

London – 15 May 2025

Building our energy future: transforming electricity transmission

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ASTI Projects and the Great Grid Upgrade

Good afternoon everyone. I'm Carl Trowell, the President of the Strategic Infrastructure division. I'm also the executive lead for capital delivery across the group and our global supply chain organisation - I therefore work very closely with Sally and Matt, in our New York business. I'm really excited to have this opportunity to talk to you about the ASTI projects and The Great Grid Upgrade.

First let me tell you a bit about me. I joined National Grid just over 2 years ago, right at the point that we decided to create the Strategic Infrastructure division. Prior to that, I spent the majority of my career at Schlumberger Ltd, where I led three global business units including the Integrated Project Management division where I oversaw the delivery of complex infrastructure projects all over the world. After Schlumberger I served as the CEO of two different marine energy services companies, gaining first-hand experience in how the global supply chain operates and thinks. When the opportunity came to join National Grid, I knew it was an opportunity to do something material for the future of the company and the UK, I just had to take it.

I have learnt through my career that delivering a major portfolio of infrastructure work requires four key criteria for success:

- The right regulatory framework,
- A strategy for delivery,
- Gaining consents and permits,
- And, developing the right supply chain relationships

Over the next 25 minutes or so, I'll cover how we've prioritised each of these, establishing strong foundations to deliver The Great Grid Upgrade.

Today I will give you a clear understanding of three things:

- A sense of the scale of the projects we're building and the exciting growth these will deliver for National Grid;
- The significant progress we've made, and how our execution strategy is already yielding major advances;
- And finally, our improved visibility which gives us confidence in our ability to execute and deliver the ASTI projects.

But before we move on, let's step back and explain what the ASTI projects are and how they came about. In April 2022 the UK government published a British Energy Security Strategy. This was triggered by the surge in international gas prices following the invasion of Ukraine. This strategy set out an ambition to instal 50GW of domestic renewable generation on the network and to expand the capacity of the transmission system by the early 2030's. National Grid worked alongside the other UK transmission companies and the system operator to identify 26 major projects that would be needed across Great Britain to deliver the power flows required by the strategy. Of these, 17 are in our licence territories of England and Wales.

It was clear to us that the unprecedented scale of this program and the pace required, could not be delivered under the existing regulatory regime. So we worked alongside Ofgem to influence the design of a new framework called the Accelerated

Strategic Transmission Investment framework, or ASTI. And the 17 projects that fell within our jurisdiction were awarded to us at the end of 2022.

As an aside, we recognised the term ASTI was meaningless to the public and other stakeholders, which is why we also refer to the portfolio of projects as “the Great Grid Upgrade”. It is a fitting name for what will be the largest overhaul of the UK electricity grid in generations.

So turning to the portfolio itself which is comprised of 12 onshore and five offshore projects.

In simple terms they satisfy three key needs:

- They increase the power flows between Scotland and England
- They add new network capacity in the east of England, where the network is sparse and new offshore wind will be located
- And they reinforce and expand the capacity of the existing network to ease constraints, ensuring increased power can flow to demand centres

Each project is unique, but they fall into three broad categories:

- Offshore links
- New greenfield onshore circuits
- And upgrades to existing circuits

I'll spend a few minutes covering each of these. First, the offshore links.

These are high voltage direct current, or HVDC, projects used to transfer bulk power over long distances. We have five of these to deliver in the ASTI portfolio, four of which will be delivered in partnership with the Scottish transmission companies and

one which links Suffolk to Kent. Each will lay dual cables, trenched into the seabed before coming ashore to connect into the AC/DC converter stations. We have some cross sections of the cable here today for you to see.

The converter stations at each end are marvels of modern electronic engineering. At one end of the link they convert the power from AC to DC to send the electricity offshore. This is because DC cables have less power loss during subsea transmission. Once the electricity comes back onshore at the other end, it's converted from DC back to AC. These are very similar to the 7.8GW of interconnectors we have built and operate in our NGV business.

Secondly, we're building brand new onshore transmission lines. In order to connect 50GW of offshore wind we need to build new circuits, especially in the east of the country. For these we need to build new substations, new overhead lines and, in some circumstances, to underground sections of high-voltage cable.

Just to give you a sense of the scale and pace of this endeavour, the total length of new overhead line we expect to build in the next six years is about six times as much as we have built in the last 30.

