

Green Power Corridor

Roadmap towards regional power grid connectivity for Sustainable Development in Northeast-Asia

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International momentum for the GPC

- Commitment to reach **net-zero emissions** economy by 2050 by Japan, Korea; by 2060 by China, Russia
- International action on **coal phase-out/down**: G7, China's 2021 UNGA announcement, PPCA, GCCPC
- International **trans-continental initiatives** increasingly address the challenge of decarbonization: B3W, Green BRI, PGII, GGI/OSOWOG
- International **public finance** increasingly targeting clean energy sectors, with electrification in focus
 - ADB's new energy policy
 - WB's Climate Change Action Plan
 - COP26 Statement on International Public Support for the Clean Energy Transition
- Fundamental shifts on the global **energy markets**:
 - tight fossil fuel supply + volatile prices in the mid- to long-term
 - Accelerated transition increasingly linked to competitiveness & security, IEA: accelerated investment into RES globally can reduce global gas demand by up to 105 bcm by 2025, renewables to become the single biggest source of electricity.
 - RES more competitive than new fossil fuel-based generation despite the commodity price crisis & supply chain bottlenecks

Emerging regional cooperation on power grid connectivity

Research & analysis since late 1980s

Several regional interconnection **initiatives proposed** – ASG, NEAEI, NAPSI

First agreements between key stakeholders

- **2016** MoU btw SB Group, SGCC, KEPCO, PJSC Rosseti – feasibility of ASG
- **2022** MoU btw KEPCO, SGCC - joint implementation of CN-KR submarine interconnector

Challenges to full-fledged cooperation efforts

- Geographic, technical aspects,
- Lacking Institutional & regulatory frameworks
- Lack of political will
- **Lack of common vision**

Roadmap objective

- Propose a coherent vision for regional power grid connectivity development
- Suggest concrete steps for development of the power grid connectivity towards the agreed vision of the GPC

Roadmap overview

Chapter 1: The green power corridor for NEA: introducing the concept

Chapter 2: Modelling the grid for the green power corridor (SEI)

Chapter 3: The Action Roadmap for a Green Power Corridor in Northeast Asia

- 3.1. Power grid connectivity across the globe: a century of trial, error and success
- 3.2. The roadmap for the Green Power Corridor in Northeast Asia: policy suggestions for NEA member countries
 - Track 1 Institutions building
 - Track 2 Infrastructure
 - Track 3 Finance/investment
 - Track 4 Regulatory track / trading model
 - Track 5 Capacity building & socio-economic development

Green Power Corridor – a common vision for regional cooperation on power grid connectivity

