POLICY BRIEF

Accelerating the Energy Transition through Transnational Power System Connectivity

Recommendations for the G20 Energy Transitions Working Group

ENERGY

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Table of Contents

Summary

The Indian Presidency of the G20 has rightfully highlighted the importance of transnational power system connectivity in improving energy security and enabling energy transition. Transnational power grids offer access to lower cost resources, help improve operational efficiency, increase power system security through resource sharing increased diversity of supply, and enables the integration of higher shares of renewable energy resources.

Power system connectivity projects can be found across the world, and nearly all G20 members are involved in some form of transnational power connectivity initiative.

Progress on transnational power system connectivity projects, however, is fragmented and in many cases limited. Connectivity projects are technically and politically challenging. Limited political will, a lack of available data or analyses, limited capacity of relevant stakeholders, and limited or entirely absent regional institutions are all obstacles to development.

In 2021, ESCAP member States endorsed the Regional Road Map on Power System Connectivity (Road Map) for Asia and the Pacific. The Road Map contains a vision, a set of principles, and nine strategies that together provide a useful framework for enabling the further development of connectivity initiatives while also ensuring their alignment with sustainable development.

This policy brief has been prepared as an input into the G20 Energy Transition Working Group's deliberations on the role of transnational power system connectivity in the energy transition, and how to best support the development of existing or new connectivity efforts. It details the Road Map's vision, guiding principles, and nine strategies, and then provides a few case studies to illustrate how these strategies are being implemented in practice. The paper ends with some specific recommendations for the G20 Energy Transitions Working Group, focusing in particular on a subset of strategies that may be most relevant for a G20 context.

Abbreviations

AMS	ASEAN Member States
ASEAN	Association of Southeast Asian Nations
ENTSO-E	European Network of Transmission System Operators for Electricity
ESCAP	Economic and Social Commission for Asia and the Pacific
GHG	Greenhouse Gas
HAPUA	Heads of the ASEAN Power Utilities / Authorities
IEA	International Energy Agency
ITP	Independent Transmission Provider
MOU	Memorandum of Understanding
PCI	Project of Common Interest
SAFIR	South Asia Forum for Infrastructure Regulation
SOE	State Owned Enterprise
Solar PV	Solar Photovoltaics
TYNDP	Ten Year Network Development Plan

I. Introduction

Power systems are the lifeblood of modern economies. Access to affordable and reliable electricity is necessary for the provision of basic services such as lighting, heating, and cooling, and to help drive economic growth through. At the same time, the energy sector contributes more than one-third of total greenhouse gas (GHG) emissions. Decarbonization of the power sector is therefore critical to mitigate the impacts of climate change.[1]

As countries seek to develop modern power systems develop, they must find an appropriate balance between three main development priorities: affordability, security, and sustainability. For any individual country, resource constraints and other obstacles may require tradeoffs that limit their ability to meet all three goals simultaneously.

Power system connectivity is a key strategy that can help resolve the tension between these three objectives. Transnational power grids can provide access to lower cost resources, including renewable energy resources, that may be located far away from demand centers. It can improve security of supply by allowing countries to share generating capacity and by increasing resource diversity. And it can improve sustainability by enabling the integration of higher shares of variable renewable energy resources like wind and solar photovoltaics (solar PV).

Transnational power system connectivity is therefore a key tool in enabling a secure and affordable energy transition.

At its core, developing transnational power grids is not fundamentally different from developing national or sub-national power systems. However, the cross-border nature of these projects does create a set of unique challenges to overcome.

Power system development starts with a planning exercise. This involves, for example, forecasting future demand, identifying resource needs, and ensuring consistency with national policy goals like expanding access to electricity or meeting renewable energy targets. In the case of transnational power system connectivity, these elements remain important, but are complicated by the involvement of additional sets of stakeholders who may have differing views on core assumptions, different resource bases, and divergent policy objectives.

Once power system development plans are in place, they must be financed and built. At a national level the nature and form of investments will depend primarily on the structure of the domestic power market – state vs investor-owned utilities, for example, or the structure of the retail tariff. When building cross-border infrastructure, additional factors that need to be considered include differing investment environments, different regulatory and market structures, and issues such as cost-sharing and recovery.

