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LEADERSHIP ROUNDTABLE HOSTED BY

HITACHI

TACKLING THE POWER DEMAND SURGE AND GLOBAL ELECTRIFICATION CHALLENGE

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OUTCOME REPORT

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LEADERSHIP DIALOGUE SUMMARY

CONCEPT

Global electricity demand is surging. As nations race to decarbonise and electrify their economies, the challenge of expanding and modernising power grids has become the central bottleneck to progress. Despite increasing investment in generation, transmission and distribution infrastructure is lagging. This is a threat to climate targets, industrial growth and energy security. BloombergNEF estimates that achieving net zero emissions will require annual global grid investment to increase from $274 billion in 2022 to approximately $871 billion by 2030. Meanwhile, 3,000 GW of renewable projects remain stranded in connection queues worldwide, according to the International Energy Agency (IEA). This roundtable convened senior leaders from utilities, OEMs, policy bodies, financial institutions and multilateral organisations to chart solutions. Discussions focused on strategic priorities, including grid flexibility, supply chain bottlenecks, financing models and the role of innovation in building more responsive, resilient infrastructure.

INTRODUCTION

Held under the Chatham House Rule at the 2025 World Utilities Congress, this roundtable brought together senior leaders from 20 global organisations for a high-level dialogue chaired by Neil O'Keeffe, Middle East Energy, Utilities & Resources Leader at PwC. This report was authored by PwC in close collaboration with Hitachi Energy to capture and share the most critical insights that emerged from the discussion.

The discussion reflected both regional and global perspectives, including sharp electricity demand growth in the Middle East, rising AI and data centre loads, and the growing urgency of enabling large-scale renewable energy integration. It was evident from the discussion that energy infrastructure plays a more central role in societal progress today than at any time in the past 50 years. This outcome paper summarises the key themes, takeaways and reflections from the session.

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EXECUTIVE SUMMARY

ADDRESSING THE ENERGY TRILEMMA

Power systems face three competing pressures: sustainability, affordability, and security, with grid development at the centre. Renewables supplied 32% of global electricity in 2024 and are projected to reach 46% by 2030. Electrification of transport, buildings, and heavy industry is intensifying demand, with Abu Dhabi's electricity needs alone expected to triple by 2030. "This growth cannot succeed without system flexibility," noted a participant. A sudden 700 MW drop in solar output from fast-moving clouds can trigger instant backup demand, exposing grid fragility. Stability requires a mix of renewables and backup energy, supported by battery storage, digitalisation, and power electronics such as synchronous machines and grid-forming inverters. Private capital is rapidly funding renewables, but regulatory frameworks remain a key hurdle. Participants emphasised that while technology and investor appetite exist, regulations must evolve to keep pace.

GRID MODERNISATION AND FLEXIBILITY

Legacy transmission systems are too small, old, and rigid to meet future demand, and traditional expansion strategies are no longer sufficient. Intelligent, digitally managed, and hybrid grids must be developed to keep pace. "In some regions, infrastructure is the main bottleneck, while in others, digital maturity limits growth," noted a roundtable participant. In the UAE, rapid demand growth from data centres, EV deployment, and rooftop solar has created unprecedented strain on local distribution systems.

> We need to take a long-term view. In Abu Dhabi, we are targeting net zero by 2050, and we're looking closely at the infrastructure required to deliver it. While 2050 may seem far off, the numbers are staggering—we expect demand to possibly triple. Electrification is a key driver, alongside emerging factors we couldn't have predicted just 18 months ago, such as the rapid growth of data centres - *Unattributed quote.*

Supply chain bottlenecks, regulatory fragmentation, and copper shortages (30% by 2035) pose major risks. Long-term planning, investments in manufacturing capacity, and R&D are underway, but further coordination is needed.

Grid flexibility emerged as a key theme. Cross-border interconnectivity, AI-driven automation, and software-based controls are essential to manage volatile and decentralised loads. Participants also highlighted that cybersecurity must be a core design requirement as grids become increasingly digitised. “We need smarter, more adaptable grids to keep pace with rising demand,” shared another participant.

TECHNOLOGY, DIGITALISATION AND INNOVATION

Innovation is the defining lever in building smart, resilient, and scalable energy systems. Participants highlighted AI, machine learning, and digital twins as game-changers for real-time forecasting, diagnostics, and predictive maintenance. Advanced grid-forming technologies like virtual synchronous machines will ensure stability in low-inertia systems, while cloud-based platforms will connect distributed assets for a dynamic power ecosystem. Cost efficiency was also addressed, with innovations in cable manufacturing potentially cutting prices by 20%—from US$100 to US$80 per metre—through standardisation and process optimisation. This, attendees noted, highlights technology’s dual value: resilience and economic gain. Speakers added that digital capability is key to attracting young talent, who are drawn to industries building smart, connected, and fast-moving systems over traditional sectors.

