INNOVATIVE WAYS OF WORKING

Unlocking Capacity in the UK Energy Supply Chain

A report prepared on behalf of the Electricity Transmission Industry Skills & Workforce Planning Programme

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As the sector skills voice, Energy & Utility Skills Group supports collaboration across employers and the supply chain through workforce planning, labour market analysis, data coordination and sector convening, helping build shared insight into the skills and workforce capacity needed for future infrastructure delivery.

Disclaimer:
Organisations contributing to this work participated through survey responses and engagement with the Innovative Ways of Working (IWOW) working group. Participation does not imply endorsement of all views, findings, or recommendations set out in this presentation or the associated report.

Executive Summary

Delivering energy security and Net Zero at the pace now required will depend not only on workforce size, but on how effectively skills and expertise are deployed across the transmission and distribution system. While investment levels and policy ambition continue to rise, the sector faces persistent constraints in specialist engineering, planning, assurance and delivery capability. Simply recruiting and training more people will not be sufficient to meet delivery targets.

The Innovative Ways of Working (IWOW) group, operating within the Industry Skills & Workforce Planning Forum, was established to identify how new delivery models, processes and technologies can relieve pressure on constrained skills and improve productivity at scale. The IWOW survey was undertaken to build an evidence-based understanding of how innovation is already being applied across the supply chain—and what is preventing proven approaches from being adopted consistently. Responses were received from 21 organisations including design consultants, Tier 1 contractors, OEMs and transmission owners, typically from senior technical, delivery and leadership roles.

The evidence shows a strong and consistent consensus: innovative ways of working are essential to meeting the energy security challenge. Many organisations are already deploying approaches that reduce reliance on scarce specialist roles and allow expertise to be applied more effectively across multiple projects. These include AI-enabled design and planning, digital twins and remote working, standardisation and modularisation, automation and robotics, and improved site and workflow management. Crucially, these approaches do not replace skills; they amplify the impact of existing skills by removing avoidable effort, duplication and rework.

However, the survey also highlights a persistent gap between innovation activity and scaled impact. While trials and pilots are widespread, innovations struggle to transition into business-as-usual delivery. Respondents identified a set of systemic barriers acting together: fragmented specifications across networks; risk-averse and late-stage assurance processes; commercial models that reward effort rather than productivity; unclear routes from innovation funding to deployment; fragmented digital and data foundations; and insufficient long-term pipeline certainty to justify investment in new capabilities.

This report identifies three innovation pathways with clear potential to unlock workforce capacity if applied consistently across the sector. It also sets out a small number of enabling conditions that must be delivered together: mandated standardisation rather than optional reuse; proportionate, early assurance that trusts digital evidence; clear, repeatable routes from innovation funding to adoption; commercial incentives aligned to productivity; stable, long-term delivery pipelines; and strong leadership and coordination across transmission owners, industry bodies and regulators.

In summary, the evidence points to five immediate actions for the sector:

- Mandate standardisation and modularisation where technically feasible
- Reform assurance to engage early and accept digital evidence
- Create clear routes from innovation funding to delivery adoption
- Align commercial incentives to productivity, not hours worked
- Provide visible, cross-TSO leadership to normalise new ways of working

Meeting future energy security needs is not solely a recruitment or training challenge—it is a system design challenge. By embedding innovative ways of working into business-as-usual delivery, the sector can significantly improve the productivity, resilience and impact of its workforce using capabilities that already exist today

