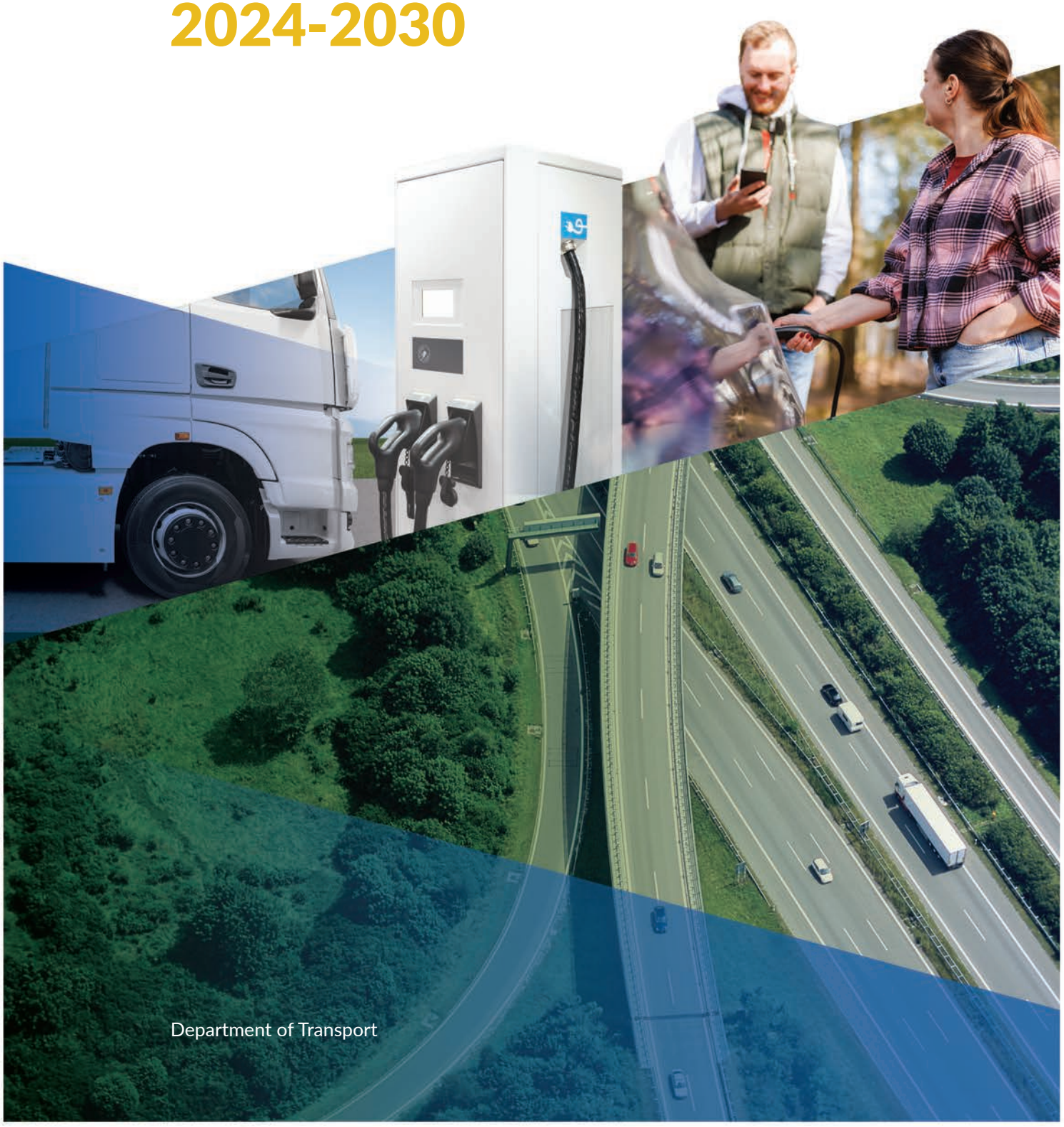
An Roinn Iompair
Department of Transport

zevi Zero Emission Vehicles Ireland

National Road Network EV Charging Plan 2024-2030



Department of Transport

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Acronyms and Definitions

Acronym	Definition
AC	Alternating Current
AFIR	Alternative Fuels Infrastructure Regulation
CCS	Combined Charging System
BESS	Battery Energy Storage System
BEV	Battery electric vehicle
CAP	Climate Action Plan
CRU	Commission for Regulation of Utilities
CPO	Charge Point Operator
DC	Direct current
DoT	Department of Transport
ESBN	Electricity Supply Board Networks
eSPSV	Electric small public service vehicle
EU	European Union
EV	Electric vehicle
GBER	General Block Exemption Regulation
HGV/ HDV	Heavy Goods Vehicle/Heavy Duty Vehicle (includes buses)
HPC	High Power Charge point
ICE	Internal combustion engine
IEA	International Energy Agency
LGV/LDV	Light Duty Vehicles/Light Duty Vehicles (passenger cars +LGVs)
LEV	Low emission vehicle
MV	Medium Voltage
NTA	National Transport Agency
PHEV	Plug-in Hybrid Electric Vehicle
PPP	Public-Private Partnership
QR code	Quick Response code
SA	Support Applicant
SDG	Sustainable Development Goal
SEAI	Sustainable Energy Authority of Ireland
SIMI	Society of the Irish Motor Industry
TEN-T	Trans-European Transport Network
TII	Transport Infrastructure Ireland
V2G	Vehicle-to-grid
ZEVI	Zero Emission Vehicles Ireland

Minister's Foreword

Climate action is the most pressing global challenge of our time and a priority for the Government of Ireland. The Climate Action Plan 2024 outlines the pathway to cut transport emissions by 50% by 2030. The transition of our vehicle fleet to electricity is critical to delivering on that challenge, and by 2030 will provide the single biggest mitigation action in the transport sector. To support this transition the Government is fully committed to supporting a significant expansion of the electric vehicle charging network over the coming years. ZEVI, an office based in the Department of Transport is charged with leading and co-ordinating this infrastructure roll out.

Launched by ZEVI in January 2023, the National EV Charging Infrastructure Strategy presents an ambitious pathway and practical steps for the delivery of a national EV charging network. The Strategy signposts the need for a pool of high-powered chargers every 60 km on our motorway network as well as home/apartment charging, residential neighbourhood charging (including new mobility hubs), destination charging and en-route charging. This **National Road Network EV Charging Plan** is the first step to delivering on the promise and identifies the level of charging that will be needed on our national primary and secondary road network. This plan forms part of a wider set of actions and initiatives aimed at accelerating the adoption of electric vehicles in Ireland as set out in the National EV Charging Infrastructure Strategy.

In addition to the Government's objective of rolling out an EV charging network to keep ahead of public demand, the European Union has agreed the Alternative Fuels Infrastructure Regulation (AFIR)[i], which will apply from 13th April, 2024. For charging light-duty electric vehicles including passenger EVs, the regulation requires a total power capacity to be provided based on the size of the registered fleet. This will require almost 250% increase in charging capacity by 2025 and the national road network infrastructure is a significant part of that overall effort. AFIR also calls for Trans-European Network Transport (TEN-T) coverage requirements in 2025 and 2035 for light-duty vehicles (LDVs), including passenger cars, and for heavy-duty vehicles (HDVs).

With over 110,000 EVs sold by the end of 2023, the number of electric vehicles on our roads continue to expand. To serve this market, Ireland already has a growing network of publicly accessible EV charging points with over 2,400 installed to date. However, we now need to significantly increase and accelerate the delivery of this network. This Plan sets out how Government will, working with private industry, deliver on our ambitious EV charging targets.

In addition to light-duty vehicles, the transition of heavy-duty vehicles (HDVs) to electric is now taking off across Europe. The Climate Action Plan has a target of 30% of sales for new medium and heavy-duty vehicles (MHDVs) (including buses) to be zero-emission by 2030. This **National Road Network EV Charging Plan** outlines the infrastructure that will be rolled out to serve this developing EV market.

As the fleet transitions to zero emission, the deployment of en-route charging infrastructure on the national road network presents a unique challenge. Factors such as site location, electricity grid connections and power capacity along with consideration of business models for operators all play a key part in the decision-making process. In developing this plan, ZEVI has worked with Transport Infrastructure Ireland (TII) with valuable input from ESB Networks and the wider industry. The implementation of this plan has already begun with the launch of the €21M motorway scheme. Government's ambition is to deliver a high quality, state of the art, EV charging infrastructure that works for all people living and visiting Ireland. Delivering this network will require a focused and collaborative effort from all stakeholders. Government welcomes the significant support from civil society and the private sector in taking on this task – and we look forward to delivering on this challenge.

Eamon Ryan TD,
Minister for Transport

[i] Regulation (EU) 2023/1804 of the European Parliament and of the Council on the deployment of alternative fuel infastructure

Introduction

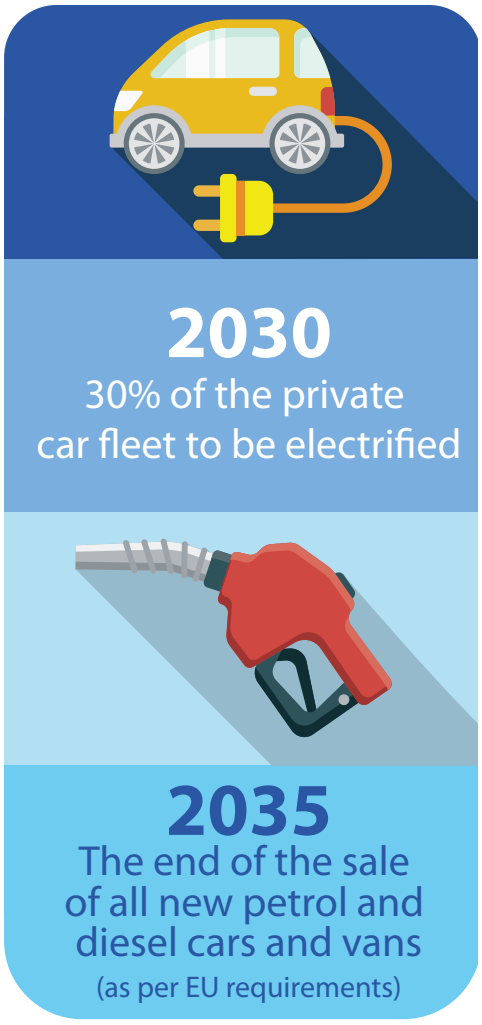
This plan provides a pathway for the delivery of electric vehicle (EV) charging infrastructure on the National Road Network in Ireland, in line with both national and European ambitions for cleaner transportation. This pathway will be accompanied by a set of potential commitments on investment, regulation, and policy instruments over the coming years, removing barriers to the adoption of light-duty vehicles (LDVs), including passenger cars, and heavy-duty vehicles (HDVs).

The Context

As Ireland transitions to a more sustainable future, electric vehicles (EVs) have emerged as a key component of reducing carbon emissions in the transportation sector. However, the widespread adoption of EVs requires a comprehensive charging infrastructure network that is accessible, reliable, and convenient for all drivers.

As of February 2024, Ireland has a growing network of publicly accessible EV charging stations, with over 2,400 public charging points across the country. However, the deployment of en-route charging infrastructure presents a challenge and requires careful consideration of factors such as charging station locations, available electricity grid capacity, suitable service operation business models and the level of funding required to support deployment, particularly in remote areas.

In order to complement national efforts to support the wider deployment of EVs, the European Commission has drafted a legal instrument, the Alternative Fuels Infrastructure Regulation (AFIR). The terms of this regulation includes mandatory deployment targets along the Trans-European Transport Network (TEN-T), the need for interoperability between different charging networks, accessibility for all users, and provision of information for users on the availability and location of charging infrastructure. **The regulation will apply from 13th April 2024.**



At a national level, this plan is aligned with the National Strategic Priorities of the National Planning Framework, particularly Sustainable Mobility and Transition to low carbon and climate resilient society. Accelerating the transition to electric vehicles and vehicle technology improvements is a critical part of the transport decarbonisation pathway set out in Ireland's Climate Action Plan 2024 (CAP24), accounting for a c.60% share of total transport emissions abatement. In order to enable this transition, both CAP24 and the Department of Transport's Electric Vehicle Charging Infrastructure Strategy 2022-2025 set out ambitious targets for the deployment of EV charging infrastructure. These include a particular focus on the development of a comprehensive high-power charging network along our national roads.

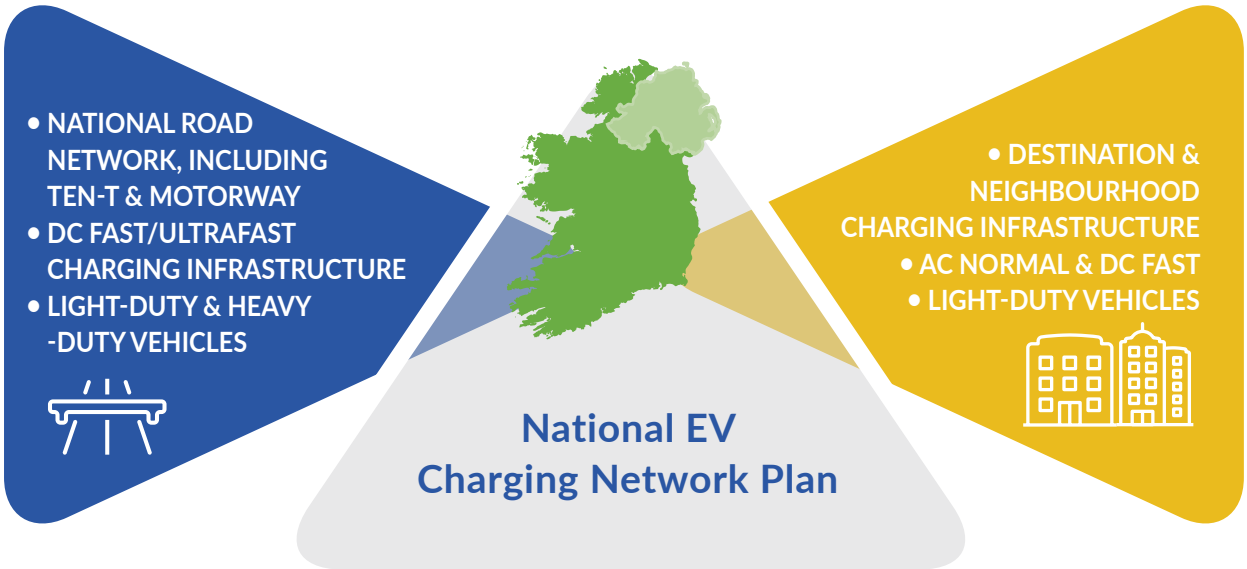
The Scope

In this context, this National Road Network EV Charging Plan provides a roadmap for the deployment of en-route charging infrastructure, working towards achieving both national and European ambitions for cleaner transportation. The aim of this plan is to set out a path to deliver on these ambitions, coupled with a series of the potential commitments on investment, regulation, and policy instruments over the coming years.

This plan will be the first part of a complete National EV Charging Network Plan for the country. In addition to this National Road Network element, Zero Emission Vehicles Ireland (ZEVI) is working with the Local Authorities to deliver the Regional and Local EV Charging Network Plan which covers the remainder of publicly accessible charging at destination and neighbourhood locations.

Given the timescales of this plan and the current fleet uptake, the main focus of this plan will be the deployment of infrastructure for light-duty vehicles (LDVs), including passenger cars. However, as the pathway to electrify the freight and bus sector has become clearer in recent years, it is important that the correct mix of policy, regulatory and incentive measures are considered early in the process to support this. For this reason, a dedicated section on heavy-duty vehicles (HDVs), which includes buses, has been included in this plan.

Zero Emission Vehicles Ireland (ZEVI) will lead on the delivery of this path towards fleet electrification by providing strategic direction, removing potential barriers, and supporting the acceleration of market growth in this initial phase. However, ZEVI will not work alone on this. ZEVI is, and will continue to be, working closely with key stakeholders such as Transport Infrastructure Ireland (TII) and ESB Networks (ESBN), Local Authorities (LAs) and other partners to deliver our national ambitions. In addition, and particularly as the market matures, it is expected that the private sector will take the lead in driving the deployment of EV charging infrastructure along our national road network.



Strategic Environmental Assessment and Appropriate Assessment

A Strategic Environmental Assessment (SEA) has been carried out on this plan. The environmental report that has been developed through the SEA process was published for consultation in conjunction with this plan and submissions have been used to ensure environmental considerations are addressed in the final National Road Network EV Charging Plan and the Environmental Statement which is published with this final plan.

In addition, an Appropriate Assessment has been carried out on the plan. The impact of the plan (either alone or in combination with other projects or plans) on the integrity of the Natura 2000 sites has been considered with respect to the conservation objectives of the sites and to their structure and function. Any mitigation measures identified have been included in this final plan.

Review of this plan

The period of this plan covers the years 2024-2030 with targets set for charging infrastructure delivery by end of 2025 and 2030 for light-duty vehicles, including passenger cars, and targets for 2025, 2027 and 2030 for heavy-duty vehicles. Following the review of the EV Infrastructure Strategy[2], the Plan along with SEA Report will be reviewed in 2027 with a view to updating the plan and 2030 targets with particular emphasis on realigning the plan if necessary:

- To reflect the market transition to EVs and delivery of targets
- For any adjustment made to Ireland's Environment–An Integrated Assessment-2020[1], National Planning Framework
- To stay aligned with changes to Climate Action Plan, Transport Sectoral plans.
- For any adjustments made to Alternative Fuel Infrastructure Regulation following the 2026 review.
- Review of usage data of existing Infrastructure and technology advancements and adjust to ensure it aligns with the needs of the EV Driver

[1] EPA - Ireland's Environment, An Integrated Assessment - 2020
[2] EV Infrastructure Strategy

CHAPTER

1

Lessons Learnt from International Experience

Learning from international experience was crucial to developing this plan, as it enables the adoption of best practice, avoids potential pitfalls, and promotes efficient and effective implementation. This chapter outlines the key lessons learned from the international experience and provides case studies from different countries.

Despite the remarkable growth of the European electric vehicle (EV) market in the last years, EV distribution has been highly uneven across territories. In Europe, high-power EV charging infrastructure deployment varies considerably across countries, with different plans and strategies having been adopted and implemented.

