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WORLD ECONOMIC FORUM

Grid Development in Europe: Five Actions to Strengthen the Business and Economic Case

BRIEFING PAPER

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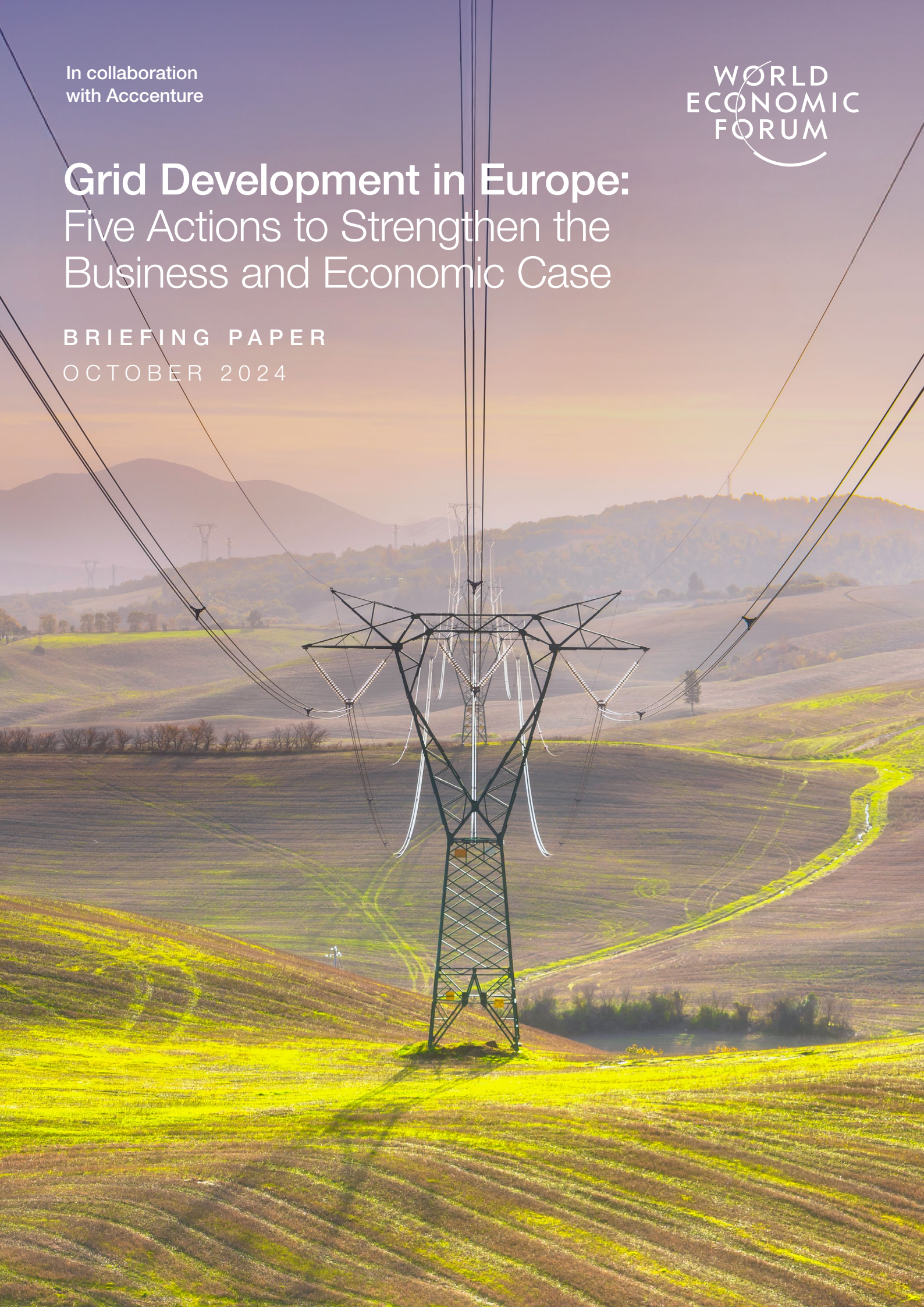

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Insights from the European Grids Roundtable organized by the World Economic Forum in collaboration with the European Network of Transmission System Operators for Electricity (ENTSO-E) and the International Energy Agency (IEA).

Introduction

Unlocking the business and economic case for investing in grid modernization and expansion is key to driving Europe's Net Zero transition.

