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GREEN TRANSPORT HUB STRATEGY

Delivering grid capacity to support the UK's Industrial Strategy Zones

Analysis of Future Electricity Capacity Requirements

A report by the REA (Renewable Energy Association)

Contents


Felixstowe

Summary

Freeport East is a major UK transport hub based around the ports of Felixstowe and Harwich. It is leading initiatives to support economic growth in the region and enable inward investment. Freeport East is seeking to become a 'Green Transport Hub'. Decarbonisation of transport can support economic growth and attract new investment in green transport technologies.

In a highly competitive international trade landscape, Freeport East must also deliver green transport solutions to customers and commercial expansion space if it is not to lose existing economic benefits. A lack of electricity capacity is a critical risk for Freeport East's continued operation and growth ambitions.

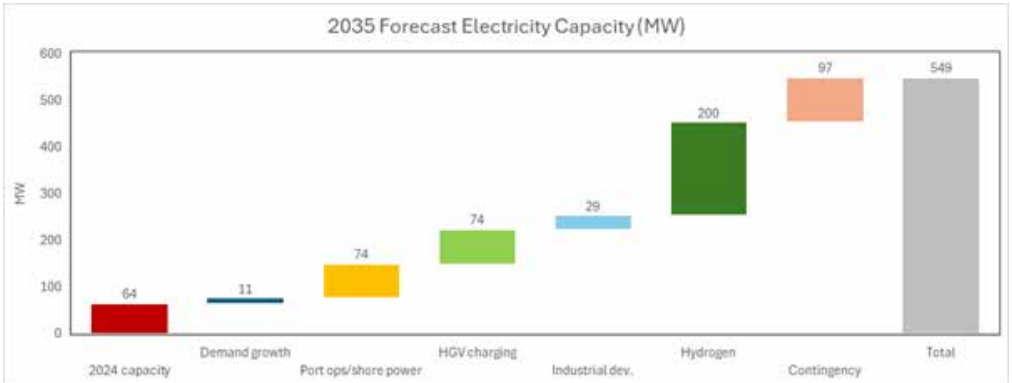
This report has carried out a 'bottom-up' review of future electricity capacity requirements with contributions from key operators and developers in the Freeport East port region. The report shows that additional electricity capacity of some 500MW is needed by 2035, with significant capacity needed ahead of this date. The results are summarised in the chart below:

The electricity network in the Freeport East region is operated by UK Power Networks (UKPN). Freeport East is working closely with the UKPN Distribution System Operator (DSO) to secure the long-term electricity capacity that Freeport East needs. Currently, network enhancement decisions require new capacity applicants to demonstrate 'deliverability' through investment commitments, but these investment commitments cannot be made without grid capacity.

Recent energy network planning reforms could address this challenge by allowing 'anticipatory investment' where there is a strategic need. Freeport East represents a major regional priority with high economic and strategic value. This report makes the following recommendations:

1. **Identifying aggregate capacity needs -** Freeport East is critical for UK economic growth. Future electricity needs should be developed as a co-ordinated plan.
2. **Governance assurance -** Freeport East should seek endorsement of future electricity needs by appropriate local and national governance bodies.
3. **Engagement with RESP process -** Freeport East should engage with the new RESP process to justify increased electricity network capacity needed before 2035.
4. **Ongoing analysis -** Freeport East should continue to update capacity needs, performing additional analysis as necessary to clarify and enhance demand forecasts.
5. **Regular engagement with UK Power Networks -** to collaborate with UKPN DSO to evolve their network investment assessment framework to support 'industrial cluster' decarbonisation in Freeport East.

Figure 1: Freeport East port region 2035 capacity forecast



1. Introduction

The Freeport East economic development region is a major UK transport hub based around three ports at Felixstowe, Harwich and Ipswich. As well as the ports, the region has three development sites (Felixstowe, Harwich and Stowmarket) which receive tax benefits and several existing and planned innovation centres, all stimulating economic growth. The locations of these sites are shown below.

Figure 2: Freeport East

The UK Government is committed to achieving a net zero greenhouse gas emission target by 2050. The transport sector must be decarbonised to achieve this target.

This report assesses the current transport decarbonisation landscape in Freeport East, focusing on the need for additional electricity network capacity. It seeks to identify the additional electricity capacity needed by 2035 along a pathway to reach Net Zero.

The report has assessed a 'bottom-up' approach of future electricity demand as described by Freeport East's existing investment partners, operators and developers, supported by internal research and analysis. The report is structured as follows:

- **Introducing the Freeport East Green Transport Hub opportunities, their development strategy and relevant policies and plans for transport decarbonisation.**
- **A summary of 'top-down' analysis performed in our 2024 report to inform the Green Transport Hub strategy.**
- **A 'bottom-up' assessment of additional electricity capacity requirements for 2035, split by location and application, together with associated assumptions.**
- **A review of electricity capacity planning arrangements and latest proposals for change, highlighting how the evidence presented in this report could help justify additional investment in electricity network capacity.**
- **Conclusions and recommendations that highlight potential next steps to secure investment in additional electricity network capacity.**

2. Background

The opportunity - Freeport East Green Transport Hub

The Freeport East economic region, based around the ports of Felixstowe and Harwich, is a major UK transport hub. Freeport East is leading a wide range of initiatives to support economic growth in the region and enable inward investment. Freeport East is aiming to attract significant additional investment at scale, into a coastal and rural area with pockets of high deprivation, creating more than 10,000 high-value new jobs and a GVA of up to £5.5bn over a 10-year period.

More so than other UK freeport locations, the global connectivity advantages of the Port of Felixstowe mean that Freeport East competes with other international port-centric locations, particularly in north-western Europe. If investment doesn't come to Freeport East, it is likely to go to Rotterdam, Antwerp, Hamburg or other major trading centres in Europe, rather than elsewhere in the UK.

Freeport East ports transit about 40% of the UK's container traffic and, during 2022, 4,400 vessels passed through the ports. Typically, these are Lift-On Lift-Off (Lo-Lo) or Roll-On Roll-Off (Ro-Ro) container vessels of 7,500-230,000 Gross Tonnage. Ro-Ro uses vehicles to roll the cargo on and off the vessel, and Lo-Lo uses cranes to lift the cargo on and off the vessel.

As a major UK transport hub, Freeport East's evolution to a 'Green Transport Hub' will bring opportunities to innovate and exploit new technologies. Freeport East can use its geographical advantage as a major transport hub to produce and supply green fuels for maritime, surface, and potentially air transport. With its large port traffic volumes, and proximity to low carbon electricity supplies, Freeport East is well positioned to additionally offer low carbon fuelling capacity to these customers, adding economic benefit to the region.

The pathway to shipping decarbonisation seems likely to prioritise e-methanol which is produced from green hydrogen (using renewable electricity). Growth in orders for methanol-fuelled vessels are increasing rapidly, with demand for methanol growing over the 2020's.

E-ammonia, produced from green hydrogen (again using renewable electricity) offers lower costs of production but the technical maturity and safety case is lagging that of methanol. As such, roll-out of ammonia at scale is expected to take place from the 2030's.

Surface transport is expected to decarbonise using electricity and green fuels. Freeport East ports provide a focal point for several road and rail corridors serving much of the UK.

