



USAID
FROM THE AMERICAN PEOPLE



POWER AFRICA
EAST AFRICA
ENERGY PROGRAM

FINAL REPORT

Submitted by:

[REDACTED] CHIEF OF PARTY

RTI INTERNATIONAL

3040 East Cornwallis Road
Research Triangle Park, NC 27709

[REDACTED]

Contract Number: AID-720-674-19-F-00004
DECEMBER 2018 TO SEPTEMBER 2023

SEPTEMBER 30, 2023

DISCLAIMER

This report is made possible by the support of the American People through the United States Agency for International Development (USAID). The contents of this report are the sole responsibility of RTI International and do not necessarily reflect the views of USAID or the United States Government. This report was prepared under Contract Number AID-720-674-18-D-00004 / AID-720-674-19-F-00004. This document is intended to comply with Section 508 Standard of the Federal Acquisition Regulation. If you have any difficulties accessing this document, please contact accessibility@rti.org.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

RESULTS SUMMARY 6

BURUNDI..... 7

DEMOCRATIC REPUBLIC OF CONGO..... 13

DJIBOUTI 18

ETHIOPIA..... 20

KENYA 30

RWANDA..... 45

SOMALIA..... 52

TANZANIA..... 60

UGANDA 68

INCREASED REGIONAL POWER TRADE 75

CROSS-CUTTING AND PROJECT MANAGEMENT SUPPORT 81

CHALLENGES..... 92

LESSONS LEARNED AND RECOMMENDATIONS 97

EAEP MEL RESULTS 100

ACRONYMS AND ABBREVIATIONS..... 103

EXECUTIVE SUMMARY

The Power Africa-funded East Africa Energy Program (EAEP) started in December 2018 and concluded in September 2023, serving as the United States Agency for International Development's (USAID's) on-grid mechanism in the region. Across nine countries, EAEP had a goal to connect 4 million East Africans to on-grid power, advance 1,500 MW of generation toward financial close, aid Power Africa 2.0's utility strengthening initiative, and realize cross-border power trade transactions.

With EAEP's implementing partner, RTI International, Power Africa successfully provided technical assistance across four objective areas in five years. EAEP was the second iteration of Power Africa's implementation mechanisms, succeeding the Power Africa Transactions and Reforms Program (PATRP). EAEP built on the successes of PATRP and expanded on-grid services in new countries in the region.

This final report details, by country and region, how EAEP performed against the targets, what lessons were learned from implementation, and what recommendations for USAID's and Power Africa's partners would further advance the on-grid electricity sector in the region.








OBJECTIVES

EAEP focused on four technical and cross-cutting objectives over the life of the program:

- **Optimized power supply** at the national level to advance generation and transmission toward financial close while supporting improvement of the enabling environment.
- **Increase on-grid connections with utilities** and service provider partners to advance universal access and reduce the time and cost to connect households and businesses.
- **Strengthen utilities and power sector entities** to improve their technical and commercial performance so as to increase reliability and delivery of power.
- **Increased regional power trade** between countries to relieve supply and demand imbalances and transmit cheaper, cleaner energy regionally.
- **Institutional performance improvement** across energy sector entities to build sustainable gains in capacity strengthening.
- **Gender equity** in the energy sector workforce to level the playing field for women in the industry.
- **Community-engagement** and investment for inclusive and socially responsible development of energy sector infrastructure.
- **Environmental considerations** to strengthen the energy sector's understanding of impacts on land, climate, and wildlife. EAEP combined technical, financial, legal, and organizational expertise to co-develop activities with partners (e.g., utilities, ministries, regulators, private companies, women-in-energy networks) to deliver impactful and sustainable results.

OPTIMIZED POWER SUPPLY

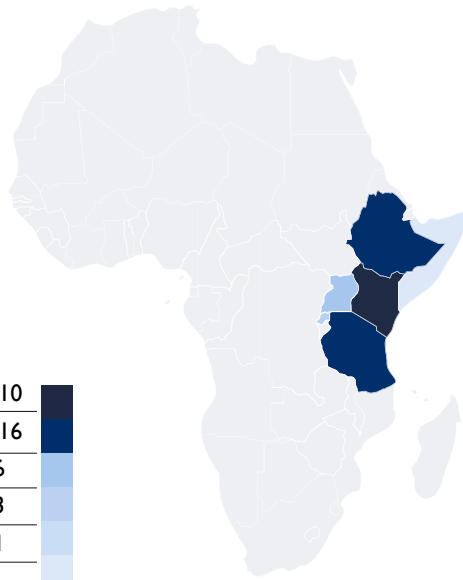
To support Power Africa’s target of 30,000 MW in generation, EAEP targeted later-stage transactions for help them reach financial close. EAEP directly advanced a pipeline of over 1,700 MW of transactions; however only **294 MW reached financial close** during EAEP’s life of program. The remaining MW in EAEP’s pipeline will be transitioned to Power Africa’s other mechanism for future counting, and EAEP is confident they will reach financial close before the 2030 timeline. EAEP also provided **commissioning support for 482 MW** throughout the region as well as transmission transaction support, resulting in **109 km of transmission infrastructure deals reaching financial close and 308 km commissioned**. Additionally, EAEP progressed legal, regulatory, and policy developments across the region to attract or retain private sector investment in the sector and to improve planning for optimized power supply, demand, and trade.

	TECHNOLOGY	TRANSACTIONS SUPPORTED BY EAEP DIRECTLY THAT HAVE NOT REACHED FINANCIAL CLOSE	TRANSACTIONS SUPPORTED BY EAEP THAT HAVE REACHED FINANCIAL CLOSE	TRANSACTIONS SUPPORTED BY EAEP THAT HAVE BEEN COMMISSIONED
	Hydro	103.2	1.65	0
	Biomass	35	0	0
	Natural Gas	0	56	0
	Geothermal	318	133	248.3
	Solar	858.8	104	133.5
	Wind	351	0	100
	Hybrid RE/RE	9	0	0
	Total	1,675 MW	294.65 MW	481.8 MW

EAEP supported transactions across multiple technologies with large pipelines for renewable energy (RE). While only 294 MW of transactions reached financial close, another 1,675 MW of transactions were supported directly by EAEP and will count toward Power Africa’s MW pipeline in the region once they close.

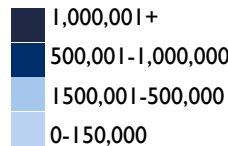
INCREASE ON-GRID CONNECTIONS

According to the World Bank, over 300 million Africans in East and Central Africa do not have access to electricity. To supplement the off-grid solutions provided by the Power Africa Off-Grid Program, EAEP supported utilities, small service providers, and private concession distribution companies to increase connections. Collectively, EAEP supported **5,176,390 connections with utilities** across the region. Most of the countries in the region have established universal access targets but are at risk of failing to meet those targets due to challenges of funding, planning, and even community-engagement. EAEP sought to bridge gaps in capacity, equipment, and planning to advance connections for households and businesses.



EAEP supported in-country and regional connections programming with utilities and service providers in five countries to tackle common challenges to universal access.

Kenya	2,261,710
Ethiopia	1,484,016
Tanzania	977,666
Uganda	259,923
Rwanda	162,411
Somalia	30,664



STRENGTHENED UTILITIES AND OTHER POWER SECTOR ENTITIES

Utilities across East Africa face financial constraints, aging infrastructure, and challenges retaining or expanding customer bases. A cycle of poor service delivery frustrates existing customers who seek alternatives and further constrains utilities' ability to serve. EAEP supported three utilities to address performance-improvement measures in pilot zones. EAEP used embedded advisors to provide technical assistance and to conduct on-the-job training that led to revenue increases, loss reductions, and commercial improvements. EAEP's longest engagement was with **Kenya Power, which achieved a 16 percentage-point improvement in aggregate technical, commercial, and collections (ATC&C) losses** in pilot zones. Additionally, the Ethiopia Electric Utility (EEU) achieved a 5 percentage-point improvement, and the Zanzibar Electricity Corporation (ZECO) had a 2 percentage-point improvement; note that EAEP's assistance to both utility programs were shorter term than for Kenya Power.



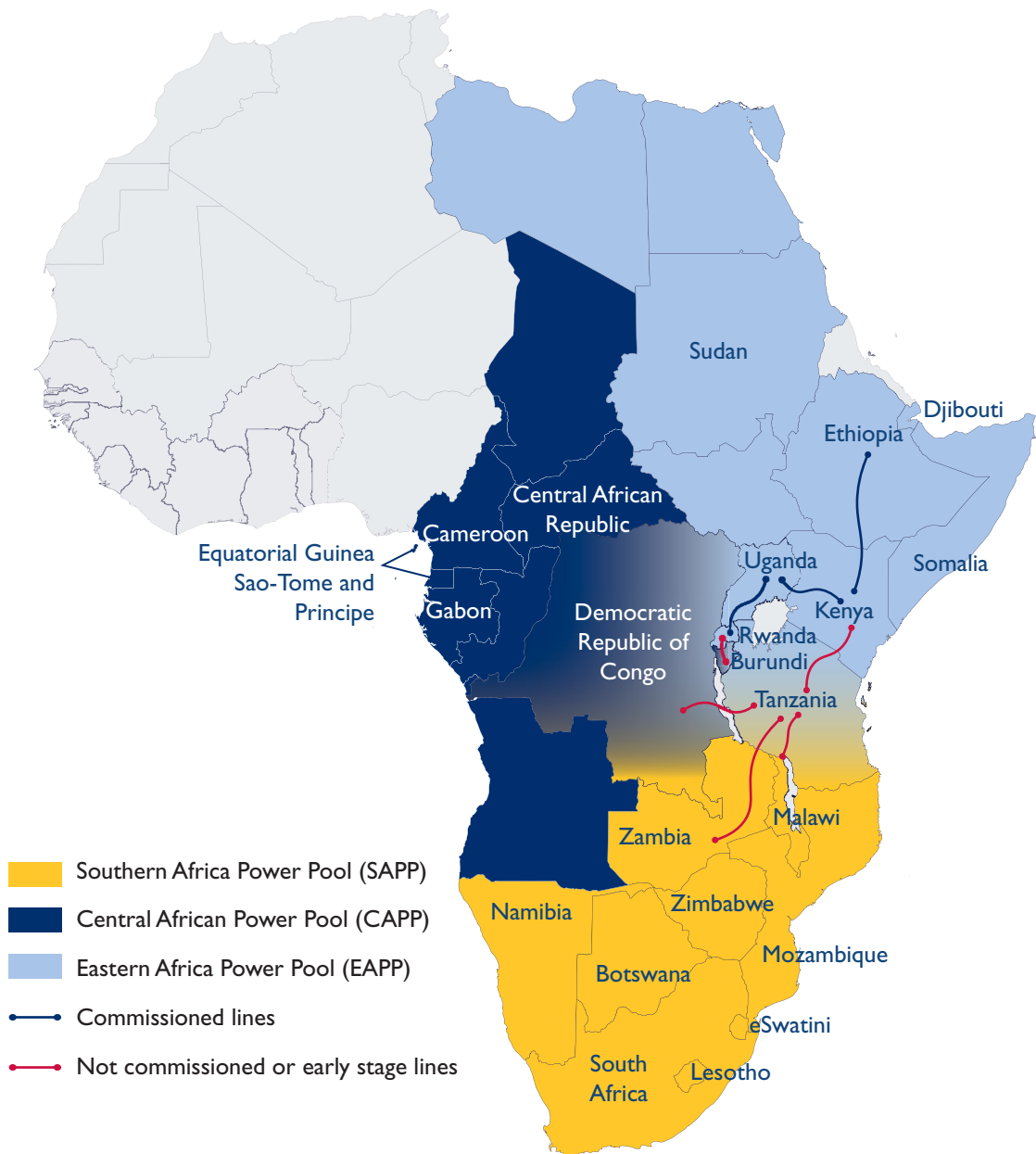
Aggregate technical, commercial, and collections losses reduced in pilot zones



KENYA POWER AND LIGHTING COMPANY	ETHIOPIAN ELECTRIC UTILITY	ZANZIBAR ELECTRICITY CORPORATION
16 percentage-point reduction from the 35% baseline	5 percentage-point reduction from 34.9% baseline	2 percentage-point reduction from 23.5% baseline

INCREASED REGIONAL POWER TRADE

East Africa's abundant renewable energy resources make it an ideal region for cross-border power trade. Through trade, countries can optimize generation planning for more affordable, green options rather than develop costly energy plants themselves. EAEP supported 2.38 TWh of power trade to advance in the region through the Ethiopia–Kenya power trade and Rwanda–Uganda interconnection. Both lines (see figure below) open the region up to more trade. Additionally, EAEP supported 1,530.19 km of line to be energized, tested, and commissioned. Many cross-border lines still need early-stage and financial close support to connect East Africa fully to Central and Southern African countries.



Cross-border trade to connect across Africa. By advancing the Uganda–Rwanda and Kenya–Ethiopia lines to commissioning, Power Africa has accelerated the eventual interconnection of East Africa to Central Africa. Regional bodies are collaborating to eventually interconnect.

CROSS-CUTTING SUPPORT

Each activity supported by EAEP integrated cross-cutting considerations into implementation and looked for opportunities to amplify gender equity, improve community-engagement, and enhance environmental awareness. EAEP integrated these cross-cutting areas into each country section and summarized achievements in the Cross-Cutting and Project Management Support section of this report. EAEP had the unique opportunity to implement Women in Rwandan Energy (WIRE) initiative, funded by the Women's Global Prosperity Fund. WIRE focused on gender equity and increasing women's roles in Rwanda's energy sector. Through WIRE, EAEP supported 111 women—out of 154 total women apprentices—to secure full-time jobs and helped formally launch the POWERHer network for Rwandan women in energy. The lessons learned from WIRE were applied across the region with other energy sectors. Additionally, EAEP took a new approach to capacity building with application of the USAID human and institutional capacity development (HICD) model within energy sector institutions. For example, EAEP gathered representatives from across Kenya's energy sector to self-identify performance areas for improvement and co-developed work plans to address gaps. Through routine validation workshops and check-ins, the institutions made progress on their performance scores and became equipped to manage future learning needs. Additionally, EAEP carried on PATRP's community-engagement guidance to work with Kenya's energy sector entities to implement best practices. EAEP was able to support policy revisions, introduction of complaints-handling mechanisms, and integration of community needs and investments into generation and transmission planning practices.



In Pako Village, Kenya, a man walks the wayleave or right-of-way of the Kenya Electricity Transmission Company Ltd. (KETRACO) towers of the 101 km Sultan Hamud–Oloitoktok transmission line project. Photo credit: EAEP

RESULTS SUMMARY

RESULTS ON KEY PROJECT GOALS

INDICATOR	TOTAL TARGETS		% ACTUAL VS. TARGET
New grid actual direct connections	4 Million	5,176,390	129.4%
MW from transactions that achieved financial close	1,500 MW	294 MW	19.6%
MW that have been commissioned	750.5 MW	475.8 MW	63.4%
Amount of investment mobilized for energy investment	Not applicable (N/A)		N/A
Km of new, reconstructed, rehabilitated, or upgraded transmission and distribution lines that have been energized, tested, and commissioned/installed	1,324.6 Km	1,531.2 Km	115.5%
Km of transmission and distribution power lines reached financial close	526.1 Km	109 Km	20.7%



Laws, policies, regulations, or standards to enhance energy sector governance formally proposed, adopted, or implemented

Target: 83



Host-government power sector strategic planning documents adopted, implemented, or revised

Target: 24



Competitive procurement processes for new generation capacity implemented

Target: 21



Female interns who receive EAEP gender and capacity building support

Target: 264

BURUNDI



MW REACHED FINANCIAL CLOSE	MW COMMISSIONED	MW ADDED TO PIPELINE	PEOPLE TRAINED
1.65 MW	7.5 MW	44.2 MW	Men: 32 Women: 5
SECTOR SUMMARY			
Installed capacity	74 MW	Population	12.5 million
Available capacity	40 MW	Access rate (on and off)	13%
Average tariff	\$0.16 per kWh	Active independent power producer (IPP)	Yes, multiple

Burundi’s energy sector is providing unique opportunities for private companies to become involved in diversifying generation and building distribution infrastructure. Having one of the lowest access rates in the world, Burundi is looking to replace expensive diesel generators and to connect more people and businesses to a stable grid.

Burundi has abundant unexploited renewable energy sources, including hydro, wind, and solar. However, as of 2023, installed generation capacity was approximately 74 MW, with 45 percent sourced from diesel. Of note, the available capacity is lower due to poorly functioning hydropower plants. The Government of Burundi has set the ambitious target of 30 percent access by 2030 and is supporting large hydropower projects to come online before 2026. These large, donor-financed projects will add significant energy to the grid, but they have faced delays in financial close and commissioning. Smaller developers have seen success, however. For example, in April 2022, a 7.5 MW solar project from Gigawatt Global became the first non-diesel IPP plant commissioned in the country. This project alone increased the installed capacity of the country by 15 percent.

In 2021, Burundi advanced from Tier 3 to Tier 2 on the United States Government’s (USG’s) three-tiered Trafficking in Persons list, which made the government eligible for Power Africa support. Previously, EAEP had been restricted to working exclusively with the private sector; which meant that EAEP provided only legal services for developers looking to replicate Gigawatt Global’s success; Gigawatt Global was the only IPP to successfully close and commission a project in Burundi. After late 2021, EAEP expanded assistance to Burundi by engaging the government, the utility, Régie de Production et de Distribution de l’Eau et de l’Électricité (REGIDESO); and the regulatory agency, l’Autorité de Régulation des Secteurs de l’Eau Potable et de l’Energie (AREEN), for support. Under EAEP, Power Africa supported 45.85 MW of new generation transactions, the establishment of a private distribution utility in addition to REGIDESO, and interconnections for transmission.

ACTIVITIES SUMMARY

OBJECTIVE 1: OPTIMIZED POWER SUPPLY

REACHED FINANCIAL CLOSE

RUVYI HYDRO (1.65 MW). The Ruyvi hydropower project, developed by American-owned Songa Energy and Virunga Power at a cost of ██████████, reached financial close in May 2023 with an equity investment from Virunga Power. The project received legal support from EAEP, including the development of project documents: power purchase agreement (PPA), Concession Agreement, Grid Connection Agreement, and Letter of Comfort. The project is one of two in these companies' portfolio (with the second project expected to reach financial close in early 2024).

ADVANCED FINANCIAL CLOSE

KIRASA ENERGY HYDRO (16 MW). EAEP supported this project for several years—starting during PATRP, when the transition was subjected to a due-diligence review (through a qualified transaction assistance tool [QTAT]) and the developer attended PATRP's public-private partnership (PPP) training. When the developer encountered challenges on tariff negotiations with lenders, it asked EAEP to complete a financial model with a sensitivity analysis. After EAEP agreed to conduct the activity, the developer decided to use internal resources to complete the model. EAEP remained available for additional support as needed. As of August 2023, the developer was in advanced conversations with two lenders, the African Development Bank (AfDB) and Eastern and Southern African Trade and Development Bank, with financial close expected soon.

MPANDA HYDROPOWER PROJECT (10.2 MW). EAEP advanced this transaction towards financial close by completing a due diligence (QTAT) and providing legal support through a review of contract documents, the land lease, O&M and EPC agreements. Before reaching financial close, the developer will amend the project documents with the Government of Burundi based on feedback from EAEP's legal review. As of August 2023, the developer is in conversations with lenders.

MULE HYDRO (9 MW). Like the process described above for Ruyvi, Mule's project portfolio partner, EAEP advanced the Mule project toward financial close by providing legal support, including preparing project documents: PPA, Concession Agreement, Grid Connection Agreement, and Letter of Comfort. In August 2023, the developer was in advanced conversations with lenders.

RUZIBAZI 12 (9 MW). EAEP advanced this transaction toward financial close by completing a QTAT, and by providing legal support through a bankability review of project contract documents. To reach financial close, the developer will need to update its studies and amend the project documents based on EAEP's legal advisory feedback. The developer was in early-stage conversations with lenders in August 2023.

COMMISSIONING SUPPORT

MUBUGA SOLAR (7.5 MW). Gigawatt Global completed the Mubuga 7.5 MW solar power project in April 2021 and immediately started supplying power to the utility, REGIDESO. However, the developer did not receive either formal acknowledgment of commercial operations from REGIDESO or a permanent commercial operations license from AREEN. To help release these items, EAEP worked with the US State Department in Burundi to write briefs for the Ambassador to advocate for the commissioning of the project, which was finally achieved in February 2022. The 7.5 MW became a significant addition to the country's grid.

OPTIMIZED POWER SUPPLY ACTIVITIES

In addition to supporting Burundi's IPPs, EAEP conducted **PPP & Public Finance Training** in March 2023. EAEP's legal and financial advisory teams led this in-person training on the legal and financial intricacies of energy sector PPPs. The Government of Burundi had asked EAEP to support this training with participation from the country's PPP Unit, REGIDESO, l'Agence Burundaise de l'Électrification Rurale (ABER – rural electrification agency), AREEN, and the Ministry of Energy. The objective of the training was to strengthen the participants' understanding of, and comfort in working with, energy sector PPPs to better position the Government of Burundi for project procurement and negotiations with private sector developers.



Participants in EAEP public-private partnership training in Bujumbura, Burundi, in 2022. Photo credit: EAEP

OBJECTIVE II: INCREASED ON-GRID CONNECTIONS

GRID HARMONIZATION COST BENEFIT ANALYSIS: EAEP advisors concluded that the health of Burundi's utility, REGIDESO, could be improved if it were to reduce technical and commercial losses. Burundi will soon have new 220 kV transmission lines accompanying large donor-funded projects, such as Rusumo Falls hydro (80 MW with 26 MW for Burundi), Jiji-Mulembwe (32 MW), Ruzizi III (147 MW with 49 MW for Burundi), and an interconnector between Burundi and Rwanda. The 220 kV lines will help evacuate the power from the large generation projects; however, the limited distribution network in the country consists of varying voltages and leads to high technical losses (REGIDESO estimates at 30 percent). The Government of Burundi asked EAEP to conduct a cost-benefit analysis of projected load growth and generation capacity expansion. It became evident that building additional 110 kV lines is critical. The essential question was whether the reduced technical losses would offer enough savings to warrant investing in the network upgrade. EAEP's findings did show that selected lines were worth the expense of upgrading, especially considering future load growth and generation plans. The Government of Burundi is now able to share the findings with donors for potential funding opportunities.

PSS@E MODELING AND CAPACITY BUILDING. During the cost-benefit analysis activity described above, it became apparent that REGIDESO lacked a PSS@E model, instead using Excel to forecast and plan for transmission and distribution network development. Although Burundi is soon to be interconnected with its neighbors, the country needs to increase its technical capacity for those transmission investments. In response to a request from the Government of Burundi, EAEP created a PSS@E model for the country's transmission network. In July 2023, EAEP conducted a five-day in-person capacity building on the planning software and model. Attendees included personnel from the utility, regulatory agency, Ministry, and ABER. The model and capacity strengthening improved Burundi's national and cross-border power trade capabilities. Participants, the majority of whom had no experience with the software, now are familiar with it and are able to conduct basic modeling and simulations themselves. The updated PSS@E model is a critical tool for energy planning.

VIRUNGA POWER CONCESSION SUPPORT. Based on 2021 World Bank data, less than 2 percent of Burundi's rural residents had access to electricity. Although REGIDESO has been working to increase generation and transmission, the feat of electrifying the rural population remains a challenge. In May 2021, the Government of Burundi signed a memorandum of understanding (MOU) with Virunga Power granting it exclusive rights to develop a PPP proposal for rural distribution. In February 2023, EAEP's legal advisors drafted a term sheet transitioning the MOU to a legal document and later drafted the PPP and PPA documents for the developer. EAEP also created a financial model to help Virunga Power better understand tariff options, as well as conducting a series of seminars on establishing a new utility. In December 2022, EAEP hosted a high-level energy sector dialogue in Washington, DC, which the President of Burundi attended; Virunga Power presented its latest studies. Under the planned concession, Virunga Power is expected to electrify 70 percent of the country (approximately 50,000–60,000 connections in the first two years) and was continuing to develop its business model as of August 2023.



During the December 2022 US-Africa Leader Summit in Washington DC, the President of Burundi and delegation visited representatives from USAID, Power Africa, and Virunga Power to discuss the concession progress and reaffirm a commitment to the project.

BUILDING BURUNDI'S GRID THROUGH PUBLIC-PRIVATE PARTNERSHIP

With hilly terrain, networks of rivers, and abundant sunshine, Burundi has immense potential for domestic energy generation. Yet Burundi is among the least electrified nations in the world. In much of the country, only 13 percent of the population has electricity access, while Burundi's electricity generation capacity is less than half that of its similarly sized neighbor, Rwanda. More than 90 percent of households are rural, and for small-scale cooking and heating, they primarily use biomass, an energy source without much use in terms of economic development.

Burundi's utility, Régie de Production et de Distribution de L'eau et de l'Électricité (REGIDESO), holds a monopoly on electricity transmission and distribution. Energy developer and Power Africa partner Virunga Power proposed an alternative solution: to develop a public-private partnership (PPP) for rural distribution. The advantages of this type of partnership are that private developers typically secure financing faster than public utilities, and their success is driven by a required return on their investment for profitability and long-term commercial viability. Under the Virunga Power PPP, the developer will purchase power from REGIDESO, allowing the utility to benefit from the model.

In May 2021, the Government of Burundi signed a memorandum of understanding with Virunga Power granting the company exclusive rights to develop a PPP proposal. With the window open to develop the utility model, Virunga Power collaborated with Power Africa to better understand how to build a business plan that would be accepted by the government. EAEP supported Virunga Power to complete necessary studies, analyses, and agreements to advance its business proposition and secure government buy-in. For example, Power Africa provided the company with a financial model and led a series of seminars on establishing a new private utility and a tariff for services. EAEP's legal advisors also worked with the government and development partners to update Burundi's 2015 electricity law to include language on distribution PPPs. In February 2023, EAEP's legal advisors made progress toward formalizing the PPP by creating a legal document based on the memorandum and drafting the PPP and power purchase agreements for Virunga Power.

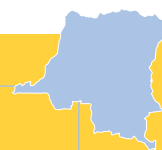
With a goal of electrifying 70 percent of the country, including 50,000–60,000 households in the first two years of distribution, the Virunga Power PPP can leapfrog the traditional grid expansion model. It also encourages additional private sector engagement by Burundi's energy stakeholders and shows that the government is open to sector reforms that will catalyze further development and energy access for citizens. In December 2022, Power Africa hosted a high-level energy sector dialogue in Washington, DC, attended by the President of Burundi, during which Virunga Power presented its latest studies, including those supported by EAEP. At the dialogue, the President called the Virunga Power distribution project a “win-win” for the country and the developer.

The Virunga Power PPP can serve as a model structure for replication in countries with similar access challenges. While traditional development generally focuses on electrifying and building out from a country's capital cities, the Virunga Power model specifically targets the rural population, which has only 4 percent energy access. New access under the PPP will drive economic development by providing reliable energy to health care facilities, schools, and agriculture operations. The proposed Virunga Power PPP shows how private utilities can work hand-in-hand with national utilities to reach large rural populations in an expedient manner, jointly taking the path to universal energy access.



Trenchworks for REGIDESO distribution expansion in Bujumbura, Burundi. With the Virunga Power PPP, scenes like this will become more common across Burundi in order to connect more homes and businesses. Photo credit: EAEP

DEMOCRATIC REPUBLIC OF CONGO



MW REACHED FINANCIAL CLOSE	MW ADDED TO PIPELINE	PEOPLE TRAINED	
0 MW	375.3 MW	Men: 22 Women: 44	
SECTOR SUMMARY			
Installed capacity	2,677 MW	Population	95.9 million
Available capacity	1,338 MW	Access rate (on and off)	19%
Average tariff	\$0.198 per kWh	Active IPP	Yes, multiple

The energy sector in the Democratic Republic of Congo (DRC) is diversifying as demand increases, but the population’s electricity access rate remains far from universal. Given increasing interest from the private sector, especially in the country’s high-potential mining industry, the Government of the DRC must align demand, potential, and affordability to expand the energy sector sustainably, for both households and industry.

With a population nearing 100 million, the largest land mass in East and Central Africa, and abundant renewable resources, DRC has the potential to be the continent’s leading energy producer. However, DRC has struggled to harness its full wind, solar, and hydropower resources, with just 1,338 MW of available generation capacity and only 19.1 percent of the population having access to electricity.

To meet these challenges, IPPs have expanded into distribution; and the national utility, Société Nationale d’Electricité (SNEL), has awarded concessions for selling power directly to consumers in the form of metro-grids. Other developers are looking to create escrow accounts with mining companies to mitigate the risk of either SNEL or the companies defaulting on utility payments.

In DRC, EAEP focused on support to IPPs to de-risk their proposed projects for investors in eastern DRC. Given EAEP’s limited presence in DRC, as well as ongoing support there from other Power Africa mechanisms, EAEP worked with IPPs such as Globeleq and East African Power to diversify generation by adding solar to the grid. In total, EAEP supported 375.3 MW of generation in DRC through legal advisory work and transaction advisory support.

Additionally, EAEP offered planning support to SNEL and other energy entities and strengthened their capacity for grid development. Through these activities, Power Africa identified clear areas for future interventions in DRC that could emphasize electricity resource planning and expanded access.

ACTIVITIES SUMMARY

OBJECTIVE 1: OPTIMIZED POWER SUPPLY

ADVANCED FINANCIAL CLOSE

GREENSHARE SOLAR (100 MW). EAEP advanced this project toward financial close by studying the possibility of interconnecting the solar power project with a predominantly hydropower-based grid. The developer, Globeleq, requested this study under the premise that a positive finding could aid in proving the technical feasibility of the project as the developer sought funding. Also, as part of its progress toward financial close, Globeleq began working with the Government of DRC to ensure that risk will be properly allocated between the parties. Additionally, Globeleq will update its studies and contract documents before progressing with financing conversations with lenders and investors. As of August 2023, Globeleq had met several times with the US International Development Finance Corporation (DFC), which showed an interest in the project.

