nationalgrid

2022 EV strategy summary

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Contents

2022 EV strategy summary

This updated strategy document sets out NGED's vision for electric vehicle (EV) charging for a range of customers and its commitment to ensure the network is ready for EV drivers to charge their vehicles at a time and place to suit them.

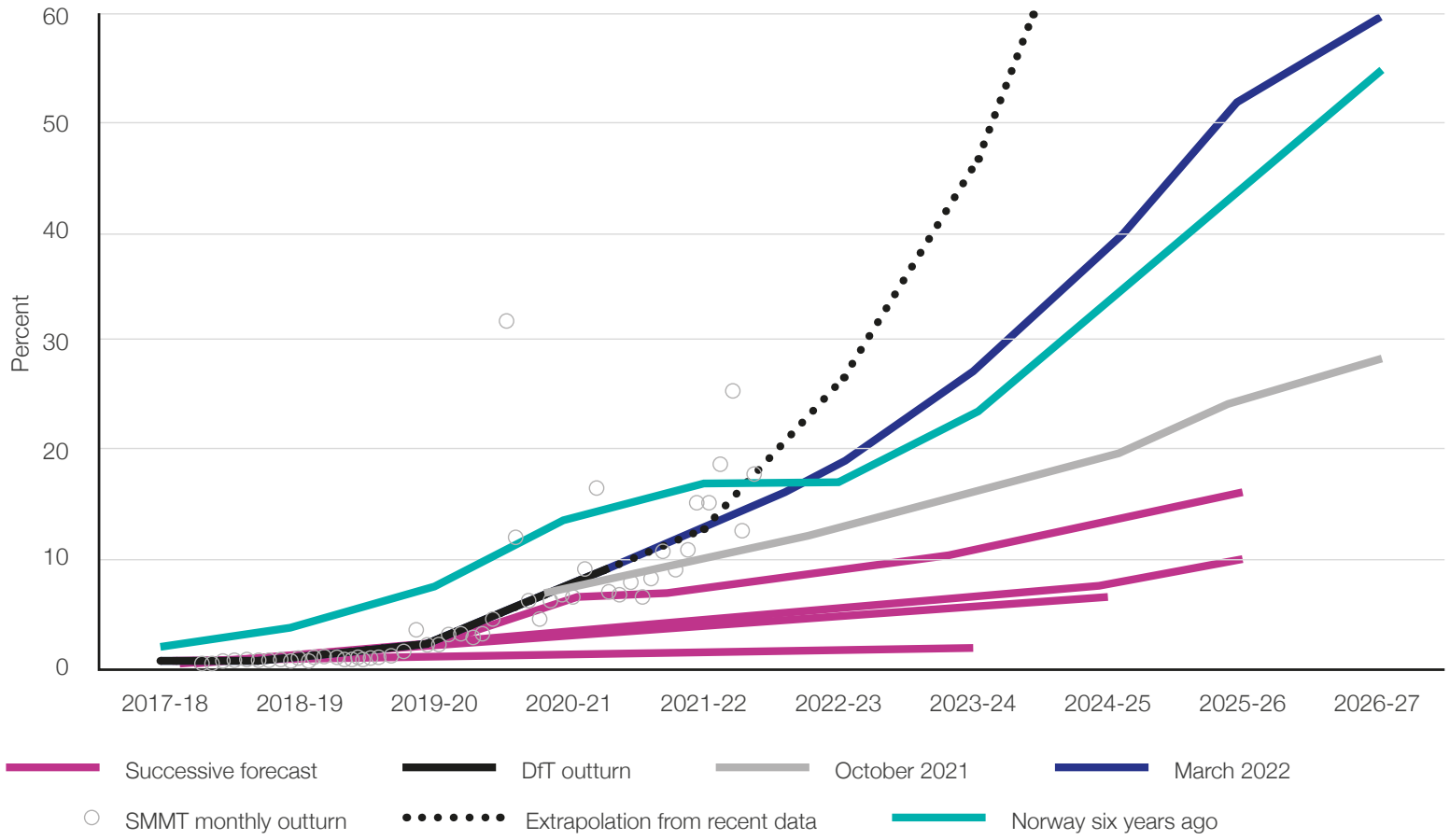
The strategy covers NGED research and activities, including innovation projects, and the adoption of early stage solutions into 'business as usual' activities.

1. Uptake of BEV vehicles

Research shows that the market share of car and light van battery electric vehicles (BEVs) is increasing, from 2.7% in March 2020 to 6.9% in March 2021.

In January 2022, new car sales showed that one in five buyers are going electric, highlighting support for the government's plans to decarbonise transport.

There is also a marked increase in BEV HGVs, as well as BEV buses and coaches.



Source: DfT (Department for Transport), SMMT (Society of Motor Manufacturers and Traders), European alternative fuels observatory, OBR

1. Uptake of BEV vehicles

1.1. Government objectives for cars, light vans and HGVs

A new government scheme to support 'local electric vehicle infrastructure' (LEVI) allows local authorities and partnerships to apply for funding to install chargers.