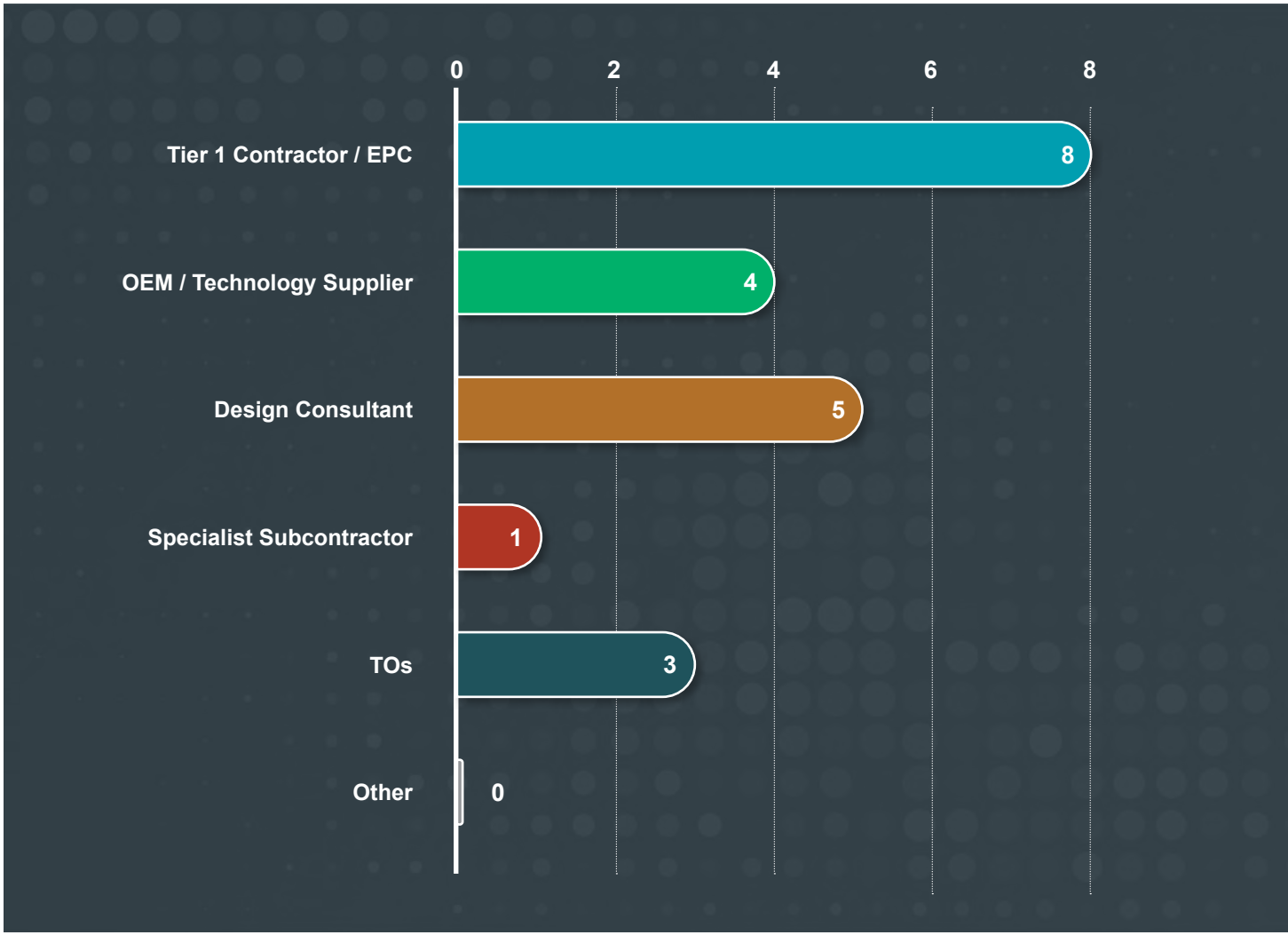
Introduction

The IWOW survey was designed to build an evidence-based picture of how innovation is currently being applied across the UK transmission and distribution sector, and to understand what enables—or inhibits—its adoption at scale.

Responses were received from design consultants, Tier 1 contractors, OEMs and transmission owners, with contributors typically holding senior technical, delivery, innovation or leadership roles. Collectively, the responses reveal a sector that is highly motivated and actively experimenting with new ways of working, particularly in digitalisation, standardisation, automation and modular construction.

However, they also highlight a consistent and important reality: the main constraints on releasing workforce capacity are systemic rather than technical. Technology maturity is rarely the limiting factor. Instead, fragmented specifications, assurance rigidity, commercial disincentives and cultural inertia combine to prevent proven approaches from becoming routine practice.

Respondents were clear that there are no single “silver bullets”. Unlocking workforce capacity requires changes in mindset, behaviours, governance and incentives, alongside technology adoption. Innovation must move from being treated as exceptional activity to being designed into the system by default.



Opportunities:
Proven Pathways to Unlock Workforce Capacity

Across the supply chain, three innovation pathways stand out as already delivering measurable productivity and workforce benefits. These pathways are not speculative; they are in use today. The challenge is scaling them consistently across organisations, projects and regions.

Pathway 1:
Automation, Robotics and Mechanisation

Timescales to impact realisation: 0-2 years

Across the UK supply chain, automation and robotics are already being deployed to reduce reliance on scarce specialist labour, improve safety, and remove people from hazardous environments. These applications most commonly focus on inspection, repetitive site activities, and manufacturing processes rather than full end to end replacement of site delivery.

