2nd Asia-Pacific Regulatory Forum on Power System Connectivity

6 - 7 June 2023, 12:00 – 16:00 hrs (GMT + 7)

Summary report

The United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP), in cooperation with the Florence School of Regulation (FSR) of the European University Institute, organized the 2nd Asia-Pacific Regulatory Forum on Power System Connectivity on 6 - 7 June 2023. More than sixty participants joined the Forum included 27 speakers and discussants (see agenda in Annex I below)..

The overall objective of the Forum was to facilitate collaboration and experience sharing across the Asia-Pacific region, in particular to achieving increased power sector connectivity in support of the energy transition, decarbonization and ensuring sustainable energy for all.

Mr Hongpeng Liu, Director of Energy Division, UN ESCAP, and Mr. Leonardo Meeus, Director, Florence School of Regulation welcomed all participants at the opening session.

The Forum had four sessions over two days. Each day began with a keynote speech, and each session started with two leading presentations, followed by short interventions and discussions.

Day 1 – 6 June 2023

On the first day, keynote remarks were provided by Ms. Wu Ye, Director of Department of Market Regulation, National Energy Administration (NEA), China. She emphasized the timely organization of the Forum and the importance of energy connectivity for all countries.

Session 1: Regulatory collaboration on power sector issues across the region

The session focused on regulatory collaboration at regional level and was moderated by Mr. Matthew Wittenstein, Chief of Section on Energy Connectivity, Energy Division, UN ESCAP.

The opening presentation highlighted a significant shift in the energy landscape. While many countries in the Asia-Pacific region announced their ambitious targets to achieve net zero emissions, the region faces significant challenges in transitioning to a sustainable and low carbon system. Asia and the Pacific accounts for over 60% of global energy-related CO2 emissions, and the region's emissions are still increasing. The region's reliance on coal, most notably in the electricity sector, is a major factor. At the same time, the region has a rapidly growing economy and population. In addition to mitigating climate change, the region must adapt to and prepare for the increasingly felt impacts of climate change, including rising sea levels and more frequent extreme weather events.

Interconnectivity is a key to enable a timely and cost-effective integration of renewable energy sources. Regulators play a crucial role in driving energy transition and accelerating cross-

border connectivity through regional cooperation. However it was noted that bilateral exchanges currently dominate in the region.

The enablers and barriers of multilateral interconnectivity project were discussed. The Laos-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP), an electricity exchange project to facilitate the import hydropower from Laos to Singapore via Thailand and Malaysia was highlighted as the first multilateral interconnectivity project in the region. It was noted that LTMS-PIP can be used as a pathfinder for similar projects.

A stable political relationship with a strong government-to-government cooperation was noted as a cornerstone of successful connectivity projects. It was mentioned that domestic opposition in individual countries could create challenges for cross-border power trade, and therefore governments should seek to ensure secure energy supplies at the country level. Social and acceptability considerations were also highlighted. There is a need for a public outreach on the benefits of cross-border electricity exchanges, which is important for building community-level support for cross-border interconnections. Transparency was emphasized as a centrepiece of energy connectivity for a just transition. Another issue which was mentioned is the fact that economic market structure may vary between countries; to overcome these differences, consultations with utilities and other stakeholders on the market model, licensing requirements and so on are needed. Finally, technical challenges were discussed. Interconnection projects require a minimum level of harmonization of grid codes related to security, reliability and interconnectivity. Regional cooperation of regulators could play a crucial role in overcoming those barriers and enabling an acceleration of cross-border interconnectivity.

The session also highlighted regulatory cooperation in the Pacific, where physical grid connections between countries is not feasible. Instead, there is a window of opportunity to increase connectivity through knowledge and best practices sharing. The role, the objectives and the ongoing work for the development of the Office of Pacific Energy Regulators Alliance (OPERA) were presented. OPERA aims to: (i) strengthen and enhance the regional capacity in utility regulation in its member countries; (ii) promote the independence, professionalism, accountability and visibility of national utility and energy regulators; and (iii) develop a regional and international outreach and visibility with a communication strategy and action plan. OPERA supports the preparation of regulatory reforms to facilitate market-based incentives for attracting private sector participation.

The other example of a regional regulatory collaborative body which was discussed during the session is the South Asia Forum for Infrastructure Regulation (SAFIR). SAFIR's work includes the organization of working groups which conduct studies and capacity building programmes.

Both OPERA and SAFIR have conducted consultations and benchmark studies of their members' national regulations. This has enabled the identification of best practices and can help support regulatory harmonization. Through cooperation, regulators can develop platforms to share their skills and improve decision making.