The government's Project Rapid is also helping service area operators on motorways and major A roads to prepare the network for zero emissions vehicles.

The aim is to support early adoption of electric vehicles by delivering a rapid charging network ahead of need and removing range anxiety for drivers on long journeys.

1.2. High level plans for HGVs

HGVs account for only 5% of the total mileage recorded by vehicles in the UK but produce 16% of GHG emissions.

To meet truck emission targets, the UK's charging network needs to accommodate a Mega Watt Charging System (MCS), a charging connector capable of up to 1250V and 3000A, designed for large battery vehicles.

1.3. High level plans for HGVs at motorway service areas and hubs

Distances between charging stations for HGVs will need to be set on motorways and A roads, to take into account the vehicle range of BEV HGVs and driver rest periods.

This would include a mixture of high-power charging at strategic sites giving 150kW for overnight charging and 1MW or 3.7MW for shorter 45 minute break charging.

1.4. How NGED will facilitate EV charging

To meet these commitments, NGED is building one of the largest private charging networks in the country, which can be accessed by employees using the NGED 'Pay as you Go' app and is a vital resource for staff and official visitors without off-street parking.

NGED has so far installed 248 rapid charging bays at 48 depot sites.

For public charging then NGED must ensure the infrastructure is ready to meet the demand for higher volumes of energy needed for EV charging.

Larger local transformers are expected to be able to accommodate one 35kWh charge for cars and vans every five days for each customer connected to it – this provides most EVs with a charged range of 125 miles. The backbone 33kV underground cable network and primary transformers are also expected to be able to accommodate this level of charge point activity.

Older homes may pose more of a challenge where cables and distribution transformers supplying local streets and LV service cables serving individual properties are more likely to become constrained. Some houses share looped LV service cables with their neighbours which are not recommended for EV charger connections.

Having identified this as an issue, NGED is now installing larger LV mains and LV service cables for new build estates and when carrying out service alterations, and will proactively uprate local distribution transformer and cable networks, where appropriate.

NGED is calling for a national notification service to inform network operators when new LCT assets, such as electric vehicles, are connected to enable DNOs to take proactive steps to address possible constraints.

2. Flexibility and charging

Flexibility is expected to play a key role in delivering EV charging.

As more customers embrace smart meters, they are likely to be able to take advantage of 'time of use' tariffs offered by electricity suppliers to keep down the cost of charging.

Fleet users with depots are likely to make use of overnight charging to recharge their vehicles for the next working day.

Depot charging facilities may require a larger electricity supply similar to that of a large factory but this demand could be managed using flexible connection solutions to allow charging at off peak times and avoid network reinforcement. This would make charging quicker and easier for business customers.

3. Existing charge points and capacity

NGED has considerable experience of installing charge points on the network to support the early adoption of EVs.

3.1. BEV recycling

A battery recycling venture is already underway in Europe.

4. Forecasting and data

4.1. Forecasting for our Business Plan, 2015 – 2023 (ED1)

NGED used national forecasts to predict the numbers of electric vehicles on its network during this period. These forecasts enabled NGED to target its work to uprate assets in areas where it was confident of load growth.

In its Business Plan for 2015 – 23, NGED allocated £58 million for reinforcement related to EV charging.

All DNO's are currently awaiting Final Determination on their respective RIIO-ED2 Business Plans, which is due 30th November 2022.

4.2. Developing Distribution Future Energy Scenarios (DFES)

NGED has been producing DFES since 2016 to predict the likely impact of EVs and other new technologies.

This helps to identify possible constraints on the network and plan investment to address these.

4.3. EV growth factors

For most customers, the main barrier to EV adoption will be price. National and local legislation will also influence future growth of EVs, including the introduction of local clean air zones, driving charges and vehicle bans.

4.4. Forecasting local growth and pinpointing upgrades

NGED is also working with EA Technology to develop a tool which will assess the impact of EVs on the local LV network, helping to highlight where proactive reinforcement could prepare the network for EV connections.

4.2. Developing Distribution Future Energy Scenarios (DFES)

NGED has been producing DFES since 2016 to predict the likely impact of EVs and other new technologies.

This helps to identify possible constraints on the network and plan investment to address these.

4.5. Forecasting for our Business Plan, 2023 – 28 (ED2)

NGED's DFES were used to help identify where flexible solutions might offer an alternative to conventional reinforcement.

5. Planning and capacity availability

5.1. NGED's expectation of EV charger installations

Advances in charging technology mean that EVs can now be charged more quickly than ever, allowing them to travel greater distances on a single charge.

Modern EV charge ports can range from 2kW up to 350kW.

Smaller sized chargers are more likely to be seen at domestic properties or as street side charging. Larger rapid chargers are more likely to be seen at locations such as motorway service areas and car parks where a faster charge is required, as well as locations where a quick turnaround is needed, such as taxi ranks.

Charging times vary depending on the charging unit, the LV supply capacity to the charger and the model of EV being charged, but a full charge on a 3kW unit will typically take between six and 12 hours.

Some EVs are compatible with rapid charging.

