Future Fleet

WP4 Geospatial modelling of eHGV demand

17-08-2026

UK Power Networks

This report describes the geospatial model how it translates fleet-level eHGV demand into a spatial view of network impact

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WP4 links eHGV charging demand to network impact and the CBA

Section	Summary
Introduction	▸ WP4 translates fleet-level eHGV demand into a spatial view of network impact, providing the locational evidence base for the CBA and detailed network impact analysis. ▸ Builds on WP2 fleet archetypes and demand profiles and complements WP3 smart-energy levers and business models. ▸ Focuses on geospatial modelling – identifying where charging demand may emerge as a function of charging strategies across UKPN's licence areas.
Geospatial model	▸ Simulates eHGV journeys from origin-destination matrices calibrated to WP2 archetypes and routes them across the UKPN road network. ▸ Assigns charging stops using state-of-charge, range and stop-interval logic, then aggregates demand by location and archetype into a spatial demand layer. ▸ Configurable and extensible archetypes, external destinations, depot / land-use filters and charging strategies (depot-centric, balanced, dispersed); multi-threaded and built in Python with QGIS preprocessing.
Results	▸ Charging demand concentrates in built-up areas and along major roads, clustering at depots, logistics hubs and industrial locations. ▸ Differences between depot-centric and dispersed strategies are limited in an absolute sense, but relative energy demand shifts materially – an overall 'cooling' of the network when moving to dispersed charging, indicating the potential of smart levers to manage network impact of the electrification of heavy transport. ▸ Outputs scaled to the DFES Holistic Transition trajectory show depots evolving between small, medium and large bands through to 2050.
Summary & conclusions	▸ WP4 provides a transparent, reproducible geospatial evidence base ready for the network impact analysis and the Ofgem SIF CBA. ▸ Depot-to-primary aggregation and annual demand profiles identify where and when eHGV demand may trigger network reinforcement. ▸ Sensitivity to charging strategy signals clear value in WP3 smart levers; outputs are indicative and should be combined with substation headroom to prioritise trial use cases and candidate sites.

Baringa

Introduction

About this project and report

WP4 translates fleet-level eHGV demand into a spatial view of network impact, providing the locational evidence base for the CBA and detailed network impact analysis

About Future Fleet

- Future Fleet explores how DNOs can enable cost-effective electrification of eHGV fleets across their licence areas.
- Charging demand is expected to concentrate at depots, logistics hubs and industrial locations, creating localised MW-scale loads.
- WP4 focuses on the geospatial modelling only, identifying where charging demand is likely to emerge and how it may interact with the network.

Project Structure

- **WP2** defines fleet archetypes, duty cycles and charging demand behaviours.
- **WP3** assesses smart energy levers and business models that can reduce connection requirements.
- **WP4** builds on the outputs of WP2 to develop a spatial view of eHGV charging demand.

The role of geospatial modelling

- Identifies where eHGV charging demand may emerge spatially, enabling outputs to be mapped to substations for network planning.
- Based on the model configuration, it simulates journeys, assigns charging stops, and aggregates demand by location and vehicle archetype.
- Provides the geospatial inputs for the CBA, including depot-to-primary mapping, this enables the identification of where and when eHGV demand may trigger network reinforcement.

WP2 inputs
Fleet archetype & demand profiles

WP4 geospatial modelling
Geospatial output of eHGV charging demand and network impact assessment

CBA and insights for trials
Cost-benefit analysis and GB-wide extrapolation

Linking the WP4 geospatial outputs with the network impact analysis and CBA

How Future Fleet geospatial demand outputs are combined with SFS network data to assess primary-level network impact, reinforcement triggers and CBA-ready cost outputs across UKPN licence areas

INPUTS

SFS network inputs
- Primary substation / grid-site reference
- Winter & summer peak demand (MW)
- Firm capacity (MVA)
- Reinforcement cost assumptions (£ per intervention / scheme)

Future Fleet demand assumptions
- Archetype load profiles for each charging scenario (i.e. unmanaged, BESS + solar etc.)

