

## Financing energy connectivity

*This policy brief aims to explore regional energy connectivity and its role in meeting broader energy goals within the framework of the Sustainable Development Agenda. Challenges, particularly relating to financing gaps will be highlighted through existing sub-regional initiatives*

### Introduction

There is growing agreement that energy challenges in Asia can be effectively addressed through enhanced regional energy connectivity and diversification of energy sources through the increased use of more efficient and sustainable generation technologies. Asia-Pacific energy resources, both fossil and renewable, vary greatly in their distribution across countries and subregions. The ability to share and trade these resources, in order to address energy surpluses and deficits, requires physical connectivity infrastructure, such as electricity transmission links and gas pipelines, which in turn require significant financing for construction. Underpinning this goal, however, there must be a shared vision, political agreement and the institutional infrastructure necessary for energy exchange between countries, to overcome financing challenges and to enable benefits to be equitably shared.

### Financing challenges

Energy networks are capital-intensive and, given their large sunk costs, present major challenges in financing and maintenance, especially when these are subject to different legal and regulatory regimes. When energy markets are dominated by state ownership, investments from private sources are difficult to attract because of the lack of creditworthiness of state enterprises and opaque governance structures. In the current situation, even if subregional support is present, cross-border projects have large transaction costs and it takes an extended period for any project idea to move from the drawing board to secure multiple approvals and reach actual implementation.

There are large positive and negative externalities inherent in energy connectivity. Invariably, there are problems in measurement of the costs and benefits, and in designing

policy regimes that can fully address these externalities. Balancing the gains with overall costs among different groups of stakeholders requires a robust institutional mechanism. The energy integration process is not limited to the creation of physical links across borders; it requires a series of policies and regulations for facilitating different types of flows inherent in the process. The subregional energy integration programmes generally show a lack of consensus in defining a comprehensive model of integration. Energy security issues are of prime importance to the political leadership and it was believed, given the emphasis on domestic production in most sectors of the economy, that national energy security would be compromised through regional energy trade.

### Current initiatives

Many countries will create new infrastructure including energy networks to serve the large and growing demand for energy services in the next few decades. The Asia-Pacific region is expected to account for over 40 per cent of the \$68 trillion cumulative energy investments until 2040<sup>1</sup>. In today's connected world, no country alone can meet these challenges. In that context, sub-regional initiatives are of particular importance.

#### Association of Southeast Asian Nations (ASEAN):

Energy consumption by the South-East Asian nations is expected to more than double over the next decades. ASEAN faces the challenge of finding the right balance between energy security, environmental sustainability, and economic competitiveness. The subregion has made good progress on several of its goals contained in the ASEAN Plan of Action for energy Cooperation (APAEC) covering 2010 to 2015; six of the 16 planned interconnections under the ASEAN Power Grid and 12 bilateral gas pipeline

interconnections have been commissioned. This work will continue under the APAEC 2016-2025.

ASEAN needs to add 354 gigawatts of additional capacity for power generation by 2040, which more than doubles today's capacity and calls for investments of \$618 billion in generation and \$690 billion in the transmission and distribution of this power.<sup>2</sup> It is one thing to discuss the advantages of power system integration, and another thing altogether to demonstrate that the benefits of integration outweigh the costs. The ASEAN Energy Market Integration (AEMI) study on the benefits of integrating the ASEAN energy market estimates that system costs would decline between 3 per cent and 3.9 per cent, and real GDP would increase by between 1 per cent and 3 per cent (AEMI, 2013).<sup>3</sup>

### South Asian Association for Regional Cooperation (SAARC):

In order to promote cooperation among the SAARC member States, the Islamabad Declaration of the 12th SAARC Summit, held in January 2004, mandated South Asian energy cooperation, including the vision to establish an energy ring. Signing the framework agreement for cooperation in the power sector, which will ensure electricity trading through grid connectivity, the leaders directed the relevant SAARC bodies and mechanisms to identify regional and subregional projects in the areas of power generation, transmission and power trade, including hydropower, natural gas, solar, wind and biofuel. Funding is provided by SAARC Member States; supervised by a governing board comprising all Member States.<sup>4</sup>

The following cost/benefit analysis on power interconnection opportunities was conducted by SAARC in 2015:

Grid inter-connection	Capacity (MW)	Estimated cost (\$ mio)	Est. annual benefit (\$ mio)
India-Bhutan	2,100	160	1,840
India-Nepal	1,000	186	105
India-Sri Lanka	500	600	186
India-Bangladesh	500	250	389
India-Pakistan	500	150	491
CASA 1000	1,000	970	906

Note: Cost estimate depend on time and specific design options. <sup>5</sup>

### Central Asia Regional Economic Cooperation (CAREC)<sup>6</sup>:

CAREC's mandate is to help its member countries — mostly vast, landlocked areas with small, scattered populations — to build the trade, transport and energy links that are necessary to promote economic development and reduce poverty. The CAREC Ministers endorsed an energy strategy in 2008 that provides the framework for energy cooperation. Its vision is to ensure: (i) energy security through balanced development of the region's energy infrastructure and institutions; (ii) stronger integration of the region's energy markets; and (iii) economic growth through energy trade. The Energy Work Plan (2016-2020) identifies six elements with measurable indicators, namely: (i) developing the Central-South Asia Corridor; (ii) promoting regional electricity trade and harmonization; (iii) managing energy-water linkages; (iv) mobilizing financing for priority projects; (v) capacity-development and knowledge-management; and (vi) promoting clean energy technologies.