KOLWEZI SOLAR POWER PROJECT (132.9 MW) AND LIKASI SOLAR POWER PROJECT (132.9 MW). EAEP advanced both projects toward financial close with EAEP legal advisors' review of the project's legal contracts for the developer, East African Power, which is also a Power Africa private sector partner active across sub-Saharan Africa. Additionally, EAEP's legal advisors developed a framework for East African Power to support an escrow model with the mining companies—the anticipated primary power consumer—to mitigate the risk of payment default by the off-taker, the national utility, SNEL. The mining region has an estimated unmet demand of 800–1,200 MW, such that the additional generation would have a significant impact on the reliability of power to the mines and local community. As of August 2023, before it could reach financial close, the developer needed to renegotiate the PPAs for both projects based on the feedback from EAEP's legal advisors, to ensure that the contracts will be bankable and meet international standards.

OPTIMIZED POWER SUPPLY ACTIVITIES

STRENGTHENING CAPACITY IN TRANSMISSION FINANCING. In May 2023, the US Embassy in DRC and EAEP—through the Commercial Law Development Program (CLDP)—hosted a two-day capacity development program on transmission financing for DRC counterparts in Kinshasa. The event brought together international experts, regional specialists, and local leaders for an in-depth workshop on financing national transmission as well as regional interconnections and power trade. Speakers included experts from CLDP, Trinity Law Firm, the AfDB, the Tony Blair Institute, and Power Africa. Many attendees came from SNEL, the Agence de Régulation de l'Électricité (ARE), and development partners such as Proparco and private sector company AEE Power Ventures. The sessions were interactive, with great questions and dialogue from participants and speakers. The workshop was the first of a five-part capacity development series organized by Power Africa to bring USAID and donors together to hear from DRC counterparts on priorities and gaps.

PPP REGIONAL TRAINING PARTICIPATION. Between November 2020 and September 2021, EAEP conducted a regional PPP training, which was implemented by the Institute for Public–Private Partnerships (IP3). The remote training featured attendees from utilities, regulators, and ministries throughout the region and two participants from ARE, the regulatory agency. It addressed the legal and financial intricacies of energy sector PPPs, with the objective of improving stakeholders' understanding of and confidence in working within the sector.



Participants at the CLDP-hosted transmission financing workshop in Kinshasa, May 2023. Photo credit: CLDP

OBJECTIVE II: INCREASED ON-GRID CONNECTIONS

SUPPORT TO VIRUNGA ENERGIES. Support to Virunga Energies. EAEP supported Virunga Energies' operations from 2021 through 2023. Virunga Energies, not to be confused with Virunga Power, develops hydropower projects and distributes the energy in the North Kivu region. Because of damage to SNEL's Ruzizi I hydropower dam in South Kivu in 2022, caused by plastic pollution in the Ruzizi River, Virunga Energies saw a surge in demand in its service region and began looking for options to increase supply until it could complete its in-progress projects. One possibility identified as a stopgap solution was importing power from Uganda. EAEP introduced the developer to Uganda's transmission company, Uganda Electricity Transmission Company Ltd. (UETCL), and later to the Ugandan regulator, the Electricity Regulatory Authority (ERA), in the hope of facilitating cross-border power importation. Ultimately, the developer decided against importing power from Uganda due to bureaucratic challenges on both sides of the border. In late 2023, EAEP completed technical diagnostics for Virunga Energies related to network unreliability. The objective of the support was to increase reliability for its 27,000 customers in North Kivu. Additionally, as Virunga Energies expands its generation capacity and increases its household connections, the support provided will directly improve network reliability. Additionally, as Virunga Energies expands its generation capacity and increases its household connections, the support provided will directly improve network reliability.

OBJECTIVE IV: INCREASED REGIONAL POWER TRADE

NURU ENERGY SUPPORT FOR TRANSMISSION DEVELOPMENT. Starting in early 2020, EAEP supported Nuru, a private company with owners in both the United States and DRC, that wanted to expand from mini-grid development to large transmission infrastructure. Because Nuru was new to this aspect of the energy sector, EAEP supported the company by training its personnel on project financing, modeling PPP transmission options, advising on transactions, reviewing feasibility and environmental studies, and providing the grid planning software, PowerFactory DlgSILENT. The support did not lead to the development of the envisioned 400 kV Uganda–DRC interconnector but did support smaller generation advancements for strategic placement in eastern DRC.

See section on “Increased regional power trade” for information on the DRC–Tanzania interconnection prefeasibility study.

CROSS-CUTTING ACTIVITIES

GENDER EQUITY SUPPORT. EAEP sponsored two internships in DRC with Nuru. After having learned of the apprenticeship program’s success in Rwanda, Nuru requested interns for short-term assignments. EAEP could fund only two appointments; however, this model of private sector sponsorship could be replicated in future Power Africa interventions.



Members from across DRC’s energy sector and US Government representatives gathered in Kinshasa in May 2023 to share experiences and opportunities for financing transmission as part one of an ongoing capacity strengthening series. Photo credit: CLDP

LEVERAGING INDUSTRY TO EXPAND AFFORDABLE ENERGY IN DEMOCRATIC REPUBLIC OF THE CONGO (DRC)

With more than 100 million inhabitants, DRC is the fourth most populated country in Africa. Unfortunately, with only 20 percent access, it is also the eighth least electrified country in the world, according to the World Bank. Eighty million Congolese are without access to energy due to insufficient installed generation and a limited grid network. The Société Nationale d'Électricité (SNEL), the national utility, offers below-cost tariffs to consumers, thereby taking a loss that limits the funds available to the company to maintain its infrastructure and equipment or to develop new generation to meet demand. Independent mini- and metro-grids have sprung up beyond the reach of SNEL's limited network, but these relatively small projects are not a sustainable means of increasing electricity access.

Simultaneously, mining is a substantial source of revenue in DRC. Gold, diamonds, coltan, cobalt, copper, lithium, and other materials are extracted daily from the many mines dotting the country's southeast region. Yet operations and productivity in this well-resourced area are constrained by unreliable electricity; SNEL is unable to generate enough energy to meet an estimated demand of 800–1,200 MW. As a result, the industry often relies on expensive diesel generators and has expensive options for expansion of services.

To increase generation in this important region, Power Africa private sector partner East African Power is developing the Kolwezi and Likasi solar projects. The addition of an expected 265.8 MW to the grid will significantly improve access to clean energy for the mines and the local population.

Mining companies are often reluctant to sign long-term power purchase agreements or to undergo the required due-diligence processes, so the only off-taker for power at this scale is the national utility. However, SNEL's financial challenges limit its creditworthiness in the eyes of the private sector. As a solution, EAEP supported East African Power to develop a legal framework for creating escrow accounts with the mining companies, who will be the primary consumers of the solar power. The mining companies will pay into an escrow account for their power; the account will hold the payment until SNEL pays East African Power for the electricity. Should SNEL default on its payment, the money would be available in the escrow account to be recovered by East African Power. The mines will receive reliable power and the developer will have a payment guarantee.

The escrow model is both innovative and replicable and unlocks new opportunities for independent power producers (IPPs) in the energy sector. EAEP also began exploring a similar mechanism with another IPP in DRC. If this model proves successful, power producers can use the escrow model as a basis to expand energy access in the DRC and to cement private sector participation in the sector going forward. The model could also be used for transmission development.

DJIBOUTI



MW REACHED FINANCIAL CLOSE		MW ADDED TO PIPELINE		PEOPLE TRAINED	
0 MW		35 MW		Men: 19 Women: 6	
SECTOR SUMMARY					
Installed capacity	123 MW	Population	1.12 million		
Available capacity	~ 60 MW	Access rate (on and off)	62%		
Average tariff	\$0.28 per kWh	Active IPP	Yes, one active		

In the past five years, Djibouti’s power sector has taken steps toward its goal to be 100 percent powered by renewable energy by 2030. Advancements include 220 MW of interconnection to Ethiopia’s hydro-dominated power system (one interconnection is operational and a second is under construction), as well as development of wind, solar, waste-to-power, and geothermal generation.

Although the country has significant renewable resources, domestic electricity supply comes largely from oil-fired thermal power stations. The development of large ports in Djibouti City has driven increased demand as the country aspires to become a commercial hub in the region, given its strategic location in the Horn of Africa, at the confluence of the Red Sea and the Gulf of Aden. Renewable power development includes a 60 MW wind project, a 30 MW solar photovoltaic (PV) scheme, and a well-advanced 35 MW waste-to-energy project led by American company and IPP CREC Energy Concepts (CREC Energy). Djibouti also has high-quality geothermal resources, but significant technical and cost challenges have hindered its commercial development.

The national electricity utility, Électricité de Djibouti, has a monopoly to transmit and distribute electricity in Djibouti. It is overseen by the Ministry of Energy and Natural Resources, which determines policy. Although legislation now allows private participation in power development, little has occurred in the way of encouraging IPPs. Similarly, despite a legislative framework to facilitate foreign direct investment, Djibouti’s administration seems reluctant to create an enabling sovereign risk environment.

EAEP visited Djibouti in December 2019 to initiate a potential support program. During the visit, the USAID Country Office and EAEP agreed that Power Africa should support the Djibouti power sector wherever there was an appetite for it. Overall, EAEP did not detect strong interest in private sector or Power Africa involvement; however, EAEP did begin to support CREC Energy.

Although EAEP was interested in assisting with some specific areas of geothermal development, the technical problems noted above were already being addressed by Power Africa. EAEP did involve Djiboutian participants in a regional PPP training program and continued to provide ongoing targeted support to CREC Energy.

ACTIVITIES SUMMARY

OBJECTIVE 1: OPTIMIZED POWER SUPPLY

CREC DJIBOUTI – RENEWABLE ENERGY PARK PROJECT. The developer, CREC, progressed a waste-to-energy project that plans to use general solid waste and tires as fuel. The plant would cost about [REDACTED] to build and would produce renewable base-load electricity of 35 MW net capacity. CREC Energy claimed the plant could consume all waste and tires in the Republic of Djibouti. EAEP continuously engaged CREC starting in November 2019 until EAEP's conclusion regarding financial advisory and partnerships. The CREC proposal was appealing because the project could potentially solve environmental problems around waste management while also contributing to the supply of renewable energy. The CREC developers had undertaken significant feasibility work and had good support from the Djibouti government, including a feedstock supply agreement, a PPA, and an implementation agreement. CREC had also completed an environmental and social impact assessment (ESIA). Significantly, if the CREC project were to succeed, it might be replicable in other countries.

EAEP undertook due diligence of the CREC project and developers, and CREC Energy responded to all information requests for this exercise. EAEP reviewed the critical project documentation and CREC's financial model. EAEP advised CREC that some aspects of its project documentation might require changes to make the project bankable for typical IPP project financiers. In addition, EAEP recommended enhancements to CREC Energy's financial model to make it useful as a "bank" model for financiers to undertake an in-depth analysis of the project. In late 2020, EAEP completed a Power Africa Environmental and Social Review Methodology (PESRM) assessment of CREC Energy's project based on their ESIA.

During 2020, EAEP energy experts undertook the first of two assessments of CREC Energy's technical approach. The review noted that the CREC project would use pyrolysis to convert waste to energy, and that the engineering design was quite complex. The evaluators also observed that pyrolysis has had mixed success when used in waste-to-energy applications. Despite some misgivings about CREC Energy's choice of technology, EAEP's assessments revealed no fatal flaws and formed the basis for a successful application to USAID to qualify the CREC project for Power Africa support.

After USAID approval, EAEP introduced the project design to several potential funders of power project feasibility and development work for IPPs, including DFC. In addition, EAEP supported InfraCo Africa—an infrastructure investment firm based in the United Kingdom—to undertake due diligence of the CREC Energy project. After the review was concluded, however, InfraCo Africa declined to proceed with financing.

EAEP concluded that the technological risk was the greatest impediment to investment. In a follow-up review, EAEP noted that the overall CREC project technology was unique; that is, whereas the individual technologies that make up the facility design are well established, they have never been assembled as part of a full system. EAEP also recognized that CREC did not have a working pilot project that could serve as a reference for potential funders to assess commercial viability.

Despite the obstacles, the EAEP advisors indicated that the CREC project would be a tremendous asset with great potential for Djibouti if it could be built and could meet its projected results.

ETHIOPIA



MW REACHED	ON-GRID CONNECTIONS	MW COMMISSIONED	MW ADDED PIPELINE	ATC&C REDUCED	PEOPLE TRAINED
0 MW	1,484,016 connections	0 MW	200 MW	5 percentage points in pilot zones	Men: 782 Women: 236

SECTOR SUMMARY

Installed capacity	5,238.5 MW	Population	120.2 million
Available capacity	Unknown	Access rate (on and off)	56%
Average tariff	\$0.034 per kWh	Active IPP	None

EAEP built relationships at EEU and Ethiopian Electric Power (EEP) that created a pipeline of over one million new connections from 2019 through 2021 and led to buy-in for better planning for an optimized energy sector.

As EAEP was starting up in early 2018, EEU had a goal to add one million new on-grid connections per year; a pace that would propel Ethiopia toward universal access by 2030. Despite strong efforts, however, EEU was falling short of connections targets and, like most utilities in sub-Saharan Africa, needed guidance on how to reduce losses and increase revenue to support such efforts. As a result, EAEP assisted EEU to improve efficiencies, increase revenue, and roll out more connections. Because EEU had a workforce of over 20,000 employees, EAEP and EEU collaborated on a pilot approach to engage the utility personnel with strategic planning interventions to cascade training and information across the remaining regions in the country.

EAEP's approach to EEU's transformation plan was to conduct on-the-job training for district and service center employees from identified support areas, over multiple years. As a result of their efforts, ATC&C

losses declined from 34.9 percent in September 2019 to 20.57 percent in August 2021, and revenue increased by ██████████ between 2020 and 2021.

EAEP also supported a request from the Ministry of Energy, Water, and Irrigation (MoWIE) and EEP to update their master plan. This plan would become a critical enabling-environment deliverable that would dictate generation, transmission, and distribution development from 2025 through 2040. Additionally, EAEP supported MoWIE, EEP, and the regulator (Ethiopian Electricity Authority [EEA]) to advance critical policies and regulations that would unlock renewable energy transactions, including geothermal.

Despite these efforts, EAEP was not able to guide a generation transaction to financial close in Ethiopia. The primary obstacles were capital transfer and convertibility for IPPs. Ethiopia's negative trade balance and foreign exchange scarcity, influenced by external debt obligations, have led the National Bank of Ethiopia to establish stringent controls over foreign exchange. Additionally, EEP, responsible for off taking the output of any renewable energy projects, grapples with a financial paradox: despite significant capital expenditures on generation, transmission, and distribution, it operates with unusually low electricity tariffs.

In December 2021, EAEP stopped on-the-ground operations and activities with host-government entities (including the utilities) because of conflict in northern Ethiopia. EAEP did continue supporting private companies; advising regional initiatives; and counting connections based on previous equipment installation.

ACTIVITIES SUMMARY

OBJECTIVE 1: OPTIMIZED POWER SUPPLY

ADVANCED FINANCIAL CLOSE

SCALING SOLAR SUPPORT. In December 2019, Saudi Arabian solar developer ACWA Power secured two 125 MW solar projects, named Gad and Dicheto, under Round 1 of Ethiopia's Scaling Solar Program. Despite the International Finance Corporation's (IFC's) early involvement, the projects faced financing challenges and were mutually terminated by the Ministry of Finance's PPP Directorate General (PPPDG) and ACWA Power in May 2022. Simultaneously with the first round, PPPDG initiated Scaling Solar Round 2. This phase aimed to develop up to 500 MW of solar PV energy across four distinct projects: Weranso, Welencheti, Humera, and Mekelle. These projects, part of a [REDACTED] infrastructure pipeline, were designed under a PPP model, following earlier energy sector deployments. The projects had secured land sites and had begun transferring land-use rights to mitigate potential risks. However, in May 2022, due to the termination of the Round 1 solar projects amid conflict in northern Ethiopia, the Round 2 projects were also suspended before they could reach the request for proposals (RFP) stage. PPPDG indicated that the projects would be re-tendered, although it provided no specific timeline. EAEP developed the required resettlement action plan (RAP) for the initial five solar projects flagged by the World Bank, resulting in the approval of a [REDACTED] partial risk guarantee from the World Bank. Additionally, EAEP advised the Ministry of Finance on resolving currency availability and convertibility issues for advancing solar projects. Power Africa allocated [REDACTED] to the Ethiopia-IFC Scaling Solar program, supporting Round 1 solar projects including Gad and Dicheto.

CORBETTI GEOTHERMAL PHASE 1 (50 MW) AND PHASE 2 (100 MW) AND TULU MOYE PHASE 1 (50 MW) AND PHASE 2 (100 MW). Starting in 2013, Power Africa was deeply engaged in advancing the Tulu Moye and Corbetti geothermal projects, each targeting 150 MW. EAEP played a pivotal role, offering transaction advisory support and effectively resolving challenges to propel these projects toward financial close. From 2014 through 2018, Power Africa supported the transactions through the AfDB's African Legal Support Facility; advised on the PPA and implementation agreement; supported the drafting and finalization of the geothermal proclamation; and advocated for the projects and geothermal works with new administrations and energy sector leaders. Subsequent negotiations in January 2019 led to the re-signing of the PPA and implementation agreement in March 2020, accompanied by 16 conditions precedent for commercial closure. Power Africa's transaction advisors partnered with the Ethiopian government and EEP to fulfill these conditions, culminating in commercial closure for the Tulu Moye project in December 2020 and the Corbetti project in January 2021. However, as EAEP concluded its Ethiopian operations in 2022, the projects faced critical challenges in reaching financial close. Ongoing discussions and disruptions, such as civil unrest, underscored the complexity of finalizing agreements and operationalizing the projects.

In summary, Power Africa's involvement was pivotal in propelling the Tulu Moye and Corbetti geothermal projects from their inception in 2013 to significant milestones. The program's persistent efforts, collaboration with legal experts, and alignment with regulatory bodies transformed these projects into promising components of Ethiopia's evolving energy landscape.

METEHARA SOLAR PROJECT (100 MW). Building upon the efforts of the PATRP initiative, EAEP advanced the development of the first 100 MW solar project in Ethiopia through competitive tendering and comprehensive structuring. Initially, the ESIA and a framework resettlement plan for the project were formulated. However, when the World Bank stipulated that a complete RAP would be necessary to secure a guarantee, EAEP promptly undertook the task of developing it. Once the RAP was completed, the entire package received approval for the partial risk guarantee amounting to [REDACTED] for solar projects in Ethiopia. EAEP continued to serve as a transaction advisor for the project until EEP and the project developer (Enel Green Power) reached a mutual decision to terminate the project. This decision stemmed from unsuccessful tariff renegotiations.

OPTIMIZED POWER SUPPLY ACTIVITIES

GEOTHERMAL IPP SUPPORT. Power Africa began supporting two geothermal IPP projects in Ethiopia in 2013: the Tulu Moye and Corbetti power stations described above. To bring them closer to commercial completion, EAEP advisors collaborated with the Government of Ethiopia's external counsel, an effort that was funded through Power Africa's contribution to the AfDB's African Legal Support Facility. This accomplishment would not have been possible without extensive technical assistance from EAEP advisors and the Facility. Their efforts played a crucial role in effectively structuring, revising, and updating the project documents, PPA, and implementation agreement. Additionally, the advisors assisted the government in drafting a new geothermal law and relevant working regulations.

As of mid-2023, these projects had reached a critical stage for financial close. Tulu Moye Geothermal Operations (TMGO), the developer of both projects, was actively engaged in debt financing with a consortium of lenders. Concurrently, the developer was collaborating with the National Bank of Ethiopia to secure approval for the required guarantee form. TMGO was also in discussions with EEP to address new commercial terms that EEP had raised during the process. The progress made underscored the joint efforts of all stakeholders involved in bringing these initiatives to fruition. However, it is important to note that the power plants did not reach financial close at the end of EAEP. This outcome was attributed to challenges related to foreign currency guarantees with the National Bank of Ethiopia, a prerequisite for the developers to finance the projects. EAEP recommends that Power Africa continue to monitor progress on these transactions, given the National Bank of Ethiopia's progress toward resolving the foreign currency guarantee exemption for energy projects in September 2023.

SUPPORT FOR OPTIMIZATION OF EXISTING HYDROPOWER PROJECTS. In September 2019, EEP requested EAEP's support to conduct an in-depth engineering assessment of several hydropower plants (Gibe I, II, III; Melke-Wakena; and Fincha) to increase their hydropower generation capacity. The support was expected to include drafting terms of reference for a contract, as well as assisting with procurement for materials and equipment for upgrading the facilities. Power Africa directed EAEP to prepare a PESRM Checklist and a hydropower supplement to analyze potential environmental and social risks for USAID. However, the completed PESRM Checklist for Gibe III revealed that the identified risks were unacceptable, leading to a decision that USAID would not proceed further with that specific dam.

For the Fincha, Wakena, Gibe I, and Gibe II hydropower plants, EAEP proposed an action plan to conduct in-depth environmental and social due diligence. The plan included field visits and interviews with stakeholders, which were to take place in February and March 2020. A hydropower expert was to be engaged to procure data and technical details to incorporate into the Rehabilitation Assessment Terms of Reference. Scoping meetings and stakeholder engagement were to be carried out to gather relevant information. After this field visit, EAEP was supposed to produce a comprehensive memo with summaries of technical data, potential impacts, and mitigation recommendations. However, the trip never occurred due to the onset of the COVID-19 pandemic, which limited travel in the region. Although pandemic travel restrictions ended in 2022, the 2020–2022 conflict in Tigray prevented further travel and EAEP was unable to help advance the work.

SUPPORT TO GAD AND DICHETO TRANSACTIONS. EAEP advisors reviewed IFC's Financial Advisory Services Agreement with EEP and provided inputs to EEP and MoWIE. PATRP had previously funded the external transaction advisors that IFC had hired to support the RFP process (i.e., preparing the competitive bidding and project documents), an investment of over [REDACTED]. Moreover, EAEP advised the Ministry of Finance to resolve the currency availability and convertibility guarantee issue to advance solar projects. As of August 2023, the program team was optimistic that these bodies would continue their efforts in the absence of EAEP. One catalyst should be [REDACTED] that Power Africa designated for Round 1 solar projects under the PPPDG pipeline, including the Gad and Dicheto solar projects described above.

SUPPORT FOR UPDATED EEP MASTER PLAN, SYSTEM INTEGRATION STUDY, AND NATIONAL GRID CONTROL CENTER. EAEP supported the development of Ethiopia's long-term integrated resource plan (25 years, 2020–2045) as well as its short-term operational plan (2–5 years). The aim was to help EEP and other involved institutions to align the growth in demand with the government's expected growth in its gross domestic product. Together, the plans would paint a more realistic picture of how to achieve a supply–demand balance without overcommitting the Government of Ethiopia's limited development resources. At the same time, through operational planning, EAEP supported EEP's National Grid Control Center to better plan its hour-ahead and day-ahead operations, to reduce unscheduled outages that were impacting economic development. EEP last reported using the master plan to advance energy sector infrastructure investments determined at the national level before EAEP had to stop working from Ethiopia.

SUPPORT FOR PPPS. EAEP directly supported eligible individuals from PPPDG to obtain IP3 certification as Public–Private Partnership Specialists. This certification verifies that participants have acquired the required knowledge and skills needed to manage PPPs among governments, private sector firms, financial institutions, and other relevant stakeholders. EAEP supported PPPDG's five-year strategic plan and road map to enhance its institutional performance. It can use the road map as a reference tool and to direct each step for successful PPP projects. Through this support, PPPDG was able to (1) identify the critical and priority areas for strengthening its capacity over the next two years; (2) identify a critical path for executing its new strategic plan; (3) determine the key stakeholders and partners to approach for institutional strengthening and coordination; and (4) build capacity to undertake monitoring, evaluation, research, and learning aligned to the strategic plan.

LEGAL AND REGULATORY FRAMEWORK GAP ANALYSIS. The regulator, EEA, recognized the need to establish a more efficient and private-sector–friendly licensing process for generation projects in Ethiopia. The existing licensing procedures for renewable energy resources were complex, with varying requirements for each type of generation. For instance, geothermal and waste-to-energy projects required multiple licenses, while solar and wind projects needed only a generation license. This complexity acted as a barrier to private sector investment in the sector. In response to the challenge, EAEP conducted a comprehensive regulatory and process review, focusing on the EEA and other relevant power sector entities. The primary objectives were to identify gaps in the existing licensing and permitting process, clarify the roles and responsibilities of the different entities involved in the licensing process, and assess the technical capacity deficiencies within these entities. By bridging the regulatory gaps and enhancing the capabilities of staff in the respective agencies, the licensing and permitting process could be streamlined, making the renewable energy sector in Ethiopia more attractive to private sector investment.

OBJECTIVE 11: INCREASED ON-GRID CONNECTIONS

GEOGRAPHIC INFORMATION SYSTEM (GIS) SUPPORT. To improve EEU's planning for connections, EAEP supported the establishment of a GIS unit that would prepare and roll out a larger strategy for better distribution planning. Once the unit was established, EAEP helped assess its GIS server's capacity to accommodate medium-voltage data collected at the national and regional levels. EAEP made recommendations regarding data storage capacity, data sharing policy, data protection and security, and data updating activities. Additionally, EAEP provided ongoing training to the regulator, EEA, to develop a geothermal cadaster database management system; to help automate geothermal licensing; and to enhance the EEA's capacity in various energy technical fields. In addition to training, EAEP suggested database development procedures and tools that were incorporated into consultants' workstreams (using EAEP-supported terms of reference). These interventions also moved EEA toward web-based GIS platforms for creating and maintaining the web interface for the geothermal cadaster database. Finally, at EEU, EAEP supported an organizational assessment to reveal gaps in GIS implementation, needs for capacity building, and budget constraints related to necessary materials and subscriptions.

HEALTH FACILITY RELIABILITY AND ACCESS. Health facility reliability and access. In response to the COVID-19 pandemic, EAEP proposed the development of a system that would enable health facilities to report power failures. Early reporting and repairs could shorten outages affecting critical activities such as vaccine storage and COVID-19 testing. The proposed system would use Microsoft Power BI integrated with Esri's ArcGIS and the Kobo Collect mobile-based application. EAEP presented the system to the EEU GIS unit's managers and experts for feedback and further integration into their system.

ANALYSIS OF DISTRIBUTION NETWORK MAP. Analysis of distribution network map. An EAEP investigation found that most of the EEU distribution network was constructed using wooden overhead poles. These poles, which were aging, posed safety hazards during maintenance. Furthermore, line workers had attached the transformers and other network components to the poles without adherence to any standards or proper workmanship. The tension of the overhead wires was loose, and they were not properly maintained to clear roads, buildings, other electric lines, and telecom lines. This poor construction and maintenance lead to electrical hazards and accidents when wires come down. They also increase power outages. EAEP submitted its findings assessing the distribution network's safety and reliability issues to the EEU distribution system manager. The study report recommended mitigation measures to improve safety for workers and reliability for customers.

REDUCED TIME AND COST TO CONNECT TO THE GRID. EAEP and EEU conducted a baseline study to assess the average time and cost for new electrical connections, broken down by customer type. The study surveyed 30 EEU service centers to analyze records on connection times and costs. It looked at the time from a customer applying for a grid connection to that connection being completed, separating data for residential and productive use customers. The study also examined EEU's costs at the service center level for providing these new connections. It then made recommendations across areas such as staffing, tools, and procedures to strengthen and streamline the connection process. EEU used this baseline study to improve customer service by reducing connection costs and the time required to bring new customers onto the grid.

EEU NEW CUSTOMER SUPPORT. According to the organizational evaluation, one of EEU's challenges was dissatisfaction caused by poor customer relations. To address this issue, EAEP brought in a local firm, Ethiopian Airlines Academy, for train-the-trainer sessions on customer service (for an initial 100 employees at EEU). With the Academy's support, over 2,200 regional employees from all of EEU's regions received customer service management training.

PROCUREMENT AND CONTRACT ADMINISTRATION. EEU shared with EAEP that they had been having issues with delayed procurements and material shortages for new connections. These shortcomings resulted in customers waiting long periods to get power, even after they had paid their connection fees. Procurement procedures also were not standardized or well documented, which meant that newly assigned procurement staff at the regional offices could not properly carry out their duties. This confusion among employees caused further delays. To address the procurement problems, EAEP delivered a train-the-trainer series on procurement and contract administration for 32 EEU procurement staff. The training aligned with EEU's new decentralized structure across all 11 regional offices. By embedding trainers regionally, EAEP was able to reach over 900 EEU staff. The goals were to improve and standardize EEU's procurement and contract management processes, and to equip staff with skills to avoid procurement delays and material shortages. The end result was more timely connections for customers who had paid their fees.

METER TEST BENCHES FOR INCREASED CONNECTIONS. When EAEP first engaged with EEU, the utility was using outdated test benches to check the accuracy of purchased energy meters. To improve EEU's quality assurance of customer connections, EAEP obtained two fully automated, modern meter test benches. In addition to paying for the equipment and the shipping, EAEP supported EEU meter lab engineers and technicians to participate virtually in factory acceptance testing, installation, and commissioning of the new benches. After successful installation, over 30-meter lab staff were trained on powering up the benches and running various tests and troubleshooting procedures. Once operational, the benches increased the pace of

EEU's meter testing and quality assurance. The new test benches could automatically assess medium-voltage fuse elements as well as testing miniature circuit breakers. As a result, EEU installed more verified and safe customer connections, even during pauses in direct EAEP support due to the conflict in Tigray. The modern test benches increased EEU's internal capacity to assure new meter accuracy.

WORKPLACE SAFETY MANUAL. EEU had a history of its technicians suffering death or severe injury due to unsafe workplace conditions and practices. To reduce the numbers of fatalities and injuries, EAEP and EEU jointly developed a workplace safety manual especially for junior technicians. The manual was written in English and then translated into Amharic so that technicians across Ethiopia could access the information more easily. It was shared with EEU's environmental safety and health department and distributed to all regional offices. The manual enabled wider adoption of standardized safety practices across the organization, thereby especially protecting more vulnerable junior staff.