Other EV drivers opt for slow charging which allows them to charge at home overnight. Slow units can also be found in workplaces or other locations where vehicles are stationery for a longer period, such as park and ride sites or office car parks.

Although slow charging can be carried out using a standard three pin socket, EV owners who charge regularly at home or in the workplace are advised to install a dedicated EV charging unit.

Assume that the battery electric vehicle has a 55kWh battery, which the on-board capabilities are limited to 11kW maximum AC charging, plus the car is capable of accepting a maximum 170kW DC rapid charge.

Charge point type and power output	Likely installation location	Specific connection requirements	Network considerations	Likely charge time for 0% to 100%
Slow up to 2.3kW	Domestic	None – connects via household 13A plug/socket	None	25 hours 45 minutes
Slow 3.7kW	Domestic or street side	Dedicated household circuit or on street equivalent	In some cases limited local reinforcement is required	16 hours
Fast 7kW	Domestic or street side	Dedicated household circuit or on street equivalent	Likely upgrade to cut-out and/or LV service cable and LV local mains	8 hours
Fast 22kW (the car limits this to 11kW)	Street side or public charging location	Three phase dedicated supply point	Requirement for three phase connection and likely local mains upgrade	5 hours 30 minutes
Rapid 50kW	Public charging location	Three phase dedicated supply point	Requirement for three phase connection and likely local mains and transformer upgrade	53 minutes
Rapid 150kW or multiple rapid chargers	Public charging location	Supply point from dedicated transformer	In most cases a new transformer will be established	26 minutes

5. Planning and capacity availability

5.2. Estimating connection costs and timescales

At a domestic level, minimal works will be needed to accommodate EV chargers but, for large installations and hubs of multiple chargers, new transformers and substations are likely to be needed.

Costs and timescales will vary according to the complexity of the works involved.

Charge point type and power output	Likely installation location	Typical approximate connection lead times	Network and third party considerations	Approximate connection cost
Slow up to 3kW	Domestic	Immediate	None	None
Slow 3.7kW	Domestic or street side	Immediate in most cases	Usually none	Usually none
Fast 7kW	Domestic or street side	4 to 8 weeks	Likely upgrade to service cable and local mains	Usually none
Fast 22kW	Street side or public charging location	8 to 12 weeks	Streetworks and permissions	£3,500 to £12,000
Rapid 50kW	Public charging location	8 to 12 weeks	Streetworks and permissions	£3,500 to £12,000
Rapid 150kW or multiple rapid chargers	Public charging location	16 weeks	Streetworks, permissions and cost of land for transformer	£70,000 to £120,000

5.3. Simplifying the applications process

At the time of writing, NGED uses a paper copy version of the ENA application form for new EV connections.

In 2023, the application process was set to become electronic, speeding up the connections process for the customer.

5.4. Making use of existing local capacity

Transformers supplying local networks from the 11kV network are sized to accommodate the demands of the area they serve.

This means there is a level of additional capacity available for future growth.

NGED is likely to use this capacity to support the early adoption of EVs and other LCTs, particularly in urban areas where larger numbers of transformers offer more available capacity.

Larger local transformers are expected to be able to accommodate the demands of home connected EV charging.

5.5. Planning and design changes

NGED network assets stay in place for up to 50 years so it is important to future proof new networks by incorporating future changes into plans and designs.

To accommodate growing demand for LCTs, NGED has already changed its policy for all new build and service alterations and now installs three phase cables and cut outs as ‘business as usual’.

Where LCT connections are being made to existing houses with a looped LV service cable, the cable will be un-looped following installation. Load control must be verified by the LCT installer where a connection supplies more than one LCT.

5.6. Mitigation of local network constraints

In isolated locations, clusters of new EVs may exceed the capacity of the local network, usually with domestic EV charging.

Where clusters are not identified by modelling, this may result in power cuts for customers.

While the network is being upgraded, equipment developed during the Connect and Manage Project can be used as a short term solution to manage load demands.

5.7. Technical changes related to EVs

To enable the connection of EV chargers, NGED has taken steps to overcome technical issues relating to thermal capacity, earthing and power quality.

6. Providing information to customers

All guides produced by NGED are available to download from the NGED website. These include:

BEV charging guide for local authorities - 610867

Business guide for BEV charging - 610868

Guide for purchasing a BEV - 117721

NGED is working on a new guide aimed specifically at fleet conversion for BEV HGV's, LCV's and cars.