In the process of preparing the National Road Network EV Charging Plan, the following lessons learned from successful international experiences have been considered and applied:

Setting Clear Targets

Several European countries have set ambitious targets for the deployment of EV charging infrastructure along major roads, and it has proven to be essential to set a clear direction to incentivise the deployment of EV charging infrastructure. For example, as part of the German economic recovery package designed to boost electric car sales, Germany's initiative would see every petrol station in the country offer some form of electric car charging. In a similar way, through the publication of a Decree, the French government wants to ensure that all service areas on the concession motorway network will be equipped with recharging stations for electric vehicles. In 2021, the Danish government proposed a comprehensive plan for the roll-out of charging infrastructure for electric cars, setting aside a budget of €67M for charging infrastructure. The Danish Directorate estimated that with this investment 99.9% of long journeys on the national road network could be completed in an electric car without detours, and that the waiting time to charge would not exceed 10 minutes in the 100 busiest hours of the year.

Figure 1: *Lessons Learnt from Successful International Experiences*

Coordinated Approach

Coordination with stakeholders, including local authorities, energy companies and charging infrastructure providers is key to ensure the effective deployment of EV charging infrastructure. The Norwegian government, for example, has worked closely with stakeholders to create a comprehensive network of fast chargers along its highway corridors. The Danish and French governments have seen success through the provision of sites at the most sensible locations and managing the grid connection process. Additionally, ensuring alignment with national and regional planning frameworks (i.e. the National Planning Framework, County Development Plans) where appropriate, is critical for coordination.

> ***Germany has implemented a standard for EV charging infrastructure interoperability, which requires all charging stations to be accessible with a single payment method.***

Provide Funding and Support

Overcoming barriers to expanding EV infrastructure will generally involve offering financial incentives and regulatory support to drive the transition to Electric Vehicles. The use of financial incentives or subsidies has been widely used across European countries and has proved – when adequately coupled with the right business models - to be a powerful tool to accelerate the development of EV charging infrastructure, particularly in areas where it may not be commercially viable. All countries reviewed during the preparation of this report, including Germany, Sweden, Denmark, the Netherlands, Norway and the UK, have provided funding supports to ensure adequate coverage of charging infrastructure on their major road networks. For instance, the UK government has implemented a £950m rapid charging fund (RCF) to future-proof electrical capacity at motorway and major A-road service areas to prepare the network for 100% zero emissions vehicles uptake.

Encourage Private Investment

Governments should also encourage private investment in EV charging infrastructure by creating a favourable regulatory and business environment. The deployment of high-power EV charging infrastructure requires a considerable level of investment, which cannot be entirely assumed to be delivered by public institutions. Lessons from more mature EV markets show that, with the right set of incentives, private investors are quite willing to share the costs of charging infrastructure development. Competition among prospective providers is a reliable way to obtain the best quality infrastructure at the lowest possible price. For example, the German government has implemented various measures to encourage private investment in EV charging infrastructure, such as simplified permitting procedures and access to public funding.

Standardisation & User Experience

Governments should guarantee and encourage standardisation to improve user experience and ensure efficient deployment of infrastructure. Some of the areas that have proven to be essential in the deployment of high-power infrastructure are the standardisation of connectors, the provision of clear signage and instructions, availability and reliability data, payment options and interoperability, accessibility and customer support. While some of these areas will be regulated through the upcoming AFIR, governments will need to ensure that there are no gaps and that there is coherence at national level to ensure confidence and enhance the overall customer experience. As an example, Germany has

implemented a standard for EV charging infrastructure interoperability, which requires all charging stations to be accessible with a single payment method. The country has also established a roaming platform for EV charging that enables drivers to use any charging station in the country with a single access and payment solution. In recent funding tenders in Sweden, bidders were incentivised to go beyond the standard requirements through offering "Merit" criteria, which included providing access to toilets and convenience services within 300 m, as well as future-proofing the installations for possible upgrades to increase individual power, or the number of charging points if needed.

Plan for a Resilient & Scalable Network

As the world moves towards electrification of transportation, the demand for EVs is expected to increase significantly. This puts immense pressure on the existing charging infrastructure, which could result in long wait times and inadequate charging facilities. By future-proofing high-power EV charging infrastructure, we can ensure that the infrastructure is equipped to handle the growing demand for EVs. Smart data, as well as smart charging, are two key means of ensuring that today's chargers continue to support the smooth integration of EVs into the future.

Continuous Monitoring & Evaluation

The deployment of EV charging infrastructure should be monitored and evaluated on an ongoing basis to ensure that it is meeting the needs of EV drivers and the wider community. The Swedish government, for example, has commissioned regular surveys to assess the satisfaction of EV drivers with the country's charging infrastructure. In the UK, under new laws planned by the government, rapid charging networks for electric vehicles (EVs) will need to have a 99% reliability rate. To achieve this it will be essential to ensure that the right number of people with the right skills are in the right place to provide installation and maintenance services, both now to establish confidence in the network, and into the future to sustain and repay that confidence.

CHAPTER

2

The National Road Network and the Electric Mobility Market

To fully understand the context of this plan, an overview of some of the key aspects related to Ireland's national road network has been provided in this chapter. It includes a definition of the network itself, the TEN-T road network, the electric vehicle market for both vehicles and EV charging infrastructure along national roads, and the key stakeholders involved in the national road network in Ireland.

2.1 The National Road Network

The national road network consists of c.5,300 km of roads: national primary roads (including motorways) and national secondary roads, across Ireland. The network forms vital transport infrastructure for all sectors of society. It facilitates movement of people and goods and a wide range of trip purposes including health, education, employment, tourism and access to services. It carries c.43% of the country's total road traffic and most of Ireland's freight.[3]

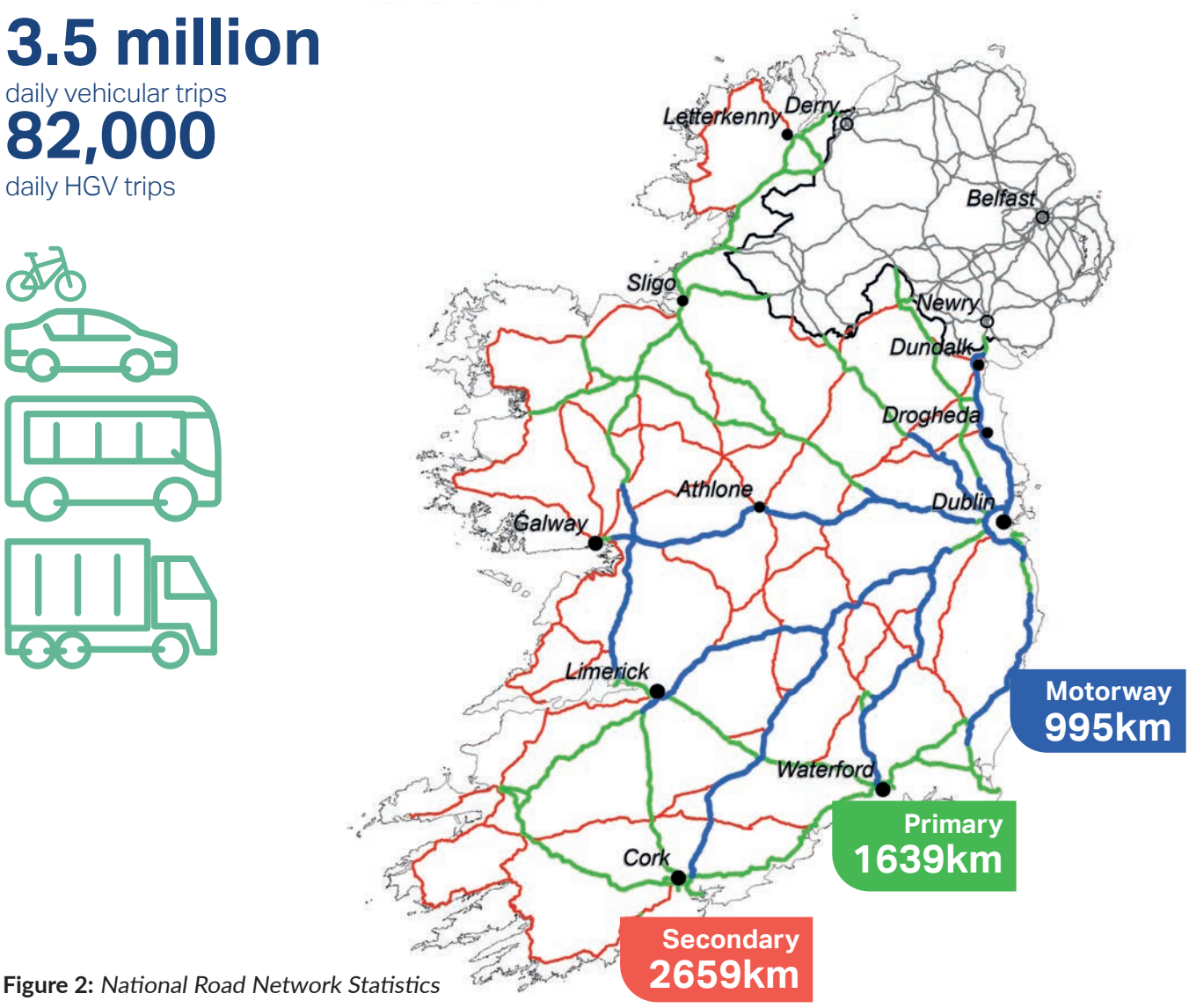


Figure 2: *National Road Network Statistics*

[3] Our National Road Network - (tii.ie)

2.2 The TEN-T Road Network in Ireland

The TEN-T road network is a European Union (EU) initiative to develop a comprehensive and interconnected transportation infrastructure network across member states. The TEN-T stands for Trans-European Transport Network and includes road, rail, inland waterways, and maritime transport. Its primary objective is to provide seamless connectivity and access across the EU member states, improving trade and economic growth while also promoting sustainable transportation practices.

In Ireland, of the 5,300 km of national road network, the TEN-T road network makes up almost 2,200 km: 500 km of core network and 1,700 km of comprehensive network[4]. The TEN-T road network consists of several categories of roads, including motorways, dual carriageways, and other primary roads. These TEN-T roads alone carry 19.2% of all vehicle kilometres in the country.

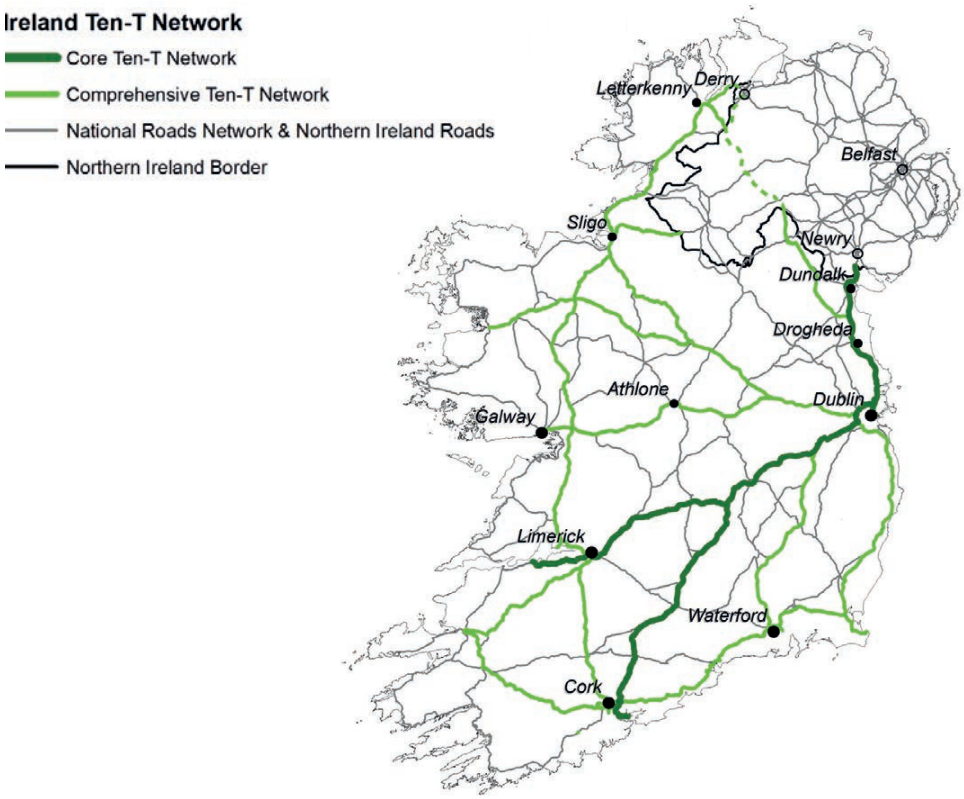


Figure 3: *National Road Network Categories*

TEN-T policy offers funding opportunities while imposing the responsibility to adhere to EU policy standards and requirements, including the recently agreed Alternative Fuels Infrastructure Regulation (AFIR). This regulation carries specific requirements for EV charge point coverage on the TEN-T road network for light-duty vehicles, including passenger cars, and heavy-duty vehicles. See Figure 4. Some of these requirements involve having:

[4] The TEN-T road network comprises two categories of road:
- The core network includes the most important connections linking major cities and nodes. It needs to meet the highest infrastructure quality standards.
- The comprehensive network connects all regions of the EU to the core network.

- 400 kW charging pools on the TEN-T core road network at 60 km intervals in both directions by 2025.
- Charging pools of 600 kW for LDVs at 60 km intervals in both directions on TEN-T core and comprehensive road network by 2035.
- Dedicated charging pools for HDVs of 3,600 kW at 60 km intervals in both directions on the core network and 1,500 kW at 100 km in both directions on the comprehensive network by 2030.

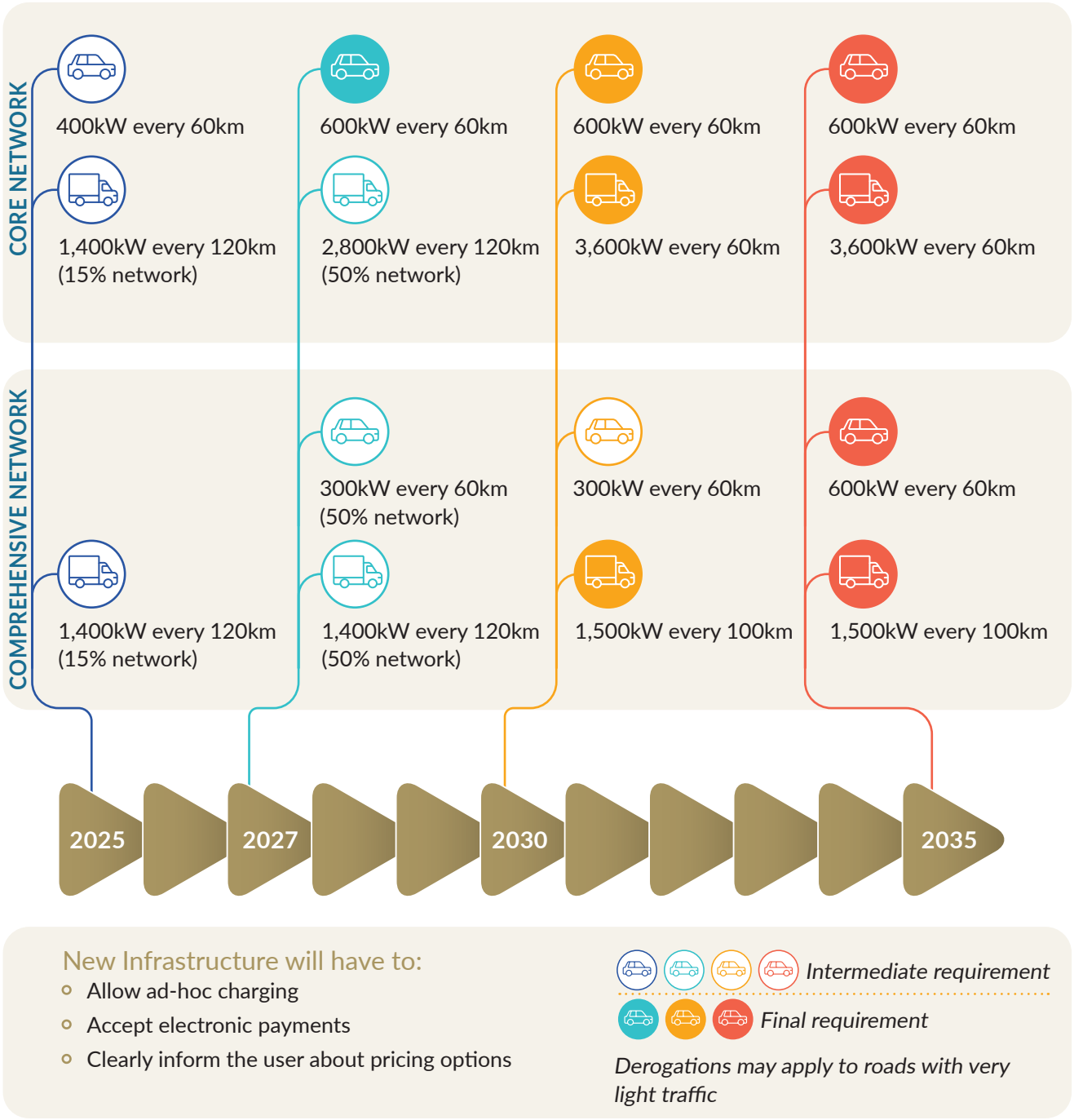
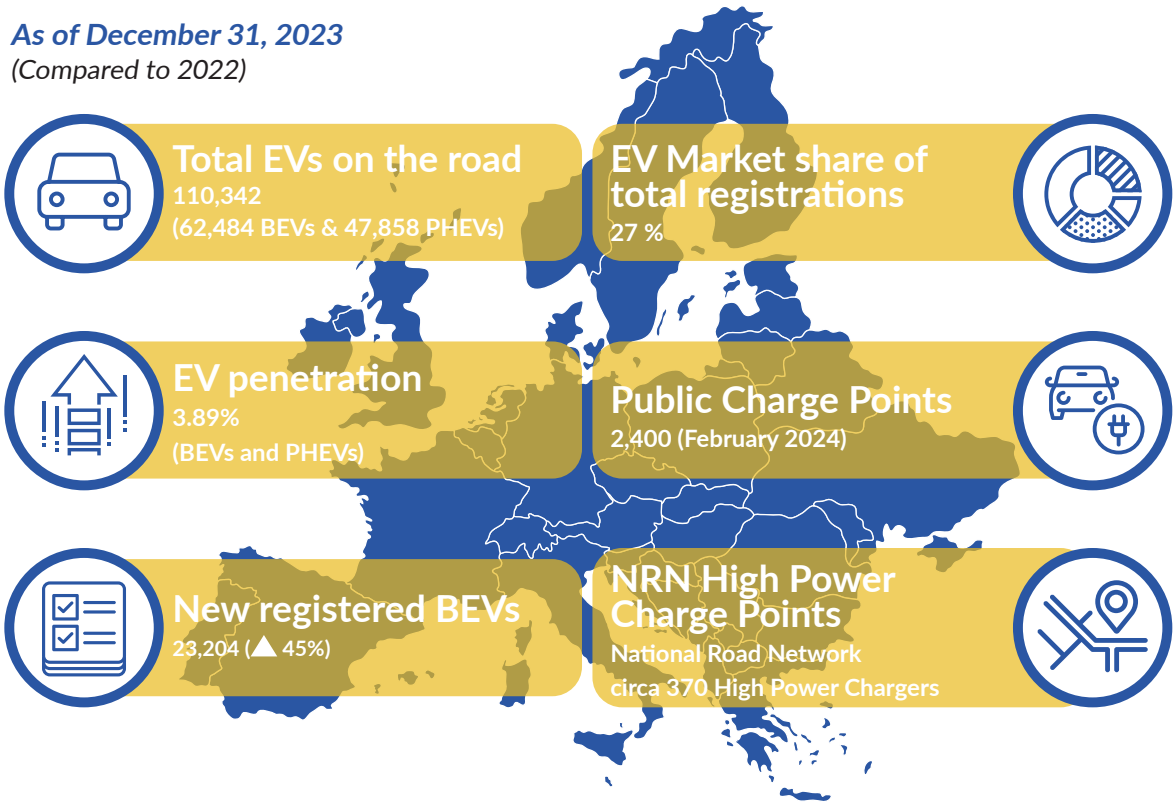


Figure 4: *Key Alternative Fuels Infrastructure Requirements*

2.3 The Electric Mobility Market in Ireland: Vehicles and Infrastructure

The EV market in Ireland has seen significant growth in recent years, driven by a combination of government incentives, increasing consumer awareness, and improving technology. As of the end of 2023, there were over 110,000 total electric vehicles registered in Ireland.