Geospatial outputs
- Annual eHGV uptake trajectory aligned to DFES
- Depot to primary / grid-site mapping to match SFS network inputs

CALCULATIONS

1 Import SFS network inputs
- Load primary-level peak demand & firm capacity by year
- Load reinforcement cost assumptions

2 Overlay Future Fleet eHGV demand profiles
- Scale depot geospatial demand to the DFES eHGV trajectory
- Add incremental eHGV demand by archetype and year

3 Build primary-level demand profiles
- Map location-level demand to primary substations
- Create annual primary-level eHGV demand profiles

4 Calculate adjusted peak demand
- Winter / summer peak = SFS peak + coincident eHGV demand
- Apply diversity / coincidence factors; test vs firm capacity

5 Identify reinforcement trigger
- First year demand exceeds firm capacity, by primary & scenario
- Record reinforcement requirement and timing

6 Calculate network cost impact and compare scenarios
- Apply reinforcement cost assumptions to build annual cost profile
- Compare scenarios; quantify timing, deferral & cost impacts

OUTPUTS

Primary-level outputs
- Trigger year by season (winter / summer)
- Capacity breach (Y/N) & reinforcement requirement
- Reinforcement cost (£) by year
- Utilisation (%)

Scenario outputs
- Network impact by Future Fleet scenario
- Reinforcement timing / deferral
- Impact on peak demand
- Cost impact by scenario, year & cumulative to 2050

SIF-CBA outputs
- Input tables for Network CBA
- Annual cost forecasts
- Comparative load profiles to assess carbon impact

Methodology: SFS network data, Future Fleet demand assumptions and geospatial mapping outputs are combined to build annual primary-level demand profiles. These are compared against firm capacity to identify reinforcement triggers and quantify network infrastructure and cost impacts for each Future Fleet scenario. Carbon benefits are added separately when results are brought into the Ofgem SIF CBA template.

Geospatial model

Modelling approach and functionality

The model simulates eHGV journeys and charging behaviour to produce a geospatial demand layer for substation mapping, network impact assessment and the CBA

Modelling approach

- The model generates eHGV trips from origin-destination (OD) matrices and routes them across the UKPN road network.
- OD-matrices are built using a standard gravity model calibrated to WP2 archetypes.
- Proxies used for eHGV activity are sizes of fleets and employment data. We assume the latter scales well with relevant economic activity and therefore with eHGV needs.
- Charging stops are allocated based on state of charge, vehicle range, stop intervals and the location of the stop in the journey.
- Demand is aggregated by stop location to estimate charging stop counts and energy demand by archetype.
- A bottom-up approach is used to capture depot clustering, major-route charging patterns and potential infrastructure gaps

Objectives

- Identify where eHGV charging demand may emerge across the UKPN licence areas.
- Estimate charging stop counts and energy demand by location and vehicle archetype.
- Reflect differences between vehicle types based on the outputs of WP2.
- Produce outputs that can be mapped to primary substations and used in network impact analysis.
- Provide a transparent, reproducible evidence base for the CBA and trial prioritisation.

Logic summary

Origin-destination demand is determined per vehicle archetypes to simulate routed journeys, assign required charging stops, and aggregate outputs into a spatial demand layer for substation mapping and cost-benefit analysis purposes.

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Configuration and preprocessing create the reusable inputs used in the model

Configuration defines the vehicle, charging and spatial assumptions. Preprocessing creates the OD matrices, road network and candidate stop inputs used across model runs.

STEP 1: CONFIGURATION

Define the assumptions that shape the model behaviour

VEHICLE ARCHETYPES
Define battery size, efficiency, trip share, stop interval, minimum state of charge and road preferences

EXTERNAL DESTINATIONS
Define external hubs and archetype-specific external trip shares

DEPOT AND LAND-USE FILTERS
Define commercial and industrial eligibility rules as well as depot classification thresholds

CHARGING STRATEGIES
Define where charging can occur, charging rates, dwell times and stop placement preferences

STEP 2: PREPROCESSING

Create the reusable spatial and trip inputs used across model runs

1. **BUILD LICENCE-AREA ZONES**
   Create LAD / zone boundaries for UKPN's licence areas
2. **BUILD OD MATRICES**
   Use employment totals and demand proxies to generate origin-destination matrices
3. **BUILD ROAD NETWORK**
   Create the routable OpenStreetMap road network
4. **GENERATE TRIP FILES**
   Generate trips by archetype, including external destinations where configured
5. **PREPARE STOP LOCATIONS**
   Create and classify candidate stop locations for stop assignment

Architecture
High-level architecture of the geospatial model, built in python. Preprocessing is done outside the model QGIS.

Data Extraction & Caching
- build_road_network.py

OD & Trip Generation
- build_od_matrix.py,
- generate_trips_from_od.py

Routing & Stop Logic
- routing.py
- stop_model.py
- assign_stops.py

Output Aggregation
- aggregate_results.py

Orchestration: Run the pipeline for all archetypes

Model runs and post-processing produce the spatial demand outputs

Model runs route trips, assign charging stops and aggregate demand, before post-processing converts outputs into analysis-ready datasets for the network impact analysis and CBA.

