

Discussion note for the 2nd Horn of Africa Initiative Regional Power Trade Technical and Coordination Workshop - April 11, 2022

A. Background

1. **Eastern Africa¹ and the HoA countries have diverse endowments of energy resources that create a strong foundation for regional power trade.** The considerable variation in available primary energy sources and power system size and maturity provides win-win opportunities for countries constrained by small domestic electricity markets that face a high cost of domestic supply (such as Djibouti and Somalia) and countries that have access to large resources of low-cost renewable or other energy resources (such as Kenya and Ethiopia in the HoA and other countries in Eastern Africa). A regional approach to power sector development induces economies of scale to reduce transaction costs associated with financing infrastructure and unlocks the region's vast renewable resources (including hydropower solar, wind, and geothermal resources).²

2. **Eastern Africa is at a critical point in time with about 4 GW of interconnection capacity coming online in the next 5 years,** which will create a single interconnected region of Eastern Africa Power Pool (EAPP) countries,³ and put in place major regional transmission corridors to allow a significant scale-up in power trade opportunities. Therefore, to leverage the investments already made or underway in physical interconnections, the EAPP is focusing on coordinating the development of soft infrastructure (the commercial and operational frameworks required to trade over the physical interconnections) and institutional strengthening required to support regional power trade.

3. **The HoA region has existing power interconnectors, many of which are not utilized optimally due to technical challenges related to operating procedures, and some power interconnectors are under development.** Mainly as a result of technical challenges, existing interconnectors between Ethiopia-Sudan (250 MW), Ethiopia-Djibouti (180 MW), Uganda-Kenya (145 MW) have utilization rates less than 50%. On the other hand, the interconnector between Ethiopia-Kenya (2000 MW – HVDC) is under construction and the second Ethiopia-Djibouti interconnector (120 MW) is being developed. In addition, feasibility studies for a second interconnector between Ethiopia-Sudan and interconnection between Ethiopia and Somalia are underway. To reap the benefits of regional trade, **HoA countries need to focus both on developing hard infrastructure to access the regional power market and actively participating in the development and adoption of the soft infrastructure needed to use the hard infrastructure effectively.** This can also allow countries with lagging power sectors to leapfrog, enabling a faster development trajectory.

B. EAPP-HoA Workshop in 2021

4. **The Eastern Africa Power Pool (EAPP) General Secretariat together with the World Bank convened a virtual workshop on regional integration in the energy sector under the Horn of Africa (HoA)**

¹ Eastern Africa includes the thirteen Eastern Africa Power Pool (EAPP) member countries (Burundi, Djibouti, D.R. Congo, Egypt, Ethiopia, Kenya, Libya, Rwanda, Sudan, Uganda, Tanzania, South Sudan, Somalia) and Eritrea as prospective member country of EAPP – a total of fourteen countries.

² <https://www.irena.org/publications/2021/Apr/Planning-and-prospects-for-renewable-power-Eastern-and-Southern-Africa>

³ <https://eappool.org/>

Initiative on March 30th, 2021. The objective of the workshop was to examine ongoing EAPP initiatives and agree on collaborative actions to advance power trade in the HoA region. The meeting was attended by representatives from HoA countries, the African Union Commission, regional economic community representatives (from COMESA and EAC), and development partners (including AfDB, AFD, EIB, EU, Korea EXIM Bank, Norad, Sida, USAID Power Africa).

5. **Specific action areas for EAPP and HoA countries discussed during the meeting focused on the institutional, operational, commercial, and planning pillars related to power trade (Annex 1).** For institutional strengthening, priority actions identified were the approval of the short term-action plan (STAP) by the EAPP's Council of Ministers (CoM), capacity building of the EAPP technical committees (operations, planning, market), as well as improving coordination between EAPP and other regional stakeholders. To advance readiness for interconnected operations, the priority areas identified were, the development of detailed regional operational guidelines to facilitate adherence of EAPP member utilities to the regional interconnection code, development of telecommunication systems to monitor power trade operations, and delivery of just-in-time technical assistance to improve trade along existing interconnectors. On the commercial frameworks, the priority action areas included the adoption of standardized bilateral power purchase agreements, and to finalize the high-level design of the voluntary centrally organized regional market with the subsequent adoption of a day-ahead market trading platform. Lastly, on planning, the need for the annual regional power balance statements for EAPP and support for integrated resource planning, with a special focus on variable renewable energy (VRE) integration, incorporation of regional trade opportunities, and climate resilience, was discussed.