OBJECTIVE III: STRENGTHENED UTILITIES AND OTHER POWER SECTOR ENTITIES

UTILITY TRANSFORMATION PLAN AND ATC&C BASELINE ASSESSMENT. For EAEP's utility strengthening in Ethiopia, the program focused on two regions—Addis Ababa Region and Finfine District—but also supported EEU in rolling out initiatives to other regions nationwide. As EAEP got under way, these two selected areas were serving close to one million customers and accounted for more than 50 percent of the total consumption in the country, also generating more than 50 percent of revenues for the entire utility. The transformation plan was based on a diagnostic assessment from 2019 whose most significant finding was the utility's lack of information on energy delivery. As a result, EEU's baseline for ATC&C losses was difficult to establish. To address this issue, the EAEP team, in collaboration with EEU, assessed the status of substation/feeder metering progress and recommended that relevant EEU departments address issues with unmetered feeders.

The transformation plan included several key initiatives, such as establishing an energy accounting process, revamping commercial operations, reducing commercial losses, protecting revenue, and setting and evaluating performance targets.

IMPROVED METER SEALING. To reduce commercial losses, EAEP and EEU developed and instituted procedures for meter sealing and resealing that would better prevent tampering as well as faulty or fraudulent meter reading. The team also reviewed the meter-sealing management process and drafted a meter-sealing instruction document for EEU, specifying the type of seal for each customer group, responsibilities of employees authorized to seal the meters, etc. At the time of EAEP's departure from Ethiopia, the utility was still procuring the seals necessary to fully implement the process. EEU's management committed to follow EAEP's recommendations and approaches once the seals were procured and delivered.

ENERGY LOSS REDUCTION. EAEP and EEU developed policies and procedures to improve monthly energy accounting, regular reviews of customer consumption profiles, and random and targeted inspection activities. All these interventions contributed to loss reductions and practices that helped EEU better identify and eliminate meter installation irregularities, pinpoint damaged or malfunctioning meters, and optimize revenue generation overall.

SUPPORT FOR HANDHELD METER READING DEVICES. Other EAEP initiatives included amending the performance evaluation policy, supporting the use of handheld devices to read customers' meters, and identifying where to install advanced metering. Overall, the transformation plan aimed to improve EEU's efficiency and sustainability, and the pilot projects in the two selected regions proved the concept and helped obtain buy-in from EEU management.

ROLLOUT OF CHANGES TO EEU COMMERCIAL CYCLE AND IMPROVEMENT OF UTILITY OPERATIONS. The EAEP team took steps to calculate ATC&C losses in the pilot areas by ensuring proper energy accounting, including installing meters at key distribution transformers and training staff. They implemented an optimized commercial cycle in a service center, which increased revenue by five percentage

points compared to the previous year and recovered 8 percent of customers who had not been billed previously. This pilot project was successful and resulted in the rollout of the optimized commercial cycle to the entire North Addis Ababa District (126,904 customers), which increased revenue by 45 percentage points compared to the baseline and added over 20 percent of previously unbilled customers.

IMPLEMENTATION OF PROPOSED REVENUE-PROTECTION PROCEDURES. EAEP also established inspection teams to reduce commercial losses, developed an operating procedure for the Revenue Protection Department, created an employee performance evaluation policy, and provided technical support for procuring advanced metering infrastructure. EAEP's tools, approaches, and revenue-protection activities led to significant improvements in EEU's operations—for instance, revenue increased by ████████ between 2020 and 2021 in the pilot areas.

CROSS-CUTTING ACTIVITIES

HICD WITH PPPDG. EAEP supported PPPDG's HICD process, which enabled the unit to achieve an overall improvement of 14 percentage points in two years in the following areas: organizational strategy, 14 percentage points; capacity of PPPDG to negotiate, procure, and manage power projects, 15 percentage points; and personnel performance management, 11 percentage points.



Staff at EEU performing equipment inspections with EAEP's utility-turnaround team. Photo credit: EAEP

Gender equity. EAEP contributed gender foundations training for EEU and other Ethiopian stakeholders, as well as guiding a new network, Ethiopian Women in Energy (EWiEn). In 2021, EAEP supported EWiEn to hold a regional launch and learning events in two regions of Ethiopia: The Southern Nations, Nationalities, and Peoples' Region and Sidama. Additionally, EAEP worked with EEU to organize training on gender foundations, workforce readiness, and gender policy development, all of which aligned with the USAID Engendering Utilities (now Engendering Industries) initiative within EEU.

“ This process has enabled the PPPDG to realize two key milestones: (1) the development of a five-year strategic plan and (2) operationalizing the process of handling unsolicited proposals through introduction of a regulatory framework/ policy for streamlining the process. This has gone a long way to support inclusive and innovative approach to address the infrastructure agenda, in supporting the Government of Ethiopia's Growth and Transformational Plan (2015/16 – 2019/20) that underscores the need to explore PPP models in selected sectors of the Ethiopian economy. ”

— **Director General, PPPDG**

IMPROVING ETHIOPIAN ELECTRIC UTILITY (EEU) OPERATIONS FOR MORE CUSTOMERS

In 2017, the Government of Ethiopia launched the first National Electrification Program, which aims to extend electricity services to all of the nation's 100 million citizens by 2025. EAEP supported the national EEU to develop and implement loss-reduction strategies to improve its performance and increase revenue. As of August 2023, Ethiopia was far from reaching its ambitious universal access goal, with only 54 percent of the population having access to electricity.

This slow expansion rate can be attributed to various challenges facing distribution companies and the poor financial health of utilities, signaled by high technical and commercial losses, poor revenue collection, billing errors, inaccurate meter reading and data, and poor customer service, including lengthy customer connection processes. In 2020, the COVID-19 pandemic further reduced power demand across East Africa, exacerbating the energy sector's financial uncertainties.

In terms of support, EAEP and EEU elected to use an "on-the-ground" approach with an in-depth assessment of the national utility. The EAEP utility-turnaround team interviewed EEU field staff and managers to understand processes and identify gaps, inspected EEU field sites, and reviewed shared data. EAEP then developed a customized transformation plan and road map for the utility that included proposed loss-reduction strategies. EAEP engaged EEU managers and field teams to discuss the proposed policy and procedure changes and then piloted the new strategies in Addis Ababa and Finfinne Districts, where high numbers of residential and commercial customers offered plentiful data points for analysis.

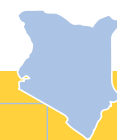
The piloted loss-reduction strategies focused on revenue and data management, commercialization, planning, revenue protection, and customer service. EAEP worked side-by-side with utility staff to ensure effective and efficient meter reading, daily quality control, and customer alignment. For example, to improve the efficiency of collections and disconnections, the teams targeted nonpaying customers with high outstanding balances. EAEP focused on large power users and other commercial customers by aligning large power customer revenues with their respective feeders to prevent losses.

EEU's new approaches resulted in the Addis Ababa and Finfinne pilot regions accounting for more than 55 percent of total EEU billing revenue. Loss-reduction work in North Addis Ababa District led to the addition of over 1,000 customers to the billing system and fewer unidentified customers. Comparisons of current and previous data showed significant progress, with notable decreases in unpaid bills. In April 2020, these figures amounted to [REDACTED] compared to the August 2020 report showing [REDACTED].

Through these enabling-environment shifts at the utility operational level, EEU was able to significantly improve its performance in the pilot zones and start rolling out practices across the utility.

Utility-turnaround engineer on site during EAEP support programs in Ethiopia. "The Power Africa East Africa Energy Program has provided great support to EEU in identifying and reducing commercial losses and increasing revenues. EEU now puts more effort into billing and collecting for every kWh of energy. Moreover, EAEP is rolling out the optimized commercial cycle in other service centers, which is increasing employees' accountability and improving overall commercial operations." [REDACTED], Head of Energy Management Directorate, EEU. Photo credit: [REDACTED]





MW REACHED FINANCIAL CLOSE	ON-GRID CONNECTIONS	MW	MW ADDED PIPELINE	ATC&C REDUCED	PEOPLE TRAINED
213 MW	2,261,710 connections	468.3 MW	647 MW	16 percentage points in pilot zones	Men: 542 Women: 537
SECTOR SUMMARY					
Installed capacity	3,601 MW		Population		53 million
Peak Demand	2,149 MW		Access rate (on and off)		65%
Average tariff	\$0.15 per kWh		Active IPP		Yes, multiple

Kenya led the region in adding on-grid connections, transforming its utility to reduce losses, and advancing MW toward financial close and commissioning. Under EAEP, Kenya advanced cross-border trade and supported the development of energy transmission systems in an environmentally and socially sustainable way.

EAEP and Kenyan energy sector entities co-developed interventions across all four objective areas and cross-cutting areas. Kenya served as EAEP’s field headquarters, and its advanced energy sector supported EAEP pilot programs in utility transformation, HICD programming, and environmental and community-engagement interventions. EAEP’s team members worked with senior leaders at Kenya Power and Lighting Company (Kenya Power), Kenya Electricity Generation Company Ltd. (KenGen), KETRACO, Geothermal Development Corporation (GDC), the Ministry of Energy and Petroleum, the Energy and Petroleum Regulatory Authority (EPRA), and Rural Electrification and Renewable Energy Corporation.

For generation, EAEP targeted late-stage solar, wind, hydro, and geothermal transactions to reach financial close. Despite a pipeline of 860 MW supported by EAEP, only 213 MW reached financial close before the end of EAEP. The delays affecting generation projects were largely due to a government-issued moratorium on signing PPAs and a corresponding review of sector commitments. Although the moratorium delayed new projects, the pause did give Kenya time to refocus on optimized planning, affordable tariffs, and advanced imports of power from Ethiopia. However, Kenya still requires more power as demand increases.

Despite challenges in generation, Kenya Power was able to add more than 2.2 million connections during 2019–2023 with EAEP support. EAEP’s utility transformation programming with Kenya Power included embedded advisors in pilot zones for loss reduction and EAEP distribution experts working with planning to improve technical skills, procurement, and contract management, and to reduce time and cost to connect.

EAEP focused on sustainability across all objectives with support from cross-cutting team members. For example, Kenya conducted the first sector wide HICD program with a performance assessment program. EAEP co-developed activities for community-engagement and environmental improvements with KETRACO, KenGen, and GDC. Going forward, Power Africa can continue to support Kenya’s green growth initiative, integrate on- and off-grid access improvements, and focus on affordability to continue to lead the region.

ACTIVITIES SUMMARY

OBJECTIVE 1: OPTIMIZED POWER SUPPLY

REACHED FINANCIAL CLOSE

ALTEN KESSES (KESSES 1) (40 MW). The Alten Kesses project is part of a Kenyan renewable power success story. In the past two years, four solar PV projects totaling 160 MW have been commissioned. All four of these projects benefited from substantial Power Africa support in their development. Alten Kesses adds 40 MW of clean electricity to Kenya's grid, thereby displacing some of Kenya's thermal generation. Power Africa's support for Alten Kesses included training Kenya Power on PPA negotiations for solar power IPPs, and funding Kenya's grid management support program, which supported the modernizing of Kenya's grid to integrate renewable energy. Power Africa worked with the National Treasury to create a bankable draft of the government letter of support and helped develop new grid codes. Power Africa also funded studies assessing the impact of integrating variable renewable energy from wind and solar PV projects on Kenya's power system. EAEP later identified related technical needs, which led the program to support the finalization of project documents and the management of associated conditions required to reach financial close, including deeds and permits. EAEP supported Alten Kesses to reach both financial close (in July 2021) and commercial operations (commissioned in October 2022) within EAEP's operational period.

MENENGAI-08 (DEVKI GROUP [SOSIAN ENERGY] (35 MW). As part of the GDC priority projects, the Menengai-08 project was developed to generate renewable geothermal power, which provides consistent power, 24 hours a day. The Menengai projects were contracted using an innovative PPP structure to attract private investors to the geothermal generation sector. This was initially a tracking transaction, and only started receiving EAEP support in August 2021. The transaction initially received support from PATRP, which offered technical assistance to GDC through a full-time in-country transaction advisor to assist with geothermal development in Kenya. EAEP supported a capacity needs assessment and advised on managing community-related aspects of the transaction. The transaction reached financial close on August 5, 2020, and will add 35 MW of base-load renewable energy to Kenya's grid upon completion.

OLKARIA 1 UNITS 1 – 3 GEOTHERMAL POWER PLANT REHABILITATION (15 MW). To make the most of output from its world-class geothermal generation, KenGen is progressively rehabilitating or expanding existing generation power stations. The Olkaria 1 rehabilitation is one of the first of these KenGen geothermal expansion projects and will increase renewable power output, which will displace thermal power use in Kenya. EAEP offered support directly to KenGen that includes online training in technical and leadership for 15 participants, capacity development on PPPs with EAEP's legal advisors, participatory review of bidding documents, and legal training by the Cyrus R. Vance Center for International Justice in 2020. In 2020, EAEP provided KenGen capacity building on Kenyan laws, acts, and policies related to the energy sector. EAEP also supported KenGen on the development of a grievance and complaints handling mechanism to deal professionally with community challenges, and on assessments of the company's organizational health. The 15 MW geothermal plant reached financial close in June 2023, opening the path for construction and rehabilitation of the facility.

ADVANCED FINANCIAL CLOSE

KENYAN WIND AND SOLAR IPPS WITH SIGNED PPAS. EAEP supported a study undertaken by Kenergy Renewables (the developer of Rumuruti Solar) on behalf of six Kenyan wind and solar IPPs, including the following projects:

- Baharini Mpeketoni Wind Farm (90 MW)
- Chania Green Wind Project (50 MW)
- Isiolo Solar Farm (40 MW)
- Rumuruti Solar (40 MW)
- Makindu Solar (30 MW)
- Kopere Solar (40 MW)

The IPPs in the study all had signed PPAs but were not able to advance their projects with the utility, Kenya Power. Kenya Power initially had stopped engaging and progressing power generation projects, due to concerns over cost and cash-flow management issues, management of technical issues associated with intermittent renewable power, and energy oversupply concerns. Subsequently, the Kenyan government's moratorium on PPAs meant that the disengagement continued. Despite these challenges, EAEP provided support, including for financial analyses and studies of renewable technical integration that were previously carried out with Power Africa funding and editorial advice. The studies were presented to both the Ministry of Energy and Petroleum and Kenya Power. Through its other engagements with the Ministry of Energy and Petroleum (e.g., commentary on Kenya's Presidential PPA Task Force report and its least-cost power development Plan [LCPDP]), EAEP consistently highlighted the same issues raised in this study—notably, that increased renewable supply would actually improve Kenya Power's financial woes and that the true picture of Kenya's current power supply and demand balance was obscured by operational sector issues, including struggles to deliver, meter, and even connect, willing consumers. Consequently, Kenya's actual demand for power is unknown but certainly understated. EAEP believes that Kenya will need the power from these IPPs it has supported and that EAEP's advocacy for these renewable energy IPPs means these projects will progress more rapidly than they would otherwise have done.

These wind and solar projects cannot reach financial close because of delays in the government support measures and the associated conditions that the Kenyan government invoked. The measures include a government letter of support, direct agreements between the Kenyan government developers and project financiers, and a legal "no objection" opinion from the Attorney General. Of the wind and solar projects with PPAs, only Chania Green has a government letter of support, and it still requires the other necessary measures; all the other projects remained outstanding as EAEP ended.

VIRUNGA POWER SMALL HYDRO PORTFOLIO. Virunga Power has approximately 30 MW of small hydro projects at various stages in the development pipeline. Many of Virunga's hydro projects are in western Kenya and are coupled with local grid developments. EAEP directly engaged with Kenya Power on behalf of Virunga, which helped in advancing certain projects toward financial close. EAEP also helped Virunga Power make a case to DFC for funding its portfolio of small hydro projects, which include:

- Tindinyo Falls Resort (2.4 MW)
- Mathioya Hydro (7.5 MW)
- Middle Nzoia (6.5 MW)
- Mutunguru Phase I (7.8 MW)

In order for the Tindinyo Falls hydro plant to reach financial close, Kenya Power must sign off on amendments to its current PPA, which would bring it up to date. Unlike Kenya's solar and wind projects, the PPA tariff has been updated and gazetted, and Virunga Power's small hydro projects do not need government support measures. The PPAs must be signed for Mathioya Hydro, Middle Nzoia, and Mutunguru Phase I before they can reach financial close, but the content of the contracts has been agreed upon, and the PPA tariff has been gazetted.

NGONG WIND FARM EXPANSION (11 MW). Ngong Wind Farm is a valuable project for KenGen and Kenya because it could incrementally add cost-effective renewable power. Power Africa supported KenGen's plan to increase the MW and the performance of the existing wind turbines of the Ngong Wind project and therefore increase the output of the total wind farm. EAEP advised KenGen on previous recommendations and revisited the feasibility study and other required work, as recommended in a study funded by PATRP and carried out by Aurecon. Ideally, Ngong Wind Farm should be optimized, and EAEP helped keep this option alive. The project should be able to progress relatively quickly, both because it is a brownfield expansion and because, compared to an IPP, the transaction should require fewer contractual conditions to achieve financial close. Although some disagreement emerged within KenGen about the need to prioritize this project, EAEP remained hopeful that the upgrade of Ngong Wind would proceed soon.

OLKARIA VI (140 MW). The Olkaria VI PPP structure represents a groundbreaking approach by KenGen to attract private capital for generation projects in Kenya's geothermal power development sector. Private capital is required for Kenya's generation projects because the Kenyan government and KenGen are constrained in the amount of funds they can allocate for generation development. Early in EAEP, KenGen and the government were interested in exploring a PPP approach versus balance-sheet project funding for Olkaria VI as the pilot. EAEP provided commercial, legal, and financial advisory support and capacity building to the KenGen project appraisal team working on the Olkaria VI geothermal PPP. This support assisted KenGen to advance Olkaria VI to the procurement stage; however, KenGen did not pursue a PPP model for Olkaria IV but anticipates that under future PPP projects, the KenGen team will be able to efficiently execute the project development phase and achieve financial close with minimal delay.

OSERIAN (8 MW). Oserian Two Lakes is developing an exciting and unique geothermal industrial park in Naivasha, Kenya. The industrial park supports Kenya's industrial development goals and creates power and economic development opportunities. Oserian Two Lakes has a mix of geothermal and solar power electricity generation. EAEP assisted with planning for additional generation of 8 MW of geothermal power. EAEP supported Oserian through a range of short assessments and commercial, legal, financial, and technical advice. This work included completing a high-level assessment of the required legal and regulatory framework for geothermal industrial park development and advising on financial requirements for viability and capital raising. EAEP also helped assess the technical integration of generation and industrial consumers and the connection with the existing Kenyan power grid. Although the Oserian project was delayed because of financial restructuring and other issues, it continued to progress and will be able to move faster, thanks to EAEP's interventions.

RUPINGAZI MINI HYDRO POWER PROJECT (6.8 MW). The Rupingazi project was initiated by local developer Kleen Energy. It would provide low-cost renewable power to Embu County in Kenya. Kleen Energy made impressive progress on the project, including early-stage construction, before finalizing arrangements with its project partners. Subsequently, however, there were disagreements with the development partners (Camco Energy acting on behalf of the Renewable Energy Performance Platform Fund) as they struggled to agree on fundamental steps in development and organization. EAEP assisted by introducing potential new partners to Kleen Energy. EAEP also supported the consortium to broker an agreement among all the development partners.

NYAKWERE HILLS SOLAR PV POWER PROJECT (40 MW). Nyakwere Hills solar PV project previously received a United States Trade and Development Agency grant and, if developed, would be an important project in Kenya's renewable energy portfolio. The EAEP team assisted the Nyakwere Hills solar project investor, CVE Africa, with advice on its engagement with the regulator, EPRA, regarding the scheduling of the project. EAEP also advised CVE Africa to submit materials to the Presidential PPA Task Force and subsequently supplied CVE with the information required to make such a submission. It is important that IPPs continue to raise issues and concerns to Kenya Power; and EAEP has supported IPPs with these actions. Kenya is planning to develop a competitive bidding approach for the next round of large renewable projects. Because Nyakwere Hills does not have a PPA with Kenya Power, it will probably have to wait and participate in Kenya's planned round of renewable generation procurement.

SAIGRENE ENERGY SMALL HYDRO PROJECTS (17 MW). Saigrene Energy has a promising portfolio of small to medium hydro power prospects. In the past, EAEP advised Saigrene on possible partners to help advance its pipeline of small hydro projects; however, no partnerships progressed. EAEP also advised Saigrene on the implications of Kenya's Presidential PPA Task Force and LCPDP and recommended next steps. Saigrene has progressed slowly, partially due to Kenya Power's slow engagement, and the project would benefit from the involvement of an experienced and dynamic development partner.

XAGO SOLAR (40 MW). In 2017, Xago Solar developed an innovative plan for solar PV combined with battery energy storage, and funding was approved for a United States Trade and Development Agency grant. Although this development did not proceed, Xago continued to develop a solar PV project, and subsequently EAEP assisted Themis Power, then a partner in the Xago Solar project (with Siaya Solar Power), in its strategy and engagement with Kenya Power, EPRA, and the Principal Secretary of the Ministry of Energy and Petroleum. This partnership resulted in engagement and negotiations involving the EPRA-determined commissioning in December 2024 being brought forward, and relief for Kenya Power from the energy PPA requirement. EAEP subsequently advised Xago Solar on the implications of the Presidential PPA Task Force and LCPDP and offered advice on next steps. Because Xago Solar does not have a PPA with Kenya Power, it probably will have to wait and participate in Kenya's planned competitive generation procurement for large renewable projects.

GDC SUPPORT TO MENENGAI 09 AND 10. EAEP assisted GDC to develop a community-engagement strategy to provide guidelines for planning and conducting community-engagement activities in a nine-year strategy (2022–2030). GDC has been working toward financial close with private partners for two geothermal plants, each 35 MW, but has faced challenges with land acquisition and resolution of community disputes that delayed financial close. As part of its growth strategy, GDC believes that conducting robust community-engagement, as a core business best practice, will produce dividends. Meaningful engagement and empowerment of communities should result in the acceleration of development and commissioning of new power plant projects, as well as the mitigation of existing risks associated with current power plants. The rollout of the strategy commenced in 2023, and the committees to handle grassroots community grievances are operational. Both Sosian (Menengai-8) and Globeleq participated in the EAEP- and GDC-led rollout of the strategy, which included a new guide, a grievance and complaint handling mechanism, and a risk mitigation strategy. Symbion (Menengai-10) is proceeding with development (using equity funding) without all its required government support measures. Globeleq's Menengai-9 has broken ground but has not begun construction and is waiting for outstanding government support measures as well. Financial close for Menengai-9 has been delayed until the project has secured the required government letter of support and a legal "no objection" opinion from the Attorney General.

COMMISSIONING SUPPORT

ALTEN KESSES SOLAR, MALINDI SOLAR ELDOSOL SOLAR PROJECT, AND RADIANT SOLAR PROJECT (ALL 40 MW SOLAR PV).

In a period when Kenyan IPP developments have made slow progress, Power Africa supported solar PV IPPs. Alten Kesses, Malindi, Eldosol, and Radiant reached financial close and began commercial operations in the period of March 2019 to October 2022. This 160 MW of solar PV helped make Kenya one of the major renewable power countries in sub-Saharan Africa. EAEP supported Alten Kesses, which reached commercial operation in October 2022 after overcoming delays during commissioning, with some disputes between landowners and requests from Kenya Power for some additional substation works. Malindi Solar was developed by Globeleq and its project partner, Africa Energy Development Corporation, and as of August 2023 was the only renewable power plant located in the coastal area. EAEP helped Power Africa private sector partner Globeleq with aspects of battery storage and tariff structuring, as well as with managing the implications of the changing regime for Kenya's ancillary services. EAEP also offered guidance on the enabling-environment and how it could affect power development. The plant was commissioned in January 2022. All of these solar PV projects benefited from EAEP support, such as:

- Training Kenya Power for PPA negotiations with solar power IPPs
- Working with the national treasury to create a bankable draft of the government letter of support

- Helping develop new grid codes and identifying related technical needs for strengthening the network to allow Kenya to keep pace with increased demand and plan for potential electricity export to other countries via the EAPP.

KIPETO (100 MW). The Kipeto Wind Farm was connected to the national grid in July 2021 and is Kenya's second largest wind power project, with 60 wind turbines providing 100 MW of clean power. EAEP efforts to support the Kipeto project included providing critical data to Power Africa private partner BTE Renewables, one of the project developers. EAEP supplied BTE Renewables with data on recovery of power and energy demand in the country after the easing of the COVID-19 lockdown measures. The data was useful to BTE Renewables in negotiating with Kenya Power on the timing of connecting Kipeto to the national grid. EAEP also supported BTE Renewables in discussions with Kenya Power on mechanisms for including battery storage in the Kipeto project.

KENGEN OLKARIA PROJECT COMMISSIONING. The Power Africa Initiative began its activities 10 years ago and has emerged as a leading independent counsel to all Kenya's power sector participants. EAEP advisors maintained this status and became respected as apolitical advocates for the industry, taking the lead in areas such as power sector reform and geothermal developments. EAEP continued supporting KenGen through a range of commercial, legal, and financial capacity building for the KenGen project development team. Under EAEP, KenGen completed the commissioning of the 83 MW Olkaria I Unit 6. In June 2022, KenGen completed the expansion of the original Olkaria I project by commissioning the sixth unit of that power station. KenGen had begun the project before completing all the required conditions for its major financing. Ultimately, the conditions were met, the European Investment Bank provided a facility, and the project was completed despite COVID-19-related delays.



The 100 MW Kipeto Wind Farm power project. Photo credit: USAID/Kenya, Mwangi Kirubi

OPTIMIZED POWER SUPPLY ACTIVITIES

KENGEN PPP SUPPORT. KenGen's Olkaria VI project is its first foray into PPP generation projects. EAEP provided support and capacity building to enable KenGen to understand the PPP process, to interpret advice from consultants, and—when appropriate—to challenge that advice. EAEP's legal advisors completed the KenGen Olkaria VI PPP training series for over 40 participants. The training covered topics such as PPP risk allocation and project implementation; importance of project documents in the tender process; project agreements; steam supply; development, construction, and operation phases; changes in relevant laws; force majeure and political events; termination events; PPA revenue; and tariff and credit enhancement. The training was tailored to equip the PPP project team to manage the processes and documentation of the PPP project life cycle. EAEP's legal advisors completed the review of the draft PPA, project implementation, and steam supply agreement for the KenGen Olkaria VI transaction. In addition, EAEP submitted a document that set out comments and recommendations for harmonizing the provisions of the project agreement with the procedures and provisions of the Kenyan Public–Private Partnerships Act of 2013, and provisions of the Kenyan Public–Private Partnerships Regulations of 2014. Additionally, six KenGen staff participated in various trainings that EAEP facilitated at the Cyrus R. Vance Center for International Justice, primarily on assorted topics related to the development of PPPs. Also, one KenGen representative and one representative of the PPP Directorate of the National Treasury attended the regional PPP training that covered PPP strategies, methods, and project structuring, financial analysis techniques for PPPs, and modules on negotiations and contracts for PPPs.

OLKARIA–LESSOS–KISUMU TRANSMISSION SUPPORT. EAEP and KETRACO, developed and implemented an environmental and social management framework, which is a set of guidelines for obtaining community consent and adjudicating environmental issues during the planning, siting, and construction of overhead transmission lines. Having this framework in place will expedite KETRACO's rollout of transmission infrastructure. Previously, the utility had resorted to commissioning environmental and social impact assessments on a project-by-project basis—a significant investment in time and money. EAEP and KETRACO jointly developed the environmental and social management framework to align with Kenya's Vision 2030, which focuses on environmental conservation, pollution and waste management, disaster preparedness, and adaptation to the impacts of global climate change. To finalize the environmental and social management framework, EAEP and KETRACO did an environmental and social audit of the Olkaria–Lessos–Kisumu transmission line. Together, EAEP and KETRACO traversed the construction sites of the 308 km line to identify remaining risks and recommend mitigation measures for resolution ahead of commissioning. KETRACO resolved outstanding issues and commissioned the line in June 2021, allowing for evacuation of geothermal power across a critical nationwide segment of transmission.

AFRICA50 INFRASTRUCTURE FUND–KETRACO TRANSMISSION PPP SUPPORT. In 2019, EAEP provided commercial, transaction, and project management support for KETRACO's PPP program. However, in 2022, KETRACO stated that the gap in Kenya's transmission funding was [REDACTED] and that finding private sector financing remained challenging. In 2019, EAEP provided commercial, transaction, and project management support for KETRACO's PPP program. In response, EAEP procured a team of technical, financial, and legal advisors to support KETRACO and undertake the following:

- Prepare a risk-assessment matrix.
- Recommend a preferred PPP structure and project contractual structure.
- Develop criteria and help KETRACO get a negotiation mandate to evaluate the outcomes of future negotiations between KETRACO and Africa50.
- Develop a PPP financial model.
- Build capacity so that the financial model could be handed over to KETRACO and its team of financial analysts could understand and operate the model.
- Advise KETRACO on a preferred payment mechanism and affordability analysis of the proposed payment mechanism.

- Provide independent advice on transmission planning.

In addition, EAEP provided detailed and specific training covering the following:

- Legal capacity building addressing both risks and the development of contracts for transmission PPP projects.
- Financial modeling and handover of a financial model for the transmission PPP transaction.
- Training in transmission planning software.

EAEP supported KETRACO at project meetings with its chosen partner, Africa50. The KETRACO PPP project was delayed while Kenya developed a new PPP Act, established a new PPP Directorate, and dealt with Africa50's concerns over the proposed project structure. In 2022, the project developed momentum again, and Africa50 and the Power Grid Corporation of India signed a joint development agreement to pioneer Africa's first transmission PPP project. This groundbreaking initiative, known as the Western Transmission Corridor, aims to enhance Kenya's power sector by improving the country's transmission network and increasing access to electricity. The project involves the construction of two transmission lines: Lessos to Loosuk (185 km, 400 kV) and Kisumu to Musaga (73 km, 220 kV). With an estimated cost of [REDACTED], the project is scheduled for completion in 2025.