STEP 3: MODEL RUNS

Use configured inputs to simulate routing, stop assignment and charging demand

1. **LOAD TRIPS BY ARCHETYPE**
   Load pre-generated trip files for each archetype and scenario
2. **ROUTE TRIPS THROUGH THE NETWORK**
   Attach trips to the nearest network nodes and route them across the road network
3. **IDENTIFY CANDIDATE AND REQUIRED STOPS**
   Assess candidate stops using SoC, archetype range, stop interval logic, trip position, and look ahead logic
4. **ASSIGN CHARGING EVENTS**
   Assign charging using the configured strategy, stop type, charging rate, dwell time, and battery constraints
5. **GENERATE MODEL OUTPUTS**
   Record charging events, stop counts, and energy demand by stop location and archetype

STEP 4: POST-PROCESSING

Convert model outputs into location-level datasets for mapping, scaling and network analysis

1. **MERGE ARCHETYPE AND SCENARIO OUTPUTS**
   Combine stop counts and energy demand across archetypes to produce geospatial outputs
2. **CREATE LOCATION-LEVEL DEMAND LAYERS**
   Produce spatial demand layers for GIS review and map visualisation
3. **LINK OUTPUTS TO NETWORK GEOGRAPHY**
   Map location-level demand to UKPN primary substations for network impact analysis
4. **PREPARE DEPOT SCALING INPUTS**
   Package location-level outputs for DFES scaling, depot-equivalent calculations and CBA use
5. **EXPORT OUTPUTS FOR ANALYSIS**
   Save geospatial and tabular outputs for GIS review, network mapping and further analysis

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Orchestration: Run the pipeline for all archetypes

Model parameters: archetypes and per-archetype OD matrices

Archetype assumptions are used to generate archetype-specific OD matrices, route preferences and trip inputs

Key parameters and assumptions

- Vehicle archetype — Defines the vehicle type being modelled (2-axle rigid, 3-axle rigid, 4-axle rigid, 2-axle articulated, 3-axle articulated)
- Trip share — Allocates total trips across archetypes using WP2-aligned shares
- Battery and efficiency — Defines the energy requirement and effective range for each archetype
- Minimum state of charge — Sets the reserve threshold used in stop assignment logic
- Stop interval — Sets the target distance between rest / charging stops
- Average trip length — Provides the network-distance target used to calibrate the archetype-specific OD matrix
- Highway preferences — Applies road-type cost multipliers to favour or penalise different road types
- External trip fraction — Allows longer-haul archetypes to include trips that originate or terminate outside UKPN's licence areas

How archetype parameters feed preprocessing

1. Define archetype parameters, including trip share, battery, efficiency, minimum SoC, stop interval and road preferences
2. Generate OD flows using zone data, employment totals and demand proxies
3. Apply archetype-specific distance decay and trip share to reflect target trip patterns
4. Integrate external trips where internal geography cannot meet longer-haul trip length
5. Produce per-archetype OD matrices and trip files for model runs

Archetype	Role in the model	OD matrix treatment
2-axle rigid	Local / short-haul rigid vehicle	Calibrated short-haul internal OD matrix
3-axle rigid	Medium-haul rigid vehicle	Calibrated internal OD matrix
4-axle rigid	Longer-haul rigid vehicle	Internal OD matrix supplemented by external trips
2-axle articulated	Long-haul articulated vehicle	Internal OD matrix supplemented by external trips
3-axle articulated	Long-haul articulated vehicle	Strongest reliance on external trips to reflect longer-distance freight movements

Why this matters

Different vehicle types are not treated as a single generic HGV. Local rigid vehicles and longer-haul articulated vehicles generate different trip patterns, route choices and charging requirements, which then flow through to stop assignment and spatial demand outputs.

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Model parameters: external destinations and external trip share

External hubs are used to represent longer-distance freight movements that cannot be captured fully within the UKPN licence area alone

Key parameters and assumptions

- External destination hubs — Defines representative freight hubs outside the UKPN licence areas
- OD matrix extension — External hubs are added to the per-archetype OD matrix and sampled alongside internal trips
- External trip fraction — Sets the share of trips for each archetype that originate or terminate outside the UKPN licence area
- Archetype-specific trip mix —External trip shares vary by archetype, reflecting different trip-length requirements
- Routing implications — Allows modelled trips to enter, leave and pass through the UKPN licence area with realistic stop assignment while travelling inside the UKPN licence area

How external destinations are used

1. Define representative external hubs outside the UKPN licence areas
2. Extend the per-archetype OD matrix with external destinations
3. Sample a natural mix of internal and external trips
4. Calculate entry SoC for external-origin trips before they enter UKPN's licence areas
5. Route all trips through the UKPN licence area and assign stops