The challenge

Given the highly competitive international trade landscape, Freeport East will need to ensure that it can optimise its future competitive position if it is not to lose existing economic benefits. In future, shipping customers are increasingly likely to seek the benefits of using a green, affordable energy hub. If Freeport East is not able to deliver this, then traffic through the port may fall with a negative economic impact and damage to the UK's economic competitiveness.

Freeport East's current and future competitive position is dependent upon the availability of sufficient electricity capacity. If capacity is made available, it provides a strong incentive for businesses to locate within Freeport East and will also enable a transition to a green transport hub for surface transport. Giving electric heavy goods vehicles (EHGV's) the ability to recharge within the port region will accelerate the transition away from fossil fuels and deliver a positive wider economic impact.

Similarly, if the industrial and logistics businesses that could be located within the Freeport East area are unable to achieve electricity connections, then they may locate elsewhere, with a high likelihood they will go to other international locations, also with a significant economic impact.

Securing additional electricity capacity where and when it is needed is critical for both Freeport East's continued operation and its aims for economic growth.

Recent energy policy developments

The UK Government is committed by legislation to delivery of Net Zero targets by 2050. The transport sector, covering surface transport, aviation, and shipping, currently accounts for about one third of the UKs overall greenhouse gas emissions. Rapid progress will need to be made in this sector if 2050 Net Zero decarbonisation targets are to be achieved.

Since coming to office in 2024, the Labour Government has established five national missions[1] including economic growth and to make Britain a clean energy superpower. The Government's target for the clean energy mission is:

'Securing home-grown energy, protecting billpayers, and putting us on track to at least 95% clean power by 2030, while accelerating the UK to Net Zero'

In December 2024, the Government published its Clean Power 2030 Action Plan[2] which set out actions to accelerate clean power development to meet the rapid growth in power demand expected over the 2030's and 40's. The plan includes actions to reform electricity network connection queues, planning processes, and investment timescales.

Government and Ofgem expect that electricity demand will at least double by 2050. As such, they are seeking to accelerate electricity connections and ensure investment in network capacity takes place ahead of need. The decision to realise 'anticipatory network investment' represents a radical change from historic regulatory approaches where there were incentives for network companies to defer network investment until the need for new investment was certain.

A key initiative in delivering this plan will be the role of the independent National Electricity System Operator (NESO) in delivering a Strategic Spatial Energy Plan (SSEP)[3] for Great Britain. This plan will assess the optimal locations, quantities and types of energy infrastructure required to meet future energy demand through clean, affordable and secure supplies. The plan will reflect societal, political and wider stakeholder engagement.

A key contributory element will be from new Regional Energy System Plans (RESPs) that the NESO has been tasked to prepare. These are discussed later in this report.

The need for strategic planning has been further emphasised in the National Infrastructure Commission's (NIC)[4] findings of its electricity distribution network study. In February 2025, the NIC published their review into the steps necessary to ensure Britain's electricity distribution network is fit for net zero. They recommended that proactive, large-scale investment to increase distribution network capacity was urgently needed alongside anticipatory investment that is already happening for transmission networks.

With regard to transport policy, the Department for Transport (DfT) has recently published a Maritime Decarbonisation Strategy[5]. Policy measures are proposed to reduce maritime greenhouse gas emissions including a policy for reducing emissions from vessels while at berth in ports. In addition, a new National Policy Statement (NPS) for ports is expected to be published shortly. It is anticipated that this will contain targets for significant future UK port growth (including Freeport East) that underpin the Government's national economic growth mission.

3. Summary of 2024 Green Transport Hub Report

The Freeport East Green Transport Hub Report[6] was produced by the REA and launched at the Houses of Parliament in May 2024. Informed through consultation with major private sector investors such as Sizewell C, Scottish Power, RWE, Maritime Transport, Gateway 14 and Hutchison Ports, the report set out a clear vision and roadmap for delivery of Freeport East economic development and decarbonisation goals. The report was targeted at mobilising the public and private sector resources needed to bring this to reality. It received a positive response, including a useful contribution from UKPN, the electricity distribution network operator (DNO) for the Freeport East region.

A Green Transport Hub Strategy will allow the Freeport to position itself as a UK and international leader in transport decarbonisation. Freeport East is already well placed to pursue this strategy through the UK Government's energy transition plans which:

- For energy supplies, targets investment and growth in nearby offshore wind, low carbon hydrogen and nuclear power.
- For transport, targets an acceleration to zero emission surface vehicles and green fuels for shipping and aircraft.

The global transition to green transport fuels means that current fuel supply chains for surface, sea and air transport will need to change. Freeport East can use its geographical advantage as a major transport hub to produce and supply green fuels for maritime, surface, and potentially also air transport at nearby Stansted airport.

Growth in electricity demand

Future energy requirements were determined by applying the Climate Change Committee's recommended UK decarbonisation scenario to the Freeport East region. By 2050, it shows that energy use for shipping increases, reflecting increased trade and shipping volumes, but there is a major reduction in residential and surface transport energy use. The figure below shows the scale of the electricity demand and capacity challenge:

The report forecast dramatic changes in the Freeport East energy mix with petroleum and gas being replaced by low carbon electricity and hydrogen. Electrolysis to produce green hydrogen and its derivatives will add significantly to the electricity demand. The report assessed that an additional electricity demand of 2.2TWh p.a. would be needed by 2035, and 11TWh by 2050.

There were two important conclusions from this analysis:

• electricity consumption will increase significantly by 2050 (estimated at six-fold from 2022) to supply electricity for transport and hydrogen electrolysers. This will require major new investment in electricity networks and associated infrastructure, and,

• major new hydrogen production and storage facilities will be required to supply green transport fuels, initially methanol but expected to be ammonia by the 2030's

