

How the energy sector works: a guide for transport professionals

This introductory guide to the energy sector is aimed at transport professionals seeking to collaborate with energy colleagues across the energy system. This has become particularly pressing as we seek to shift vehicles away from fossil fuels in order to meet decarbonisation targets.

It covers the following questions:

- Why collaborate with the energy sector?
- Who does what in the energy sector and who should I contact to discuss collaboration?
- Are there key opportunities to collaborate with the energy sector?

The guide ends with asks that will enable better collaboration between the transport and energy sectors.

Why collaborate with the energy sector?

As we seek to decarbonise the transport sector, there will be an increasing need for close collaboration with the energy sector. Net zero targets in our cities and regions are rapidly approaching and shifting to zero emission vehicles is a key aspect of meeting these targets. Emissions from the transport sector have remained stubbornly high over the last decade or so but the current focus on zero emission transport, such as the ban on the sale of internal combustion engine cars, looks set to change that.

Zero emissions vehicles will need to be supplied by zero carbon energy. The choices for zero carbon energy seem to be narrowing down to electricity and hydrogen although there are other options such as biofuels. And, as we switch from traditional forms of fuel such as petrol and diesel, to these new forms of energy, they will need to be a 'delivered' to the vehicle in different ways than before.

In the case of battery electric cars, we need to put the right amount of EV (electric vehicle) charging infrastructure in the right places to support all types of road users, whether private car owners, taxi drivers and owners, and delivery vehicles. Where fleets are shifting to electric vehicles, electric grid upgrades may be required to support the charging infrastructure. And there will be competition for zero emission electricity as we seek to decarbonise other sectors of the economy, particularly domestic heat. Therefore, close collaboration with the energy sector will be required to facilitate the decarbonisation of transport.

Hydrogen will be delivered to the vehicle much like diesel today, however the supply chain looks very different. At present, there is no clear structure for hydrogen generation, distribution, and supply, as there is for electricity and gas. This is a challenge for shifting to hydrogen fuelled vehicles and requires working with a range of private sector actors.

In both energy scenarios, there may be opportunities for city regions to make connections through renewable energy generation on their own estates and infrastructure. So in both cases, there are large and important decisions to be made by local authorities on the way transport will interface with the energy sector.

Who does what in the energy sector and who should I contact to discuss collaboration?

There are four key aspects to the UK electricity sector:

- Generation
- Transmission & Distribution
- Supply
- Regulation

Generation

Electricity generation is conducted by companies who operate fossil-fuel based power stations (e.g. gas, coal), bio-fuel power stations, nuclear plants, or renewable, zero emission infrastructure such as wind, solar or hydro.

Transmission and Distribution

Once this electricity is generated, it is transmitted and distributed across the country by the National Grid. There is a similar national distribution grid for gas. At a local level, energy is distributed to homes and businesses by 'Distribution Network Operators' (DNOs). DNOs are responsible for the infrastructure between a substation operated by National Grid and the property's meter. There are nine DNOs in the UK. You can find out who is the DNO in your area via the Energy Networks Association (ENA), the representative body for DNOs: [Who's my network operator? – Energy Networks Association \(ENA\)](#). ENA also provide guidance on [requesting data on the energy network and system](#) and on [connecting electric vehicle fleets to the network](#).

Distribution Network Operators

The DNO is responsible for installing and operating all the infrastructure which delivers energy to the meter, whether in a building or an EV charging point. A building (or carpark) will be supplied by a substation and the infrastructure sized to



the electrical demands of that building, such as lighting, heat, and other services. If a major upgrade to that building or site is required, such as the installation of several Rapid EV chargers, then an upgrade to the connection from the secondary substation is likely to be required incurring costs to the customer and project. These costs can be significant and can prove a barrier to project feasibility.

As the UK moves towards Net Zero, and electrifies heating as well as transport, the demands on the distribution network will only increase. DNOs are currently facing high demand for connection upgrades and the timescales of these upgrades can be significant and need to be considered when planning a project.