Archetype	Role in the model	External destination treatment
2-axle rigid	Local / short-haul rigid vehicle	Primarily internal trip patterns with limited reliance on external trips
3-axle rigid	Medium-haul rigid vehicle	Mainly internal trip patterns, with external destinations used where needed
4-axle rigid	Longer-haul rigid vehicle	Internal OD matrix supplemented by external trips where internal geography is insufficient
2-axle articulated	Long-haul articulated vehicle	Higher external trip share to reflect longer-distance freight movements
3-axle articulated	Long-haul articulated vehicle	Highest reliance on external destinations to reflect the longest trip patterns

Why this matters

External destinations help the model represent longer-distance freight movements more realistically. Without them, longer-haul archetypes would be constrained by the geography of the UKPN licence area, resulting in unrealistically short trip patterns and less representative charging demand outputs.

Model parameters: charging strategies and stop assignment

Charging stops are assigned using SoC-aware rules, charging rates and stop times that reflect operational eHGV constraints

Key parameters and assumptions

- Minimum state of charge – Sets the reserve threshold used to decide when a vehicle needs to charge
- Charging locations – Defines where charging can occur: origin / depot, destination and mid-route stops
- Charging rates – Applies different charger rates by stop type: origin / depot slow charging, destination medium charging and mid-route fast charging
- Stop times – Sets the time available for charging at each stop type
- Charging strategies – Tests depot-centric, balanced and dispersed approaches by changing stop placement preferences.

How stop assignment works

1. Generate candidate stops along the route
2. Track state of charge and identify required stops using SoC viability and rest intervals
3. Assign required stop to the nearest real stop location, or record simulated fallback if no real stop is available
4. Calculate energy charged at the identified required stops using charger rate, dwell time, SoC and remaining battery capacity
5. Aggregate stop counts and energy demand by stop location and archetype

Configuration element	How it is applied	Key setting / assumption	Purpose in the model
Minimum SoC	Vehicle SoC is tracked along the route	20% reserve threshold	Ensures vehicles can reach the next charging stop
Charging locations	Charging is assigned by journey stage	Origin / depot, destination, mid-route	Captures where charging can occur in the journey
Charging rates	Charger rate depends on stop type	Origin / depot 50 kW; destination 200 kW; mid-route 400 kW	Reflects different charging speeds by stop type
Stop times	Charging energy is constrained by dwell time	Origin / depot 8 h; destination 2 h; mid-route 0.5 h	Limits energy charged by available time at each stop
Charging strategies	Stop placement preferences are varied by scenario	Depot-centric; balanced; dispersed	Tests how demand shifts between depot, destination and mid-route charging
Stop assignment logic	Stops are selected using SoC, stop interval	Archetype range, stop interval and route deviation assumptions	Places charging demand at feasible modelled stop locations

Charging is assigned only where it is operationally feasible and required to keep the vehicle above the minimum SoC.

Why this matters

Charging strategy and stop assignment settings determine where and how much charging demand is allocated across the network. This allows the model to test whether demand remains depot-led or shifts towards destination and mid-route locations under different charging strategies.

Model parameters: depots and land-use filters

Depots are inferred from eligible commercial and industrial land-use areas as well as existing hauliers' places of operations

Key parameters and assumptions

- Land-use eligibility – Uses OpenStreetMap commercial and industrial polygons as candidate depot locations
- Eligibility thresholds – Applies parcel size and building coverage filters to identify plausible depot locations
- HGV operators – Consider existing hauliers' places of operations as depot candidates
- Origin / destination weighting – Weights trip starts and ends towards eligible locations
- Depot classification – Classifies stopping locations into small, medium or large depots based on stop counts per day to align with WP3 site archetypes
- Clustering of small locations – Locations a low number of stop events are merged into their nearest larger neighbour.

How land-use filters feed depot outputs

1. Extract commercial and industrial land-use polygons from OpenStreetMap
2. Apply eligibility filters: parcel area ≥5,000 m² and building coverage ≤60%, add existing hauliers' operations
3. Weight trip origins and destinations towards eligible locations
4. Aggregate modelled charging stops by location
5. Classify depots into small / medium / large and consolidate locations with low number of stop events