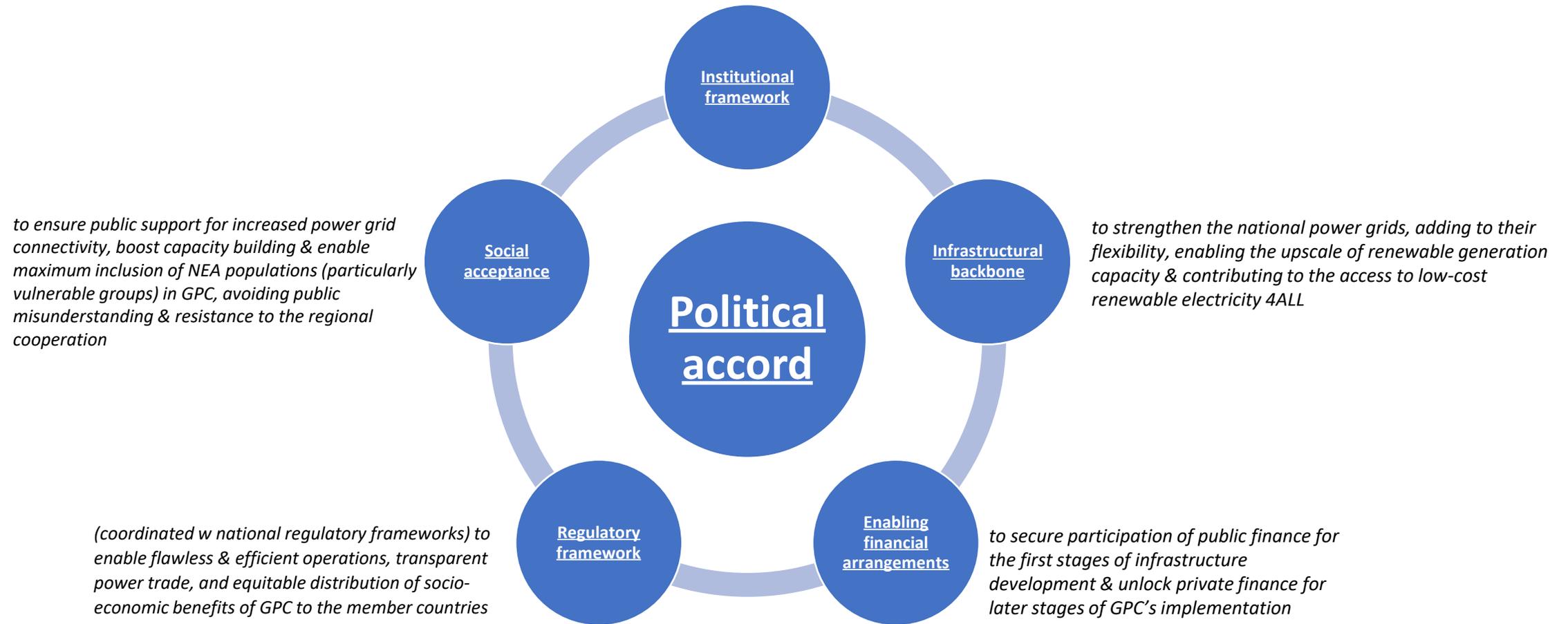


*“initiative which provides an enabling **institutional, financial, regulatory, political, and social environment** for strengthening the regional power grid connectivity for increased **access to clean, affordable, and secure electricity supply**. It supports the national emissions reduction and renewables development goals and is **developed in coordination** with the national energy strategies, power grid development plans, and regulatory frameworks”.**

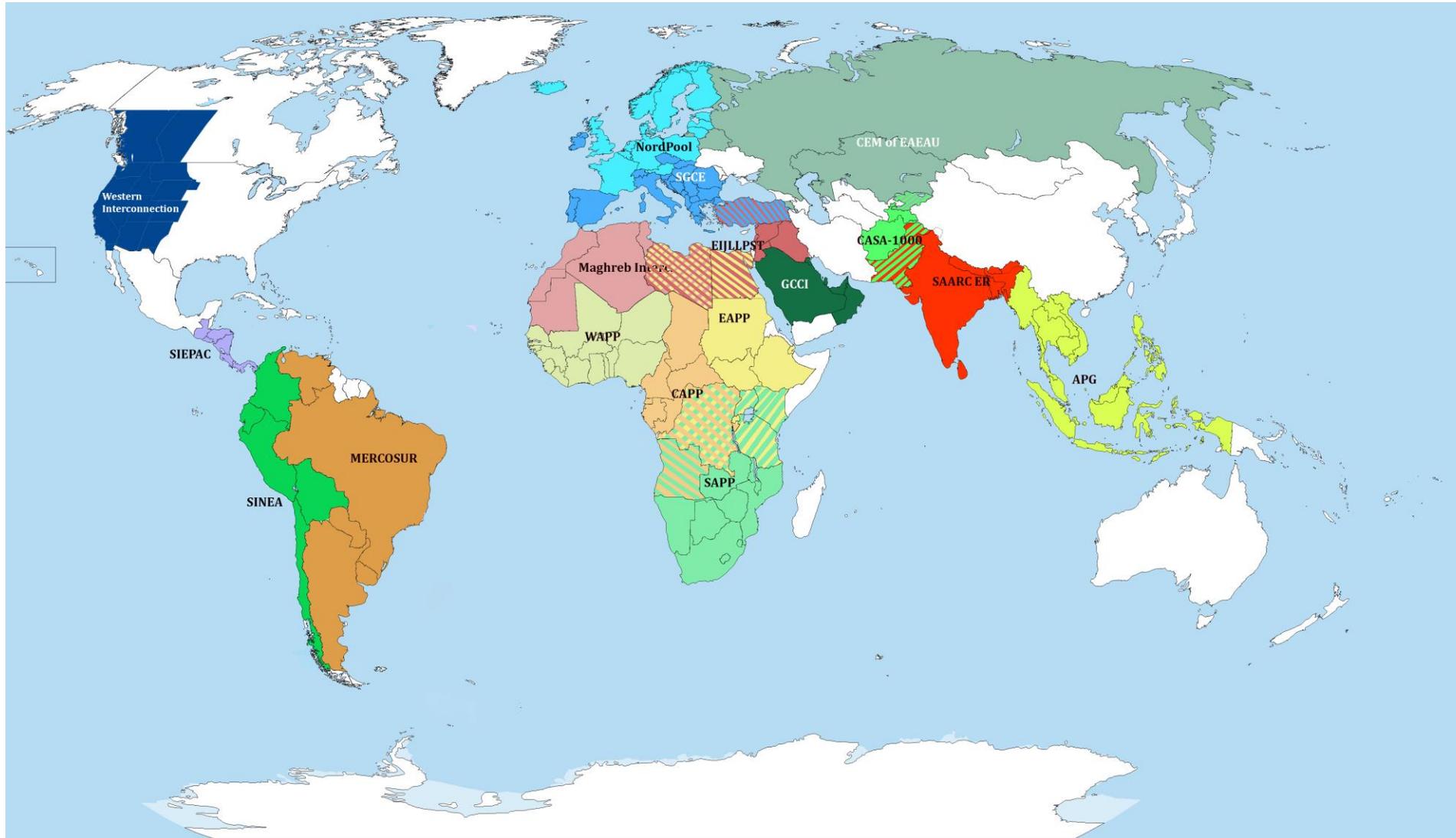
* The definition of the Green Power Corridor has been developed based on the reference research of over 70 studies and articles and has been informed by both the Northeast Asian context and a comparison to the connectivity initiatives undertaken in other regions