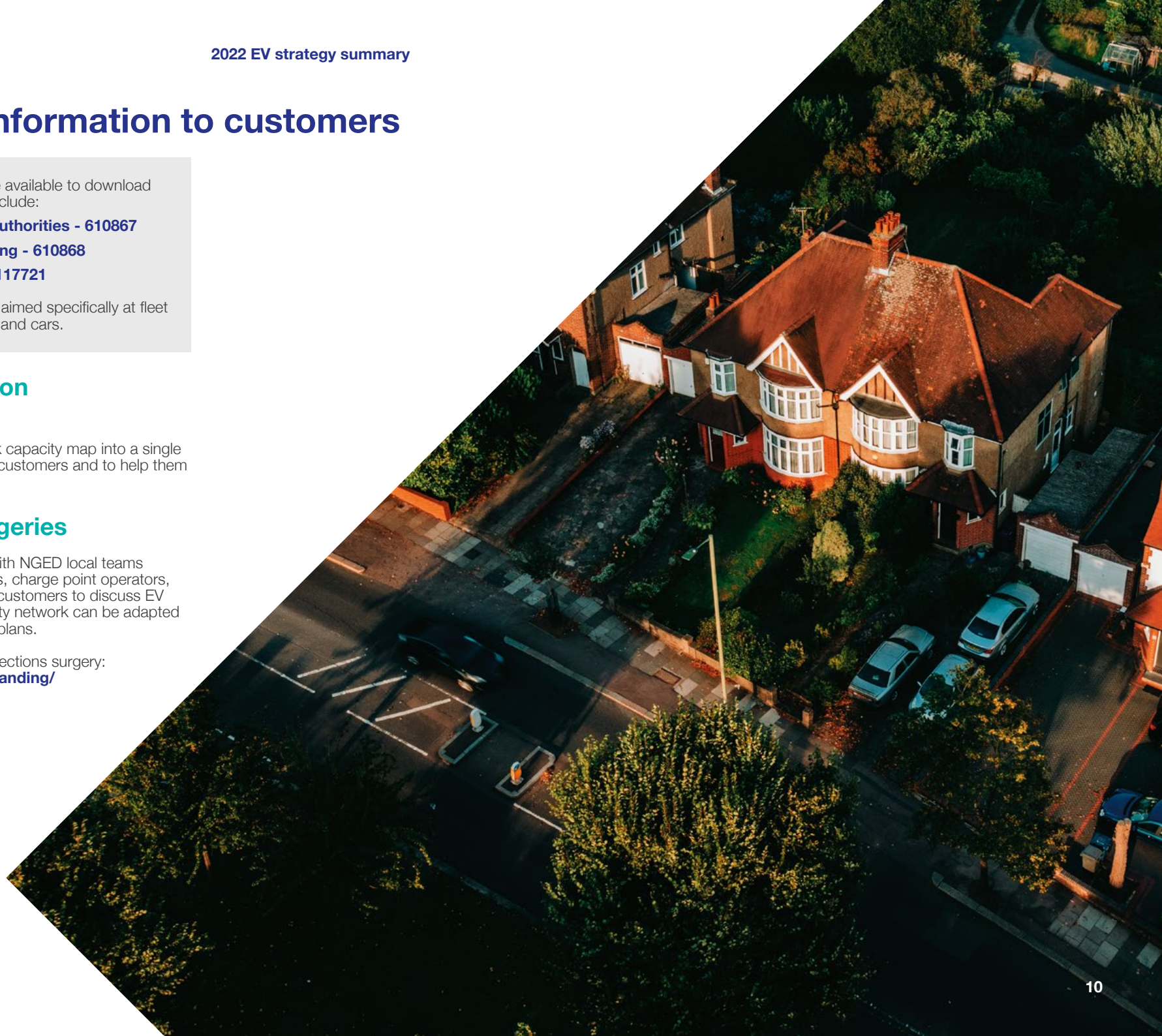
6.1. Capacity indication for customers

NGED has consolidated the network capacity map into a single map to make it more accessible for customers and to help them with their connection decisions.

6.2. Connections surgeries

One to one connections surgeries with NGED local teams can be requested by local authorities, charge point operators, bus depots, and business and fleet customers to discuss EV charging plans and how the electricity network can be adapted or updated to accommodate future plans.

Visit the webpage to request a connections surgery:
nationalgrid.co.uk/connections-landing/changing-your-connection



7. Stakeholder engagement

7.1. NGED's approach to stakeholder engagement

The level of engagement depends on the needs of individual stakeholders. This may follow a more strategic, company level approach or take place at a more local level.

Stakeholder engagement includes (but is not limited to): customer panel, stakeholder workshops, connections conference, vulnerable customers' survey and local authority engagement.

7.2. Business Plan strategic stakeholder engagement

NGED has an excellent track record of stakeholder engagement across its Business Plan areas, including EV charging.

7.3. Strategic engagement with local authorities

Local authorities are taking the lead on EV charging in public places including car parks and park and ride sites. NGED updates its 'EV guide for local authorities' every year.

Following engagement with local authorities, NGED has worked with manufacturers to develop equipment for rapid EV charging at hub locations.

7.4. Local engagement with local authorities

Local authorities can now request one-to-one connection surgeries with their local NGED team to discuss plans for EV charging. In Wales, NGED met with members of the Cardiff Capital Region - a group of 10 local authorities – to help streamline and speed up the process for EV charger installation.

NGED's programme of local stakeholder engagement includes specific session on EV charging and covers all local authorities across its four licence areas.

7.5. Engagement with EV charge point operators

NGED offers a leading service to charge point operators, creating a tailored connection process (that allows for shorter leases of about 15 years) and speeds up the connection process to enable more EV charge points to be installed across the UK.