And finally, we have projects which are designed to materially upgrade the capacity of the existing network. These are often the enablers for the power flows delivered by the other ASTI projects. Upgrades generally involve replacing old conductors with higher voltage lines that can transfer more power, as well as expanding sub-stations and upgrading transformers.

While these might sound easier than green field projects, they bring the complexities of working on the embedded and energised network and commonly some very interesting site access challenges as you will see in the video later.

However, it's important to point out that the types of projects and technologies we are delivering are not novel. Certainly, the scale and pace are different, but we have successfully delivered HVDC projects, overhead lines, tunnels and buried cables across the group over many decades.

So now let me return to the four criteria for success, starting with the right regulatory model. As I mentioned earlier, we worked with Ofgem and advocated for a new regulatory framework that reflected the scale of what we need to deliver, and the evolving external environment. The resulting ASTI framework brought about four important changes over the traditional model:

- Firstly, it confirmed the needs case for all the ASTI projects rather than on an individual project basis. This has given us more long-term clarity of what we need to build than we've ever had before. It gives us visibility beyond the normal 5-year price control and enables us to agree totex allowances through separate processes. In practical terms this means we can plan with certainty both internally and externally with our supply chain.
- Secondly, it provides us with funding mechanisms, such as pre-construction and early construction funding, which allow us to make financial commitments earlier in the lifecycle. This is essential to our ability to secure equipment, and in some cases to start construction before planning is confirmed, all without taking regulatory risk.
- Thirdly, it includes new mechanisms that allow us to contract our supply chain earlier and in different ways, including introducing incentives for accelerated delivery.
- And finally, and importantly, it introduces new protections including for delays outside of our control and new totex processes where allowances are agreed in parallel with engaging the supply chain, ensuring that up-to-date costs are fully reflected in our allowances. We also have further protections, pending

Ofgem's decision, that mean so long as we are investing efficiently, any actual costs which are more than 5% above the allowance can be recovered.

All of these changes have allowed us to progress faster, and in many cases, it's reduced delivery by 2 to 4 years.

Let me give you some examples of how we have used the new ASTI regime. Take our Bramford to Twinstead project which is a new 400Kv circuit between Bramford substation, west of Ipswich to Twinstead, south of Sudbury in Essex.

We used the protections and mechanisms within ASTI to consent and build the Grid Supply Point at Twinstead under the faster Town and Country Planning Act, therefore removing it from the critical path and starting construction almost a year ahead of plan.

Looking at a second example, we used the early construction funding mechanism under which we can invest up to 20% of a project value ahead of agreeing allowances and consents, to secure and build supply chain capacity for two of our HVDC projects: Eastern Green Links 1 and 2.

We were able to place capacity reservation payments in advance that not only secured the equipment in a tight market, but supported investments in expanding factory capacity and to commission a new cable lay vessel.

Our engagement with Ofgem is ongoing and constructive as we work to evolve the ASTI framework to be more efficient. An example of this is how we aligned to make the Great Grid Partnership possible, a supply chain methodology that was not originally envisaged within the ASTI framework. Another example is how we have worked to put in place an advanced procurement mechanism that can now be used across our wider transmission projects.

So, let's move on to our second criteria for success: our execution strategy and how we have organised to deliver the ASTI projects. In simple terms we decided on four fundamental strategies:

- to form a dedicated division to deliver ASTI
- to deliver our Eastern Green Link offshore projects through incorporated joint ventures
- to break the delivery into two waves
- And to bring our supply chain in early

I'll come back to supply chain strategy a little later but let me explain the first three in more detail.

Very early on we decided that we should form a dedicated division to deliver the ASTI projects to ensure maximum focus, agility and pace, whilst also allowing the core electricity transmission business to remain focussed on its operations.

We started with 200 people transferred from the major projects group within the Electricity Transmission team. Today, just over two years later the organisation stands at 1,000 people with a further 350 people expected to join over the next year.

Two years ago when I joined one of the things I was told was that we'd struggle to attract the right people. I've been totally blown away by who we've been able to attract. We've successfully drawn expertise from across the group as well as attracting talent from other infrastructure sectors with major project experience.

This is due to having one of the largest and most visible infrastructure portfolios in the UK if not across Europe. It's brought great talent to our door. The division is set up around two delivery vehicles, one managing offshore projects and the other managing onshore projects. These delivery vehicles are made up of project

management and engineering experts. Around them we have built what we call “centres of excellence” in project controls, planning & consenting, strategic procurement and risk management.

We’ve established the expertise we need to deliver the ASTI projects and the next waves that will come beyond that, and to develop and share that best practice across the group. We’ve also set a strategy to deliver with our partners.