Green Power Corridor: building blocks

To support, steer & monitor the development process and operation of the GPC



Lessons learned from other regions



Interconnection	Status
Western Interconnection	Interconnections in place, power market in place
SGCE	Interconnections in place, power market in place
Nord Pool	Interconnections in place, power market in place
SIEPAC	Interconnections in place, power market in place albeit with low volumes due to outstanding regulatory/policy issues
SAPP	Interconnection in place, power market nominally in place, power trade hindered
SINEA	Interconnections in place, bilateral power trade partly via market mechanisms (TIEs), partly via bilateral agreements. Harmonization underway.
GCCPG	Interconnection in place, power exchange on country-to-country basis. Plans to transition to a full-fledged power market based on the NordPool model.
EAEU	Interconnections in place, power market treaty signed, harmonization underway. Power trade via bilateral treaties, pilot spot trading took place.
CASA-1000	Interconnection under construction. Power trade to be carried out through bilateral PPAs.
APG/GMS	6 interconnections exist (SG-ML, Th-ML, Th-CM, LPDR-VN), 9 in construction, 16 more planned. Power exchange- and trade based on bilateral agreements. Exception - LPDR-Thai-Malaysia trilateral agreement.
WAPP	Interconnection in place, no power market - major investments in strengthening power grid and solar generation are flowin in from IOs, NGOs.
EAPP	Interconnections only partly in place, several under construction. No power market, power trade via bilateral arrangements.
CAPP	Interconnections only partly in place, several under construction. No power market, power trade barely existing.
MERCOSUR	Interconnections partly in place, bilateral trade via existing interconnections.
Maghreb Int.	Interconnection in place, cross-border electricity exchange
EIJLLPST	Interconnection in place, cross-border power exchange mostly limited to emergency operations
SAARC ER	Interconnection partly in place, no power market, bilateral power trade via existing interconnections.

Lessons useful for the NEA context

Graduality is key to a functioning RPGC

- **Bilateral interconnections** (usually) precede regional cooperation
- **Knowledge exchange** and coordination often precedes formal high-level political agreement
- Establishing cooperation dialogue on RPGC is a **long-term process**

Institutional framework & buy-in of relevant gov-t, financial and business stakeholders is key

- **Support of IOs:** important guarantee for large-scale projects
- Existing **regional fora for economic cooperation** (APEC, GTI) could provide the needed environment for consolidating political will to support RPGC
- Exchange/coordination **platforms organized and run by utilities and regulatory bodies** on a regular basis help to kickstart the implementation beyond bilateral interconnections
- **Looping in IFIs and national PFIs** in the dialogues and planning early on key to secure financial support

Economic rationale is needed for on-the-ground progress

- RPGC is usually **not a political project** but launched for pragmatic considerations (stability of the grid, cheaper electricity price, demand-supply synergies, load sharing etc)
- **Socio-economic rationale** of every part of the interconnection needs to be outlined & communicated as detailed and as transparent as possible to support the business case

Integrated national grids are not a prerequisite but can contribute to faster development of connectivity initiatives.

Track 1 – Institutions building

Guiding questions : What existing fora can be used to steer and monitor the development process and operation of GPC? What new institutions are needed?

