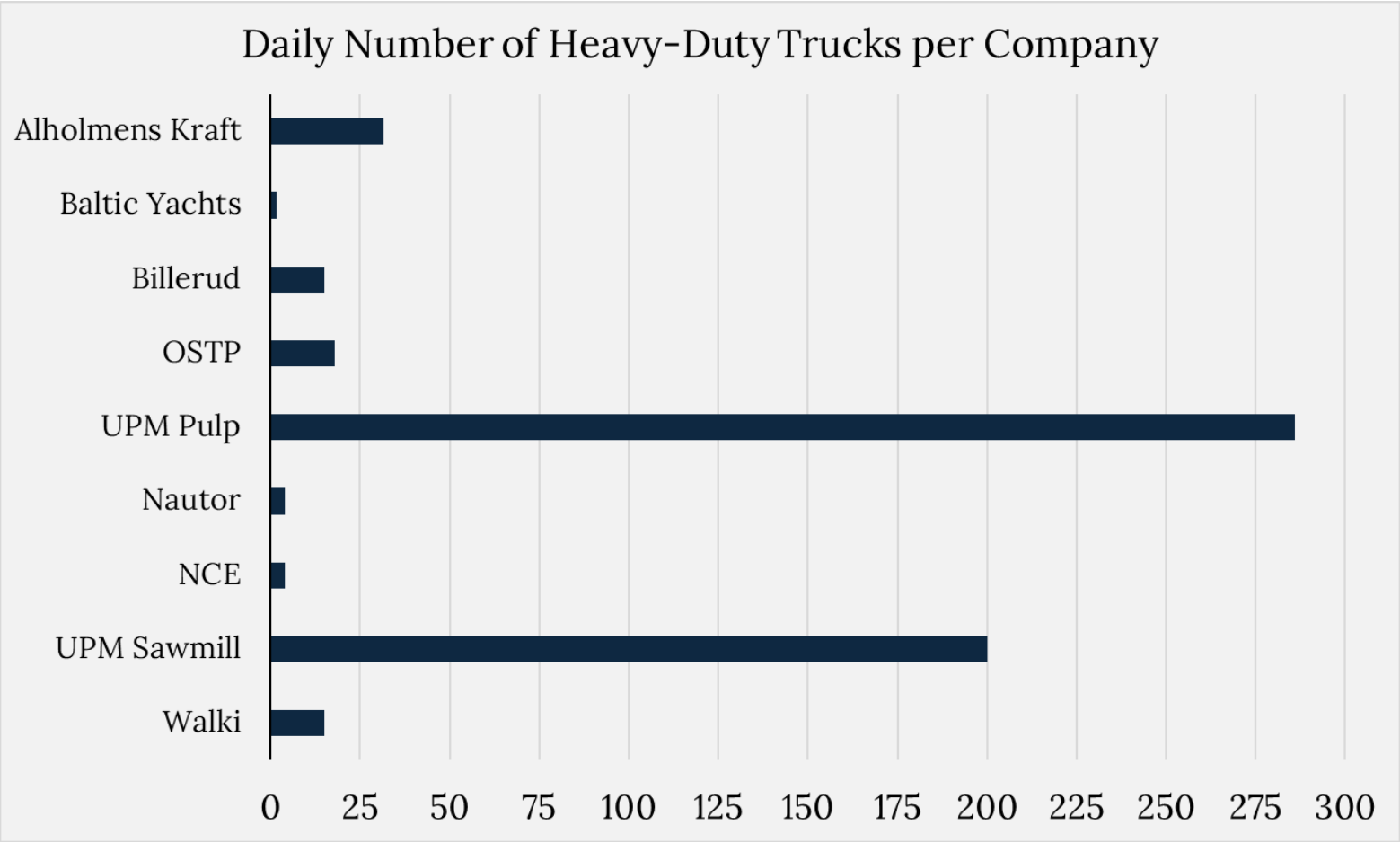
Appendix



- Distribution of heavy-duty vehicles among companies operating at Alholmen Industrial Park.
- The graph indicates that there are two operators responsible for the majority of the heavy-duty vehicle traffic into the area.