Fortunately, the costs of upgrading electrical connections are being changed from 1st April 2023 to effectively lower the cost to the customer of upgrading their connection. This may remove or lower the barriers for some projects.

The DNO is therefore a key collaborator for the transport sector when planning zero carbon transport projects. There is already communication between transport authorities and their respective DNOs in many regions as both parties map the future transport and energy demands onto the network. This can help identify locations where there is available capacity as well as provide insight for DNOs for where to focus their long-term investment plans. Across the energy sector more broadly, the creation of 'Local Area Energy Plans' by local authorities can be used by DNOs in development of their business plans, although it is not a mandatory requirement. The Energy Network Association, the industry body for the energy networks, is a good starting point to understand how this sector is responding to the challenge of Net Zero: [Energy Networks Association \(ENA\) - The voice of the networks](#).

Energy Suppliers

Energy suppliers are the companies who supply domestic and commercial properties with electricity and gas. There is considerable competition in this space and range of tariffs based on usage and energy generation. Green tariffs, using only renewable energy, are now commonplace and some companies offer tariffs which provide discounts at certain times and uses, for instance to support EV charging overnight.

The role of 'demand side' response will grow over the coming years, whereby consumers (private or commercial) will react to conditions on the grid: either over- or under-supply of electricity. For instance, at times of plentiful wind generation consumers will be incentivised to use electricity, possibly in charging battery storage, to take advantage of this intermittent energy generation source. This introduces the role of the 'energy aggregator' who can play the role of an intermediary between the energy markets and a range of assets, for instance buildings across a campus, and optimise the delivery of energy based on need and price.

As battery storage increases in size, the role of demand side response will only increase as providers and consumers will be able to shift their demand to periods of high generation (and therefore low price) and then use that energy later when prices are higher.

Hydrogen Supply

Hydrogen, with high fuel density, is more suitable for longer-range and heavier vehicles which can be less suited to battery electric motors.

There are a number of ways in which hydrogen can be generated: from natural gas (called brown hydrogen) and from electrolysis (green hydrogen, which is zero carbon). Hydrogen from electrolysis is being generated across a few sites in the UK, usually supported by central government funding. For instance, the Tyseley Energy Park in Birmingham is generating green hydrogen for a fleet of hydrogen buses and vans. Generation does not need to be situated at a depot but could potentially be transported via tanker from large-scale generation facilities.

When it comes to hydrogen governance, there is currently no national generation, transmission, and distribution structure. Currently hydrogen is not transported by pipeline although there are plans for the gas network to take up to 20% of the capacity as hydrogen in the natural gas mix and possibly 100% in the long-term.

In terms of opportunities for local authorities to engage with the hydrogen supply chain, this usually involves engagement with either current hydrogen suppliers or equipment manufacturers who supply electrolysis plants. The latter engagement would be within the context of a major project to build a generation facility and interaction with the technology provider would likely be in early concept design and during the official procurement process as the final solution provider is chosen.

Regulation

Ofgem is the regulator for the entire energy system in the UK, including the electricity and natural gas markets. Ofgem are responsible for setting the licences for the DNOs determining the ways in which the DNOs interact with customers and make long-term network plans.

What are the key opportunities for local authorities in engaging with the energy sector?

Interaction with DNOs

As discussed above, the DNOs are the major point of connection between a local authority and the energy sector as new low-carbon projects are conceived and executed. Local authorities have an opportunity to engage with their local DNO to understand the major constraints in the networks, the places where existing capacity is available and to provide input on major transport strategies which will need to be factored into long-term planning.

Provision of Electrical Connections

The cost of upgrading DNO electrical connections can be financially prohibitive for private market investment as the capital costs of an upgrade can be challenging to recoup in normal investment cycles. There is opportunity for local authorities to invest in DNO connections to unblock private market investment; this could involve use of public funds to upgrade a connection which is then leased to companies.