Data source: Government & CSO statistical bulletins

Figure 5: *EV Market Statistics*

The majority of EVs on Irish roads are battery electric vehicles (BEVs), which accounted for 57% of the country's total EV passenger fleet in 2023. Plug-in hybrid electric vehicles (PHEVs) represented the remaining 43% of total EV fleet. In terms of new sales, the electric car segment continues to grow strongly with 36,768 new electric cars registered in 2023, an increase of 42% in EV sales and 45% in BEV sales since 2022[5]. Though sales of EVs has softened in recent months, it is imperative that the pace of transition will increase again if Ireland is to deliver it's carbon reduction targets. The Irish government has set an ambitious target of all new cars sold in Ireland being zero-emission by 2030. European regulations require this by 2035.

[5] Number of Vehicles by Taxation Class and Fuel Type under Current Taxation on 31 December 2023

The EV charging infrastructure along national roads (en-route) in Ireland is continuing to expand in response to the growing demand for EVs. Many of EV charging points along national roads are fast-charging stations, which have the capacity to charge an EV to 80% in just 20-30 minutes. These stations are strategically located in service areas along motorways or on the major national road network and provide EV drivers with the ability to recharge their vehicles while taking a break or stopping for a meal.

Figure 6 below shows the fast charging (DC) infrastructure currently installed on the national road network. Across the TEN-T network, there is a reasonable geographic coverage to enable charging of LDVs including passenger cars, and the minimum standards set by AFIR for 2025 (400 kW capacity every 60 km on the core network) are almost met. Although the capacity at some locations falls below what is merited based on the growing number of EVs on the road, large charging hubs installed and expected to be installed within a year along the motorway network (see Table 1 and Table 2) will go significantly towards catering for that need in 2024.

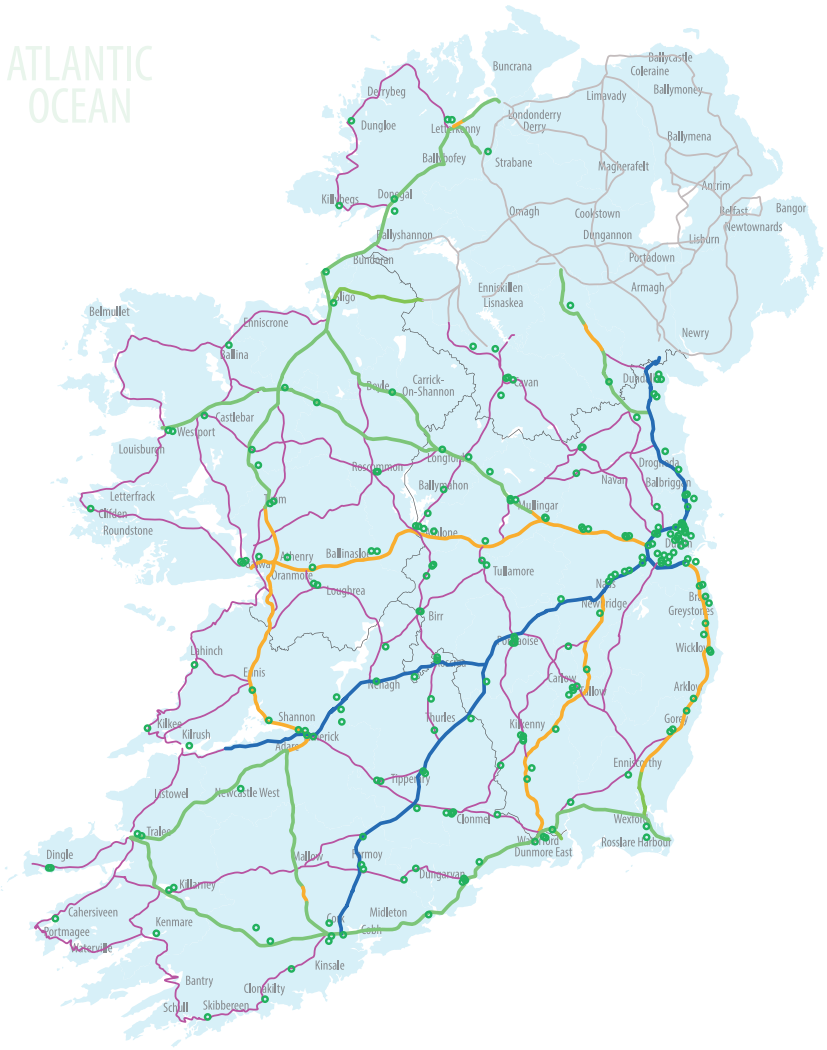


Figure 6: *Current EV Charging Infrastructure on the National Road Network*

In relation to heavy-duty vehicles (HDV) which includes buses, the AFIR requires that separated dedicated charging bays are made available for those vehicles classed as M2, M3, N2 or N3. To date, in Ireland, there is only one initiative (by SSE in Mullingar) initiated for public charging infrastructure for some of these classes[6].

Despite the progress made in the deployment of EV charging infrastructure along national roads, there are still challenges that need to be addressed. These challenges include the need for more charging points to give full coverage and reduce queuing, ensuring the reliability and maintenance of existing charging points, and the need for interoperability to provide a seamless charging experience for all EV users.

2.3.1 Charging Infrastructure in On-line Service Areas

Existing motorway service areas play a crucial role in the delivery of en-route EV charging infrastructure. These service areas serve as strategic locations where EV charging stations can be installed, providing convenient and accessible charging options for EV drivers during their journeys.

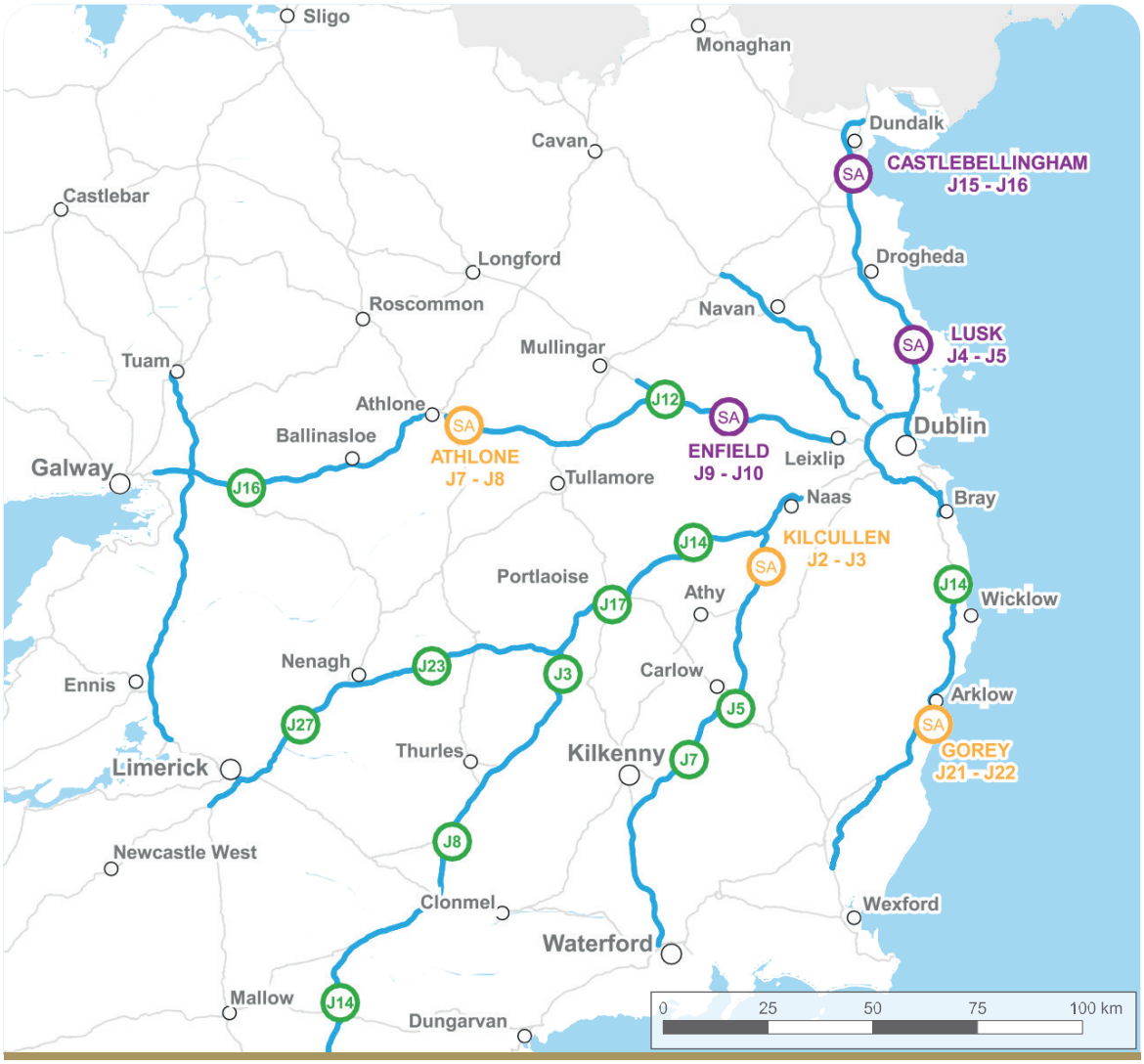


Figure 7: *Motorway Service Areas*

[6] Work begins on 10-vehicle electric charging facility in Westmeath | Westmeath Independent

By leveraging the existing infrastructure and amenities available at motorway service areas, such as parking spaces, rest areas, and facilities, EV charging stations can be seamlessly integrated into these locations, ensuring a positive charging experience for drivers and encouraging the adoption of electric vehicles.

Currently there are 22 on-line service areas serving the almost 1,000 km of motorway network in Ireland. Transport Infrastructure Ireland (TII) is directly involved in nine of these service stations. In 2009 the first tranche of motorway service areas (MSAs) was granted a PPP (locations identified in purple in Figure 7). Each of the first tranche sites have facilities located on both sides of the motorway. The PPP for the second tranche of MSAs was allocated in 2018 (locations identified in yellow in Figure 7). These covered three single sites with one station serving both sides of the motorway. All of the PPP contracts are over a duration of 25 years. The remaining on-line service areas, coloured green in Figure 7, were developed by private investment to standards required by TII.

Largely, charge point infrastructure installed to date has been provided with private investment with an element of support through Climate Action Fund support for ESB ecars and Connecting Europe Facility (CEF) European funding for Ionity installations. The details of the EV charging provision located at the on-line service stations are provided in Table 1 below. This details existing and new infrastructure going live in 2024.

Site Owner	Route	Junction	Location	Forecourt Operators	CPO	Connectors (kW)
TII - T1	M1	Northbound After J4	Lusk	Applegreen	Applegreen electric	1x180 CCS,1x100 CHAdeMO, 1x22 AC
TII - T1	M1	Southbound After J5	Lusk	Applegreen	Applegreen electric	1x180 CCS,1x100 CHAdeMO, 1x22 AC
TII - T1	M1	Northbound After J15	Castlebellingham	Applegreen	Tesla Applegreen Electric	8x150 Supercharger 1x180 CCS, 1x100 CHAdeMO, 1x22 AC
TII - T1	M1	Southbound After J16	Castlebellingham	Applegreen	Tesla Applegreen Electric	8x150 Supercharger 1x180 CCS, 1x100 CHAdeMO, 1x22 AC
TII - T1	M4	Westbound After J9	Enfield	Applegreen	Applegreen Electric	1x180 CCS, 1x100 CHAdeMO 1x22 AC
TII - T1	M4	Eastbound J10	Enfield	Applegreen	Applegreen Electric	1x180 CCS 1x100 CHAdeMO, 1x22 AC
Private	M4	East J12 West J10	Kinnegad	Supermac's/ Texaco	Easygo ESB ecars	2x50 CCS, 2x50 CHAdeMO 8x200 CCS, 8x70 CHAdeMO

Site Owner	Route	Junction	Location	Forecourt Operators	CPO	Connectors (kW)
TII - T2	M6	East J7 West J8	Athlone	Circle K	CircleK Ionity	2x 50 CHADeMO 2x 50 CCS 4x 350 CCS *(*) 2x350 CCS*
Private	M6	J16	Kiltullagh	Supermac's / Texaco	ESB ecars	1x150 CCS, 1x70, CHAdeMO 1x50 CCS, 1x50 CHAdeMO, 1x43 AC
Private	M7	J14	Mayfield	Lydon Group/ Texaco	ESB ecars	7x150 CCS 3x50 CHAdeMO
Private	M7	J17	Portlaoise	Supermac's/ Texaco	ESB ecars	1x150 CCS, 1x70 CHAdeMO, 1x50 CCS, 1x50 CHAdeMO,1x43 AC *8x200 CCS, 8x70 CHAdeMO*
Private	M7	J17	Portlaoise	Applegreen	Applegreen Electric	2x180 CCS
Private	M7	J23	Moneygall	Supermac's/ Texaco	ESB ecars	8x200 CCS, 8x70 CHAdeMO
Private	M7	J27	Birdhill	Applegreen	Tesla Applegreen Electric	6x150 Superchargers 2x120 CCS, 2x60 CCS
Private	M8	J3	Rathdowney	Circle K	Tesla ESB ecars	8x150 Supercharger 1x50 CCS, 1x50 CHAdeMO, 1x43 AC 1x150 CCS, 1x70 CHAdeMO
Private	M8	J8	Cashel	Circle K	Ionity ESB ecars	4x350 CCS *(*) 2x350 CCS* 1x50 CCS, 1x50 CHAdeMO, 1x43 AC
Private	M8	J14	Fermoy	Circle K	Circle K	3x(100-300) CCS, 3 x100 CHAdeMO

Site Owner	Route	Junction	Location	Forecourt Operators	CPO	Connectors (kW)
TII - T2	M9	Southbound After J2 Northbound After J3	Kilcullen	Circle K	ESB ecars	1x50 CCS, 1x50 CHAdeMO, 1x43 AC
Private	M9	J5	Carlow	Circle K		3x(100-300) CCS, 3 x100 CHAdeMO
Private	M9	J7	Paulstown	Applegreen	Applegreen electric	2x180 CCS
Private	M11	J14	Cullenmore	Applegreen	ESB ecars Applegreen electric	1x50 CCS, 1x50 CHAdeMO, 1x43 AC 1x60 CCS, 1x60 CHAdeMO 2 x 120 CCS
TII - T2	M11	Southbound After J21 Northbound After J22	Gorey	Circle K	Ionity	4x350 *(*) 2x180 CCS*
(*) New EV charging infrastructure under construction						

Table 1: *Existing EV charging infrastructure at motorway service stations and new infrastructure in construction. At time of publication, Tesla chargers, listed in the above table, are only available to Tesla drivers.*

2.3.2 EV Charging Infrastructure Close to the Motorway Network

In addition to on-line service areas there are a number of EV charging pools, just off respective motorways that also provide significant charging opportunities. Table 2 outlines these existing facilities and new facilities planned to go live in 2024.