GEOTHERMAL INDUSTRIAL PARK DEVELOPMENT. In 2020, EAEP worked with the USAID Kenya and East Africa Mission to engage stakeholders to promote potential geothermal direct use at industrial parks, with a pilot plant at Oserian Two Lakes. The development of geothermal industrial parks is a flagship concept under Kenya's Vision 2030: a vehicle to increase generation, demand, and connections. Therefore, supporting geothermal industrial parks was a 2020 priority for EAEP. EAEP supported USAID with the coordination and planning for a Kenyan national workshop on the parks. EAEP also worked with legal and financial contractors to develop content for the proposed workshops. The workshops were planned to include private and publicly owned geothermal industrial parks and to focus on steps required for their development. Unfortunately, the impact of COVID-19 and associated shifts in budget priorities meant that a large part of support for the geothermal industrial parks had to be canceled. Nevertheless, EAEP continued to provide some support for Oserian Two Lakes. The program team recommends that this workstream be reestablished under future Power Africa programs, subject to Kenyan industrial development policy. The development of geothermal industrial parks represents a great opportunity for Kenya to tap into its geothermal renewable resource and establish power projects to support Kenyan industry.

INTEGRATING BATTERY ENERGY STORAGE AND ANCILLARY SERVICES. EAEP assisted EPRA to develop the terms of reference for its ancillary services study. The work was significant because, in the light of increasingly variable renewable generation in Kenya's system, there is a growing need for an ancillary services framework, including costing and pricing for these services. As battery energy storage becomes commercially relevant for multiservice system providers, East African ancillary services policies must be aligned across the interconnected EAPP.

ENERGY ACT 2019 IMPLEMENTATION AND REGULATIONS. EAEP supported the Ministry of Energy and Petroleum with the implementation of the Energy Act of 2019. The program advised on the implications of the Act for the major Kenyan power entities, including Kenya Power, KETRACO, KenGen, GDC, the Rural Electrification and Renewable Energy Corporation, and EPRA. EAEP also helped shepherd various pieces of Act-related legislation through the appropriate levels of government. EAEP's advisors reviewed, among other strategic documents, the draft Integrated National Energy Plan Framework, and various energy regulations drafted by the Ministry such as electricity reliability, quality of supply, and quality of service regulations; and provided comments. The impact of these various policy and regulatory instruments is that they lend transparency and clarity to the energy sector legal framework for all stakeholders, particularly the private sector. The transparency and clarity are needed as the government looks to increase private participation in both generation and transmission via models such as PPPs like the Olkaria VI geothermal transaction and the KETRACO/Africa50 lines.

KETRACO RESETTLEMENT POLICY FRAMEWORK. EAEP assisted KETRACO to review and update the Resettlement Policy Framework in 2022. This framework now acts as a guide for the company's social responsibility. It focuses on wayleave (right-of-way) acquisition, fair compensation, and actual management of stakeholders during implementation of project-specific RAPs. The current framework has several challenges because it is not anchored in any law, and some courts have continued to disregard it. EAEP, KETRACO, and other stakeholders, including the Kenya Law Reform Commission and National Land Commission, embarked on a process to deliver legislation that could effectively address challenges in the compensation of project-affected persons during construction of high-voltage transmission lines. EAEP assisted in developing the land (wayleave and public right-of-way compensation) regulation in 2023, ready to be subjected to public participation before being gazetted into law. The legislation will help reduce litigation disputes with landowners and farmers and will guide courts on fair interpretation of the law on wayleave and crop compensation. Incidents of inflated compensation to landowners will be limited and will save project contractors from related costs and time delays. It also will reduce project stoppage delays occasioned by arbitrary injunctive orders.



Community members in Kenya gather to inform EAEP on needs as project-affected persons. Photo credit: EAEP

KENGEN GRIEVANCE AND COMPLAINTS-HANDLING MECHANISM. EAEP assisted KenGen in developing a mechanism to address complaints, grievances, suggestions, or comments on its projects and to bring them to a logical conclusion. With the new mechanism, KenGen can establish timely, consistent, structured, and trusted procedures for receiving and addressing community concerns, complaints, and grievances and can ensure they are processed promptly and treated with respect. The process also ensures that proper documentation is maintained and that complaints are disclosed, and any resulting corrective actions are communicated. EAEP conducted training on conflict resolution and project management for the regional staff mandated in the mechanism's implementation.

“

Grievances and complaints are inevitable in the scale and complexity of KenGen's energy infrastructure projects. Nevertheless, the company lacked a clear standard process for handling grievances and complaints. It is against this background that Power Africa EAEP [...] worked with KenGen team and developed a KenGen corporate grievances and complaints handling mechanism to be integrated into the existing Community Engagement Strategy with an objective of strengthening community engagements and interactions. ”

— [REDACTED], **Corporate and Regulatory Services Director,**
KenGen, May 2021

GDC COMMUNITY-ENGAGEMENT STRATEGY. EAEP assisted GDC to develop the community-engagement strategy with an overall objective to provide general direction and specific guidelines to GDC for planning and conducting community-engagement activities for 2022–2030. As part of its growth strategy, GDC believes that conducting robust community-engagement, as a core business best practice, will produce dividends. Meaningful engagement and empowerment of communities should result in the acceleration of development and commissioning of new power plant projects, as well as mitigation of existing risks associated with current power plants. The rollout of the strategy commenced in 2023, and the grassroots community grievance handling committees are operational. The stakeholders and IPPs participating in the strategy rollout include Sosian Energy and Globeleq.

OBJECTIVE II: INCREASED ON-GRID CONNECTIONS

SUPPORT KENYA POWER MIGRATION TO A NEW AND ENHANCED DISTRIBUTION MASTER PLAN.

From 2019 to 2020, EAEP supported a process for updating Kenya Power's distribution master plan. The assistance involved two phases. Phase I would help Kenya Power interface its industry-standard distribution planning software, PSS@SINCAL, to its GIS-based Oracle facilities database. In 2021, EAEP conducted PSS@SINCAL training for integration with Kenya Power's facility database and also provided a more powerful laptop requested for network analysis. For Phase II, EAEP supported Kenya Power to develop an RFP to fully develop a new master plan and receive two bids. Unfortunately, EAEP was not able to support fulfillment of the master plan due to unavailability of funds, but the program highly recommends that Kenya Power continue to pursue this critical planning deliverable.

KENYA POWER SUPPORT FOR SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM.

EAEP assisted Kenya Power in implementing a training program on SCADA, a system that gathers and analyzes real-time data from the distribution network. Kenya Power sought this training after the introduction of an energy management system into its SCADA architecture. This integration was aimed at optimizing the utility's electrical grid infrastructure operations and enhancing decision-making for grid operators. The training covered SCADA system architecture, fundamental hardware and software components of SCADA, energy management system application functions, alarm processing, supervisory control, an overview of the SCADA system's concurrent operation with the energy management system, a detailed look at various energy management system functions, and the benefits of the energy management system.

KENYA POWER CONTINUED PSS@E SUPPORT. EAEP held a five-day in-person PSS@E modeling training for Kenya Power. The training taught the Kenya Power engineers specialized skills in advanced scripting and automation of industry-standard software PSS@E using Python; optimal power flow; and comprehensive modeling, simulation, and analysis of variable renewable energy systems and various high-voltage direct current operational modes. One of the significant topics was the determination of optimal spinning reserve levels in the presence of increasing variable renewable energies (e.g., solar, wind generation) for the Kenya Power grid. As a direct outcome of this training, Kenya Power engineers are now primed to augment grid-based distribution connections. Moreover, this training has strategically positioned Kenya Power distribution engineers to commence their work on the forthcoming distribution master plan.

KENYA POWER TRAINING ON FINANCIAL AND TECHNICAL APPRAISAL FOR DISTRIBUTION PROJECTS.

In 2023, EAEP facilitated a comprehensive five-day training program for engineers from Kenya Power. The training focused on analyzing technical and financial options for distribution projects. Kenya Power's newly appointed managing director announced plans to reduce system losses from 23 percent to 16.5 percent, encompassing both technical and nontechnical losses, by fiscal year 2025. To realize this ambitious goal, Kenya Power's senior managers assembled a dedicated team tasked with reducing technical distribution losses. Alongside their strong commitment to loss reduction, the team recognized a need for more in-depth skills in financial and economic appraisal of projects that reduce distribution loss. EAEP's training program bridged the skills gap among Kenya Power engineers in economic and financial analysis for power distribution projects. The course underscored the essential role of these analyses in project decision-making, feasibility evaluations, and strategic planning. Furthermore, it incorporated distinctive methodologies from the World Bank and AfDB, equipping participants with practical financial modeling skills necessary for effective project planning, execution, and management.



Kenya Power staff who completed PSS@E training to improve power flow, modeling, and simulation capabilities for distribution. Photo credit: EAEP

BUSINESS PROCESS REENGINEERING AND COLLECTIONS QUALITY CONTROL. Working with Kenya Power’s leadership, EAEP supported a diversification strategy, a commercial strategy, and a proposal for business process reengineering. Through reengineering, Kenya Power was able to identify gaps in the organization, processes, systems, network, and existing resources to achieve business efficiencies and optimization for connections. As a result of the process, Kenya Power confirmed a company focus on accelerating connection times, and thus increasing revenues; improving meter reading efficiency, frequency, and billing quality; increasing first-time payments; and improving revenue collection by reducing theft, tampering, and illegal connections and reconnections. Ultimately, the recommendations for reengineering business processes were adopted and integrated into Kenya Power’s operations, which resulted in more connections.

TIME AND COST STUDY. In 2021, EAEP carried out a desk review comprising 1,337,404 customer service delivery records from 2017–2021. The desk review aimed at (1) determining the average time and cost it takes to connect different types of customers to the grid using the earliest year as a baseline; (2) comparing the time and cost data with results annually from 2019 to 2021; and (3) identifying whether the EAEP-supported regions showed evidence of reduced time for connections. The results indicated that nationally, the average cost in United States dollars to be connected to the grid decreased across all customer types, except for small and medium and commercial enterprises, where costs increased by 4 percent. Similarly, the findings showed that, nationally, the amount of time to connect to the grid decreased across all customer types during 2018–2021.

OBJECTIVE III: STRENGTHENED UTILITIES AND OTHER POWER SECTOR ENTITIES

Through the diagnostic assessment process, EAEP and Kenya Power identified 11 key project areas for utility transformation. Kenya Power's commitment came from the senior-most levels, and in response, EAEP embedded advisors in the utility to undertake on-the-job training, to support integration of new tools and processes, and to coach utility teams through the agreed-upon transformation plan. Ultimately, Kenya Power benefited from a 16 percentage-point reduction in ATC&C losses and a 23.3 percentage-point increase in revenue in the pilot zones supported by EAEP's embedded advisors.

STRENGTHENING MANAGEMENT EFFECTIVENESS. To address organizational challenges within Kenya Power, EAEP supported 10 workstreams to strengthen effectiveness. EAEP support included transforming the organizational structure to improve efficiencies and internal controls; reviewing and updating job descriptions that assign employees to the right positions and processes; and creating key performance indicator metrics for performance improvement and routine performance evaluation processes.

ENHANCE TALENT MANAGEMENT. With a revised organizational structure in place, EAEP supported Kenya Power to retain and attract talent, a consistent issue in utilities throughout the region. The EAEP team supported Kenya Power to define the required number of employees to achieve goals set forth in organizational strategic plans and ensure a proper employee-to-customer ratio for better coverage. EAEP also supported Kenya Power to develop an incentive scheme to reduce the number of unreasonable overtime hours charged and increase the effectiveness of work completed during work hours.

ENHANCE INTERNAL CAPACITY FOR OPERATIONS AUDITS. EAEP and Kenya Power started to enforce the audit of commercial operations, with a focus on revenue protection and revenue management. Additionally, Kenya Power improved its technical operations audits to ensure proper energy management and installation of measuring points in the network for low-voltage, medium-voltage, and high-voltage meters to preserve network maintenance. EAEP did so by reviewing the existing internal control processes and corporate governance documents for the audit committee and other organizational work teams. EAEP shared recommendations with Kenya Power for revised systems integration.

IMPROVE COMMERCIAL OPERATIONS. To improve commercial operations, EAEP and Kenya Power co-developed methods and practices that improved communication, performance reporting, and customer interactions. EAEP and Kenya Power established interdepartmental communications to include routine reporting and analytics and drafted standard operating procedures for commercial controls such as a standard baseline for calculating ATC&C losses, methodology, and ATC&C targets. They focused on improving meter reading processes and efficiency to decrease inaccurate billing data and adjustments. Also, this workstream focused on customer mapping for post-paid and prepaid meter customers. It established control and monitoring of the efficiency and accuracy of reporting by engaging the Revenue Protection Unit and Internal Audit (Operational Audit). Lastly, EAEP and Kenya Power focused on improving customer care and public relations by instituting agreed-upon changes in key performance indicators and working with customers to make repairs and respond to challenges in pilot zones.

IMPROVE TECHNICAL OPERATIONS. By reducing technical losses, EAEP and Kenya Power can improve efficiency that can, in turn, improve revenue. To support technical operations, EAEP focused in selected pilot areas on balancing energy between the outgoing feeders of the transmission substation and the distribution substations, as well as on improving energy accounting and network alignment. These interventions allowed the 11 kV, 33 kV, and 66 kV feeders to be aligned with business units based on feeders at the regions, thereby accurately defining energy delivered and informing energy management, billing efficiency, and collections. The teams also used audits to identify (based on the energy balance) technical losses in high- and medium-voltage meters and to improve periodic checking of distribution transformers for load and load balance that led to network improvements.

RISK MITIGATION. The final focus area for the transformation plan was risk mitigation procedures and practices. The team established a field enforcement unit for external risk and did internal risk assessments and recommendations for preventive measures. Ultimately, the teams created and adopted monitoring methodologies to increase the accuracy and efficiency of service delivery, allowing Kenya Power to achieve its goals and targets.

CROSS-CUTTING ACTIVITIES

HICD. EAEP developed institutional capacity performance assessment tools for Kenya Power, KenGen, EPRA, and KETRACO. Mid-level energy utility managers contributed to the assessments and validated the resulting data with input from their leaders. Introduced at Kenya's first sector-wide institutional performance strengthening workshop, the assessments were implemented annually to track progress over time. Kenya's four main entities developed self-identified gains across nearly every category of planning and mapped areas for improvement. The HICD approach resulted in capacity gains for Kenya's energy institutions, according to their unique needs and priorities.

GENDER EQUITY SUPPORT. In Kenya, EAEP focused on a baseline gender assessment of the large energy sector entities and built activities with counterparts in Kenya Power, KenGen, KETRACO, and the Ministry of Energy and Petroleum to increase women's roles in the energy sector. EAEP provided gender equity foundations training to build skills for gender-inclusive policy development and human resource practices within their organizations. EAEP also developed a coaching map to help train power entities to put in place inclusive practices across the employee life cycle, with each company guided by its organizational priorities. The coaching pilot program was carried out with Kenya Power, KenGen, GDC, and KETRACO, and was specifically targeted at supporting these companies' gender equity priorities, including complying with Kenya's gender policy. Additionally, EAEP supported internship programs for women at Kenya Power and KenGen.

KETRACO construction team preparing equipment ahead of stringing the Sultan-Hamud-Loitoktok transmission line near Oloitoktok in southern Kenya. Photo credit: EAEP



FAIR COMPENSATION STANDARDS TO BENEFIT KENYA'S COMMUNITIES AND ENERGY GROWTH

As the Government of Kenya amps up its energy development to stay ahead of the ever-growing needs of the country, more land is needed to host the large infrastructure projects that will benefit its citizens. Without definitive regulations on compensation for private landowners, disputes over compensation often occur, leading to project cost and time overruns. In response, EAEP supported the development of crop compensation and wayleave regulations to build strong rapport between developers and communities and to streamline the growth of energy infrastructure.

According to the Kenya Land Act of 2016, before projects can commence, landowners must be provided due compensation for the right-of-way and use (wayleave) or acquisition of their land and any destruction of their property, such as crops and trees. Ideally, these compensation exercises not only address land loss but also bring benefits to participating communities and promote goodwill among citizens toward government infrastructure programs.

For example, KETRACO is undertaking the 101 km Hamud–Sultan–Oloitoktok transmission line project, which passes through Pako Village, situated at the foothills of Mount Kilimanjaro. According to Benjamin Ntiliya, a resident and primary school teacher in Pako Village, most of the residents received compensation for their land and buildings and will soon receive the same for crops and trees. Because large pieces of land are required for the project, the compensation amounts are substantial and have had a significant positive impact on the community. For example, many residents were able to upgrade their housing from mud and wattle materials to more permanent structures. The developer also repaired a large water tank at the community's request, boosting access to this valuable resource for the largely pastoral community. Mr. Ntiliya said that the community is incredibly happy with the way KETRACO handled compensation and with the feeling of partnership that the company fostered.

The visible success of the compensation exercise on the Hamud–Sultan–Oloitoktok line is in part due to the rollout of KETRACO's updated Resettlement Policy Framework, supported by EAEP. KETRACO's clear guidelines and collaborative approach to community-engagement increased the company's credibility in the eyes of Pako Village residents and smoothed the development process. However, compensation can be troublesome for developers because the Kenya Land Act does not provide guidelines specific to the energy sector. Legal disputes about compensation take time, money, and other resources away from energy projects.

To advance the legal process for public right-of-way compensation regulations, EAEP and KETRACO collaborated with the Kenya Law Reform Commission and the National Land Commission to hold workshops to develop and validate the draft regulations. The draft regulations were presented for review to sector stakeholders and the Ministry of Agriculture, and the Kenya Forestry Service had advisory roles and provided guidance on the values of crops and trees. Once these regulations become law, they will catalyze critical changes to the planning and execution of energy projects. Developers will be able to budget projects more accurately and community members will be better protected by law. By supporting the development of crop compensation and wayleave regulations, Kenya is advancing its energy development goals and setting an example for other sectors how to invest in their communities.



Communities across Kenya are impacted by energy infrastructure, whose construction can disrupt households, livelihoods, and heritage lands. Power Africa has been working with KETRACO and other energy sector stakeholders to develop right-of-way and crop compensation legislation for energy projects. Photo credit: EAEP

RWANDA



MW REACHED FINANCIAL CLOSE	ON-GRID CONNECTIONS	MW COMMISSIONED	MW ADDED PIPELINE	PEOPLE TRAINED
56 MW	162,411 connections	0 MW	10.5 MW	Men: 313 Women: 1,169
SECTOR SUMMARY				
Installed capacity	332 MW		Population	13.4 million
Available capacity	180 MW		Access rate (on and off)	61%
Average tariff	\$0.198 per kWh		Active IPP	Yes, multiple

Rwanda sought to improve planning, affordability, and expansion of its energy sector with support from development partners. With EAEP, Rwanda successfully advanced energy planning, transmission, and gender equity across the energy sector as a model for the region.

Working with the Rwanda Energy Group (REG) and its subsidiaries Energy Utility Corporation Ltd. (EUCL) and Energy Development Corporation Ltd. (EDCL), EAEP developed activity plans that supported improved planning for generation, transmission, and distribution.

EAEP supported a pipeline of 66.5 MW of generation, although many of the negotiated deals stalled before financial close, because of higher tariffs than REG was able to support. To improve generation planning, EAEP and REG agreed to create an updating methodology for the LCPDP. REG is now able to use international and local data sources to monitor the optimal generation balance for Rwanda (e.g., hydrology, wind patterns, solar irradiation). Building on the LCPDP, EAEP also supported REG's integration of climate change scenarios into planning. With the low-emissions analysis platform (LEAP), REG can now factor in climate risks to better understand impacts on future generation. For transmission, EAEP supported planning by funding the necessary feasibility study package for transmission tendering with EDCL and funded by the AfDB. By supporting EDCL to procure contracts for three transmission lines, EAEP leveraged [REDACTED] of AfDB funds; these were the only transmission transactions under EAEP that successfully reached financial close.

In 2019, EAEP started the WIRE initiative, which dedicated [REDACTED] to gender programming in Rwanda's energy sector. This unique opportunity allowed EAEP and partners to build a network of women in energy, a curriculum for increasing the number of women in the workforce, and policies to improve the sector's gender equity.

ACTIVITIES SUMMARY

OBJECTIVE 1: OPTIMIZED POWER SUPPLY

REACHED FINANCIAL CLOSE

KIVU 56 (56 MW). In November 2019, Shema Power Lake Kivu's 56 MW methane-to-power project reached financial close. Power Africa (under PATRP and EAEP) supported the project to reach financial close by advocating for the project's advancement and by facilitating PPA negotiations between the developer (which was Symbion at the time) and the Government of Rwanda. Symbion sold the project to Shema Power Lake Kivu in 2019, and in July 2023, the company started sending 18 MW to the grid, with the expected commissioning of the full 56 MW upon REG's completion of a local substation. The new generation will be a significant addition to the grid. It will increase the installed capacity from 276 MW to 332 MW. The Kivu 56 tariff is less than half the tariff of existing diesel power plants, and will significantly reduce the need for fossil-fuel-based plants.

ADVANCED FINANCIAL CLOSE

BIHONGORA HYDRO (4.2 MW). EAEP advanced this East African Power project toward financial close by developing a financial model that can be used in tariff and PPA negotiations with the Rwandan government, and to satisfy lender requests. EAEP also advocated to financiers and grant facilities for development-stage funding on East African Power's behalf. Before the project can reach financial close, the developer is awaiting the execution of the concession agreement and PPA and is seeking funds to close a financing gap.

KIRIMBI I, II, AND III HYDRO (1.8 MW). EAEP tracked this project with the developer, East African Power, but in April 2021, REG put the project on hold. For this project to advance, a new PPA would have to be executed. The developer confirmed it will turn its focus to the project's advancement once its other project, Bihongora, advances.



The POWERHer network celebrates the Sustainable Energy for All (SEforALL) international meeting in Kigali, Rwanda, with a Power Africa networking event. Photo credit: USAID/ Rwanda

AMAHORO ENERGY HYDRO (4.5 MW). EAEP advanced the project, which is being developed by American-owned Amahoro Energy, toward financial close by advocating for it before the Rwanda Development Board, working with developer shareholders, and connecting the developer to potential financing opportunities. Additionally, EAEP helped the developer cure a default notice, which permitted the renegotiation of the PPA. The project received United States Trade and Development Agency funding for feasibility studies in 2016. As of August 2023, the developer was in conversations with lenders, with any advancement contingent upon the execution of the PPA.

OPTIMIZED POWER SUPPLY ACTIVITIES

IPP PROJECTS TO FINANCIAL CLOSE. EAEP supported several power projects, all of which were in REG's LCPDP. EAEP offered legal, financial, and/or technical advisory services to advance transactions toward financial close. Kivu 56's 56 MW is a significant addition to Rwanda's generation capacity, enabling the country to meet its demand needs without the use of diesel energy.

CAPTIVE-POWER REGULATION. EAEP's original work plan had included an activity focused on captive power, but since the Power Africa-funded National Association of Regulatory Utility Commissioners (NARUC) had already started working on the subject with the Rwanda Utilities Regulatory Authority (RURA), the Rwandan regulatory agency, it made sense for the Association to continue to lead the charge. At RURA's request, NARUC drafted a captive-power policy, which USAID/Rwanda asked EAEP to review. During a review of the policy with energy sector stakeholders, there was significant pushback from the utility and private sector. RURA agreed that an impact study would have to be conducted before the captive-power policy could be approved.

PPP TRAINING FOR REG. At the request of the REG IPP team, EAEP launched a regional PPP training focused on the legal and financial intricacies of PPPs. The training, which took place between December 2020 and September 2021, was offered to selected participants working with PPPs from Djibouti, DRC, Ethiopia, Kenya, Rwanda, Somalia, Tanzania, and Uganda. Rwanda was represented by three members of the REG IPP team and two members from RURA. IP3 implemented the 10-month intensive training program. The goal of the training was to increase the capacity of PPP teams across the region to undertake improved management of these partnerships.

ACCELERATE NATIONAL TRANSMISSION LINES. At REG's request, EAEP funded feasibility studies, designs, and preparation of tender documents for two of Rwanda's national transmission lines (Gisagara–Huye, Huye–Rukarara, and Kirehe–Rwinkwavu). The studies were required before funding for the lines, earmarked by the AfDB, could be approved. The activity also involved building EDCL's capacity to conduct ESAs, produce environment and social management plans and RAPs, and develop bidding documents for other national transmission lines currently in the pipeline.

At the request of EDCL, EAEP's transmission advisors added a deliverable: to a review of the tender documents for the 110 kV Bugesera transmission line. Because EAEP capacity building helped EDCL staff understand the tender documents, EDCL was able to develop the documents for the transmission line. However, the AfDB required that they be reviewed by an external consultant before being approved for financing. EAEP's independent transmission advisors reviewed the lines, and they were then approved by the AfDB. REG should now be equipped to develop future tender documents with its in-house capacity. EAEP's support helped unlock \$37 million of AfDB funding for 109 km of transmission lines in Rwanda.

LCPDP RESOURCE ASSESSMENT. From May 2020 to May 2022, at REG's request, EAEP conducted a resource assessment for electricity generation sources and delivered associated capacity building sessions. The assessment aimed to capture Rwanda's domestic generation potential by evaluating each resource based on its market, economic, and technical potential, and its availability as a physical resource. The research focused on renewable energy sources such as solar, wind, and hydro. The study included a weekly capacity building session with REG and Ministry of Infrastructure staff with the goal of enabling future assessments to be conducted internally. REG uses the data for updating the LCPDP every six months.

CLIMATE CHANGE ASSESSMENT AND LEAP TRAINING. In June 2022, after the completion of the resource assessment, EAEP expanded the scope of work to include a climate change assessment and in-depth LEAP training. The expanded scope came at the request of REG and was supported by USAID/Rwanda. LEAP was the software used for conducting the resource assessment because it has the functionality to examine carbon emissions and climate change impacts. EAEP continued its capacity building sessions with REG and Ministry of Infrastructure staff through August 2023. The climate change assessment was submitted to REG in April 2023; in June and July, EAEP spent time with REG staff reviewing the key takeaways and answering questions. The expanded scope aligns with Rwanda's pledge to reach net-zero greenhouse gas emissions by 2050. The capacity building sessions enabled REG in-house personnel to conduct future assessments and to prepare better resource plans.

UTILITY TARIFF METHODOLOGY. In August 2020, EAEP supported the regulator, RURA, with an updated tariff methodology, cost-of-service study, and capacity building. The updated tariff methodology establishes the guidelines to be used in the cost-of-service study; the cost-of-service study models the development costs, ongoing REG operating costs, and any costs associated with delivering electricity. The study is then used for setting the tariffs. The study not only shows the cost-reflective tariff but also includes the ability to add subsidies. The Rwandan government currently subsidizes the electricity tariff to make it affordable for its population. In addition, EAEP conducted an in-person capacity building session to work with RURA staff, with the goal of enabling them to conduct future tariff reviews and revisions in-house.

OBJECTIVE II: INCREASED ON-GRID CONNECTIONS

SUPPORT TO EUCL FOR THE ELECTRICITY ACCESS ROLLOUT PROGRAM (EARP). EARP is housed under EUCL. When EAEP reached out to EARP offering support, EAEP was asked to provide training on the software system DlgSILENT to EUCL as the best avenue to improve and increase distribution planning. To help REG reach its target of universal energy access, and in response to its request, EAEP provided a week-long in-person DlgSILENT load-flow training to EUCL staff in April 2022. The objective of the training was to increase EUCL's DlgSILENT capacity to enable a better managed distribution network, leading to increased household connections. EUCL requested that EAEP conduct a follow-up in-person coaching session, which took place in February 2023. EAEP remained available for the life of the program to answer any questions and/or problem-solve with EUCL.

GIS SUPPORT. In response to a request from EUCL, EAEP conducted a GIS training for selected EUCL and EDCL employees. The training was implemented in a virtual month-long beginner-level first phase in November 2022, followed by an in-person five-week-long advanced training that took place in December 2022 and January 2023. The training was implemented by Esri Eastern Africa, which was selected through a competitive procurement process. As part of the engagement, Esri offered an additional three-month follow-up coaching from February through April 2023. An increased understanding of GIS will lead to a better managed distribution network and increased household connections.

PSS@E TRAINING. At REG's request, EAEP conducted a two-week in-person PSS@E training in Kigali. In July 2023, EAEP taught a beginner-level course introducing the basic fundamentals of the modeling software. In August 2023, EAEP led a more advanced course, focusing on dynamic modeling. The PSS@E software is important for transmission planning, both domestically and as Rwanda starts interconnecting with its neighbors. The REG staff gained knowledge of the software that will allow them to optimize system stability, improve reliability, and make informed decisions for efficient power system operation.

CROSS-CUTTING ACTIVITIES

WIRE INITIATIVE. EAEP implemented the WIRE initiative to support the Rwandan government and the private sector to bring 1,400 women into the fast-growing energy sector. WIRE focused on gender equity in Rwanda's energy workforce through capacity building, on-the-job work experience, network support, and company coaching. From 2019 to 2022, WIRE focused on four workstreams:

- Apprenticeship program: EAEP placed 153 apprentices in 26 Rwandan energy companies, utilities, regulatory agencies, or education institutions to build their on-the-job skills while demonstrating the benefit of more women in the workplace for a sector with relatively low women's participation. When the WIRE activities ended in 2022, 111 apprentices got full-time employment because of EAEP's support.
- POWERHer network establishment and support: POWERHer founding members established a formal nongovernmental organization in Rwanda to be the first women's professional network dedicated to the energy sector. Through the network, WIRE conducted workforce-readiness training and skills development for existing and prospective members. POWERHer developed its social media presence, increased its network membership, and started offering training and outreach events. WIRE supported POWERHer to develop a five-year strategic plan to increase membership, offer more outreach, and generate revenue to keep its momentum.