This paper proposes five actions to boost the economic and business case for grid development in Europe. It presents case studies with best practices, highlighting what works well and may serve as inspiration for other countries and geographies.

As the world moves towards Net Zero goals, investments in grid expansion and modernization are becoming imperative for the clean energy transition. To stay on track to meet net-zero emissions by 2050, grid investments must double from their current level to over $750 billion per year by 2030.[1] By 2050, the total grid length must more than double to up to 166 million kilometres, and half of the existing grids must be replaced.[2]

Meanwhile, many wind and solar projects are waiting for a grid connection in Europe today.[3] Acceleration requires innovation in approaches to regulation, coordination and collaboration across the value chain.

In November 2023, the European Commission (EC) published the EU Grid Action Plan[4] to accelerate grid development and the investments needed. The EC is implementing this plan together with countries and businesses. However, investment is only possible if there is a sound **business case**, resulting in benefits for the investor.

While the nature of the business case will vary across the value chain, the challenges are common. They include delays in permitting and approval, a lack of skilled workers, supply chain issues and regulatory uncertainty. These glitches threaten the robustness of the business case and delay investments in grid development and manufacturing capacity.

At the same time, grid investments can create significant benefits beyond business value. These include job creation, economic growth, sustainability and security of supply. Collectively, this value constitutes the **economic case**, which in turn can be used to strengthen and steer the individual business cases.

Strengthening the business and economic case for grid development was the topic of a roundtable dialogue hosted by the World Economic Forum in collaboration with the European Network of Transmission System Operators (ENTSO-E) and the International Energy Agency, supported by Accenture. Participants included transmission and distribution system operators, technology providers, and government and regulatory representatives. The dialogue highlighted the need for viable business cases, including returns at least comparable to alternatives, a manageable level of risk, and lifting of boundary restrictions on resource availability. Additionally, the need for a strong economic case to justify the cost of funding and to steer investments was also emphasized.

This paper proposes **five actions** to boost the economic and business case for grid development in Europe. It presents case studies with best practices, highlighting what works well and may serve as inspiration for other countries and geographies.

TABLE 1 **Five actions to boost the economic and business case for grid development in Europe**

	Action 1 Assess grid investments holistically	Action 2 Improve the attractiveness of grid-related investments	Action 3 Rethink consumer tariffs	Action 4 Adopt a comprehensive approach to network planning	Action 5 Accelerate infrastructure delivery
Governments	Driver[5]	Driver	Driver		Supporter
Regulators	Driver	Driver	Driver	Supporter	Supporter
Grid operators	Supporter	Supporter	Supporter	Driver	Driver
Technology providers				Supporter	Driver
Financial institutions		Driver			
Large energy consumers			Supporter	Supporter	

Action 1

Assess grid investments holistically

Governments can strengthen the economic case for grid development by accounting for the costs of inaction as well as the broader societal benefits.

Governments can strengthen the case for grid development by making a comprehensive economic case. This approach requires that the direct impacts and the costs of a delayed energy transition due to "non-action" be included in the business case. These include the cost of renewables curtailment due to grid congestion, the cost of stranded renewable assets awaiting connection permits, and the annual cost of delayed electrification in terms of fossil fuel imports.

In addition, decision-makers must also consider the indirect benefits from a system value perspective, including economic, technical, societal and environmental considerations. Examples include job creation, skill development, health improvements, higher economic growth and resilience against extreme weather events. This is particularly important when justifying anticipatory investments,[6] which are typically based on projections of future needs rather than traditional investments supported by connection requests.

CASE STUDY 1

ARERA regulatory framework for grid development in Italy

The Italian energy regulator ARERA recently deployed a new approach aimed at supporting investments in grid development.[7] Distribution System Operators (DSOs) can present investment plans that have specific objectives, such as increasing resilience to extreme weather events and expanding grid capacity for renewables.

These plans must demonstrate positive cost-benefit outcomes based on a predefined methodology. A wide range of benefits are considered, such as the variation of the infrastructure risk index *before* and *after* the resilience intervention, the economic value of lost load (VOLL), and the number of consumers benefitting from the project.

This ensures a system value perspective for assessing grid investment beyond a strictly financial return-on-investment approach.

