

▶ The Grid

Connections to drive the energy transition

E-FWD members met in June 2024 to discuss how changes to the grid may help - or hinder - the energy transition

ANALYSIS

#THEGRID – MORE THAN JUST ELECTRONS

By Seb Kennedy

'The grid' is synonymous with electricity, and it is often considered in isolation to fuels. But sector coupling technologies such as hydrogen and carbon capture are blurring the boundaries, necessitating a change in how we think about what 'the grid' really is – and how to decarbonise it.

Conventional wisdom holds that decarbonising electricity involves lots of wind, solar, pylons, substations and some storage. This is not wrong. But we need to think bigger: the grid is about more than just power. It is about the entire energy system, and how it interacts with discrete segments of the wider economy.

E-FWD members discussed the role of hydrogen and carbon capture at The Grid, our latest in-person event in Aberdeen in June. The wide-ranging discussion contemplated macro and micro challenges to sector coupling, and identified several no-regrets solutions.

- **Systems thinking:** Hydrogen and CCUS overlap electricity and fuels, so require a holistic approach. No more policy silos.
- **Vision & strategy:** A clear vision of the future energy mix and utilisation of each energy vector is crucial to crafting policy that builds investor confidence.
- **Resource mapping:** The geographic availability of H2 and CCUS must be co-ordinated with end-use requirements to avoid prohibitively costly transmission and transportation
- **Skills:** Hydrogen and CCUS hold great promise for transitioning the North Sea oil and gas workforce, so play a key role in enabling a just transition

Systems thinking

'The grid' should include all energy infrastructure, not just onshore power networks. From offshore and onshore energy production and injection, pipelines, transportation, connectivity to the network and distribution all the way to the end user – the grid encompasses every aspect of the energy system.

Considering the breadth of this approach, there is no room for politics in decision-making. Energy and net zero should transcend politics and an excessive focus on party positions or energy factions hinders creativity. Nascent industries cannot progress when they become political footballs, or when confronted with too many hoops to jump through.

Carbon capture, utilisation and storage (CCUS) is crucial for realising net-zero ambitions and also supporting the continuation of UK industry. But too often it is viewed through the prism of culture wars: enabling a continuation of fossil fuel expansion. An all-encompassing systems approach is needed to articulate where CCUS achieves cornerstone objectives without undermining other areas of energy policy delivery such as renewables, transmission upgrades and energy efficiency.



In the tent: E-FWD members discussed the role of hydrogen and CCUS in decarbonising the grid in Aberdeen in June 2024. Image: Kenny Elrick/DC Thomson

Utilisation in particular is too often overlooked in the conversation around carbon capture. Treating CO₂ purely as a waste product denies the opportunity for creative business models that are revenue-generating for critical industries facing a heavy decarbonisation liability. CO₂ is used in many end products such as plastics and surfactants and carbon removal must be included in the holistic plan.

Similarly, geothermal offers opportunities to attend to both power and heat demand in ways that could relieve the burden of electrification on the grid. Advanced geothermal technologies, as well as conventional and modular nuclear, are complementary to the expansion of wind, solar and energy storage on the grid and a holistic approach must provide room for these solutions.

Vision & strategy

A holistic approach to the energy grid would open the door to a comprehensive vision for the future energy mix. All energy vectors must be considered on their merits, allowing the articulation of a vision that plays to the strengths of each in a UK-specific context.

Key to achieving this is a demand-oriented approach that considers the energy requirements of the future economy. The cluster sequencing approach to CCUS development is an improvement on what came before. While it still requires further reform (see below), it offers a more cost-beneficial template for the rollout of hydrogen than the current atomised market-driven hydrogen production business model. A targeted strategy underpinned by systems thinking would end the uncertainty surrounding the future role of hydrogen. For example, if hydrogen is not going to be used in heating, then why delay what appears to be an inevitable announcement to that effect until 2026?