The WIRE initiative placed apprentices across companies in Rwanda for on-the-job experience while integrating women into the energy sector. Photo credit: EAEP

PLANNING RWANDA'S GREEN ENERGY FUTURE

Rwanda has a unique energy mix: almost 50 percent of its supply is hydropower; one quarter is diesel, and the remainder is a mix of methane, solar, biomass, peat, and imported energy. Among the goals of the Government of Rwanda is net-zero emissions by 2050, while satisfying “the forecasted growing demand for electricity within the country,” according to its First National Strategy for Transformation. To achieve these objectives, Rwanda has committed to phasing out diesel and increasing hydropower and methane.

With a strong renewable energy profile, Rwanda has an interest in mitigating the effects of climate change on its green energy resources. For example, many hydropower plants face water shortages in dry seasons and supplement with diesel, at a high cost. Preparing for more frequent or prolonged dry seasons could help ensure a consistent energy supply.

Rwanda has set forth progressive energy policies and is building a culture of data to achieve its energy goals. EAEP supported Rwanda to integrate the expected effects of climate change into its data-driven energy forecasting for the first time. EAEP first trained the utility—Rwanda Energy Group (REG)—and the Ministry of Infrastructure to better understand and assess the country’s domestic generation resources. Over one year of weekly capacity building sessions, participants learned to use low-emissions analysis platform (LEAP) software to analyze resource availability, technical requirements, costs, and market potential of energy resources.

EAEP then worked with the government to incorporate climate change into the LEAP resource calculations. For example, the software can now account for the impacts of drought and flooding on hydropower, Rwanda’s main energy resource. This information will be used to guide climate risk mitigation and strategic planning. Power Africa also worked with REG and the Ministry of Infrastructure to use LEAP modeling data to identify decarbonization strategies.

With new, detailed information about Rwanda’s energy supply and climate change modeling capabilities, Power Africa facilitated an assessment of Rwanda’s energy resources and capacities, providing crucial information to update the country’s least-cost power development plan. With updated data, the Ministry of Infrastructure can identify and pursue the most affordable, climate-sensitive energy investment options for the government and consumers.

Building on the support from EAEP, Rwanda’s key energy institutions can lead energy resource assessments that will ensure the country’s power development plans and policies are evidence-based and account for climate change. Those assessments can also serve as a basis for power purchase agreements between the government and private sector energy developers. With energy objectives and new climate-sensitive analytical capacity, Rwanda is better prepared for strategic and sustainable sector growth.

East African Rwaza hydropower (2.6 MW) plant on the Mukungwa River, Musanze District, Rwanda. Photo credit: [REDACTED]





MW REACHED FINANCIAL CLOSE	MW	ON-GRID	MW ADDED TO PIPELINE	PEOPLE TRAINED
6 MW	6 MW	30,664 connections	18 MW	Men: 214 Women: 53
SECTOR SUMMARY				
Installed capacity	126 MW		Population	17 million
Available capacity	Unknown		Access rate (on and off)	36%
Average tariff	\$0.40 per kWh		Active IPP	Yes, multiple

Somalia is open for business. Private companies lead the energy sector, providing highly reliable—although expensive—energy where demand is ever increasing.

Consumers in Somalia pay some of the world’s highest prices for electricity. Some of the private electricity service providers (ESPs) were charging up to \$0.75 per kilowatt-hour as of July 2023 to deliver electricity through isolated diesel-powered grids that are unreliable and have a large carbon footprint. Even at these high prices, however, many ESPs fail to recover their costs of generation and delivery.

This situation leads to a vicious cycle of poor cost recovery, underinvestment in infrastructure, and frequent power outages. ESPs have little information on their grids or on consumer energy use, which makes it difficult for them to make strategic decisions or targeted improvements. High prices and customers without meters lead to theft and contribute to technical and nontechnical losses that can be as high as 40 percent among some ESPs.

Taking an on-the-ground approach, EAEP worked with ESPs in Somalia beginning in 2021 to identify their gaps and goals for energy sector growth, as a way to start planning for expansion and meeting demand. Early on, ESPs asked what they should learn about various generation and distribution models, and how they could access other finance streams, given that most ESPs are self-funded. After two years, the ESPs had embraced planning technology, invested in battery options and renewable energy, and begun working with private sector companies outside of Somalia to diversify funding. EAEP focused on 18 MW of generation transactions with ESP support and on connection increases with the smaller ESPs, which brought 30,664 additional connections to a country without a national grid.



Shop front at night in Mogadishu. The owner uses electricity to extend business hours and to provide more goods to customers. Photo credit: EAEP

ACTIVITIES SUMMARY

OBJECTIVE 1: OPTIMIZED POWER SUPPLY

REACHED FINANCIAL CLOSE

BLUESKY ENERGY 6 MW SOLAR PV. In April 2023, BlueSky energy in Mogadishu commissioned a 6 MW solar PV installation for its Daynile Power Station. This additional renewable energy doubled BlueSky's total generation capacity, aiding BlueSky to meet the growing demand from its existing customers as well as new customer demands from their ever-increasing geographic coverage. The additional renewable generation capacity also allowed BlueSky to sideline some of its diesel-based power generation. BlueSky has 7.5 MW of diesel generator sets, and the newly commissioned 6 MW solar PV setup, but the maximum required load during peak hours is around 10 MW. This means BlueSky can fully utilize the solar PV output during the daytime while sidelining most of the diesel-based generation. EAEP provided technical and advisory support to BlueSky, including generation planning and procurement, renewable energy grid integration, and generation synchronization. EAEP's support took the form of both technical training for BlueSky's engineers and technicians responsible for the construction of the 6 MW, and advisory sessions with the Chief Technical Officer responsible for overseeing the project.

ADVANCED FINANCIAL CLOSE

NATIONAL ENERGY CORPORATION OF SOMALIA (NECSOM) SOLAR PV WITH BATTERY STORAGE.

NECSOM has been engaging with investors and IPPs to raise capital and develop a 4 MW solar PV project with a battery energy storage system (BESS) for 20 MWh. Previously, NECSOM did not engage with IPPs and did not have experience in outsourcing power generation. To help NECSOM succeed in developing additional generation through IPPs, EAEP provided technical and advisory support for generation planning and procurement processes. Additionally, EAEP designed and delivered a series of training sessions on forecasting demand, identifying appropriate technologies, and understanding restricted and unrestricted procurement methods. Simultaneously, EAEP technical advisors consulted with NECSOM on their negotiations with IPPs, such as guidance and inputs on term sheets, MOUs, and technical feasibility studies. As of August 2023, NECSOM had completed a technical feasibility study and had entered final negotiations with Frontier Energy, a renewable energy investor and IPP.

MINISTRY OF ENERGY AND MINERALS (MOEM), 7 MW SOLAR PV IN BERBERA. The 7 MW solar PV plant in Berbera, financed by the Abu Dhabi Development Fund, was operational as of mid-2023 but had not been commercialized, meaning that the off-taker—Berbera Electric Company (BEC)—was receiving power free of charge. The facility is owned by the Somaliland Administration, with MoEM being the Administration's representative that manages the project. MoEM asked EAEP to help propose commercialization and operations models for the PV plant. EAEP hosted several information-sharing meetings with MoEM and BEC, which is also Berbera's sole ESP, to solicit input from stakeholders and to envisage suitable commercial and operational models. Considering the project's funding source and partners' project goals, EAEP developed a financial model determining an appropriate off-taker tariff for the project. EAEP trained MoEM officials and staff on the financial model to create the necessary capacity to implement it for future projects. As of August 2023, MoEM and BEC had yet to agree on the tariff, but EAEP's support had helped them to be informed and to actively negotiate.

MINISTRY OF ENERGY, MINERALS, AND WATER RESOURCES (MEMWR), 7 MW SOLAR PV IN BOSASO, PUNTLAND. Like the Berbera 7 MW solar PV plant, the MEMWR Bosaso plant also has output of 7 MW of solar PV, is financed by the Abu Dhabi Development Fund, and was under construction in mid-2023. The facility is owned by the Puntland Administration, with the Puntland Electricity Development Agency (PEDA) being the Administration's representative managing the project. PEDA needed to establish a commercial framework for the ownership and operations of the power plant and the sale of its output to Puntland Electric Power Company (PEPCO), a partially state-owned ESP into which all ESPs in Bosaso merged in 2023. At PEDA and PEPCO's request, EAEP carried out stakeholder consultation meetings and developed a commercial framework and its components. Addressed in the commercial framework were contracting models for ownership, operations, and output sales, as well as an implementation plan. Additionally, EAEP provided technical assistance on the installation of solar panels and design of a 33 kV power line connecting the solar PV plant to the PEPCO network. Out of the 7 MW, PEPCO and PEDA expected to commission 3.5 MW and connect it to the network as of August 2023.

OPTIMIZED POWER SUPPLY ACTIVITIES

GENERATION DEVELOPMENT SUPPORT. Somalia's power sector had reached a threshold: in order to substantially increase the required generation capacity and reduce the cost of generation, the system required a major capital injection to invest in larger power stations and associated energy storage systems. Thus, to help prepare power sector stakeholders to attract international private investment, EAEP designed and delivered a series of training and coaching modules on generation planning and procurement processes. More than 50 staff members from 20 ESPs operating across Somalia participated in these trainings and coaching sessions. EAEP also facilitated introductory meetings between ESPs and IPPs operating in the East Africa region. More than half of the trained ESPs soon began actively negotiating with IPPs and EPC firms for generation development.

Moreover, EAEP created a guide to investing in and developing Somalia's power sector, highlighting the Somaliland area. The guide was intended for potential IPPs to successfully navigate Somalia's nascent energy sector. The guide provided insights into risk assessments and existing opportunities and proposed a practical checklist of recommendations and alternative measures to address perceived gaps and risks in the sector. The guide helped existing power sector stakeholders (e.g., the government agencies and ESPs) to understand what developers needed to invest in and how those needs could be addressed.

PPP ADVANCEMENT. As part of an energy sector reform efforts by Puntland State of Somalia, The Puntland MEMWR—through PEDA—spearheaded the establishment of PEPCO, as noted above. PEPCO was envisioned to pool the resources of all ESPs in Bosaso, which is the main commercial city of Puntland State and is projected to see substantial growth in energy demand. PEDA and the individual ESPs in Bosaso asked EAEP to support a possible PPP structure for PEPCO. EAEP facilitated a strategic planning session with PEDA and the ESPs to help them articulate their sector reform strategy and advance PEPCO setup. EAEP provided recommendations to Bosaso stakeholders on PEPCO's ownership and operations, strategic planning, and the implementation of PEPCO's establishment plan. PEPCO was officially launched on May 30, 2023. As of August 2023, with EAEP support, a technical team consisting of personnel from the ESPs was working to physically interconnect the ESPs' networks under PEPCO.

OBJECTIVE II: INCREASED ON-GRID CONNECTIONS

TECHNICAL CAPACITY DEVELOPMENT FOR ESPS. For ESPs to expand their distribution networks and add generation sources to meet future demand, they will need to scale up the technical skills of their personnel. To this end, EAEP designed and delivered training modules on (1) equipment and components typically found in utility networks and (2) the electrical theory behind it—for example, calculating the short circuit currents that equipment can withstand. Although the trainings covered planning methods that can be employed to ensure networks will meet current and future load growth, EAEP also introduced hands-on practical training through the synchronization of different types of generators and construction of actual low- and medium-voltage power lines. At the time, NECSOM was planning to construct a technical training center, and EAEP contributed a suggested

layout design as well as specifications for training equipment. Within a few months, NECSOM had built the training center. EAEP used the new facility to deliver sessions on overhead line construction and transformer maintenance, among many others. ESPs participating in the technical capacity development reported 30,664 new connections.

POWERFACTORY DIGSILENT VIRTUAL TRAINING. Building on the technical training for ESPs, EAEP hosted hybrid sessions on PowerFactory DlgSILENT software. The sessions aimed at improving ESP planning teams' and managers' knowledge and understanding regarding power flow analysis for improved planning. The training demonstrated concepts through practical utility cases. EAEP started with only three ESPs but eventually increased that number to seven. EAEP uploaded NECSOM's network data to DlgSILENT and demonstrated it to other ESPs. DlgSILENT enabled the ESPs' planning engineers to simulate expansion and densification of the distribution network in a timely manner, meeting all power quality parameters as well as the budgetary requirements. To further enhance the ESPs' network planning and monitoring capabilities, EAEP facilitated introductory meetings between the ESPs and SparkMeter, a US-based Power Africa private sector partner that offers digital grid solutions to medium-sized utilities. SparkMeter successfully completed a pilot project with NECSOM and later signed a commercial agreement to roll out SparkMeter's technology to NECSOM's network of 20,000 customers. As of August 2023, SparkMeter had entered discussions with a few other ESPs in Somalia.



NECSOM developed a training center for staff to practice applied skills and support new connections. Photo credit: EAEP

OBJECTIVE III: STRENGTHENED UTILITIES AND OTHER POWER SECTOR ENTITIES

UTILITY DIAGNOSTIC ASSESSMENTS. Most ESPs in Somalia were established without adequate planning or technical expertise. As a result, they had long grappled with inefficient power facilities and poor operational practices. To better understand the degree to which this challenge impacted ESPs both technically and financially, EAEP conducted utility diagnostic assessments with NECSOM, in Garowe; and BEC, in Berbera. These ESPs were selected based on their willingness to share the information required for the assessment. With each ESP, EAEP undertook a three-day diagnostic, including site visits and in-person interviews with divisions such as the technical unit, human resources unit, information technology unit, and meter reading and billing unit. EAEP analyzed the information gathered and identified that both ESPs had gaps in meter standards, commercial operations, and internal control processes, all of which were causing high technical and commercial losses. To effectively communicate the assessment findings, EAEP hosted a meeting with managers from both the ESPs and presented the results along with recommendations to address the gaps identified. NECSOM appointed a dedicated team representing all units to implement EAEP's recommendations.

UTILITY PERFORMANCE-ENHANCEMENT WORKSHOP. To further the recommendations shared with ESPs, EAEP also designed and delivered workshops to address the skill gaps identified through the diagnostic assessments. EAEP understood that the energy landscape in Somalia is similar in all parts of the country and that ESPs were all confronting similar challenges. Therefore, although the assessment was conducted with only two ESPs, EAEP allowed staff members from more than 20 ESPs to attend the workshops. The first workshop was held in Garowe for ESPs operating in Somalia, including NECSOM. The second workshop took place in Hargeisa for all ESPs operating in Somaliland, including BEC. The workshop sessions provided guidelines on general utility management best practices, energy accounting, revenue protection, data utilization, and the functions of a commercial cycle (such as setting of energy costs, energy sales, and revenue collection).

OBJECTIVE IV: INCREASED REGIONAL POWER TRADE

SOMALIA ROAD MAP FOR CROSS-BORDER POWER TRADE. As mentioned earlier, Somaliland's power sector is currently a decentralized power supply model—that is, there are no centralized or national grids. Although decentralized models can accelerate energy access by leapfrogging long distances and bypassing expensive power lines, power distribution via many disconnected metro-grids may not be suitable for regional power integration. In other words, a transmission backbone is usually necessary for cross-border power trade. To help prepare Somaliland for cross-border power trade, EAEP worked with Somaliland energy sector stakeholders and produced a cross-border power trade road map for Somaliland. The road map assessed the state of Somaliland's power sector and provided a guideline on how ESPs can coexist and harmonize their independent distribution systems by working together through joint planning and agreed-upon operations grid codes. The road map also illustrated the benefits of centralized planning, which can lay a foundation for regional interconnection, thereby taking advantage of the reliability and market benefits that come from participating in the EAPP. Additionally, the road map explored several institutions' roles in introducing regulations to support regional trade. Finally, the road map underscored the need to create local capacity and raise stakeholder awareness for future regional power integration and trade.

CROSS-CUTTING ACTIVITIES

SOMALIA DEVELOPMENT PARTNER COORDINATION. Over about four years, EAEP supported the Somalia development partner working group for the energy sector; to enhance collaboration and align the development partners' work in Somalia. As a Secretariat, EAEP regularly organized Somalia donor coordination meetings to update each other's work, share specific areas of intervention, and discuss holistic approaches to address energy challenges in Somalia.

HICD IN SOMALIA. EAEP used the HICD process in Somalia to support ESPs' performance improvement. The process started with a participatory baseline assessment to identify the gaps and areas that needed EAEP support. The ESPs identified energy distribution capacity, energy generation capacity, and PPPs as their high-priority areas. EAEP led various technical training programs on the identified areas and conducted annual reassessments to gauge capacity improvements. By the second year of support, each of the identified areas indicated improvement, as follows: energy distribution capacity, 24 percentage points; energy generation capacity, 10 percentage points; and PPPs, 2 percentage points.

GENDER EQUITY SUPPORT. EAEP expanded gender equity support activities in Somalia with Mission buy-in funds, focusing on training, development of a women-in-energy network, and internships. For training, EAEP taught gender foundations training that examined the basics of gender equity in the workplace. EAEP placed 10 interns with ESPs NECSOM, Ente Nazionale Energia Elettrica Bosaso, and BEC in 2022; ultimately, two interns secured full-time positions after their appointments. Lastly, EAEP supported the official launch of the women-in-energy network ActivateHER, in 2022. EAEP supported the development of ActivateHER's website, to expand its presence both regionally and internationally, thereby increasing its credibility, membership, and partnership base. EAEP also trained ActivateHER members on workforce readiness and career development.



Member of ActivateHER at the official launch event in 2022. Photo credit: <https://www.activateher-somalia.org/>

DIGITAL SOLUTIONS FOR SOMALIA'S GROWING ENERGY SECTOR

Somalia's energy sector has a unique history in Africa. Whereas many of its neighbors are dominated by government-owned electricity utilities and are just beginning to venture into privatization, Somalia's energy growth was led by the private sector from the start, out of necessity. As the country began to emerge from civil war in 2010, dynamic electricity service providers (ESPs) built the energy sector from scratch, supplying an essential commodity and competing for customers with available tools and resources. There are benefits to this privatized path: compared to its neighbors, Somalia's homes and businesses enjoy remarkable electricity stability, with few blackouts.

This makeshift, unregulated growth also resulted in a patchwork of electricity standards, skills, and technologies among ESPs. This fragmentation led to inefficiencies that undermine electrification in Somalia, where only 35 percent of the population has access and tariffs are six times higher than the global average. Outdated infrastructure and technologies prevent Somali ESPs from increasing access, boosting revenue, or lowering customer costs.

Many ESPs in Somalia have shown initiative by preparing to update their infrastructure or consolidate resources, while others have invested in renewable energy. Even so, Somalia's ESPs face major hurdles to modernization, including lack of technical expertise and obsolete technologies. EAEP is working with seven Somali ESPs to implement digital solutions that will bring Somalia's enterprising energy sector into the 21st century.

To bring renewable energy to customers, ESPs must be able to regularly calculate network demand to match it with supply. Yet most Somali ESPs do not have reliable data on demand, usage, or losses, or on the maintenance needs of infrastructure such as power lines. One of the largest ESPs in Somalia, the Garowe-based National Energy Corporation of Somalia (NECSOM), typically sent employees to read each of its customers' 20,000 electricity meters to gauge demand and process bills. This process was time-consuming, prone to errors, and culpable for revenue losses.

EAEP introduced grid planning software to NECSOM and other ESPs to allow them to more easily forecast renewable energy usage and better balance it with supply. NECSOM reported that the new software automated their analyses and enabled them to calculate system losses more accurately, detect pilferage, eliminate billing errors, and see outages before customers called. To complement this improved forecasting, EAEP facilitated a partnership between NECSOM and SparkMeter, a US company offering digital energy technology solutions. Together, the companies are piloting smart meters that will provide NECSOM with data on customer usage trends and supply costs, to better forecast additional renewable energy demand and load. The smart meters will also help NECSOM streamline its billing process and reduce revenue losses.

SparkMeter is also working with NECSOM to digitize its billing processes so that staff are not required to manually read every customer meter, and to implement "digital twin" geospatial technology to track power flows that show whether infrastructure like power lines and transformers is performing optimally or requires repair or replacement.

Both utilities and customers benefit from technologies that improve service quality and reduce costs. Digital solutions, like those offered by SparkMeter, have important implications for the long-term viability of Somalia's energy sector, where competition incentivizes progress and growth.



Staff from NECSOM examining a solar panel at their site. NECSOM's growth as a small provider to larger ESPs has shown how Somalia is meeting demand without having a structured grid utility system. Photo credit: EAEP



REACHED FINANCIAL CLOSE	ON-GRID CONNECTIONS	MW ADDED TO PIPELINE	ATC&C REDUCED	PEOPLE TRAINED
18 MW	997,666 connections	345 MW	2 percentage points in pilot zones	Men: 314 Women: 189
SECTOR SUMMARY				
Installed capacity	1,892 MW		Population	63.5 million
Available capacity	1,490 MW		Access rate (on and off)	70%
Average tariff	\$0.098 per kW		Active IPP	Yes, multiple

Tanzania and Zanzibar contributed greatly to EAEP’s connections target, and energy sector entities emphasized the need to improve planning. As the potential hub to connect Eastern and Southern Africa, Tanzania is developing skills that can optimize energy for both Tanzania and its neighbors.

EAEP started support to Mainland Tanzania in 2019; however, a requested cooperation framework agreement between the Government of Tanzania and RTI International delayed activities on the mainland for two more years. It was not until a change of administration, and a request from Tanzania Electric Supply Company Ltd. (TANESCO) to support grid development, that EAEP began work with the mainland in 2021. In the interim, EAEP dedicated resources to the island of Zanzibar, which is fully dependent on the mainland for grid energy but also uses its own backup generators, typically diesel.

In Zanzibar, EAEP and the utility, ZECO, co-developed activities for increasing connections, reducing losses, and investing in their first-generation assets on the island. Building on the previous program funded by Sweden, EAEP embedded advisors for utility performance improvement and paired with the World Bank’s new program to advance a solar PV plant with battery storage to help with rising energy costs and low reliability.

After 2021, EAEP started connections support with the utility TANESCO and the Rural Energy Association, to support their rapid expansion toward universal access. Additionally, EAEP supported a long-delayed renewable energy auction (a potential 345 MW of wind and solar) by helping TANESCO improve planning for the intermittent resources and integrate them into its systems. Unfortunately, no MW reached financial close in Tanzania under EAEP. Nevertheless, ongoing negotiations between TANESCO and prospective developers have persisted. There is a degree of skepticism within TANESCO and the Government of Tanzania regarding engagement with the private sector, an attitude that has its roots in past administrations. Although some private developers have accomplished modest achievements, many developers experience long project approval timelines while they work with an ever-changing roster of personnel at the energy and government entities who are trying to develop the necessary skills and confidence for effective collaboration with the private sector.

ACTIVITIES SUMMARY

OBJECTIVE 1: OPTIMIZED POWER SUPPLY

REACHED FINANCIAL CLOSE

ZECO SOLAR + BATTERY PLANT (18 MW). EAEP worked with ZECO and the World Bank to support the Zanzibar Energy Sector Transformation and Access (ZESTA) Project for first-generation transaction. ZESTA is financed by the World Bank for [REDACTED]. The project will support the development of Zanzibar's first grid-scale 18 MW solar PV generation plant and battery storage infrastructure. The transaction reached financial close in August 2021, thanks to the collaboration between EAEP and the World Bank. The project will improve the security of energy supply on Zanzibar's Unguja Island, pave the way for the future scale-up of renewable energy, and finance investments for strengthening distribution networks and scaling up electricity access. EAEP provided technical training to ZECO to help staff better understand grid interaction. The program enabled effective resolution of energy storage challenges and helped prevent costly mistakes commonly associated with the adoption of recent technologies. By leveraging World Bank financing and the contributions of other development partners, the project succeeded in reaching financial close.

ADVANCED FINANCIAL CLOSE

RENEWABLE ENERGY COMPETITIVE PROCUREMENT (345 MW). TANESCO announced a competitive procurement of 345 MW utility-scale wind and solar plants in 2019. Upepo Energy bid for the 50 MW solar Singida and 100 MW wind Singida projects, while RP Global Italy and Aries Energie SI bid for the 45 MW Iringa Solar. Globeleq Africa Holding Limited bid for the 50 MW Dodoma Solar project; WindLab Development Tanzania Limited bid for the 100 MW Makambako Wind project.

During the negotiation process, developers of the 50 MW Dodoma and 45 MW Iringa Solar projects sought sovereign guarantees and cash deposits from the Government of Tanzania to be funded by TANESCO to cover ongoing PPA payment obligations to progress negotiations. However, the government rejected these requests. In mid-December 2022, TANESCO reported reaching consensus on implementation agreements. Negotiations for PPAs were scheduled for the end of 2022 after finalization of the implementation agreement. However, in January 2023, the Ministry of Energy rejected the implementation agreement versions because new clauses were added by the developers' hired legal firm (all four developers were represented by one law firm). This caused the negotiations to fail, and as a result, the competitive tender for the 345 MW projects was canceled. In February 2023, developers approached the Ministry of Energy and TANESCO to reengage. At this point, the developers were asked to prepare and submit commercial negotiation proposals.

As EAEP was nearing its close, developers of Iringa Solar (45 MW), RP Global Italy (in a joint venture with Aries Energie SI), as well as developers of Singida Wind (100 MW) and Singida Solar (50 MW), submitted project proposal concept notes and MOU documents. As of August 2023, however, none of the projects had reached financial close. See EAEP contributions to this competitive procurement under the activities section below.

COMMISSIONING SUPPORT

KINYEREZI I NATURAL GAS EXPANSION (186 MW). EAEP provided coordination support to TANESCO and General Electric when General Electric was still negotiating with TANESCO, and prior to a new tendering process TANESCO decided to issue. General Electric then submitted a bid in response to the new bidding process, with support from EAEP. General Electric's bid was not selected, and ongoing commissioning challenges delayed the project's expansion.

OPTIMIZED POWER SUPPLY ACTIVITIES

PPA AND PPP SUPPORT. In 2020, the Attorney General's Chambers requested in-depth training on competitive procurement to advance the 345 MW renewable energy projects that Tanzania planned to procure competitively. EAEP began designing the training; however, the activity was put on hold at the request of USAID Power Africa, pending an overall discussion on the scope of work and level of engagement in Tanzania at the time.

Instead of EAEP providing training on competitive procurement in 2021, 12 Tanzanian energy sector employees were given the opportunity to participate in regional PPP training, which EAEP supported. The training consisted of 12 sessions in technical energy fields. The 10-month-long training was completed in late 2021. All 12 attendees were from Mainland Tanzania.

PSS®E TRAINING AND MODELING FOR COMPETITIVE PROCUREMENT. Following TANESCO's announcement that it would competitively procure the 345 MW of utility-scale wind and solar projects, TANESCO requested that EAEP help increase the capacity of organizations that would be involved in the competitive procurement. As a result, in the summer of 2022, EAEP conducted a comprehensive five-day training for TANESCO, focusing on modeling tools for integrating renewable energy. The training covered power system analysis and use of PSS®E software. This instruction directly assisted TANESCO in competitively procuring the 345 MW of renewable energy. EAEP collaborated with the US Department of Energy's National Renewable Energy Laboratory to extend technical assistance to TANESCO and ZECO. This collaboration continued, facilitating TANESCO's capacity building. EAEP coordinated training with the Laboratory on power system dynamics and subsequent sessions to evaluate the impacts of integration of renewable energy.

Furthermore, EAEP provided supplementary training for TANESCO after the initial PSS®E training in June 2022. The objective was to bolster TANESCO's capabilities in executing renewable energy projects, particularly the 345 MW projects, and addressing associated transmission needs. The training encompassed power system dynamics, methods for estimating unavailable dynamic data, and validation of dynamic responses. Its focus was on modeling and analyzing intermittent renewables to enhance TANESCO's proficiency with short circuit analysis and dynamic simulation. During the training, EAEP developed preliminary load-flow operational models of TANESCO's network using data suitable for short circuit analysis, load-flow assessment, and dynamic simulations. These models were handed over to TANESCO as part of the training's final outcomes. In response to TANESCO's request in January 2023, EAEP offered additional assistance to integrate the Julius Nyerere Dam into PSS®E models.

BATTERY ENERGY STORAGE SUPPORT. In 2021, EAEP and the World Bank offered a three-day training on IPP procurement and management, EPC procurement and management, competitive procurement, project finance, and battery storage technologies to the Ministry of Energy, Ministry of Finance and Planning, ZECO, and the Zanzibar Utilities Regulatory Authority (ZURA). EAEP tailored the training to meet ZECO's needs as it aimed to advance both IPP projects and an EPC solar PV project financed by the World Bank. In May 2022, EAEP trained ZECO engineers and technicians on solar PV and BESS technologies, power system operations, BESS investments, and SCADA systems. The five-day training was impactful, as ZECO had limited experience in these areas, and helped improve its ability to manage future projects and negotiate agreements. This was the only transaction to reach financial close during EAEP in all of Tanzania.

ZECO TRANSMISSION SUPPORT. In 2022, ZECO requested EAEP's support to analyze its 132 kV submarine cable from Mainland Tanzania, which had been exhibiting peculiar behavior. ZECO's network had been observing unusually high load readings at Mtoni Substation. The usual loading at Mtoni Substation ranged from 47 MW to 53 MW during peak hours, but the readings were now in the 90+ MW range. This surge had caused ZECO's other system parameters to deviate from their steady-state range.

EAEP planned to help ZECO collect data and run simulations to determine the cause of these system behaviors and propose technical solutions to resolve them. Additionally, EAEP planned to recommend alignment with ZECO's future infrastructure plans to introduce a 132 kV backbone and install a new 18 MW solar PV plant with storage, which was part of the ZESTA project. However, the activity did not progress due to ZECO's lack of responsiveness in providing the required data.