Site Owner	Route	Junction	Location	Forecourt Operators	CPO	Connectors (kW)
Private	M1	J7	Stamullin	Circle K	Ionity	6x350 CCS
Private	M4	J9	Johnston House Hotel Enfield	Hotel	Tesla	6x250 Supercharger Open to all EV Drivers
Private	M4	J17	Lough Sheever Pk (Mullingar) (In Construction)	SSE	SSE	Maxol *(*) 5x150 CCS*
Private	M6	J17	Athenry	Raheen Woods Hotel	Tesla	4x250 Super Chargers Open to all EV Drivers
Private	M7	J7	Kill South	Circle K	Ionity	4x350 CCS *(*) 2x350 CCS*
Private	M7	J7	Kill North	Circle K	Ionity	4x350 CCS *(*) 2x350 CCS*
Private	M7	J12	Newbridge	Maxol	Maxol	*6x200CCS*
Private	N40	Mahon interchange	Mahon Point Shopping Centre	Shopping centre	Tesla	4x250 Supercharger (for Tesla Drivers Only)
Private	M20	J2	Dooradoyle, Limerick	Crescent Shopping Centre	ESB ecars	*8x200 CCS+8x70 CHADeMO*
Private	M50	J6	Blanchardstown Shopping Centre	Shopping Centre	ESB ecars	*(*) 8x200 CCS, 8x70 CHADeMO*
Private	M50	J10	Ballymount	Applegreen	Applegreen Electric	2x120 CCS (*) 2x60 CCS
Private	M50	J16	Carrickmines	Shopping Area	ESB ecars	*(*) 8x200 CCS, 8x70 CHADeMO*
(*) New EV charging infrastructure under construction						

Table 2: *Existing EV charging pools (with at least 150 kW chargers) within 3 km of the national motorway and installations planned to be delivered in 2024 that meet this criterion.*

2.4 National Road Network: Key Stakeholders

In order to successfully deploy a National EV Charging Infrastructure Plan, it is important to identify and engage with the key stakeholders who will be impacted by this initiative. These stakeholders have a significant role to play in the planning, design, and implementation of the infrastructure, so their engagement and cooperation are essential for the success of the plan.

 **State agencies**	The Irish government and its agencies, such as Transport Infrastructure Ireland (TII), play a critical role in planning, designing, and funding the national road network. TII has overall responsibility for the operation, maintenance of, and improvements to the national road network, along with ensuring its efficient use and safe operation. TII also has responsibility for carrying out strategic studies to determine the future needs of the national road network in Ireland and appraising those needs. It is currently planned that the ZEVI office will move to TII in 2025/2026 once the initial work of the office is complete and the responsibility of the office transitions to ongoing operations and delivery. Legislative orders will be required for this to occur.
 **Local authorities**	Local authorities are responsible for the management of urban and remote sections of dual carriageway, single carriageway national primary roads along with national secondary, regional and local roads in Ireland.
 **Road users**	Road users, including drivers, cyclists, and pedestrians, are key stakeholders in the national road network. Their safety and comfort are important considerations in the planning and design of road infrastructure.
 **Public transport providers**	Public transportation providers, including bus and rail services, rely on the national road network for the efficient and reliable movement of passengers and goods.
 **Freight & Logistic Sector**	This sector is heavily reliant on the national road network for the efficient and timely delivery of goods, and has a vested interest in the quality and safety of the roads. They require well-maintained roads and infrastructure to ensure the smooth flow of traffic and minimise delays.

Service Area Operators	Forecourt operators provide essential services along the national road network such as fuel, food, welfare and rest facilities for drivers on long journeys. Their role is to ensure that drivers have access to necessary amenities, making the driving experience safer and more comfortable.
Charge Point Operators	Charge point operators play an essential role in the delivery of en-route EV charging infrastructure on national roads in Ireland. As stakeholders in the charging ecosystem, they fund, plan, install, and maintain the charging stations along the national road network.
PPPs	Approximately 320 km of the 916 km motorway network is currently operated by Public Private Partnerships (PPPs). In terms of on-line service areas, six of them are currently operated by PPP companies. These companies operate and manage motorway service areas under long-term concession agreements with the government, making them responsible for the development, construction, operation and maintenance of these facilities.
ESBN	ESB Networks are responsible for the delivery of electricity to homes, businesses, and infrastructure across the country. Their role is critical in supporting the growth and adoption of electric vehicles (EVs) in Ireland, as they are responsible for the operation, maintenance and development of the electricity distribution network in Ireland. They are also responsible for maintaining and developing the transmission network. As stakeholders, ESB Networks have a role to play in the planning and development of the infrastructure serving the national road network.
EirGrid	While it is not anticipated that EV charging infrastructure will require connections directly to the transmission network, all electrical connections to the ESB Networks grid will need to be catered for at the transmission level and all load applications above 4MVA need an individual study of impact at the transmission level. Also, the electrical load drawn by the EV charging network will be an element in system generation planning.

Table 3: *National Road Network - Key Stakeholders*

CHAPTER

3

National Road Network EV Charging Infrastructure Deployment

Different modelling methodologies and scenario analyses have been used to inform the en-route charging infrastructure plan. These assessments, together with the AFIR requirements, have provided insights to shape the deployment of en-route charging infrastructure in a way that is both efficient and effective, and that meets the needs of EV drivers while also supporting the transition towards a more sustainable transportation system.

The deployment of electric vehicle (EV) charging infrastructure along the national road network in Ireland is a critical step in facilitating the widespread adoption of electric vehicles. In order to ensure that the necessary infrastructure is in place to support this transition, it is essential to develop this comprehensive National Road Network EV Charging Plan. This plan must take into account a wide range of factors, including user needs, EV penetration projections, the current and future demand for EV charging, the legislative level of charging required through AFIR, the geographic distribution of charging points, and the availability of electricity supply and grid infrastructure.

To ensure that the deployment plan is effective in meeting the needs of EV drivers, it is important to use modelling and analysis to inform the decision-making process. This involves the use of different models and simulations to forecast the demand for EV charging and to evaluate the potential impact of different deployment strategies.

In this chapter, we will provide an overview of the modelling and analysis that was conducted to inform the EV charging infrastructure deployment plan for en-route charging in Ireland. The key assumptions and inputs that were used in the modelling process will be presented, together with descriptions of the alternatives that were evaluated. The potential impact on the national electricity grid was also considered.

By using various modelling methods and analyses to inform the deployment plan, we can shape the deployment of infrastructure in a way that is both efficient and effective, and that meets the needs of EV drivers while supporting the transition towards a more sustainable transportation system. Informed by modelling and analysis, three alternative deployment proposals are presented.

As part of this plan, modelling and analyses were carried out across six specific areas as follows:

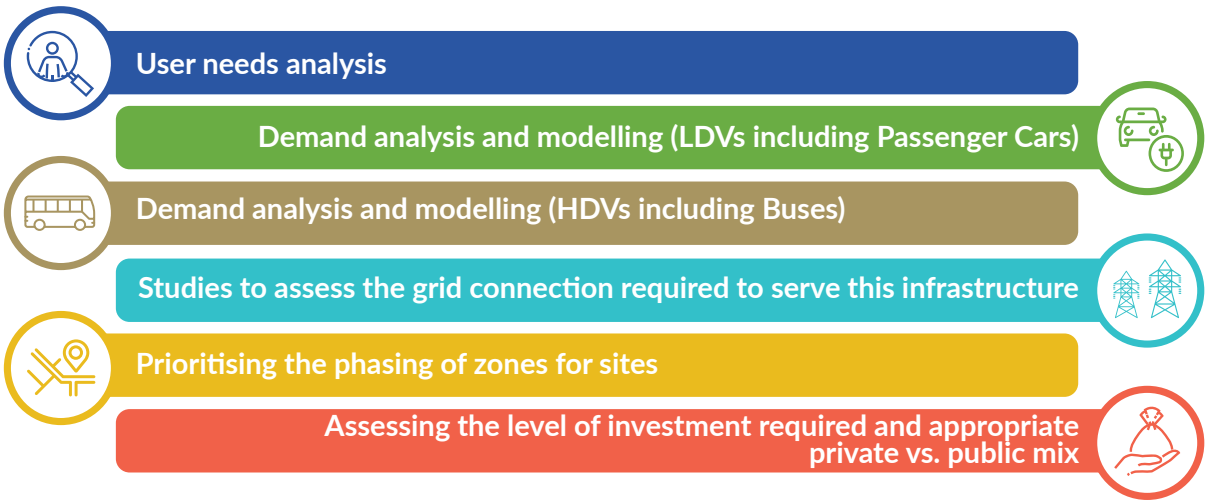


Figure 8: *Six Specific Areas Modelled/Analysed in this plan.*

3.1 User Needs Analysis

The Electric Vehicle Charging Infrastructure Strategy 2022-2025 already stressed the importance of understanding user experience and people's charging journeys in the development of any EV charging infrastructure plan. In the Strategy, seven characters and their journeys through charging were developed to understand how people may interact with the future EV public charging network, identifying their potential challenges and opportunities to address them.

These characters or "personas" help identify specific user requirements such as charging preferences, driving patterns, and charging frequency, which inform decisions on charger locations, charging speeds, and payment methods. They also enable stakeholders to anticipate future trends and adapt the infrastructure to accommodate emerging EV user groups.

These personas plus an additional user group (van drivers) have been used as different lenses to assess the main concerns and challenges experienced by EV users when charging on national roads. The issues identified for the personas profiled are applicable to a wider set of personas than those profiled. Improving services for one group will have a positive impact for all – for example, universal design guidelines not only improve accessibility for wheelchair users, they will make it easier for people who travel with prams or people who have reduced mobility or have mobility aids. Once these challenges have been defined, they have been used to identify the required supports.

Figure 9: *Electric Vehicle Charging Infrastructure Strategy 2022-2025 Proposed Persona along with additional/modified persona added for this plan.*

		Description	Main Concerns (en-route)	Supports (en-route)
Car Sharer		They use a car sharing club because they don't own their own car. They usually take public transport or active mobility, but there are some trips whereby they need a car - e.g., travelling to the countryside or retail park.	○ Not having a full charge when first renting the car. ○ Getting fined for not returning the car with enough charge. ○ Having the same access to charging despite not having charging accounts. ○ Speed of charge (total time may influence the trip cost).	○ Carsharing stations equipped with chargers to avoid the need to charge. ○ Information when booking a car about where to charge and range available. ○ Clear signalling of charging options en-route. ○ Charging interoperability. ○ Ease of payment – no need for multiple apps for infrequent use. ○ Fast charging points.
Rural Commuter		They rely on their car for most of their journeys due to the lack of sustainable and convenient alternatives. Due to the number of kilometres travelled per day, sometimes they need to rely on the en-route charging network.	○ Range anxiety ○ Adequate pricing ○ Charging speed and availability ○ Queueing for a charger ○ Safety at the charging station	○ Readily available information about location and pricing of charge points. ○ Fast and affordable charging points. ○ Clear signals and signposting for charging facilities. ○ Services and facilities at charging stations.
HDV Driver		They drive HDVs for a company and frequently use the national road network. Even though they mainly rely on depots, they need to have access to convenient and fast chargers along the route in order to get back on the road quickly to meet their deadlines.	○ Range anxiety ○ Charging speed and availability ○ Queueing for a charger ○ No facilities to wait at ○ Powering of truck cab while charging ○ Impact on rest rules ○ Safety of charging while sleeping	○ Information about location and pricing of charge points and available facilities. ○ Clear signals and signposting for charging facilities. ○ Fast charging points. ○ Charging interoperability. ○ Charging infrastructure located close to amenities and rest areas.

		Description	**Main Concerns** (en-route)	**Supports** (en-route)
Tourist		Tourists may use their own vehicles or rent an EV to travel around the country - both to cities and more rural destinations. Ideally, they will charge at destinations overnight, but they may rely on the en-route charging network when this is not available.	○ Range anxiety ○ Not able to navigate the apps. ○ Payment options, particularly for international users. ○ No facilities to wait at. ○ Safety at the charging station.	○ Information about location and pricing of charge points and available facilities. ○ Clear signals and signposting for charging facilities. ○ Charging interoperability. ○ Ease of payment – no need for multiple apps for infrequent use. ○ Charging infrastructure located close to amenities.
Taxi Driver		They drive around their local town working as a taxi driver. They spend most of their time doing short, local trips. They have to navigate traffic which makes their journeys longer. Occasionally they have to do a longer or inter-urban trip, so they may rely on the en-route charging network.	○ Range anxiety. ○ Charging speed and availability. ○ Adequate pricing. ○ Safety at the charging station.	○ Conveniently located charging points. ○ Clear signals and signposting for charging facilities. ○ Charging interoperability. ○ Fast and affordable charging points.
Apartment dweller		They have shared EV chargers in their apartment block, so these may not always be available. Occasionally, they may rely on the en-route charging infrastructure network when travelling around the country or when they need a high-speed charger.	○ Range anxiety. ○ Adequate pricing. ○ Charging speed and availability. ○ Safety at the charging station.	○ Information about location and pricing of charge points. ○ Clear signals and signposting for charging facilities. ○ Services at charging stations. ○ Fast and affordable charging points.

		Description	Main Concerns (en-route)	Supports (en-route)
Mobility device User		For them, being independent is key. They may rely more or less on the en-route charging network, but if they need it, they need to be confident that the infrastructure is easy to find, use and is accessible.	○ Not able to find accessible chargers. ○ Complex charging facilities, making them difficult to use. ○ Potential need for assistance at charging stations. ○ Safety at the charging station.	○ Information about location and availability of accessible chargers. ○ Clear signals and signposting for charging facilities. ○ Ease of use. ○ Services at charging stations. ○ Charge points designed according to Universal Design Guidelines.
Commercial/Van driver		They drive frequently for work and ideally charge up at home to avail of the cheapest rate. They will rely on high-power charging en-route for inter-urban trips.	○ Range anxiety. ○ Charging speed and availability. ○ Payment and pricing. ○ Safety at the charging station.	○ Clear signals and signposting for charging facilities. ○ Fast and affordable charging points. ○ Charging interoperability. ○ Ease of payment.

Table 4: *Personas used for the development of this plan, with their main concerns and proposed key supports.*

3.2 Modelling Charging Needs for LDVs including Passenger Cars

3.2.1 EV Uptake Scenarios

The initial step in the modelling process involves forecasting the anticipated uptake of electric vehicles (EVs). The current trajectory is encouraging, with over 110,000 EVs (of which 62,500 are full electric vehicles (BEVs)) on the road as end of 2023. This progress puts the country on track to meet the Climate Action Plan 2024 target of transitioning 195,000 passenger/LGVs to electric by 2025 (as per Figure 10). The CAP24 envisions a significant acceleration in EV adoption during the latter half of the decade. However, the impact of the COVID-19 pandemic has resulted in decreased levels of new car sales and additional challenges in the supply chain have further prolonged this trend.

Furthermore, the objectives outlined in CAP24, such as a 25% reduction in daily private car journeys and a 20% reduction in kilometres travelled by car by 2030, may contribute to a lower number of passenger cars on the road.

Although the CAP target to transition 30% of internal combustion engine (ICE) vehicles to electric by 2030 will remain unchanged, it is possible that the absolute number of EVs on the road by then may be adjusted considering the evolving circumstances. Separate to this plan, a revised model for predicting the transition to EVs through to 2030 is being developed by the Department of Transport as part of modelling for the Climate Action Plan. However, this will not be complete in time for this plan.

The acceleration of EV uptake is dependent on a set of different factors, ranging from behavioural trends, incentives, infrastructure provision, technology, and the regulatory framework. For the purposes of developing this plan we have assessed the charging needs based on the Climate Action Plan targets of:

- 175,000 passenger EVs and 20,000 LGVs by 2025 - (62% BEV)
- 845,000 passenger EV and 95,000 LGVs by 2030 - (80% BEV)

3.2.2 Modelling Approach and Methodologies

Assessing the requirement for public EV chargers to meet and surpass the charging demand can be approached through both bottom-up and top-down approaches. By combining these perspectives, the proposals presented in this document have been formulated. It is acknowledged that the delivery infrastructure required by the AFIR regulation (requiring 1.3 kW of charging infrastructure per BEV and 0.8 kW per PHEV) may result in front-loading of capacity, more than may be needed according to the needs-assessment. However, it was considered important to ensure that more than enough capacity is provided to alleviate the anxiety of electric vehicle users, who otherwise might be afraid of not finding infrastructure to recharge their vehicles.

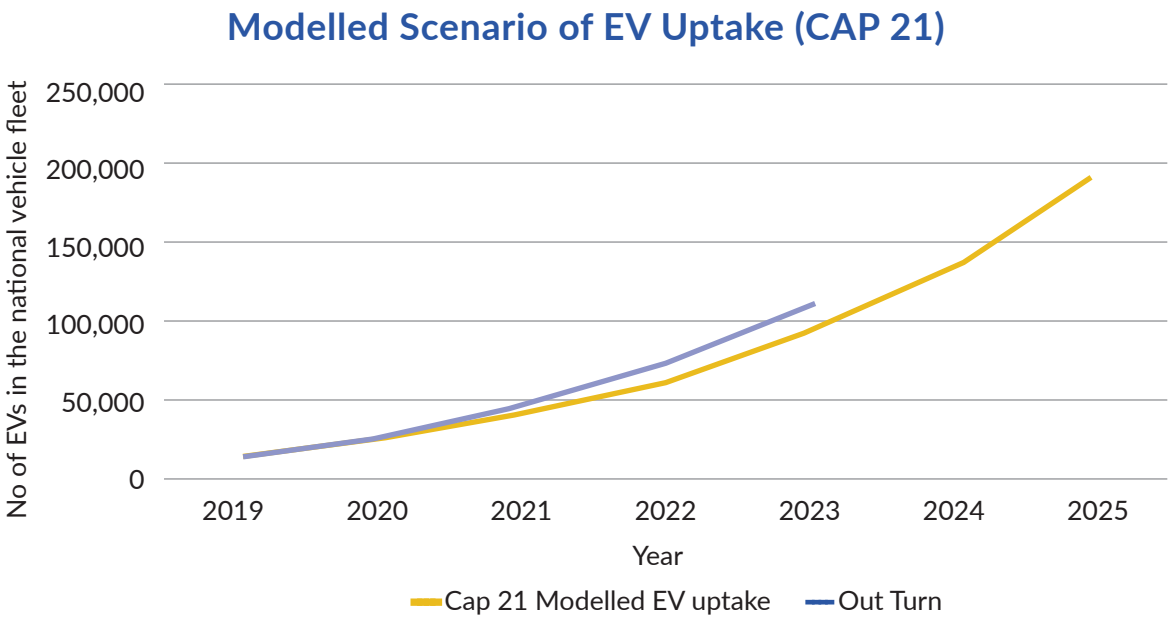


Figure 10: *Modelled Scenario of EV Uptake CAP21 (note that Department of Transport are currently reviewing this model for 2030)*

It is accepted that delivery of AFIR will be sufficient to meet the evolving needs of EV drivers anticipated in 2025. Therefore, we will consider these requirements as the foundation in our planning for 2025. On the other side, the modelling, together with AFIR requirements, will be the foundation to assess the charging requirements for 2030 and 2035.