Ingrid Huldal, director sustainable energy solutions at Expro, discussed the hydrogen and CCUS workshop in a panel debate at #TheGrid. Image: Kenny Elrick/DC Thomson

There is a mountain of evidence supporting the view that hydrogen is best deployed for heavy industry with excessive heat requirements, and in heavy-duty transportation. Wind on its own is not a panacea and a cluster-based policy framework for marrying up hydrogen supply and demand would go a long way towards resolving the impasse.

A clear vision and strategy will enable market demand, offer a clearer picture of how and where demand will evolve, and support a clear pipeline of opportunities. This, in turn, will generate the certainty required for investors, developers and the supply chain.

With these elements in place, government can then move forward with the implementation of a UK Carbon Border Adjustment Mechanism (CBAM) or similar export framework. The GB market needs a bilateral trade agreement to support transportation of CO₂ and H₂ between the UK, Europe and other international trading partners.

Resource mapping

A key challenge to overcome is the geographical dislocation between supply and demand. This applies principally to hydrogen, but is relevant also to the development of CCUS initiatives.

A comprehensive resource mapping exercise should identify zones where grid constraints make hydrogen production a more viable route to market, and where these overlap with future industrial demand for H₂.

Scotland faces significant wind energy curtailment due to grid constraints, low demand, and lack of storage solutions. Despite having abundant wind resources ideal for green hydrogen production, the absence of onshore salt deposits for energy storage necessitates relying on transmission to the rest of the UK or neighbouring countries. This reliance is crucial to ensure that valuable renewable energy isn't wasted and can be economically utilised elsewhere.

Excess wind could be used to create hydrogen for small scale advanced bio-fuel production. For example, one offtaker in the E-FWD tent explained how they are struggling to source hydrogen for their project even though wind is being curtailed in the vicinity.

This mismatch highlights the need for hydrogen policy to consider demand at both the macro and micro scale. Large capital investments are needed to mobilise capacity to meet ambitious targets, but at the same time there is an evident need to plan for smaller modular hydrogen production that can also make a significant contribution to the alleviation of grid constraints.

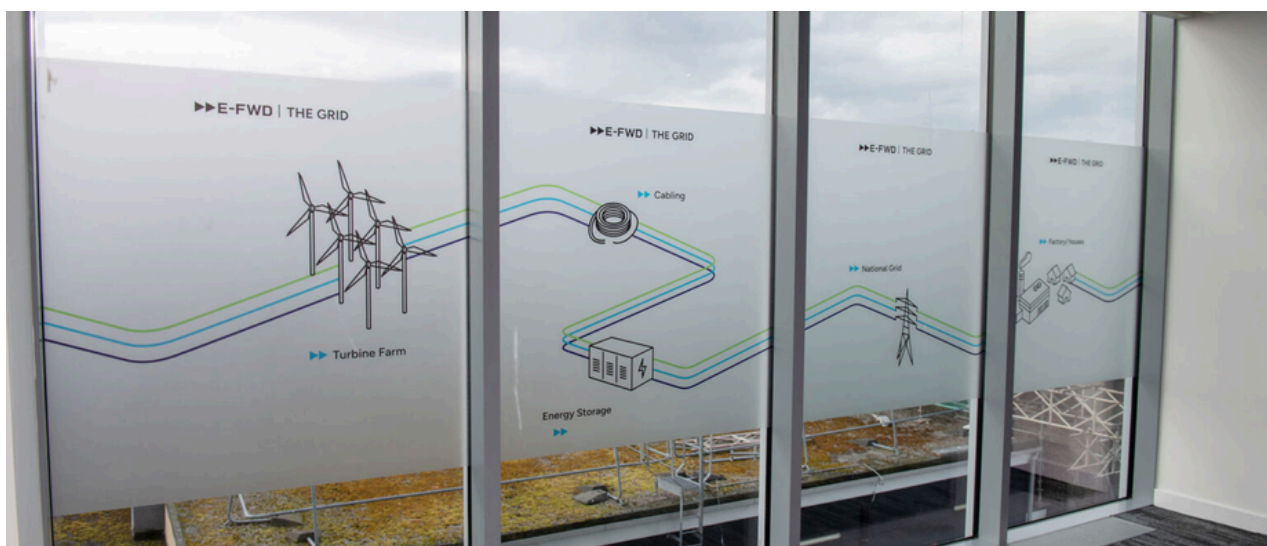


Image: Kenny Elrick/DC Thomson

The resource mapping exercise should include an assessment of supply chain capability to address gaps, encourage more local manufacturing and inward investment from overseas. Existing green hydrogen targets require a vast number of electrolyzers, but currently there is no local manufacturing available to attend to this need. Also, the lead time on compressors is a problem for both CCUS and electrolyzers for hydrogen.