Examples: Design consultants such as **AtkinsRéalis** described transferring proven robotic and remote operation technologies from adjacent regulated sectors into energy infrastructure, noting that *"we have funded technologies for Nuclear projects… through investment in drone technology and robotics, to remove the need for human intervention in certain fields."* At delivery level, **Tier 1 contractors** reported multiple live applications of automated plant and robotic systems on construction sites: **VINCI Construction** referenced *"trials of driverless excavators, drilling robots and plasterboard cutting robots,"* while Omexom reinforced this direction by highlighting ongoing support for *"robotics, site methodologies and AI to help make site operations more efficient."*

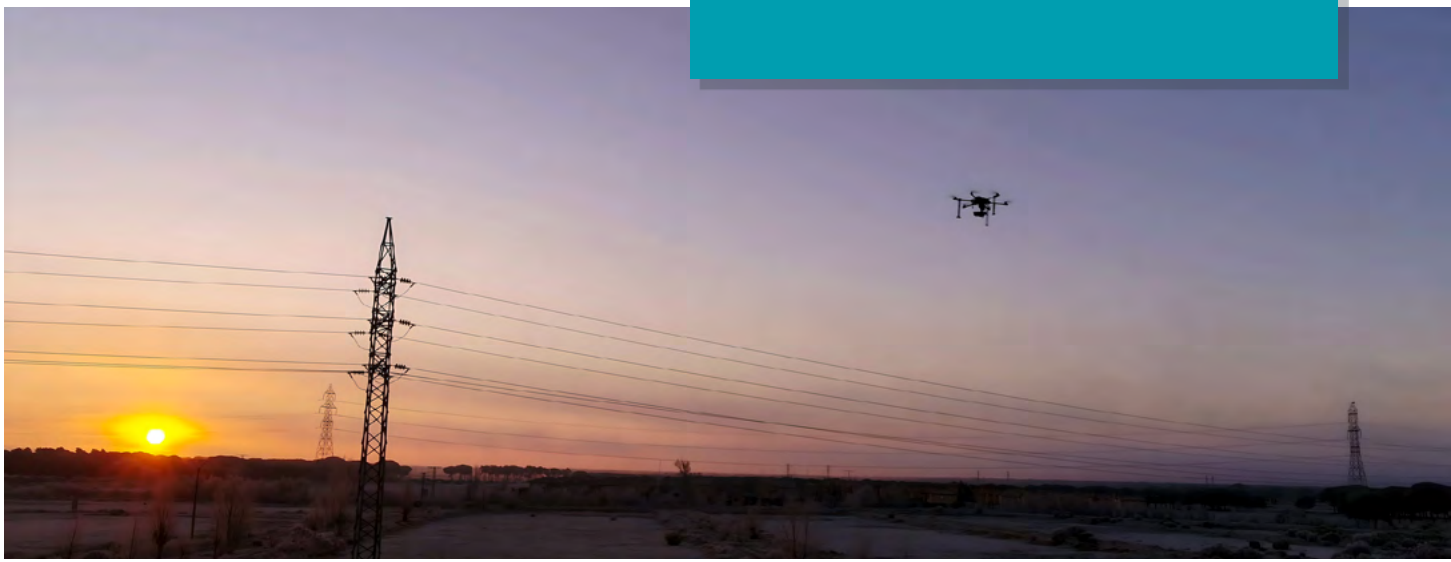
These approaches extend beyond trials into operational deployment, with contractors such as **BAM** describing the use of robotic site monitoring, including *"a mobile robot that uses a scanner to collect data remotely via a private 5G network,"* explicitly reducing the need for personnel in active construction environments.

At operator level, **SSEN Transmission** characterised autonomous inspection not as a future ambition but as an operational capability, citing *"a funded trial involving the installation and testing of an autonomous robotic inspection system… enabling continuous monitoring of HVDC valve halls,"* which directly removes people from high risk locations.

Taken together, these examples demonstrate that automation and robotics are already being used across design, delivery and operation, but remain predominantly task specific rather than scaled as a consistent, system wide capability.

Enablers

- Clear assurance pathways;
- repeat deployment;
- alignment with standardised processes.



Pathway 2:

Standardisation and Modularised Build

Timescales to impact realisation: 2-5 years

Design consultants described standardisation as a means of reducing repeat effort and relieving pressure on assurance and design teams. **AtkinsRéalis**, for example, highlighted the use of *"standardised substation design and asset management – standard specs for as many components as possible,"* emphasising the role of common specifications in improving efficiency and repeatability. **AECOM** similarly noted that they are *"innovating through standardisation and automation of designs,"* explicitly linking this to skills constraints by explaining that these approaches *"optimise resources and constrained skills to allow greater flexibility throughout delivering across the project lifecycle."*

Among **Tier 1 contractors**, standardisation and modularisation are being applied at both system and component level to improve productivity on live programmes. **Murphy Group** cited *"standardisation of our in house precast foundation methodology"* as a practical example of modularisation improving repeatability and efficiency. **Linxon UK** described a more holistic application, noting that *"design standardisation – reusing proven layouts and modularised packages (with off site construction) across the workbook shortens design cycles, compresses site duration and lifts right first time performance."*