All CAREC countries have substantial investment needs for power sector development, as indicated by their national development plans and recent studies. According to the 2012 Power Sector Regional Master Plan involving four CAREC countries (Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan) and completed in October 2012 through Asian Development Bank technical assistance, an investment of about \$36 billion is required over a 10-year period (2013–2022) for the rehabilitation and expansion of power infrastructure in these countries alone. The 10-year plan includes \$32.8 billion of investment in generation and \$3.2 billion of investment in the 500-kilovolt and 220-kilovolt transmission systems. The recently completed Afghanistan Power Sector Master Plan and the National Power System Expansion Plan for Pakistan contain similarly challenging investment projections. For example, the Afghanistan plan has established a total investment requirement of \$10.1 billion, including \$7.3 billion for power generation and \$2.8 billion for power transmission in the country.<sup>7</sup>

### Lessons learned

Several interesting and useful lessons can be drawn from the analysis of international experience with integrated energy markets. Bilateral energy trade can be developed based on contracts but wholesale competitive markets are better for taking full advantage of the diversity among member countries. Large investments are needed to capture the benefits of energy trade, which requires private sector investment. It is possible to have markets for regions with relatively low energy consumption and also for very large

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energy-consuming areas. Although wholesale markets send price signals, this is not a sufficient condition for attracting private sector investments; project developers and lenders make their own projections for which all energy-related data has to be publicly available. Markets require adjustments from time to time to maintain a balance between the interest of investors and energy consumers. Robust institutions should be created for promoting and managing regional energy trade.

Unlike commodities, energy networks present unique challenges to trade. Physical energy networks, be they gas pipelines or transmission grids, are capital-intensive and generally subject to economies of scale. With large sunk costs, energy networks present major challenges in financing and maintenance, especially when they have to traverse many countries. These capital attributes lead to many market and government failures, and private investors are reluctant to enter such risky areas.

Efficiency improvements and real economies of scale occur when power or natural gas is freely traded across different markets. As markets progress from cooperation to integration, demands for investments, capacity, technology and standardization increase. Since there is no single central energy organization in the Asia-Pacific region, the process of gaining country-level approvals and accountability creates a major risk for all regional projects.

## Ways forward

By linking areas with energy surpluses and deficits, and pooling diverse generation plants with diverse loads, benefits are created for both energy suppliers and consumers. Regional power grids can allow a greater contribution of variable renewable energy and avoid curtailment as the integration of solar and wind generation expands. In order to advance energy connectivity initiatives, financing challenges including: diverse legal and regulatory structures; substantial capital requirements; large transaction costs; and lack of creditworthiness of state enterprises and opaque governance structures need to be overcome. In an effort to address these challenges, ESCAP is promoting dialogue between member States on the subregional level and enhancing the knowledge base on energy connectivity through its holistic approach to regional economic cooperation and integration. The following are suggested means to overcome barriers to increased connectivity, with special emphasis on addressing financing challenges:

- **Long-term contracts:**

Unlike other industrial assets, the useful life of power grid interconnections and natural gas pipelines is very long; the early installations have completed 40 to 50 years of

service and continue to operate with reasonable reliability. Investments in properly designed and well managed energy connectivity assets will provide stable long-term returns, though renegotiation of contract terms may become necessary for adjusting to the changing macroeconomic conditions.

- **Multiple government and private entities:**

The simplest cross-border infrastructure will require agreements between at least two governments. If the routing of the power transmission line or gas pipeline needs to traverse through a third country, another government will be involved. The transaction cost and time can be made manageable and bankable by using a transparent and objective process for identifying, preparing and selecting developers for energy connectivity infrastructure projects using the PPP model.

- **Bankable projects:**

No matter how desirable a regional infrastructure project is from the viewpoint of providing public service, it has to be bankable so the developers can raise capital. However, a lender's return is linked to interest rate so the project cash flow has to be adequate to cover debt service obligations during the loan tenure. When structuring a PPP regional project, governments will need to balance the risks and rewards; the payment to the private sector party will have to be linked to agreed performance standards and risk must be assumed over the life of the asset. Furthermore, transnational projects attract close scrutiny from international civil society and therefore have to be built according to high standards; this lowers the reputation risk for international financial institutions that support such projects.

- **New capital stock:**

In a large number of countries in the Asia-Pacific region, new capital stock is being created now and it is important to ensure that efficient technologies are employed, through advocacy, awareness campaigns and knowledge-sharing; cooperation between countries with similar issues will hasten the deployment of new technologies. Aggregating small investments across the region will lower transaction costs. Large regional programmes for renewable energy can be designed as special purpose funds, which can lower the risk and increase investment in small hydropower, solar, commercial biomass and clean cooking fuels; diversion of part of the benefits from energy connectivity infrastructure projects will boost these funds.