6. **Discussions during the workshop highlighted the need for continued and greater collaboration between HoA countries to enable beneficial power trade.** HoA countries would thus benefit from the developing institutional capacity at EAPP to facilitate regional power sector integration and support countries in their technical preparedness to harness regional power trade opportunities. Countries have a key role to play as members of EAPP to actively engage in development of the regional market and in further strengthening the EAPP, enabling EAPP to enact its mandate effectively, while holding EAPP accountable for achieving its targets. To do this, HoA countries must actively contribute to the development of the institutional, operational, and commercial power market architecture in EAPP.

The workshop culminated in the participants endorsing their commitment to:

- dedicate sufficient resources (human and capital) to support EAPP in developing the regional power market,
- support development of the Independent Regulatory Board (IRB) to become a fully functioning regional regulator,
- ready national utilities to comply with the regional EAPP Interconnection Code (IC),
- facilitate deeper regional coordination in system planning and operations, and
- commit to strengthening the financial performance of national utilities.

C. Progress since the workshop

7. **There has been notable progress made in the last year on the regional integration agenda in the HoA region,** including on action items discussed in last year's workshop under all four pillars:

1. Institutional capacity
 - a) EAPP's Short Term-Action Plan was approved by the CoM in Oct 2021. The STAP identifies priority activities for EAPP over the next three years to deepen regional integration of power systems.
 - b) A package of capacity building activities for technical committees – operations, planning and markets – is being prepared and will be rolled out by EAPP over the remainder of 2022. The recently formalized EAPP Market Committee, which is leading development of the centrally organized regional power market, has received shadow market training (under AfDB financing).
 - c) IRB's Short Term-Action Plan and Strategic Plan were approved by the CoM in Oct 2021. The plans provide the framework for IRB's operationalization, including regulatory functions, organizational structure, staffing, funding and a road map. The legal texts related to IRB's mandate are being reviewed by the EAPP governance and HR committee for strengthening.

2. Soft-infrastructure - operational
 - a) A first phase of work to identify compliance gaps of countries (including Ethiopia, Kenya, Sudan) with the regional EAPP Interconnection Code has been completed. The next phase, which will include investment plans to bridge these gaps, will soon be launched.
 - b) Just-in-time technical assistance to undertake a root cause analysis of operational issues limiting power trade on the existing Ethiopia-Sudan interconnector was completed and recommendations were presented to representatives from both countries.
 - c) A study on the design of the regional telecommunication/IT systems and grid coordination unit is ready to be launched soon.

3. Soft-infrastructure - commercial
 - a) A draft short-term standardized power purchase agreement (PPA) template that is intended to facilitate regional power trade through bilateral contracts has been circulated by EAPP for comments. Comments received are being incorporated into a revised version.
 - b) The high-level design for the voluntary centrally organized short term regional power market has been finalized. EAPP is now launching a market design roadshow to all member countries to raise awareness about the new day ahead market.

4. Soft-infrastructure - planning
 - a) A training on integrated resource planning (IRP) for regional utilities is being launched that will focus on topics including the integration of regional supply and demand options and the integration of variable renewable energy.

Finally, EAPP has prioritized outreach and information sharing with regional stakeholders. In addition to the planned market roadshow, EAPP is launching an updated website, and has started publishing a quarterly newsletter on the state of regional trade and providing updates on activities to further increase regional trade.

D. Looking ahead

7. **HoA countries should champion the regional power trade agenda to spur and, in turn, benefit from a strengthened EAPP.** With the existing regional transmission interconnectors and those under implementation or being planned, the HoA will have the main physical infrastructure in place to enable deep integration of the power system. HoA countries need to collaborate and actively participate in EAPP

to reap the benefits of regional trade and deeper integration of their power systems. In summary, countries should continue to focus on developing both the hard infrastructure and soft infrastructure needed for regional power trade.

Ongoing activities and issues related to regional integration in the individual HoA countries are highlighted below.

