The present document contains the draft detailed outline of the 2022 Regional Trends Report on Sustainable Energy Connectivity in Asia and the Pacific: status, trends, and opportunities. It reflects upon its underpinning rationale, aim, and structure.

The Report will be prepared by ESCAP’s Energy Division, in close consultation with experts and consultants. Specific contributions from experts and key stakeholders will be requested to enrich the Report. The valuable insights from the Expert Working Group on Energy Connectivity are therefore appreciated.

BACKGROUND

ESCAP’s 2022 Regional Trends Report (RTR) will focus on regional power system connectivity. The publication will serve to review and present the state of power systems connectivity across Asia and the Pacific region with the goal of reinforcing regional cooperation.

In February 2021, the Committee on Energy endorsed the “Regional Road Map on Power System Connectivity: Promoting Cross-Border Electricity Connectivity for Sustainable Development” (‘Regional Road Map’). This endorsement marked an important step in the process of acknowledging the importance of energy connectivity as a tool in attaining Sustainable Development in the region, in particular SDG7 targets. The document provides a reference for regional cooperation towards achieving power grid integration in the period 2020 to 2035. The drafting and endorsement of the Regional Road Map was the result of a comprehensive process involving ESCAP and the Expert Working Group on Energy Connectivity.

While the endorsement was an important step, it is now crucial to build on member States’ commitment and actively work towards the successful implementation of the nine strategies proposed in the Roadmap. Several interconnection lines have been established to carry out cross border power trade and the results of regional power cooperation have become more prominent. Hence, the 2022 RTR represents an opportunity to examine and critically reflect on the progress made in terms of national, intra-regional and regional power connectivity. In doing so, it will examine the opportunities and challenges connectivity faces in the region, and enable way forward.
The overarching goals of the 2022 RTR are:

a) to build on the development of the regional road map on power system connectivity, and capture relevant regional trends;

b) to identify case studies and good practices (policies and programs) from the region and around the globe that demonstrate opportunities to address some of the persistent and emerging challenges in promoting energy connectivity in the Asia and Pacific region.

Guided by these goals, The Regional Trends Report 2022 will pursue specific objectives:

1. Highlight the relevance of regional power connectivity in attaining sustainable development and energy security;
2. Present the current state of regional power connectivity, pointing out the progress and prospects;
3. Review and discuss the challenges to further deepen cooperation and cross-border power connectivity;
4. Emphasize the financial dimension as one of the main barriers for the planning/development of cross-border power systems while showing prospects and proposals to improve access to capital;
5. Focus on the existing coordination institutional mechanisms and discuss their challenges;
6. Launch the discussion on cross-cutting and emerging issues and their actual/potential effects in regional power connectivity.

The 2022 Regional Trends Report will stem from the critical intersection of several inputs, and will be prepared in close consultation with experts. Hence, to generate evidence, a set of strategies will be applied based on eliciting expert knowledge. These include surveys (including a Delphi survey), expert panels/focus groups, Interviews, and the inputs from EWG-EC7 and EWG-EC8.

Together, these techniques are expected to produce predominantly qualitative results. The different nature of each method, based on different forms of communication and levels of formality, allows for the integration of different types of feedback. The main objectives of these information gathering methods are: a) to assess the present and estimate the future impact of sustainable energy connectivity; b) to understand the opportunities and challenges it encloses; c) to identify key trends that might influence its path; and d) to develop strategies to accelerate energy connectivity through regional cooperation. Information gathered through these research methods is expected to contribute and meet the objectives of the Report.

