Roadmap for the Green Power Corridor in Northeast Asia

Maria Pastukhova
Senior Policy Advisor, Energy Diplomacy, E3G
The Roadmap serves as:

A practical application of the Green Power Corridor framework to Northeast Asian context.

A set of incremental, time-bound and concrete steps towards establishing an institutional & political cooperation base to support long-term development of cross-border clean power trade in Northeast Asia.

A long-term pathway towards regional power grid connectivity that enables faster energy transition while boosting economic growth & energy security.
Structure of the report

Executive summary
Introduction
Chapter 1: The Green Power Corridor concept
Chapter 2: Modelling the grid for the Green Power Corridor (SEI)
Chapter 3: International lessons for the successful development of a power grid connectivity roadmap for Northeast Asia
Chapter 4: The Roadmap for a Green Power Corridor in Northeast Asia
  • Track 1. Political accord
  • Track 2. Institution building
  • Track 3. Infrastructure
  • Track 4. Finance/investment track
  • Track 5. Regulatory track / trading model
  • Track 6. Capacity building & social track
Key takeaways

• Reaching an agreement at the political level, even in principle, can facilitate faster implementation, draw in needed investments and signal a region’s clean energy ambition.

• Working-level coordination in the near-term can go a long way towards creating a solid basis for regional cooperation in the long-term.

• The delivery of the GPC is a multi-layered process that requires coordination among key stakeholder groups and an open dialogue with communities on the ground.

• Existing international platforms can provide institutional support during the initial stages of GPC implementation.

• A GPC for Northeast Asia can help to deliver the existing national climate and energy goals faster and more efficiently, while laying the basis for higher ambitions.

• Pursuing regional power grid connectivity is a no-regrets option, while Northeast Asian countries have all the prerequisites to leverage it as a powerful tool to serve domestic climate and energy transition goals.
International lessons

Drawn based on the analysis of historic development of 17 regional connectivity initiatives in

- Europe (SGCE, Nord Pool),
- Americas (Western Interconnection, SIEPAC, SINEA, MERCOSUR)
- Africa and Middle East (SAPP, WAPP, EAPP, CAPP, Maghreb Int., EIJLLPST, GCCPG)
- Asia-Pacific (EAEU, CASA-1000, SAARC ER, APG/GMS)

... to provide an overview of the available „toolbox“ for boosting cross-border connectivity as well as highlight approaches proven to lead to success and/or failure across different geographies.
International lessons and new challenges for NEA

1. Power grid connectivity was historically an evolutionary process
2. Economic / socio-economic rationale is one of the key drivers of cross-border connectivity
3. International and non-governmental/private entities are key during the implementation phase
4. Synchronization and market liberalization are not prerequisites to a functioning cross-border power trade
5. Political support is necessary to go beyond incremental bilateral interconenctions towards regional connectivity formats.

New terrain for emerging connectivity initiatives
- maximising the potential of interconnections to enable higher RES intake in national power systems
- climate ambition (net-zero by mid-century) and shorter timeframes available for deploying new energy infrastructure
- cyber security and climate resilience of new infrastructure
Three Phases of the Roadmap for GPC in NEA

Phase 1: Setting the groundwork
Working level, less formal, multi-stakeholder processes and structures.

Phase 2: Implementation
Formalised multi-stakeholder processes & structures; key financial decisions; new infrastructure.

Phase 3: Organic Development
Ad-hoc development of regional connectivity together with countries’ energy and climate priorities, market dynamics & regulatory context.

* Political agreement in principle needed to facilitate faster implementation, draw in the needed investments.
1. Political accord

**GPC Principles:**

- Develop an overarching vision to guide, support and enable development of power system connectivity projects at all levels, including allocation of responsibilities and resources as appropriate.
- Formalize political accord through joint statements, Memorandums of Understanding (MoUs), and other forms of intergovernmental agreements.

Political agreement in principle needed to facilitate institutions building, help attract needed public finance and create confidence into the project for private investors

First step – recognition of a common high-level vision of regional power grid connectivity
2. Institution building

GPC Principles

- Identify or, if necessary, establish inter-jurisdictional platforms for collaboration across all relevant areas.
- Develop a common methodology for feasibility studies (including the required modeling).
- Commit to data transparency wherever possible, and data sharing with selected partners for sensitive data.
- Update data on an agreed upon schedule.