From an OEM perspective, respondents were clear that while modular and standardised solutions already exist, misalignment between client requirements is undermining their potential. **GE Vernova** illustrated this challenge by highlighting that *"all specifications for the three TSOs are close but not the same,"* citing even low value variations such as *"GIS in three different colours – white, grey and green."* They linked this directly to manufacturing and delivery efficiency, noting that if specifications were aligned to a single agreed standard, *"this would introduce cost savings during production."*

Enablers

- Workforce capacity is unlocked through a small set of system-level enablers, not isolated initiatives.
- Mandated standardisation and modularisation deliver the biggest gains, enabling design reuse, manufacturing scale and flexible use of scarce skills.
- Proportionate, early assurance must replace late-stage, duplicative challenge.
- Commercial models that reward speed and productivity, not hours worked

Pathway 3:

Digital Tools & AI

Timescales to impact realisation: 5+ years

Digital tools, artificial intelligence, and the automation of design and planning emerged from the IWOW survey as one of the **most established and widely deployed innovation pathways** across the transmission and distribution supply chain. Respondents consistently highlighted that digitalisation removes friction at the **planning and early design stages**, which are increasingly constrained by limited engineering, assurance, and system planning capacity. In contrast to later delivery stages, where labour constraints can sometimes be addressed through additional resource, bottlenecks in planning and design directly cap delivery throughput; digital tools provide a means of increasing output without increasing headcount.

Design consultants in particular reported mature use of **AI enabled design automation, digital twins and data driven optioneering** to reduce manual drafting, eliminate repeated calculations, and accelerate early stage decision making. **Mott MacDonald** described the deployment of digital twins and analytics through its Moata platform to support grid planning and asset performance, noting that these tools are *"developed through to implementation status and embedded into business as usual"*. **AECOM** similarly linked digital automation directly to skills constraints, describing the *"deployment of AI and machine learning to drive standardisation and efficiencies in delivery"* in order to *"optimise constrained skills across the project lifecycle"*.

WSP and **AtkinsRéalis** echoed this, highlighting the use of 3D design systems, digital construction rehearsal, and digital site data to reduce rework and minimise dependence on physical site access during design development.

Across contractors and OEMs, respondents emphasised the role of **digital construction workflows, reality capture and remote access** in reducing demand on scarce specialist resource. **Linxon UK**, for example, described early adoption of digital tools such as OpenSpace 360° and AI driven analytics to enhance coordination and compress delivery times, while BAM cited the automation of site and asset monitoring to *"save time and human resource, and avoid risk."* Collectively, these approaches enable senior engineers and assurance specialists to oversee multiple projects in parallel, rather than being embedded within individual schemes.

At transmission owner level, digital twin capability is beginning to demonstrate how these principles can be applied at scale. **National Grid's DELIVER (Digital Twin Enabled Innovation for Energy Network Restoration) project**, developed under the ENA innovation framework, provides a live example of how integrated digital models can bring together asset data, operational constraints and scenario planning into a single, visual decision support environment. While DELIVER is focused on network restoration rather than capital delivery, survey respondents recognised its wider relevance: it demonstrates how digital twins can reduce coordination overhead, enable rapid scenario testing, and allow expert input to be applied remotely—capabilities directly transferable to planning, design assurance and delivery sequencing for network expansion.

Taken together, the IWOW survey responses show that digital tools, AI and automated planning are **already delivering tangible workforce capacity benefits,** particularly by relieving pressure on constrained engineering and assurance roles. The remaining challenge is not technological maturity, but the ability of the system to **trust digital outputs, reuse them at scale, and embed them consistently into governance and assurance processes.**

Enablers

- Strong digital and data foundations (interoperable systems, single source of truth).
- Proportionate, early assurance that accepts digital evidence.
- Clear routes from pilot to business-as-usual adoption (e.g. DELIVER to live use).
- Commercial and regulatory incentives aligned to productivity and cycle time, not effort.
- Visible leadership and cross-TSO coordination to normalise digital-first delivery.