7.6. Engagement for fuel station operators

NGED is part of Project Rapid, a scheme to roll out rapid EV charging to 130 motorway service areas, 48 of which are in NGED's region. It is predicted that an additional 14 sites will be included in phase 2 of Project Rapid.

As part of the NIA-funded Take Charge Project, rapid charging has been installed at Moto services in Exeter, using compact technology to provide electrical capacity for 80 rapid chargers.

NGED is also working with the Welsh Department of Transport to facilitate the connection of rapid charging on motorways and A roads in South Wales, as well as on other plans for rapid charging hubs across its licence areas. It is also working to introduce EV chargers on local forecourts.

7.7. Engagement for housing design

NGED has been working with other DNOs to develop the Future Homes Standard which includes guidelines for the fitting of EV chargers to new and retro-fitted buildings. (As previously mentioned, NGED now installs three phase cable as standard in new build houses and when carrying out service alterations).

The Superfast Electricity Project in Tonyrefail has also helped to develop understanding of the impact of LCTs in homes.

7.8. Engagement with vehicle manufacturers and transport operators

New EU regulations governing emission performance standards for HGVs require emissions to be reduced by 30% by 2030.

Electric trucks will pose a challenge for the energy industry because of the size of their batteries and chargers, their relatively short range, and high charging speeds.

NGED is working with customers to understand their needs and enable the swift upgrade of network connections. NGED also supports the creation of a global megawatt charging system (MCS) to establish an industry standard to streamline the introduction of commercial electric vehicles.

7.9. Engagement with depot-based fleet operators

Fleet operators whose vehicles return to the depot overnight can help to meet demand on the network by charging their fleet at times of low demand.

7. Stakeholder engagement

7.10. Engagement with UK government

Changes to UK building regulations call for the installation of 7.4kW fast chargers in all new homes and retrofitted homes going forwards.

NGED has also been involved with Project Rapid (see above) and the Electric Vehicle Energy Taskforce to advise the government on ways to ensure the UK energy system is ready for the mass uptake of EVs.

Engagement has also taken place with BSI, BEIS, members of the civil service and public sector workers to share knowledge of EVs and the electricity network.

7.11. Engagement with Welsh government

NGED engaged early with the Welsh government to facilitate its plans for decarbonisation, including work to ensure a charging network for 400 BEV HGV buses.

7.12. Engagement with Local Enterprise Partnerships (LEPs)

NGED liaises closely with local stakeholders to ensure their development plans are taken into account when planning future network investment. NGED uses its local consultations on planned demand, generation and storage growth to produce future energy scenarios which are then shared with LEPs and other local stakeholders.

7.13. Stakeholder engagement completed in 2021

NGED continues to engage with the UK and Welsh governments and the Welsh Department for Transport.

It has also engaged extensively on its RIIO-ED2 Business Plan commitments, using feedback from 25,000 stakeholders to co-create the final plan and prepare for the mass adoption of EVs.

Biannual stakeholder workshops were conducted online. There were also topic-specific workshops on NGED's Environmental Action Plan, DSO and connections strategies.

Distribution managers engaged with all 130 local authorities in our region to align our DFES planning with their ambitions. All local authorities were also invited to work with NGED on a coordinated energy plan to achieve net zero targets and asked for their feedback on proposed investment and LCT forecasts, including the local roll out of EVs.

In 2021, NGED carried out its annual local investment workshops online, with 206 stakeholders attending 11 regional workshops to discuss investment plans and projections.

7.14. Stakeholder engagement plans for 2023

Stakeholders will be able to discuss their Local Energy Plans, including EV take-up, and our Business Plan priorities, at a series of events including online/ face-to-face Business Plan workshops, regional stakeholder engagement workshops, topic-specific workshops, interactive local authority events and local investment workshops.

8. Plans to support EV charging

8.1. NGED's approach

An EV travelling 10,000 miles a year uses the same volume of electricity as a gas fired, centrally heated home.

NGED will use its wealth of network experience to develop an EV charging infrastructure in the most efficient and economical way. This includes carrying out network modifications, where necessary, and introducing innovative solutions to allow faster connections.

NGED is preparing its network to connect an anticipated 2,000 LCTs every working day and is ensuring new networks are ready for the future demands of LCTs.

8.2. Releasing existing network capacity

There is a finite volume of available capacity on the LV network. NGED predicts that the majority of larger local transformers will support the demands of home EV charging and that the backbone 33kV network and transformers will be able to accommodate this level of charge point activity.

Customers will be able to access our network capacity map to find out more about the capacity available in their area for LCTs, including EVs.

NGED will use constraint signals on the map to explore flexibility solutions.

8.3. BEV HGV charging

Research shows that it will be important to have a strong distribution network close to motorway service areas for BEV HGV charging and that one Megawatt Charging System (MCS) will need to be installed for each 50 to 60 customers.