A geo-strategic supply chain plan would allow small and medium businesses in particular to plan targeted capacity investments that attend to these deficiencies with reduced risk of under-utilisation.

Progress in CCUS is hindered by the cluster and hub model and government track approvals. Since the 1930s, natural gas facilities have used amine technology to remove CO₂, but without storage, the CO₂ is vented into the atmosphere. Currently, carbon capture companies in the UK are capturing CO₂ from various industries, yet lack storage options until the approved clusters become operational in 2030.

A key challenge for CCUS is connecting remote emitters to storage sites. Building new pipelines is costly, so road transport to a pipeline or storage site may be a short-term solution if no nearby storage is available. Transportation in CCS adds to the cost, prompting efforts to streamline this process, such as the source-to-sink model in the US and the cluster and hub model in Europe.

Skills and a just transition

Hydrogen and carbon capture offer distinct job creation opportunities than conventional grid decarbonisation technologies such as wind and solar. As such, they hold promise as a means of delivering a more just energy transition that supports the reskilling and redeployment of the existing North Sea workforce.

Identifying transferrable skills, expertise and capabilities will be a core element of the holistic approach to decarbonising the grid. Collaboration across industry, government, regulators, investors, operators and the supply chain is paramount.

The 'low hanging fruit' in this regard has already been picked. Now, the magnitude of investment and coordinated efforts required to deliver an integrated and flexible energy system will need a much-improved co-ordinated response.

Collaboration – the overused C-word of the energy transition – will be key to fostering a sustainable workforce. An adherence to the competitive approach that defined energy contracting in the 20th century will perpetuate the squeeze on small and medium enterprises. These companies will do much of the heavy lifting on job creation and retooling workforces so must be supported.



On the E-FWD stage, L-R: Michael Dodd, DNV; David Cunningham, Gneiss Energy; Seb Kennedy, E-FWD; Claire Addison, Flexitricity; Ingrid Huldal, Expro. Image: Kenny Elrick/DC Thomson

If the UK creates a commercial environment in which only the big players can survive, the personnel who design and build the hydrogen and carbon capture assets of the future will not be sourced from the existing GB workforce – increasing the risk of communities that host these developments being left behind in the process.

Creating pan-industry opportunities for SME participation would help. For example, there are technical challenges for certain safety and integrity-critical technologies for CCUS and H2. The supply chain cannot shoulder the full cost for development and qualification testing. In order to keep this equitable and ensure SMEs can access future opportunities, these are best managed through Joint Industry Partnerships and co-ordinated by not-for-profit enabling bodies, such as the Net Zero Technology Centre.

ANALYSIS

#THEGRID – BENDING OVER BACKWARDS TO TACKLE DEMAND

By Ed Reed

The grid is not fit for purpose. When considering how to change it, though, demand will be a key element. A lack of policy certainty has prevented much-needed investment from moving ahead. Resolving the political questions will trigger commercial certainty. Only then can the UK finally move ahead with its mission to decarbonise energy. E-FWD members discussed these themes at the latest in-person event, The Grid, in Aberdeen in June.

- **Political will:** Governmental drive to decarbonise the grid is crucial, setting out incentives and penalties
- **Prosumers:** Consumer flexibility will grow as more companies compete to offer smarter ways of working
- **Location:** Nodal pricing will not solve the problems created by the UK's supply and demand mix
- **Pace:** Accelerating decarbonisation would drive down wholesale power costs

One of the four tents at the event focused on demand. A major theme from discussions was around policy uncertainty. Lack of clarity has hampered investment and, as a result, consumers fail to see the benefit of decarbonisation.