The objective of the proposed ZESTA project is to expand access to reliable and efficient electricity services and to scale up renewable energy generation in Zanzibar. One of the three components of ZESTA is “Grid Modernization and Access Scale-Up,” which will include construction of the first 132 kV high-voltage transmission-backbone infrastructure in Zanzibar to meet growing power demand, evacuate power from the proposed solar PV power plant, and improve power supply quality and reliability across Unguja.

OBJECTIVE II: INCREASED ON-GRID CONNECTIONS

REDUCE THE TIME AND COST TO CONNECT TO THE GRID (ZECO). In 2022, EAEP conducted a study to determine the average time to connection and the cost of electrical equipment needed to connect residential and business customers to the grid. ZECO provided data from 2019–2022 with files containing 67,637 customer records. The study identified the average cost in US dollars per connection, which decreased from ██████ in 2019 to ██████ in 2021, while the average time per connection increased from 25 days to 38 days. The main reason for this increase was the impact of COVID-19 on the manufacturing and supply chain. The results were presented to the ZECO executive management team, and EAEP provided requested training to the ZECO teams on the methodology and usage of the tool to personnel.

GIS AND ADVANCED GIS TRAINING. ZECO, TANESCO, and Tanzania’s Rural Energy Agency identified training and capacity building in GIS as one of the areas that will enhance the connection planning process. In this regard, 45 employees from TANESCO and the Tanzanian Rural Energy Agency and ten from ZECO undertook a week-long basic training session, which was followed up with a three-month coaching session. The goal of the GIS training was to introduce TANESCO and ZECO employees to the ArcGIS Utility Network Management system. In this way, employees were exposed to the creation and management of functionalities typically used in the utility planning environment. Participants also were exposed to reporting functions, such as the creation of dashboards to supply managers with information to make strategic decisions.

PROCUREMENT AND CONTRACT MANAGEMENT. Utilities also requested support for improved procurement and contract management of connections services, equipment, and materials. EAEP trained 10 ZECO employees and 40 employees of TANESCO and the Tanzanian Rural Energy Agency. The training used as baseline the current public procurement policies and regulations applicable to Tanzania. The objectives were to strengthen participants’ capacity to understand procurement; to teach them techniques for identifying procurement needs and for writing clear specifications, terms of reference, and statements of work; to demonstrate how to set bid evaluation criteria and evaluate accordingly; and to show how to negotiate with consultants and draft and manage their contracts.

DISTRIBUTION PLANNING AND LOAD-FLOW SUPPORT. The last focus area for the Tanzanian utilities to increase grid connections involved methodologies for planning distribution networks, especially densifying existing networks and determining where the new networks must be constructed to maintain the momentum of electrifying villages in rural areas. EAEP strengthened distribution planning departments by equipping the planning engineers to use PowerFactory’s DlgSILENT software, which simulates power systems. DlgSILENT optimizes distribution and reticulation networking planning and customer connections in a timely and cost-effective way. TANESCO and ZECO staff had access to DlgSILENT, but due to their lack of hands-on experience with the software, they were unable to use it. EAEP led training in DlgSILENT for distribution planning. After a week of classroom training that involved discussing all the software’s functionalities as well as using them, the training continued with a three-month coaching session.

OBJECTIVE III: STRENGTHENED UTILITIES AND OTHER POWER SECTOR ENTITIES

TANESCO UTILITY-TURNAROUND SUPPORT. In 2019, EAEP and TANESCO agreed to a diagnostic assessment for planned transformation support in selected pilot zones. After six months of slow data gathering and lack of information, EAEP prepared a draft transformation plan with recommendations for TANESCO. Despite initial interest, the utility decided not to pursue turnaround support in the pilot zones, and work ceased because of challenges to the agreement on the cooperation framework between the Government of Tanzania and EAEP.

ZECO DIAGNOSTIC. Due to budget adjustments and time constraints, the EAEP team focused on energy accounting, business process reengineering, strengthening of revenue protection and internal audit functions, and capacity building related to these activities. The activities co-developed with ZECO resulted in a 2 percentage-point reduction in ATC&C and built best practices into the utility culture for distribution performance.

ZECO ENERGY PROCESS MAPPING AND REENGINEERING. Due to time constraints, EAEP focused on ZECO's commercial operation processes that are key for reducing energy losses and increasing revenue. The EAEP team worked with ZECO on mapping its commercial operation processes and then making recommendations for streamlining and improvement. The team met with various ZECO teams, including operational and commercial directors and information technology personnel, to discuss the initiative to reengineer business processes. They reviewed existing ZECO processes and documentation, identified areas for improvement, and discussed all processes that dealt directly with customers, starting with the new-customer connection process, meter installation, installation commissioning, meter reading, billing, collection, disconnection for nonpayment, inspection, revenue loss recovery, meter replacement, meter sealing, customer complaint handling, etc.

ZECO INTERNAL AUDIT STRENGTHENING. The utility-turnaround team supported ZECO's internal audit department in drafting an internal audit manual, standard operating procedures, and support for information technology annual planning. EAEP also drafted operating procedures, a risk-assessment work plan, an information and communication technology working process, and reporting templates.

ZECO ENERGY ACCOUNTING. EAEP and ZECO worked together on mapping a medium-voltage line and respective distribution transformers and their associated customers. The teams visited over 7,000 customers connected to 22 transformers of the Saaten 5 feeder, inspected their metering points and connections, captured global positioning system data, and mapped their energy accounting. The teams identified and reported 146 damaged meters, which ZECO then replaced. ZECO recovered the unaccounted-for energy. Furthermore, the teams identified 19 cases of electricity theft, took evidence, and undertook all the necessary actions to eliminate the possibility of theft. The teams reported the cases for loss recovery actions and further legal proceedings. These actions resulted in over 60,000 recovered kWh corresponding to over [REDACTED] Tanzanian shillings (approximately [REDACTED]).

OBJECTIVE IV: INCREASED REGIONAL POWER TRADE

TRAINING ON THE ROLE OF INTERCONNECTORS IN THE ENERGY SECTOR. In Tanzania, EAEP delivered training, titled “An Interconnected Future,” over two sessions, targeting high-level Tanzanian power sector officials for one day and technical staff for three days. In all, 28 participants from government (Ministry of Energy, Ministry of Finance and Planning, Attorney General’s Chambers), regulators (Energy and Water Utilities Regulatory Authority, Public Procurement Regulatory Authority, ZURA), and utilities (TANESCO, ZECO) attended the training. Communicating ahead of time that the Permanent Secretary of the Ministry of Energy would officially open the proceedings resulted in great participation from the energy sector. The training offered insights into the key principles and elements of operating in an interconnected power pool and undertaking cross-border energy trading. EAEP delivered a strategic session to help high-level officials understand what a power pool is, its advantages and disadvantages, its benefits and risks, and typical governance and structures. The session deliberated on the roles of all stakeholders—within Tanzania and the Southern African and Eastern African Power Pools, within which Tanzania will operate. The technical team focused on the technical and commercial operations in depth.



The 200 kV high-voltage alternating current Mawakibeta substation is critical for connecting Mbeya in southwestern Tanzania to its neighbors—Zambia, Malawi, and DRC—through a cable passing under Lake Tanganyika. Photo credit: EAEP

CROSS-CUTTING ACTIVITIES

GENDER EQUITY SUPPORT. Tanzania was the second country to use WIRE funding and principles to dedicate activities to improving gender equity in the workforce. As did Rwanda, Tanzania supported an internship program with private companies, given that EAEP’s ability to work with government and state-owned enterprises was limited. The most significant development was the support provided to launch and build up the Tanzanian Women in Energy Development network, a professional women’s network dedicated to increasing women’s access and entry to the energy workforce. Once the network was launched, EAEP supported it with sustainability training, education campaigns, business plan development, and increasing membership. EAEP’s methods involved creating workforce readiness, policy, and gender audit materials that the network now owns and can use across the country.

DEVELOPING GREEN ENERGY INDEPENDENCE IN ZANZIBAR

Without its own robust energy infrastructure, Zanzibar's energy landscape has long been marred by limitations, with only half of its 1.6 million residents having access to electricity, leading to reliance on emergency diesel generators during inevitable electricity failures.

Over the past decade, Zanzibar has begun to prioritize its energy security through policy. The Zanzibar Strategy for Growth and Reduction of Poverty III (2016–2020) prioritizes energy infrastructure for self-reliance and economic growth. To achieve its goal of universal energy access by 2032, Zanzibar will use locally available energy resources and minimize dependence on imported energy.

As part of its approach to increasing energy generation and access in Zanzibar, EAEP strengthened a government-led solar energy initiative with trainings that will serve immediate renewable energy development and support long-term goals. In 2021, the World Bank launched the Zanzibar Energy Sector Transformation and Access (ZESTA) project to develop 18 MW of solar power infrastructure at the southeastern tip of Zanzibar's largest island, Unguja. Solar energy is a climate-smart and sustainable resource for Zanzibar and could significantly reduce reliance on the power supply from the Tanzanian Mainland, as well as the costs of importing it. To make solar energy more reliable for households and businesses during peak-usage evening hours when sunlight is waning, the ZESTA project includes large-scale battery storage—among the first of its kind in Africa. The five-year project will expand access to consistent and efficient electricity services and scale up renewable energy generation in Zanzibar.

With the ZESTA project under way, Zanzibar's energy sector initiated an important transition to energy security. However, infrastructure and technologies eventually become obsolete. ZECO's in-house knowledge of solar and battery energy storage systems was “basic,” according to Engineer Zabrina Makame. “We needed knowledge of new technologies to improve [our] plans and management of grid extension initiatives,” said Salma Said Abdallah, President of the Zanzibar Ministry of Finance and Planning. Without knowledge of maintenance, operations, and procurement, Zanzibar would have to rely on external sources for updates.

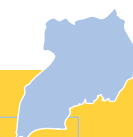
EAEP and the World Bank agreed on a comprehensive training that responded to the capacity building priorities shared by Zanzibar energy institutions and would help Zanzibar see the ZESTA project to fruition. Sessions included topics such as competitive procurement of power providers, project finance, and battery energy storage technologies and services. The Ministry of Energy also requested training for ZECO and the regulator on owning and operating a solar generation facility, given that this would be the first large-scale generation asset on the island.

With feedback from the government of Zanzibar on emerging skill gaps, Power Africa revised the training curriculum to include the fundamentals of engineering, procurement, and construction contracts. An additional training for Ministry of Energy and ZECO engineers in 2022 also included topics such as power system operations, battery energy storage, and remote control of multiple power systems. The EAEP training contributed “to the [capacity] development of the government of Zanzibar and increased capacities of ZECO engineers,” said Mr. Makame. From this collaboration, the 18 MW solar-with-battery transaction reached financial close to pave the way for construction and could support up to 400,000 Zanzibaris with new and more reliable electricity supply.



A student at Dr. John Pombe Magufuli Secondary School in Zanzibar attends a computer class. Access to reliable and more affordable electricity has enabled schools like these to introduce computer literacy classes for their students.

Photo credit: EAEP



ON-GRID CONNECTIONS		MW ADDED PIPELINE		PEOPLE TRAINED	
259,923 connections		0 MW		Men: 67 Women: 80	
SECTOR SUMMARY					
Installed capacity	1,346 MW	Population	45.8 million		
Available capacity	1,261 MW	Access rate (on and off)	43%		
Average tariff	\$0.15 per kWh	Active IPP	Yes, multiple		

Despite abundant hydropower and a strong enabling-environment in the private sector, Uganda’s energy sector still has low access rates for on- and off-grid customers and reliability challenges across the country. EAEP worked with Ugandan entities at a critical time in their access planning and expansion efforts to lower the cost of energy and increase consumption.

EAEP started support to Uganda in late 2020, after the conclusion of the Power Africa Uganda Electricity Supply Accelerator, which focused on both on- and off-grid support. EAEP transitioned the transmission and distribution staff from the Accelerator, given the potential of the country’s Electricity Connections Policy (ECP) to catalyze universal access. Uganda was at around 30 percent on-grid access at the time, despite an impending oversupply of hydropower available. The goal in Uganda was to expand the grid and make it denser across the

multiple service providers that would increase access and improve livelihoods.

EAEP took a multipronged approach, with activities for service providers on productive use of energy to improve consumption as well as advisors embedded in the then-Rural Electrification Agency (REA) in Uganda to support the implementation of the ECP. The advisors supplied REA with technical, database, and communications support. With the onset of the COVID-19 pandemic and country lockdowns, supply-chain issues stalled the ECP results and quickly dropped the number of quarterly connections down to a trickle. By 2023, Ugandan service providers recovered their pre-pandemic access figures, but Uganda still needs support to meet the universal access goals.

Simultaneously, the Ugandan government was undergoing a rationalization process of all its agencies and ministries in a bid to cut down government expenditures and reduce redundancy. Specifically, for the electricity subsector, the government decided to merge the REA back into the Ministry of Energy and Mineral Development (MEMD), a process that was completed in October 2022. In addition, the government expects to rebundle the three electricity companies that had been formed from the unbundling of the then Uganda Electricity Board in 1999–2000. The generation, transmission, and distribution companies would then become a single Uganda Electricity Company.

Much is still unknown about the rebundling implementation; however, EAEP continued to support the entities on other planning priorities (e.g., the Shango–Mbarara interconnector, ECP rollout) and private sector engagement.

ACTIVITIES SUMMARY

OBJECTIVE I: OPTIMIZED POWER SUPPLY

SUPPORT CAPACITY DEVELOPMENT OF PPPs. EAEP launched a regional PPP training focused on the legal and financial intricacies of PPPs. The request for this training was common and came from multiple utilities. The training, which took place between December 2020 and September 2021, was offered to selected participants working with PPPs from Djibouti, DRC, Ethiopia, Kenya, Rwanda, Somalia, Tanzania, and Uganda. Uganda was represented by two members from the regulator, ERA. IP3 implemented the 10-month intensive training program. The goal of the training was to increase the capacity of PPP teams across the region to undertake improved management of these partnerships. One of the attendees managed to secure additional funding to complete the full PPP certification.

MATRIX OF POTENTIAL RISKS AND MITIGATION STRATEGIES FOR THE POWER SECTOR

RATIONALIZATION. In September 2018, the Government of Uganda's cabinet decided to disband or merge dozens of government statutory agencies, including in the electricity sector. In February 2021, the cabinet approved a road map for the implementation process over a period of two years, and in April 2021, the MEMD officially started implementing the process of rationalizing its agencies and companies per the implementation plan of the Ministry of Public Service. Given the progress of these events, donor partners agreed to have EAEP develop a matrix of strategies to mitigate the risks that might ensue. The main objectives of the matrix were to assess the potential key risks that the Government of Uganda would face with rebundling the electricity sector value chain, and to propose mitigation strategies. The matrix would offer a basis for more robust and in-depth assessments that would enable further elaboration and quantification of the risks, identification of more detailed designs for mitigation strategies, and evaluation of the Government of Uganda's capacity to adapt to the needs of the new power sector structure and thus effectively implement the mitigation strategies. During the development of the matrix, EAEP reviewed literature on the Ugandan power sector since its unbundling in 1999 and interviewed key stakeholders, including the head of Ugandan Energy Generation Company Ltd., Uganda Electricity Distribution Company Ltd., ERA, donor partners, and the Permanent Secretary of MEMD. The matrix was completed and presented to the donor partners group.

REGULATORY BENCHMARKING STUDY. ERA needed a structured approach to assess the cost levels and benchmarks in investment applications tailored to the Ugandan setting to properly assess the economic viability of generation, transmission, and distribution projects, and to establish a solid ground for cost-reflective tariffs. For this reason, ERA requested EAEP's support to develop an exhaustive standard-cost tool as a benchmark to guide ERA on costs for projects undertaken on the transmission and distribution grids. The purpose of this project was to create a cost database for substations, lines, and relevant associated equipment that would allow ERA to evaluate future investments and tariff studies for the Ugandan market, in both transmission and distribution segments. To that end, standard and preferred configurations were selected, to focus the effort and select the most used solutions in the country.

Based on all the findings, the program developed a cost tool suitable to calculate the investment cost of any selected project against similar projects in Uganda and abroad, to ensure that project costs were not inflated, given that they would be built into the tariff equation. The tool was developed in close consultation with the ERA staff, and once it was completed, the consultant offered a six-month period within which ERA could use the tool and submit queries and receive additional training. The tool will play a vital role in the project approval process and will ensure that the regulator can determine the effect of any impending project on the tariff prior to its approval.

OBJECTIVE II: INCREASED ON-GRID CONNECTIONS

PRODUCTIVE USE OF ENERGY (PUE) WITH KILEMBE INVESTMENTS LTD. (KIL) AND KYEGEGWA RURAL ELECTRICITY COOPERATIVE SOCIETY LTD. (UGANDA) (KRECS).

KIL requested EAEP support with the promotion of PUE, which would increase the demand for electricity and lead to higher revenue for the utility. KIL has a customer base of nearly 19,000, but of these, only 1 percent are commercial customers, and just 0.3 percent of that are industrial. This means that KIL has a very low monthly average consumption: approximately 25 kWh. These numbers indicate that the utility cannot recover the average connection or O&M costs from most of the customers on the network. The utility therefore sought support from EAEP to conduct a robust PUE campaign that included a customer mapping exercise; a survey to understand the PUE opportunities in the area; development of PUE-centric information, education, and communication materials; and business and entrepreneurship training for selected participants that included access to finance training, as well as a matchmaking session with financial institutions. The training was also extended to the staff and board members of KIL and KRECS to ensure that, right from the outset, the importance of PUE was appreciated and understood and that the necessary support was available to the staff of the utilities, and to the customers as well.

KRECS also requested similar support for three districts that had recently been added to its service area. KRECS was facing the challenge that the network in these areas was relatively new. It had to encourage customers to connect and had to hire new staff to service this area. EAEP provided KRECS with support similar to that given to KIL, which included customer mapping; development of information, education, and communication materials; and business and entrepreneurship training that included access to finance, among other things. Additionally, KRECS staff learned how to handle and support PUE customers and how to incorporate promotion of PUE into their day-to-day activities, among other management aspects.

These training courses led to an increase in the number of commercial and especially industrial customers for the utility. They also helped the utility staff address issues impeding their would-be customers from connecting to the grid, such as reliability and cost.

UGANDA'S REA/RURAL ELECTRIFICATION PROGRAMME (REP) TECHNICAL ADVISORY SUPPORT.

Through the embedded technical advisor, EAEP provided technical assistance to the Rural Electrification Department of the MEMD under the Service Territory and Connections Division, mostly in the areas of implementation and verification of last mile connections and monitoring and supervision activities to facilitate grid expansion in service territories. The EAEP advisor supported the commissioning of distribution networks; coordinated the receipt and handover of the networks to service providers; and supported the procurement of connection materials (prepaid meters, cable, accessories), consulting services related to verification, and material testing. In addition, EAEP advisors supported the preparation and review of technical specifications for connection materials, low-cost internal wiring materials, and other service connection accessories for the various projects. The EAEP advisor also supported sample material tests and factory acceptance tests to ensure the quality of the connection materials procured.



An official from distribution company KRECS answers questions from local entrepreneurs from Mayirikiti Village, Uganda, on electricity access and use. Uganda has one of the lower on-grid access rates in East Africa but is working to connect households and businesses across the country. Photo credit: EAEP

REA/REP ADVISORY SUPPORT DATA AND SYSTEMS. EAEP's embedded database advisor provided technical support to the REA/REP connections department. After REA/REP was integrated into the MEMD beginning in May 2021 (completed in October 2022, as noted above), the EAEP advisor offered similar support for MEMD's Rural Electrification Department, specifically for developing and maintaining new and existing electricity connections, software applications, and databases. This support was aimed at facilitating the capture, collection, validation, verification, and reporting of electricity connections established under the ECP and throughout the country. The embedded advisor emphasized system design, process analysis, database security, and performance optimization, as well as managing data migration, creating analytics dashboards, overseeing change processes, assessing consultancy proposals, and contributing to EAEP reports.

REA/REP ADVISORY SUPPORT COMMUNICATION. The embedded Communication and Knowledge Management Specialist provided communications support to the REA/REP connections department, particularly with the promotion of the ECP. This effort involved reviewing documents and departmental communications; preparing routine reports; and sourcing (i.e., carrying out interviews and taking photographs) and preparing success stories on the ECP.

SUPPORT ENERGY SECTOR GIS WORKING GROUP. EAEP launched an initiative to enhance GIS proficiency for electricity utilities across East Africa. Building on ongoing efforts, EAEP aimed at strengthening utility GIS infrastructure, covering aspects like mapping, database management, and strategic system planning for expanding new connections.

Kicking off the initiative, 25 working group members began with basic GIS training online. This foundational course was succeeded by an intensive five-day in-person advanced GIS training, which explored field data collection, enterprise data management, and utility network dynamics. To gauge the training's impact, EAEP conducted a post-training assessment three months after the training was delivered. EAEP's post-training evaluation report highlighted the significant benefits that the participants acknowledged having gained. The tasks and projects undertaken by the participants post-training not only affirmed the success of the training but also demonstrated their enhanced proficiency and practical application of GIS technology in the monitoring and management of electricity utility networks.

OBJECTIVE III: STRENGTHENED UTILITIES AND OTHER POWER SECTOR ENTITIES

KRECS DIAGNOSTIC SURVEY. As part of its support to distribution utilities in Uganda, two consultants from EAEP visited KRECS in March and April 2021 to assess the situation, identify gaps, and recommend improvements that could be implemented.

They met with all relevant KRECS staff, including managers, department heads, and technical and administrative staff. Secondly, they visited locations where KRECS was operating to get a closer look at how the operations were being handled and to better understand network conditions, customer metering points, customer service provision, and metering points for bulk energy supply.

EAEP developed a detailed diagnostics report explaining these and many other findings from its inspection of the system and made recommendations as to how the utility could improve its overall performance. This report was shared with the utility. Unfortunately, due to budget constraints, EAEP was not able to embed staff in the utility to support the implementation of the recommendations.

CROSS-CUTTING ACTIVITIES

GENDER EQUITY SUPPORT. Due to the limited time and budget with the transition from the Power Africa Uganda Electricity Supply Accelerator and the COVID-19 pandemic, EAEP pursued ad hoc gender equity activities in Uganda. EAEP supported the placement of 16 interns in private sector companies—including KRECS and KIL service providers—for appointments to gain on-the-job work experience. Additionally, EAEP hosted workforce-readiness training for interested groups to support interest in joining the energy sector. In the future, Uganda could benefit from longer-term, more engaged gender equity programming for the energy sector workforce.

“ Having such an initiative in the energy sector, especially targeting the female colleagues, is something that needs to stay. ”

– **Intern representative from KRECS, Uganda, in 2023 survey**

BUILDING DEMAND WITH BUSINESSES IN UGANDA

Energy is critical to commerce and to national economic growth; however, mere megawatts are meaningless without entrepreneurs who know how to harness them for business, add value, and deliver services. The productive use of energy (PUE)—for example, the electrification of coffee hulling machines, cold-chain storage devices, welding equipment, hair salon tools, or kitchen appliances—is how energy expansion translates into improved livelihoods. In Uganda, the utilities have the capacity to serve more high-consumption customers, but demand is low. Many entrepreneurs are apprehensive about investing in powered equipment due to perceptions about electricity costs and connection fees, the lack of access to efficient PUE equipment, a shortage of business advisory support to fully tap into their potential, and limited access to finance. PUE and related trainings are a meaningful way to increase electricity demand while strengthening economic growth.

EAEP and local utility companies developed outreach and training to promote PUE among Ugandan entrepreneurs, with advantages for both the utilities and their customers. By engaging local entrepreneurs on the ways that PUE can enhance their businesses, utilities can increase their energy sales, improve their load capacities, and gain new customers who benefit from improved production and higher profits.

In 2021, EAEP supported business and entrepreneurship trainings in southwestern Uganda for 280 entrepreneurs served by local electricity utility Kilembe Investments Limited (KIL). The trainings focused on building awareness of electricity benefits to businesses, reviewing cost-benefit calculations around the adoption of PUE technology, addressing general entrepreneurial skill gaps, and promoting opportunities to access finance for business investments. The EAEP training also included modules in recordkeeping, customer care, and business management to integrate PUE into local enterprises for energy saving, cost-effective solutions. Some entrepreneurs received further assistance on creating bankable business plans, which they then used in a matchmaking event with financial institutions.

From coffee processors who sought financing to procure electric hulling machines, to the salon owner who purchased hair dryers, the impacts of the training were visible. Entrepreneurs who ventured into PUE made commercial gains after introducing electricity-powered components into their businesses, as reflected in measurable increases in electricity demand from KIL. EAEP also trained members of the KIL board of directors and senior managers to ensure buy-in for this customer engagement strategy and integrate it into the utility's operations. EAEP prepared a strategy to guide KIL in promoting PUE in its service territory.

EAEP subsequently provided similar support to Kyegegwa Rural Electricity Cooperative Society (KRECS), the utility responsible for Uganda's Central Service Territory. Like KIL, KRECS is a small utility seeking ways to increase its energy sales to become more profitable and self-sustaining, including through expanded customer territory. EAEP provided staff training on PUE and its promotion and on energy efficiency at KRECS headquarters and in 15 load centers in the utility's service territory.

Rural utilities like KIL and KRECS are responsible for last-mile services to customers and represent a critical component of the energy chain. They interact regularly with the communities they serve and are a trusted source of information on electricity use. These local utilities are best placed to promote PUE among community businesses, and energy sales through increased PUE enable small utilities like KIL and KRECS to stay in business.



Access to reliable and adequate electricity allows households and businesses to operate machinery and equipment that can save time, increase incomes, and support industry. In Uganda, a welder benefits from electrification to support his business. Photo credit: EAEP

INCREASED REGIONAL POWER TRADE

TWH OF TRADE ADVANCED	KM OF TRANSMISSION AT COMMERCIAL OPERATION	KM OF TRANSMISSION AT FINANCIAL CLOSE	PEOPLE TRAINED
2.38 TWh	1531.2 km	0 km	Men: 72 Women: 16
SECTOR SUMMARY			
Existing MW capacity	1,682 MW	Average annual growth in GWh trade	5.2%

With the commissioning of critical interconnectors in East Africa, Power Africa supported interconnection commissioning in Burundi, DRC, Ethiopia, Kenya, Rwanda, and Uganda. Additionally, Power Africa and its donor partners supported a pipeline of projects that need financing that will further connect East Africa to other regions.

Regional power trade has important benefits beyond matching supply and demand across borders. For instance, power trade can increase the affordability of power and expand a country’s generation to include more renewable energy resources. In East Africa, renewable energy is abundant and available to trade—given the right transmission infrastructure to interconnect grids.

EAEP’s approach to regional trade was to build the capacity of the regional bodies like the EAPP and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) while providing transaction advisory support to specific lines to advance toward financial close and commissioning. For the power pool, EAEP supported the development of their self-identified strategic goals and complemented donor investments from the World Bank and AfDB to advance operational and technical readiness for power trading. Methods included training series on planning and operations, and establishment of market committees made up of representatives from utilities across the region.

Also, EAEP identified strategic cross-border transmission lines for transaction support. The Uganda–Rwanda interconnection was a pilot line for commissioning support that started trading in July 2023. EAEP also conducted technical and social studies for a pipeline of other transactions to start attracting finance and further interconnecting the region.

ACTIVITIES SUMMARY

OBJECTIVE IV: INCREASED REGIONAL POWER TRADE

ADVANCED INTERCONNECTOR FINANCIAL CLOSE

UGANDA-TO-DRC INTERCONNECTOR (NKANDA–BUNIA). EAEP supported private developer Nuru (see DRC section) to develop their capacity to reach financial close for a 350 km 400 kV line with 150 MW load that would import Ugandan hydropower into eastern DRC. Because this was the first private transmission line in the country, EAEP focused on technical study reviews and recommendations for attracting financing; basics of transmission financing; transmission and distribution planning (Nuru's background is in mini grids); and legal support to advance Nuru's MOU with the Government of DRC. Ultimately, the line did not advance. However, the AfDB's New Partnership for Africa's Development–Infrastructure Project Preparation Facility was considering updating the feasibility study as of August 2022.

TANZANIA-TO-MALAWI INTERCONNECTOR (MBEYA–SONGWE). USAID/Tanzania and TANESCO requested EAEP support to develop the full feasibility study, including the ESIA, conceptual design, and tender documents for the 113 km line. EAEP engaged an independent firm for the study—completed in early 2022—and built TANESCO's capacity to carry out similar studies throughout the process. As of August 2023, the Malawi side of the interconnector still needed to update their previous study to align with more updated assumptions. TANESCO and Electricity Supply Corporation of Malawi continued working together to find funding for the other side of the feasibility study and advancing financing for the line. EAEP's study package will be critical for TANESCO to secure financing to build the infrastructure and could reinforce Tanzania's ability (and by default, East Africa's ability) to trade with countries in southern Africa.

TANZANIA-TO-DRC INTERCONNECTOR (SUMBAWANGA–KATANGA). As with the Tanzania-to-Malawi interconnector, USAID/Tanzania and TANESCO requested EAEP support to complete the prefeasibility study for the interconnection to DRC, with two route options: (1) through Lake Tanganyika, with underwater cable; and (2) over land, through Zambia. The prefeasibility study was meant to provide metrics to TANESCO to determine cost-reasonableness and basic technical feasibility that such routes could happen. The southeastern region of DRC is home to many mines that need large power capacity and reliability, which could be provided by Tanzanian imports; the currently available generation from SNEL in this region is insufficient to meet mining demand. With the prefeasibility studies completed in early 2022, TANESCO began looking to secure funds to complete the full feasibility study for both Tanzania and DRC and to finalize an MOU with SNEL for the studies.

