

ISGAN Policy Brief

On Long-Term Planning and Implementation of Smart Distribution Grids

At COP28, the world committed to a series of ambitious goals: **tripling renewable energy capacity globally by 2030, doubling the global average annual rate of energy efficiency improvements by 2030, and accelerating just and inclusive energy transitions.** Central to achieving these targets is the modernization of distribution grids, which serve as the backbone of ambitious energy system transitions.

In the face of rapid energy transitions and increasing electrification, **modernizing our distribution grids** at the low- and medium-voltage levels is no longer just an option; it is a necessity. However, the road ahead is cobbled with challenges, including for households and businesses who will be required to shoulder **increasing costs of building and maintaining infrastructure.**

Energy policies play a critical role in **de-risking infrastructure investments** to attract the necessary capital for grid modernization. Policymakers must therefore craft policies that support and incentivize smart grid upgrades and **reduce uncertainties for grid owners, operators, and planners.** Together, we can ensure that the necessary infrastructure is in place to meet our global energy transition objectives, safeguard economic stability, and fulfill our COP28 energy goals.

This policy brief outlines how policymakers can **help reduce uncertainties for grid actors and assist them in managing risks.** ISGAN proposes four key messages and areas of action for energy policy-makers to create the essential framework conditions for efficient and **forward-looking planning processes.**



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The urgency of making distribution grid modernization a policy priority

The full benefits of increased renewable energy source (RES) integration and the acceleration of electrification on the demand-side hinge on modernizing our low- and medium-voltage grids. Without this reinforcement, multi-year delays in grid connections will slow down the deployment of these critical technologies, undermining our energy transition efforts. The **current infrastructure bottleneck** poses a serious obstacle, **threatening the pace** at which we can achieve our decarbonization targets and hampering economic development.

Moreover, the following issues should draw the attention of the Clean Energy Ministerial and the international energy community to the importance of **distribution grid modernization and digitalization**.

The **need for extensive investments** in low- and medium-voltage grids is now recognized as far more substantial than previously anticipated and is acutely felt by many actors on the ground. The International Energy Agency (IEA) estimates that, after over a decade of stagnation, smart grid investment will need to nearly double globally by 2030 to over USD 600 billion per year¹, with emphasis on digitalizing and modernizing thousands of local grids. Without immediate coordinated action, the **security, affordability, and quality of service for consumers could be compromised**.

Climate-related costs are expected to be substantial, but are likely underrepresented in current investment estimates due to uncertain predictions and the growing frequency of extreme weather events. Electricity grids may need to be upgraded or redesigned to withstand the impacts of increasingly severe hurricanes, floods, heatwaves, and wildfires, as well as cyberattacks and other human-related events. Therefore, **incorporating adaptation to climate change** into grid planning is crucial to ensure that our grids remain resilient and capable of supporting the future energy landscape.

Long-term planning means acting now!

¹ International Energy Agency, 2023. Electricity Grids and Secure Energy Transitions: Enhancing the Foundations of Resilient, Sustainable and Affordable Power Systems

Key Actors

Besides national government ministries and regulatory bodies, the following key actor groups play crucial roles in forward-looking, long-term planning of Smart Distribution Grids. Mandates and responsibilities vary between jurisdictions, and these roles can overlap. For example, a local government may be the grid owner.

Local/Regional Government:

Local and regional governments develop and implement energy policies in the context of broader policy priorities. They often enforce regional regulations, represent community interests in long-term grid planning processes, and ensure that grid development aligns with other planning processes, such as spatial and regional planning.

Grid Owners:

Public and private grid owners make strategic decisions on investing in grid assets, focusing on their long-term viability.

Distribution System Operators/Utilities:

They set and execute the strategic direction for the grid and align their goals with public policy and other actors and stakeholders in the energy system. Ensuring the technical integrity and reliability of the grid is a core responsibility.

Other Energy Sector Actors:

The importance of involving and partnering with actors such as transmission system planners, energy suppliers, aggregators, and both active and passive grid users, grows with the increasing complexity of the evolving energy landscape and the need to be more proactive in long-term planning.