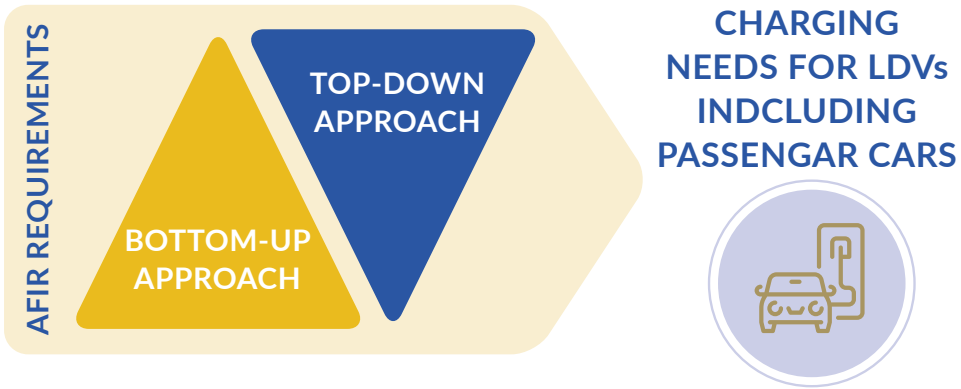


Figure 11: *Modelling and Analysis Approach and Methodologies*

3.2.3 Demand Driven - Bottom-up Model

From a bottom-up perspective an extensive agent-based modelling tool was developed to consider the needs for EV charging. Agent-Based Modelling (ABM) is a class of computational model for simulating the behaviour of individual agents with a view to assessing their effects on the system as a whole. Agents can be given specific characteristics that influence their behaviour and the cumulative impact of agent choices across a system can be analysed. This modelling analysed where and when agents with EVs will want to charge in 2030 and 2035.

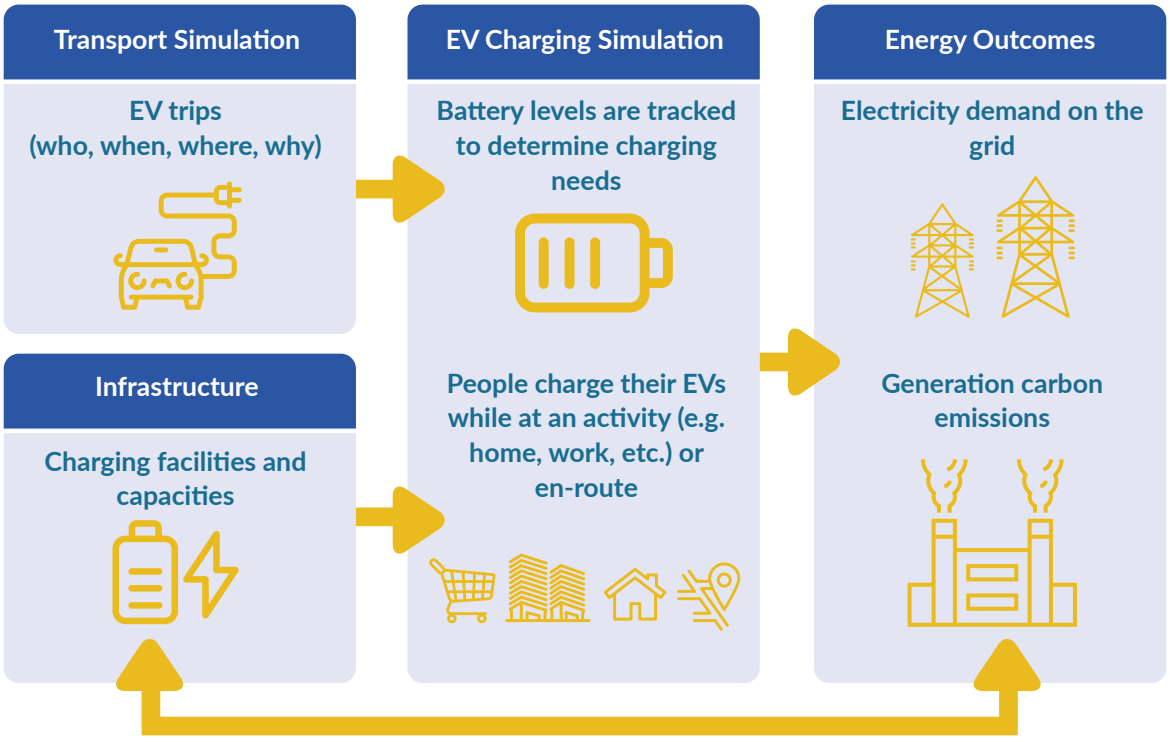


Figure 12: *Methodology Used for the Bottom-up Model*

During the development of the modelling, the following criteria were considered:

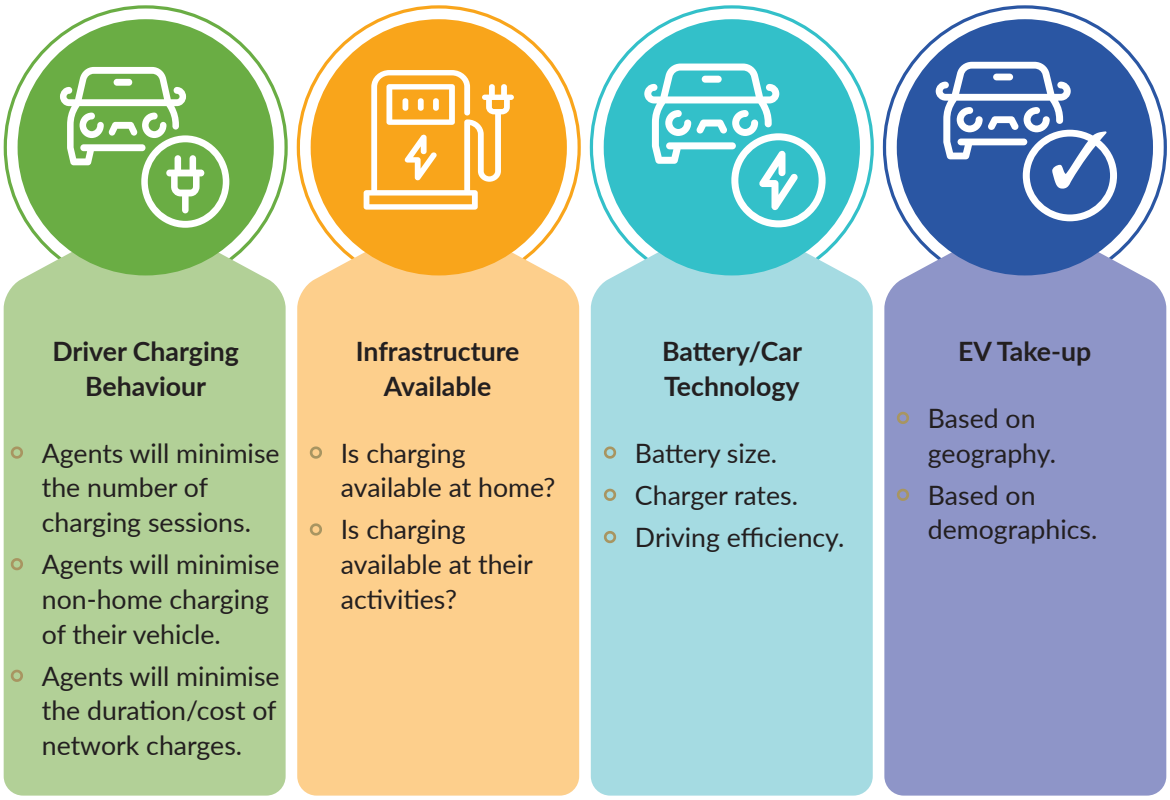


Figure 13: *Bottom-up Modelling - Criteria Considered*

3.2.4 Top-Down Approach

As part of this second modelling approach, requirements for high-power charging (HPC) based on the total annual kWh requirement for public HPCs and total kWh charging possible per charger was analysed at a county level. Average annual daily traffic (AADT) data on the national road network were analysed at county level to determine the volume of traffic and allocation of HPCs within the county.

During the development of the modelling, the following criteria were considered:

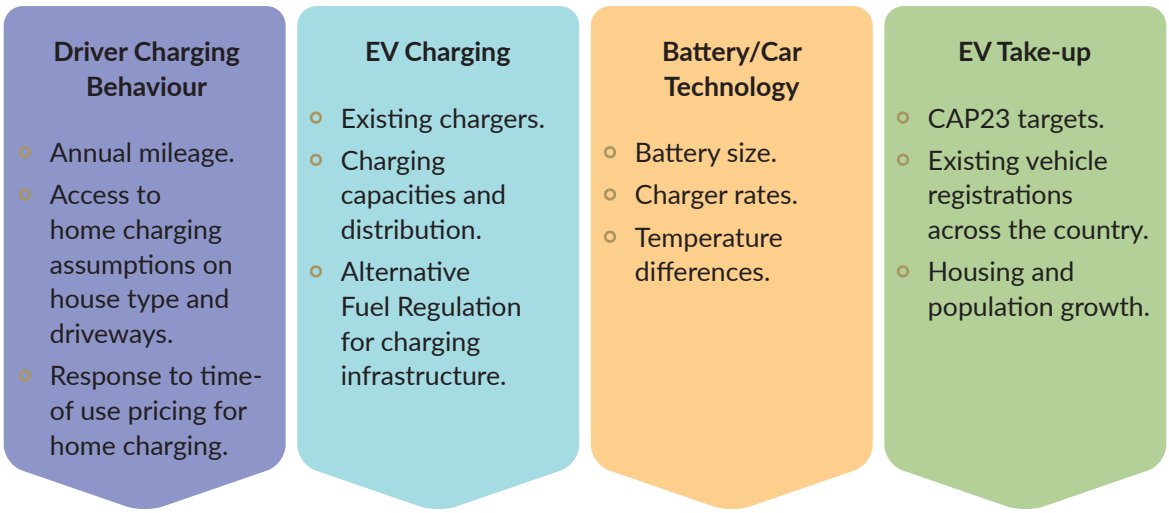


Figure 14: *Top-down Modelling - Criteria Considered*

3.2.5 AFIR Targets and Allocations (Top-Down)

The Alternative Fuel Infrastructure Regulation has now been agreed including a requirement for EU Member States to rollout the following:

- Specific levels of EV charging infrastructure for LDVs, including passenger cars, on the TEN-T core and comprehensive network (see Figure 15). By 2035 it requires 600 kW of charging infrastructure at 60 km distances, each direction across the entire TEN-T network.
- A total level of publicly accessible EV charging infrastructure capacity for passenger cars that is proportionate to the uptake of electric vehicles. This "fleet based" target requires a charging infrastructure power output of 1.3 kW per Battery Electric Vehicles (BEVs) and 0.8 kW per plug-in hybrid vehicle (PHEVs). The allocation of the fleet-based target level of EV charging infrastructure across the three categories of public charging (neighbourhood, destination, and en-route) was also considered in this study. As outlined in Chapter 2, through traffic counters and monitoring, TII has calculated that the national road network (national primary and national secondary roads) carried approximately 43% of the country's vehicle kilometres in 2021 while the TEN-T road network alone carried 19.2%. This information informed the top-down approach.

Figure 15: *Ireland's TEN-T Road Network*

Once the national fleet share of light-duty vehicles reaches more than 15% of battery-electric vehicles, member states are permitted, based on a reasoned request to the Commission, to lower or cease the requirements for the fleet-based targets. It is anticipated that this level of EV penetration of the national fleet will be reached when there are approximately 620,000 LDVs transitioned to EV. This is expected to be reached before 2030. At this stage it is expected that any new charging infrastructure installed in the en-route category will be driven by market forces.

3.2.6 Modelling Output

As discussed in section 3.2.1 the adoption of EVs has been progressing at a notable rate, with an annual growth of 68% since 2019. Nonetheless, achieving the goal of having 30% of the passenger and light-good vehicle entire fleet comprising electric vehicles by 2030 will require an almost exponential increase in the number of EV users in the second half of the decade. In order to facilitate and encourage users to make the transition, the current national road EV charging infrastructure must rapidly expand, thereby removing one of the main obstacles of charger/range anxiety.

To arrive at the targeted level of charging infrastructure provision for 2025 and 2030 outlined in Table 5 and Table 6 below, the AFIR overall fleet-based target was informed by traffic information extracted from TII's National Transport Model.

The agent-based modelling (ABM) tested a sample scenario of charging locations, distributed across the TEN-T network. The results suggests that the level of EV charging, that would be required on the TEN-T network by 2030, would be significantly higher (to a factor of 2 or more) than that required under AFIR, however this does vary by location.

3.3 Proposed Infrastructure Delivery

3.3.1 Targeted En-route Charging Infrastructure in 2025

The above analysis resulted in three alternatives for EV charging infrastructure deployment for the national road network. This considers both the primary and secondary national roads and is planned to serve only LDVs including passenger cars.

- **Alternative 1 "Alternative Fuels Infrastructure Regulation":** The first alternative outlines the required EV charging capacity that needs to be delivered in Ireland to comply with the AFIR requirements on the TEN-T road network.
- **Alternative 2 "Medium EV Charging Capacity Scenario"** calls for AFIR 2030 TEN-T Core Network targets for LDVs to be delivered in 2025, and on the comprehensive motorway/dual carriageway roads for the 2035 target to be delivered by 2025 along with 100 kW of charging every 30 kilometres on the remaining primary and secondary national roads. This is driven by the need to deliver the AFIR fleet-based national target. It is also informed by the modelling for 2030 conducted as part of this plan that indicated that AFIR distance-based charging targets, for TEN-T road network would not be adequate to meet demand. This, Alternative 2, would deliver 21% of the total fleet-based AFIR target in terms of power output required across the country based on having 195,00 passenger/LGVs on the road.
- **Alternative 3 "High EV Charging Capacity Scenario"** calls for a higher level of high-power en-route charging guided by the fact, as outlined above, TII has calculated that the national road network (national primary and national secondary roads) carried approximately 43% of the country's vehicle kilometres. This scenario is also informed by the modelling for 2030 conducted as part of this plan that indicated that AFIR targets for TEN-T road charging network would not be adequate to meet demand.

Both alternatives 2 and 3 call for a significantly accelerated deployment of en-route EV charging infrastructure across the national road network. Our objective would be to deliver at least Alternative 2, with Alternative 3 level of charging being considered where required. It is anticipated that market forces may drive higher capacity levels than this in some locations.

2025: Where * Row colour corresponds to road on Figure 16	Road Length (km)	Alternative 1: Alternative Fuel Infrastructure Regulation 2025	Alternative 2: Medium EV Charging Capacity Scenario 2025	Alternative 3: High EV Charging Capacity Scenario 2025
TEN-T core (each direction)[7]	500	400 kW @ 60 km 3-4 charge points At least one with 150 kW capacity	600 kW @ 60 km 4-6 charge points	900 kW @ 60 km 6-9 charge points
TEN-T comprehensive (motorway / dual carriageway) (each direction)	700	Nothing specific – (covered by fleet target)	600 kW @ 60 km 4-6 charge points	900 kW @ 60 km 6-9 charge points
TEN-T comprehensive (single carriageway) (each direction)	1000	Nothing specific – (covered by fleet target)	300 kW @ 60 km 3-4 charge points	400 kW @ 60 km 3-4 charge points
Primary and secondary road (non-TEN-T)	3100	Nothing specific – (covered by fleet target)	100 kW @ 30 km 1-2 charge points	200 kW @ 30 km 2-4 charge points
Total charging power (kW)	5,300	7,200	45,200	72,200
Approx. no. of charge points		78-104	415-706	706-1118
No. of EVs anticipated		195,000	195,000	195,000
National fleet-based target output (kW) (Required by AFIR)		214,000	214,000	214,000
% of national fleet-based target output (kW) delivered through en-route charging infrastructure		3%	21%	34%

Table 5: *2025 - Targeted En-Route Charging Infrastructure for LDVs including Passenger Cars*

It is worth noting that the target levels above identify the total publicly accessible infrastructure that ZEVI will aim to see in place on the national primary and secondary road network by 2025. As outlined in Chapter 2, some of this infrastructure is already in place and it is also expected that the deployment of a significant share of this infrastructure will be delivered purely through the private sector investment. However, it is possible that further support for private investment will be needed to accelerate the delivery, potentially in lower trafficked locations.

[7] "Each Direction" requires this level of infrastructure to be available to cars travelling in each direction. For a single charging pool serving both sides of the road, with the given distance, this charge capacity level needs to be doubled.

While Ireland is still in the early stages of transitioning to an electric fleet, it is key to signal ambitious targets to boost and support this deployment. This need for an accelerated roll-out of infrastructure is backed-up and stressed by both the modelling conducted and feedback from existing EV users. Therefore, the objective of this plan is to stimulate the private sector to accelerate their plans to deliver the infrastructure that will, at minimum, deliver Alternative 1 above. This plan will also consider and explore the most appropriate supports and incentives for the private sector to be able to deliver Alternatives 2 or 3 by 2025.

Figure 16 below shows the roads to match the four road categories of target infrastructure presented in Table 5. The exact locations of the infrastructure will be decided based on a market assessment as outlined in Chapter 4.

Figure 16: *National Road Networks coloured to identify level of EV charging network proposed for the four classes of road: Ten-T Core Motorway, Ten-T Comprehensive Motorway/Dual carriageway, Ten-T Single Carriageway and the Non-Ten-T Single Carriageway, as per Table 5 and Table 6.*

3.3.2 Targeted En-route Charging Infrastructure in 2030

Table 6 below outlines indicative alternatives for 2030. While the specific requirements of the AFIR scenario will need to be met at a minimum, modelling has shown that demand requirements will considerably exceed this level of infrastructure. These demand requirements will be of the order of the proposed medium or high charging infrastructure alternative scenarios or even higher at individual sites in proximity to the urban centres. While this is a forecast need at this stage, the ultimate charging infrastructure provision will be informed by analysis of actual usage pattern data of existing charge points closer to the time.