Djibouti

A first interconnection line with Ethiopia became operational in 2011 and has been supplying about 70 percent of Djibouti's power consumption during 2020. The design capacity of the interconnector is 200 MW, though the current transfer capacity is 80 MW. The existing interconnector also serves demand in eastern parts of Ethiopia. Power demand is increasing on both sides of the border, and the future demand is expected to exceed the capacity of the existing transmission lines. Further, the Djibouti electrical network is composed of two isolated grids: (i) Djibouti city fed by two thermal power plants and the first interconnection with Ethiopia, (ii) the northern area of Djibouti fed by small thermal units.

A second interconnection between the countries is being planned that will help serve the growing demand, improve reliability and enable the connection of the northern area in Djibouti to the main network. This second interconnector will enable Djibouti to develop greater VRE resources (wind and solar PV). Finally, the second interconnector will almost triple the transfer capacity between the two countries from the current 80 MW to 220 MW while improving grid reliability in Djibouti.

In parallel with development of the second interconnector between Djibouti and Ethiopia, commercial agreements for power trade are being discussed and are targeted for January 2023.

Ethiopia

Ethiopia is currently interconnected to Sudan and Djibouti, and the planned HVDC interconnection with Kenya is almost completed and is expected to be commissioned in the coming months. The associated commercial agreements for power trade are being discussed by the two countries and are anticipated to be finalized by May 2022. The countries also need to jointly develop operational guidelines for the operation of the HVDC interconnector.

Technical challenges have constrained the power trade across the existing Ethiopia-Sudan interconnection. The two countries recently undertook a technical analysis to assess the cause of the constraints and identify measures to improve operational reliability and capacity utilization, including the need for improvement in power system monitoring and protection equipment to resolve operational issues in the existing interconnector. Recently, substantial arrears have built up due to non-payment for imported power by Sudan. At the same time, in the past one year, Ethiopia has significantly increased the power export to Sudan by better coordination with Sudan's dispatch center and improving system operations from both ends. But the buildup of arrears impacts the further expansion in power trade flows.

Nevertheless, a second Ethiopia-Sudan interconnector, and interconnectors to Somalia are also planned that will help displace expensive thermal generation in importing countries. Preparatory/feasibility studies are underway for all of these interconnectors.

Kenya

Kenya is already interconnected with Uganda through a 132 kV line and a second 400 kV interconnector with Uganda is being commissioned. A HVDC interconnection with Ethiopia and a 400 kV interconnection with Tanzania will be completed soon. Internal reinforcements in the Kenyan network, including the installation of a static synchronous compensator (STATCOM) at the Suswa substation are needed to ensure safe operation of the interconnector and internal Kenyan network at increased power flows across the interconnector. Prior to installation of a STATCOM, power transfer of about 185 MW is assessed to be possible. Discussion on commercial agreements for power trade between Kenya and Ethiopia is expected to be finalized by May 2022. Kenya and Tanzania have also been in discussion on a transparent wheeling tariff for possible power flow through Kenya along the Ethiopia-Kenya-Tanzania transmission corridor. The commercial agreements are under discussion for both interconnectors and should be finalized expeditiously for the interconnectors to be operational and exploit their full potential. The interconnections should also be incorporated in the least cost plans for generation and transmission that will inform future capacity additions as well as the transmission network strengthening needs.

Somalia

Somalia recently joined the EAPP in March 2022 to benefit from the technical assistance and capacity building activities offered through EAPP, and the ability to actively participate in the regional power market in the future. Feasibility studies for the Ethiopia-Somalia interconnection are currently being prepared. Currently, the electricity system in Somalia is comprised of isolated (mostly) inadequately maintained mini-grids powered by diesel-based generators that are operated by privately owned electricity service providers (ESPs). Various hard and soft investments are planned in the electricity sector to facilitate regional integration in the coming 2-3 years.

- Strengthening of the distribution networks in Mogadishu and Hargeisa with an associated sub-transmission network ring around these cities and development of distribution master plan in other major load centers. The major load centers will later act as bulk offtake points for future interconnectors with neighboring HoA countries allowing Somalia to tap into cheap renewable power from neighboring countries.
- Analysis of options for the future institutional structure of the electricity sector, which currently lacks a national utility or a credible off-taker to import power.
- Operational readiness in the form of a) investments in system control, protection and reliability equipment and b) adoption of a national grid code
- Establishing an electricity regulator with the appropriate initial staffing.