STRUCTURE and detailed outline

Steered by the vision of an interconnected regional power system, the Report will follow a funneling approach, in which case studies have a prominent role. It will examine the current status and future trends of regional power system connectivity of the Asia-Pacific region, with a particular focus on five topics/chapters:

1. Regional Power System Planning;
2. Developing and Financing Cross-border Power System Infrastructure;
3. Coordinated Power Systems Operations;
4. Cross-Cutting Issues; and
5. Emerging Topics
The following sub-sections of this detailed outline of the Report offer a brief overview of the reasoning and key messages of each chapter. The development of these topics/chapters will be guided by the Strategies and Milestones included in the Road Map:

**Strategy 1 (S1):** build trust and political consensus for cross-border electricity trade  
**Strategy 2 (S2):** develop a regional cross-border electricity grid master plan  
**Strategy 3 (S3):** develop and implement intergovernmental agreements on energy cooperation and interconnection  
**Strategy 4 (S4):** coordinate, harmonize and institutionalize policy and regulatory frameworks  
**Strategy 5 (S5):** move towards multilateral power trade and create competitive markets for cross-border electricity  
**Strategy 6 (S6):** coordinate cross-border transmission planning and system operation  
**Strategy 7 (S7):** mobilize investment in cross-border grid and generation infrastructure  
**Strategy 8 (S8):** build capacities and share information, data, lessons learned and best practices  
**Strategy 9 (S9):** ensure the coherence of energy connectivity initiatives and the Sustainable Development Goals

### Chapter 1  
**Regional Power System Planning**

**Justification and aim:**  
Steered by the vision of an interconnected regional power system, chapter 1 aims to offer a comprehensive understanding of the status of cross-border power connectivity in Asia. This includes offering an overview of the existing/planned cross-border connectivity initiatives and, above all, highlighting the progress and prospects.  

The Road Map was preceded by the elaboration of four subregional status reports; however, it is essential to survey any updates for the careful mapping of existing high voltage transmission network.¹ This will also be the departing platform to summarize the persistent challenges relevant to regional power generation and planning. Some of these challenges will be addressed in subsequent chapters.  

In order to offer a constructive vision, the chapter will present case studies and good practices that have been put forward by States across the region to address the identified challenges, and also concrete proposals for better regional power system planning.  

Chapter 1 will be guided by the following Road Map Milestones:  
- Regional grid master plan might be agreed by member States by 2025 and mapping of the region’s existing high voltage transmission network by 2022 (S2)  
- Establishment of coordinated mechanisms for cooperation among system operation and transmission utilities (S6)

**Tentative structure/content of chapter 1:**

1. **Outlook: cross-border power connectivity in Asia**  
   1.1. Intra-regional status of connectivity  
      a. Southeast Asia  
      b. South and South-west Asia  
      c. East and North-East Asia  
      d. North and Central Asia

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¹ Experts are requested to provide the most recent information and data on this aspect.
1.2. Inter-sub-regional and regional initiatives
   a. Generation (cross-border projects)
   b. Cross-border Transmission

1.3. Achievements
   a. Bilateral and regional agreements (generation and transmission planning)
   b. Changes at the national level to support regional agreements
   c. Perceived/concrete benefits to countries derived from power connectivity

1.4. Gaps and the Potential Opportunities for cross-border power connectivity in the road from bilateral to multilateral connectivity and trade

2. Identifying persistent challenges in regional power generation and grid planning
   a. Geographic, Political and geopolitical
   b. Lack of trust and information sharing
   c. Inexistence of unified regulatory framework, policies, and tariff structures
   d. Absence of harmonized operational and technical standards and codes
   e. Economic, business/financial factors
   f. Lack of coordination/cooperation for the planning and operation of cross-border power systems, electricity power market design in the region (CBET)
   g. Low national/regional institutional capacity
   h. …

3. Winds of change? Case studies and good practices from the region

4. Lessons learned: Priorities and Proposals for better regional power system planning

5. Drawing the map towards a regionally integrated power market: an evolutionary process

Chapter 2
Financing and Developing Cross-border Power System Infrastructure

Justification and aim:
In the framework of the persistent challenges identified in chapter 1, chapter 2 will specifically address one of the most recurrent problems identified by States when planning/developing cross-border power systems: the financial dimension.

Financing the development of cross-border power system infrastructure raises several difficulties. Long distances, difficult routes and high cost for interstate (multi-stakeholder) transmission lines are some of the reasons hindering investment mobilization. On the other hand, the inexistence of harmonized regulatory frameworks, policies, and tariff structures often carries considerable uncertainty, which makes projects uncompetitive and unattractive for investors.