Configuration element	How it is applied	Key threshold / rule	Purpose in the model
Land-use source	OpenStreetMap commercial and industrial polygons	Commercial / industrial land use	Focus on locations that are plausible for HGV depot activity
Parcel size	Filter by minimum parcel area	≥5,000 m²	Exclude very small sites unlikely to host depot charging activity
Building coverage	Filter by maximum building coverage	≤60%	Retain sites with available space for yard, vehicles and chargers
Depot sizing metric	Aggregate modelled stop counts by location	Stops per day	Reflect operational activity rather than land area alone
Depot classification	Classify locations by stop count thresholds	Small ≤15/Medium 16–100 /Large >100 stops/day	Align geospatial outputs with WP3 site archetypes and CBA mapping
Clustering rule	Consolidate locations to their largest. nearest neighbor	<5 stop events	Avoid fragmented representation of very small stop locations

Depot classification thresholds are tuned to match WP3 archetypes: small ~5 vehicles, medium ~35–80 vehicles, large ~150–200 vehicles. Threshold for clustering is informed by the trip sample size.

Why this matters

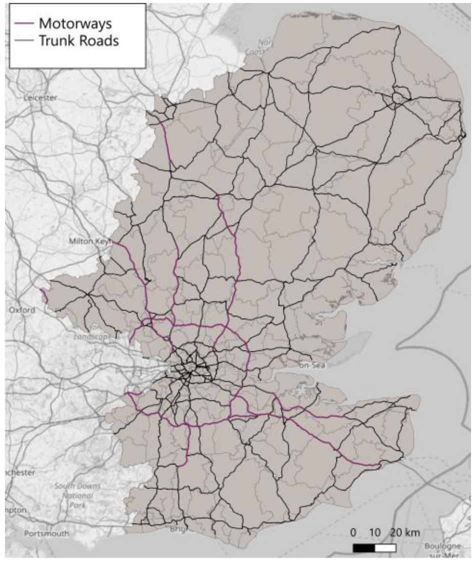
Using land-use filters and stop-based sizing helps ensure depot-like locations are identified in plausible areas and classified based on modelled activity. This supports consistent mapping from geospatial outputs to WP3 site archetypes, substations and the CBA.

Results

The model produces a spatial charging demand layer showing where eHGV charging activity is likely to concentrate across UKPN licence areas

The geospatial model combines routed trips, candidate stop locations. and stop assignment logic to estimate spatial patterns of charging demand

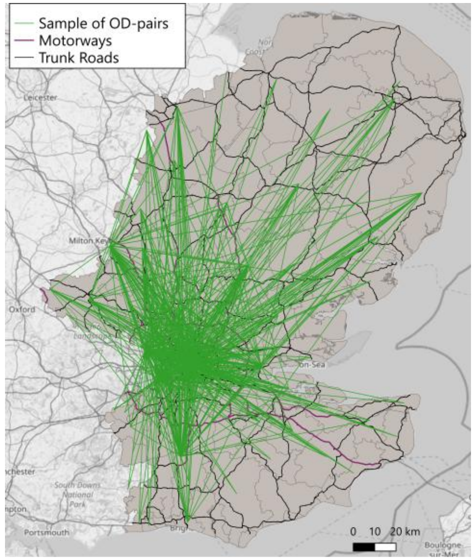
1. UKPN licence area and demand basis



Major road networks in UKPN licence area

- Covers UKPN's three licence areas and uses zonal demand proxies to allocate eHGV trip activity
- Provides the geographic basis for routing, stop assignment and later substation mapping
- Routing uses configurable road-type preferences, with current defaults favouring major roads, motorways and trunk roads

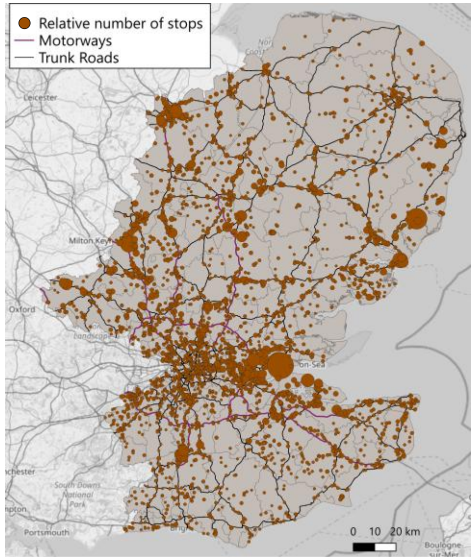
2. Trips between start and stop locations



Random selection of 700 trips (origin-destination pairs)

- Trips are generated from origin-destination matrices and land-use weighted origins / destinations. They can include external trips and existing hauliers' bases of operations
- Candidate stopping locations are drawn from a curated Fraunhofer ISE dataset
- Potential stops include fuelling stations, parking, rest areas, motels etc

3. Aggregated stops after routing



Circles scale with the number of stops summed for all archetypes

- Required charging stops are assigned using SoC, range and stop interval logic
- Relative number of stops per location does not depend strongly on the charging strategy
- Demand is aggregated by stop location and vehicle archetype to create a spatial demand layer

How to read the outputs

The maps illustrate spatial demand patterns rather than precise site forecasts. Circle size represents relative modelled stopping activity at each location.