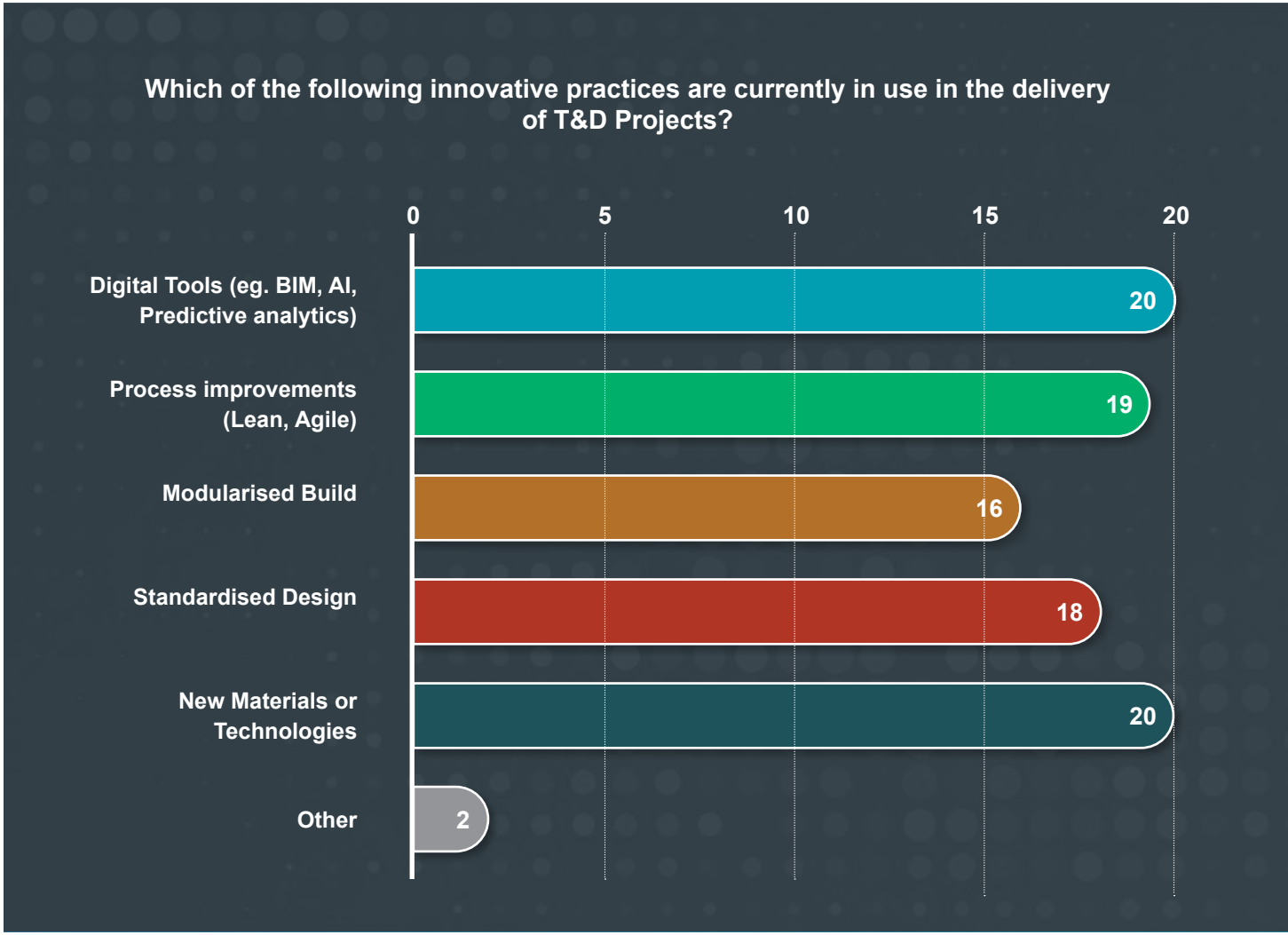
Barriers

Across the Transmission and Distribution supply chain, there is a strong and consistent appetite for innovation. Every organisation participating in the survey reported having a culture of innovation, often embedded in strategy documents, values, and dedicated innovation teams.

Yet, despite this clear intent, the survey reveals a set of systemic barriers that make it difficult for the supply chain to adopt, test, and scale innovative ways of working. The story that emerges is not one of reluctance, but of a system whose processes, commercial structures, and cultural norms constrain the ability to translate good ideas into real world change.

A Gap Between Innovation Funding and On-the-Ground Adoption

One of the most significant themes raised across the responses was the gap between **TSO funded innovation** and the supply chain's ability to deploy those innovations in delivery environments. Several organisations highlighted that while funding mechanisms such as NIA (Network Innovation Allowance) and SIF (Strategic Innovation Fund) support the development of promising technologies, there has been little structured support to transition them into live projects although it is noted that from RIIO T3, Networks will have access to 'SIF Deployment Fund' and will available to bid for to secure funding to deploy innovation meeting certain criteria.



A Tier 1 contractor described this vividly, reflecting the well-known *"Valley of Death":*

> ***We need funding that allows us to offset the negative impact we see on our projects from trialling solutions until they are mature enough to give real value... it's called the Valley of Death for a reason.***

Without dedicated sandboxes, early deployment programmes, or clear pathways for scaling, innovations often stall at the proof of concept stage. Several OEMs and EPCs also noted an overreliance on startups with low technology readiness levels, meaning promising solutions frequently lack the robustness required for integration into major infrastructure programmes.

