Understanding the Digital Infrastructure–Energy Connection

Framing Paper for Digital – Energy Nexus Working Group

Purpose

The purpose of this paper is to help energy-sector stakeholders, regulators, policymakers, and industry participants better understand the factors that shape digital infrastructure and the role energy plays within that ecosystem. It is intended to frame discussion within the Working Group.

As digital economies continue to evolve, energy and digital infrastructure are becoming increasingly interconnected. At the same time, digital infrastructure should not be viewed as a single asset with a single set of requirements. Different digital services create different infrastructure needs, different energy demands, different resilience requirements, and different geographic considerations.
The objective is to provide a set of lenses through which we can discuss the connection of Digital Infrastructure and Energy and better understand where energy, digital infrastructure, regulation, investment, and geography intersect.

This is important because discussions around digital infrastructure often gravitate toward a single topic, such as data centres or AI. While these are important components of the ecosystem, they represent only part of a much broader picture.

The challenge for all of us is to understand not only what digital infrastructure exists, but what digital services we are trying to support, what infrastructure those services require, what role energy plays in enabling them, and how countries and regions can align their digital ambitions with their energy realities.

1. Start with Digital Demand

Before we discuss energy requirements, we should first understand the digital services we are trying to support. Digital infrastructure develops in response to demand. Governments, enterprises, communities, and individuals increasingly rely on digital services, but not all digital services are the same.

A useful starting point is therefore to ask:

- What digital services are required?
- Where are those services needed?
- Who will consume them?
- What performance requirements do they have?
- How close must those services be to end users?
- Are these services intended primarily for domestic consumption, international markets, or both?

The answers matter because different forms of digital demand create different infrastructure requirements. Some services can be delivered from significant distances. Others require close proximity to users. Some require substantial computing capacity meaning more power usage. Others depend primarily on reliable connectivity and uninterrupted service delivery.

For example, some digital workloads can be delivered remotely from another region or even another continent. Other digital services require proximity because latency becomes a critical factor. In some cases, users may never know where a service is being delivered from. In others, distance may directly affect performance.

For energy stakeholders, understanding digital demand is often the first step in understanding future infrastructure requirements. The discussion should therefore begin with the digital services we are trying to support, rather than the infrastructure itself.

How can energy planning better align with the digital services that governments, enterprises, and societies are seeking to develop?

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2. Digital Infrastructure Is Not a Monolith

One of the challenges in discussions around digital infrastructure is that it is often treated as a single category. It is not. Data centres are an important component of digital infrastructure, but they represent only one part of a much larger ecosystem.

That ecosystem includes:

- Data centres
- Hyperscale computing facilities
- AI training infrastructure
- AI inference infrastructure
- Internet exchanges
- Cable landing stations
- Terrestrial fibre networks
- Metropolitan connectivity infrastructure
- Regional transport networks
- International transport networks
- Submarine cable systems

Each of these elements plays a different role in the delivery of digital services. Each has different requirements for energy, resilience, regulation, and location. Some parts of the ecosystem are focused on processing data. Others are focused on moving data. Some are highly energy intensive. Others consume comparatively little energy but are critically dependent on continuity and resilience.

Understanding these distinctions is important because a single approach to planning, regulation, or energy provisioning may not adequately reflect the diversity of the digital infrastructure ecosystem.

If digital infrastructure is not a monolith, then neither are its energy requirements. Are we sufficiently distinguishing between the different infrastructure layers that support digital services?

3. Availability and Stability Are Not the Same Thing

Not all digital infrastructure requires the same thing from energy systems. Some digital infrastructure requires large amounts of energy. In these cases, the discussion often centres around energy availability and capacity. This certainly encompasses the Data Centers.

Examples include:

- AI training environments
- Large-scale computing facilities
- Certain hyperscale deployments

Other forms of digital infrastructure may consume comparatively modest amounts of energy but depend on uninterrupted operation. In these cases, stability, continuity, resilience, and recoverability may be just as important as capacity itself.

Examples include:

- AI inference infrastructure (edge, close to the user)
- Cable landing stations
- Connectivity hubs
- Internet Exchanges
- Terrestrial transport routes
- Edge infrastructure supporting real-time applications

Some digital infrastructure may be constrained by the amount of energy available. Other digital infrastructure may be constrained by the quality, resilience, and continuity of the energy supply. As digital services become more deeply embedded in economies and societies, both dimensions become increasingly important.

Should energy planning for digital infrastructure consider energy availability and energy stability as separate but equally important requirements?

4. Keeping the Digital Economy Connected

Digital services do not simply sit inside a data centre. They move. A digital service may pass through local access networks, metro infrastructure, regional transport routes, Internet exchanges, data centres, cable landing stations, terrestrial corridors, and submarine cable systems before reaching an end user.