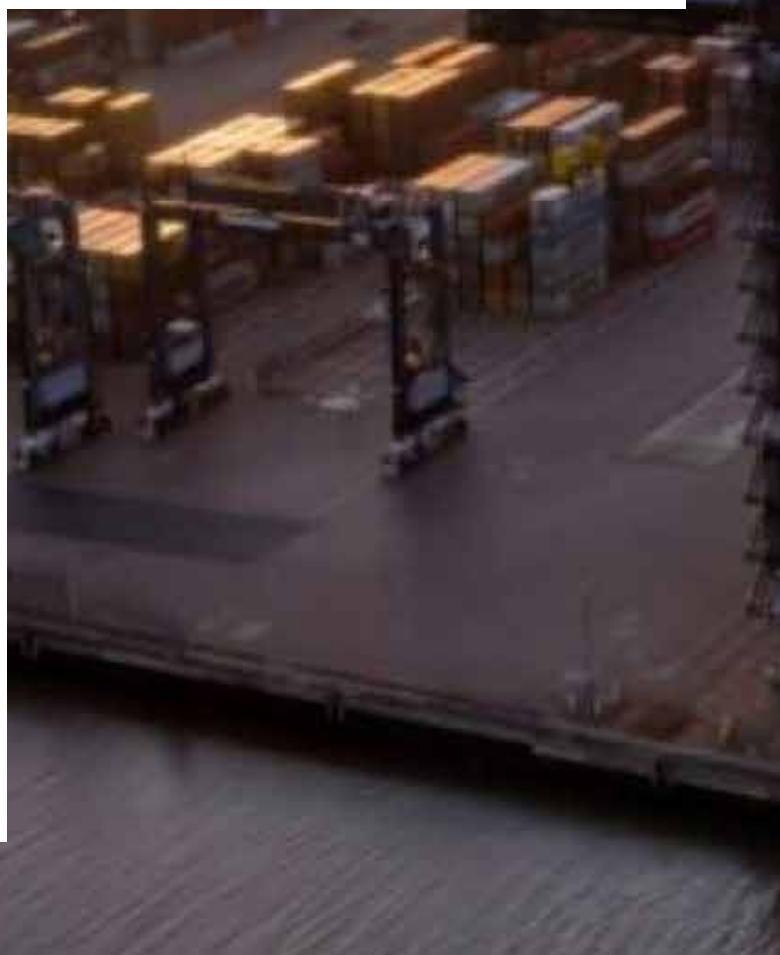
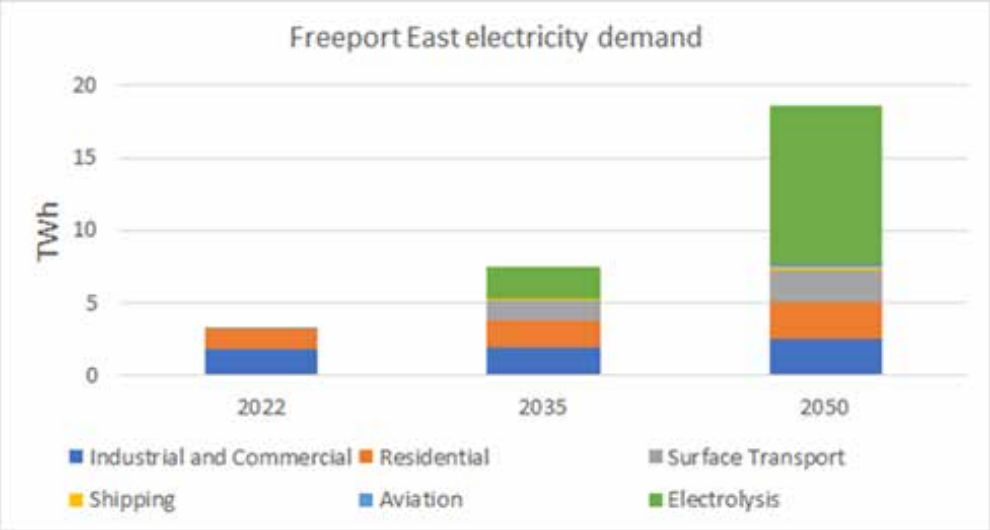


Figure 3: Freeport East electricity demand 2022-2050 (TWh)



The report concluded that the Freeport East energy transition to Net Zero will need to be supported by significant new infrastructure investment. But this currently faces barriers arising from insufficient electricity capacity and from access to finance. It will be important that a coordinated plan and investment pathway for new electricity capacity and the transport/fuel infrastructure is identified. This report recommended four strategic themes are pursued by Freeport East:

- **Enhance electricity resources - identify investments needed to enhance electricity network capacity, customer electricity infrastructure and electric vehicles**
- **Enable hydrogen production - identify investment needed in electrolyser capacity and the supply chain for production, storage and supply of green fuels**
- **Enabling finance solutions - identify priority investments and business cases to enable a mix of public and private finance solutions**
- **Integrated resource planning and delivery - lead the development of co-ordinated energy plans to optimise the delivery of Net Zero targets across the whole energy system. Prepare delivery plans which identify priority investment needs and delivery models and financing solutions.**

Freeport East's evolution to a co-ordinated 'Green Transport Hub' will bring opportunities for investment and to innovate and exploit new technologies. These can bring significant economic benefits to the area and the wider UK economy.

Limitations of the report

The May 2024 REA Green Transport Hub report used 'top down' electricity demand scenarios to identify the huge potential increase in Freeport East green energy demand. While this provided a compelling vision for a vast scale of regional electricity network expansion, it was less effective at defining the where, when and what is needed to initiate additional network capacity investment in the short term. UKPN requires evidence that is sufficiently certain to plan and approve network enhancements. There is also limited transmission capacity available to supply the region until additional construction can take place.

4. Freeport East future electricity demand

Electricity demand growth is expected to centre around the ports of Felixstowe and Harwich. Parties making new investments on tax sites at Freeport East are likely to include manufacturers for the offshore wind and clean energy sectors, logistics operators and data centres, all of which have high energy demands.

In addition, there are three key road transport corridors (A14, A120, and A12) as shown below. These road corridors are of critical national significance in terms of supporting the growth ambitions of London, and the sustained industrial potential of both the Midlands, and the North. Bulk EHGV charging sites are expected to be located within the vicinity of the port and the main transport corridors in the immediate Freeport East region.

Figure 4: Freeport East key electricity demand locations (Source: Freeport East)

1. Freeport East Felixstowe

2. Freeport East Harwich

3. Freeport East Gateway 14 (Stowmarket)

4. A14 - HGV route from Felixstowe-Midlands-North

5. A120 - HGV route Harwich-Stansted-Central England/Midlands

6. A12 - HGV route Felixstowe-Suffolk-London

Felixstowe

The Port of Felixstowe is the UK's biggest and busiest container port. It handles 60% of all UK-Asia trade and serves EU markets through regular container and roll-on/roll-off services with a three-times daily sailing to Rotterdam. Four million TEUs (Twenty-foot Equivalent Units) and approximately 2,000 ships are handled by the port annually, with the deep-water facilities allowing the world's largest container vessels to be served.

Figure 5: Port of Felixstowe (Source: Freeport East)

There are three other significant developments adjacent to the Felixstowe Port, exploiting tax sites located close to the port. These are

- **New industrial development -** a tax site is currently being developed for mixed industrial activities including manufacturing and associated logistic facilities.

- **HGV charging -** another tax site has been cleared and is ready for development as an all-purpose logistics hub, providing truck parking and associated services. This site is expected to be equipped with high power 400kwh+ chargers for HGV Battery Electric Vehicles (BEV's), with a peak demand of 10MW.

- **Hydrogen -** Scottish Power are developing a green hydrogen electrolysis project[1] at the Port of Felixstowe with the aim of producing up to 40m tonnes per day.

To assess the future electricity requirements for the Freeport East port area, it is important to focus on the peak electricity demand requirements i.e. what is the maximum customer demand in Megawatts (MW). This is a critical factor in determining the maximum size of electricity network capacity that is needed. The following estimates of 2035 peak electricity demand requirements are based on comparable data, and discussions with site owners and developers and the Freeport East development team.

Figure 6: Port of Felixstowe forecast electricity demand increase – 2025 to 2035 (MW)

Felixstowe – MW increase by 2035	Peak MW	Comments
Core terminal operations - port equipment decarbonisation	17	Demand increase from 17MW in 2025 to 34MW in 2035
Shore Power	25	5 berths x 5MW
Industrial development - tax site 1	24	Industrial development demand
HGV charging - tax site 2	10	Maritime[8] site (25 x 400kW charging points)
Green hydrogen	100	Scottish Power site
Total additional peak demand	**176**	

Overall, the total 'bottom-up' estimate for the additional electricity capacity needed at Felixstowe by 2035 is 176MW.