Policy recommendations going forward

- Focus on establishing an institutional framework enabling regular working-level exchange and coordination

- Make use of the existing regional fora for economic cooperation as a springboard

- Create space for exchange and coordination platforms organized and run by utilities and regulatory bodies on a regular basis

- Involve international and national PFIs in the institution-s building and planning early on

- Make sure the core focus of the institutional work is optimizing the socio-economic and technical potential of cross-border connectivity
## 2. Institution building

<table>
<thead>
<tr>
<th>Key Stakeholders</th>
<th>Key Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td>- National &amp; private utilities; regional expert groups &amp; research institutes</td>
<td>- Interim secretariat;</td>
</tr>
<tr>
<td>- IOs, existing regional integration institutions &amp; platforms</td>
<td>- Utilities coordination forum;</td>
</tr>
<tr>
<td>- Government agencies</td>
<td>- Expert working groups;</td>
</tr>
<tr>
<td>- Public financing institutions</td>
<td>- Cross-stakeholder consultation group;</td>
</tr>
<tr>
<td></td>
<td>- Regulatory Council;</td>
</tr>
<tr>
<td></td>
<td>- Association of national transmission system operators (ANTSO)</td>
</tr>
</tbody>
</table>

### Timeline

1. **Laying the groundwork (2023-2030):** Establishing key coordination and cooperation formats (working level)
2. **Implementation (2030-2040):** Formalising institutional framework (MoU, RC, NTSO-E)
3. **Organic development (2040-):** ad-hoc institutional development to respond to any emerging needs of the GPC and the member countries
3. Infrastructure

GPC Principles

- Develop a common methodology for feasibility studies (including the required modeling).
- Least cost energy modelling approach including relevant sustainability parameters
- Provide a transparent and open process for connecting renewable energy generation to the grid.
- Coordinate cross-border and intra-jurisdictional infrastructure planning

Policy recommendations going forward

- Align regional modelling with national outlooks for future energy demand and renewable deployment plans.
- Enable and facilitate regular exchange between relevant agencies on national power grid development planning
- Accelerate the expansion and integration of domestic power grids, with particular focus on connectivity between sub-national power systems and adequate distribution networks.
- Conduct regular assessments of national power grids’ flexibility & analyse the potential of cross-border power grid connectivity to add the needed flexibility as the share of renewables-based generation grows.
- Develop additionality criteria for connecting cross-border power interconnections to renewable generation capacities in NEA countries
- Identify a set of bilateral projects of strategic importance as the initial step towards a GPC in NEA, focusing on regions with higher synergies (NE China-Mongolia, ROK-China, ROK/Busan-Japan/Fukuoka).
## 3. Infrastructure

### Key Stakeholders
- National and subnational TSOs;
- organisations for cross-regional coordination of TSOs (e.g. OCCTO);
- power generation companies,
- relevant ministries;
- Expert WG(s);
- public and private investors.

### Key Formats
- early feasibility studies
- bilateral priority projects
- grid connection agreements
- regulatory arrangements for siting, permitting and procurement
- Procurement, tender preparation, location surveys, permitting,

### Timeline
1. **Laying the groundwork (2024-2030):** identifying priority projects, early feasibility studies, first cross-TSO exchanges on nat grid planning, grid connection agreement on the first project batch
2. **Implementation (2030-2040):** Construction of new interconnectors and adjacent RES generation; i.a. enhancements of existing capacity; new interconnectors begin operation; Master Plan for GPC in NEA agreed.
3. **Organic development (2040-):** studies on potential benefits of reg grid synchronisation, new multilateral interconnectors; Master plan for GPC in NEA regularly updated & aligned w nat grid development plans.
4. Finance/investment track

GPC Principles

- Infrastructure development requires sustainable financial frameworks
- Leverage all forms of available financing to support the development of transmission infrastructure, both within and between jurisdictions

Policy recommendations going forward

- Ensure **clarity over the financial burden** for key national stakeholders incl a mechanism for calculating the fair burden allocation for financing the operations of the GPC project
- Develop **transparent communication of investment return mechanisms** and timelines.
- **Identify future electricity demand** and needed renewables-based power generation and transmission capacity in the region
- Accompany feasibility studies on the new interconnections with an **assessment of investment needs, risks & of the socio-economic rationale**
- **Utilize the existing (national) support mechanisms** for deployment and connection of renewables-based generation capacity to support the GPC investment case.
## 4. Finance/investment track

<table>
<thead>
<tr>
<th>Key Stakeholders</th>
<th>Key Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilities, project developers and installers, IFIs, national financing institutions, National development organizations relevant ministries, Energy Charter Treaty, International Energy Charter.</td>
<td>Learning workshops with key IFIs and other institutions PPAs btw the participating utilities Financing agreements with the supporting IFIs Co-financing arrangements with private investors</td>
</tr>
</tbody>
</table>

### Timeline

1. **Laying the groundwork (2024-2027):** clarifying financing of GPC secretariat, exchange on best financing practices, study reviewing the financing toolbox & proposing a set of financing instruments
2. **Implementation (2027-2035):** project agreements w supporting IFIs, PPAs signed on a priority set of bilateral interconnectors, co-financing agreements w private investors
3. **Organic development (2035-):** dialogue on a legal framework for GPC investments; growing share of private finance in follow-up GPC infrastructure; PFIs focus on TA and capacity building
5. Regulatory track/ trading model