Message 1:

Confidence to invest in smart distribution grids requires reliable and supportive legal and institutional conditions for a long-term planning horizon.

Provide conditions that results in confidence to invest

- Ensure a predictable and robust legislative and regulatory framework that transcends election cycles and links grid planning to long-term targets.
- Establish a clear legal foundation that gives highest priority to rapid smart grid implementation.
- Clarify roles and mandates for all actor groups, including public and private grid owners.
- Enshrine a national consensus on electricity as a universal basic service for the people.
- Create effective incentive structures to guide planning and implementation, balancing rewards and penalties to ensure compliance and progress.

Message 2:

Planning of medium- and low-voltage grids demands broader coordination across key actors in the energy sector. This would facilitate de-risking the upfront investments for lasting and efficient smart grid infrastructures.

Encourage and facilitate coordination among all actors

- Promote a shared language and vision among actor groups to ensure common understanding as a basis for coordination and collaboration.
- Facilitate engagement by creating platforms for long-term planning between actor groups.
- Ensure dialogue and coordination between actors and stakeholders in the planning of transmission and distribution grids.
- Establish global forums for infrastructure investment strategies of public and private grid owners.

Message 3:

Long-term planning must be adapted to new complex realities, shifting from traditional master plan approaches to forward-looking, agile, and scenario-based approaches.

Adopt enhanced long-term planning practices

- Transition to forward-looking, agile planning processes, moving away from master plan approaches to adaptive, scenario-based approaches.
- Implement incentives for adaptive planning practices and consideration of innovation scenarios, for example the leveraging of technical and market-based flexibilities.
- Align regulations on planning horizons, approval intervals, and lead times to new realities.
- Update planning principles, tools, and methods to better manage increased uncertainties and reduced predictability.

Message 4:

Policymakers should ensure the availability of sufficient knowledge and data infrastructure to support agile planning and resilient operations. This includes building a knowledge base for planning of smart grids and promoting data sharing.

Ensure sufficient knowledge and data availability

- Enable global exchange on prioritizing investments in smart grids.
- Implement strategies for smart grid data sharing (e.g., smart meter data, PV and heat-pump installations, EV chargers), focusing on access, data protection and critical infrastructure security.
- Equip key actors with tools and know-how to adopt a forward-looking long-term planning approach, and ensure the availability of knowledgeable staff.
- Improve risk assessments on climate change to support financing and insurability, including reinsurance policies.

About ISGAN

The International Smart Grid Action Network (ISGAN) is a joint Clean Energy Ministerial (CEM) Workstream and IEA Technology Collaboration Programme (TCP). ISGAN is dedicated to the accelerated development and global deployment of advanced, sustainable, and highly adaptable electricity grids, commonly referred to as “smart grids.” ISGAN serves as a pivotal platform to facilitate knowledge exchange and foster international collaboration in the field of smart energy. This work encompasses insights into industry trends, lessons learned, emerging best practice, and future strategies in line with national, regional, and global climate and clean energy objectives. ISGAN is represented by national experts from over 25 countries, the European Commission, and various other stakeholders. Their combined expertise – including engineers, analysts, academics, industry leaders, and policymakers – drives the mission to advance smart grid technologies and foster global collaboration for a sustainable energy future.

About this Policy Brief

This policy brief has been developed as part of the ISGAN Lighthouse Project on Smart Distribution Grids, a new strategic initiative aimed at harnessing the collective expertise and innovative potential of the ISGAN community. The project is dedicated to elevating global awareness of the critical role that smart distribution grids play in meeting the essential targets to triple global renewable energy capacity and double the global average rate of energy efficiency improvements by 2030. It underscores the necessity of adopting more efficient, forward-looking strategies for long-term planning and implementation. The policy brief was co-developed in partnership with ISGAN experts through a dynamic process of interactive workshops and analytical activities conducted throughout 2024. The process also involved dialogue with key actor groups from all continents with responsibilities for designing and implementing the distribution grids of the future.



Contact

For more details about this Policy Brief and the ISGAN Lighthouse Project, please visit www.iea-isgan.org or contact the ISGAN Lighthouse Project Manager, Helena Lindquist, helena@iea-isgan.org

Disclaimer

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