Commercial Models that Discourage Innovation

Commercial constraints emerged as one of the most powerful inhibitors. Respondents consistently pointed to **risk allocation, cost based procurement, and challenges around IP** as barriers that prevent organisations from trying new approaches. Because most contracts are structured around outputs and milestones, rather than learning and experimentation, suppliers are often disincentivised from deviating from well established processes.

A design consultant summed this up clearly:

> ***Commercial models based on hours and rates do not incentivise upfront investment... participants need a model that rewards speed of deployment, not hours billed.***

Similarly, a Tier 1 contractor highlighted the dilemma of exclusivity:

> ***If innovation is developed with one contractor, it can't scale. But without exclusivity, no contractor can justify investing. So it dies.***

IP protection is another recurring issue. Both OEMs and consultants highlighted concerns about sharing early stage ideas in multiparty forums without clear NDAs or agreed boundaries.

Regulatory and Assurance Processes that Slow Change

Many respondents described the regulatory and assurance environment as **rigid, slow, and risk averse**, making it difficult to introduce new methods or technologies. Technical specifications were repeatedly described as "over prescriptive" or "gold-plated," requiring bespoke designs even when standard solutions might suffice.

Mott MacDonald referenced the burden of assurance processes directly:

> ***Type registration, BP500, and assurance processes constrain innovation... the industry prefers proven methods over novel approaches.***

One OEM offered a concrete example of the way these constraints limit operational innovation:

> ***Spacer robots are used globally but can't be used in National Grid due to regulatory requirements for a specific rubber seal that the robot can't handle***

Across consultants, EPCs, and OEMs, the message was consistent: even where innovation offers clear safety or productivity benefits, the assurance burden can be so high that teams avoid proposing it.

Cultural Resistance and Organisational Inertia

Alongside structural constraints, many survey participants pointed to cultural and behavioural factors. Despite widespread organisational enthusiasm for innovation at the strategic level, delivery teams often operate under intense programme pressure, making experimentation difficult.

WSP noted that tight timescales leave little room for new approaches:

> ***Client processes and reluctance to change... tight programme timescales don't give enough time to think and try anything new***

Similarly, **Siemens Energy** described a long standing cultural pattern across the sector:

> ***Old school engineering culture... proven methods are favoured over new approaches on live networks.***

The perception that *"we won't get through assurance"* was cited by several respondents as a powerful deterrent even to suggesting alternative materials or methods, such as the recurring example of alternative backfill materials to replace cement bound sand.

Skills and Resource Constraints Across the Sector

Many respondents raised concerns about whether the sector has the skilled capacity needed to implement innovations at scale. Although organisations are committed to training, digital upskilling, and cross-sector mobility, specialist talent remains scarce.

AECOM noted that innovation can only progress if the industry addresses skills shortages:

> ***Upskilling/reskilling resources across sectors is needed to address bottlenecks... compliance with existing specifications limits flexibility.***

Other respondents commented on a misalignment between high-level digital ambitions and project-level capability. Several contractors reported pushback when digital or AI based methods were proposed, simply because project teams lacked the time or capacity to adopt them.

Fragmented Data, Tools, and Interoperability

Another clear theme is the fragmented nature of data and digital tooling across organisations. Nearly all respondents referenced digital tools as a major area of innovation, yet many also highlighted the inefficiencies created by incompatible platforms and siloed data environments.

One consultant put this plainly:

> ***Each contractor wants to do their own designs... everyone is investing in their own tools and there isn't a common approach***

This fragmentation creates duplication, makes collaboration harder, and prevents the supply chain from benefiting from automation, AI assisted workflows, or *"design once, deploy many"* approaches at scale.

Recommendations

The recommendations outlined below are designed to close the gap identified through the barriers analysis and unlock the opportunities evidenced in the industry's forward looking ambition. Each action responds directly to the systemic constraints highlighted by the supply chain, fragmented specifications, assurance rigidity, inconsistent innovation pathways, commercial disincentives, and digital fragmentation, while creating the conditions to scale the labour saving, productivity enhancing innovations identified in the Opportunities storyboard.

Taken together, these interventions aim to reduce labour demand at critical pinch points, shorten delivery cycles, and build a more consistent, innovation ready transmission ecosystem ahead of key regulatory milestones such as RIIOT4 and ASTI Wave 2.

Cross TSO Collaboration on Standardised Equipment & Layout Specifications

A coordinated move toward standardised specifications, such as unified switchgear colour coding, consistent GIS layouts, and common substation templates directly addresses one of the most cited barriers: the **overprescriptive, goldplated and highly variable technical standards** that require bespoke engineering, inflate design cycles, and restrict resource mobility across TSOs.