A new government will be in power shortly. Top of the agenda should be a focus on accelerating the transition at the lowest cost. To achieve this, the next administration should draw up a timeline around how fast things will change and put in place policy incentives, most likely Contracts for Difference (CfDs), to deliver this.

These measures would give investors and operators a way to model future cash flows and come to a decision around where to allocate capital.

Rewarding flexibility

One point of change will be making the grid – and consumption – more sophisticated. Octopus' Kraken platform is the market leader, for now, providing a means to turn demand up or down. Time-shifting demand to cheaper points of the day will provide benefits to consumers and reduce waste, improving overall system efficiency.

For instance, charging an EV at certain times of day can be rewarded. [Octopus Go](#) supplies power in the middle of the night at a tenth of the price of daytime rates.



In the tent: E-FWD members discussed how to tackle demand in Aberdeen in June 2024. Image: Kenny Elrick/DC Thomson

Where this lower priced power may occur in the day may change. Demand is lower in the small hours, but as renewables increase their share on the grid, other factors – such as sunshine or when the wind blows – may become just as important.

The market is evolving. Suppliers are not yet passing on wholesale pricing to customers, but competition may cause this to change.

Pricing demand

One of the decisions that could trigger change in the UK's grid plans are proposals for locational or zonal pricing. This would see different parts of the country pay different prices for power. For instance, in Scotland, consumers would benefit from offshore wind. While in southern England, prices would be higher. Discussion on the night did not back this. Changing pricing in this way would reduce the incentives to build new generation capacity where it would operate most efficiently. For instance, industry would need to install three times as many wind turbines in Bedfordshire than in Scotland.

The least cost approach must be to develop the highest resource sites to produce power, rather than reward development in sub-optimal resource locations.

Energy storage plans would also suffer. In southern England, many battery installations might face bankruptcy in the face of structurally higher power prices.

The argument for locational pricing suggests industry would relocate to areas with low prices. The ease with which manufacturing could relocate is a challenge – decisions on location are driven by more than just power prices. There is also the need to access customers, logistics and workers.

A move to locational pricing would also require changes in grid balancing. While Scotland would have a greater share of renewable energy driving prices, it would also face higher balancing costs.

Balancing act

Balancing the grid has been a perennial challenge in the drive to decarbonise power. The grid is increasingly reliant on intermittent renewables, at around 40%. As the role of gas in the system is reduced, wholesale electricity prices at peak hours increases.

Gas generators must secure higher returns from higher prices over fewer operating hours, and/or via capacity payments. The system acts to meet the last unit of demand with the lowest marginal cost generator – which continues to be gas.

It is the paradox of renewables that the more the country adds, the higher the balancing and peaking costs are.



Image: Shutterstock

The Labour and Conservative parties have both committed to gas power plants for use beyond 2030, in order to fill the gaps. The Conservatives are targeting 2035 to decarbonise power, while Labour is sticking with 2030.

If the next government is serious about seeing this through, the focus must be to decarbonise the grid as fast as possible. To do this at the least cost, it should provide clarity on plans to the market.

Companies considering gas plant investments would benefit from certainty on when unabated operations must end. If, at the same time, government offered CfDs this would allow them to finance projects

This would also incentivise companies to move ahead with baseload renewable technologies, such as tidal and hydropower. It would also provide backup to the system by encouraging pumped storage hydro.

Both major parties have talked about the opportunities that renewable energy can provide. Decarbonising the grid is fundamentally an engineering problem, wrapped in a political debate. If politicians are serious about achieving the stated goal, they must put measures in place to drive change. Government has the ability to create carrots and sticks, but does it have the will?

ANALYSIS

#THEGRID – JOINING THE DOTS TO EXPAND INTERCONNECTION

By Ed Reed

There is no energy transition without an expanded grid, so building new interconnections is mission-critical to the UK's net zero delivery plan.