While the above analysis shows the capacity needed for 2035, some of this capacity will be required by 2030 as electrification plans start to be implemented. Furthermore, in order that businesses can commit investment for their electrification plans for 2035 and beyond, they will need to be confident that their full capacity requirements can be delivered.

Harwich (Bathside Bay)

Bathside Bay is a new port and logistics development in Harwich, comprising a 130-hectare expansion of existing port facilities.

Planning consent has been granted, and it is being developed in conjunction with Harwich International Port and Port of Felixstowe. Bathside Bay is designed to handle 2 million TEUs per year, which is 50% of the Port of Felixstowe capacity. It is expected that electrical capacity for port operation, shore power, and HGV charging facilities will be needed on the site.

Bathside Bay will also include a major new hub for offshore and green energy projects to support large-scale manufacturing and logistics to serve the UK and overseas offshore wind market. Harwich is already home to RWE's support base for the Galloper offshore windfarm.

A green hydrogen project[9] is also being developed in Harwich by RWE and Haltermann Carless, the proposed offtaker. Haltermann Carless Harwich is a hydrocarbon production site, manufacturing a range of products for Agrochemicals and Fuel Additives businesses.

Figure 7: Bathside Bay development (Harwich) (Source: Freeport East)

Development and realisation of the project is currently being driven by a timeline linked to future available grid capacity, which is the project's biggest limitation.

Alongside deployment of green hydrogen, the company is targeting the production of sustainable products, including sustainable aviation fuels (SAF) from the Harwich site. All future developments at the Harwich site rely on reliable electricity grid connectivity.

The following estimates of 2035 peak electricity demand requirements are based on comparable traffic and development data from the Felixstowe site described above and, discussions with site owners and developers and the Freeport East development team.

Overall, the 'bottom-up' estimate for additional electricity capacity at Harwich by 2035 totals 149MW. As for Felixstowe, some of this capacity will be required by 2030 as electrification plans start to be implemented, and businesses will need to be confident that their full capacity requirements for 2035 and beyond can be delivered.

Figure 8: Port of Harwich forecast electricity demand increase - 2025 to 2035 (MW)

Harwich – MW increase by 2035	Peak MW	Comments
Core terminal operations	17	New demand requirements
Shore Power	15	3 berths x 5MW
HGV charging	12	Harwich Port estate - 30 x 400kW charging points
Industrial development	5	Green Energy Hub, including RWE offshore wind support facility
Green hydrogen	100	RWE/Haltermann Carless development, supporting low carbon fuel production
Total additional peak demand	**149**	

Felixstowe and Harwich electricity demand locations

The specific location of the sites where additional electricity capacity is needed in Felixstowe and Harwich is shown in the diagram below.

Figure 9: Freeport East - electricity demand locations (Source: Freeport East)

1. Port of Felixstowe terminal decarbonisation
2. Port of Felixstowe shore power
3. Freeport East tax site – new industrial/logistics development
4. Freeport East tax site - HGV charging hub
5. Felixstowe Green Hydrogen development
6. Bathside Bay (Harwich) port development
7. Bathside Bay (Harwich) shore power
8. Harwich HGV charging
9. Green energy industrial demand
10. Harwich Green Hydrogen development

In addition to the specific sites shown above, further capacity is needed in the local transport corridors for EHGV charging as discussed overleaf.

Port region demand growth

A key driver of regional electricity demand growth will be the decarbonisation of surface transport, i.e., road and rail. While rail solutions may be more efficient long-term, development and construction may take significant time and rail solutions have not been considered for this assessment. This report has focused on the decarbonisation of road transport, especially HGVs.

Freeport East is undertaking a parallel exercise to assess the electric charging capacity needed for green transport corridors linking Freeport East to other parts of the country. From this analysis, it is evident that HGV charging points are likely to be grouped together in bulk charging centres near to their destination, optimising the distribution logistics. As such, it is anticipated that a significant number of charging points will be needed in close vicinity of the ports. For this analysis, we have assumed that this covers a 15-mile radius around the ports of Felixstowe and Harwich, also including Ipswich. We term this the 'Freeport East port region'.

There are three factors that need to be considered when assessing electricity demand for road transportation, namely number of HGVs attending the port, numbers of HGVs that will be electric, and number of charging points needed. These are discussed below:

Freeport East port region HGV numbers

It's difficult to estimate actual HGV numbers as there will be a mix of long-distance traffic and shunters to/from local haulage yards or warehouses where containers are marshalled before their long-distance journey. Many of the shunters are doing one-way loads, i.e., they either arrive or leave empty, but the long-distance trucks will normally be full on both inbound and outbound journeys.

Current estimates are that there are around 4,000 HGV visits per day at Felixstowe of which around 3,300 are trunk-haul which may need to charge each visit and about 700 local shunts (but fewer actual vehicles) who would charge when necessary.

In addition to the Felixstowe capacity, further vehicle numbers are expected as the Bathside Bay terminal is developed. It is anticipated that a further 2,000 HGV visits per day will be added by 2035 to 2040, resulting in a total of 6,000 HGV visits per day.

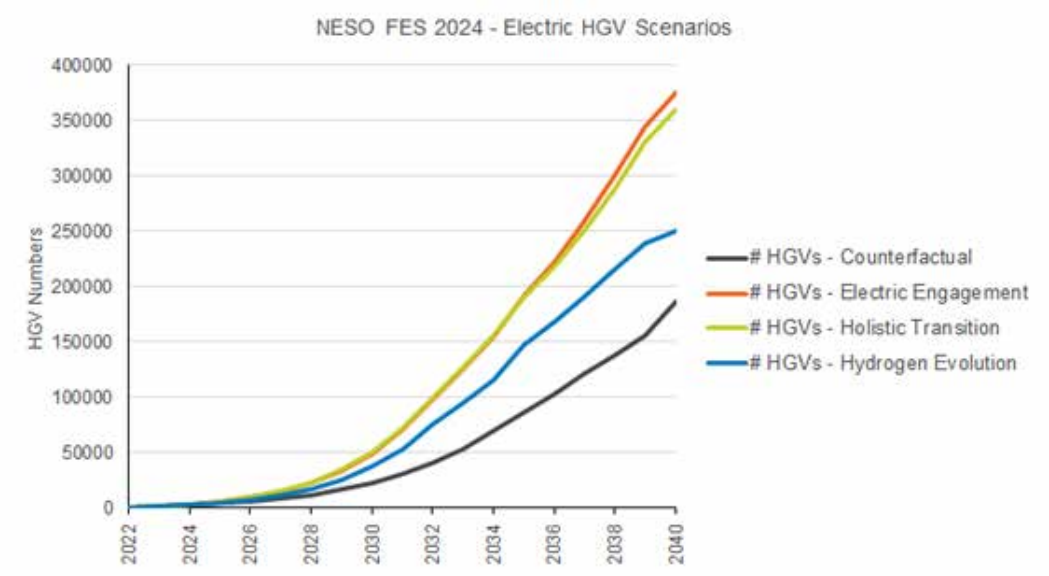
Electric HGV (EHGV) numbers

At present a very small proportion of HGVs are electrified but Government policy for Net Zero is targeting a rapid acceleration over the next decade. To derive a forecast for the Freeport East region, forecasts from the National Electricity System Operator (NESO) have been used. The NESO is required to produce annual Future Energy Scenarios (FES). In its 2024 FES, the NESO has used the following four scenarios for its modelling:

- **Holistic Transition -** Net Zero met through a mix of electrification and hydrogen, with hydrogen mainly around industrial clusters. Consumer engagement in the transition is very strong with demand shifting, with smart homes and electric vehicles providing flexibility to the grid.
- **Electric Engagement -** Net Zero met through mainly electrified demand. Consumers are highly engaged in the energy transition through smart technologies that reduce energy demands, utilising technologies such as electric heat pumps and electric vehicles.
- **Hydrogen Evolution -** Net Zero met through fast progress for hydrogen in industry and heat. Many consumers will have hydrogen boilers, though energy efficiency will be key to reducing cost. There are low levels of consumer engagement. Hydrogen will be prevalent for heavy goods vehicles, but electric car uptake is strong.
- **Counterfactual -** Net Zero missed, though some progress is made for decarbonisation compared to today. While home insulation improves, there is still a heavy reliance on gas across all sectors, particularly power and space heating. Electric vehicle uptake is slower than the net zero pathways but still displaces petrol and diesel.

As part of this analysis, the NESO has forecast EHGV numbers for the four scenarios as shown in the diagram overleaf.

Figure 10: FES 2024 EHGV numbers by scenario



In 2035, the four FES scenarios show that EHGV numbers (as a percentage of total HGVs) range from 17% to 38% as shown in the following table.

Figure 11: FES 2024 EHGV numbers in 2035

Scenario	Total HGV ('000's)	EHGV ('000's)	%
Counterfactual	505	87	17%
Electric Engagement	505	193	38%
Hydrogen Evolution	505	147	29%
Holistic Transition	505	191	38%
Average	**505**	**155**	**31%**

The average of the 2035 EHGV percentages is 31%. It is proposed to use this figure as an assumption for the calculation of EHGV demand in the Freeport East region.

Numbers of charging points

To optimise the use of HGV charging points, it will be important that both the capacity and utilisation of charge points is optimised. A key aspect of this will be the siting of chargers at ports and logistic centres where charging points and charging can be reserved to ensure vehicle use is optimised. Some HGV operators will wish to charge in the Freeport East port region, and others will wish to charge elsewhere. For the purposes of this analysis, we have assumed that 50% of HGVs will wish to charge in the Freeport East port region.

Based on discussions with developers, it is anticipated that individual charger capacity will be 400kW with an expected 1-2 hour charging duration. As HGV traffic at Freeport East operates continuously, it is assumed that 5 vehicles are charged at each charging point each day.

Based on these assumptions, the 2035 HGV charging demand in the Freeport East port region is forecast as follows:

Figure 12: Freeport East port region EHGV charging demand

Assumptions	2035	Comments
Number of HGVs per day	6000	4000 current and 2000 added at Bathside Bay
Electric HGVs per day	1860	Assumes 31% of total HGVs are electric
Number of vehicles charging	930	Assumes 50% of HGVs charge in region
Number of charge points	186	Assumes 5 vehicles charge per point per day
Electricity demand (MW)	**74**	**Assumes 400kW per charge point**

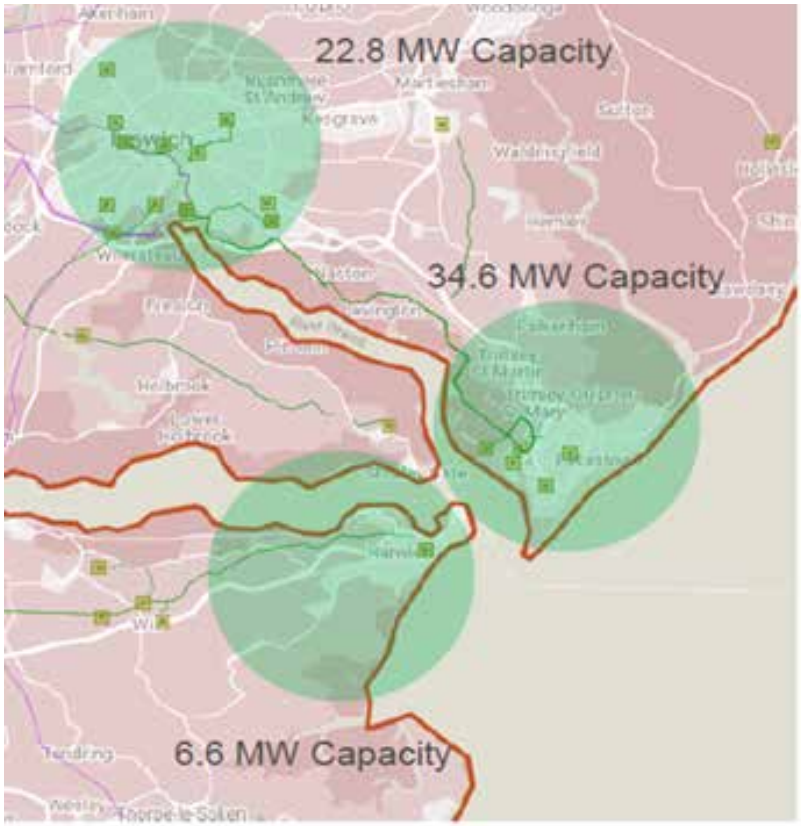
The above estimates for EHGV charging points at Felixstowe and Bathside Bay total 25 (Felixstowe) and 30 (Bathside Bay), a grand total of 55. Based on the above calculation, a further 131 charging points (400kW) will be needed across the remainder of the Freeport East port region, resulting in an additional 52MW of HGV charging demand.

Port region residual demand growth

Alongside the growth in electricity demand arising from Freeport East port and transport decarbonisation, there will also be an increase resulting from changes in the residential and industrial/commercial sectors in the region. This will need to be included in the overall estimation of electricity demand for the region in 2035.

The following figure (provided by UKPN for our May 2024 report[10]) shows the location of key grid supply points and current electricity capacity in the Freeport East port region. There is currently 64MW of capacity available from Felixstowe, Harwich, and Ipswich grid supply points.

Figure 13: UKPN Freeport East Port Region Network Capacity - 2022 (Source: UKPN)



In our May 2024 report, UKPN advised that there is a £16m investment programme in place over the next four years to increase capacity in the region as well as increasing resilience to climate change and increasing network resilience. The Felixstowe grid capacity will be uprated with 132kV assets replacing 33kV ones.

The adjacent diagram shows the total network capacity available in the Freeport East region but the current peak demand will be lower than the available capacity. Using Ofgem's assumption of an average distribution network capacity headroom (spare capacity) for primary substations of 44%[11], the current peak demand is estimated at 36MW.

In order to forecast the peak demand increase for 2035, the NESO FES scenarios have again been used.