1 IPCC Sixth Assessment Report, Working Group III, Mitigation of Climate Change, available at https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf

Operational issues are also challenged in a transnational context. At the national level, power systems may be managed by a single utility, or, if there are multiple utilities, there a single entity, such as a national regulatory authority, that can provide appropriate oversight. In an international context, there may be no single entity with the authority or capacity to oversee and help guide operational issues, for example by helping to harmonize grid or technical codes or ensure that they are properly implemented by utilities.

Transnational power system connectivity also brings with it a set of issues that are unique compared to a purely national context. For example, the involvement of two or more national governments brings issues of sovereignty to the forefront. Effective power system connectivity initiatives require at a minimum a sufficient level of trust and political will. Policy and regulatory environments must be harmonized in such a way as to enable integration while also remaining consistent with national policy objectives and priorities. And, countries must share knowledge, data, and resources that they may consider sensitive.

Many power system connectivity initiatives can be found across the world, including initiatives that involve G20 members. In many cases, despite many years of work, these efforts remain stuck at an early stage. Obstacles to progress include limited political will or an absence of a common vision for a more interconnected future, limited availability of data or analysis of the impacts of increased connectivity, limited capacity of relevant national institutions (such as utilities, regulators, and Ministries), limited financial resources, and regional institutions that have limited capacity or which are entirely absent.

Recognizing both the benefits of and obstacles to progress on transnational power system connectivity, in 2021 ESCAP member States endorsed the Regional Road Map on Power System Connectivity (Road Map) for Asia and the Pacific.[2] The Road Map contains a vision, a set of principles, and nine strategies for increasing secure and sustainable power system connectivity across the region.

While the Road Map strategies were developed in an Asia-Pacific context, they offer a set of relevant lessons for furthering the development of sustainable connectivity initiatives across the globe.

This paper will present the Road Map, with a particular emphasis on the strategies and the areas of transnational power system connectivity they address, followed by a few selected case studies. It will end with some specific recommendations for the G20 Energy Transitions Working Group.

2 https://www.unescap.org/our-work/energy/energy-connectivity/roadmap

II. The Regional Road Map on Power System Connectivity for Asia and the Pacific

A. ROAD MAP VISION, PRINCIPLES AND STRATEGIES

The Road Map is a guiding document that seeks to provide actionable recommendations for countries to accelerate progress on connectivity initiatives where they exist or develop new initiatives where they are absent. The Road Map contains a vision, a set of principles, and nine strategies for accelerating progress on power system connectivity while ensuring alignment with sustainable development

Vision

The overarching vision of the Road Map is that transnational power system connectivity can, if properly guided, enable the development of interconnected grids that are more reliable, affordable and sustainable. Integrating power systems across borders allows countries to leverage their diversity both in terms of supply and demand to lower the cost of power system development and operations while simultaneously improving reliability and decreasing carbon emissions. Transnational power system connectivity therefore contributes to achieving Sustainable Development Goal 7 and other Goals.

There are already many power system connectivity initiatives in the Asia-Pacific region (Figure 1), and these represent only a fraction of the connectivity initiatives globally. However, in contrast to other parts of the world, power system connectivity in Asia and the Pacific remains primarily bilateral in nature. Countries would be able to take full advantage of the benefits of transnational power system connectivity by moving beyond bilateral to multilateral modes of connectivity and build up from the various sub-regional initiatives to develop a fully interconnected continental grid.

Principles

A core principle of the Road Map is that each country faces a set of unique issues, and that power system connectivity must be supported by optimal policies, regulations, and business models that consider each country's circumstance.

While transnational power system connectivity is a critical tool for enabling a secure and affordable energy transition, the Road Map acknowledges that it is only one tool, and that each country can and should decide for themselves whether transnational connectivity is appropriate and in what context. The Road Map is non-binding, and the strategies can therefore be implemented on a voluntary basis.

The Road Map also acknowledges that geography can be a key constraint for many countries. For archipelagic countries in particular, cross-border power system connectivity may face significant

technical and economic challenges. At the same time, these countries may face high costs of imported fuels, and therefore even in this context connectivity can potentially offer benefits.