A prototype business hub model based on 125 hectares, visited by about 24 short haul HGVs and 9 long haul HGVs per business day and per hectare, is expected to require a total grid capacity of 60MW and will therefore need to be connected to a primary substation.

8.4. Motorway services and major road filling stations

As part of Project Rapid, NGED will supply capacity for cars and light vans to rapid charge at 40 of the motorway service areas included in the scheme. To meet this load, NGED expects to supply the sites at 33kV and has already developed an innovative solution for Moto services at Exeter during the Take Charge Project.

As Project Rapid does not include HGVs, this will create additional load that can be met by a 33kV solution which offers flexibility for demand to increase.

NGED is also working with major road filling stations to create a new solution to meet the need for a forecourt of multiple rapid EV charging points in an urban location. NGED is providing a 1.5MVA rapid charging hub, enabling 10 – 12 150kW chargers to be connected.

8.5. New homes

NGED now installs larger cross sectional area cables in new homes and is working with developers and local authorities to future proof new homes for EV charging and other LCTs, as part of the government's Future Homes Standard.

8.6. Existing homes

Older homes may not have the correct service cable to accommodate the additional demands of an EV charger.

Looped services must be un-looped for the connection of LCTs.

NGED is working with the ENA and other DNOs to devise a common and simple assessment process for customers wanting to connect LCTs.

8.7. On street charging

About 40% of drivers are not thought to have access to off street parking.

NGED is following the Road to Zero strategy to enable local authorities to provide new street lighting installations or bespoke EV charging installations on their streets. In some cases, this will mean uprating services.

8.8. Depot-based fleet owners

NGED reviews and updates its HGV BEV guide for businesses every year.

After becoming the first DNO to produce this in 2020, NGED distributed a copy to all businesses in its four licence areas, outlining the steps for fleet conversion.

Connections will vary on a case by case basis. As most charging for these customers takes place overnight when network demand is usually low, flexible solutions will enable them to make the most efficient use of the network.

8. Plans to support EV charging

8.9. Workplace and off street charging

Charging points are likely to be installed at workplaces and other communal locations, such as park and ride sites, supermarkets, shopping centres, hotels and other leisure settings.

Where the existing supply can support the additional load, then full use will be made of this. Where an upgrade is needed, NGED will reinforce the low voltage network or add a high voltage substation.

Third party EV charging sites are expected to be set up in car parks. NGED is using the EV Hub Charging Project to look at how this demand can be met at these locations using bespoke solutions.

8.10. Vehicle 2 X (V2H = Vehicle to Home, V2G = Vehicle to Grid)

NGED has carried out V2G trials as part of the Electric Nation and PoweredUp projects.

8.11. Smart charging

All new homes on the Tonyrefail Project (where NGED is working in partnership with Welsh Housing Association Pobl and Sero Homes) have been fitted with three phase cables, and a full suite of LCTs, including EV charging.

This project has explored ways to reduce charging times and charge at times of low demand, making the network more efficient and minimising the need for reinforcement.

8.12. EV clustering

NGED is using information about clusters of EVs to monitor the LV network and ensure demand is not close to reaching maximum levels and to direct proactive reinforcement of networks, where appropriate.

9. Smart solutions and flexibility

NGED uses a range of solutions to tackle network constraints, including smart and flexible solutions. (In 2021, it won Utility Week Disrupter of the Year for its Flexible Power brand).

The Flexible Power brand is now being used as a model to develop a response to EVs in the domestic market. This could include the use of V2G as EVs offer a great opportunity for flexibility if plugged in for an extended period, such as overnight, either at home or at a depot location or long stay car park.

There is less scope for flexibility from quick and immediate charging, such as at motorway services.

9.1. Domestic flexibility

Customers' willingness to embrace smart charging will help NGED to facilitate the quick and efficient connection of EVs. Electric Nation found that customers were happy to accept smart charging, as long as it did not affect their lifestyle or vehicle use.

NGED will work with service providers like energy suppliers and market flexibility aggregators to make sure smart charging takes place in harmony with local network capacity.

A range of flexibility solutions are available, including 'time of use' tariffs and active network management, to deal with short term local constraints.

9.2. Commercial flexibility

Larger clusters of EVs at depots or long stay car parks may enable site operators to participate in NGED's flexibility markets.

NGED will continue to deliver cost effective projects where flexibility can be used to enable EV charging capacity without the need for conventional reinforcement. At some locations, it may be possible to use unused daytime network capacity for night time EV charging, to avoid expensive network reinforcement.

In another example of active network management, customers can respond to constraints by restricting charging at times of peak demand.

9.3. Whole system flexibility

As V2G and smart charging solutions develop, NGED will be able to take advantage of these on the network.

A customer who makes use of local generation, storage and EV charging could reduce their impact on the network and help avoid conventional reinforcement.

10. Projects to demonstrate EV connections

10.1. Developing a balanced portfolio

NGED projects align with our Innovation Strategy and are supported by our extensive programme of stakeholder engagement.

When it comes to EVs, local authority stakeholder engagement and focused EV surgeries ensure our projects provide the right balance of technical and practical solutions.