2030: Where	Road Length (km)	Alternative 1: Alternative Fuel Infrastructure Regulation 2030	Alternative 2: Medium EV Charging Capacity Scenario 2030	Alternative 3: High EV Charging Capacity Scenario 2030
TEN-T core (each direction)[8]	500	600 kW @ 60 km	1,800 kW @ 60 km	3,000 kW @ 60 km
TEN-T comprehensive (motorway / dual carriageway) (each direction)	700	300 kW @ 60 km	1,800 kW @ 60 km	3,000 kW @ 60 km
TEN-T comprehensive (single carriageway) (each direction)	1,000	300 kW @ 60 km	600 kW @ 60 km	1,200 kW @ 60 km
Primary and secondary road (non-TEN-T)	3,100	Nothing specific	300 kW @ 15 km	400 kW @ 15 km
Total charging power (kW)	5,300	28,200	150,151	250,000
Approx. no. of charge points	The number of charge points will depend on technology development, this may drive higher charger capacities			
% of total charging power to be installed across the country[9]	940,000 EVs	4%	22%	35%

Table 6: *Targeted En-route Charging Infrastructure in 2030*

3.3.3 Predicting Charging Needs for Heavy-Duty Vehicles (Including Buses)

The transition of heavy-duty vehicles (HDVs) to electric power is currently in the early stages of development. However, this will start to gather pace towards 2030 as total cost of ownership (TCO) of EV reduces to lower than equivalent ICE. Studies are already showing that for many classes of HDVs this is the case today and by 2030 almost all classes of truck will have reached parity on a

[8] "Each Direction" requires this level of infrastructure to be available to cars traveling in both directions. For a single charging pool serving both sides of the road, with the given distance, this level is doubled.

[9] As outlined in 3.2.5, it is expected that 15% of the national fleet will be electric before achieving a penetration of the CAP target of 940,000 cars. It is estimated that AFIR fleet target will require approximately 712,395 kW of charging capacity to be installed by 2030.

TCO basis with its ICE equivalent[10]. This is a crucial sector that requires decarbonisation efforts. According to Ireland's Road Haulage Strategy 2022–2031, there are approximately 41,850 HDVs in Ireland, contributing to 20% of the road transport emissions[11]. To address this, the Climate Action Plan has set specific targets, aiming for 700 HDVs and 300 buses to be electric by 2025. By 2030, the CAP envisions 3,500 low-emission trucks and 1,500 electric buses. Furthermore, CAP24 expands on these targets by placing a greater emphasis on targeting fleet shares and vehicle kilometres travelled rather than focusing solely on absolute numbers of low-emission vehicles.

In addition, CAP24 sets a complementary target of 30% of sales for new medium and heavy-duty vehicles (MHDVs), which includes buses, to be zero-emission by 2030. It is reasonable to expect that first adopters will be businesses whose charging needs will be satisfied by depot charging, and thus may not rely heavily on public charging infrastructure. However, the development of dedicated public charging infrastructure for heavy-duty vehicles will enable a broader range of industries to consider transitioning their fleets to electric vehicles.

The implementation of the Alternative Fuel Infrastructure Regulation imposes a substantial infrastructure rollout obligation on each Member State across Europe, including Ireland, for heavy-duty vehicles (HDVs). It is expected that this infrastructure will be sufficient to meet the requirements in 2030. In fact, it is expected to surpass the actual demand. A comprehensive analysis commissioned by ACEA[12] in 2022, which examined the GPS coordinates of approximately 400,000 trucks operating throughout Europe over a 12-month period, focused on the duration of stops at individual locations. The findings indicated that Ireland would only require three locations on the TEN-T network to be operational by 2027, along with two additional sites outside of the TEN-T network.

The specific requirements of the Alternative Fuel Infrastructure Regulation (for charging infrastructure dedicated to HDVs) are outlined in Table 7 provided overleaf.

[10] ZEV cost: Total cost of ownership | Zev Transition Council (zevtc.org)
[11] EPA-Ireland's-Provisional-GHG-Emissions-1990-2021_July-2022v3.pdf
[12] https://www.acea.auto/figure/interactive-maps-electric-trucks-stop-locations-western-europe/

Year	Road Network	Rechargers for heavy-duty vehicles
By 2025	TEN-T core & comprehensive[13] - see Figure 1 above	15% of the total length of TEN-T road network ○ **1,400 kW** every **120 km** in each direction – *with at least one **350 kW** charge point*
	Urban node, (Dublin, Cork, Foynes and Galway)	**900 kW** – *provided by stations with an individual power output of 150 KW*
By 2027	TEN-T core & comprehensive	*50% of the total length of TEN-T road network with capacity and distance as follows:* ○ **TEN-T core: 2,800 kW** in each direction every **120 km** ○ **TEN-T comprehensive: 1,400 kW** in each direction @ **120 km** **note derogations may apply see Table 8*
	At each HDV parking and rest area	**2 recharging stations** dedicated to heavy-duty vehicles (minimum **100 kW** each)
By 2030	TEN-T core & comprehensive	○ **TEN-T core – 3,600 kW** every **60 km,** in each direction– *with at least two stations with 350 kW each* ○ **TEN-T comprehensive – 1,500 kW** every **100 km,** in each direction – *with at least one station with 350 kW - *note derogations may apply see Table 8*
	Parking and rest areas	At each safe and secure parking area **4 recharging stations** dedicated to heavy-duty vehicles *(minimum **100 kW** each)*
	Urban nodes	**1,800 kW** - *provided by stations with an individual power output of **150 kW***

Table 7: *Dedicated EV Charging Infrastructure to be Rolled Out of HDVs*

To determine the extent of derogations, we used outputs from the National Transport Model (NTM) 2021. Actual data was used to predict traffic volumes for the years 2025 and 2030. These will be reviewed in future years as more up to date traffic information is available.

[13] 'TEN-T core network' means a network as defined in Article 38 of Regulation (EU) No 1315/2013 - maps

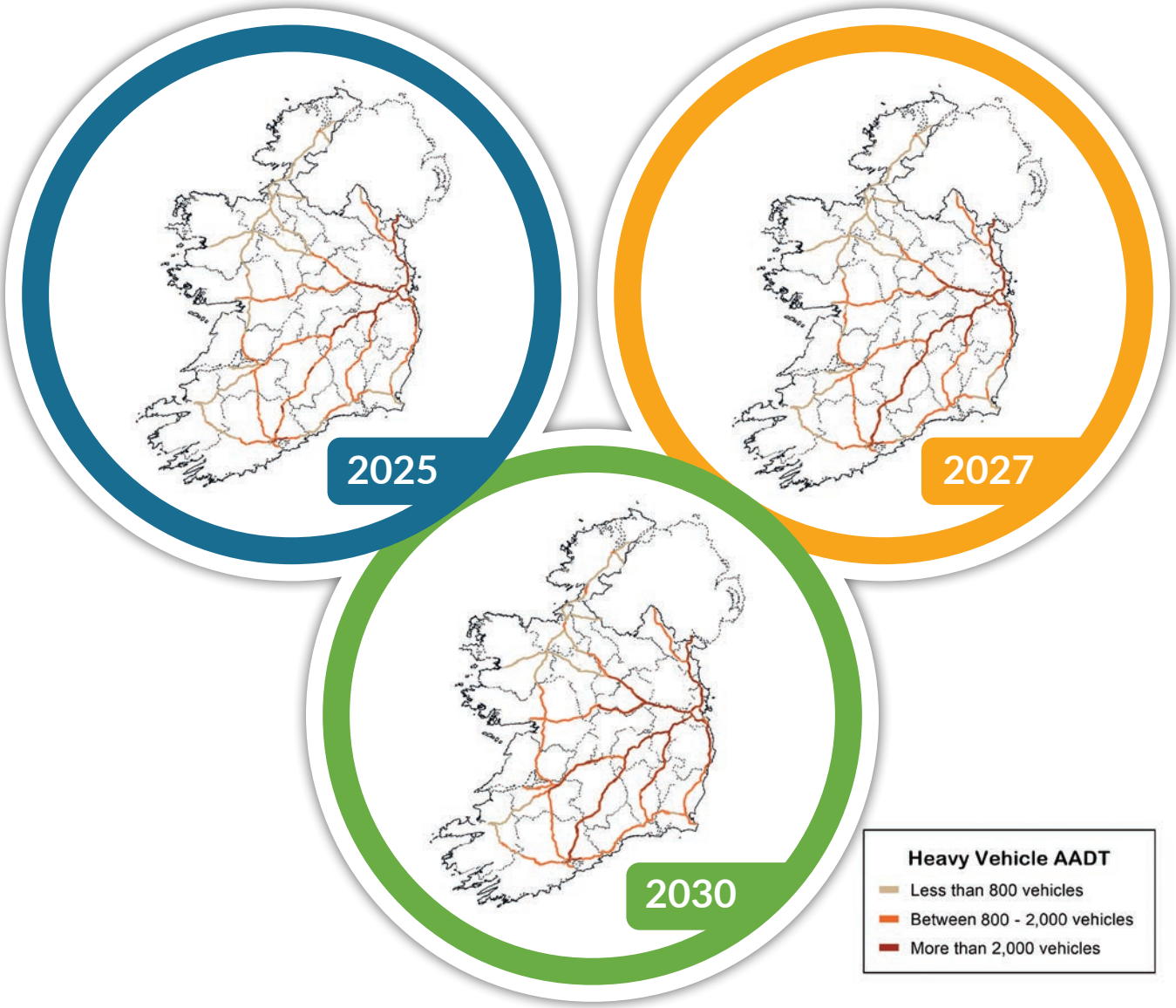


Figure 17: *Maps of Derogations Available in Roll out of HDV Charging Infrastructure*

Flexibility	A single pool can serve both directions with double output.	
Derogations allowed	Output (1)	If AADT (Annual Average Daily Traffic) for the road is less than 2,000 HDVs, then only 50% of capacity is required
	Output (2)	If AADT (Annual Average Daily Traffic) for the road is less than 800 HDVs, then distance can be extended to every 100 km between pools.

Table 8: *Flexibility and Derogations allowed to the required level of charging infrastructure installed based on low HDV traffic volumes.*

This analysis indicates that only a limited section of the road network – mainly Dublin-Cork, Dublin-Limerick and Dublin-Belfast TEN-T core network – could experience annual average daily traffic figures exceeding 2,000 heavy-duty vehicles (HDVs) by 2030. If this is accurate, Ireland may seek a

derogation that permits 50% of the necessary dedicated charging capacity for HDVs to be installed on roads with low levels of HDV traffic. It will be necessary to inform the EU Commission of any derogations that may be sought. Even with derogations, a high level of infrastructure would be installed with 7,200kW installed on the heavy trafficed roads and 1500kW of HDV charging every 100KM on the TEN-T single carriageways including from Donegal to Kerry ,Cork, Waterford and Roslare. This should be adequate to meet the needs of HDV drivers serving those areas.

The process of identifying appropriate locations for the infrastructure outlined in Table 7 for 2025 (i.e. to deliver dedicated EV charging requirements for HDVs for 15% of the TEN-T network) will need to consider several key factors:

- The availability of ESB Networks grid connection or smart technology capable of supporting the necessary power requirements.
- Geographical location to deliver required coverage.
- Environmental considerations.
- Understanding of existing HDV movements (and distance travelled) and projected future movements on TEN-T network will also inform optimal site locations.

3.4 Grid Assessment & Development

For en-route EV charging infrastructure, the level of electricity required to supply a single charging pool is equivalent to the size of a large industrial plant. The level of spare electrical grid capacity that may already exist at a site or localised area of the electricity network, or the ease at which additional capacity can be developed, is a crucial input to site selection. Therefore, in order to support in the delivery of the above infrastructure, one of the key challenges is the ability to deliver the forecasted grid capacity that will be required to power these sites within the associated timeframe.

The detailed technical studies required to plan and develop the electrical grid for such large charging pools take considerable time. In order to support the development of public EV charging capacity, ESB Networks has introduced a connection screening process, available since April 2023. Through this process, ESB Networks is carrying out high level screening of the identified potential charge pool locations and providing non-binding estimates of timelines and costs associated with providing the anticipated grid capacity at these locations, for guidance purposes. These grid development timelines are divided into four categories as per the following index.

Green	Likelihood that indicative capacity could be provided within 3 months from date of payment. Minor network reinforcement may be necessary.
Amber	Likelihood that indicative capacity could be provided within 3-6 months from date of payment. Some network reinforcement may be necessary.
Red	Likelihood that indicative capacity could be provided within 6-18 months from date of payment. Significant network reinforcement may be necessary
Purple	Likelihood that indicative capacity could be provided greater that 18 months from date of payment. Major network reinforcement may be necessary.

Figure 18: *P-R-A-G Colour Coding of ESB Networks Connection Timelines*

As part of this Plan, to get an understanding of timelines, TII and ZEVI have requested 20 existing service area locations to be screened. While initial capacity (a minimum kVA) may be made available within one year, at many of these sites, in order to be able to provide a combined capacity forecasted for both HDV and LDV, 18+ months will be required to develop and deliver the necessary connections.

Crucially, a key insight from connection screening assessments completed by ESB Networks to date, indicates the current status of network capacity shows a direct need for reinforcement at 38 kV and medium voltage (MV) level, to be able to accommodate the intended development and deployment of public EV recharging infrastructure.

It is important to note that in order to get a full connection offer, a formal quotation has to be made to ESB Networks. Potential means of overcoming this challenge will be addressed in Chapter 4.

3.5 Assessment of the Level of Investment Required

As part of this plan, the capital costs involved in its delivery have been examined. This is the first step in understanding the wider business case that any CPO may need to consider when deciding if, where and when to deliver charging infrastructure. This will be an important consideration in terms of deciding the level of support, getting approved funding and compliance with EU State Aid Frameworks.

The costs considered for the Motorway Scheme, launched on 14th February include:

- Charge point procurement costs.
- Civil works for on-site installation of charge points with associated charging bays.
- On-site electrical works for distribution of electricity to the charge points.
- Off-site civil works associated with the electrical connection.
- ESB Networks electrical grid connection costs.
- Battery costs associated with accelerating connections.
- Planning consent costs.

In order to minimise land-take, costs associated with land procurement or leasing, or the cost of providing additional services, such as on site conveniences, have not been considered.

As outlined in the Electric Vehicle Charging Infrastructure Strategy, the Government has committed €100M towards capital funding of EV charging infrastructure up to 2025 to cover market support for all publicly accessible charging including en-route, destination, and neighbourhood charging.

The delivery of this plan, along with funding required, is just one element of the overall national strategy for public EV charging infrastructure to be ahead of EV driver demand and to deliver on Ireland's legislatively binding EU AFIR targets. Where a lower level of en-route EV charging infrastructure is installed on the national road network, this gap in charging infrastructure power will need to be compensated by installation of additional charging infrastructure in the other public charging infrastructure categories; destination/ neighbourhood/ residential charging.

CHAPTER

4

Accelerating Delivery of En-route High Power Charging Infrastructure

ZEVI intends to support the private sector to deliver charging infrastructure to meet the needs of the marketplace and Ireland's AFIR obligations. Based on a set of principles set out below, a series of potential support options and indirect measures to accelerate en-route high powered charging infrastructure are presented for consideration in this chapter. These supports range from proposed business models to enabling policy, regulations, and the development of standards.

Whilst the private sector has been rolling out high power charging infrastructure across the network, charging supply is likely to lag behind demand for the foreseeable future. High costs for charging equipment, land purchases, or leases, achieving planning consent, or an electricity grid connection, and the uncertainty of timing of all of these, act as significant barriers to investment by the private sector, along with uncertain demand projections. As a result of such barriers, gaps in charging infrastructure are emerging on the national road network, and these gaps will potentially continue to increase in the absence of an intervention.

The analysis in Chapter 3 shows that approximately up to 104 charging points will be required on the TEN-T road network to meet AFIR requirements and the expected demand for LDVs, including passenger cars by 2025. However, modelling and analysis reflecting driver needs indicates that up to 1,118 charge points will be required on the national primary and secondary road network by 2025. Effective management and coordination with the relevant stakeholders of the wider electricity system (e.g. Eirgrid and ESBN) will be critical to addressing the challenge of timely delivering of the required en-route charging infrastructure across Ireland.

High costs for charging equipment, land purchases, or leases, achieving planning consent, or an electricity grid connection, and the uncertainty of timing of all of these, act as significant barriers to investment by the private sector, along with uncertain demand projections.

ZEVI is of the view that addressing the logistical challenges in delivering charging infrastructure is crucial if Ireland is to be successful in eliminating the national fleet's reliance on fossil fuels. These 'logistical challenges' can be simply described as 'getting adequate grid infrastructure and high-power chargers installed at the right locations across the national road network at the right time'. This includes not oversupplying the market with high powered charging infrastructure at the risk of overinvestment and creating stranded assets.

To accelerate the delivery of en-route high power charging infrastructure, the State proposes supporting the private sector by reducing the barriers to their deployment plans and incentivising and accelerating development of high-power chargers across Ireland. Reaching Ireland's Climate Action Plan targets will require a collaborative effort between all stakeholders.

4.1 Principles of Intervention

Much like existing fuelling infrastructure for ICE vehicles, private sector companies active in the provision of services are well placed to provide the en-route high power charging infrastructure to satisfy customer demand. Specialist developers can react to drivers' requirements, allowing innovation and competition to drive constant improvement in service standards and customer experience. Accordingly, any potential intervention in the high-power charging infrastructure market must support the long-term growth and dynamism brought by the private sector, while addressing short term critical market failures in furthering Ireland's climate action goals.

Internationally, financial incentives and regulatory support have been effective mechanisms for expanding charging infrastructure. Subsidies and/or grant aid can effectively target the main constraints on private sector delivery of EV charging infrastructure, quickly addressing obstacles to the development of the network by making less attractive locations viable to investors and developers.