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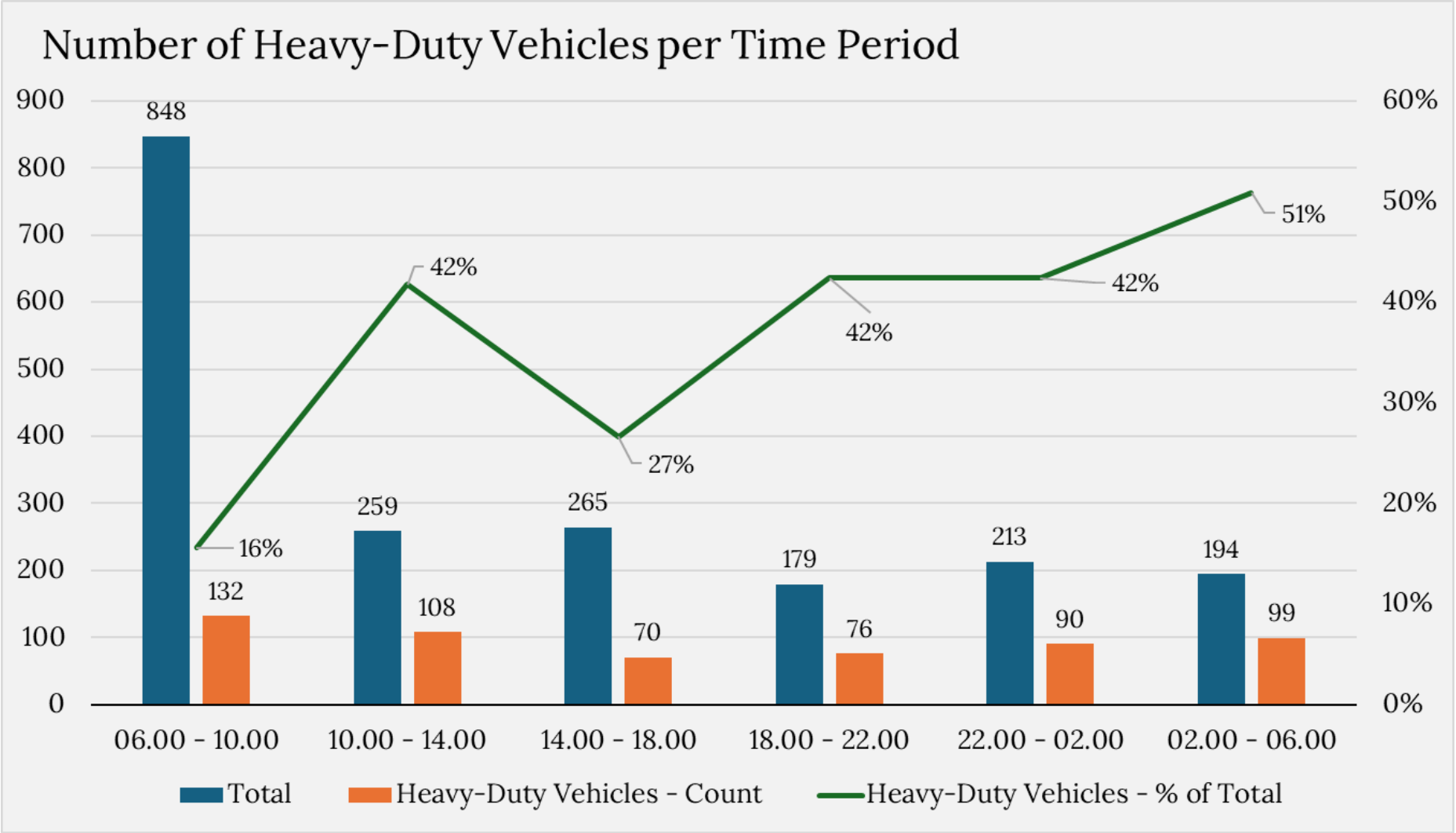
Traffic distribution during a day



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Appendix

- **Scenario 1 / Positive Growth 2027 -** Detailed Charging Demand

Total Charging Demand	kWh/day	MWh/day
Passenger Cars	1,515	1.51
Medium-Duty Trucks	212	0.21
Light-Duty Trucks	456	0.46
Heavy-Duty Trucks	1,898	1.90

EV Time Distribution	Passenger Cars	Medium-Duty Vehicles	Light-Duty Vehicles	Heavy-Duty Vehicles	MWh Required	MWh Average
06.00 - 10.00	66	1	1	1	**1.48**	**0.37**
10.00 - 14.00	10	0	1	1	**0.62**	**0.15**
14.00 - 18.00	15	0	0	1	**0.54**	**0.14**
18.00 - 22.00	6	0	0	1	**0.43**	**0.11**
22.00 - 02.00	6	1	1	1	**0.52**	**0.13**
02.00 - 06.00	5	0	0	1	**0.49**	**0.12**
Total Sum	**108**	**3**	**3**	**6**		

- **Scenario 2 / Positive Growth 2030 -** Detailed Charging Demand

Total Charging Demand	kWh/day	MWh/day
Passenger Cars	2,727	2.73
Medium-Duty Trucks	530	0.53
Light-Duty Trucks	1,141	1.14
Heavy-Duty Trucks	5,695	5.70