Engagement with Charge Point Operators

Local authorities can also work with charge point operators, the organisations which install, operate, and maintain electric vehicle chargepoints. These organisations tend to cater for different sectors of the EV charging market: from the traditional fuel companies such as BP and Shell, through to specialist providers of on-street charging infrastructure, with each having different strategies and business models.

Explore Funding Opportunities

There are a range of government funds supporting net zero transport projects which will require collaboration with the energy sector. Government departments and national funding bodies run competitions for pilots and trials of innovative technologies which usually target consortia of public and private organisations. Local authorities should engage with such bodies, such as UKRI, to understand the pipeline of funding: [UKRI – UK Research and Innovation](#).

Shared Infrastructure

Local authorities can map the common connection points between transport users and how energy infrastructure could be shared between modes. For instance, the electrical connection to a bus interchange for EV opportunity charging might be shared between bus operators and potentially extended to a nearby EV charging station. Electricity infrastructure at railway depots, lines and stations could also be used to support EV charging.

Local Generation

Local authorities could look at local energy generation schemes which could provide energy to transport users, either using local government owned land or through planning support. The ability to use locally generated energy, possibly connected via a 'private wire' to a transport user (such as a bus depot) could be one way in which local authorities support low carbon transport schemes which are constrained by grid connection costs.

Participation in energy sector consultations

Ofgem periodically undertake consultations with the market on the major aspects of the energy sector and the regulations Ofgem governs. For instance, in 2022 Ofgem undertook a review of the Energy Code to ensure that Ofgem is aligned with government's net zero ambitions. Recent reform of the regulations governing DNO connection costs show how the market, and key stakeholders, can influence the

regulatory framework to better enable local government strategies around decarbonisation.

Our asks

1. Data Accessibility

Accessing data about the energy network within an area can present a challenge for organisations looking to shift to zero emission fleets. Some DNOs are stronger than others on sharing mapping of local energy capacity. Capacity information is important for understanding the potential at a specific site and whether grid upgrades may be required in the preliminary stages of project development.

Our ask is for the implementation of a standardised approach to data sharing by all DNOs. This sharing of good quality data in an accessible format would support better early project decision making and reduce uncertainty.

2. DNO Connection Upgrades

There are issues around both the cost and the prioritisation of projects within an area. DNOs generally work on a first come first served basis in terms of providing grid upgrades. This can cause substantial delays for authorities looking to decarbonise vehicles, including public transport vehicles where grid upgrades are required e.g. to support a depot transitioning to EV.

Our ask is the development of an approach, based on set criteria, to prioritise grid upgrades with strategic importance. Alongside this, DNOs and local authorities should work together to ensure clarity on the forward pipeline of planned grid upgrades to enable planning and to capitalise on opportunities.

3. Lack of Certainty Around Hydrogen Production

The development of hydrogen infrastructure is fragmented with no clear government policy on the application of hydrogen to transport. There have been several competitions for government grants for the use of hydrogen for transport, however this has not been supported by an overall strategy as is the case for electric vehicles.

Our ask is for government to build on the [UK hydrogen strategy - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/uk-hydrogen-strategy), to develop a hydrogen vehicle strategy that sets out the future vision for hydrogen powered transport in the UK.

4. Location of EV Charging

The UK is set on a challenging trajectory to transition to battery electric vehicles with the ban on the sale of conventional combustion vehicles due in 2030. A large amount of EV charging will need to be in place to enable this transition.

There are uncertainties around the right mix of EV charging locations and whether Rapid charging at 'fuel station' type locations or slower (called Fast) charging at parking destinations will predominate. The different approaches have different



energy needs with Rapid charging needing larger grid connections which are constrained for the reasons mentioned above.

Our ask is for local authorities and other stakeholders to develop clear strategies setting out their EV charging goals. These could be focused around one approach or incorporating a mix of different charging options. Setting out these plans will allow for forward planning of grid capacity and help to facilitate the targets to transition to zero emission vehicles.

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