10.2. Completed projects

Cabled (2009)
NGED was a project partner in the UK's first at-scale demonstrator, designed to engage the public on the subject of EVs and assess the impact of EV charging on the local electricity network. Its findings have helped to influence NGED design policy relating to EV infrastructure.

V2G taxi (2011)
This set out to understand how V2G technology could be used by electricity distribution operators.

Electric boulevards (2014)
The project proved that inductive charging is a viable and efficient charging solution for larger vehicles like buses.

Smart charging and vehicle telematics (2015)
Data from bus telematics systems was used to estimate the recharging requirements for vehicles at each charging location and to ensure local grid capacity was available when it was needed. Additional smart charging solutions were used during overnight charging to ensure all buses left the depot in the morning with 100% charge.

Learning from this project has fed into NGED's Electric Nation Project.

EV emissions (2016)
Valuable insights were delivered into the performance and compliance of vehicles with mandatory electrical emissions standards.

Alternative connections for EV charging (2017)
Alternative connections were offered to customers wishing to install charging infrastructure where the cost of connection would otherwise by prohibitively large.

Electric Nation (2019)
As Europe's largest domestic EV charging trial, this project delivered learning on how EV customers charge their vehicles at home and their acceptance of smart charging. It provided a longer term, strategic view of the implications to the electricity network of EVs becoming mainstream, including details of the frequency of charging and the amount of energy consumed per charge.

Many of the findings of Electric Nation underpin our EV strategy.

IET code of practice ED 4 (2019)
This code of practice for electrical equipment installers was produced at the request of the IET.

LV connect and manage (2019)
This project demonstrated the active management of LCTs by managing load and alleviating network constraints. It provides emergency overload protection for the network in the unlikely event that customers all decide to charge at the same time. Customers are advised when the network is at capacity, giving them the option to wait for conventional reinforcement or install a Connect and Manager domestic load controller which automatically reduces the EV charging level in the event of a possible network overload. Connect and Manage is only ever used as a last resort.

LCT detection (2019)
This project is improving the notification process to make it easier for drivers and EV installers to tell NGED when charge points have been fitted. This information is crucial to enable NGED and other DNOs to manage networks effectively.

Superfast electricity (2019)
NGED was a partner in this project to look at the feasibility of fitting LCTs to 20,000 properties in Caldicot, Wales.

Reinforcement planning (2020)
This project builds on the work done during Electric Nation which provided a visualisation tool for NGED planners to illustrate the number of EVs. The tool devised during this project allows visualisation of smart meter data, consumption data and network conditions and may help to identify local constraints and design solutions, as well as being made available to customers.

Smart homes – EVs and storage
All homes in the Tonyrefail Project will be equipped with LCTs and will be part of an 'electricity coop', offering locally generated energy and storage back to the grid to reduce fuel bills. This project combines energy storage and EV charging in a flexibility solution for the first time.

Self-assessment
To make it easier for customers to connect LCTs, NGED is developing an online application process.

Hub charging solutions
Local authorities are expected to create charging hubs in car parks and other off-street locations. These will be powered using a bespoke transformer. As this transformer is not likely to be in continual use, NGED is working with a transformer manufacturer to develop a low loss version of the standard unit to reduce running costs.

Temporary event charging (2021)
This research concluded that portable battery storage systems will be the best solution for EV charging at temporary events so there is no call for the DNO to provide EV charging infrastructure.

Electric Nation – Powered Up
Existing EV users will be equipped with V2G technology to enable the project partners to study and manage their energy usage. The findings will be used to create a network modelling tool to understand the effect of varying levels of EVs on a range of networks and to explore issues such as the constraints and incentives needed for a commercial low voltage network demand/ export response service.

10. Projects to demonstrate EV connections

10.2. Completed projects

Take charge
This project will design, build and trial a new technology solution to provide primary substation scale network capacity at motorway service area locations faster and cheaper than traditional methods to support growing numbers of EVs.

Dynamic charging of vehicles
This feasibility project explored the impact of Dynamic Wireless Power Transfer on the electricity network, as an additional way of charging vehicles alongside existing methods. In theory, EVs should be able to travel longer distances between 'plug in' charges. However, the project found that DWPT was nearly 10 times more expensive and delivered less electricity than traditional charging, meaning it was not currently a viable charging option.

DC share
This project was set up to determine if LVDC meshed networks could help EV developers to obtain HV/ LV capacity more easily than existing approaches. It was halted during the design phase when it became clear that LVDC meshes were unlikely to deliver the expected benefits at scale.