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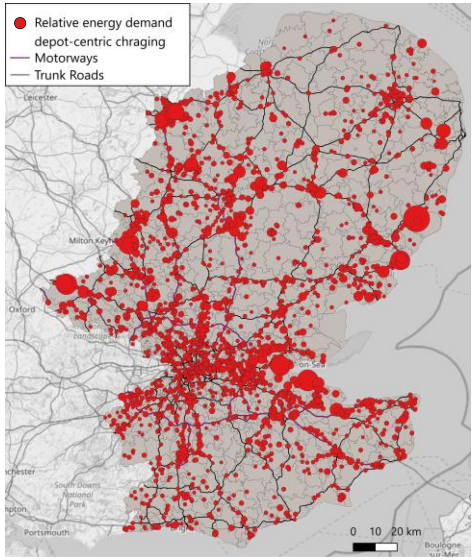
Charging strategies shift modelled stops between depot, destination and mid-route locations

Circle size represents relative modelled energy demand resulting from charging activity at each stop location

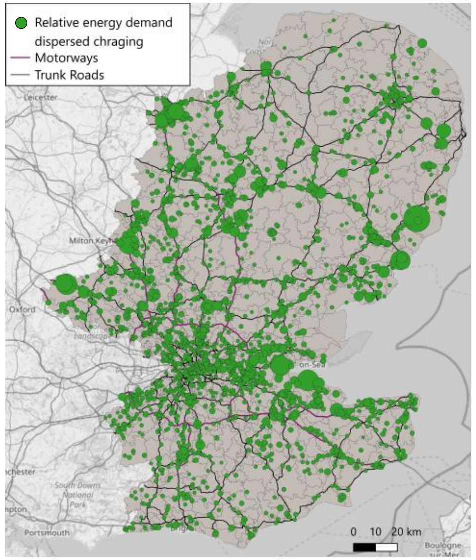
1. Depot-centric

Greater concentration of demand at depot / origin locations, with more limited reliance on mid-route charging



2. Dispersed

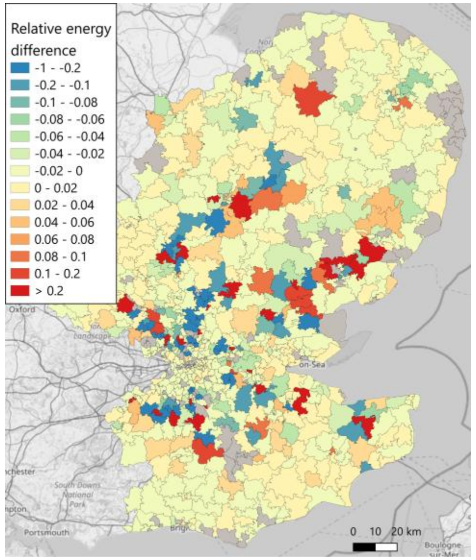
Greater use of mid-route / public charging locations, with lower concentration at depots



- The differences between the outcomes for the two charging strategies are limited when viewed at the licence area level, with stops being concentrated in built-up areas and along major roads.
- The apparent lack of difference between charging strategies is a result of the average daily driven distance being smaller than the eHGVs range for the majority of trips/archetypes.
- No charging stops are planned if the SoC does not require this as would lead to unnecessary operational inefficiencies and increase energy costs as home-depot charging is generally most cost-effective.

3. Differences

Although not immediately obvious from the preceding plots, differences do exist between charging strategies



- Significant changes in relative energy demand can occur when changing charging strategies. This signals the relevance of leveraging smart levers to reduce network impact.
- An overall ‘cooling’ of the network is observed when moving from depot-centric to dispersed charging.
- Results are indicative serve to demonstrate potential rather than need to be augmented with substation headroom to design smart interventions

Translating geospatial outputs into annual depot growth

The geospatial model identifies where eHGV charging demand may concentrate. DFES provides the annual uptake pathway and is used to scale demand over time. These two inputs are key inputs for the network impact analysis as they allows us to assess where and when eHGV demand could trigger grid reinforcement