Figure 14: NESO FES Peak GW demand scenarios

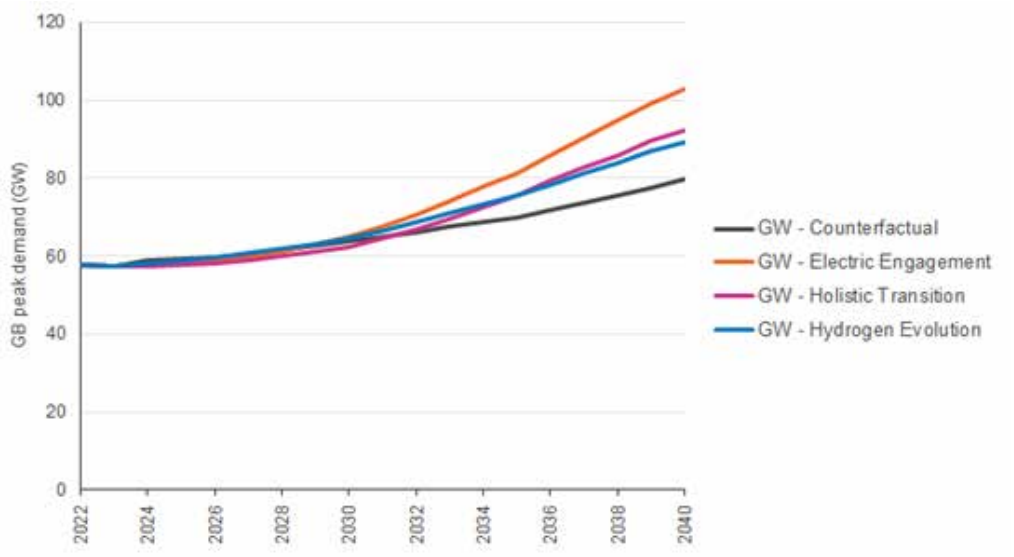


Figure 15: FES 2024 EHGV numbers in 2035

Scenario	2024 Peak Demand (GW)	2035 Peak Demand (GW)	% increase
Counterfactual	58	70	21%
Electric Engagement	58	81	40%
Hydrogen Evolution	58	76	31%
Holistic Transition	58	76	31%
Average	**58**	**76**	**31%**

The average of the 2035 peak demand percentages is 31%. It is proposed to use this figure as an assumption for the calculation of residual demand increase in the Freeport East port region. Therefore by 2035, residual electricity demand may be expected to increase by 11MW (from 36MW to 47MW.

Data centres and other demand drivers

In addition to the growth profile described above, there are several other potential demand drivers which may cause these forecasts to increase. These include:

- **Data centres** - UK data centres currently require about 1GW of grid capacity. Due to the growth in AI applications, their capacity requirements are expected to increase six-fold over the next 5 years. The Freeport East port region could become an attractive destination for these facilities, given regional strengths in the Artificial Intelligence (AI) industry, subject to grid capacity on the national transmission system being available.

- **Policy change** - Government policies may further accelerate decarbonisation e.g. through greater hydrogen production/storage targets. Again, the Freeport East port region could become an attractive destination for these facilities, subject to grid connection capacity being available.

These additional potential demands have not been included in this analysis which has sought to focus on developments which are already underway and have a high degree of delivery probability.

Freeport East port region 2035 total electricity demand forecast

This section has considered the key drivers for increased peak electricity demand at Freeport East port locations, tax sites and across the local port region. The results of the analysis are captured in the following summary table.

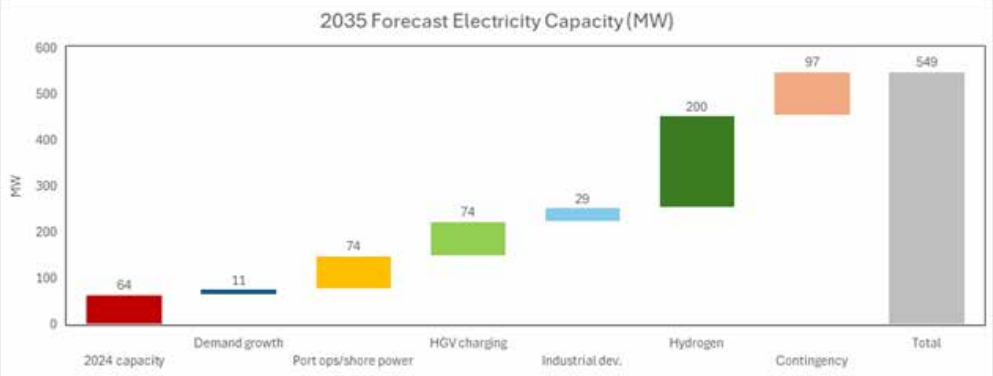
In addition to meeting peak demand, it is expected that sufficient contingency, or capacity 'headroom' must be maintained to ensure resilience and retain flexibility for changing demand requirements. For this analysis, we have assumed that an additional 25% of capacity headroom (97MW) will be required by 2035. This is in addition to the 44% (20MW) headroom that is assumed be available today.

Figure 16: Freeport East 2035 additional demand forecast

2035 Demand forecast (MW)	Felixstowe	Harwich	Region	Total
Port - operations	17	17		34
Port - shore power	25	15		40
Port tax sites - HGV charging	10	12		22
Green hydrogen production	100	100		200
New industrial demand	24	5		29
Other regional HGV charging			52	52
Residual demand growth			11	11
Contingency (25% assumed)	*44*	*37*	*16*	*97*
Total capacity	**220**	**136**	**79**	**485**

The following chart shows the key drivers for capacity increases through to 2035.

Figure 17: Freeport East 2035 electricity capacity forecast



Overall, the chart shows that about 500MW of additional grid capacity is needed in the Freeport East region by 2035 if planned economic growth is to be realised.

5. Regional energy system planning

As highlighted earlier in this document, there has been a significant recent shift in Government and Ofgem policy towards ensuring that electricity network capacity does not become a blocker to decarbonisation or economic development. The need for 'anticipatory network investment' is recognised as being critical if the vast amount of network reinforcement is to be delivered. Priorities for investment will be driven from the Strategic Spatial Energy Plan (SSEP) and Regional Energy System Plans (RESPs) that the NESO is required to prepare.

This section describes the current and proposed future network planning processes, and how the Freeport East increased capacity demands may be addressed in this planning process.

Current distribution network planning processes

Currently, regional energy network planning is primarily performed by regional electricity and gas distribution companies who produce their own energy scenarios, engage with their customers and stakeholders, and submit individual company investment plans to Ofgem for approval. Approved investment allowances are then included in company price controls for delivery over 5-year periods. Network enhancement decisions by UKPN are based on current network utilisation together with accepted connection applications over 1MW.

UKPN's Distribution System Operator (DSO) function produces annual Distribution Future Energy Scenarios (DFES) and support local authorities with the development of Local Area Energy Plans (LAEPs). UKPN also provides extensive open data on network utilisation, forecast capacity, plus guidance to help local authorities develop these plans.