- **Investors initiatives:**

Integrated subregional power transmission and gas networks require substantial capital investment. In order to attract needed funds with more reasonable terms, the

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risks to investors must be minimized. Through economic and political stability, a solid legal framework, and an overall investment climate which encourages investment through stable policy, which lowers the perceived risks for investors, among others, governments can attract increased investment with lower required rates of return. Regional programmes aimed at establishing norms, insuring investments, and pooling funds can also go a long way to channel investments in these vital areas.

- **Regional cooperation:**

Regional cooperation is supported in the Region by international financial institutions including: the World Bank Group; European Bank for Reconstruction and Development; European Investment Bank; and Islamic Development Bank. There is urgency to accelerate the transition to low-carbon growth and development but this goal cannot be fulfilled unless there is cooperation across the region, not only for physical connectivity, but also around financing and technology. Coordination is needed between member States and international financial institutions and bilateral donors that support regional cooperation and energy security. It is important to satisfy the more stringent requirements of the development institutions, particularly regarding transparency and minimizing environmental and social impacts.

- **Regional energy connectivity:**

Regional energy cooperation, through better connectivity of electricity grids and gas pipelines, can yield net economic gains, greater energy security and enhanced sustainability. One example includes China's Belt and Road initiative proposes a strategic vision of greater regional connectivity through a series of economic corridors which includes oil, gas and power transmission lines. According to Information Handling Services (IHS), an estimated \$1.2 trillion could be provided for infrastructure projects as part of the Belt and Road Initiative routes by lenders that include the newly formed Asian Infrastructure Investment Bank, the Silk Road Fund and a host of Chinese commercial banks and financial institutions.

<sup>1</sup> International Energy Agency, *World Energy Outlook* (Paris, 2014). Available from [www.worldenergyoutlook.org/weo2015/](http://www.worldenergyoutlook.org/weo2015/).

<sup>2</sup> International Energy Agency, *Development Prospects of the ASEAN Power Sector: Towards an Integrated Electricity Market* (Paris, 2015). Available from [www.iaea.org/publications/freepublications/publication/Partnercountry\\_DevelopmentProspectsoftheASEANPowerSector.pdf](http://www.iaea.org/publications/freepublications/publication/Partnercountry_DevelopmentProspectsoftheASEANPowerSector.pdf)

<sup>3</sup> AEMI Group, *ASEAN Energy Market Integration (AEMI): From Coordination to Integration* (Bangkok, 2013). Available from [www.asean-aemi.org/aemi-from-coordination-to-integration/](http://www.asean-aemi.org/aemi-from-coordination-to-integration/)

<sup>4</sup> Salis Usman, "Medium term vision for energy connectivity in the SAARC region", presentation prepared for the 8th Japan-SAARC Energy Symposium, Islamabad, Pakistan, 9-10 March 2015. Available from [www.saarcenergy.org/wp-content/uploads/2016/03/Medium%20Term%20Vision%20For%20Energy%20Connectivity%20in%20the%20SAARC%20Region%20by%20Mr.%20Salis%20Usman,%20SEC,%20Islamabad.pdf](http://www.saarcenergy.org/wp-content/uploads/2016/03/Medium%20Term%20Vision%20For%20Energy%20Connectivity%20in%20the%20SAARC%20Region%20by%20Mr.%20Salis%20Usman,%20SEC,%20Islamabad.pdf).

<sup>5</sup> *Ibid.*

<sup>6</sup> The Central Asia Regional Economic Cooperation, or CAREC, Program is a partnership of 11 countries: Afghanistan, Azerbaijan, China, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.

<sup>7</sup> Asian Development Bank, "Study for a power sector financing road map within Central Asia Regional Economic Cooperation, Technical Assistance Report, Project Number 48147-001 (Manila, 2008). Available from <https://www.adb.org/sites/default/files/project-document/82310/48147-001-tar.pdf>

<sup>8</sup> Information Handling Services, "One Belt One Road to provide USD 1.2 trillion in new infrastructure financing", 17 June 2016. Available from <http://fairplay.ihs.com/commerce/article/4270276/one-belt-one-road-to-provide-usd1-2-trillion-in-new-infrastructure-financing>.

The ESCAP Policy Briefs aim at generating a forward-looking discussion among policymakers, researchers and other stakeholders to help forge political will and build a regional consensus on needed policy actions and pressing reforms. Policy Briefs are issued without formal editing. The content of this issue was prepared by Kohji Iwakami and Sean Ratka. This policy brief benefited from comments by Vatcharin Sirimaneetham. For further information on this issue, please contact Hamza Ali Malik, Officer-in-Charge, Macroeconomic Policy and Financing for Development Division, ESCAP ([escap-mpdd@un.org](mailto:escap-mpdd@un.org)).