Myriad problems prevent faster infrastructure deployment, and second order effects arising from failure to address these are rippling up supply chains. E-FWD members discussed the bottlenecks and how to unblock them at the latest in-person event, The Grid, in Aberdeen in June.

- **Communication:** The energy industry must show, and explain to people, the need for grid transformation
- **Vision:** A clearer vision would attract new entrants to the grid sector, meeting the need for more hands on deck
- **Plan & deliver:** The supply chain is squeezed so if the UK intends to meet its goals it must demonstrate practical steps in pursuit of the vision

The state of interconnection in the UK is such that the grid is a blocker, rather than an enabler, of decarbonised energy. A pathway to change has been set out, but there are numerous challenges to how it is delivered.

The state of interconnection in the UK is such that the grid is a blocker, rather than an enabler, of decarbonised energy. A pathway to change has been set out, but there are numerous challenges to how it is delivered.

DNV has predicted UK transmission must more than quadruple, to 140,000 km by 2050, while distribution should nearly triple to 1.4 million km. In order to transform the grid, the consultancy called for a trebling of investment from historic levels.



In the tent: E-FWD members discussed how to expand interconnection in Aberdeen in June 2024. Image: Kenny Elrick/DC Thomson

The vision thing

The UK does have a vision to expand its grid capacity. In March, National Grid Energy System Operator (ESO) set out a plan to invest £54 billion to decarbonise power by 2035. This sees major expansion to offshore wind farms in Scotland, with power transmitted around the country by a new “spine”.

Beyond this, the government has approved a new National Energy System Operator (NESO), bringing in National Grid. NESO will be charged with providing a holistic view of the entire system, including gas and hydrogen. The UK vision for this is world leading. No other country has made such a bid for whole system planning, so there are no examples to work towards.



Photo: Shutterstock

Participants in the E-FWD tent in early June discussed how there was a lack of understanding from people – and politicians – on how the grid would change. Companies attempting to build out infrastructure often fail to communicate the broader imperatives to people. This lack of comprehension slows progress in a number of areas, not least in planning.

There is broad political consensus around the need to decarbonise power and, therefore, the need for new grid investments. It is the scale of change that gets lost.

The autumn statement from last year highlighted some plans around grids and electricity. Meanwhile, Labour has made commitments around removing the grid obstacles to clean energy projects.

Line up

One challenge is in managing the grid queue. The average time to receive a new connection is 14 years and the aim, set out in late 2023, was to bring this down to seven.

There are more than 700 GW in the grid queue at present, with more being submitted all the time. Developers tend to apply for a spot speculatively, with the only barrier to entry being one of a fairly modest cost.

While it is generators that have most often complained about the queue, they must also shoulder their share of responsibility. It may be prudent as a developer to submit applications for all potential projects, but the net result is the system freezes up from being overloaded.



Michael Dodd, business director of power grids UK & Ireland at DNV, summarised the group's findings in a live panel debate. Image: Kenny Elrick/DC Thomson

National Grid has set out plans to reform the queue. It has the stated aim of tackling “zombie” projects that will never actually be developed. It is tightening the rules, requiring projects to demonstrate they have achieved certain objectives – such as securing planning permission and land – before taking a place.

Developers have complained they have little understanding of how National Grid operates. Stripping out the deadwood from the queue and allowing National Grid to focus on the most appropriate projects should allow the two sides to have a better understanding of each other.

National Grid could also distribute information better, for instance via digital twins. This would allow them to demonstrate how the grid will change over time – and how to work alongside it.

One result of a move to tighten restrictions on the grid is that smaller developers will be squeezed out. Such a rule change will make speculative bids harder and put more risk on developers.

People power

Another of the challenges for National Grid, which compounds its queue management and communication problem, is lack of personnel.

This will be exacerbated following the launch of NESO, given the need to bring in a host of new disciplines and incorporate them.

National Grid employs around 22,000 people already, but is aware of the arising skills problem. For the expansion to succeed, it will need to be able to attract both young people but also – as the organisation evolves – from other disciplines.