INTERCONNECTOR COMMISSIONING SUPPORT

RWANDA-TO-UGANDA INTERCONNECTOR (SHANGO–MBARARA). Starting in 2019, Power Africa supported the EAPP and NELSAP to make regional power trade a reality by focusing on a pilot line: the 220 kV Uganda and Rwanda interconnection. Power Africa facilitated an interconnector working group among the utilities and power pool to support their system operators to continuously advance the line. Power Africa also established a forum for EAPP members to share best practices, exchange ideas, and agree on protocols to be followed during the commissioning of the line. Power Africa also helped prepare Ugandan and Rwandan utilities to commission the Shango–Mbarara interconnector and facilitated both in-person and virtual meetings between the utilities to discuss and agree on commissioning protocols and operational issues. To help ensure smooth cross-border interconnector operations, Power Africa developed a manual of standard operating procedures for interconnectors and supported equipment purchasing and installation to synchronize the lines. The technical commissioning of the line was completed with power trading at 7 GWh in June 2023 and 19 GWh in July 2023. Power Africa compiled a detailed project closeout report including lessons learned and snags that need to be addressed.

ETHIOPIA-TO-KENYA INTERCONNECTOR (SODO–MOYALE–SUSWA). Picking up from Power Africa's support under PATRP, EAEP supported member parties of the Ethiopia–Kenya–Tanzania (EKT) electricity superhighway to advance commissioning of the Ethiopia–Kenya segment. In 2019, EAEP provided legal reviews of the PPA between EEU and KETRACO for the Ethiopian delegates. In 2020, EAEP and the EAPP outlined gaps to commissioning, including understanding of the wheeling fee model previously negotiated. EAEP revised the model with the EAPP and member parties to use on EKT and future interconnectors to support simulations and trade negotiations. In November 2022, the Ethiopia–Kenya segment completed technical commissioning and started trading up to 200 MW from Ethiopia to enhance energy security in Kenya. The Ethiopia–Kenya segment also saw the commissioning of 1,058.12 km of the 500 kV high-voltage direct current transmission line between the two countries (431.97 km on the Ethiopia side and 626.22 km on the Kenya side) with a transfer capacity of 2,000 MW.

INCREASED REGIONAL POWER TRADE ACTIVITIES

IMPROVED COUNTRY CAPACITY TO PARTICIPATE IN REGIONAL TRADE. With EAPP and NELSAP members participating in regional committees, trainings, and decision-making, EAEP supported requests from individual countries on building understanding of technical and legal concepts within their own energy sectors. Through country-focused capacity strengthening sessions, EAEP was able to familiarize decision-makers with energy trading concepts and to build comfort and buy-in necessary to advance interconnection transactions. In December 2020, EAEP supported Ethiopia's EEP to undertake electromagnetic transient training for advanced network analysis. The EEP planning engineers are now able to conduct power system analysis, power system quality studies, power system harmonic studies, and high-voltage direct current design; all supported the large-scale interconnections Ethiopia has and is planning with neighboring countries. Also in December 2020, EAEP hosted a training on interconnector basics in Tanzania with participation from the Ministry of Energy and Finance and Planning, regulators, the national utility, the Attorney General's Office, and counterparts from the island of Zanzibar. In 2021, EAEP conducted "An Interconnected Future" training for the Horn of Africa countries (Djibouti, Ethiopia, and Somalia) that shared insights into the key principles and elements of operating in an interconnected power pool and undertaking cross-border energy trading. As of August 2023, most countries were aware of cross-border trade benefits in the region; however, this support should continue with the EAPP committees as administrations and regimes shift throughout the region and new decision-makers are brought in.

CONTROL-AREA CONCEPT AND CRITICAL REQUIREMENTS FOR EAPP OPERATIONS COMMITTEE.

Responding to EAPP's strategic plan, EAEP supported Operations Committee members to build capacity on components, processes, and technical requirements of control areas and interconnected tie-line operations. Because the concept of tie-line operations is relatively new in the EAPP, EAEP explained the differences between a control area and the countries' national grid-system operations. The training was offered in 10 modules. In all, 135 system operators from nine countries completed certification in September 2021. Operations harmonization is critical for market trading, which EAPP anticipates in 2024, and which will enable cheaper and cleaner power availability across the region.

CONTRACT ADMINISTRATION AND PROJECT MANAGEMENT FOR EAPP PLANNING COMMITTEE.

In response to EAPP's request, EAEP conducted contract administration training for EAPP member utilities in August 2021. Attendees included utility representatives from Burundi, DRC, Egypt, Ethiopia, Kenya, Libya, Rwanda, Sudan, Tanzania, and Uganda. The training strengthened participants' grasp of project and contract management principles and objectives; the role of a contract manager; good contract governance; contract implementation (managing time, cost, quality, and risk); managing contract change; and dispute management and resolution of contract-implementation disputes. To supplement the training program, EAEP also sponsored 30 technical committee participants from 11 utilities and the EAPP Secretariat to undertake virtual project management courses through the Coursera learning platform. From September 2021 to March 2022, the participants completed up to eight courses for certification and held check-in sessions with EAEP's institutional performance team for additional coaching. Combined, these trainings supported the member utilities to harmonize their understanding of administration and project management principles and familiarized the participants with other utility practices and standards that can be applied to quicken regional transmission infrastructure development.

PPP PROGRAM AND CERTIFICATION TRAINING FOR EAPP PLANNING COMMITTEE. From September 2021 through January 2022, EAEP collaborated with the US Department of Commerce's CLDP to build the EAPP technical committee's PPP capacity. This APMG International PPP training system enables participants to establish a fundamental understanding of PPPs and eventually earn the Certified PPP Professional accreditation. Through this longer-term training series, EAPP members were able to build their confidence in understanding the PPP model's applicability to transmission interconnectors, an often-underfinanced portion of the power supply chain.



In 2022, EAEP and CLDP sponsored a PPP workshop in preparation for certification exams for representatives from EAPP member utilities. Photo credit: CLDP

EAPP BILATERAL TRADE MODEL PPA. In 2021, EAPP requested finalization of the Power Africa-supported draft bilateral trade framework agreement (BTFA). This is a standard form agreement that EAPP trading entities will use for short-term transactions with other signatories, based on a set of common terms and conditions approved by EAPP and applicable to all transactions executed under the agreement. Along with the EAPP market working group, EAEP's legal advisors supported an updated draft BTFA for review and consultations with EAPP member ministries, regulators, and utilities, before resubmitting to the EAPP steering committee for approval. As of August 2023, the BTFA was still with the working group, which was continuing to push the steering committee and Ministry members to adopt the model PPA for future interconnectors.

CONNECTING FOR GROWTH ACROSS EAST AFRICA

Despite bountiful natural resources for clean energy (e.g., hydropower, wind, geothermal), many countries in East Africa face supply challenges that impact the reliability of energy delivery to households, businesses, and critical services such as health clinics and water systems. The region's countries also have a powerful tool available to help them optimize these resources: cross-border energy trade. With cooperative engagement and technical expertise, East Africa countries can share energy to stimulate economic growth across the continent. EAEP has supported regional energy trade in East Africa to bring more affordable and reliable energy to the region and to expand past those regional borders to connect other regions.

Regional energy trade has important benefits beyond matching supply and demand across borders. Energy trade can make power more affordable and expand a country's energy mix to include more renewable energy resources. Moreover, a country with a power deficit may find it more practical to import energy from a neighboring country with an abundance of affordable energy than to generate domestically. For example, Rwanda needs to meet growing local demand for energy, but could potentially face inadequate supply or rely on costly, nonrenewable energy that would make the tariffs unaffordable. Conversely, Uganda spends significant funds to develop new power generation capacity that is surplus to its needs and may pass those costs to consumers through high electricity tariffs. In both cases, energy trade has potential economic benefits.

Since 2019, Power Africa has worked with other development partners to prepare members of the Eastern Africa Power Pool (EAPP) to advance regional power trade. The EAPP consists of government utilities from 11 countries with an interest in sharing their energy resources to bring efficient, reliable electricity to households and businesses. EAEP facilitated an interconnector working group to continuously advance the Shango–Mbarara 220 kV transmission line with the system operators from the utilities. EAEP also established a forum for EAPP members to share best practices, exchange ideas, and agree on commissioning protocols to be followed during the commissioning of the line. The Shango–Mbarara interconnector commissioning started in mid-June 2023 and was completed in August 2023. The completion of the line has interconnected the grids of Kenya, Uganda, Rwanda, eastern DRC, and Burundi.

This new, reliable trade network affords the region the ability to use power as a commodity to generate revenue, relieve oversupply, and create an affordable option for countries looking to import power. For Rwanda and Uganda, trade started in June 2023 with 7 GWh of energy imported from Uganda and increased to 19 GWh over the following month. As Rwanda's industries continue to build, they now have a reliable power source with Ugandan power.

Beyond energy security, the savings from energy trade can benefit climate change resilience. While low-cost, imported energy meets immediate demand, governments can invest their savings to develop a climate-friendly energy portfolio. This diversification will lay the groundwork for a more resilient energy future that relies less on conventional energy sources. By 2030, more interconnectors should open cleaner and more affordable trade across East Africa, as well as connections to other regions. Through trade, countries across the region can increase their access rates, build only necessary energy infrastructure, and invest in economic growth projects, knowing they have energy security from their neighbors.

The Mbarara substation in Uganda now trades power across the border to Rwanda, creating a source of revenue for UJETCL and securing Rwanda's energy supply. Photo credit: EAEP



CROSS-CUTTING AND PROJECT MANAGEMENT SUPPORT

GENDER EQUITY

From 2019 to 2022, EAEP supported gender equity interventions in the energy sector focused on (1) building women-in-energy networks across the region, (2) improving company and government policies and practices for gender equity in the energy sector; and (3) giving female interns and apprentices access to workforce experiences. EAEP started the gender cross-cutting stream with baseline sector assessments in selected countries. The assessors reviewed the existing gender composition of energy sector entities (e.g., utilities, ministries, regulators) and interviewed stakeholders on proposed gaps and interventions. EAEP consistently found women's overall participation in the energy sector to be about 30%, although the proportion of women in leadership roles within these on-grid entities varied more substantially.

Most of the interviewed stakeholders were interested in policy support to improve the hiring and retention of women, capacity strengthening for workforce development and readiness, and guidance and training on anti-sexual harassment policies. EAEP co-developed work plans with the entities and supported ongoing internship programs with funds to increase the number of women entering the energy sector workforce.

In late 2019, EAEP received funds through the WIRE initiative to dedicate resources and build a team that enhanced women's role in Rwanda's energy sector and allowed EAEP to pilot opportunities that could be used throughout the region. In Rwanda, the apprenticeship program was larger than in other countries, with 153 apprentices supported with stipends across 26 companies. Moreover, the women's network POWERHer was supported for events, elections, training programs, and campaigns for recruitment; and WIRE sponsored technical and workforce-readiness training on a large scale.

The lessons and methods from WIRE were used in DRC, Ethiopia, Kenya, Somalia, Tanzania, and Uganda at various scales, given available funds. While interviewing company representatives and apprentices for a 2023 learning report, EAEP found that many networks, apprentices, and companies were supportive of gender equity interventions and wanted extensions of similar activities. EAEP found the networks to be great ambassadors for sector equity and cooperative partners to reach local institutions and attract government focus. In the future, EAEP can recommend supporting networks directly, possibly with grants, and bringing them into the design and procurement processes for interventions rather than being recipients of USAID activities only.



██████████ is a WIRE apprentice at the REG metering unit at Water and Sanitation Corporation Pompage Runda in Kamonyi District, Rwanda. Photo credit: WIRE Initiative

COMMUNITY-ENGAGEMENT

EAEP focused on Kenya for community-engagement and investment activities after energy sector entities identified gaps in understanding and implementation during an HICD exercise in September 2019. During the HICD effort, some of the utilities identified shortfalls in their community-engagement strategies as a hindrance to progress in Kenya's energy sector development. For example, KETRACO was during protracted mediation with community members impacted by wayleaves (rights-of-way) for transmission infrastructure, both commissioned and under development. These types of misunderstandings often delayed transmission, leading to cost and time overruns—as well as unhappy community members. Motivated to improve their engagement strategies, the utilities worked with EAEP to co-develop interventions that would standardize best practices and policies in socially responsible energy development.

Many of the entities requested support to prepare a policy and community-engagement framework. With GDC, EAEP developed a community-engagement strategy to improve community relations and promote timely project delivery. The strategy became a framework for GDC to conduct proactive public outreach and created an engagement pathway to reduce project delays and disruptions to their critical generation developments. EAEP and KenGen developed a mechanism to handle grievances and complaints, which became an essential tool for building trust by proactively addressing community concerns about energy development.

KETRACO requested support to build on its resettlement action policy framework. RAPs are critical for transmission to successfully advance past conception stage, and KETRACO found that its overall policy, as well as policy implementation, should be improved. The revised policy framework now includes provisions for prompt and just compensation for loss of assets and standards of living, with a clear livelihood restoration strategy. The KETRACO framework integrates international statutes and policies and can serve as a policy guide for the growing number of power transmission projects in East Africa. In a related action, EAEP supported an independent study of KETRACO's Suswa–Isinya line resettlement compensation, along with making recommendations to simplify compensation and make it more transparent.

Overall, EAEP learned a great deal about the practical actions that utilities need to make to implement community-engagement and investment effectively. EAEP recommends meeting with utilities for three key purposes: (1) to determine where gaps exist, (2) to gauge to what extent their organization has human and capital resources to improve community-engagement, and (3) to determine their willingness to improve such practices. Once senior-level counterparts have bought into the process, EAEP recommends co-developing pilot interventions that align with specific transactions. EAEP believes that Kenya's community-engagement work can be easily scaled in other countries, depending on sector interest and willingness to build better practices.

ENVIRONMENTAL CONSIDERATIONS

EAEP supported improvement of environmental considerations in energy planning and implementation across the region while also reviewing transactions for compliance with IFC environmental standards. EAEP hosted environmental compliance and awareness-building training in Kenya, Rwanda, Somalia, and Tanzania, with utilities and private sector companies. In Kenya, EAEP and KETRACO identified gaps in environmental compliance during the HICD exercise. KETRACO's seven-person environmental and social compliance team needed to have a framework to better implement best practices across all the divisions of the utility to improve planning, construction, operations, maintenance, and financing.

Together, EAEP and KETRACO created the utility's first Environmental and Social Management Framework, which pairs international environmental standards and Kenyan laws and regulations with KETRACO's existing business processes for infrastructure development and maintenance. KETRACO needed a system to mitigate environment-related delays and enhance implementation of recommendations stemming from ESIA's. To test the new framework, Power Africa supported KETRACO with an environmental audit along the route of the Olkaria–Lessos–Kisumu high-voltage transmission line. EAEP advisors and KETRACO traversed the line's path

“ Power Africa's support for KETRACO has been transformative in approach and value. The biggest impact is in addressing systematic challenges related to environmental and community engagement aspects that have in the past slowed the pace of project development, in some cases resulting to increased project costs. ”

— [REDACTED], **Head of Environment Unit, KETRACO**

by ground vehicle and on foot and provided recommendations that advanced the commissioning, which was completed in June 2021. The 308 km line increases the transmission capacity from the geothermal fields to western Kenya's load centers.

On a regional scale, EAEP developed Power Africa's first wildlife incident management guide for East Africa. It focuses on the unique biodiversity of the region and its interaction with energy infrastructure. The guide was developed for utilities' environmental compliance offices, to aid them in reviewing possible incidents and in mitigating, planning, and responding.

The report was made publicly available in late 2021 with a social media campaign, direct outreach to utilities, and promotions at environmental conferences. As a next step, EAEP wanted to build wildlife mitigation capacity directly at utilities with audits, tools for cost-benefit analysis, and GIS integration modules; however, funds and time were limited by mid-2022. EAEP's partner, Endangered Wildlife Trust, engaged heavily with Kenya Power, KETRACO, and EEU given their interest in mitigation. EAEP can recommend reengaging them in this focus area.

Although direct environmental programming concluded in 2022, EAEP continued to review the ESAs for all transactions that were added to the pipeline and to the Power Africa Transactions Tracker (PATT), to confirm their environmental compliance for EAEP support. During this process, EAEP noted that none of the transactions in Somalia had ESAs, given that these assessments were not required of the nascent regulator. The ESPs in Somalia are primarily self-funded and have not needed to complete standard ESAs to obtain international and/or donor funding. However, these same ESPs are interested in expanding their footprints and in seeking private funds for future developments. In response, in July 2023, EAEP conducted a survey of the ESPs to learn more about their knowledge of environmental considerations as well as their needs. The survey results indicated that the ESPs had little background on environmental standards and processes for infrastructure development and were interested in building capacity. Given EAEP's limited time, the survey results will be made available to USAID/Somalia for a future Power Africa intervention.

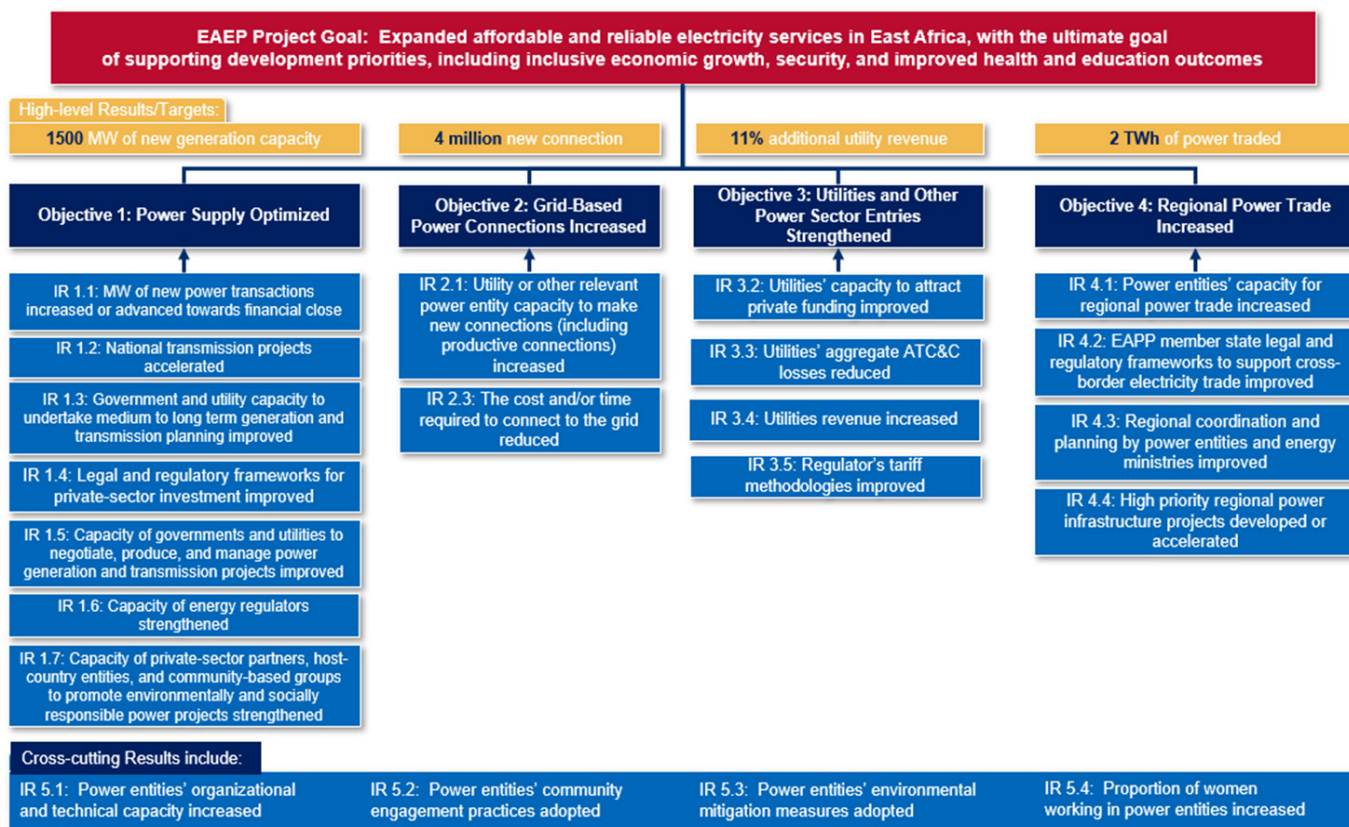


EAEP prepared a regional wildlife guide to support utilities to integrate environmental considerations into planning and infrastructure construction.

MONITORING, EVALUATION, AND LEARNING (MEL)

LOGICAL FRAMEWORK AND THEORY OF CHANGE. The EAEP logical framework, shown below, includes four objectives, each with underlying intermediate results, as well as four cross-cutting intermediate results. The framework underpins a theory of change stating, "If EAEP can apply a demand- and market-driven model to mitigate critical barriers to attracting and sustaining necessary investment in power generation, transmission, and distribution, then the program will facilitate expanded supply of, and access to, affordable and reliable electricity services in East Africa and help strengthen the overall vitality and sustainability of the power sector." With this logical framework (see **Figure 1**) and theory of change in place, EAEP worked to meet its overall goal.

Figure I. EAEP logical framework



IR = Intermediate Result.

In the five years of program implementation, the theory of change held true. Stakeholders (e.g., ministries, utilities, regulators, private sector companies) continued to prioritize affordable energy investments through planning improvements. Although this preference delayed the overall MW gains in generation, EAEP saw connections grow consistently across host countries; backed new master planning and strategy documents based on models and simulations; and integrated gender equity across the energy sector workforce successfully. However, through interactions with collaborating utilities, EAEP was able to outline priority areas for these entities, which meant that some of the Intermediate Results had to be revised. Some measures that initially were intended to assess performance had to be revised to be tracking measures, or measures that informed EAEP and USAID more about the working environment.

PATT AND NEW QTATS FOR THE PROGRAM. EAEP consistently used the QTAT to document all new generation transactions that it supported. First, all the key details required in the QTAT file were completed, which included expected MW and the stage of the transaction, as defined by Power Africa, as well as the contact information of the point person for the transaction. For all new transactions under EAEP, QTATs were completed and submitted to the respective USAID country leads for approval. As USAID reviewed them prior to approval, transactions were entered into the PATT system and designated “proposed.” If USAID granted permission, EAEP then updated the information in the PATT system to read “supported.” This approach ensured that at any given time, the PATT system had the most accurate information regarding the EAEP MW pipeline. Additionally, EAEP updated information on all the transactions in the PATT system quarterly based on input from the technical advisors, delivered through internal quarterly data calls.

TRANSMISSION QTATS AND SUPPORT. The PATT system included transmission line information that largely went without updates because the information requirements of the PATT system for the transmission lines were not uniform. Working with the PATT team, EAEP needed to track the transmission lines it supported given their role as a key performance metric of cross-border power trade. Given the need for a transmission specific QTAT, EAEP's Objective 4 technical team embarked on creating one. EAEP unveiled a new transmission QTAT that contained the fields that Power Africa needed to use in their PATT system to better track transmission transactions. Power Africa now uses the inputs from EAEP for their updated transmission tracking and EAEP anticipates that Power Africa will roll out the transmission QTAT for use by all Power Africa implementing mechanisms.

TIME AND COST STUDIES. The time and cost to connect customers to the grid were initially performance metrics for EAEP's utility improvement work. Over a two-week period in August to September 2020, EAEP collected customer data from 30 EEU service centers in Ethiopia and carried out a qualitative systems assessment audit of the EEU data management system. The results from this study revealed very high costs to connect customers (██████ for industrial customers and ██████ for residential customers). Similarly, the time it took to connect customers was also long, with industrial customers waiting up to 143 days to get connected, and residential customers waiting up to 51 days. The EEU data management system audit was scored on a scale of 0–3, and the baseline score was 1.96, suggesting that the EEU data management system needed strengthening. Based on these findings, EAEP worked with EEU to design various activities, including trainings, which would help reduce the time and cost of connecting customers to the grid. Approximately one year after the initial time and cost study, EAEP carried out another study to determine the time and cost metrics. This time, however, EAEP conducted a desk review, and EEU provided the time and cost dataset to EAEP, which then analyzed the data. The analysis results showed a 40 percent reduction in the cost of connecting industrial customers; no change occurred in the cost for connecting residential customers. The time to connect also was reduced. At this point, industrial customers waited an average of 55 days to get connected, while residential customers got connected in 41 days. EAEP also used this approach of analyzing a utility dataset in Kenya and Zanzibar and shared results with utility management teams in each country. Overall, the findings showed high costs and a time lag to connect to the grid, both of which can be improved with enhanced power system planning capabilities; consistent data collection and analysis for connections information; improved operational procedures for procurement and installation of connections; and improved customer service communication, campaigns, and expectation setting.

GENDER EQUITY LEARNING AGENDA. Gender equity in the energy sector was one of the key aspects of EAEP work. It included supporting the placement of women as apprentices at energy companies; the registration and employment of women-in-energy networks; and gender-related trainings, including workforce development. It also guided the drafting and implementation of gender policies. In Rwanda and Tanzania in particular, EAEP received funding from the Women's Global Development Prosperity fund (US White House initiative) to carry out gender equity efforts in the two countries. This funding allowed EAEP to support the placement of hundreds of women as apprentices at energy companies in Rwanda and Tanzania. Moreover, hundreds of women also benefited from workforce-readiness trainings, which led to several of them securing employment. Exit interviews with the apprentices and the hosting energy companies provided insightful information for future gender equity work: (1) any future apprenticeship program should have a minimum period of six months; (2) EAEP should design and implement report-writing training for the apprentices it supports; and (3) clear expectations need to be set at the beginning of the apprenticeship among the apprentices, the hosting company, and EAEP. This initial meeting should then be complemented with regular meetings between EAEP and the apprentices.

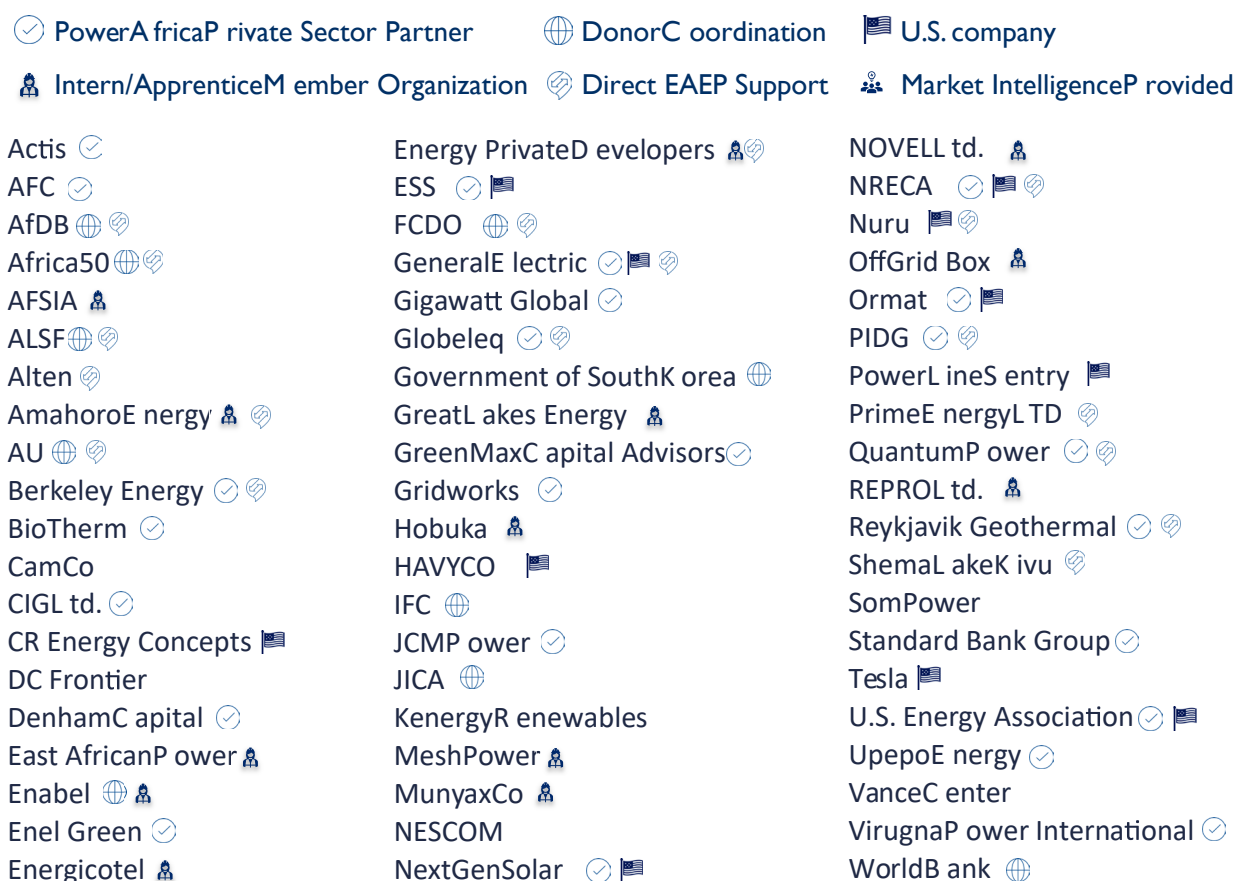


An EAEP MEL team member consults with staff at a health clinic in Zanzibar on the services available as a result of on-grid electricity access. Photo credit: EAEP

PARTNERSHIP COORDINATION

EAEP supported Power Africa's model of coordinating partnerships, with a presence on the ground in the operating countries. With EAEP staff, Power Africa was able to support donor initiatives; engage the private sector; and coordinate with US Government counterparts at embassies, visiting the region to advance Power Africa's goals. **Figure 2** demonstrates a sample of partners EAEP supported over the life of the program.

Figure 2. EAEP engagement with partners



SOMALIA DONOR COORDINATION. EAEP supported the Somalia development partner working group for the energy sector to regularly share specific areas of intervention to improve coordination. Support included the following:

- Updated and routinely disseminated the donor matrix for streamlined activity reporting.
- Drafted an MOU for managing donor coordination to align efforts among the donors and stakeholders.
- Developed a calendar and minutes for regular meetings.
- Helped to advance policy and regulatory reform coordination. Specifically, EAEP supported the group to map out which donors were working on the master plan reforms and how best to align government support.