Hence, this chapter will: a) highlight the specific challenges faced by sub-regional initiatives and developing the infrastructure; b) explore the type and role of financial institutions (and other relevant organizations); c) investigate attempts/solutions for improving access to capital for the development of cross-border power system infrastructure; and d) understand whether there are prospects for change (better understanding of the need for regional power connectivity and more willingness to find financing solutions).

Chapter 2 will be guided by the following Road Map Milestones:
- Subregional Platforms, convening financial institutions, utilities and governments, created to advance financing of energy cooperation (S7)

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2 Experts are requested to provide concrete examples and good practices in addressing the challenge of investment attraction.
Chapter 3
Developing Coordinated Power Systems Operation

Justification and aim:
Regional and sub-regional discrepancies in terms of policies, regulations and standards are often pointed out as impediments of power connectivity in Asia. Additionally, the lack of coordinating mechanisms that could mitigate/overcome this lack of harmonization is also envisioned as thwarting the progress of enlarging the network of cross-border power connectivity.

This chapter will address these issues. More specifically, it will focus on the existing coordination institutional mechanisms and discuss the challenges they face. An enabling regulatory environment is one of the main conditions to harnessing the potential of power connectivity.

Hence, this chapter will present global/regional successful examples (arrangements/institutions) in developing political trust and providing clear vision towards developing coordinated power systems operation. From these examples, the chapter will extract lessons that can be applied/replicated in the region.

Chapter 3 will be guided by the following Road Map Milestones:
- Intergovernmental Agreement in NEA by 2022 (S3)
- Gap analysis in grid policies, regulations and standards in each subregion by 2023 (S4)
- Development of subregional and Asia-Pacific studies to evaluate the economic, energy security, social and environmental aspects of multilateral electricity trade (S5)
- Establishment of coordinated mechanisms for cooperation among system operation and transmission utilities (S6)

Tentative content/structure of chapter 3:

1. Coordination institutions and mechanisms: an overview
   1.1 Regional and sub-regional institutions
   1.2 Challenges and Limitations: technical and political (trust, culture, mindset) factors
   1.3 Institutional versus non-institutional arrangements - advantages and disadvantages
2. Synchronizing power systems operations: Insights from institutions outside the region
   Examples of (inter alia):
   a. integrated regional power markets
   b. harmonization of regulatory, technical frameworks, and policies for CBTE
   c. coordination of National Power Development Plans
   d. multilateral dispute settlement mechanisms
   e. models of unified energy market design
   f. electricity common markets
   models for cross-border power purchase agreements and asset development
   g. technical interconnection blueprints
   best practices in procurement strategies
   h. agreements on energy security issues
   i. technical know-how cooperation and information sharing
   j. Methodology for bilateral/ multilateral power trade
   k....

2.2. Success factors and lessons learned

3. The way forward
   3.1. The potential role of deeper regional cooperation
   3.2. Proposals towards developing and operating coordinated power systems

Chapter 4
Cross-cutting issues

Justification and aim:
As highlighted in previous chapters, the importance of regional power connectivity and trade in
achieving sustainable development is broadly recognized. As stated in the Road Map, “a more
interconnected grid offers a more reliable, affordable and sustainable electricity supply. This would
underpin the region’s social and economic development and assist the member States to transition
to more efficient, flexible, economical and lower greenhouse gas emissions energy systems”.

However, this endeavor raises persistent challenges, not least the lack of commitment. Although
the previous chapters have pointed out the main challenges to power connectivity, there are cross-
cutting issues that have impact across all stages of planning, development and operation of
interconnected power systems. As such, these issues require dedicated attention.

This chapter will focus on topics that may have far-reaching positive effects in the commitment to
more connectivity projects both within sub-regions and across the region. Departing from a broader
perspective, the chapter will present examples and good practices as evidence of the positive
effects of power connectivity initiatives.