Strategies

The nine Road Map strategies (Figure 2) are:

Strategy 1: build trust and political consensus for cross-border electricity trade

A primary obstacle to progress on transnational power grid connectivity is a lack of trust. This strategy focuses on building trust through continuous engagement. It highlights the role of relevant international, regional, and sub-regional organizations. It also acknowledges that the context for power trade may vary from country to country, and that understanding these differences is critical to build and ensure mutual support.

To support implementation of this strategy, the Road Map calls for the organization of regular meetings on grid integration.

Strategy 2: develop a regional cross-border electricity grid master plan

As noted earlier, power system connectivity in the Asia-Pacific region is primarily bilateral in nature. To move beyond bilateral as a default modality, it is important to develop a common vision for a more interconnected regional grid. This strategy calls for the development of a regional grid masterplan, a voluntary document that would offer one possible approach to a fully integrated region that is consistent with the principles of energy security, grid stability, economic feasibility and inclusiveness.

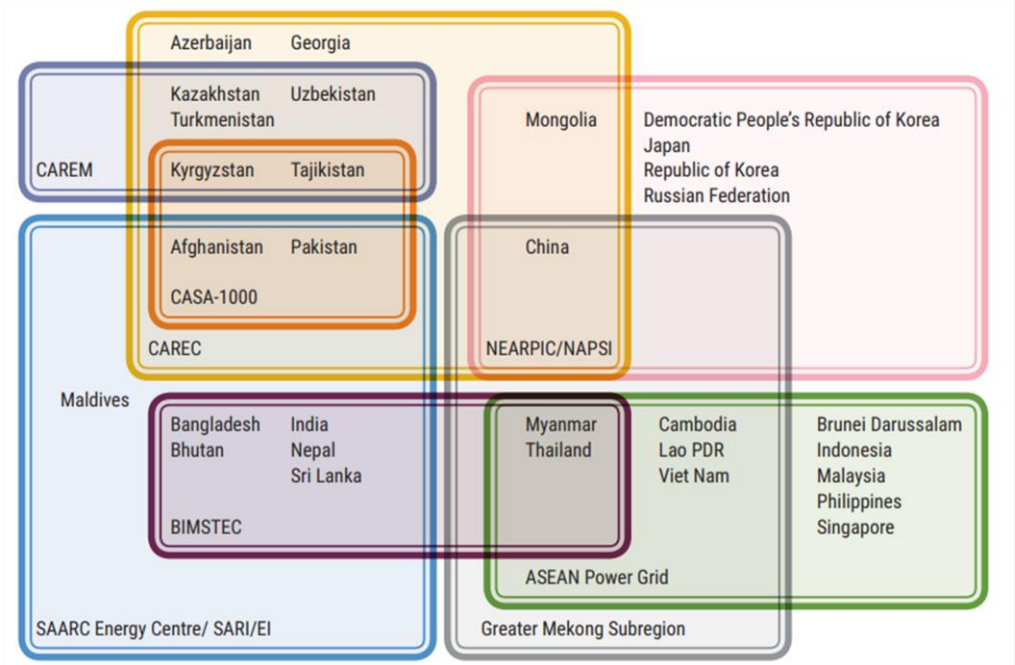
To support implementation of this strategy, the Road Map calls first for mapping existing grid infrastructure, and then development of a regional grid master plan.

Strategy 3: develop and implement intergovernmental agreements on energy cooperation and interconnection

To be successful, power system connectivity initiatives must be underpinned by clear commitments to collaboration. Treaties, intergovernmental agreements, and memorandums of understanding are all important documents that should be pursued where possible. This strategy also recognizes that different sub-regions are at different stages of progress, and therefore calls for collaboration or even potential integration among relevant institutions and the establishment of platforms for collaboration where they do not exist.

To implement this strategy, the Road Map calls for the organization of high-level meetings at a sub-regional

Figure 1. Selected connectivity initiatives in Asia and the Pacific



Source: 2022 Regional Trends Report, UN ESCAP, available at https://www.unescap.org/kp/2022/toward-sustainable-energy-connectivity-asia-and-pacific-status-trends-and-opportunities

level and the development of new interconnection agreements.