Bottom-up, project specific, information is also sought by UKPN DSO alongside the top-down DFES scenarios. Large, strategic projects are highlighted and followed up individually. The following information is likely to be requested from local authorities and other network users for each project or projects requiring network capacity via a project pipeline template:

At present a very small proportion of HGVs are electrified but Government policy for Net Zero is targeting a rapid acceleration over the next decade. To derive a forecast for the Freeport East region, forecasts from the National Electricity System Operator (NESO) have been used. The NESO is required to produce annual Future Energy Scenarios (FES). In its 2024 FES, the NESO has used the following four scenarios for its modelling:

- Project background - identifying the lead local authority and DNO licence area
- Asset class - identifying the type of infrastructure assets (single or group) requiring the additional capacity
- Information - identifying the specific location of the infrastructure requiring grid capacity, together with details of project maturity (e.g. project identification, concept/ pre-development, development, ready for implementation), timeline for start of construction and date in service).
- Project cost - identifying the proposed project investment timeline, and whether financing is available or explaining how it will be secured.
- Other information - supporting public/ confidential information to corroborate the above.

UKPN performs analysis to assess the likelihood of network capacity being required. A 'confidence assessment' process is applied, covering:

- Governance - which assesses the endorsement from senior leadership and key stakeholder groups,
- Analysis - which considers the confidence that can be attributed to the local authority analysis - e.g. have spatial, whole system, and local stakeholder inputs been considered, have recognised datasets and policy assumptions been used, etc.
- Deliverability - is evaluated against each project shared in the aforementioned project pipeline template. Considerations for each project include funding status, commercial, economic, governance/management framework and strategic value. This approach is derived from the Treasury's five case model[12].

All this information helps UKPN prepare their network investment plans and take their ongoing network investment decisions.

Under the network planning reforms, electricity distribution companies will continue to be responsible for preparing their detailed network investment plans, which will need to take account of new Regional Energy Strategic Plans (RESPs[13]) as described below.

Regional Energy Strategic Plans (RESPs)

To improve co-ordination and accountability for national and regional energy system planning, Ofgem has introduced new requirements for strategic regional network plans. RESPs will be delivered by the independent National Energy System Operator (NESO) who must convene regional stakeholders around a common view of how the energy system will develop to support local priorities and deliver national goals. Key principles are:

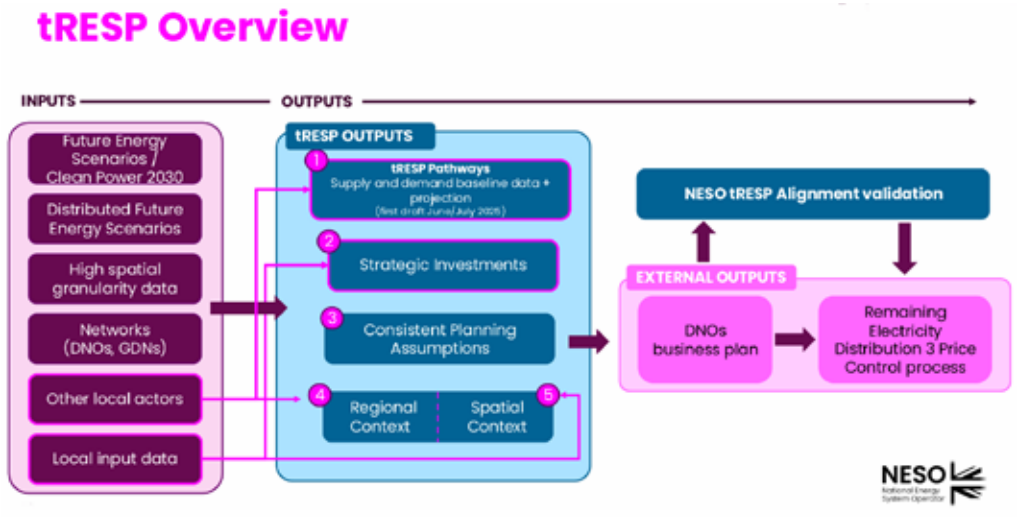
- **RESPs will be developed for eleven regions across Great Britain (Freeport East will fall into the Eastern Region which comprises Norfolk, Suffolk and Essex).**
- **RESPs will be developed from the following components:**
  - **a regional context,**
  - **spatially modelled pathways of future supply and demand,**
  - **the spatial context of these pathways against network capacity information,**
  - **a specification of strategic network need,**
  - **common planning assumptions to drive consistency in network capacity,**
  - **Spatial modelling to a granularity sufficient to support local planning and provide a detailed basis for network plans.**
- **RESPs will need to interact with wider planning e.g. electricity network plans and SSEP.**
- **RESP delivery - NESO will deliver RESPs through regional offices providing local insight and a national capability providing technical expertise, consistency and coordination.**
- **Governance will include regional strategic boards and a national steering committee alongside accessible engagement processes.**

Transitional RESP (tRESP)

A transitional RESP (tRESP) is required to feed into DNO business plans for the RIIO-ED3 price control which is due to commence in April 2028. DNOs are required to submit their business plans to Ofgem by December 2026. The tRESP is expected to provide a single-short term pathway for the period 2025 to 2035 which can feed into longer term RESP pathways.

It is required because energy sector transformation and the Clean Power 2030 Action Plan require immediate action prior to the more comprehensive RESPs being completed in 2027. It is designed to allow early stakeholder engagement to integrate regional needs within energy system planning.

Figure 18: NESO tRESP overview (Source: NESO)



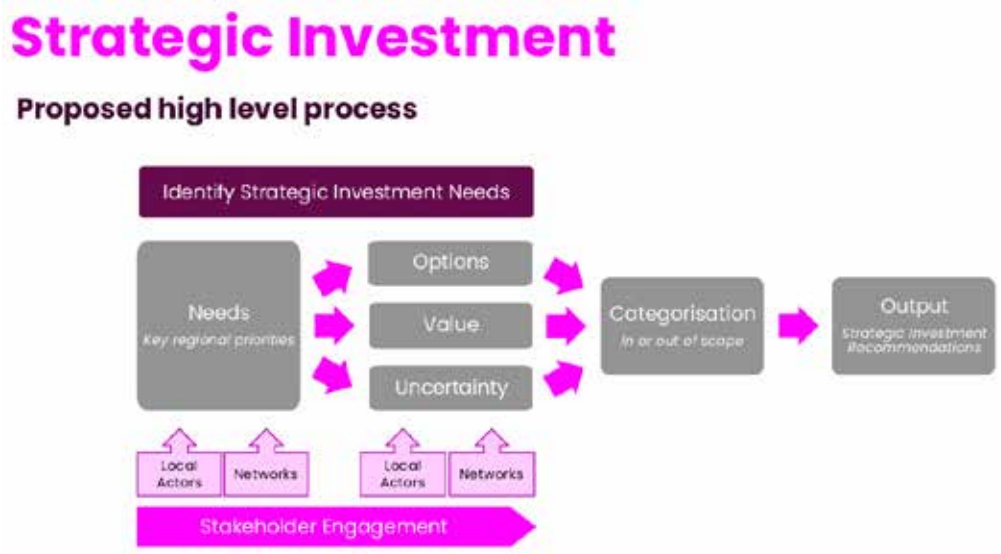
The NESO's aim for the tRESP is to identify investment needed for:

- Ready to build projects - Focus on mature, shovel-ready projects that are justified by market demands and immediate project readiness

- Strategic investment - Inform anticipatory investments based on less mature but strategically relevant projects for future capacity needs.

Strategic investment - the NESO's proposed approach for assessing strategic investment is shown in the diagram below. The methodology has yet to be developed but it is suggested that the starting point should be key regional priorities, which are then assessed against a value and options framework before investment decisions are recommended.