The digital economy therefore depends not only on where data is processed, but also on how data moves. Every part of this infrastructure chain must remain operational. This is particularly important because digital services increasingly support critical functions across government, healthcare, finance, education, industry, and society.

For energy stakeholders, this introduces a broader perspective. Powering the digital economy is not solely about powering computing infrastructure. It is also about ensuring the continuity and resilience of the systems that keep digital services moving across cities, countries, and continents. In other words, keeping the digital economy lit involves more than data centres. It also means ensuring that the infrastructure connecting users, businesses, governments, and markets remains operational.

Which elements of digital infrastructure are most critical to maintaining continuity of digital services, and how should they be reflected in energy planning?

5. Geography Matters

Every country starts from a different position. Some have abundant energy resources. Some have strong connectivity. Some have modern and resilient grids. Some have access to significant capital and investment. Others are still developing these foundations.

Understanding where a country stands today is often the starting point for understanding what digital infrastructure can realistically be developed tomorrow. Not all countries or regions will develop identical digital infrastructure profiles. Some locations may emerge as centres for large-scale computing and AI training. Others may focus on connectivity, interconnection, enterprise services, AI inference, digital content delivery, or other digital activities.

The infrastructure requirements of a digital society may therefore differ significantly from one country or region to another. This is not necessarily a weakness. It is simply a reflection of different starting points, different priorities, and different opportunities.

The objective should not necessarily be to replicate another country's development model unless it fits your strategy. Rather, it may be to understand which opportunities align with local strengths and where partnerships can help bridge gaps. Future digital infrastructure development seems to be built using partnerships even across different sectors. The energy sector is one of the partners we increasingly see in digital infrastructure development.

How can countries identify digital infrastructure opportunities that align with their geographic, economic, connectivity, and energy characteristics?

6. Energy Profiles Shape Digital Development Pathways

Not all countries start from the same energy position. Some have access to abundant renewable resources. Others may have strong nuclear generation, hydroelectric power, natural gas, or a mix of energy sources. Some benefit from modern and resilient grids. Others may still be investing in transmission capacity, resilience, or modernization. These differences matter because they may influence the types of digital infrastructure that can realistically develop within a country or region.

When discussing digital infrastructure, the question is not simply how much energy is available. It is also:

- What types of energy are available?

- How resilient is the grid?
- How stable is the supply?
- How quickly can additional capacity be added?
- What level of redundancy exists?
- What investments are required to support future growth?

Some locations may naturally support energy-intensive digital infrastructure. Others may be better positioned to support digital services that rely more heavily on connectivity, interconnection, enterprise demand, or proximity to users.

This is why energy should not be viewed solely as a response to digital development. In many cases, energy characteristics help shape digital development itself. A country's digital development path may be influenced by the energy resources it can access, the resilience of its grid, and the investments it chooses to make in future energy capacity. This creates an important opportunity for dialogue.

Energy stakeholders, regulators, infrastructure operators, investors, and enterprises all have a role to play in understanding where digital demand is emerging and what infrastructure may be required to support it. In some cases, digital ambitions may drive investment in energy systems. In others, investment in energy systems may create new opportunities for digital infrastructure development. The relationship works in both directions.

How can countries align their energy strengths, infrastructure investments, and digital ambitions to support long-term economic development?

7. Importers and Exporters of Digital Services

Not every country will play the same role in the digital economy. Some may become major producers of digital services. Others may focus on consuming, exchanging, or enabling those services. Some may host large-scale computing environments. Others may focus on connectivity, interconnection, enterprise ecosystems, AI inference, or access to international digital services.

The important question is understanding where a country is today and where it wants to go tomorrow. Digital services can increasingly be produced in one location and consumed in another. The energy required to create a digital service may be geographically distant from the location where that service is ultimately used.

As a result, countries and regions may occupy different positions within the digital economy. For some countries, the priority may be developing the infrastructure needed to produce digital services. For others, the priority may be ensuring resilient access to services produced elsewhere while continuing to advance their own digital capabilities.

What factors influence whether a country becomes an importer, exporter, or exchange point for digital services, and what infrastructure & energy implications follow?

8. International Dependencies and Cross-Border Infrastructure

Digital infrastructure is increasingly international. Digital services routinely cross municipal, regional, and national boundaries. Data may traverse multiple networks, interconnection points, cable landing stations, terrestrial routes, and submarine cable systems before reaching an end user. As digital economies become more interconnected, dependencies extend beyond domestic infrastructure.

This raises important questions:

- Which infrastructure assets are nationally important?
- Which infrastructure assets are regionally important?
- Which infrastructure assets require international cooperation?
- How should resilience be considered when critical digital services depend on infrastructure located beyond national borders?