Strategy 4: coordinate, harmonize and institutionalize policy and regulatory frameworks

While recognizing that country contexts differ, the Road Map nevertheless highlights the importance of aligning policies, regulations and standards related to the cross-border trade of electricity to ensure the stable supply of electricity among interconnected countries. It highlights the importance of harmonized approaches to licensing, open access, and grid codes, and the establishment of transmission pricing frameworks.

This strategy calls for an assessment of gaps in grid policies, regulations and standards and the organization of sub-regional associations of national regulators to act as a platform for collaboration.

Strategy 5: move towards multilateral power trade and create competitive markets for cross-border electricity

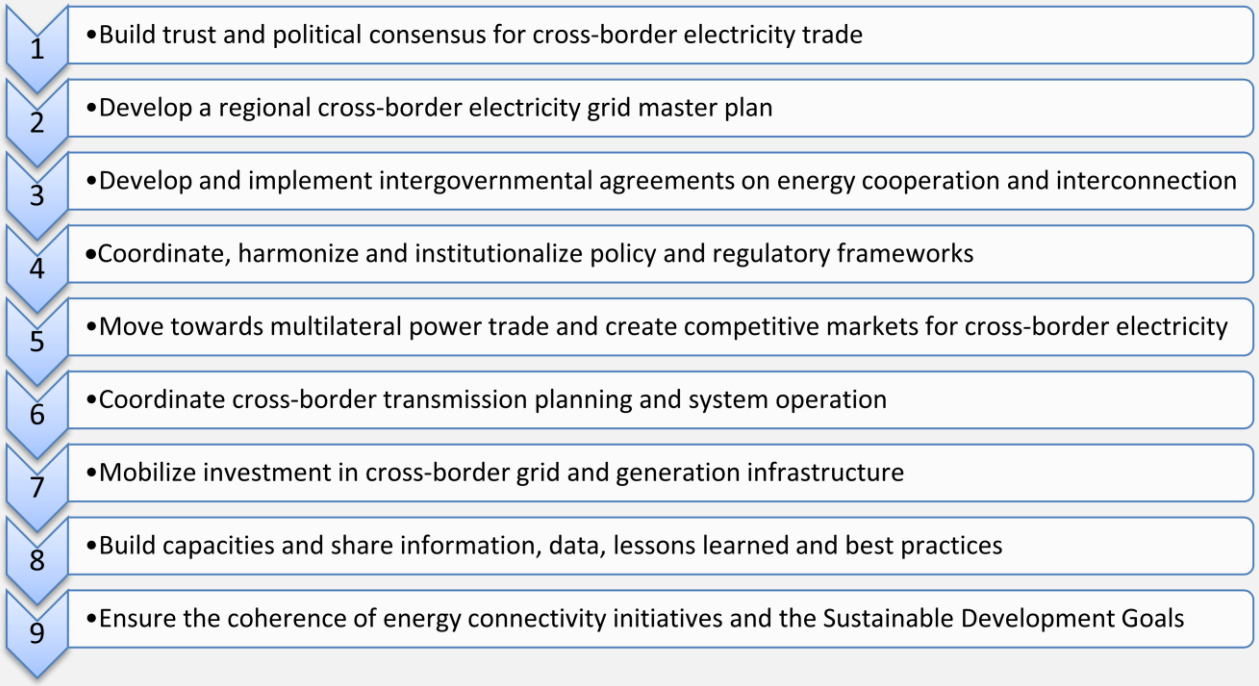
Moving to multilateral power trading is critical if countries are to take full advantage of transnational power system connectivity. As the Road Map highlights, multilateral power trading can help countries optimize regional energy resources, enhance economic growth, expand the use of renewable energy resources, improve reliability, enable the sharing of reserve generation, allow countries to take advantage of differences in demand patterns, lower costs and increase the overall efficiency of power systems. To move beyond bilateral trading, this strategy recommends developing power purchase agreement templates, transmission service agreements, and payment mechanisms that are adaptable to national circumstances.

To support implementation of this strategy, the Road Map calls for the development of sub-regional and regional studies evaluating the economic, security, social and environmental aspects of multilateral power trade.