GPC Principles

- Develop harmonized grid codes that enable secure and flexible operations
- Enable bilateral cross-border power trading arrangements through harmonized and coordinated procedures.
- Establish multilateral trading arrangements that emphasize flexible and least-cost trading of electricity
- Develop appropriate and consistent cost-sharing and cost-recovery mechanisms

Policy recommendations going forward

- **Involve national regulatory authorities** and transmission system operators **early on** in planning of the GPC in NEA
- Develop a **contract template** and an initial set of standards and requirements essential for bilateral power trade and exchange
- Ensure **clarity over price-making mechanisms** for traded electricity and transmission and test the economic rationale of power trade under agreed conditions in the context of national pricing instruments
- **Make sure price-making mechanisms are aligned with renewables trade** and are not linked to or affected by the pricing of peaking (fossil fuel) capacity
- **Consider using existing national power exchange platforms**
- Facilitate the development of the regulatory framework parallel to the development of infrastructure backbone to ensure alignment of all key tracks of the GPC.
- Work out a way **reflect the value of the GPC in NEA, not only the cost** of the projects (e.g. environmental and health benefits, jobs creation etc.).
- **Enable regular peer-to-peer exchange with regulatory institutions** involved in connectivity initiatives in **other regions** to make sure the GPC in NEA avoids undesirable path-dependencies as it pursues an increasingly renewables-based regional power system.
5. Regulatory track/ trading model

<table>
<thead>
<tr>
<th>Key Stakeholders</th>
<th>Key Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td>- National regulatory bodies (e.g. NRDC, OCCTO, KOREC etc.), where applicable – regional regulatory bodies (in later stages), national power exchange platforms (e.g. JPEX).</td>
<td>- Network codes, technical standards, environment standards, additionality requirements, guidelines on cross-border interconnector operations, cost recovery guidelines, template for bilateral power trade</td>
</tr>
</tbody>
</table>

**Timeline**

1. **Laying the groundwork (2024-2030):** mapping national reg frameworks, identifying overlaps & synergies; developing a template & core standards for new bilateral power trade agreements; initiating peer to peer dialogue btw regulatory authorities
2. **Implementation (2030-2035):** formalising NEA utilities platform (Reg Council), NTSO-E; establishing mechanisms to coordinate ancillary services, joint emergency response; discussing data sharing mechanisms.
3. **Organic development (2035-):** gradual harmonization of national reg frameworks; development of a regional regulatory framework for power trade, launching a pilot multilateral power trade project.
5. Capacity building & social track

GPC Principles

- Establish inclusive stakeholder consultations processes
- Develop targeted capacity building and other forms of training programs for all impacted social groups
- Measure and make public the social benefits of increased connectivity

Policy recommendations going forward

- Make sure local jobs and value creation in exporting countries is being fostered (e.g. RES manufacturing, in future – industrial growth using domestic H2 production etc.), focusing on local communities and border regions, as well as communities dependent on to-be-retired fossil fuel-based infrastructure (e.g. coal communities).
- Ensure gender equity when training new skilled workers for developing and maintaining the projects.
- Enable cross-regional skill learning and exchange.
- Enable studies exploring and explaining environmental risks and benefits of renewables-based power generation facilities in NEA to feed into public awareness campaigns and educational programs.
- Explore the potential of establishing a regional education program on green grids for staff and management levels, with priority access and financial support enabling local communities to participate in the program.
- Engage the local NGOs in the planning process to enable civil society buy-in.
5. Capacity building & social track

**Key Stakeholders**
- Local communities in border regions and regions with to-be-deployed renewable generation capacities,
- Capacity building organizations/educational institutions,
- IFIs, national financial institutions
- relevant ministries,
- labour organizations (unions), ILO,
- development organizations

**Key Formats**
- Capacity-building programs for staff operating renewables-based power generation capacities, power grid operations, installers, construction workers etc.;
- public awareness campaigns;
- regional youth and young professionals’ dialogues;
- joint green grids education programs (technical college or university level);
- gender diversity training; gender diversity criteria; sustainability criteria.

**Timeline**

1. **Laying the groundwork (2023-2035):** International workshops sharing lessons learned on capacity building, education programs; mapping regional capacity building needs w focus on local communities; setting up GPC education programs incl. Securing funding and education facilities

2. **Implementation (2030-2035):** Launching education and training programs, and public information & awareness raising campaings; enabling peer assessments of GPC planning & implementation process by the local CSO communities

3. **Organic development (2035-):** Growing skilled labour force to drive implementation of GPC in NEA, regular updates on the GPC from the public information & awareness raising campaign