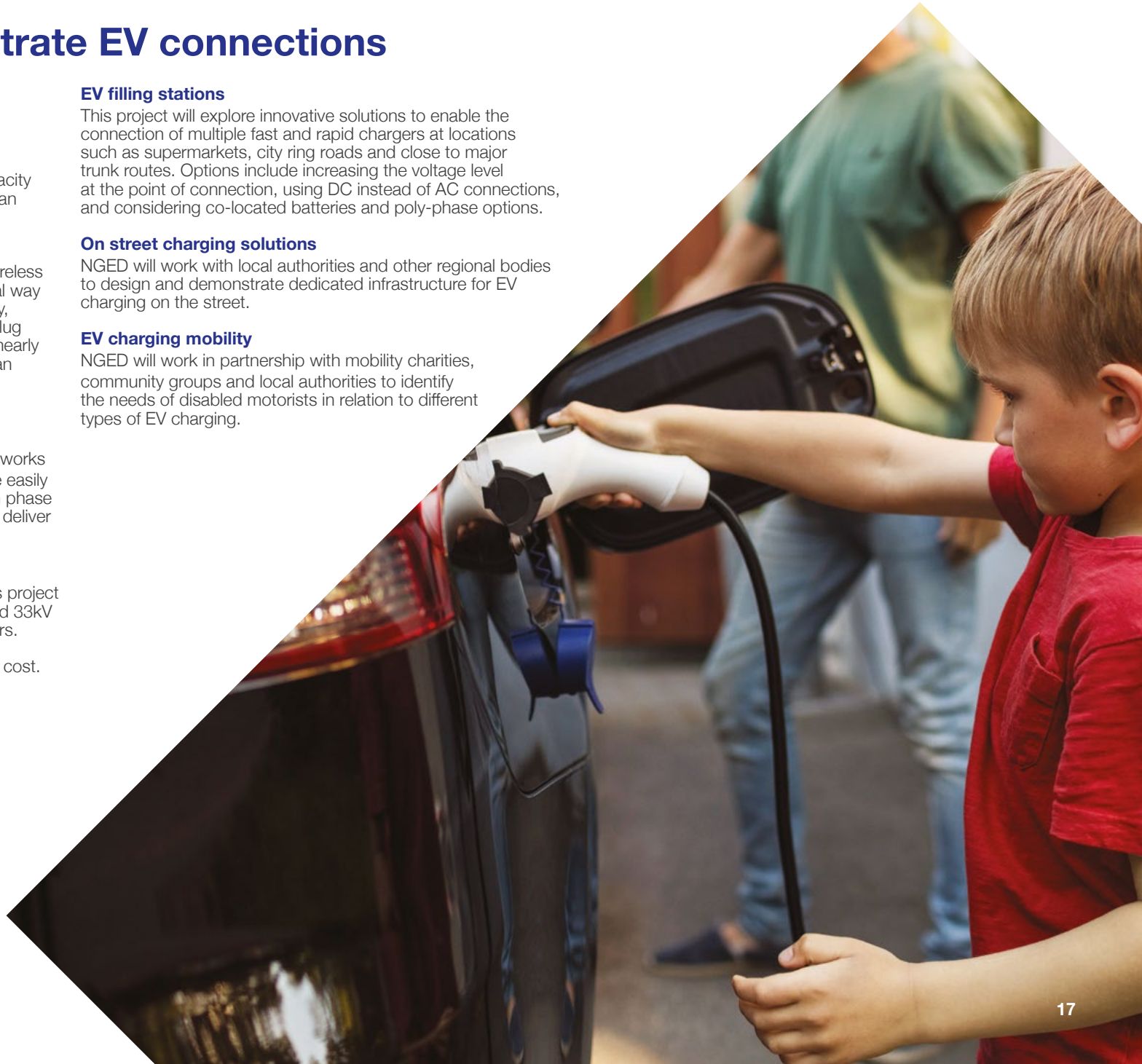
Prime EV
No additional hardware or infrastructure is needed for this project which will deliver short term ratings on NGED's 132kV and 33kV infrastructure to manage connection queues for customers.

The benefits are expected to be many times the project's cost.

EV filling stations
This project will explore innovative solutions to enable the connection of multiple fast and rapid chargers at locations such as supermarkets, city ring roads and close to major trunk routes. Options include increasing the voltage level at the point of connection, using DC instead of AC connections, and considering co-located batteries and poly-phase options.

On street charging solutions
NGED will work with local authorities and other regional bodies to design and demonstrate dedicated infrastructure for EV charging on the street.

EV charging mobility
NGED will work in partnership with mobility charities, community groups and local authorities to identify the needs of disabled motorists in relation to different types of EV charging.



11. Targeted commitments 2022

Realising benefits
Project findings become fully valuable when they are incorporated into 'business as usual' activities. NGED has already made changes to cable designs but more changes are expected as a result of the projects currently underway.

Eco home monitoring
NGED will continue to monitor 40 homes in Parc Erin where smart meter data is giving a better understanding of energy use.

Design capacity assumptions
NGED is working to understand the different charging requirements for HGVs, taking into account overnight charging and ultra rapid MCS charging.

Public charging hub infrastructure
NGED's involvement in the development of a 1.5MVA hub charging solution for car parks and other public locations will help to create a design specification for bespoke multiple rapid 150kW charging hubs. NGED is also working on a process to resolve possible lease issues to provide a rapid turnaround for charge point operators.

EV charging for motability customers
NGED will work in partnership with mobility charities, community groups and local authorities to identify the needs of disabled motorists in relation to different types of EV charging.

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