> Speed is critical if we want to make things happen. Investing more, and at a larger scale, is essential—but flexibility is key, and more storage is vital. The question is, how do we pay for that flexibility? We must create the right incentives to enable investment - *Unattributed quote.*

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FINANCING AND POLICY FRAMEWORKS

Mobilising the trillions required for global grid upgrades depends on creating investment environments that de-risk infrastructure projects and provide long-term certainty. Participants noted that, although private capital is available, it remains underutilised due to unclear regulatory frameworks and limited pipeline visibility. Several contributors advocated blended finance structures, green bonds, and expanded public-private partnership (PPP) models to accelerate deployment and reduce reliance on public capital expenditures (capex).

Permitting backlogs and regulatory delays were identified as key structural risks. A key concern raised was that projects are increasingly delayed not because of technical complexity, but due to institutional inertia. Current frameworks often reflect legacy system thinking and require reform to support integrated planning across generation, transmission, and digital infrastructure.

The discussion also underscored the importance of cross-border regulatory alignment, with harmonised approaches seen as essential to shortening deal cycles, boosting investor confidence, and unlocking economies of scale.

> Electrification is unstoppable—renewables will rise from 30% to 60% of the energy mix by 2030, driven by strong economics and business momentum. To go further, we need smarter risk-sharing, modernised procurement, and regulations that match ambition. Public sector leadership, coupled with ecosystem-wide rethinking, is essential to unlock capital, grid upgrades, and digitalisation - *Unattributed quote.*

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SUPPLY CHAIN AND MATERIAL ACCESS

Grid buildout faces major supply-side hurdles. Procurement for transformers and HV cables can take years, while new factory capacity requires 3–4 years to ramp up. Copper demand is set to surge by 2035, adding further strain. Participants noted that beyond material shortages, fragmented standards and incompatible products slow deployment. They welcomed global investments in manufacturing and R&D—Hitachi Energy alone has committed US$3 billion (2021–2024) and plans a further US$6 billion by 2027. However, standardisation, demand signalling, and early-stage coordination were seen as essential to align infrastructure readiness with accelerating energy demand.

CUSTOMER AND MARKET ENGAGEMENT

Empowering end users is increasingly viewed as a foundational component of grid design. Consumer participation—through demand response, behind-the-metre generation, and community solar—will be key to balancing variable supply and managing price volatility. Affordability was raised repeatedly, with several attendees stressing that rising energy costs could erode public support for net zero policies and dampen investor confidence. The discussion highlighted that the energy transition must ultimately deliver tangible benefits to end users; without this, its long-term success could be at risk. Market design must evolve to accommodate variability, decentralisation, and bidirectional power flows. Innovative contracting and smarter allocation of risk will also be needed to reduce financing hurdles and encourage wider participation.

GLOBAL COLLABORATION AND SYSTEMIC RISK

The scale and complexity of the energy transition demand unprecedented cooperation. Energy security challenges are evolving—from gas dependency to critical minerals, digital infrastructure, and geopolitical fragmentation. Participants underscored the need for integrated planning, aligned investment strategies, and the use of global rather than local or regional standards to ensure better harmonisation. Without coordination, infrastructure duplication and delivery delays are inevitable. Collaboration platforms—including academic partnerships, public-private forums, and multilateral institutions—were recognised as essential for sharing knowledge and scaling innovation. The discussion emphasised that building the grid of the future will require collective effort, as no single entity can achieve it alone.

A LOOK AT THE FUTURE

Grids are the backbone of the net zero economy, and ensuring their readiness is both a technical and societal imperative. The roundtable concluded with a unified call to bring the grid from the background to the centre of energy strategy; it is clear that without urgent, coordinated investment, the current trajectory is unsustainable.

Governments, utilities, industry and investors must act to deliver:

- Long-term, technology-enabled grid strategies
- Capital models that unlock private and multilateral financing
- Regional interconnection for system balancing as well as increased resilience, sustainability and integration of renewables
- Strong digital and cybersecurity frameworks
- Clear and harmonised policy environments

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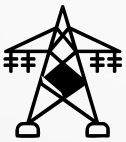
CONCLUSION AND CALLS TO ACTION

Transmission investment is lagging
Current spending must increase from US400$bn to over US600$bn annually



Grid flexibility is the new constraint
Capacity alone will not deliver system stability or reliability

Standardisation and digitalisation are essential
To reduce costs, shorten timelines and scale innovation

Private capital is available
But policy certainty, risk-sharing, and regulatory reform are needed to unlock it

Supply chains must be secure
Through greater visibility across the order pipeline, supported by longer-term, coordinated, and holistic planning

Customer engagement matters
Affordability and social licence are vital to success

Global collaboration is critical
Fragmented planning will undermine climate and energy security goals

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Yas Creative Hub Yas Island Tower 4 , Level 6
Office C40-L06-10, PO Box 769256, Abu Dhabi, UAE

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5th Floor, The Palladium Tower, Cluster C, Jumeirah Lakes Towers, Dubai, UAE