EV Time Distribution	Passenger Cars	Medium-Duty Vehicles	Light-Duty Vehicles	Heavy-Duty Vehicles	MWh Required	MWh Average
06.00 - 10.00	119	1	1	4	**3.28**	**0.82**
10.00 - 14.00	17	1	1	3	**1.62**	**0.41**
14.00 - 18.00	27	1	1	2	**1.33**	**0.33**
18.00 - 22.00	11	1	1	2	**1.14**	**0.28**
22.00 - 02.00	11	2	2	3	**1.39**	**0.35**
02.00 - 06.00	10	1	1	3	**1.34**	**0.34**
Total Sum	**195**	**7**	**8**	**17**		

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Appendix

- **Scenario 3 / Optimistic Growth 2030 -** Detailed Charging Demand

Total Charging Demand	kWh/day	MWh/day
Passenger Cars	3,787	3.79
Medium-Duty Trucks	1,059	1.06
Light-Duty Trucks	2,282	2.28
Heavy-Duty Trucks	13,289	13.29

EV Time Distribution	Passenger Cars	Medium-Duty Vehicles	Light-Duty Vehicles	Heavy-Duty Vehicles	MWh Required	MWh Average
06.00 - 10.00	165	3	3	9	**5.98**	**1.50**
10.00 - 14.00	24	2	3	8	**3.45**	**0.86**
14.00 - 18.00	38	2	2	5	**2.66**	**0.66**
18.00 - 22.00	15	2	2	5	**2.43**	**0.61**
22.00 - 02.00	15	3	3	6	**2.97**	**0.74**
02.00 - 06.00	14	2	2	7	**2.92**	**0.73**
Total Sum	**271**	**15**	**15**	**40**		

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EU regulations part of EU Green Deal and the Fit for 55 package, aiming for a climate-neutral transport sector by 2050.

1. Emission Trading System 2 (ETS2): buildings, road transport and additional sectors

•Starting in **2027**, the ETS2 will cover **road transport** and buildings, requiring **fuel suppliers to buy emission allowances**. Objective to create **economic incentives to reduce emissions** by increasing the cost of fossil fuel usage

2. CO_2 Emission Standards for Vehicles

•**Passenger Cars & Vans**:

- **55% CO_2 reduction for new cars by 2030** (compared to 2021 levels).
- **100% CO_2 reduction by 2035**, effectively banning the sale of new fossil-fuel-powered cars.

•**Heavy-Duty Vehicles (Trucks & Buses)**:

- **15% CO_2 reduction by 2025**.
- **45% CO_2 reduction by 2030**.
- **65% CO_2 reduction by 2035**.
- **90% CO_2 reduction by 2040**.
- By **2030, all new city buses must be zero-emission**.

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EU regulations (cont.)

3. Renewable Energy Directive (RED III)

Requires **42.5% of energy consumption in transport** to come from renewable sources by **2030**. Encourages **sustainable biofuels, e-fuels, and renewable electricity**.

4. Alternative Fuels Infrastructure Regulation (AFIR)

Sets **mandatory targets** for charging and refueling stations for electric and hydrogen vehicles alont TEN-T

5. FuelEU Maritime & ReFuelEU Aviation

Indirectly affects road transport by promoting alternative fuels across multiple transport sectors.

6. Energy Taxation Directive (ETD)

Proposes **higher taxation on fossil fuels** and incentives for cleaner alternatives.

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AFIR regulation: To install DC fast charging points along the TEN-T Network (core and comprehensive)

TEN-T core and comprehensive network (bold red: core, yellow: urban nodes)

Source: acea report; Transport&Environment – Fully charged for 2030

~108 000 km

Trans-European Transport Network (TEN-T)

2025

eHDVs: TEN-T Core Network

- At least **15%** of network length
- Charging hub **≥1400kW**
- **One** charging point **≥350kW** in each direction of travel