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The UK has an array of skilled professionals, but they need to be made aware of the prospect of this major infrastructure buildout in order to attract them to key roles.

This question of people and timing links in to the challenge around the supply chain. Without clarity around project awards, plans will slip. There is global competition for this sort of capacity and timing will be crucial. For instance, there are only three HVDC manufacturers in the world.

The UK must be able to secure capacity and then not miss its timelines. If politicians backtrack or reconsider plans – as the country has seen on HS2 – the chances of achieving timely decarbonisation will be lost.

The grid has made progress and is moving in the right direction by clearing out zombie projects from the queue. But the UK is a relatively small market. If the country misses its shot at securing capacity, at making the case for this grid expansion, the opportunity will be squandered

ANALYSIS

#THEGRID – STORING UP PROBLEMS FOR THE FUTURE

By Seb Kennedy

Energy storage already plays an important role matching electricity supply and demand, providing grid services and equipping the system for higher penetration of renewables. Much more is needed, but it won't be delivered without an injection of pace.

Sadly, the opposite is happening. Investors are running into labyrinthine complexity, unfathomable risks, and unhelpful rules and regulations. Big policy decisions have been kicked into the long grass, leaving the next government with a bulging in-tray.

E-FWD members convened in Aberdeen in June at the latest in-person event, The Grid, to discuss how to remove barriers and deliver a multiplicity of storage technologies at the pace and scale necessary to decarbonise the grid this decade.

- **Simplicity:** Policy must provide clarity of purpose and appropriate market structures.
- **Decisions:** The time for consultation is over. The next government must move decisively.
- **Missing money:** Unhelpful rules create a 'valley of death' that few investors can fill.

Energy storage technologies of all stripes and durations will be required no matter how quickly or successfully the UK grid is expanded to accommodate new forms of generation. The painful reality is that the grid is already a blocker to decarbonisation and congestion is becoming acute.

This means there's an even more pressing need to roll out short, medium and long duration storage assets to fix some of the shortcomings of the grid itself. But for those bringing new technologies to market, the current policy and regulatory environment leaves a lot to be desired.



In the tent: E-FWD members discussed the role of energy storage in decarbonising the grid in Aberdeen in June 2024. Image: Kenny Elrick/DC Thomson

Navigating complexity

For investors, energy storage is an opaque asset class. Contemplating market entry requires pulling together diffuse strands: not only understanding each technology's strengths and weaknesses, but also the way these characteristics are rewarded or penalised in each of the markets where they might operate. Business models can and are being developed by stacking revenues and subsidies. But this is happening almost exclusively for well-established short-duration technologies such as lithium-ion batteries. As a result, this market segment is well on its way towards saturation.

The big challenge is to repeat this for medium and long duration energy storage. Here, the task is much more daunting because the technologies are less developed and the providers have less commercial experience. At the same time, the UK energy market is on the cusp of huge changes. Those two factors combined – commercial immaturity and policy upheaval – are a recipe for stagnation. To break the logjam and guide investment, policy clarity is required to help investors identify commercial opportunities and navigate the complexity of the investment landscape.

Death by consultation

Energy policy under the last parliament was characterised by a frenzy of consultation. Many helpful ideas were floated, and industry responded in good faith. But the silence since then has been deafening. Once the general election is done and dusted, the next government will be faced with a series of big decisions. For energy storage, the biggest missing piece is the overarching vision: what is energy storage solving for, exactly? Is the idea to replace the role of back-up gas-fired power plants at peak times, and if so for how many hours?

Is it needed to fill in the supply-demand gap over multiple consecutive winter days? Is it system services like inertia and other grid stabilising services, which we currently get as a byproduct of fossil fuel generation? Or is it a combination of all of these, and everything in between?

Once the purpose of each storage duration category is clarified, government must design technology-neutral markets that deliver the most cost-efficient outcomes for the required volume of capacity. Then, investors can make their decisions about which technologies to back within those frameworks.