Figure 19: NESO tRESP Strategic Investment process (Source: NESO)



Timetable

There are three key outputs that the NESO must deliver, the transitional RESP (tRESP), the SSEP, and eleven RESPs. The key dates are:

- RESP forums are being established in Q2 2025. The aim is to engage with all regional stakeholders to inform delivery of the tRESP and RESP.

- A tRESP pathway consultation is planned for Q3 2025. The tRESP is required by Q1 2026.

- The final SSEP is to be published in Q4 2026 following consultation on a draft SSEP during 2026.

- The first RESPs are due to be published in 2027, following consultations on RESP methodology in Q4 2025, and establishment of strategic boards during 2026.

Implications for Freeport East Electricity Capacity Needs

This report presents the future network capacity needs in the Freeport East area using 'bottom-up' input from leading transport and energy businesses. It suggests that around 500MW of additional capacity will be needed by 2035, if these investment projects are to proceed.

Freeport East must be confident that this grid capacity will be available where and when it is needed to support transport decarbonisation plans. It will be important that Freeport East continues to work closely with UKPN to provide the certainty needed for grid investment.

The current UKPN/Freeport East collaboration has identified that Freeport East has the characteristics of an 'industrial cluster' which should be considered

differently from the Local Authority Energy Plan (LAEP) approach that is more generally applied for electricity network planning.

The collaboration has identified some challenges in complying with the current grid capacity assessment framework. Taking the key criteria in turn:

a) Project identification - individual projects may have been identified but there is not a co-ordinated electricity capacity need case or future pathway

b) Analysis - while individual connection applications have been made, evidence is still needed to show that a co-ordinated, whole system, spatial plan has been developed using local stakeholder inputs, recognised datasets and policy assumptions.

c) Governance - while planning consents may be in place for specific projects, local or national authorities have not yet supported the overall capacity proposals

d) Deliverability - while backed by strong investors, project cost, timing, maturity and financing may appear uncertain because delivery of grid capacity is uncertain

This report seeks to address points a) and b) above - it identifies the key energy transition projects in the Freeport East area and their capacity requirements between 2025 and 2030.

On c), governance assurance may be obtained through subsequent local and national authority endorsement of the findings of this report.

The challenge with d) deliverability, is that without knowledge that grid capacity will be available, business cannot make delivery and investment commitments. Without investment commitments, grid capacity cannot be justified. To address this challenge, Freeport East and the UKPN DSO will need to collaborate and adapt the network investment assessment framework to cater for initiatives such as Freeport East decarbonisation.

The introduction of the tRESP and RESP process should hopefully address this deliverability barrier. The stated aim is to enable anticipatory investments based on less mature but strategically relevant projects for future capacity needs. The Freeport East green transport hub would appear to fit well with this aim. It is understood that justifications for such strategic capacity investments will need to be submitted to the tRESP process before autumn 2025, when assessments will commence.

6. Conclusions

Freeport East is a major UK transport hub which aims to transition to a 'Green Transport Hub'. Freeport East can use its geographical advantage to produce and supply green fuels for maritime, surface, and potentially air transport. With its large port traffic volumes, and proximity to low carbon electricity supplies, Freeport East is well positioned to additionally offer low carbon fuelling capacity to these customers, adding economic benefit to the region.

Freeport East represents an economically important UK 'industrial cluster' which competes at an international level. Investment that is lost to the Freeport East area is most likely to move to other countries and incrementally undermine the UK's international competitiveness. Barriers to investment in the Freeport East area are also barriers to UK national economic growth.

Given the highly competitive international trade landscape, Freeport East will also need to ensure that it can optimise its future competitive position if it is not to lose existing economic benefits. In future, shipping customers are increasingly likely to seek the benefits of using a green, affordable energy hub. If Freeport East is not able to deliver this, then traffic through the port may fall with a negative economic impact.

Securing additional electricity capacity where and when it is needed is critical for both Freeport East's continued success and its aims for economic growth.

In our 2024 report for Freeport East, we undertook 'top-down' analysis, applying Climate Change Committee assumptions to Freeport East regional electricity demand. The report concluded that electricity demand could increase six-fold by 2050 to meet net zero targets.

This report has undertaken a 'bottom-up' approach of future electricity capacity requirements in the Freeport East region. Requirements have been assessed through engagement with Freeport East's existing operators and developers, supported by internal research and analysis. The report shows that an additional 500MW of electricity capacity is needed by 2035, with significant capacity needed ahead of this date to enable ongoing business investment. Specific locations for this investment have been identified, many with planning consent in place and others with development under way.

Current processes for grid enhancement planning and approval require individual businesses or local authorities to demonstrate 'deliverability' of projects, including evidence of investment commitments. But these investment commitments cannot be made without grid capacity. The challenge for the group of businesses in Freeport East is that they cannot make investment commitments without assurance of grid capacity availability for their future operations.

Recently announced energy planning reforms have the potential to address this issue. The NESO is required to develop national and regional plans that accelerate electricity network investment, allowing 'anticipatory investment' where there is a strategic need. The initial 'tRESPs' to specify these regional network investment plans are due to be developed during 2025, with publication due in Q1 2026.

Strategic Investment in additional Freeport East electricity network capacity would appear to meet key policy criteria for strategic investment, namely:

a) Being of high economic and/or system value and

b) Necessary to deliver key regional priorities.

7. Recommendations and Next Steps

This report has undertaken 'bottom-up analysis to identify that investment in some 500MW of additional electricity capacity is likely to be required in the Freeport East region by 2035, with some of this capacity being required in advance. For this to be realised the following next steps are recommended:

1. **Identifying aggregate capacity needs -** currently, local stakeholder plans for future electricity capacity requirements for Freeport East are not aggregated. This report has presented a co-ordinated plan which shows the needs of Freeport East as a key 'industrial cluster' that is critical for UK economic development. It is recommended that future plans for Freeport East electricity needs are developed as a co-ordinated plan.

2. **Governance assurance -** to provide additional assurance about the strategic need and deliverability of additional Freeport East electricity demand, it is recommended that scrutiny and endorsement of Freeport East aggregate requirements is provided by appropriate local and national governance bodies.

3. **Engagement with RESP process -** the new RESP process gives an opportunity to justify increased electricity network capacity needed for Freeport East. It is recommended that engagement is prioritised such that the tRESP to be published in early 2026 fully addresses the Freeport East future electricity capacity needs.

4. **Ongoing analysis -** this report has provided an aggregated 'bottom-up' view of future electricity capacity requirements for Freeport East as envisaged in early 2025. This will need to be updated on an ongoing basis to remain current. It is recommended that further analysis be performed as necessary to clarify and enhance the analysis.

5. **Regular engagement with UK Power Networks -** to collaborate with UK Power Networks DSO to utilise their existing data and digitals tools for net zero planning, joint collaboration with RESP, and evolve their network investment assessment framework to support large scale industrial decarbonisation projects including Freeport East.

This report has been prepared for the Renewable Energy Association (REA) by Robert Hull of Riverswan Energy (roberthull@riverswan.co.uk). The author has extensive energy transition experience, previously holding senior roles in Ofgem, National Grid and KPMG.

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