2027

eHDVs: TEN-T Core Network

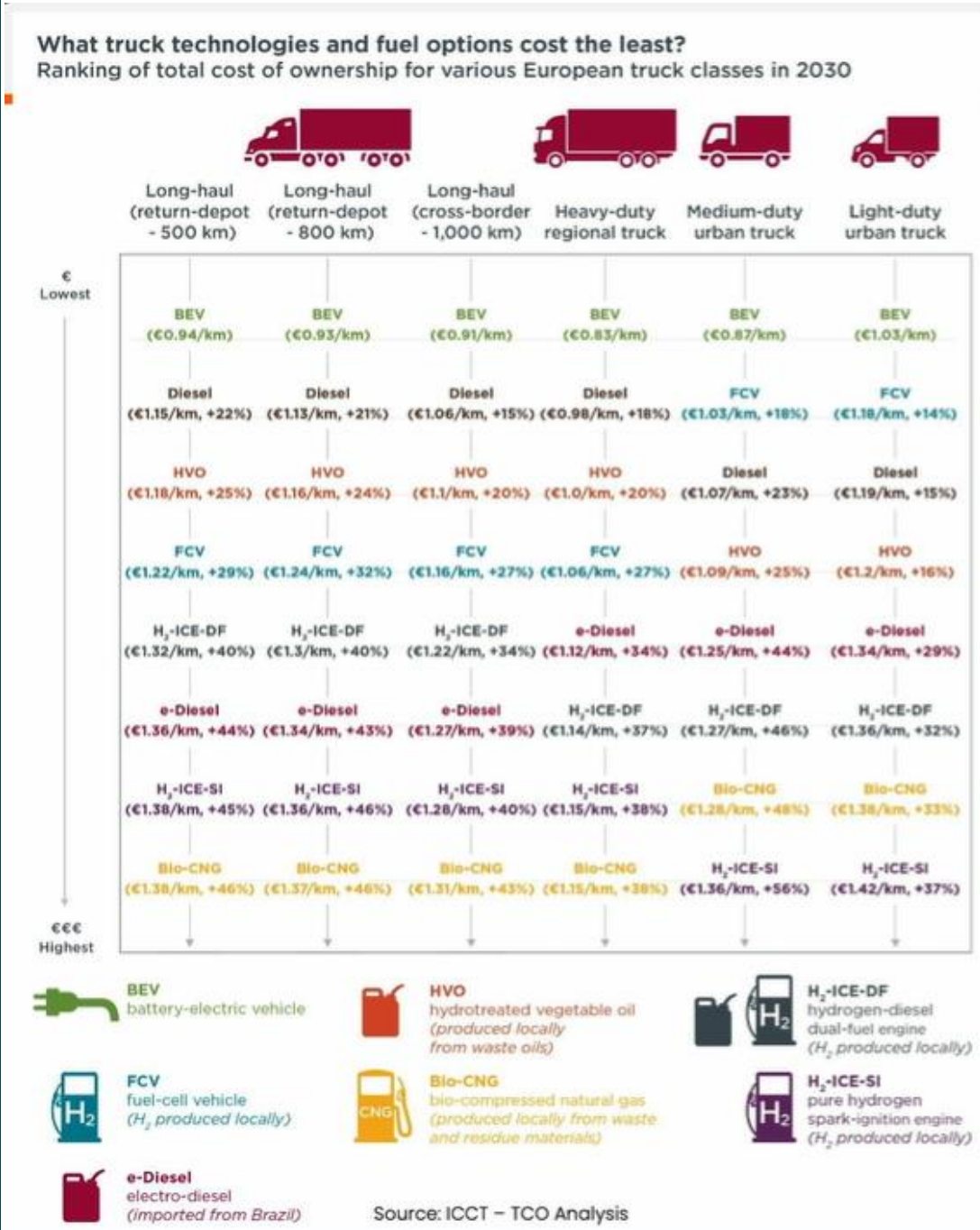
- At least **50%** of network length
- Charging hub **≥2800kW**
- **Two** charging point **≥350kW**

2030

eHDVs: TEN-T Core Network

- Charging hubs of **≥3600kW** every **60km**
- **Two** charging point **≥350kW**

Ref. Kempower HETE webinar 5 March 2025



Total Cost of Ownership (TCO) one of the key factor of Truck Electrification

By 2030:

- Battery electric trucks are projected to be the least-cost.
- Fuel-cell trucks powered by green hydrogen are expected to become cost-competitive with diesel trucks by 2035.
- Trucks equipped with a conventional combustion engine powered by alternative low greenhouse gas fuels, their TCO is projected to be 15% to 45% higher than their zero-emission counterparts.
- Trucks employing hydrogen internal combustion engines may not match the economic performance of their zero-emission or diesel counterparts.

Ref. Kempower HETE webinar 5 March 2025

A simple calculation for heavy duty vehicles

- Typical HDV battery capacities are **600 kWh – 1 MWh**
- With **350 kW** power (high-power CCS)
  - charging from 20 % SOC to 80 %
  - time needed: 1 h – 2 h
- With MCS **1 MW** power
  - charging from 20 % SOC to 80 %
  - time needed: **22 min - 36 min**
- 45 minutes is the typical rest time for HDV
- **Verdict:**
  - with MCS the on-road en-route charging is feasible

Ref. Kempower HETE webinar 5 March 2025

Conclusions

- Megawatt charging (MCS) is (finally) coming
- MCS makes long-haul heavy duty electric vehicles feasible
- CharIN has had a central role in pre-standardisation work
- Finalization of MCS standards is now ongoing
  - Mostly in 2025
  - All are ready in 2026
- Target: unified (more or less) global standard
- Work continues with practical implementations and future expansions

Ref. Kempower HETE webinar 5 March 2025