Claire Addison, head of regulation at Flexitricity, summarised the working group's findings in a live panel debate. Image: Kenny Elrick/DC Thomson

Mind the funding gap

The current suite of commercially viable technologies will not be able to deliver government targets for 55 GW of short-duration and 50 GW of long-duration storage. So, innovation is required. But the current regulatory environment actively discourages innovation by erecting unnecessarily high thresholds to entry.

For example, DESNZ is proposing that a first-of-its-kind technology – i.e. anything other than li-ion – must be deployed at a minimum of 50 MW to gain support. The same goes for innovative new use cases of established technologies. But there are a lot of new storage concepts that need to be tested in real-world settings at smaller capacities first before scaling up, and few investors will take on technology risk alone until that has happened.

As a result, innovative storage technologies developed in the UK are being taken overseas for small-scale deployment because those markets offer more viable routes to commercialisation. One example cited in the discussion pod was a subsea battery storage technology developed in Aberdeenshire that is being field tested in Denmark as a contribution to the non-price factor support criteria in the Danish offshore wind tender.

A simple rule change would allow promising British technologies to be commercialised at home, and for the economic benefits to remain in the GB market. Unless government decides that the UK can meet its storage needs with mass deployment of two-hour li-ion battery installations, it will need to encourage a multiplicity of technologies, and that means supporting innovation from proof-of-concept all the way through to commercial deployment.

The UK is in a global competition and cannot expect to attract private capital when there is much more generous support available from the US Inflation Reduction Act or via EU subsidies. But removing unnecessary barriers to entry would be a welcome step in the right direction.

ANALYSIS

PIECING TOGETHER THE GRID JIGSAW

By Alan Wyatt and Paul Hallas

The grid must expand. Where it is currently a drag on growth, a well-executed plan could unlock new investments – but policy certainty is a must.

The modern world relies on hydrocarbons, with grid infrastructure underpinning this. With commitments to cut emissions, the source of energy is changing – but so too must the way in which energy is delivered. In May 2021, the IEA report Net Zero by 2050 defined 400 milestones to achieve net zero by 2050. It called for “a complete transformation of how we produce, transport and consume energy.” Few if any of those milestones have been reached. Several European governments are winding back on commitments to achieve those milestones.

Governments and companies must investigate and invest on a massive scale in existing and new technologies if the world is to get close to net zero in the next 25 years.

The US government has chosen to throw a huge amount of money into low-carbon technologies. In Europe, and the UK, there are far fewer financial resources available. Making the right choices, and constantly reviewing choices, is critical. This should reset the environment for the energy industry and attract investment.

At the same time, governments must keep a close eye on the true full cost of any strategy. In turn, industry should be pointing out to government the major obstacles to low carbon investment and help to ensure that there is a consistent policy focus on delivering carbon abatement in a timely, cost-effective way.

Governments and companies have recognised they must make huge efforts to develop known low-carbon electricity sources, such as wind and solar. They are also working on new opportunities to move quickly along this path.

As the generation mix evolves, the demands on the system also change.

Implications for GB grids

Although there have been many incremental changes over the last 15 years, the UK's approach to grid development and operation has not fundamentally changed since the Climate Change Act of 2008. The 2019 decision to adopt a legally binding Net Zero 2050 target adds a need for greater urgency.

Up until now, the UK has adopted a siloed approach. The government has overseen a separation of electricity and gas grids, with their own legislation, licensing and network price control arrangements. Amid this has been a focus on controlling costs, to protect consumers. The result of this has been a reluctance to sanction "anticipatory" strategic investments ahead of proven specific need.

The transmission level was built up to channel supply from large generation assets, such as gas, coal and nuclear.

There has been a relatively loose connection between electricity transmission and distribution systems. This includes a lack of "visibility" at the electricity system operator level, in terms of distributed energy. This became apparent during the first wave of growth in solar generation.

Offshore wind has struggled to gain access to the transmission grid, because of its location and a piecemeal approach which has often led to disruption of coastal communities, with offshore transmission sometimes ill-coordinated with the onshore grid.

Local electricity distribution grids have traditionally flowed in one direction, based on the system's roots in large generation. However, the system has become increasingly complex, with distributed generation, EV ownership, grid constraints and a need for demand-side response.