Strategy 6: coordinate cross-border transmission planning and system operation

Transnational power system connectivity requires the development of cross-border transmission infrastructure. As a first step, this means coordinating planning efforts to identify opportunities for interconnection. It also means coordinating on key technical issues, such as grid code development and implementation, metering of power flows, and coordination of generation scheduling. Open access to grids is also important, though the Road Map also acknowledges that this may first require the

Figure 2. The Road Maps' Nine Strategies



Source: Regional Road Map on Power System Connectivity

development of sufficient grid infrastructure.

The strategy calls in particular for increased coordination among system operators, transmission utilities, and technical institutions, and the establishment of coordinated mechanisms for cooperation among system operators and utilities.

Strategy 7: mobilize investment in cross-border grid and generation infrastructure

Once opportunities for grid connections have been identified, they must be developed. This requires the mobilization of sufficient funds to develop cross-border infrastructure. This may in turn require the development of innovative financial instruments such as green bonds, blended financing, and renewable energy certificates, and mechanisms to both mobilize financing and reduce financing costs. The strategy also recognizes the importance of investment-friendly policies, guidelines and frameworks. The strategy also notes the importance of clearly defined dispute resolution procedures, and the particular relevance of sub-regional institutions in this area. It also acknowledges the challenge of uncertain taxes and duties, and potentially volatile currencies, both of which are particularly challenging in a multinational context.

To implement this strategy, the Road Map calls for the development of subregional platforms that can convene financial institutions, utilities and governments to advance financing for connectivity projects.

Strategy 8: build capacities and share information, data, lessons learned and best practices

Though progress on power system connectivity initiatives in the Asia-Pacific region is fragmented, there is nevertheless a wealth of knowledge that can be drawn upon to help make progress on the development of transnational power grids. Access to relevant data and information, however, is limited. This strategy therefore calls for increased sharing of information, data, lessons learned and best practices, including through targeted capacity building programs. It also recommends leveraging existing knowledge platforms, such as ESCAP's Asia-Pacific Energy Portal,[3] to enable data sharing.

To support implementation of this strategy, the Road Map calls for the development of capacity building, knowledge generation, data support plans, and the identification of resources to support capacity building efforts.

Strategy 9: ensure the coherence of energy connectivity initiatives and the Sustainable Development Goals

The Road Map's final strategy focuses on the need to take proactive measures to ensure that power system connectivity initiatives are aligned with sustainable development. Recognizing the Sustainable Development Goals as an agreed-upon framework for measuring progress across a range of social, economic and environmental dimensions, this strategy in particular highlights the fact that creating strong synergy between energy connectivity projects and sustainable development means considering not only the role of connectivity in enabling GHG emission reductions, but also how to mitigate against other potentially negative impacts such as social dislocation and biodiversity loss. Connectivity projects must seek to respect national circumstances and priorities, including economic and security concerns, as well as to enable positive social impacts and environmental protection.

To implement this strategy, the Road Map calls for the development of a set of principles to enable the assessment of connectivity projects against economic outcomes, efficiency and sustainability criteria.

3 https://asiapacificenergy.org/

III. Power system connectivity case studies

This section will present examples of how the strategies are being applied in practice in practice.

Enabling power system connectivity in South-East Asia

The Member States of the Association of Southeast Asian Nations (ASEAN) have a longstanding strategic vision to develop the ASEAN Power Grid (APG).

First articulated in 1997 as part of the ASEAN Vision 2020, the APG is an ambitious effort to link the power grids of the ten ASEAN Member States (AMS) together through the development of cross-border transmission lines and the harmonization of technical standards and markets

A critical element of the APG's development is the ASEAN Interconnection Master Plan Study (AIMS) (Strategy 2). The AMS have developed three AIMS studies. The latest version, AIMS III, is the first to take into account the benefits of the APG for the integration of higher shares of renewable energy (Strategy 9).

One key conclusion of the AIMS III study is that the APG can facilitate larger shares of variable renewable energy in ASEAN more cost effectively compared to a scenario where the APG was not developed.