As I outlined earlier four of our HVDC projects connect Scotland to England and will be built in partnership with SSE and Scottish Power Transmission.

By choosing to manage these projects through fully incorporated joint ventures, we’re able to draw on our track record of successful partnerships across our interconnector portfolio and Westernlink. These 50:50 joint ventures establish a separate vehicle in which you have a dedicated team responsible for the delivery of the full project regardless of whether activity is in Scotland or England. It allows for good governance and removes interface risk.

We’re also using different delivery strategies for the projects depending on their relative maturity and have split the portfolio into two distinct delivery waves. You can see this on the slides behind me.

The six most advanced projects form what we call Wave 1.

These have been around as concepts for a long time, and in many cases planning work had already been undertaken prior to being included in the ASTI framework. They are also the projects with the earliest required delivery dates. We’ve moved with agility and pragmatism to advance them as quickly as possible.

The other 11 projects form Wave 2, these were less mature at the time they were appointed to us. This gave us the opportunity to be even more innovative about how we approach their design, ranging from construction, standardisation, the early engagement of the supply chain and our approach to consenting.

Turning to our third criteria for success: planning and consenting.

It commonly takes twice as long to plan and consent a new transmission project as it does to build it. Therefore, gaining timely consent is critical to delivering on time.

In the UK we develop projects under several planning regimes, but most of our major projects are considered Nationally Significant Infrastructure Projects and therefore require a Development Consent Order, known as a DCO, and this is the most complex and challenging planning regime in the UK.

Establishing a world class planning and consenting capability has been a major focus for us. Our current centre of excellence would be the envy of any infrastructure organisation and is comprised of experts who have worked on some of the UK's largest projects such as Hinkley Point, Cross Rail and Heathrow Terminal 5. This focus has enabled us to attain planning permissions, land access and the 'right to build'. And as a result, we've already obtained Development Consent Orders for three of our ASTI projects, submitted another DCO application for the SeaLink project and we will make 5 more DCO applications, covering seven projects, by the end of 2026.

To get to this point we have run 324 consultations events with over 23,000 people attending and we've incorporated 43,000 pieces of community feedback into our designs and planning applications.

Thus far we have been granted planning consent on time for every submission we have made.

Our experts have also been working with government to influence the new Planning and Infrastructure bill, which includes a number of proposals that are important to us, including giving certain projects the flexibility to choose the type of consenting regime used, and providing opportunities to accelerate the consenting process. If implemented these could help reduce consenting times in the later stages of the ASTI program and what comes beyond.

During the networking session later you will be able to meet some of our experts in this area and they will be able to demonstrate to you some of the new technologies and digital visualisation tools that we have developed to engage with our communities through the consenting process.

Clearly one of the big risks to delivering such a big programme of work is having access to the right equipment and services. Which brings us on to our final success criteria: supply chain relationships.

It has been our strategy to engage key suppliers in a fundamentally different way in order to:

- Help them build capacity and skills
- To secure critical services
- And to bring their expertise into the design and delivery model

At the heart of our approach has been two new contracting arrangements, the Great Grid Partnership and the HVDC frameworks.

The Great Grid Partnership is something completely new for transmission projects. After running a structured procurement process to find the right partners, we awarded the entire scope of the Wave 2 onshore projects to a consortium of seven partners, two providing design and consent capability and five providing EPC construction capabilities. One of them is Murphy Group, who you heard from earlier in the panel discussion.

We've also joined the consortium as a partner in a structure known as an "Enterprise" or "Project 13 partnership". This is something we trialed on the London Power Tunnels 2 project to great effect.

These partners have been brought in years before construction will begin and this allows us to use their expertise to develop new construction techniques, to standardise and to accelerate delivery.

We also intend to deploy these partners in a truly different way, adopting a more production line approach to construction across the portfolio rather than project by project. We are most excited by the possibility of introducing more prefabricated modules rather than the conventional way of "construction at site". And you can see an example of this on the right, which is our partnership design for a standardised substation.

There is another important reason for contracting in this way. We were concerned that the supply chain would not have the capacity to deliver essential skills when we needed them. By guaranteeing them work over such a large portfolio, these partners have the certainty they need to invest in building capacity.

As an example, three of the partners, including Murphy's, are now building new overhead line training centres to serve the ASTI projects.

The Great Grid Partnership was awarded and formed one year ago. It is based in Birmingham with all partners collocated as one team. The partnership is now deep into the process of engineering and planning the delivery of wave 2.