Horn of Africa Regional Integration Sustainable Energy Systems (HoA RISES) project

The scope of the proposed World Bank funded HoA RISES project includes support for the construction of a second Ethiopia-Sudan interconnector and preparatory studies for interconnection of Ethiopia and Somalia. Preparatory studies for both interconnectors are being implemented by EAPP in collaboration with the beneficiary country utilities/ministries through established joint study teams to oversee the studies and provide technical reviews and guidance. For the second Ethiopia-Sudan interconnector, the feasibility study is under way and the procurement of the environmental and social impact assessment (ESIA) is under preparation. The procurement for the preparatory studies for the Ethiopia and Somalia interconnection is currently at the pre-RFP stage. A joint study team comprising representatives from EAPP as well as representatives from EEP in Ethiopia and the Ministry of Energy and Water Resources in Somalia has been formed to evaluate proposals and provide technical guidance to advance the interconnector projects. A joint technical committee between Ethiopia and Somalia is expected to be established to oversee the construction and operation of the proposed two interconnectors.

E. Priority Action Areas to scale-up power trade

To build on the progress made over the last year, HoA countries are encouraged to take concerted steps to harness power trade opportunities. A set of priority action areas are presented in Table 1 grouped by the same four pillars as in 2021. The actions are explained below the table.

Priority actions under the **institutional capacity pillar** work at three different levels to improve regional integration and power trade. At the level of policy makers, a dialogue is needed to garner political support for trade. EAPP's technical committees play a key role in developing the soft infrastructure (operational and commercial arrangements) required for secure and efficient trade and those committee members are drawn from the EAPP's member utilities. The ongoing support of member utilities is needed to have effective technical committees. Finally, each entity that intends to trade in the EAPP region will also need to establish its own trading unit, staff that unit, put in place internal systems, controls and permissions to trade and, importantly, train the traders and the supporting staff.

Under **operational soft infrastructure** the priority actions relate to putting in place the technical processes and systems required for secure and safe operation of the regional power system. Since the system is a network, this requires harmonized rules and procedures throughout the region as set out in the EAPP Interconnection Code, complemented by detailed operating procedures for individual interconnectors agreed by the transmission system operator (TSO) of the two neighboring countries operating that interconnector. In addition, to ensure a stable frequency throughout the region and to facilitate trade, control areas must be established to maintain the net balance (net import or net export) in each area. Every country must be in a control area. Either a country TSO becomes a control area operator, or the country agrees to be part of a control area where the TSO from another country is the control area operator.

Table 1. Priority Action plan for HoA countries from 2022

	Pillar	Action	Key Actors	Timeline
1.	Institutional capacity	Establish and maintain a platform for a sustained high-level dialogue on regional power trade that will inform the EAPP CoM and HoA ministerial meetings.	All HoA countries	Ongoing
2.		Strengthen EAPP organs by actively participating and contributing to technical committees for operations, markets, and planning	All HoA countries	Ongoing
3.		Nominate trading staff, establish and equip trading units to prepare for participation in the EAPP day ahead market	All HoA countries	Q2 2023
4.	Soft infra – operational	Prepare country action plans to identify investments in grid strengthening to comply with EAPP regional Interconnection Code enabling reliable power trade	All HoA countries	Q2 2023
5.		Put in place operational procedures for Ethiopia-Kenya HVDC interconnector.	Ethiopia, Kenya	Q3 2022
6.		Establish and operationalize control areas for the EAPP power market	All HoA countries	Q2 2023
7.	Soft infra – commercial	Complete negotiations of commercial agreements for Ethiopia-Kenya	Ethiopia, Kenya	Q2 2022
8.		Support finalization and adoption of the standardized bilateral short-term power purchase agreement	All HoA countries	Q3 2022
9.		Improve and maintain financial sustainability of utilities to ensure credible off-takers and payment discipline in the regional power market.	All HoA countries	Ongoing
10.		Agree on fair and efficient transmission pricing methodology for the regional power market.	All HoA countries	Q3 2023
11.	Soft infra – planning	Share timely data with EAPP for monitoring, planning and operations of the regional system	All HoA countries	Ongoing
12.		Incorporate regional trade opportunities in national master plans, using in a regionally consistent approach	All HoA countries	Ongoing