- Lack of coherent institutional framework – an omnipresent challenge, not endemic to NEA

Policy recommendations

- ***Gradual, step-by-step approach*** is key to a functioning RPGC initiative, but efforts to foster RPGC need to take place in parallel to national grid development.
- ***Existing regional fora for economic cooperation*** could provide the needed environment for consolidating political will to support RPGC.
- Exchange/***coordination platforms organized and run by utilities*** and regulatory bodies on a regular basis are key for bringing the cooperation forward.
- Looping in ***IFIs and national PFIs*** in the dialogues and planning early on is key to secure financial support.

Track 2: Infrastructure

Guiding questions : what interconnectors first? What adjacent infrastructure? What renewable capacities? Flexibility sources?)

Policy recommendations

- **Plan infrastructure deployment for mid- to long-term:** large-scale, long-life infrastructure always takes time, and needs to be tied to real energy demand and economic circumstances of the participating countries.
- **Accelerate the expansion and integration of domestic power grids,** addressing the distribution capacity and transmission links between key load centers.
- **Consider assessing the national power grid flexibility** (current and projected, according to the current power grid development plan) and the needed adjustments to accommodate an increased share of cross-border trade and exchange of renewables-based electricity.
- **Consider assessing the future electricity demand within the regions-to-be-connected** and the ability to cover this demand with domestically generated renewables-based electricity, to make sure the cross-border infrastructure is optimally used.
- Begin by **facilitating construction of several bilateral back-to-back cross-border links** for bulk electricity transmission between regions with highest synergies (add from the modelling exercise – likely, NE China-Mongolia, Korea-China, Korea-Japan?).
- Make sure new cross-border power grid infrastructure planning is linked to the deployment of new renewables-based power generation capacity and **doesn't cannibalize on the domestic power supply** of the exporting country (additionality). In the case new transmission infrastructure is linked to the existing renewables-based power generation capacity, strong evidence that proves that it is not needed to cover domestic demand (growth) and/or that it is not practical to use this capacity for domestic purposes needs to be produced.

Track 3: Finance

Guiding questions : what finance is needed? What banks can lead? How to attract public investors?

Policy recommendations

- Political agreement in principle - the first step needed to secure the support of IFIs.
- **Clarity over the NEA countries' future electricity demand** and needed renewables-based power generation capacity is key to inform the investment decisions.
- Feasibility studies on the new interconnections (see infrastructure track) are to be accompanied by the **assessment of investment needs, investment risk assessment as well as an outline of the socio-economic rationale** in order to establish a business case and secure the buy-in of investors.
- Existing **support mechanisms for deployment of renewables-based electricity** can help make the interconnections a more attractive investment case.

Track 4: Regulatory framework & trading model

Guiding questions: what framework needs to be in place to allow cross-border trade? How can it evolve?

Policy recommendations

- Enable **active exchange among major utilities** of the NEA countries early on in the process.
- Take an **“evolutionary” approach to the development of the regulatory framework** (from bilateral to tri- and multilateral trade and exchange mechanisms).
- **Consider using existing national power exchange platforms** as the power trade starts to evolve from 100%PPA-based towards a liberalised one.
- Prepare the ground for future partial or total harmonization of cross-border power trade across the region by establishing **common basic standards and requirements for bilateral trade agreements**.
- Enable **continuous and regular dialogue with regulatory institutions of other RPGC initiatives**, to make sure the GPC doesn't fall into the same path-dependencies (e.g. current gas price-based power pricing on the European market), on the way to increasingly renewables-based power system and cross-border power trade.

Track 5 Capacity building & social inclusion

Guiding questions: what is needed to secure public support? Potential for job creation, capacity building needs)

Not many intl. lessons learned, given that the topic itself is new for other regions as well. NEA itself has substantial experience from other engagement areas (e.g. development policy) which can be adjusted to enable a socially equitable and just development of the Green Power Corridor.

Policy recommendations

- 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/border regions, and communities dependent on retiring fossil fuel-based infrastructure (transitioning communities).
- Ensure **gender equity** when training new skilled workers for developing and maintaining the projects.
- Enable **cross-regional skill learning and exchange**. Invite experts from regions already working with highly digitalized, flexible cross-border power trade and exchange; regions trading in high shares of renewables-based electricity (e.g. Europe).
- Enable **studies exploring and explaining environmental risks and benefits of renewables-based power generation facilities** (e.g. in the case of Gobitec, wind farms in particular might be suitable for preserving vast sections of steppe habitat) to feed into public awareness campaigns and educational programmes.
- Explore the **potential of establishing a regional education program on green grids** – for staff and management levels, including representatives of national utilities, local regulatory authorities and investment bodies, with priority access and financial support enabling participation in the programme for local communities.
- **Engage the local NGOs in the planning process** to enable civil society buy-in.