The session concluded that regulation is becoming an increasingly important tool in regional and international governance to support the achievement of decarbonization targets. To foster interconnectivity, engagement through regional organizations is important. At the same time, regulators are important and a key player at the national level, through their engagement with

national stakeholders such as utilities, energy ministries, civil society, academia and NGOs for energy transition.

Session 2: Regulatory collaboration to increase renewable energy integration.

The session focused on regulatory collaboration as a tool to foster renewable energy (RE) integration and was moderated by Ms. Anna Lobanova, Sustainable Energy Specialist at UN ESCAP.

During the session it was highlighted that energy transition will pose economic and social challenges to global economies: from the high capital expenditure required to build RE generation to the skills development needed by workforces to support implementation of new technologies. However, these challenges can be turned as opportunities. Regulatory collaboration is a key to enable this shift and to ensure a cost-efficient energy transition. Regulators are responsible for developing a framework for integrating RE into the grid, for promoting investments and transmission system modernization; they also define the tariffs' structure and ensure transparency of all these processes.

Several challenges related to the integration of variable RE were presented:

1. Integration challenges, e.g., advanced forecasting and reserves management.
2. Challenges to the grid, e.g., the need for grid modernization.
3. Impacts on fossil-fuelled generators, e.g., decreasing generation hours and efficiency.

It was noted that most of the Commonwealth of Independent States (CIS) countries set aligned RE goals and energy policy targets. To achieve them, regulatory collaboration, policy and fiscal support as well as government and private funding are used, the most common tools planned are green certificates, public investments, loans and grants.

Similar challenges were identified in the European Union (EU). For example, the intermittency of RE, possible issues with voltage control and system security require more detailed forecasting. Spain has established a series of control centres to support the integration of RE generation in a secure manner. High shares of RE may also cause network congestion and call for more flexible electricity systems. Energy storage deployment could tackle the need for flexibility. Spain also provides evidence that different types of storage are necessary to complement RE intermittency; market signals and adequate regulatory incentives are needed to make storage economically efficient.

It was emphasized that electricity systems with more RE and prosumers (consumers that also produce the electricity) tend to become more decentralised and, therefore, interaction and cooperation between different actors will be key to ensure its efficient operation. Coordination and collaboration between different sectors and institutions within the country is important, but cross-border cooperation allows to elevate rational use of all existing energy resources in neighbouring countries. Efficient use of various resources combined with eco-friendly technologies can reduce the total cost of the energy transition. Harmonized regulations can enable this process.

Regional cooperation allows countries to benefit from shared opportunities in RE deployment and energy efficiency projects; it can help build robust and sustainable energy markets, support innovative policy making and allow for the development of advanced business models.

The point was then made that the deployment of RE generation and the modernization of the grid necessitate significant investments. Regulation is key in revealing investment opportunities: transparency and clear planning reduce investment risks and help to attract private investments. When developing a financial framework supporting the transition, it was discussed that governments should also consider country-specific conditions, like local economic and social opportunities. The Organization for Economic Co-operation and Development (OECD) supports the financing for RE integration by improving domestic conditions, focusing on both power and financial markets by, for example, organizing training and regional peer-to-peer learning activities, facilitating dialogues between governments and private investors.

Day 2 – 7 June 2023

On the second day, the keynote remarks were provided by Ms. Sophie Ribas, Energy Policy and Markets Lead APAC, Google. She emphasized the importance of regional power system integration for organizations who value clean, cost-effective and reliable electricity.

Session 3: Security implications of cross-border power sector connectivity

The session focused on security risks and benefits related to power sector connectivity was moderated by Mr. Alberto Pototschnig, Deputy Director of the Florence School of Regulation.

It was discussed that power system integration helps to enhance security of energy supply. The benefits associated with power sector connectivity could include improved access to low-cost resources, strengthening cooperation in the energy sector and improved balancing during peak hours. However, disturbances created in one jurisdiction may propagate to other jurisdictions. This calls for coordination and careful planning, together with meticulous market design and close collaboration among regulators; it is also important to estimate the impacts on electricity security.

A regional perspective on cross-border power sector integration is therefore necessary. For example, in the Lancang-Mekong region, the establishment of a regional power trade coordination committee has been proposed, together with the improvement of the flexibility and efficiency of cross-border trading rules and the use of pre-clearing mechanisms to match demand effectively. The development of electricity markets should also consider different aspects such as primary and secondary reserve device configurations, dispatching system support and the harmonization of grid codes.

The experience of utility company in Malaysia highlighted the positive impact of interconnections in terms of increased security, diversified supply and reduced vulnerability to contingencies and fuel prices.