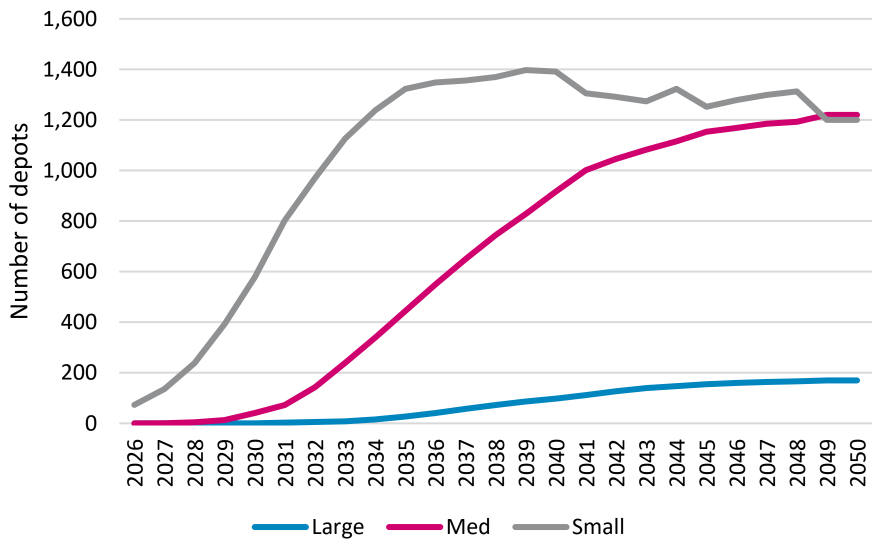
DFES scaling of geospatial outputs

- **Geospatial model** — Provides the spatial distribution of eHGV charging activity across UKPN's licence areas
- **DFES trajectory** — Distribution Future Energy Scenarios provide the annual eHGV uptake pathway, using the Holistic Transition scenario, to scale demand over time
- **Normalise and scale** — Location-level stop activity from the geospatial model is normalised to the DFES 2050 eHGV total, then scaled annually along the DFES trajectory
- **Spatial preservation** — Total uptake stays consistent with DFES while the geospatial pattern of demand is preserved as volumes grow

Annual depot reclassification

- **Fixed thresholds** — Each location is classified by daily stop count: Small ≤15, Medium >15–100, Large >100 stops
- **Annual reclassification** — Each location is re-evaluated every year against the same thresholds, so sites are not locked into a fixed size band
- **Dynamic depot evolution** — Locations can move between size bands as eHGV adoption grows, rather than being fixed in one category over time this enables depot growth to emerge naturally over time
- **WP3 & CBA linkage** — Size bands provide the bridge from location-level geospatial outputs to the WP3 depot archetypes used in the network impact analysis and CBA

Depot size curve



Why this matters

Scaling preserves the modelled spatial concentration of eHGV charging demand while aligning total uptake to the recognised DFES pathway. This creates an annual view of where depot-scale demand grows across UKPN's network, allowing the network impact analysis to assess when demand near primaries and substations may trigger reinforcement requirements and costs for the CBA.

Summary & conclusions

WP4 delivers a spatial evidence base that links eHGV charging demand to network impact for the CBA

How the geospatial model works, what the results show, and what this means for network impact analysis, the CBA and trials

What WP4 delivers

- WP4 translates fleet-level eHGV demand into a spatial view of network impact, providing the locational evidence base for the CBA and detailed network impact analysis.
- The model generates trips from OD matrices calibrated to WP2 archetypes, routes them across the UKPN road network, and assigns charging stops using state-of-charge, range and stop-interval logic.
- Five vehicle archetypes are modelled distinctly, with external hubs representing longer-haul freight that enters, leaves or passes through the licence areas.
- Demand is aggregated by location and archetype into a spatial charging layer that maps to primary substations, built entirely from open data and WP2 outputs.

What the results show

- Charging demand concentrates in built-up areas and along major roads, clustering at depots, logistics hubs and industrial locations.
- Differences between depot-centric and dispersed charging are limited in an absolute sense, because average daily distance is below eHGV range for most trips and archetypes naturally leading to large shares of depot charging.
- Relative energy demand still shifts materially between strategies – an overall ‘cooling’ of the network is observed when moving from depot-centric to dispersed charging.
- Depots evolve dynamically: sites move between small, medium and large bands as uptake grows along the DFES Holistic Transition trajectory to 2050.

Conclusions & next steps

- WP4 provides a transparent, reproducible geospatial evidence base ready for network impact analysis and the Ofgem SIF CBA.
- Depot-to-primary mapping and annual demand profiles show where and when eHGV demand may trigger reinforcement across UKPN’s licence areas.
- The sensitivity of energy demand to charging strategy signals clear value in WP3 smart levers to defer or reduce network reinforcement.
- Outputs are indicative of potential rather than precise site forecasts and should be combined with substation headroom to prioritise trial use cases and candidate sites.