Action 2

Improve the attractiveness of grid-related investments

Regulators can enhance grid investments by streamlining processes, ensuring adequate returns and anticipating future needs.

Regulators can make investments more attractive to grid operators while protecting affordability for electricity consumers. Potential actions include:

1. Prioritizing the streamlining of permitting procedures to ensure timely utilization of capital and quicker returns. Today, permitting processes for transmission grids can take up to 10 years.[8] Expanding timelines can lead to delayed commissioning and create uncertainty, directly affecting cash flows and reducing returns.

2. Defining adequate regulated rates of return, aligned with the cost of capital, to secure long-term financing for the required grid investments. As energy regulations differ between countries, regulators can consider peer-group analysis in this process.

3. Making anticipatory investments more attractive by acknowledging and factoring in the possibility that assets could occasionally remain underutilized for years and, in rare cases, even become stranded. A forward-looking regulatory environment can make the total needed grid investment up to 10% more efficient.[9]

4. Adapting the duration of price control periods, or exploring other methods, to cater for variability in future energy and supply-chain scenarios. The fast pace of developments in the energy transition may lead to new insights that can impact the size and type of investments required of the grid operator.

5. Enhancing public funding participation in investments that are essential for the future energy system, to de-risk private debt financing and encourage more private-sector involvement.

CASE STUDY 2

RIIO regulatory framework in the United Kingdom

RIIO (revenue = incentives + innovation + outputs) is a new price control framework in the United Kingdom (UK), managed by the regulator Ofgem. RIIO includes multi-year rate plans, typically spanning eight years. This long-term perspective provides utilities with the stability needed to plan and execute large infrastructure projects, reducing the risk associated with short-term regulatory changes.

Mid-period reviews known as “reopeners” allow for adjustments to the price control based on changes in the market or policy environment, including technological advancements or shifts in energy demand. The framework aims to deliver consumer benefits of over £2.8 billion, supporting bill reductions and accelerating the UK’s journey towards net-zero emissions.[10]

Action 3

Rethink consumer tariffs

Redesigning regulatory and tariff structures can optimize grid capacity use, reduce transition costs and improve energy costs for consumers.

Given the scale of investment required and its likely impact on customer affordability, redesigning regulatory and tariff structures can encourage more optimal use of existing capacity and lower the overall energy transition cost. Actions could include:

- Using real-time pricing, location-based pricing models and power- (vs. consumption-) based pricing to increase the efficiency of grid capacity use and reduce the impact on tariffs.
- Making sure that grid capacity pricing signals are not counteracted by other incentives, such as price signals from energy providers, to address customer behaviour and minimize balancing costs.
- Rebalancing non-energy-related costs currently included in electricity tariffs to alternative taxation mechanisms, to ensure that electrification is not delayed.

CASE STUDY 3

Capacity tariffs in Flanders, Belgium

In January 2023, Fluvius, the DSO for the Belgian region of Flanders, in concert with regional energy regulator VREG, changed the distribution tariffs in the region from mostly volume-based (kilowatt-hour, or kWh) towards capacity-based (kilowatt, or kW).[11] After the first year, a study conducted by the grid operator showed that this tariff change did not increase the cost to households, and importantly, it resulted in an 8.3% more efficient use of the grid and a reduced need for new infrastructure.[12]

Action 4

Adopt a comprehensive approach to network planning

Grid planning could adapt to growing electrification demand by expanding collaboration, extending time horizons and integrating flexibility.

Grid planning is increasingly challenged to accommodate increasing demand for electrification, renewable supply and flexibility resources. It can be optimized across the following dimensions:

1. Expanding planning across countries, energy vectors (electricity, gas and hydrogen) for system optimization and resilience, and grid levels (transmission and distribution).

2. Expanding planning horizons beyond the traditional 10-year time frame, to align with 2040 and 2050 decarbonization goals in national energy and climate plans.[13] A longer-term view may contribute to more efficient plans for grid development by capturing longer-term needs such as the tail end of industrial electrification or long-term investment such as in nuclear power.

3. Enhancing the integration of flexibility in long-term planning to support to transition to the 2050 energy system. Better integration can smoothen the price curves, and can reduce unnecessary curtailment and dependency on fossil fuel-based generation for times when renewables are not available.