It was also noted that the interconnections of electrical systems include not only physical connections, but also interconnections of information systems, which also increases the

security risks. The more devices are connected in a regional power system, the greater the risk of unauthorised and malicious intrusion.

Another dimension of power system connectivity relates to security of supply, in particular the importance of local energy access. This aspect is relevant not only in the Asia-Pacific region, but also in other parts of the world. In this context, several demonstration projects were showcased at the Forum. They aimed at providing energy access at the local level, while addressing security concerns at the national level. The transition from the local to the regional level requires policy and regulatory support, technical assistance and the development of bankable projects. Energy security and energy access rely on various factors, including the deployment of RE, regional interconnections, the development of electricity markets and system flexibility. It was noted that scaling up of solar-based generation could be an important component of this strategy.

However, several challenges are associated with achieving security in the power sector at regional level, including work with different governments and market stakeholders, navigating dynamic geopolitical relations, addressing the technicalities of interconnections and the techno-economic feasibility of such regional integration projects.

Session 4: Implications of pricing for power system integration

The session focused on the various structures of transmission charges for cross-border and regional power exchanges and was moderated by Mr. Leonardo Meeus, Director of the Florence School of Regulation.

In this session, best regulatory practices to promote regional connectivity were discussed and their possible implications in various jurisdictions. According to the Asia-Pacific Energy Research Centre (APERC) reference scenario, growth in electricity demand is expected to be driven by electrification of end-use sectors and economic growth.

The current best practice is that cost recovery of existing and future network development should be transparent, fair, predictable and non-discriminatory. Wheeling charges, when used to enable the transit of power across third-party grids, should be sufficient to cover additional investment and operation and maintenance costs, and losses. Various methods can be used to estimate and structure these charges. It was noted that wheeling charges are only a part of the cost of electricity, which also include the generation cost, which reflects the fuel mix, and, often, subsidies.

The allocation of cross-border interconnection costs is an important consideration. Upgrading or building new transmission infrastructure for interconnection requires investments, and the parties involved must agree on the cost allocation. However, reaching an agreement becomes increasingly challenging when more parties are involved. Therefore, having a transparent conflict-resolution mechanism in place is essential.

To define the best regulatory practice for regional connectivity, two questions were raised: how much should be paid and who should bear the cost? It was mentioned that best practices to address these issues should reduce the cost of servicing by dispatching the most efficient resources, avoiding unnecessary investment risks and ensuring that transmission cost allocation does not discourage trade or create opposition to transmission projects.

It was also mentioned that there are schemes which create unnecessary risks, such as revenue dependency on transaction volumes, incorrect regulatory updates of historical rates based on replacement cost/market value, failure to ring-fence the transmission revenue requirement and flawed cost allocation methods leading to opposition to paying charges.

The concept of the ‘single system paradigm’ was discussed as a possible guiding principle for designing transmission charges in a regional context, aiming to achieve regional regulation that comes as close as possible to the regulation of a single system. Cost allocation for regional transmission projects should be structured correctly to avoid pancaking. Charges should be independent of transaction paths, and based on estimated benefits or by tracking actual or forecasted flows. The transmission pricing regime may have a very important role in enabling cross-border transactions. Historically, bilateral transactions were easier to charge since the involved assets could be easily identified. It was noted that pancaking is less of a serious problem in bilateral exchanges. In multi-jurisdictional regional markets, efficient charging becomes more complicated and the single system paradigm provides a possible solution.

There is a need for South Asia to develop a uniformed policy for transmission pricing and harmonization of grid codes. The recovery of transmission charges in India is through monthly transmission charges via regulated tariff, based on parameters like loan repayment, depreciation, O&M charges, return on equity, etc., regardless of the quantum of power flows, ensuring cost recovery for transmission infrastructure. System operators in Africa need to develop transmission infrastructure to unlock trade opportunities, but they face the challenge of raising tariffs. For example, in Zimbabwe, the development of the transmission system was delayed given the difficulties of collecting sufficient revenues from transmission charges. In Europe, it has been recognised that benefits do not always accrue in line with the typical territorial criteria for cost coverage. The issue has been addressed by introducing a benefit-based cross-border cost allocation (CBCA), in which costs are allocated on the basis of the benefit delivered by the project to the different jurisdictions. It was also mentioned that work is conducted in South Africa to address this challenge.

The evaluation of the benefits of connections is a difficult task, particularly in small countries where there are no economies of scale for large power plants. To build trust, import contracts should be respected even during moments of crisis.

Finally, the concept of a clean electricity-dominated global energy interconnected power system was discussed. China's system was noted for its highly regulated prices based on cost accounting and extensive cross-regional electricity trading. Large-scale power integration is primarily driven by clean energy. While market mechanisms are encouraged, there is acknowledgment that pricing may need regulation in certain cases.