Studies like AIMS III are critical for building trust and political will (Road Map Strategy 1). Showing how the APG can securely and affordably enable a higher share of variable renewable energy can help move the APG from a vision on a page to actual power lines in the ground.

Development of AIMS III required significant collaboration among the AMS. The Heads of the ASEAN Power Utilities / Authorities (HAPUA) played a central role, with the strong support of the ASEAN Centre for Energy (ACE), which led development of the AIMS III study.

Studies like AIMS III are critical in building trust and political support. It also helps to unlock grid financing by highlighting potential economic and environmental benefits, and identifies gaps that will need to be addressed to fully unlock the APG's potential, in particular enabling multilateral, multidirectional power trading.

Private investment in grids in India

India stands out in the Asia-Pacific region as a country that has managed to mobilize significant amounts of private investment in grids (Strategy 7). Private companies have invested more than USD 5 billion of capital in grids using the Independent Transmission Provider (ITP) model.

Under the ITP model, grid projects are identified by system planners and then tendered out to private investors for development. Depending on the context of the ITP, tenders can be early or late in the development stage. In an early-stage tender, the developer has more freedom to be innovative with the design, but also bears more costs and responsibilities, for example environmental impact assessments and securing right of way. In a later stage tender, many of these issues will have already been addressed. This means that the winner is more bound by predefined project requirements, which limits development risk but also puts the burden of meeting these fundamental requirements on the underlying utility.

The ITP model works best for large grid projects, as there are high costs associated with running the tender on both the government and bidder side, and the size of the project must therefore justify the transaction costs. A key lesson from the Indian experience is that the model can work alongside a traditional grid model, where the SOE is responsible for grid development. In addition, because the ITP model focuses on specific transmission lines, it can be relatively easy to pilot.

One main lesson of the Indian experience is that attracting bidders and increasing competition is key to a successful project. This helps to drive down project costs. The ITP model could be utilized by national grid expansions as well as transboundary grid projects, however complexity does increase with transnational grids, and as such tenders should be carefully designed.

Aligning power system connectivity with sustainable development in Europe

The European experience offers several relevant lessons for how to assess sustainability benefits and link them to power system development.

The Ten-Year-Network-Development-Plan (TYNDP) combines both a bottom-up and top-down approach to system planning (Strategy 2). The power system development plans of individual countries (or in some regions, such as the Nordics, groupings of countries) are combined into a holistic grid plan for the entire European continent. The TYNDP also enables open discussion on how to best optimize system development at both the national and regional level (Strategy 1).

Like many modelling processes, developing the TYNDP is complicated and data-intensive. The results may quickly become out of date, as system changes may move faster than the modelling can accommodate. In the European context this is addressed in part by having a clear owner of the regional model, a transparent process for maintaining and developing the model itself and the underlying data, and a bottom-up approach where inputs from the national utilities form the basis for all modelling.

A core element of the TYNDP is its use in identifying Projects of Common Interest (PCIs). To be classified as a PCI, a grid project must be shown to aid the European Union's efforts to achieve its core energy policy and climate objectives: affordable, secure and sustainable energy for all citizens, and the long-term decarbonization of the economy in accordance with the Paris Agreement (Strategy 9).

Once an PCI has been identified, it becomes eligible for a number of benefits to support their development:

- Accelerated planning and permit granting;
- A single national authority for obtaining permits;
- Improved regulatory conditions;
- Lower administrative costs due to streamlined environmental assessment processes;
- Increased public participation via consultations; and,
- Increased visibility to investors.

In addition, PCI's are eligible for funding through the Connecting Europe Facility.

Outside of the EU, where there is less market and regulatory harmonization across countries, and more limited or entirely absent regional institutions, recreating the TYNDP and PCI process is more challenging, but not impossible. In particular the TYNDP process reveals some of the core benefits of coordinated or even common approaches to grid planning, highlighting some key regulatory and policy reforms that could help in the development of these projects both within countries and across borders, and suggests an opportunity for the development of funding mechanisms that could focus on cross-border transmission projects that have demonstrated that that can meet certain sustainability criteria.