CASE STUDY 4

Integral Programming Infrastructure in the Netherlands[14]

In the Netherlands, grid expansion has not been able to keep up with the increased speed of electrification. Today, it is estimated that 17,000 consumers are in congestion queues for 9 GW of capacity.[15]

As Dutch grid operators cannot handle up to 25% of the required work of grid buildouts,[16] they are faced with the challenge of prioritizing their grid investments across the country. To that end, an improved planning system that leads to regional energy outlooks will be rolled out towards the end of 2024.

Grid operators and local governments will work closely together to connect industrial sector plans, future residential areas and renewable energy generation locations to design the required underlying energy infrastructure. This infrastructure will include transmission and distribution grids, residential heating and hydrogen networks.

Better planning allows the Dutch government to more efficiently allocate the available grid resources and accelerate permitting processes. It also provides more certainty to the supply chain.

Action 5

Accelerate infrastructure delivery

To avoid delays and overspend, a range of actions are essential, such as training the workforce, forging partnerships, aligning specifications and integrating digital technologies.

Grid infrastructure delivery is at high risk of delays and overspend because permitting and other regulatory approvals take long, and due to labour shortages and supply chain constraints. Already, critical grid components face long lead times, such as over 18 months for transformers,[17] a situation expected to be compounded by a doubling of demand for materials by 2030.[18]

To address these challenges, regulators, policy-makers, grid operators and technology providers must work together to promote innovation in workforce, technology, business models and policies. Actions could include:

1. Developing training and internship programmes to enhance skills that are in shortage. These range from critical engineering skills, such as in direct current (DC) controlling, to project management and technical expertise for technicians and factory workers.
2. Fostering industry alliances and strategic partnerships to advance the research and development of novel solutions. These solutions may include the development of new strategic framework agreements on critical items such as DC components and the direct investment from network operators in manufacturing to secure a stable supply chain.
3. Aligning on common technical specifications, increasing interoperability between grid technologies and digital platforms, and streamlining the manufacture and supply of critical components, thereby reducing cost and delivery time.
4. Accelerating the integration of artificial intelligence (AI) and digital technologies to improve workforce productivity and optimize capita delivery, such as AI-driven asset management, digital control centres and capital project management solutions.

CASE STUDY 5

TenneT – New framework agreements in Germany and the Netherlands

TSO TenneT, which operates in Germany and the Netherlands, must connect more than 40 GW of wind energy in the North Sea to the shore by 2030, compared to 12 GW today. To leapfrog to faster grid buildout, TenneT has developed a new 2 GW platform approach, under which it will build at least 14 systems.

Central to this approach are framework agreements, where instead of tendering each system on its own, high voltage direct current (HVDC) platforms and cable systems are tendered on a large scale, thus stimulating the market to increase production capacity and streamlining production.

CASE STUDY 6

Siemens Energy – Functional specifications in Europe

Many of the roughly 1,000 grid operators in Europe maintain specific technical requirements for their grid components, requiring a high degree of customization from component manufacturers.

Siemens Energy is proposing that project developers shift away from individual, bespoke technical specifications for each project and focus on functional requirements instead. This new way of working in the procurement process could radically reduce the complexity of procurement documents, bringing them down from 23,000 pages to 1,000-2,000 pages. This could also accelerate grid project execution by 25% and reduce costs by up to 10%.[19]

Conclusion

Five key actions can strengthen the business and economic case for grid development, supporting the transition to Net Zero.

Achieving Net Zero targets will require significant grid development in the coming years and decades, driven by growing energy demand, and supply dominated by variable renewables. A strong business case is critical to ensure that investments in grid development accelerate to the required pace and contribute to long-term economic and societal benefits.

The energy sector and relevant stakeholders must seize the opportunity to enhance the business case with a strong economic case that looks beyond short-term financial returns and focuses on the longer-term, societal and structured benefits that a clean energy system will bring.

This paper has proposed five actions that target a comprehensive approach to planning, investing in and developing the required grid networks of the future. They can increase efficiency, lower the overall costs, and accelerate the deployment of projects, with the aim of boosting the economic and business case for grid development in Europe. Adopting these recommendations needs coordination and collaboration across the value chain, including operators, suppliers, financial institutions, regulators and governments.

With collective determination to undertake concrete actions to bolster grid development, achieving a more secure, sustainable and equitable energy future is within reach.

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5. "Driver" means the primary actor behind the recommendation; "supporter" means one who is involved but not primarily responsible.
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