Action Roadmap towards development of Green Power Corridor in Northeast Asia

Indicative summary timeline

	2022-25	2025-2030	2030-2035	2040-2050	2050 onwards
Institutions	<p>Political agreement in principle</p> <p>Interim secretariat established, including exchange & knowledge management WGs</p>	<p>Master Plan for GPC in NEA based on the Roadmap & aligned w national grid plans</p> <p>MoU on multilateral cooperation in power grid connectivity</p>	<p>Regional regulatory council to kickstart harmonisation of bilateral trade</p> <p>NEA NTSO-E is formalized</p>	<p>Updated Master Plan for GPC in NEA is produced incl- grid infrastructure planning for regional power</p>	
Infrastructure	<p>Early feasibility studies on bilateral interconnections (see modelling)</p> <p>First set of bilateral priority projects agreed upon</p>	<p>permitting & procurement for key elements of the bilateral links of the GPC (RES generation, cable routing, offshore permitting).</p> <p>Existing bilateral interconnectors' capacity enhancement</p>	<p>Construction of newly planned bilateral interconnections & RES generation</p> <p>Capacity enhancement is considered and & put forward based on the Master Plan for GPC in NEA</p>	<p>Studies commissioned to identify the <i>potential benefits of regional power grid synchronisation</i></p>	
Finance	<p>Mechanism for financing the operations of the Secretariat developed & agreed upon by NEA MCs.</p> <p>A dialogue w IFIs & other FIs with RPGC experience is conducted to enable intl. learning & test the GPC as an investment case.</p> <p>A study analyzing financing instruments carried out by the NEA GPC expert WG, financing strategy proposed.</p>	<p>A set of priority bilateral interconnection projects agreed, PPAs signed.</p> <p>Project agreements w supporting IFIs signed.</p> <p>New RES generation facilities are co-financed by private investors.</p>	<p>Dialogue aiming at developing a transparent legal framework for GPC investments on a regional level started (a "green ECT for NEA"?) to draw private investments.</p> <p>Grid & generation capacity enhancements entail 50-60% private investments</p> <p>PFIs continue providing support to the GPC, focusing on technical assistance and capacity building.</p>		

Action Roadmap towards development of Green Power Corridor in Northeast Asia

Indicative summary timeline

	2022-25	2025-2030	2030-2035	2040-2050	2050 onwards
Regulations & Trade	<p>EWG conducts a mapping of the national NEA regulatory frameworks to identify overlaps/synergies & gaps</p> <p>Basic template to regulate new bilateral power trade is proposed</p> <p>National regulatory authorities start convening informally.</p>	<p>Cross-border transmission planning & operation starts being included into domestic decarbonization plans & national grid development plans.</p> <p>Nat. grid development plans & decarbonisation plans are exchanged during the informal reg. Convenings.</p>	<p>NEA utilities platform formalised & grows into a regional Regulatory Council.</p> <p>Mechanisms to coordinate ancillary services established.</p> <p>Joint emergency response mechanisms developed.</p> <p>Data sharing mechanisms to enable faultless operation are mapped.</p>	<p>Harmonization of national regulatory frameworks, paving way towards regional power trading platform, takes off.</p> <p>(opt.2) Reg. Framework for multilateral power trade proposed, a pilot (parallel to bilateral trade) launched</p>	<p>Regional power trade rules & regulations developed and confirmed, bilateral arrangements slowly phased out</p>
Social	<p>Series of cross-country dialogues & studies mapping capacity building needs, focusing on capacity building among local communities launched.</p> <p>GPC education programs for students of relevant disciplines & executive level officials + a set of training programs for staff on the ground developed.</p> <p>Funding and provision of education facilities discussed & agreed w the key FIs at the Secretariat level.</p>	<p>Launch of the education & training programs</p> <p>Public information & awareness raising campaigns developed by the relevant ministries in coop w local civil society communities.</p>	<p>Graduates form the GPC education and training programmes become the growing support & drive the implementation of the GPC Master Plan.</p> <p>Ongoing public information & awareness-raising campaigns offer regular updates on the progress re development of the GPC</p> <p>Local CSO communities & labour organisations invited for peer assessments of social inclusiveness & gender equity of GPC planning & implementation.</p>		

Thank you!

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