IV. Way forward: Recommendations for the G20 Energy Transitions Working Group

Transnational power system connectivity is a key strategy for improving energy security and enabling energy transition. The Regional Road Map on Power System Connectivity offers a useful framework for enabling the further development of connectivity initiatives while also ensuring their alignment with sustainable development.

While all nine of the Road Map's strategies may offer useful guidance to G20 members, four strategies are highlighted here as being particularly relevant for a G20 context:

- Strategy 1: Build trust and political consensus for cross-border electricity trade
- Strategy 7: Mobilize investment in cross-border grid and generation infrastructure
- Strategy 8: Build capacities and share information, data, lessons learned and best practices
- Strategy 9: Ensure the coherence of energy connectivity initiatives and the Sustainable Development Goals

With that as context, the G20 Energy Transitions Working Group may wish to consider the following recommendations.

I. Build trust and political consensus by sharing relevant experiences and best practices.

Political consensus and trust are foundational for cross-border power system connectivity initiatives to succeed. Power systems are critical infrastructure and key enablers of economic development, and so when considering transnational power system integration, it is important to ensure that there is a sufficient level of trust and political consensus.

Building trust and political consensus means first addressing the underlying concerns that countries have about the implications of increased transnational power system integration and power trade. These concerns are primarily related to the categories of benefits noted above: increased security, improved economics, and accelerated energy transition. In particular, policy makers must have a high-level of confidence that they will be able to reap the security, economic, and sustainability benefits of transnational power system connectivity while also mitigating against potential negative impacts, including power outages, increased costs, or increased emissions.

Practical experience shows that, once transnational power grids have been established, it is possible to operate them securely, while also lowering overall system costs and decreasing overall carbon intensity of generation. This points to the first step that the G20 may take in enabling increased trust and political consensus: sharing experiences and best practices.

Many G20 members have years or even decades of experience developing transnational power systems. Collecting and disseminating case studies, lessons learned, and best practices based on these experiences would be significantly valuable to countries that are either at the early stages of developing connectivity projects or who are facing obstacles to progress on existing initiatives.

In many parts of the world, however, such institutions are absent. And, even where they exist, they may not have sufficient capacity to effectively build trust and political consensus. Therefore, the G20 could consider providing guidance on the appropriate role for national and regional institutions in enabling connectivity initiatives and enable collaboration among relevant institutions.

II. Provide guidance on the appropriate role for national and regional institutions in enabling connectivity initiatives

A second enabling factor of successful connectivity initiatives is the presence of enabling national and regional institutions. This includes, at the national level, Ministries, regulators, and utilities, and at the regional level multilateral institutions, collaborative platforms, and development banks.

Many platforms for collaboration exist among sub-groupings of countries. In some cases these are focused specifically on questions related to power system integration. The European Network of Transmission System Operators for Electricity (ENTSO-E), for example, is mandated to enable collaboration on critical power sector questions among its members, which includes both EU and non-EU member States. In South-East Asia, the HAPUA performs a similar function. And, in South Asia, the South Asia Forum for Infrastructure Regulation (SAFIR) enables collaboration among regulatory bodies on, among other topics, power system connectivity.

In many cases, however, the relevant institutions do not have a clear view of the role they can and should play in supporting the development of connectivity projects. Equally important is the fact that many institutions do not have a complete sense of their roles relative to one another – for example, the relationship between regulators and utilities in the grid code development and implementation process.

The G20 could provide guidance to institutions to clarify their relevant roles and responsibilities. Crucially, it should do so in such a way as to emphasize how to balance issues of national sovereignty with the need for enhanced coordination and cooperation.

III. Enable collaboration among institutions.

Once political consensus has been established, clear signals on the importance of power system connectivity can enable power sector stakeholders such as regulators, system operators and grid developers to develop transmission infrastructure projects and securely and efficiently trade electricity across borders. Explicit statements of support by policy makers may be sufficient to start work on connectivity initiatives, but ideally should be codified in the form of intergovernmental agreements and a high-level vision for interconnection. Governments can also be instrumental in enabling dialogue and the signing of memorandums of understanding (MOUs) between relevant stakeholders, as emphasized by Road Map Strategy 3.