There is an overwhelming case for change at two levels – strategic and specific.



High level

Strategically, there is an urgent need for a coherent whole system view of the steps needed and the long-term objectives, in addition to well-informed debate and constructive co-operation. To be ready for the future, the UK must consider future demand and the expected full cost of different green electricity supplies or carbon reductions.

Strategic thinking is required, not just for electricity grid itself, but also in related areas such as energy storage, hydrogen and CO2 infrastructure. A major area to address must be the transition away from unabated natural gas, which dominates UK heating.

Finally, we require urgent action to address the infamous “connection queue”. This stems from the drive to decarbonise, with a manifold increase in connection requests. This has driven a large number of so-called “zombie” projects, which sit in that queue with little realistic chance of proceeding.

Interrelated challenges

Interconnectors have undergone a notable transformation in the last 15 years, demonstrating the dynamism of the energy shift. A proliferation of these cross-border lines has squeezed margins, with a move towards unconventional interconnectors, linking in offshore wind farms.

There has been an extraordinary growth in offshore wind, largely in Scotland. There remains excess power in the country, with too little in the way of connections to deliver to demand centres in England. Would a move to variegated pricing tackle the status quo?

Another response to this dislocation of demand and increasingly intermittent supply is energy storage. Capturing power and shifting it to alternative times helps smooth out some of the swings seen in the grid. Hydrogen and pumped storage can have an impact, and it seems the government is moving to provide support for these mechanisms.

Our notion of the grid is evolving, with the new National Energy System Operator (NESO) set to add oversight of gas and hydrogen, to electricity in its portfolio. Hydrogen and CO2 management will play an important part in decarbonisation, with the pressure on clusters to move forward effectively.

Picking direction

The decision to move from an Electricity System Operator (ESO) to the new NESO is surely an important step in the right direction.

It will not be plain sailing. There are questions around how quickly a fully staffed and capable ‘whole system’ organisation will be up and running.

Furthermore, NESO will need to navigate various public sector bodies, most notably the Department for Energy Security and Net Zero (DESNZ) and Ofgem. Should Labour win the next election, GB Energy would also be in the mix.

E-FWD's Call To Action On The Grid

Reach a decision on zonal pricing sooner rather than later, to provide investment certainty

Reform the UK ETS to increase carbon prices, which will provide incentives to invest in decarbonising technology

Support long-term jobs and skills plans for the supply chain, including the massive infrastructure expansion required

Clarify industrial policy plans, to show where investment will be supported, and accelerate grid queue reforms

The working relationship between government and Ofgem to date has not always been smooth. Effective policy, regulation and management is likely to be much more complicated when two important new players are added.

There is a risk that uncertainty will grow, rather than reduce, as government becomes more involved in the supply chain. GB Nuclear has taken an early start down this route – committing to huge payments to get industry up and running.

Labour's stated aim is to decarbonise electricity production by 2030, while the Conservatives aim for 2035.

Shadow Secretary of State for Energy Security and Net Zero Ed Miliband has talked of a drive to cut across siloes when in government. This could bode well for NESO and GB Energy.

There are challenges ahead, but there is a sense that both political parties are aware of the scale of the challenge.

The agencies in government also agree that change is needed to deliver the grid we need. The aim to shift to a "first ready, first connected" will see some projects losing out. However, allowing NESO to focus on a slimmed down list will improve efficiency and it can then take a more proactive stance.

For too long, grid plans have been based on a "just in time" ideology. Deciding where grid will be built out will unlock new investments in the same way that clusters can crowd in development plans.

Moving to a "risk on" approach will put NESO and Ofgem in a position where they can trigger new investments in a meaningful way, as part of a broader industrial policy. We've played it safe, now it's time to plan out.

Financing the energy transition

The next E-FWD event will focus on financing. Members will meet in Edinburgh on September 19, to talk about the ways in which changes to the energy system will intersect with new and old ways of securing capital.

Expect special guests, breakout tents and a chance to unwind with your peers.



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