With common specifications in place, OEMs gain the ability to manufacture at scale with fewer changeovers, enabling lower unit cost, shorter lead times, and more reliable sequencing. This unlocks the opportunity for **repeatable, modularised build approaches**, reducing engineering effort by 30–60% and on site specialist labour by 20–35%.

It also reinforces another opportunity: **design once, deploy many**, enabling faster optioneering and reducing the assurance burden tied to bespoke design.

TSO-led Innovation Forum to Define Needs, Funding Pathways & Adoption Routes

This recommendation responds directly to the **lack of structured mechanisms for transitioning ideas from TRL development into delivery** the *"Valley of Death"* described repeatedly in the survey feedback. A clear, shared forum that explains regulatory expectations, funding routes (e.g., NIA, SIF), and adoption pathways helps suppliers understand how to progress ideas without navigating fragmented processes across multiple TSOs.

It unlocks opportunities such as:

- **greater supply chain confidence to invest,**
- **clarity on innovation priorities,**
- **increased pipeline visibility,** and
- optional use of facilities like **Deeside** to derisk technology before deployment.

This transparency reduces wasted labour during multi party assurance cycles and accelerates adoption of automation, digital tools, robotics, and advanced materials.

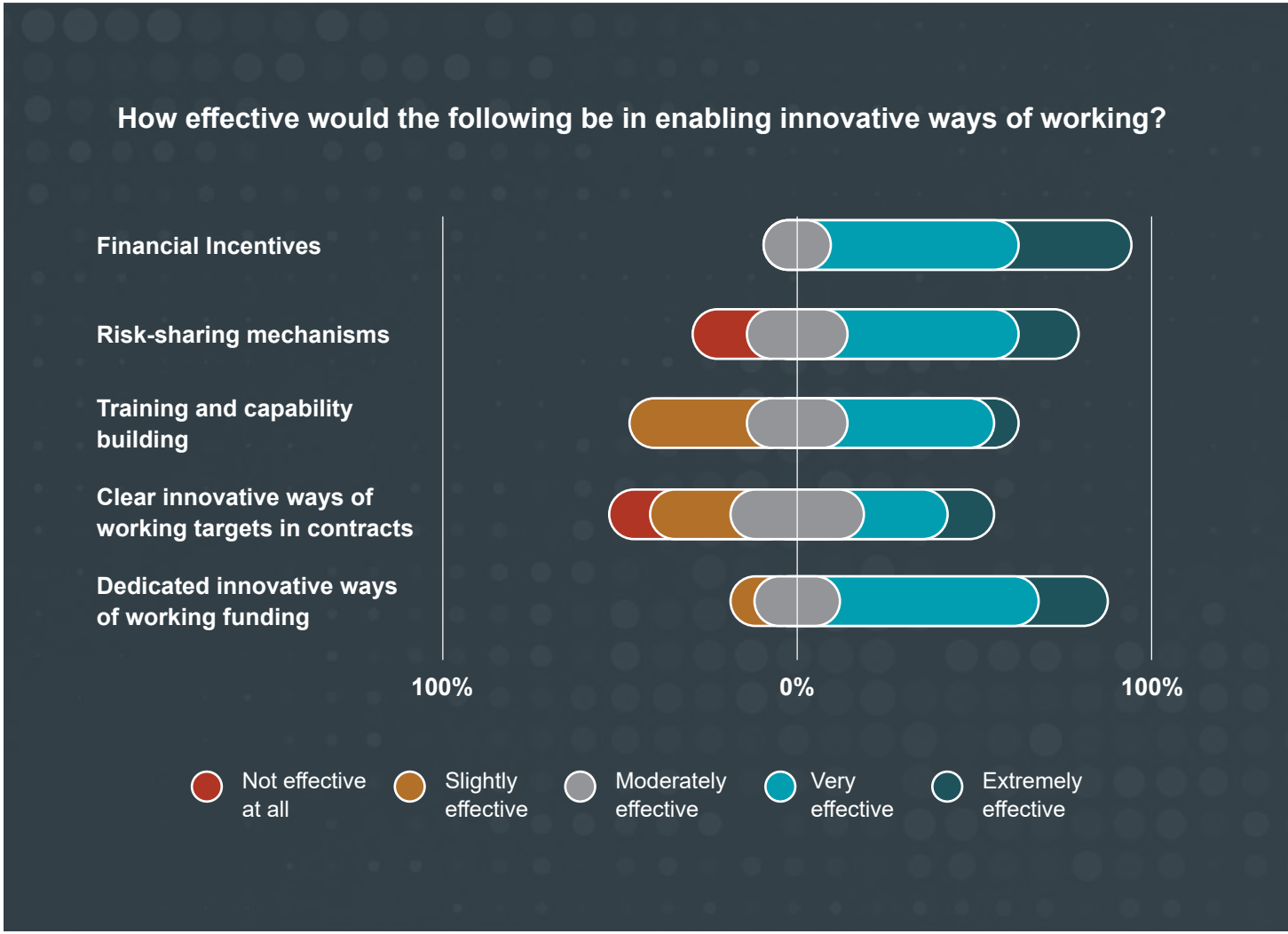
Cross-Utility Innovation Evaluation Working Group