Appendices

Input data

Data inputs risk management

Acronym table

Input data

Core model inputs draw on open data and project outputs, with UKPN network mapping applied for downstream network impact analysis and the CBA

Input	Source type	Role in the model	Primary source
Road network	Open data	Routes eHGV trips across the UKPN licence area	OpenStreetMap
LAD / zone boundaries	Open data	Provides spatial basis for origin-destination demand	UK Government Local Authority Districts Boundaries
Employment totals	Open data	Proxy for economic activity and HGV demand	UK Government Business Register and Employment Survey
Commercial / industrial land use	Open data	Weights trip origins and destinations towards commercial vehicle activity areas	OpenStreetMap
Stops and amenities	Open data	Provides candidate stop locations and categories stop assignment	Fraunhofer ISI data on Truck Parking Locations
Vehicle operator locations	Open data	Helps validate depot and fleet activity patterns	UK Government OLBS Licence Reports
Vehicle archetypes	WP2 outputs	Defines vehicle behaviour, energy need and trip mix	ECS Future Fleet WP2 data for eHGV archetypes
Substation mapping	Open Data	Links geospatial demand to network impact and CBA	UK Power Networks

Project Specific Condition 6 – Data inputs risk management

Assessment of risks linked to data quality and availability

Data element	Primary source	Availability Risk	Quality Risk	Rational and mitigative measures
Road network	OpenStreetMap	L	L	Standard OpenStreetMap data that is stable and kept up to date. Model outcomes don't critically depend on 100% up-to-date road network. Updating the toad network that feeds into the model on a semi-annual basis is sufficient
LAD / zone boundaries	UK Government Local Authority Districts Boundaries	L	L	Stable data set from a reputable source that can safely be assumed to be always available. Updating this on an annual basis suffices for the purpose of the modelling
Employment totals	UK Government Business Register and Employment Survey	L	L	Data set from a reputable source that is updated annually. Recommended to use the same update frequency for the model.
Commercial / industrial land use	OpenStreetMap	L	M	Standard OpenStreetMap data but more dynamic and with less struct classification rules and QA then for roads. Recommended to update quarterly and QA for misclassifications of land use.
Stops and amenities	Fraunhofer ISI data on Truck Parking Locations	L	M	High-quality curated primary data set underpinning several scientific publications but no longer being updated so is updated with secondary data sets and OpenStreetMap date to keep current. As this is fast evolving space quarterly updates of secondary data sets are recommended.
Vehicle operator locations	UK Government OLBS Licence Reports	L	L	Stable data set from a reputable source that can safely be assumed to be always available. Updated weekly but for modelling purposes a quarterly update
Vehicle archetypes	ECS Future Fleet WP2 data for eHGV archetypes	L	M	The used archetypes have been developed as part of this project and require validation in the Beta-phase, at which point there could be a need to update them.
Substation mapping	UK Power Networks	L	L	Core UKPN data set that is kept up-to-date and made available

Glossary of terms

CBA	Cost-benefit analysis	Assessment comparing the costs and benefits of intervention options.
CSV	Comma-separated values	Tabular file format used to store and export model outputs.
DFES	Distribution Future Energy Scenarios	Distribution network forecasts used to assess future local energy demand and network needs.
DNO	Distribution Network Operator	Responsible for operating and maintaining the electricity distribution network within a specific area, bringing energy from the transmission system to lower voltages.
eHGV	Electric Heavy Goods Vehicle	Heavy goods vehicle powered by electricity.
GB	Great Britain	Refers to Great Britain-level modelling or extrapolation.
GIS	Geographic Information System	System used to store, analyse and visualise spatial or geographic data.
HGV	Heavy Goods Vehicle	Road freight vehicle above the relevant weight threshold.
kW	Kilowatt	Unit of electrical power.
kWh	Kilowatt-hour	Unit of electrical energy.
LAD	Local Authority District	Local administrative geography used as a spatial basis for origin-destination demand and geospatial modelling.
MW	Megawatt	Unit of electrical power.
MVA	Megavolt-ampere	Unit of apparent electrical power, often used for network firm capacity.
OD	Origin-destination	Representation of trips or flows between origin and destination zones.
SFS	Strategic Future Scenarios	Network demand forecasts used to assess future primary-level demand and reinforcement requirements.
SoC	State of Charge	Battery charge level used to determine whether an eHGV can continue a trip or requires charging.
UKPN	UK Power Networks	Distribution network operator for the relevant project licence areas.
WP	Work Package	Defined project workstream or delivery package.

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