The need for political consensus is not only limited to cross-border projects between countries. For example, India developed one of the largest synchronized power systems in the world – one that provides electricity to more than 1.35 billion people – through an inclusive process involving stakeholders from the federal, state, and local levels.

There is significant value, therefore, in enabling collaboration among institutions. This could be among institutions working on different aspects of the same connectivity initiative, or between similar institutions in different regions. In the first case, outside support for collaboration can help build trust by ensuring that all voices have an equal opportunity to be heard, while also helping to identify capacity gaps that may need to be filled. In the second case, collaboration across regions can enable knowledge exchange and the sharing of best practices.

IV. Call for the increased use of private finance in grid infrastructure.

The presence of transnational power system infrastructure is a fundamental requirement for enabling cross-border power trade. Developing cross-border infrastructure, however, is a complex process. The economic case for such projects may be difficult to establish, and key elements such as cost-sharing and cost-recovery arrangements may be difficult to establish.

According to the International Energy Agency (IEA), to achieve a 2050 Net Zero scenario investment in grids needs to increase to around USD 600 billion per annum by 2030.[4]

Globally, grid infrastructure investments are primarily driven by government investments through State

Owned Enterprises (SOEs). It will be difficult, however, if not impossible, to meet expected investments needs relying on government financing alone. It is therefore important to unlock all sources of financing for networks. This entails mobilizing private finance and understanding barriers to the use of climate finance in grid investments.

Financing transnational grid projects can prove particularly difficult, as they are affected by the market structures and investment environments of multiple countries. Moreover, transnational grid projects and national grid projects are to a significant extent linked, as national power grids must be strong enough to send, receive and/or wheel power from where it is produced to where it is needed. Therefore, transnational grid development may need to be coordinated with investments in national grid infrastructure.

Related to this, healthy investment environments at the national level are also important. For cross-border grids this particularly means ensuring alignment or clear procedures on how to navigate rules and regulations on both sides of the border.

The G20 can play a significant role in enabling the mobilization of financing for grid infrastructure. For example, the G20 could issue a call for the increased use of private finance in grid infrastructure and, as there is significant experience in this area among G20 members, highlight relevant case studies and best practices. Some G20 members and institutions such as the World Bank have issued guidance on the use of climate finance grids. These could be both emphasized and ideally adjusted to accommodate a broader range of investment environments.

V. Provide guidance on data sharing and the establishment of data sharing platforms.

Transnational power system integration projects are complex endeavors that involve a range of stakeholders, including system planners, regulators, investors, and system operators. Ensuring these stakeholder groups have sufficient capacity to perform the relevant tasks is critical.

A foundational element of transboundary grid integration, however, is data sharing. In all stages of a grid asset's life cycle – conception, initial planning (including pre-feasibility and feasibility studies), financing, and operations – the collection and sharing of data is required.

Therefore, one potential area for the G20 to contribute would guidance on the secure sharing of relevant data to enable the identification and development of cross-border grid projects. The G20 could also support the development of data sharing platforms, and by encouraging members to work to make data more accessible, transparent and consistent.

VI. Develop principles to support connectivity projects aligned with sustainable development.

While transnational power system connectivity can bring a significant number of benefits, simply developing cross-border grid projects is not enough to ensure a net improvement in overall sustainability. Grids are fundamentally driven by the laws of physics, and they are indifferent to the origins of the power that flows across them. Ensuring that transnational power system connectivity is consistent with, and ideally an enabler of, energy transition and sustainable development requires interventions at the policy, planning, and operational levels.

To start, governments should set concrete targets for increasing the share of renewable energy and/or reducing emissions. Taking a transnational approach to renewable energy development can facilitate the achievement of national targets by allowing countries to tap into lower cost resources located outside their borders or increase the economic case for domestic projects by enabling their export of some of the production.

It is important that sustainability be considered throughout the development of transnational power system connectivity projects. In many cases, however, it is not obvious how to best align project development with overall sustainable development. The G20 could therefore develop and recommend adoption of a set of principles that ensure that grid planning and operations are fully aligned with the sustainable development goals. These could be narrowly targeted to specific aspects of project development, such as the planning and development stages, or could encompass the full range of relevant issues.

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