For many countries, digital resilience will increasingly depend not only on domestic infrastructure, but also on trusted international infrastructure and trusted regional partners. This is particularly relevant for the Atlantic economy, where digital services, infrastructure, energy systems, and economic relationships increasingly cross borders. And the future seems destined to develop the Atlantic economy including digital infrastructure & data movement further south away from the congested northern Atlantic segment.

What cross-border digital infrastructure should be considered strategically important to the resilience of the Atlantic economy? How can we best coordiante energy supply & stability for this infratructure?

Emerging Considerations: Enterprise Sovereignty and Data Flows

As digital services become increasingly international, some enterprises are placing greater emphasis on sovereignty, control, and predictability (we also see high interest in data sovereignty in the public sector).

Historically, the transition from on-premises infrastructure to cloud environments often involved transferring greater responsibility for infrastructure management to third-party providers. Increasingly, enterprises are re-evaluating how much control they have over the infrastructure on which their operations depend.

This is contributing to growing interest in enterprise sovereignty—the ability to influence where data is processed, where it is stored, how it moves between jurisdictions, and which providers are involved in delivering critical services.

For some organizations, these considerations are driven by compliance requirements. For others, they are increasingly viewed as matters of operational resilience, risk management, and business continuity.

As a result, questions surrounding jurisdiction, trusted infrastructure, data flows, routing control, and digital autonomy could play a growing role in future infrastructure investment decisions. These considerations may influence where digital infrastructure is developed, how digital services are delivered, and where future energy demand emerges.

To what extent might enterprise sovereignty, jurisdictional control, and trusted data flows influence future digital infrastructure development and associated energy requirements?

9. The Five Pillars of Digital Infrastructure Development

Digital infrastructure rarely develops because of a single factor. Digital hubs typically emerge through the interaction of five foundational pillars:

- Infrastructure
- Business ecosystems
- Regulation
- People and Talent
- Capital

Together, these pillars influence whether digital infrastructure investment occurs and how digital ecosystems evolve. Energy interacts with all five. Infrastructure cannot scale without energy. Business investment is influenced by reliable and predictable energy environments. Regulation shapes both digital and energy development. Capital often follows locations where infrastructure risks are manageable. Growing digital ecosystems attract people and skills when the broader environment supports sustainable growth.

Countries and regions will not progress through these pillars at the same pace or in the same sequence. Understanding where a country sits across these pillars may help stakeholders better understand future digital infrastructure and energy requirements.

Energy should therefore not be viewed solely as a supporting utility. It is one of the enabling layers that can influence how quickly and how far a digital ecosystem evolves.

How can energy stakeholders contribute not only to supporting digital infrastructure, but also to shaping the conditions that enable future digital development?

10. The Role of Public–Private Collaboration

The digital development direction of a country or region is unlikely to be determined by the public sector or private sector alone. The development of globally recognized digital infrastructure has often been shaped through cooperation between governments, regulators, infrastructure operators, utilities, investors and enterprises.

This is particularly evident where infrastructure serves broader economic, resilience, connectivity, or strategic objectives.

Examples include:

- Submarine cable systems
- Cable landing stations
- Cross-border connectivity corridors
- Strategic interconnection infrastructure
- Regional resilience initiatives
- Digital hub development

As digital infrastructure and energy systems become increasingly interconnected, closer collaboration between the public and private sector could help align digital ambitions with practical infrastructure realities. Such collaboration could help stakeholders identify where future demand is emerging, what infrastructure will be required, and what investments in energy systems, connectivity, resilience, or regulation may be needed to support long-term development.

What forms of public-private collaboration are needed to support both digital infrastructure development and long-term energy resilience?

Key Takeaways

Digital infrastructure is not a monolith and therefore neither are its energy requirements, development pathways, or policy needs.

Different digital services create different infrastructure requirements. Different infrastructure layers create different energy requirements. Different geographies create different development pathways. At the same time, energy systems do more than support digital infrastructure. Their characteristics may influence which forms of digital infrastructure emerge, how they develop, and how quickly digital economies evolve.

Digital demand drives infrastructure requirements, while energy capabilities help shape digital development opportunities.

Not every country begins with the same foundations. Differences in energy resources, grid maturity, connectivity, regulation, investment, and digital demand can all influence how digital infrastructure develops.

Understanding these starting points may provide useful context for discussions around energy supply, investment priorities, public-private collaboration, and the future development of the Atlantic digital economy.

If digital infrastructure is shaped by digital demand, and digital development is influenced by the characteristics of the energy ecosystem, how can public and private partnerships ensure that the Atlantic economy remains resilient, connected, trusted, and capable of supporting future digital growth?

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