We, and our partners, believe there are real and substantial time and efficiency benefits in adopting this new way of working.

On the equipment side, our approach to the HVDC market shares some of the same drivers as the Great Grid Partnership.

You will no doubt be aware that there is strong global competition for HVDC equipment and although we were successful in securing supply for our EGL1 and EGL2 projects we wished to procure our future HVDC projects across the group and with partners in a more strategic manner.

We wanted to utilise several competitive advantages that we have. As you will have heard from Tim at Siemens Energy earlier, National Grid and the UK is an important and attractive market for the international OEM supply chain, given our track record of delivery and certainty over of our portfolio of work. That means that our projects are less risky than others around the world, backed by strong regulation and policy support.

We therefore wanted to put in place an HVDC framework structure that would provide the supply chain with confidence and visibility over our pipeline, to collaborate with a selected group of partners on innovation and standardisation and to help develop new suppliers. We also wanted to make it easier to award work in the future as new projects came up.

We have concluded frameworks for HVDC cables and converters as shown on the screen; and we are in the latter stages of procuring specific contracts for Sealink, EGL3 and EGL4. In fact, we recently announced Siemens Energy as the preferred bidder for the converters on Sealink and we expect to reach preferred bidder status on the remaining packages within the next few months.

With the Great Grid Partnership and the HVDC framework in place we now have the primary supply chain contracted or with frameworks in place for all 17 ASTI projects.

So having discussed the four criteria for success – let's look at actual progress. We set ourselves the goal of having all six wave 1 projects in construction by the end of last financial year - and I'm very happy to say that we have achieved that.

So let me remind you of which six projects we are talking about, these are:

- the offshore HVDC projects EGL1 and EGL2,
- the onshore projects Yorkshire Green, Bramford to Twinstead, and North London Reinforcement, and
- the tunnel cable project from Tilbury to Grain.

These six have all planning consents, supply chain contracted and are now well under construction. To get to this stage has encompassed 3 DCO awards, multiple town and country planning consents and the award of £4 billion in supply chain contracts.

Here's a short video to give you an impression of what has been delivered to date.

Short video was played

I'm hugely proud of everything that the team has done to get to this stage. In the past National Grid may have commenced one of these mega projects every few years, we have launched six in just the last 12 months.

Although we moved quickly into construction by deploying more traditional contracting approaches, we have used the ASTI framework and new ways of working to accelerate and derisk their delivery.

Our Wave 2 projects are progressing rapidly through design and consenting, and the Great Grid Partnership are working on the construction and delivery plans, ready to commence once planning consent is received. We expect three of these projects to move into construction in the first half of 2026.

Now let me outline how we are capturing these costs in our regulatory agreements and how ASTI and Strategic Infrastructure fit into the five-year frame. As you'll already know, UK Electricity Transmission makes up around £23 billion of the group's £60 billion investment over our 5-year framework. Strategic Infrastructure is reported as part of Electricity Transmission and is responsible for roughly half of the £23 billion. In December we submitted our RIIO-T3 business plan, which includes the 17 ASTI projects, and we expect Ofgem's draft determination to be published in June and the final determination at the end of the year. As we're awaiting the draft determination I won't speculate on the outcomes, but it is worth touching on the new process we have for agreeing totex allowances on the ASTI portfolio. With certainty around the needs case confirmed, we now agree allowance for each ASTI project individually.

This enables us to file for allowances with Ofgem only after we've engaged the supply chain and agreed up-to-date costs, ensuring that we are closely matching

costs to our regulatory funding. This process has been working well, and I'm pleased to say that we've received all of the allowances we need so far.

This, alongside the partnership frameworks we've agreed with our supply chain gives us further confidence that the £23 billion investment across our 5-year frame is well underpinned.

So in summary, when I reflect on the last two years, I can honestly say that I have never been involved before in such a rapid and successful mobilisation of an organisation and projects. We are delivering monumental change at an unprecedented pace.

We're doing this having:

- built a dedicated project delivery organisation, now over 1,000 strong
- Mobilised our supply chain
- Adopted a portfolio approach to delivery, and
- Ensured we have the right regulatory frameworks in place

As a result, and with six projects already in construction, our visibility and confidence in being able to deliver our commitments has never been greater.

The Great Grid Upgrade is firmly underway!

Thank you for listening and I'm very happy to take your questions. But before I do, you will see we've brought some show and tell...