Annex I

2nd Asia-Pacific Regulatory Forum on Power System Connectivity

6 - 7 June 2023, 12:00 – 16:00 hrs (GMT + 7)

Agenda

6 June 2022

Time (GMT+7)	**Agenda item**
12:00 - 12:05	Welcome remarks and housekeeping announcements
12:05 - 12:15	*Opening remarks* **Mr. Hongpeng Liu**, Director of Energy Division, UN ESCAP **Mr. Leonardo Meeus,** Director, Florence School of Regulation
12:15 - 12:25	*Keynote remarks* **Ms. Wu Ye,** Director of Department of Market Regulation, National Energy Administration (NEA), China
12:25 – 13:30	*Session 1: Regulatory collaboration on power sector issues across the region* Moderator: **Mr. Matthew Wittenstein**, Chief of Section Energy Connectivity, UN ESCAP *Scene setting presentations:* • **Ms. Sharon Seah**, Senior Fellow, ISEAS-Yusof Ishak Institute • **Mr. Rafayil Abbasov**, Senior Energy Specialist, Pacific Department, ADB *Interventions by audience and discussion:* • **Madam Deki Choden**, Interim CEO, Energy Regulatory Authority, Bhutan • **Ms. Rashmi Nair**, Deputy Chief Regulatory Affairs, SAFIR • **Ms. Shilpa Agarwal**, Joint Chief, CERC • **Mr. Thy Selaroth**, Chief of Transmission and Sub-Transmission Office, Electricity Authority Cambodia • **Ms. Hannah Lord**, Research Fellow, Australian National University
13:30-14:30	Lunch break

14:30 – 15:50	*Session 2: Regulatory collaboration to increase renewables integration* Moderator: **Ms. Anna Lobanova,** Sustainable Energy Specialist, UN ESCAP *Scene setting presentations:* • **Ms. Olga Frolova**, Director of Strategy Department; **Mr. Georgy Ermolenko**, Director of External Relations Department, Executive Committee of the Electric Power Council of the CIS • **Ms. Carmen Longas,** Head of the Access to the Grid Department, Redeia *Interventions by audience and discussion:* • **Mr. Furugzod Usmonov**, Consultant, Tajikistan • **Mr. Husnu Tekin -** Director of Energy, Minerals and Environment department of ECO Secretariat • **Ms. Ariola Mbistrova**, Policy Analyst, Clean Energy Finance and Investments, OECD • **Ms. Mika Ohbayashi**, Director, REI, Japan
15:50 – 16:00	Closing remarks

7 June 2022

Time (GMT+7)	**Agenda item**
12:00 - 12:05	Welcome remarks and housekeeping announcements
12:05 – 12:15	*Keynote remarks* **Ms. Sophie Ribas,** Energy Policy and Markets Lead APAC, Google
12:15 – 13:30	*Session 3: Security implications of cross-border power sector connectivity* Moderator: **Mr. Alberto Pototschnig,** Part-time Professor and Deputy Director (World of Practice), Florence School of Regulation *Scene setting presentations:* • **Ms. Rena Kuwahata,** Energy Analyst Power System Transformation, International Energy Agency (IEA) • **Ms. Qin Yun**, Assistant to Director, International Cooperation Research Institute, Energy Development Research Institute (Lancang-Mekong Research Centre), China Southern Grid

	Interventions by audience and discussion: • **Mr. Daniel del Barrio Alvarez**, Assistance Professor, University of Tokyo • **Mr. Leslie Chai Kim Pau**, General Manager, Sarawak Energy • **Mr. Pankaj Khurana,** Solar Power Consultant, International Solar Alliance • **Mr. Han Choonghee**, Security Expert, Korean Power Exchange
13:30-14:30	Lunch break
14:30 – 15:50	*Session 4: Implications of pricing for power system integration* Moderator: **Mr. Leonardo Meeus,** Director, Florence School of Regulation *Scene setting presentations:* • **Mr. David Wogan**, Assistant Vice President, Senior Researcher, Asia Pacific Energy Research Centre (APERC) • **Mr. Ignacio Perez-Arriaga**, Interim Director of the African School of Regulation (ASR), Professor and Director of Energy Training, Florence School of Regulation (confirmed) Interventions by audience and discussion: • **Mr. Hans Arild Bredesen,** CEO, Bredesen consulting • **Mr. Pankaj Batra**, Integrated Research and Action for Development, IRADE • **Mr. Quan Nan,** Director of Southeast Asia-South Asia Office, Global Energy. Interconnection Development and Cooperation Organization (GEIDCO)
15:50 – 16:00	Closing remarks