Chapter 4 will be guided by the following Milestones:
- Regional meeting on grid integration system operation and transmission utilities (S1)
- Development of subregional and Asia-Pacific studies to evaluate the economic, social and
  environmental aspects of multilateral electricity trade (S5)
- Capacity-building, knowledge generation and data support plans developed, and resources
  identified to support MS (S8)
- A set of principles to enable assessment of interconnection projects against economic outcomes,
  efficiency and sustainability criteria by 2023 (S9)

3 Regional road map on power system connectivity: promoting cross-border electricity connectivity for
sustainable development, p. 5
Tentative content/structure of chapter 4:

1. Exploring the relationship between power system connectivity and Sustainable Development: from theory to evidence in the field
   1.1. Energy access and the reduction of energy poverty – social dimension
   1.2. The impact on renewable penetration and power sector decarbonization – contribution to climate change mitigation
   1.3. The linkage between Energy/ power cooperation and energy security
2. Assessing and measuring the impact of interconnectivity: good practice examples
   2.1. In-depth research and models to evaluate interconnectivity initiatives
   2.2. Policy-making processes and the role of information/ data
   2.3. Data challenges: generating and sharing data
3. Dissemination of Knowledge and Capacity-building
   3.1. The Needs
   3.2. Capacity development initiatives undertaken in the region (good practice)
   3.3. The role of Leadership in changing mind set
   3.4. The need to expand stakeholders’ engagement and promote the understanding of benefits among different sectors of society
      3.4.1. The role of civil society and the issue of social inclusiveness
      3.4.2. The private sector

Chapter 5
Emerging issues

Justification and aim:
Ensuing chapter 4, the present chapter will concentrate on less-explored topics that nevertheless have the potential to be disruptive and/or may influence decision-makers in endorsing cross-border electricity connectivity.

Tentative content/structure of chapter 5:

1. Trends in the power sector
   1.1. Innovative technologies and their potential (generation, distribution, storage, efficiency)
   1.2. Sector coupling
2. Energy connectivity in the Pacific
   2.1. Geographic determinism? Limitations and solutions
   2.2. The role of connectivity for small island states
3. Emerging security issues
   3.1. Vulnerability of interconnected systems
   3.2. Digitalization
   3.3. Cyber security and terrorism
Over the next decades, the Asia and Pacific region will continue to face formidable challenges in terms of energy imbalances (demand/supply; access). As regional power connectivity will help address these issues, it is important to understand how to accelerate it and achieve power grid integration across the region.

Overall, States and key stakeholders do recognize the importance and benefits of power systems connectivity for sustainable development. However, there is limited evidence of multilateral cross-border power connectivity. Most examples are still bilateral in nature.

While acknowledgment exists across countries, views on the difficulties and challenges associated with the endeavor often obscure its advantages. Financing in particular is frequently pointed to as hindering the development of cross-border power system projects. It is therefore imperative to explore the specific obstacles of raising capital and to investigate how cases of successful responses/solutions across and beyond the region can be replicated.

The role of regional coordinating bodies and mechanisms is viewed as a way to overcome many of the challenges. Evidence suggests that these arrangements have contributed to attain harmonization and to develop political trust, which are sine qua non conditions for the development of regional power connectivity.

There is diversity in the region and between sub-regions in terms of economic, social, political, and energy and power environment. However, this diversity can be perceived positively in terms of complementarities. Furthermore, there is considerable convergence in the types of challenges identified by States (political, economic, financial, technical). This suggests there is common ground for discussion in the search for solutions to overcome barriers.

It is important to highlight and learn from international (non-Asia Pacific), regional and sub-regional successful experiences of cross-border power system connectivity. These examples will expose the opportunities and positive spillover effects, which can be mimicked.

All stakeholders should be convened to the debate. Promoting cross-border power connectivity goes beyond governmental level to the need to include society and consumers, the private sector, academia, institutions. Evidence suggests that getting local acceptance is a key success factor in implementation of cross border infrastructure projects. Undertaking an inclusive approach through stakeholder engagement contributes to ensuring a socially positive imprint in local communities.

More in-depth research needs to be conducted, namely on the cross-cutting and emerging topics that have disruptive potential. Realizing the vision of an interconnected regional power grid requires a constant and close examination of the issues that may impact the commitment to deeper connectivity.