With **commercial soft infrastructure** the priority actions relate to completing the bilateral agreement to buy and sell power between Ethiopia and Kenya to use the soon to be completed HVDC interconnector

between the two countries. This will require political will and drive to complete such an important agreement. To reduce the time and effort required to agree contracts to trade power between countries, standardized bilateral contract templates are being developed, through a consultative process, for short term power trade (trade covering power flows ranging from a period of one week up to several months). These contracts allow utilities to agree almost all terms in advance, only leaving terms such as prices and volumes to be agreed in order to trade. Other actions focus on establishing credit worthy counterparties for trade in the region, and establishing transmission charges that do not act as a barrier to trade while also allowing utilities to recover an equitable share of costs of their transmission network used for regional trade from the regional market.

Planning actions involve sharing information with EAPP to allow it to develop and keep up to date a regional network model which is needed to undertake system security studies and, among other things, to develop regional transmission charges. Finally, and in addition to working through EAPP, in order to reap the benefits of trade, member countries should take into account regional opportunities for importing and exporting electricity when producing their national power sector development plans. This may mean simply using imported energy opportunistically when cheaper than domestically produced energy or it could even mean relying on capacity from neighboring countries to meet local peak demand.

While Table 1 sets out some of the priority actions areas, there are various other actions that will also be required to enhance regional trade. The member countries and other stakeholders must thus be fully engaged in the process and coordinate closely with regional partners to identify and take timely actions.

Annex 1: Policy Actions for HoA countries from 2021 Workshop on Roadmap to Regional Energy Integration in the Horn of Africa (HoA)

Pillar	Action⁴	Key Actors⁵	Timeline
Institutional capacity	Endorse EAPP's new Short-Term Action Plan	CoM	Q2 2021
	Sign updated MOUs with RECs to strengthen EAPP governance and improve regional coordination	EAPP GS/RECs	Q2 2022
	Prepare a capacity building plan for TCs and reporting on operations, planning, and market status in EAPP	EAPP GS/TCs	Recurring capacity building Reporting at least yearly
	Approve IRB's new STAP and 10-year Strategic Plan.	CoM	Q2 2021
	Decide IRB's future office location	CoM	Q2 2022
	Appoint new DG and hire key IRB personnel	CoM/IRB	Q3 2022
	Strengthening IRB's legal status (amend existing MOUs with binding clauses)	CoM	Q2 2022
Soft infra – operational	Comply with the EAPP IC and operating guidelines	Utilities	All utilities comply by Q4 2025
	Develop EAPP-wide energy information system	EAPP GS/TCs/Utilities	Q2 2023
	Set up technical assistance facility to improve trade along existing transmission lines (e.g., Ethiopia - Sudan, Kenya - Uganda).	EAPP GS/TCs/Utilities	Recurring just-in-time activity
Soft infra – commercial	Adopt standardized bilateral PPAs	CoM/IRB/MC	Q4 2021
	Approve proposed centralized market design	SC/MC	Q4 2021
	Approve regional market rules	CoM/IRB/Nat. Gov./MC	Q4 2022
	Join the EAPP centralized market trading platform	Utilities/MC	Q1 2023
Soft infra – planning	Approve updated regional power master plan (MP)	CoM/SC	Q1 2023
	Perform independent updates of the regional MP.	PC	Recurring as from 2023
	Integrate regional supply options in national MPs	Nat. Gov	All countries by Q4 2025

⁴ MOU stands for Memorandum of Understanding; REC or Regional Economic Community. EAPP needs to engage with the following RECs: COMESA, EAC, and IGAD; IC = Interconnection Code; DG = Director General.

⁵ Nat.gov. refers to national governments. Utilities refer to member utilities of the EAPP. CoM = Council of Ministers; GS= General Secretariat; TC= Technical Committee; PC = Planning Committee; SC = Steering Committee; IRB = Independent Regulatory Board (regional electricity regulator in EAPP); MC = Market Committee.