A dedicated working group with representation from technical teams, including SAPs addresses barriers related to **slow, inconsistent or unclear assurance processes**, and concerns around **lack of accountability for timely evaluation.**

It directly counters cultural blockers such as the perception that *"we won't get it through assurance anyway,"* and creates a single mechanism to:

- evaluate proposals,
- provide earlystage advice,
- coordinate multi TSO approvals, and
- reduce the assurance burden by eliminating duplication.

This working group enables the opportunities around **standardised adoption pathways** and **AI-enabled design automation** by offering a predictable environment for progressing innovations through stage gates.



Defined Process for Integrating Innovation Into TSO Project Delivery Plans

This recommendation tackles the barrier of **commercial models that disincentivise innovation**, where speed, value and labour efficiency are not rewarded under traditional costbased procurement. A clearer process classifying projects by innovation appetite and embedding accelerated timelines encourages contractors to propose novel methods (e.g., automation, modular build, AI assisted design).

Setting innovation aligned delivery expectations (e.g., 24 months standard vs. 18 months with validated innovation) incentivises suppliers to adopt labour saving approaches and allows TSOs to select partners based on genuine transformational value.

Reform of Transmission and Distribution Assurance and Stage-Gate Processes to Enable Innovation and Programme Efficiency

Reforming transmission owner and DNO assurance and stage gate processes addresses one of the most persistent structural barriers identified by the supply chain: **slow, burdensome and risk averse governance environments**. Across the sector, assurance frameworks often concentrate challenge late in the lifecycle and apply uniform evidence requirements regardless of risk, creating friction for proven innovations with clear safety and productivity benefits (for example **National Grid** Electricity Transmission TP500, **SSEN Transmission** technical assurance processes, **SP Energy Networks** engineering assurance processes, and **DNO** design approval and technical governance processes used by organisations such as **National Grid Electricity Distribution** and **UK Power Networks**).

Reallocating activities to more appropriate stages, removing unnecessary duplication, and applying **proportionate, risk based evidence requirements** would significantly ease the adoption of new methods without compromising asset integrity or safety.

This directly enables opportunities including:

- automation and digitalisation of early stage design,
- AI enabled optioneering and planning,
- reuse of standardised and modular layouts,
- reduction in engineering rework and repeat assurance effort.

More agile and aligned assurance frameworks across Transmission Owners and DNOs would unlock workforce efficiencies, shorten delivery cycles and improve throughput, supporting the sector's need for faster, higher volume delivery through forthcoming regulatory periods, including RIIO T4.

Digitalisation Plan for TSO Assets

A coherent digitalisation programme addresses the barrier of **fragmented tools, noninteroperable systems, and inconsistent data environments** across the supply chain. Poor data foundations prevent the application of AI, digital twins, design automation and remote operations limiting the opportunities highlighted in storyboard 1.

Digitalisation unlocks:

- Remote inspection.
- Automated design and asset modelling.
- Predictive maintenance.
- Improved optioneering and outage planning.
- Reduced rework due to centralised, accurate as built data.

Summary Table:

Recommendations Aligned to Barriers, Opportunities & Timescales

1. Standardised Specifications

Gold plated specs; bespoke engineering; limited resource mobility

Modularisation; design once deploy many; manufacturing efficiency

Immediate → Long-term

2. TSO Innovation Forum

Valley of Death; lack of structured adoption pathways; unclear funding routes

Stronger supply chain investment; clarity on innovation need; use of Deeside

Immediate → Medium

3. Cross Utility Working Group

Slow assurance; inconsistent evaluation; cultural resistance

Faster approvals; aligned expectations; early derisking

Immediate → Long-term

4. Innovation in Delivery Plans

Commercial disincentives; no delivery-route for innovation

AI-enabled design automation; accelerated delivery

Immediate → Medium

5. TP500 Reform

Assurance rigidity; process inertia; slow stage gates

Reduced rework; faster optioneering; clearer evidence pathways

Immediate → Long-term

6. NG Asset Digitalisation

Fragmented tools; siloed data; limited interoperability

Remote ops; predictive maintenance; automated design

Immediate → Long Term

Barriers addressed **Opportunities Unlocked**

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