ZEVI intends to support the private sector to deliver charging infrastructure to meet the needs of the marketplace and Ireland's AFIR obligations. EU regulations, including State Aid rules, are designed to ensure that any interventions are proportionate, transparent and represent value for money. The following guiding principles will be taken into account when considering what public intervention is required:

1. **Prioritise and enhance private sector participation:** The important role of the existing private sector companies who are providing fuelling, charging and ancillary services is recognised. In this regard, interventions will be designed to ensure the continued vitality of the private sector and promote a self-sustainable high power en-route EV charging market.
2. **Sustainability first:** Upgrade of existing facilities and infrastructure will be prioritised to minimise the carbon emissions associated with new construction in line with sustainable development principles. Interventions which are aligned with Climate Action policies and avoid increasing vehicle kilometres will be viewed more favourably.
3. **Alignment with wider policy, regional and local plans, and other network goals:** The interventions will support: the State's overall decarbonisation goals; the National Planning Framework (and associated National Strategic Outcomes including sustainable mobility, enhanced regional accessibility, transition to a low carbon and climate resilient society); and consider alignment with ESBN and EirGrid's electricity network strategies. Interventions will seek to avoid encouraging over-concentration of providers of en-route charging facilities on the national road network.
4. **Customer experience and equity:** Interventions will seek to provide a best-in-class customer experience to all users to ensure a positive perception of EV charging infrastructure provision and further facilitate the EV transition. As well as enduring ease of use, this includes coverage across Ireland to ensure equitable distribution ensuring connectivity across urban, rural and end of routes.
5. **Enhance and facilitate innovation:** New and innovative technologies that further accelerate the roll-out of appropriate EV charging infrastructure will be encouraged coupled with the use of data to inform decision making.
6. **Resource efficiency:** Interventions will seek to facilitate efficient use of private and public resources.

4.2 Support Options under Consideration

4.2.1 Key Support Options

To accelerate en-route high powered charging infrastructure, consideration is being given to a number of potential support options based on the principles set out above. Moreover, it will be a consideration that the support can be implemented on a phased basis and is subject to engagement and discussion with industry, further analyses, EV uptake, taking learnings from each scheme launched, as well as testing for State Aid adherence and other approvals.

It is currently planned that ZEVI and TII will take a co-ordinating role in the delivery of charging infrastructure on the National Road Network, helping to oversee the successful development of options that are ultimately advanced.

4.3 Other Required Measures

ZEVI is aware that certain grid upgrade enabling works will be required to help to achieve project timelines, and that other measures may be required to accelerate and effectively coordinate the delivery of the required en-route charging infrastructure. These are outlined briefly below:

- **Enabling delivery:** ZEVI intends to further unblock potential barriers by facilitating and progressing grid upgrade enabling works to streamline the process for the private sector companies to access the required grid power/ connections required for high powered charging sites. This is consistent with 'resource efficiency' where a 'build once for 2040' approach will avoid piecemeal grid upgrades which are resource inefficient. These enabling works should significantly reduce the overall project delivery time for en-route high power EV charging installation.
- **Public intervention:** In such case that it becomes clear (via evidence) that a market gap (i.e., insufficient en-route high power charging infrastructure to meet AFIR and/ or forecast market demand) cannot or will not be addressed, more direct public intervention measures may be considered to facilitate delivery. This may include insufficient private sector appetite for the provision of specific charging infrastructure for certain vehicle types or at certain locations/ sections of the national road network; demand/ supply analysis; market consultations; other evidence. Such interventions may take the form of direct government investments, public private partnerships, or other appropriate means.

- **Developing national standards:** Standardisation will play a vital role in creating a consistent and reliable charging experience for EV owners across the country. Details on proposed standards are included in section 4.7.
- **Planning requirements:** Reviewing the effectiveness of existing planning exemptions and working with ESB Networks and Department of Housing to amend if necessary.

4.4 Geographical Areas for Support

In evaluating the geographical area for support options, ZEVI and TII will consider locations according to the following order of priority for each option:

1. TEN-T core network (motorway/dual carriageway)
2. TEN-T comprehensive (motorway/dual carriageway)
3. TEN-T comprehensive single carriageway national primary road network
4. Non-TEN-T national primary and secondary road network

Further, while designing the geographical reach of possible options, the following considerations are likely to be taken into account:

- Compliance with national and international policies and regulations.
- Maximum coverage of national road network including regional and rural areas served by national primary and secondary roads, ensuring connectivity and end of routes are well served.
- Coverage of tourist / seasonal spots adjacent to the national primary and secondary road network.
- Facilitating and supporting key economic sectors including fleet; trade; business; commuter; and leisure.

4.5 Supporting Policy and Regulation

4.5.1 Budgetary Provision

As outlined in the EV Infrastructure Strategy 2022-2025, funding for vehicle electrification has been included in the National Development Plan 2021, €1bn of which has been allocated to specific carbon reduction measures. It includes for €100m in the period to 2025 to support investment in EV charging infrastructure. Budget has been secured for 2024 to support the first phase development of this plan. All expenditure will be in compliance with the Infrastructure Guidelines and the Transport Appraisal Framework.

4.5.2 Alternative Fuel Infrastructure Facility (AFIF)

As an initiative of the European Commission, the objective of the Alternative Fuels Infrastructure Facility (AFIF) is to support the deployment of alternative fuel supply infrastructure, contributing to decarbonising transport along the TEN-T network. With a total budget of €1.5 billion, the AFIF funds actions by the combination of Connecting Europe Facility (CEF) grants with financial support from financial institutions to achieve a higher impact of the investment. The eligible projects include publicly accessible recharging stations dedicated to LDV (with a minimum power of 150kW) and to HDV (with a minimum power of 350kW) as well as grid connection (with a minimum power capacity of 600kVA). Further information are available on the European Commission website: CEF Transport Alternative Fuels Infrastructure Facility call for proposal (europa.eu).

4.5.3 State Aid Requirements

Any scheme ZEVI, or it's Delivery partners, will implement must be in compliance with EU State Aid rules. The European Commission can, and has, forced Member States to recoup any State Aid that has been given illegally. If the Commission takes a negative decision in the context of aid that has already been paid out, the Commission requires the Member State to recover the aid from the recipient, with interest.

In general, Member States must notify the Commission of proposed state aid in advance of state aid schemes, and this can take some time. However, there is an exception for supports that fall within de minimis, General Block Exemption Regulation (GBER) or under pre-existing schemes. If none of the above conditions are satisfied, specific advance approval from the Commission is needed.

Investment aid for publicly accessible charging infrastructure for zero and low emission road vehicles is allowable under the General Block Exemption Regulation (GBER). This means that as long as the rules of the state aid GBER scheme are followed, Member States are allowed to bring into place schemes to support the roll out of charging infrastructure without prior notification to the EU Commission. Among other requirements, these rules include that support must be granted in a competitive bidding process on the basis of clear, transparent and non-discriminatory competition and that the aid granted to any one economic group shall not exceed 40 % of the overall budget of the scheme concerned.

4.5.3 Transport Infrastructure Ireland (TII) Powers

The Road Traffic and Roads Act 2023 includes an amendment to Section 19 of the Roads Act 1993 to give powers to the Minister to order an expansion of TII's responsibility to 'include preparation, or arrangement for the preparation of, schemes for the provision of a safe and efficient network of recharging infrastructure and refuelling infrastructure for such zero to low emission vehicles as the Minister may prescribe and provide and maintain, or secure the provision and maintenance of such a network'. S.I. No. 656/2023 - Roads Act 1993 (Prescribed Zero to Low Emission Vehicles) Regulations 2023 was enacted by the minster in December 2023 prescribing low emission vehicles.

4.5.4 Environmental Considerations

Development of EV charging infrastructure shall refer to the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) S.I 293/2021 and the EIA Directive 2014/52/EU as required and where needed EIA and AA Screening will be conducted.

4.6 Support Scheme Process Outline

Over the course of 2023, ZEVI/TII have engaged with market participants to determine the optimal process for support in line with the Draft National En-Route EV Charging Network Plan. TII in conjunction with ZEVI have developed and launched the first support scheme for this plan on February 14th 2024. This initial scheme aims to deliver 1200kW of charging capacity every 60km along the motorway network by the end of 2025. Subsequent schemes for charging for light-duty vehicles including passenger cars, if required, will be launched later in the year to deliver the remaining objectives of this plan for 2025. This approach will be reviewed, and if necessary modified, with learnings of the first scheme. In parallel ZEVI and TII are considering how heavy duty vehicle infrastructure can be funded. The following is the approach used for the first scheme.

4.6.1 First Support Scheme - TII Motorway Scheme

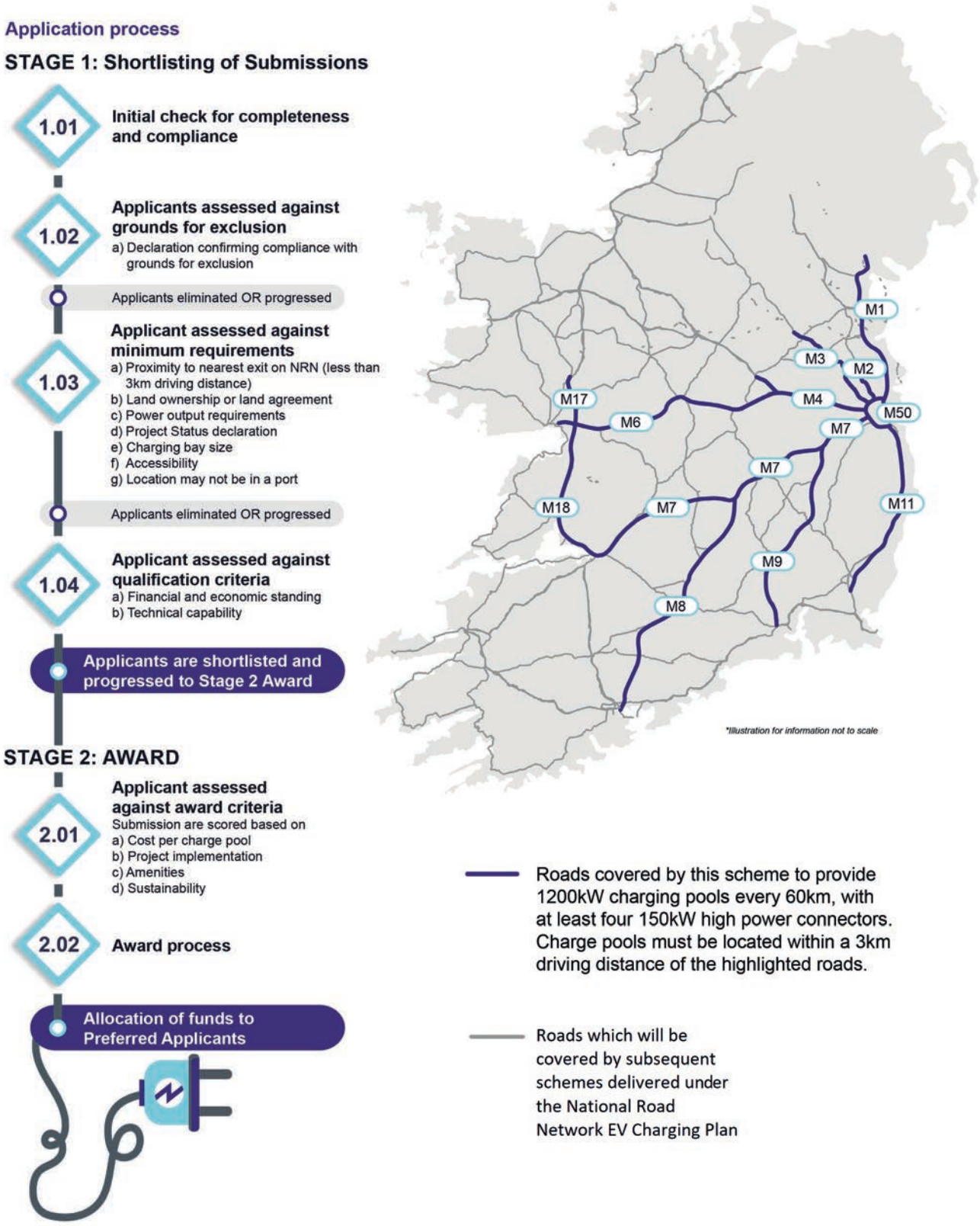


Figure 19: *Motorway Support Scheme for charging infrastructure for LDVs including passenger cars*

4.7 Standards

Developing national standards for electric vehicle (EV) charging infrastructure deployment is of paramount importance in facilitating the widespread adoption of electric vehicles and reaping their associated benefits. Standardisation plays a vital role in creating a consistent and reliable charging experience for EV owners across the country.

EV infrastructure standards are mandated through European regulations, the Alternative Fuel Infrastructure Regulation (AFIR), and Irish legislation and regulations. In the en-route high-power EV charging component, the following standards will apply:

Universal Design Guidelines	As indicated in the 2022-2025 EV Charging Infrastructure Strategy, ZEVI has been working on developing a set of universal design guidelines for charging infrastructure. The aim of these guidelines is to make electric vehicle charging stations accessible to all users. The guidelines summarise key considerations when installing electric vehicle charging stations, including the design of the charging station, accessibility of the site, and information and communications to inform users before, during, and after a charging session. This document has been published for public consultation in July 2023. Final User Design Guidelines will be published in May 2024. This will be a living document and will be reviewed if necessary after user testing, in line with new legislation, and advancements in technology.
Data Strategy	Currently ZEVI (in consultation with stakeholders) is formulating a national data strategy with the aim of publication in 2024. This data strategy has been prepared to represent Ireland's response to the AFIR requirements on the management and distribution of current and projected data demands within the EV ecosystem. The aim of the strategy is to help ensure that people, businesses, and organisations trust the data ecosystem being developed and can get access to data when they need it. The strategy outlines the need to establish an EV data exchange system to ensure a trusted and consistent single source of truth for all actors in the EV ecosystem. TII will play a coordinating role to ensure that any resulting central data management strategy / system (or similar) will support efficient operations across the national road network.
Interoperability Standards	While the market may install additional connectors, charging points for light-duty vehicles will be equipped (at least) with Type 2 connectors for AC connections and CCS (Combined Charging System) connectors for DC connections. Future innovations, such as wireless charging, will also be required to comply with minimum technical specifications.

Ease of Payment	○ All new public charge points installed after the Alternative Fuels Infrastructure Regulation applies, 13th April 2024, will be required to accept card payments by means of a contactless facility for charge points with capacity over 50 kW and for charge points with capacity below this to, at minimum, enable a QR code payment system. ○ From 1 January 2027 onwards, charge point operators shall ensure that all publicly accessible charging points operated by them within 3km of the TEN-T road network (and that have a power output equal to or more than 50 kW) can accept card payments. ○ Charge point operators will clearly display their prices, as well as comparison costs for other fuels. As a result, this information is known to end users before they initiate a charging session. Pricing will be non-discriminatory.
Smart Charging, V2G, and Innovations	AFIR requires that from 13th April 2025, all new public charge points (installed from that point onwards) will be required to be enabled for smart charging. This will enable future vehicle-to-grid operations and other system services and efficiencies such as electricity-demand regulation.
Other design standards	Other standards related to design of infrastructure elements related to EV charging infrastructure along national roads may need to be updated to reflect new requirements. Some examples may include TII's DN-GEO-03028 "The Location and Layout of On-line Service Areas" or the Traffic Signs Manual.

Table 10: *Standards Required.*

CHAPTER 5

Roadmap to Implementation

The scale of the delivery and consequent acceleration needed in current roll out demands a very focused timeline and clear plans to ensuring that this is delivered in line with public spending codes and governance standards of TII and Department of Transport.

5.1 What Will be Delivered

As per analysis carried out in Chapter 3, the proposed alternatives for delivery of national road network charging infrastructure for LDVs, including passenger cars, for 2025 and 2030 are outlined in Table 11 and Table 12. The infrastructure required for HDVs which includes buses is outlined in Table 13.

For LDVs including passenger cars charging, three alternatives are proposed. At minimum, Alternative 1 must be delivered in order to meet AFIR's specific TEN-T road network requirements. However, results of analysis show that more than this is needed in order to deliver AFIR's fleet-based targets and be ahead of the needs of EV drivers. Therefore, the target will be to deliver Alternative 2 particularly with reference to those areas of higher demand.

2025: Where	Road Length (km)	Alternative 1: Alternative Fuel Infrastructure Regulation 2025	Alternative 2: Medium EV Charging Capacity Scenario 2025	Alternative 3: High EV Charging Capacity Scenario 2025
TEN-T core (each direction)[14]	500	400 kW @ 60 km 3-4 charge points At least one with 150 kW capacity	600 kW @ 60 km 4-6 charge points	900 kW @ 60 km 6-9 charge points
TEN-T comprehensive (motorway / dual carriageway) (each direction)	700	Nothing specific – (covered by fleet target)	600 kW @ 60 km 4-6 charge points	900 kW @ 60 km 6-9 charge points
TEN-T comprehensive (single carriageway) (each direction)	1000	Nothing specific – (covered by fleet target)	300 kW @ 60 km 3-4 charge points	400 kW @ 60 km 3-4 charge points
Primary and secondary road (non-TEN-T)	3100	Nothing specific – (covered by fleet target)	100 kW @ 30 km 1-2 charge points	200 kW @ 30 km 2-4 charge points

Table 11: *Infrastructure Proposed for LDVs including Passenger Cars on the National Road Network by End 2025.*

[14] 'Each direction' requires this level of infrastructure to be available to cars travelling in each direction. For a single charging pool serving both sides of the road, with the given distance, this charge capacity level needs to be doubled.

2030: Where	Road Length (km)	Alternative 1:	Alternative 2:	Alternative 3:
		Alternative Fuel Infrastructure Regulation 2030	Medium EV Charging Capacity Scenario 2030	High EV Charging Capacity Scenario 2030
TEN-T core (each direction)[15]	500	600 kW	1,800 kW	3,000 kW
		@ 60 km	@ 60 km	@ 60 km
TEN-T comprehensive (motorway / dual carriageway) (each direction)	700	300 kW	1,800 kW	3,000 kW
		@ 60 km	@ 60 km	@ 60 km
TEN-T comprehensive (single carriageway) (each direction)	1,000	300 kW	600 kW	1,200 kW
		@ 60 km	@ 60 km	@ 60 km
Primary and secondary road (non-TEN-T)	3,100	Nothing specific	300 kW	400 kW
			@ 15 km	@ 15 km

Table 12: *Infrastructure Proposed for LDVs including Passenger Cars on the National Road Network by End 2030.*

[15] 'Each direction' requires this level of infrastructure to be available to cars travelling in each direction. For a single charging pool serving both sides of the road, with the given distance, this charge capacity level needs to be doubled.

Year	Road Network	Rechargers for heavy-duty vehicles
By 2025	TEN-T core & comprehensive[16]	15% of the total length of TEN-T road network ○ **1,400 kW** every **120 km** in each direction – *with at least one charge point with 350 kW*
	Urban node, (Dublin, Cork, Foynes and Galway)	**900 kW** – *provided by stations with an individual power output of 150 kW*
By 2027	TEN-T core & comprehensive	*50% of the total length of TEN-T road network with capacity and distance as follows:* ○ **TEN-T core: 2,800 kW** in each direction every **120 km** ○ **TEN-T comprehensive: 1,400 kW** in each direction @ **120 km** **note derogations may apply (see Table 8)*
	At each HDV parking and rest area	**2 recharging stations** dedicated to heavy-duty vehicles *(minimum 100 kW each)*
By 2030	TEN-T core & comprehensive	○ **TEN-T core – 3,600 kW** every **60 km,** in each direction– *with at least two stations with 350 kW each* ○ **TEN-T comprehensive – 1,500 kW** every **100 km,** in each direction – *with at least one station with 350 kW - *note derogations may apply (see Table 8)*
	Parking and rest areas	At each safe and secure parking area **4 recharging stations** dedicated to heavy-duty vehicles (minimum **100 kW** each)
	Urban nodes	**1,800 kW** - *provided by stations with an individual power output of **150 kW***

Table 13: *Infrastructure for Charging for Heavy-Duty Vehicles 2025, 2027 and 2030.*

[16] 'TEN-T core network' means a network as defined in Article 38 of Regulation (EU) No 1315/2013 - maps

Figure 20: *National Road Network*

5.2 Roadmap and Timelines for Delivery

5.2.1 Steps Involved to Deliver Infrastructure

The overall sequence of events to deliver this infrastructure are outlined in Figure 21.

Critical Path Items
(Some items below may overlap)

Funding for support scheme, design and approval (6 Months)
- ZEVI/TII
  - Scheme design incorporating:
    - Legal review
    - State Aid review
    - Stakeholder consultation
  - Resource Scheme administration delivery
  - Secure funding in line with the Public Spending Code

Conduct Competitive Grant Scheme (5 months)
- Applicant – complete detailed submission
- TII - review applications
- TII - inform successful and unsuccessful applicants
- Successful applicant - accept terms and conditions of funding

ESB Networks Connection Application
- CPO/SA - submit ESBN connection application and request connection screening
  - ESBN screening process (4 weeks)
  - Full ESBN Connection Application (approximate timelines:)
    - under 100 kW - 15 working days (approx. 3 weeks)
    - over 100 kW - up to 90 working days (approx. 5 months)

Planning Permission will be required for
- Motorway/Dual Carriageway Charging Infrastructure
- HDV Charging Infrastructure.
- In some incidents smaller charging pools will require planning permission.

While this should be addressed in parallel with other activities, it could emerge as a critical path item for some projects. Early engagement with the County Council is essential.

Build grid connection - 18 Months to 2 years to allow for:
- Detailed design
- Planning permission (where necessary)
- Way-leaving and land agreement (where necessary)
- Order of material (up to 18 months timeline for order of transformers)
- Build
- Commission

Tasks carried out in parallel to critical path

National En-Route EV Charging Network Plan Consultation
- Stakeholders review this plan and respond to the consultation
- ZEVI/TII review consultation responses to inform the program of initiatives to support the delivery of its objectives.

CPO /SA prepare proposals for funding application
- Consider sites, preferably within 500m and maximum within 3 km, by road, of TEN-T road network
- Discuss with landowner and initiate terms for agreement
- Consider environmental aspects of the site
- Consider planning consent process
- For sites where, with funding, infrastructure can be delivered within 12 months (e.g. has/will have grid connection/agreement with site owner/planning in progress or secured) provide full details required including evidence of ability to deliver

CPO/SA prepare site for development
- Firm agreement with site owner
- Design site layout
- Undertake appropriate environmental assessment
- Apply for planning consent
- Secure private funding required
- Select and ensure access to charge point equipment
- Prepare tender for site development including civil works

Figure 21: *Tasks to be completed to deliver an EV charging pool.*

5.2.2 Phasing of Infrastructure to be Delivered

The phasing of delivery of the infrastructure will help manage resources and should deliver a better overall outcome. In order to do this, ZEVI considered the approximate timeline that will be required to deliver the EV charging pools for each category of road.

The timeline includes the critical path tasks outlined in Figure 22. This assumes that grid connections will only be applied for when sites are successful though the competitive grant process. However, for schemes with a 2025 delivery deadline, most applicants will have already applied for electricity grid connection. It is worth noting that the timelines presented are approximate. Our objective is to deliver at least Alternative 2 in Table 11: Infrastructure proposed for LDVs, including passenger cars, on the National Road Network by end 2025, and also 2025 requirements for HDVs.

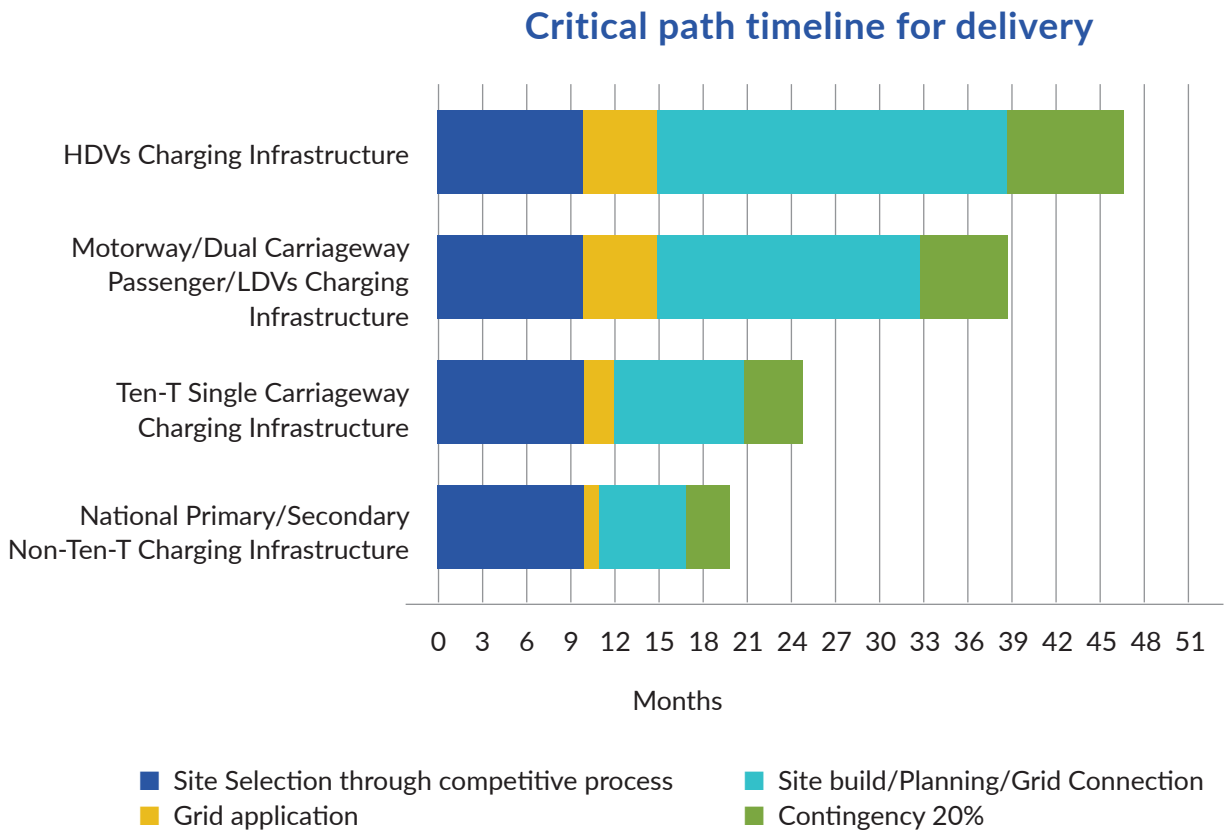
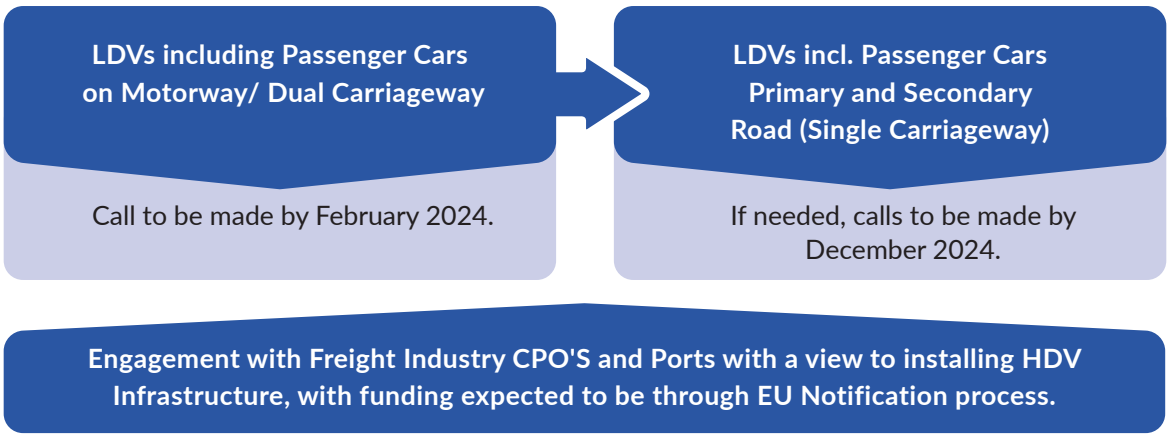


Figure 21: *Critical Path Timeline for Delivery of Infrastructure*

As can be seen above, the timeline for delivering HDV infrastructure will take up to 4 years while infrastructure planned for LDVs, including passenger cars, on the motorway/dual carriageway network can take approximately three years and three months.

The Motorway/Dual Carriageway scheme for LDVs, including passenger cars, launched on February 14th 2024, is the first of several opportunities to secure funding. It is expected that a scheme to deliver 2025 targets for the remainder of the National Roads will be run by the end of 2024. The launch of the comprehensive programme scheme, to accelerate the infrastructure roll out, is expected to be phased along the following timeline:



Along with supports to accelarate the roll out of this plan covering the National Road Network, ZEVI is currently working with Local Authorities who are progressing their EV charging strategies for their areas and will be rolling out infrastructure to deliver those strategies. There will be cross-over between their strategies and this plan, particularly for the TEN-T comprehensive dual and single carriageway as well as the non-TEN-T national primary and secondary roads.

5.3 Enabling Measures in Addition to Funding Supports

The timelines outlined in Figure 22 would result in the delivery of the programme to be outside the 2025 target for both the HDV and larger scale LDV charging infrastructure. To be in compliance with the Alternative Fuels Infrastructure Regulation requires at least Alternative 1 in Table 12 for LDV, including passengers cars, and the 2025 requirement for HDVs as outlined in Table 13 to be delivered. Moreover, it also indicates the possibility of non-delivery of the 2027 targets for HDVs. To provide a possible solution to this, a number of measures will be taken as outlined below.

In addition to the measures outlined here, ZEVI will assess any additional enablers that may be identified through consultation with stakeholders in the design of the funding scheme. ZEVI are flexible to ensuring as many obstacles as possible are removed for private sector participants.

5.3.1 Grid Application for On-line Service Areas

As part of a 'Build Once for 2040' approach, ZEVI/TII will work with ESB Networks to identify the grid connections required for later years and, where it is timely and efficient, will support the creation of those larger connections in one build to avoid multiple works on the same sites.

ZEVI have made a grid application for all the on-line Service Areas identified in Table 1 in August 2023 for capacity to supply the HDV charge-points in 2030. Any connection offer received from ESB Networks with respect to these connections will not be accepted until a market assessment is complete. If that market assessment shows that there is an alternative way to deliver the

infrastructure by 2025 for some or all of the locations, then these applications will be withdrawn for sites where a better alternative is possible. In addition, beyond this infrastructure there is potential for additional sites to deliver the capacity called for above on the motorway/dual carriageway as capacity is required in both directions. While a single on-line service area can serve both sides of the road, if alternatives are available, this will be considered. This approach offers a number of benefits:

- When firm connection offers are received for each of the sites, it may be possible to deliver the full scale of power required by LDVs, including passenger cars, by 2025 and there may be an adequate number of sites with existing power capacity available that would enable delivery of the 2025 target for HDVs (where just 15% of the TEN-T road network is to be covered by 2025 and 50% by 2027). Until all sites are evaluated this will not be known.
- The Grid Connection Application process can commence in advance of the announcement of the funding scheme and result in a reduced timeframe for charging pools to become operational.
- This will inform the need for the second enabling measure of using batteries (see below).

Battery technology is now an option to mitigate delays in grid connection and could play a substantive part in delivering infrastructure within the timescales needed.

5.3.2 Batteries

Battery technology is now an option to mitigate delays in grid connection and could play a substantive role in delivering infrastructure within the timescales needed. ZEVI has conducted a high-level cost analysis which showed that, while it will cost more than having the electrical connection, it is not prohibitively expensive. This could reduce the timelines by years in some cases and will be fully considered as part of the means of getting infrastructure in on time.

5.3.3 Encouraging the Continued Pace of Existing Rollout

In parallel to this plan, ZEVI will continue the roll out of Regional and Local Plan charging through the Shared Island Sports Club EV Charging Scheme[17] and other destination schemes that will be announced by ZEVI. ZEVI is also currently working with Local Authorities who are progressing their EV charging strategies and will be rolling out infrastructure to deliver those strategies.

As is outlined above, charge point operators are encouraged to continue the delivery of their current plans without any interruption as schemes to support the delivery of this infrastructure will dovetail with those and accelerate the overall delivery of infrastructure.

[17] Shared Island Sports Club EV Charging Scheme - Pobal

5.4 Environmental Considerations

Mitigation Measures

The Strategic Environmental Assessment (SEA) Statement and Natura Impact Statement (NIS) have identified mitigation measures to prevent, reduce and, as fully as possible, offset any significant adverse impacts on the environment that may occur with the implementation of this Plan. All mitigation measures have been developed and agreed with ZEVI as part of the SEA and Appropriate Assessment (AA) iterative processes.

The primary mitigation measure is to ensure the sustainable and appropriate development of the plan area without compromising the integrity of the natural and built environment. In addition, many impacts will be more adequately identified and mitigated at project and EIA level. All proposals for development must have due regard to environmental considerations outlined in the SEA Statement and NIS documents.

The Mitigation Measures set out in the Table 2.6 of the SEA Statement and Table 5.6 of the NIS should be read in conjunction with this Plan.

Monitoring Measures

As part of the SEA process, monitoring is required to identify any potential adverse impacts associated with the implementation of the Plan. The potential monitoring measures are based on national indicators and informed by the content of the Plan.

Please refer to Table 2.7 of the SEA Statement for the complete list of potential monitoring measures required for the Plan.

5.5 Risks to Implementation

Delivery of the infrastructure called for in this plan will be extremely challenging. As we deliver this mission, it is recognised that there are associated risks and that will need to be managed and mitigated by ZEVI and key stakeholders to enable the delivery of the plan. The first four risks outlined in Table 14 below shows the high-level risks identified in the EV Infrastructure Strategy[18] with updated dependency/mitigation measures as applicable to this plan. The risk and dependency analysis carried out under this plan has identified the remaining risks outlined.

[18] EV Infrastructure Strategy 2022- 2025

Risk	Dependency	Stakeholders
Lack of available grid capacity when needed to meet demand within the timelines	Increased planning and recognition of timeline through ESB Networks screening process for delivery, as outlined in Chapter 3. Early grid application, as outlined in 5.3.1. Market assessment to leverage CPOs who might already have grid connection offers to accelerate delivery plans, as per 4.6.1. Use battery technology to mitigate delays, as per 5.3.2. Continued engagement with ESBN on the development of plans and through the Risk Assurance group with ESBN and the Commission for Regulation of Utilities (CRU) to manage this particular risk.	ZEVI ESB Networks Transport Infrastructure Ireland Commission for Regulation of Utilities Local Authorities Charge Point Operators Motorway Service Operators Site Owners
Site availability for implementation of charge points	Market assessment with supports to improve the business case of installing charging infrastructure should ensure adequate site provision.	
Lack of available staff & delivery resources	Resourced stakeholder recruitment plans. Challenge of securing the number of skilled staff that will be required to roll out the accelerated plan. This will be monitored.	
Adequate public & private funding in the years up to 2025	ZEVI funding plan within Department of Transport planning process. Available private funding for investment.	

Risk	Dependency	Stakeholders
Legal challenges to schemes launched	These schemes will be designed in line with EU regulations, including State Aid rules, to ensure that any interventions are proportionate, transparent and represent value for money. This document gives the broad outline of the proposed intervention along with the principles and options (see Chapter 4). Through feedback to this consultation along with industry engagement, the schemes will be designed to ensure they will be open to participation by all qualified applicants and awards will be made according to clear, non-discriminatory criteria and include environmental considerations.	
Lack of confidence of vehicle purchasers that charging infrastructure will be delivered, thereby slowing the transition from ICE to electric	Delivery of proposed plan along the timelines outlined in order to accelerate the speed of charging infrastructure delivery. ZEVI will make data available to enable a public map that shows current infrastructure giving public confidence that charging will be available when needed.	
Risk of under/over specifying level of infrastructure called for in 2025 and 2030	The delivery of AFIR targets, which this aims to deliver, is designed to be ahead of demand. Targets for 2030 will be revised based on usage data of existing charge points, resulting in increasing or decreasing the target as appropriate.	
Risk of noncompliance resulting in: ○ **poor quality and standards** ○ **existing infrastructure not being upgraded to meet AFIR/ Standards requirements**	A National Data Access Point, which will collect data from each publicly accessible charge point in the country will be established by TII in 2024. ZEVI will montor the need for regulation and will work with existing regulatory authorities : Competition and Consumer Protection Commission (CPCC), the Commission for Regulation of Utilities (CRU), the National Standards Authority of Ireland (NSAI) and other relevant authorities if intervention is needed.	

Table 14: *Risks and Mitigation Measures*

Department of Transport
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