HORN OF AFRICA INITIATIVE DONOR COORDINATION. The World Bank's Horn of Africa Initiative has been advancing regional energy integration and cross-border energy trade. The initiative has conducted technical feasibility studies for several interconnectors, including three interconnectors identified between Ethiopia and Somalia. The most advanced of the three is the Jijiga interconnector (400 kV direct current line from Hurso to Jijiga through Harar substation, totaling 158 km) connecting Ethiopia's network to Somaliland. Over the years, EAEP hosted meetings with the Horn of Africa Initiative to discuss and align EAEP's activities advancing Somalia's readiness for regional power trade. More particularly, the Horn of Africa Initiative was among stakeholders consulted during the development of the Somaliland road map for cross-border power trade. In addition to the stakeholder consultations, EAEP presented the road map to the World Bank and sought input for proposed recommendations. With funds from the AfDB, the capacity of Ethiopia's Jijiga line will be increased to accommodate interconnection with Somalia; currently there is an existing 132 kV transmission network at Harar and Jijiga that extends to Hurso.

RWANDA DONOR WORKING GROUP. At least twice a year, Rwandan energy sector stakeholders gather to review country policy documents in a sector working group. The groups are co-chaired by the Ministry of Infrastructure and a donor party (latest chairs have been the World Bank followed by the AfDB). Standard documents reviewed by the group include the Forward-Looking Joint Sector Review and the Backward-Looking Joint Sector Review; additional documents for review may include any national electrification policies, LCPDPs, etc. In advance of the group's meeting, the donor chair is responsible for sharing the document and collecting feedback from the technical working group composed largely of sector donors, with some private sector participants. EAEP was a member of both the technical and sector working groups and was responsible for a capacity building review across all donors to see what training interventions were planned or requested in the forecast.

BURUNDI DONOR WORKING GROUP. For many years, the European Union chaired a donor working group called the Partenaires Techniques et Financiers (PTFs). The meetings of this group, held quarterly, were exclusive to sector donors and included activity updates to ensure harmonization of donor support. EAEP attended these meetings in person before COVID-19 struck, and virtually during and after the COVID-19 mitigation measures. In early 2022, the World Bank took over as chair of the PTFs and expanded the format to a working group (the Groupe de Travail Sectoriel Energie). The group meets quarterly and includes the PTFs; the Ministry of Energy, Water, and Mines; REGIDESO; ABER; AREEN; the PPP Unit; and the private sector. The objective of the working group is to ensure that the Government of Burundi and the PTFs undertake effective and transparent development, with the goal of achieving the energy sector's objectives by implementing policies, dialogue, harmonization, and alignment of support to the sector. EAEP was a member of the PTFs and attended the Groupe de Travail meetings.

PRIVATE SECTOR ENGAGEMENT. Across all objectives, EAEP integrated private sector engagement considerations, coordination, and direct support to advance results. When EAEP adopted private sector relationships from PATRP, the transaction advisors and objective leads sought to understand their biggest hurdles to success and then identify plans to overcome such barriers. For example, USAID/DRC alerted EAEP to a Power Africa developer's challenges in the country and connected the parties. EAEP and the developer identified grid planning with SNEL and legal barriers that were slowing financial close. EAEP co-developed a work plan with the developer to unlock those barriers while improving SNEL's capacity to engage the private sector. EAEP also worked with developers and private sector companies to provide market intelligence and connect with financing opportunities. For an example, see Somalia's impact story about Power Africa private sector partner SparkMeter connecting with ESPs.

EARLY-STAGE SUPPORT FOR PRIVATE COMPANIES. Many developers sought extensive technical assistance (e.g., legal fees, financial advisory assistance) from EAEP while they were in the prefeasibility and capital-raising stages of their transactions. EAEP was limited in the support that it could provide to early-stage transactions, as it had to focus on achieving its target of 1,500 MW at financial close before the end of 2023, which could only be realized by focusing on more advanced transactions. Additionally, EAEP sought seasoned developers that were strong fundraisers to support the effort to reach financial close, given their higher likelihood of success in the short time frame. EAEP was not able to support nascent firms or provide significant grants for fundraising, sometimes to the frustration of developers. EAEP did continuously provide market intelligence, updates on competitive procurement opportunities (even though they were limited in the region), and relationships with private sector entities across the region.

COMPETITIVE VS. NEGOTIATED TRANSACTION SUPPORT. EAEP supported both competitive procurements and negotiated transactions and was guided by a host-country's generation plan (e.g., LCPDP, integrated resources plan, master plan). Often, the USAID Missions identified companies in their deal teams that were supportive of negotiated transactions and had met with government officials (e.g., Astra in Tanzania, CREC in Djibouti) but still experienced delays in reaching financial close. EAEP would work with the negotiated transaction developers to match them with financing; support reviews of studies; and sometimes offer legal services, depending on the transaction stage. Simultaneously, most USAID energy interventions recommend institutionalizing competitive procurement processes to bring a high degree of transparency and predictability, enhance market confidence, and facilitate price discovery. Competitive procurement is gaining momentum in sub-Saharan Africa and is attracting strong interest from investors. That said, properly tailoring a competitive program for a particular country context and then implementing it requires technical expertise and can take longer than direct negotiations. On the other hand, direct-negotiation procurement methods often raise questions about how and why certain transactions were selected over others and can become tainted with pejorative connotations of political motives and rent seeking.

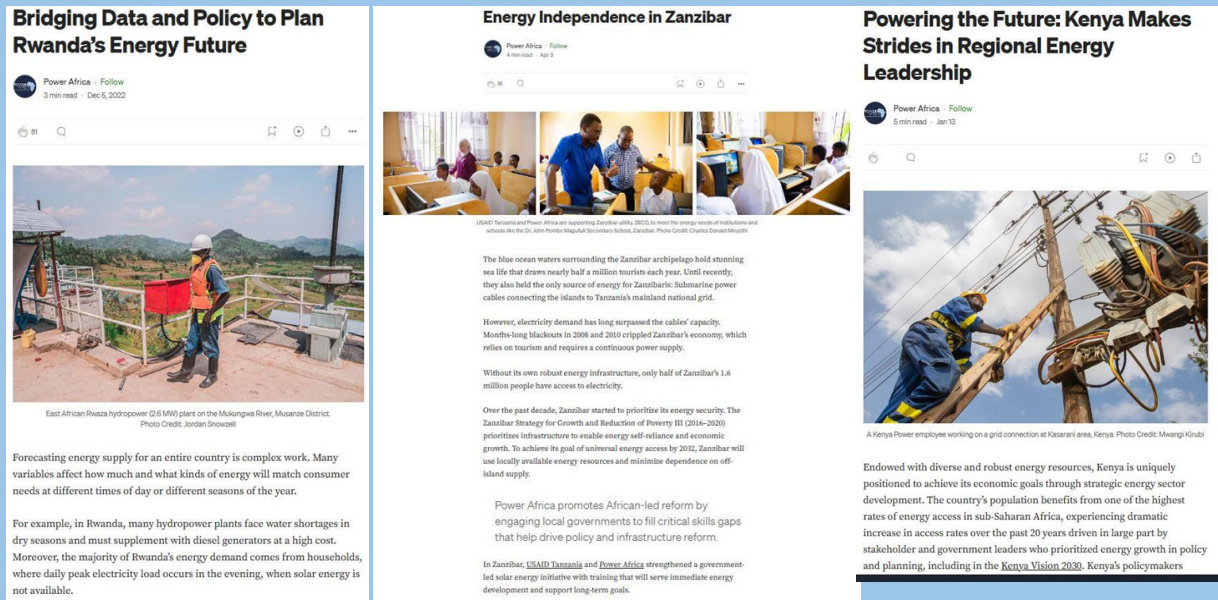
It is important to emphasize that competitive procurement processes often result in the selection of developers that boast well-established track records, substantial funding, and extensive experience. In contrast, direct negotiations may lead to the emergence of developers that are in the experimental stages of new technological concepts, lack adequate funding, and showcase limited experience. This distinction highlights the need to base collaboration with developers on their proven capabilities. It will shift the focus from mere geographical considerations, or choosing firms based on their country, to the pivotal attributes of experience and financial stability. While EAEP's inability to award substantial fundraising grants might have been frustrating for emerging firms on occasion, it represents a deliberate strategic decision to align with developers more likely to yield successful outcomes.

COMMUNICATIONS

The EAEP communications function served to keep stakeholders and target audiences informed of the program's activities and successes. The EAEP communications team regularly prepared and distributed reports through which the program kept USAID, Power Africa, and other USG stakeholders informed of progress on all activities. The communications team met regularly with the Power Africa Coordinator's Office (PACO) communications team to keep them informed and to maintain alignment with PACO on all publicity and communications activities. The EAEP communications team also utilized the different Power Africa communication platforms to showcase the program's work. Using well-crafted success stories and high-quality visuals, EAEP raised the Power Africa profile among the key audiences and regional energy sector counterparts as a strategic partner. Through these activities, EAEP also raised the profile of its various host-country counterparts by publicizing events and milestones achieved in collaboration. In addition, EAEP successfully organized and hosted energy-themed events across the region, pulling together energy sector players to focus on several access-related issues, serving to position Power Africa as a key stakeholder in electricity access in the region.

Internally, the EAEP communications team was the custodian of all branding and marking, ensuring that all publications and materials produced conformed with the USAID/Power Africa branding and marking guidelines. The team supported all other program teams by preparing talking points, editing key documents and outbound communications, documenting successes, and photographing events and field visits, as well as coordinating and guiding reporting on progress by program teams.

PUBLICATIONS. EAEP communications authored several blogs focused on the thematic areas of work in the program countries, ranging from initiatives to increase women’s participation in energy, to community-engagement work in Kenya, promotion of productive use in Uganda, and steps to increase electricity access in Somalia and Zanzibar, among others. The blogs highlighted Power Africa’s support by chronicling interventions that edged the program’s counterparts along the path of progress. The blogs were published on the Power Africa Medium blog platform and promoted on Power Africa’s social media channels.



Sample of blogs from Power Africa’s Medium blog site that had high engagement from EAEP. Photo credit: EAEP

ENERGY CAFÉS. The EAEP communications team organized energy cafés, which were virtual events designed to bring together key players in the electricity sector to discuss issues pertinent to the energy sector. The team conceptualized the event, sought out panel members, invited attendees, and promoted the events on Power Africa social media channels. EAEP successfully hosted four energy cafés: two in Kenya, one in Somalia, and a regional one that brought together participants from Ethiopia, Kenya, Rwanda, Tanzania, and Uganda. EAEP received positive feedback on the cafés from private sector, government, and development partner participants, who testified to the café’s value in improving their understanding of the topics discussed.

CAPACITY STRENGTHENING SUPPORT. EAEP’s communications team supported the program’s capacity strengthening activities and trainings through developing concept notes, drafting invitation letters, providing branding materials, editing training presentations, and documenting and photographing the activities. Internally, the communications team organized learning events to increase the program team’s understanding of various aspects of the energy sector and how they fed into the program objectives.

STAKEHOLDER FORUMS. The EAEP communications team supported the program’s participation in several stakeholder events across the region, including regional annual events like the Africa Energy Forum and Enlit Africa, as well as local events. The team offered support with branding material, fact sheets, editing of presentations, and publicity about EAEP’s participation in events on Power Africa social media channels.

SUPPORTING STAKEHOLDER COMMUNICATIONS. EAEP supported the communication function of stakeholders like Uganda’s REA/REP. EAEP’s embedded communications advisor supported REA/REP’s Connections Department with promotion of the ECP, which included developing communications materials for the ECP, supporting a marketing strategy for the connections, and aiding a funding proposal for the ECP, as well as reporting for the policy. EAEP also served utilities by providing photographs of their work for use in their own communications; and highlighted shared achievements and milestones on Power Africa’s social media channels. In addition, EAEP supported the women-in-energy networks in the region with their brand identity and communications platforms.



Home

About

My Programs

Blog

Resource



About Us

ElevateHer

ActivateHer Somalia: Empowering women, transforming lives. Founded in 2021, our platform is inspired by the extraordinary Somali freedom fighter and activist, Hawo Tako. Through tailored training programs, mentorship initiatives, and a supportive network, we empower women to excel in diverse fields. We foster partnerships to amplify our impact and drive meaningful change.

Together, we honor the legacy of Hawo Tako and inspire a generation of powerful women shaping Somalia's future. Join us and activate her potential for a brighter tomorrow



Screenshot from the ActivateHER network page for women in energy in Somalia. EAEP supported the network to develop the site to maximize outreach. Photo credit: EAEP

CHALLENGES

The countries in the East Africa region are not homogeneous, and their political, regulatory, and security climates differ. The biggest challenge in EAEP was the ability to bring transactions to financial close within the life of the program. Across the region, EAEP experienced perceived oversupply, high tariffs, and varying degrees of planning capacity that limited transactions reaching financial close; the program achieved only 294 MW of 1,500 MW, or 19 percent of the target. Additionally, EAEP faced challenges operating in Ethiopia, Tanzania, and Somalia due to political issues that delayed or stopped operations and results. As a part of Power Africa 2.0, EAEP also represented Power Africa's innovative approach to transmission and distribution programming and experienced challenges meeting those life-of-program targets as well. Lastly, EAEP experienced fluctuating budgets and scoping/de-scoping issues that impacted the ability to effectively operate the program for results. In this section, we detail the challenges and recommendations for future Power Africa programs.

MEETING THE TARGET OF 1,500 MW AT FINANCIAL CLOSE

EAEP anticipated that most of the MW supported by the project would reach financial close by the final year of implementation; however, this was not the case. The reasons below outline the challenges in securing 1,500 MW reaching financial close.

- **COMPETING MW.** The transactions initially in EAEP's pipeline were transitioned from PATRP and had undergone due diligence, typically involved other Power Africa donors, and were in later stages of development. Simultaneously, the region advanced mega-projects outside of Power Africa's purview, including the anticipated commissioning of the Julius Nyerere hydropower project in Tanzania (2,115 MW), the filling of the Grand Ethiopian Renaissance Dam (6,450 MW), and plans for Grand Inga Dam in DRC (4,300 MW) to start construction. These mega-dams are politically supported, legacy projects that greatly impact the region's power planning and can push smaller generation projects with seemingly high tariffs outside of government priorities. EAEP encouraged governments and energy sector entities to advance smaller transactions to ensure the reliability of supply, diverse energy mixes in the event of droughts, and quicker commissioning than large dams.
- **DEMAND AND SUPPLY MISMATCH.** Prior to EAEP, Uganda was a private sector hotspot with favorable IPP policies and promising growth. However, the transmission and distribution planning for Uganda did not catch up to the supply, resulting in over 600 MW of oversupply in the country along with estimates of less than 30 percent on-grid access (total on- and off-grid is 43 percent). By the end of EAEP, demand did catch up with supply in Kenya, which had stalled PPAs for new generation to slow down supply and reduce costs.
- **ENABLING-ENVIRONMENT SHIFTS.** A key challenge in many instances involved the lack of proper or fully developed enabling policies and legal, regulatory, and planning instruments. For example, the PPAs and tariff regimes were being renegotiated in Burundi, giving private sector companies pause about moving into Burundi. In Kenya, the moratorium on PPAs froze transactions for more than one year and private sector stakeholders remained concerned about future growth in Kenya with the renegotiations of PPAs. In Ethiopia, an ongoing currency convertibility guarantee challenge prevented any IPPs from reaching financial close, despite significant Power Africa resources dedicated to transactions and enabling-environment activities. In Tanzania, EAEP supported a renewable energy auction for years, at the end of which TANESCO and Government of Tanzania canceled all negotiations after meeting with selected bidders.

RECOMMENDATIONS

With succeeding programs, EAEP recommends that USAID continue to provide traditional transaction advisory support, complemented with ongoing enabling-environment support. The region still has significant gaps in the enabling-environment that will delay the pipeline of bankable transactions for financial close if not addressed. EAEP recommends continuing efforts to build the enabling-environment for IPP/PPP frameworks, procurement support, PPA clause understanding, financing risks, community-engagement and investment, and most importantly, power planning. Power sector planning is critical to ensure that generation capacity will balance with demand, and that situations of excess capacity can be avoided. Building in-house institutional capacity with modeling and having the requisite tools to develop integrated resource planning and LCPDPs will be vital for sustainable sector advancement and success.

POLITICAL CHALLENGES IN ETHIOPIA, SOMALIA, AND TANZANIA

EAEP faced political challenges in Ethiopia, Somalia, and Tanzania that prevented operations and delayed results. Ethiopia and Tanzania specifically were focus countries under EAEP and had teams on the ground impacted by political challenges.

- **ETHIOPIA POLITICAL UNREST.** Because of the conflict in Tigray, Power Africa instructed EAEP to stop working with the Ethiopian government by December 2021; this mandate included the utilities EAEP supported. EAEP had to evacuate three expatriate staff and relocate them, remove three EEU-embedded advisors to Tanzania, and transition all local staff members to other projects and positions. Additionally, EAEP and USAID/Ethiopia worked to communicate the shifts to government stakeholders, noting that they could participate in regional activities and report results from legacy activities. EAEP was able to continue counting Ethiopian connections given the investment in the meter test benches, which continued to support EEU connections. The impact of EAEP's move out of Ethiopia was that no more work in utility performance, generation, and connections could proceed.
- **TANZANIA COOPERATION FRAMEWORK DELAYS.** EAEP spent the first year of the project negotiating work areas with the Tanzanian stakeholders to support generation, distribution, and transmission priorities. The Government of Tanzania requested a cooperation framework, with RTI International as the signatory body. Unfortunately, the drafted framework fell into an endless cycle of comments and approvals among multiple government agencies. TANESCO advised EAEP to proceed without the framework completed, and EAEP began the diagnostic assessment for performance improvement with TANESCO. Political challenges within the Government of Tanzania then led to a stop of all EAEP work in the country, including the diagnostic assessment; the USAID/Tanzania contracting office confirmed that this type of stoppage was a common difficulty for implementing partners. For two years, EAEP could not operate in the country until the new regime came to power and stakeholders opened their doors. This situation was especially taxing for EAEP given that the Tanzania Mission had supplied funds to EAEP and expected workstreams in the country.
- **SOMALILAND GOVERNMENT DELAYS.** As in Tanzania, USAID/Somalia bought in to EAEP and the program's country advisor started work planning with the energy sector entities. The government of Somaliland insisted on a cooperation framework with RTI to guarantee activities and results that aligned with their Ministry's needs. EAEP advanced the cooperation framework with the Ministry and for six months negotiated terms. Eventually the Ministry let EAEP proceed but kept pushing for an MOU with USAID/Somalia and respective US Government bodies, which was not an option. Ultimately, EAEP was able to support activities in Somaliland, but the political sticking points between the two governments delayed results.

RECOMMENDATION

EAEP recommends that programs build flexibility into results that are expected to come from multiple countries. For example, EAEP's connections target of 4 million was derived from EEU's four-year target. EAEP also recommends that Power Africa negotiate MOUs with countries at high levels to secure senior-level buy-in for activities. Power Africa's MOU with Tanzania lapsed before EAEP started, and the Government of Tanzania repeatedly referred to needing a government-to-government MOU before proceeding with activities.

CONNECTION PIPELINE

As mentioned above, Ethiopia had planned for one million new connections per year but only reached 400,000 per year. As a result, EAEP needed to develop connection programming in other countries to meet the 4 million life-of-program target. EAEP had to build relationships in the utilities, co-develop connection activities, and secure reporting for quarterly connections from EUCL in Rwanda, multiple ESPs in Somalia, and ZECO in Tanzania, with TANESCO joining after the resolution of the cooperation framework challenges.

Additionally, EAEP added Uganda connections in the middle of the program once the Power Africa Uganda Energy Sector Accelerator (PAUESA) concluded in October 2020. EAEP and PAUESA forecasted 300,000 connections in Uganda per year; however, the connections fell short due to funding challenges for the electricity connections program and COVID-19-related delays for equipment and materials.

RECOMMENDATION

EAEP recommends building a healthy connections pipeline—like the one for generation transactions—that allows for flexibility to support multiple utilities. EAEP ultimately exceeded the 4 million life-of-program target, but this accomplishment was due in large part to Kenya's consistently large connections reporting and the willingness of additional utilities to accept EAEP support. EAEP developed specific trainings and policy support for utilities that addressed issues that were common across the region and then was able to quickly respond to requests from the different utilities.

TRANSMISSION CHALLENGES FOR COMMISSIONING AND FINANCIAL CLOSE

EAEP had targets for transmission to be commissioned with TWh traded for interconnectors as well as kilometers of line for financial close. Both areas were new to Power Africa 2.0 and EAEP helped build the pipeline of transmission projects in the region. EAEP did experience challenges in both commissioning and financial close for transmission, as follows.



█ a shopkeeper living in West Nile, Uganda, is a beneficiary of a free electricity connection. Alex uses the electricity to light his shop, power his refrigerator, and watch television. Photo credit: Power Africa

TRANSMISSION COMMISSIONING DELAYS. The Shango–Mbarara interconnector experienced continued delays to commissioning due to EAEP’s delayed acquisition of necessary boosters and challenges with system synchronization between the utilities and the regional power pool. The original commissioning was set for early 2020 and then continuously delayed because of the equipment issues and gaps and inconsistencies in power planning, both of which EAEP sought to support. Even in 2023, the utilities disagreed on underfrequency load shedding protections that further delayed Phase I commissioning. Ultimately, EAEP had to engage RTI’s legal division to apply pressure for the booster equipment delivery, after months of delays. Additionally, EAEP hosted a protection team meeting at UETCL and EUCL to find a resolution on underfrequency load shedding, with EAPP as the regional interlocutor, and they came to a resolution.

TRANSMISSION FINANCIAL CLOSE DELAYS. EAEP successfully supported 109 km of financial close in Rwanda after two years of technical assistance to EDCL to conduct the feasibility studies, ESIA’s, RAPs, and tender documents for the lines. At the same time, EAEP supported KETRACO in Kenya to advance PPP for over 400 km of transmission toward financial close. EAEP provided financial advisory training, models, and legal support to KETRACO, but after four years, the lines still had not reached financial close, which impacted EAEP’s life-of-program target. KETRACO still wants to pursue the PPP model and requires additional support to advance the transactions.

RECOMMENDATION

For commissioning, these delays demonstrate the difficulty in finalizing commissioning for transmission across two countries. EAEP recommends that Power Africa reduce involvement in the commissioning of interconnectors to allow the utilities and the power pool to lead the process. The power pool should be home to commissioning expertise or should facilitate consultants to complete commissioning procedures as part of their planning department. The power pools have access to utility and ministry senior leaders, and their country trade commitments to push transactions effectively and supply commissioning specialists are incentives to meet deadlines.

When supporting transmission for financial close, EAEP recommends that Power Africa support only lines that have funding earmarked by the utility or already secured from donor partners. Most of the utilities have priority transmission line lists that need to be completed in tandem with generation projections. Power Africa should work with those utilities to see what late-stage support can be provided to reach financial close. Examples are critical studies, reviews of documents, legal support, and/or financial matchmaking. For early-stage transmission, the financial close timeline is typically greater than five years, which could push past Power Africa’s 2030 timeline.

OPERATIONS CHALLENGES

SHIFTS IN CLOSEOUT. EAEP originally was to close in December 2022; however, Power Africa extended the program first to March 2023 and then again to September 2023. In September 2022, EAEP largely started transitioning staff, closing offices, and preparing for a closeout that took a year longer than expected. Additionally, EAEP stakeholders continued requesting additional support, but limited time and budget prevented the program from fully accommodating them. Not supporting these requests risked alienating stakeholders, who might seek other support, thereby complicating future USAID engagement; and misaligning with an anticipated USAID follow-on program’s objective, which would harm future Power Africa relations.

BUDGET UNCERTAINTY. EAEP received unclear or reduced budgets in early 2020, 2021, 2022, and 2023, which caused delays in launching new activities until funding was confirmed. This uncertainty strained planning and resource allocation and limited support to stakeholders. For example, EAEP could not support certain activities that were not focused on achieving program minimum outputs or critical MEL indicators, even if they were important to stakeholders. EAEP mitigated the financial issues through conservative planning and scenario analyses. Budget issues continued to impact the program during the extension period through September 2023; funds eventually became available, but it was too late to initiate activities with stakeholders if they could not be completed by the end of the program.

COVID-19 PANDEMIC DISRUPTIONS. COVID-19 caused significant delays to project timelines and objectives throughout 2020 and 2021 due to lockdowns, travel restrictions, strained budgets, and impacts to counterpart operations. EAEP adapted implementation to be flexible through virtual meetings, remote work, and augmented safety protocols. COVID-19 continued to affect staff health and supply chains in 2022 but had declined enough by mid-2022 that in-person engagements could resume. EAEP supported stakeholder resilience with a COVID-19 “return to office” plan with KenGen and mapping health clinic and support facilities with EEU in Ethiopia for reliability support.

INFORMATION SECURITY AND SHARING. EAEP implemented controls such as confidentiality training and tracking of information sharing to minimize risks of sharing sensitive project data.

TRANSITION AND CLOSEOUT CHALLENGES. Staff departures and reductions increased workloads through 2022 and 2023 as the project wound down. EAEP rehired critical staff and implemented transition plans. The Ethiopia closeout continued to incur costs due to the inability to formally close out operations and dispose of assets, because of missing government clearances, which EAEP worked to obtain. Managing stakeholder expectations was difficult given limited time and budget at the end of the project. EAEP focused on priority needs and communicated pending transitions to staff and stakeholders.

RECOMMENDATION

EAEP recommends that Power Africa try to secure budgets with realistic timelines to share with the implementing partner prior to work plan approval. This step would limit unfulfillable promises to stakeholders and better secure activities for completion. EAEP also recommends transparently and cooperatively working with stakeholders to develop limited, mutually beneficial activities to ensure that future engagement remains possible.

LESSONS LEARNED AND RECOMMENDATIONS

As the follow-on project to PATRP, EAEP benefited from prior lessons learned under Power Africa. Detailed below are overarching lessons learned for future implementation. Overall, the program was well designed to meet the anticipated targets from Power Africa. In a midterm review, EAEP examined the assumptions within the logical framework (see MEL section above) and adjusted approaches to meet the reality on the ground. During the midterm review, EAEP refocused the approach to (1) securing MW for financial close and (2) working toward improving the enabling-environment for transactions to be not only successful, but also sustainable. The overall lessons learned were to co-develop activities with the energy stakeholders, prioritize their organization's needs for assistance, and leverage donor investments and private sector interests across the region for success.

SUPPORTING MW TO FINANCIAL CLOSE

Bearing in mind that countries in the region are not homogeneous—differing in respect to their political, regulatory, and security climates—EAEP encountered significant delays in advancing transactions to achieve financial close across the region. Numerous transactions that EAEP supported stalled because various enabling instruments either were lacking or were underdeveloped (see challenges section).

FOCUS ON TRANSACTION ADVISORY SUPPORT ALONG WITH THE ENABLING-ENVIRONMENT. EAEP recommends that traditional transaction advisory support be paired with ongoing enabling-environment support to ensure a sustainable pipeline of bankable transactions that will reach financial close and commissioning. This support can include further education on PPPs, negotiation of PPAs, regulatory frameworks (especially for new technology), financial simulations for tariffs, and climate risk analysis for transactions.

PUSH PLANNING AGENDAS. Power Africa should limit expectations of large generation growth in the region to allow for connections, transmission infrastructure, and affordability to catch up. Institutions in East Africa urgently need planning support to produce LCPDPs, generation master plans, integrated resource plans, etc. EAEP successfully supported Rwanda to improve their LCPDP process to integrate realistic growth and climate impacts. Such exercises are still needed in Burundi, Kenya, Tanzania, Uganda, and especially in DRC, where government commitments to energy planning are being made without proper demand analysis. EAEP recommends that Power Africa take the same position as other donors that will not support transactions outside of the LCPDP for the countries; this approach would ensure political buy-in to reach financial close.

ADVANCE COMPETITIVE PROCUREMENT. EAEP recommends continuing an emphasis on evidence-based planning for all stakeholders that will ensure adequate generation capacity to meet demand and avoid situations of excess capacity. Once the need is determined, EAEP recommends that the country host an auction for the necessary generation rather than jump to a negotiated deal. While this process might seem long, the negotiated deals in the region are five or more years in development on average and do not guarantee an affordable tariff.

ON-GRID CONNECTIONS

EAEP successfully reached the life-of-program target for on-grid connections by making services available to utilities at a regional scale but also customizing them to their needs. EAEP recommends that future engagements with utilities for connections activities first assess the utility employees' capacity for grid planning.

CONDUCT NEEDS ASSESSMENTS. Before providing training, Power Africa should gauge the competency levels of the potential attendees and adjust presentation materials accordingly. Most utilities had a list of trainings that they wanted their staff to take, but after preassessments, EAEP found that many of the participants did not have the necessary background or skills to effectively use the training. EAEP recommends working with utility leaders to co-develop the training, select the participants, and build the curriculum together, preferably with a train-the-trainer component for sustainability.

SECURE SENIOR-LEVEL BUY-IN. EAEP found success by working with the senior or central offices of the utilities to communicate across departments and regions. Once senior-level buy-in was secured, EAEP identified individuals within the utilities who reported on connection figures and engaged frequently with them to secure quarterly figures. In some instances, the “connections point of contact” at a utility departed or transitioned to another department, causing delays in figure reporting, given that these points of contact were not standardized across utilities. EAEP recommends that Power Africa projects engage early and often with utility executive managers to keep them apprised of what the program is all about, as well as the benefits it will bring to the utility. Power Africa should focus first on activities that will not be contentious and that can build appetite for connections reporting. EAEP experienced multiple utilities that were not aware that USAID technical assistance was free, which is a big selling point for the utilities’ managers. All EAEP asked for in return was routine reporting on connections activities.

CONSIDER EMBEDDING ADVISORS. EAEP also found that each utility’s organization was unique in terms of where distribution network planning took place, and how it was done. For example, even large utilities typically had groups of no more than five people responsible for GIS and they often were overwhelmed by requests and possibly not available for longer-term, in-depth training, given the demands of the job. EAEP found that utilities were open to embedded advisors or longer-term training programs that did not demand week-long or greater commitments for training. For utility performance improvement, EAEP chose to embed technical advisors within several utilities. This approach not only ensured the visibility of the program and its personnel within the utility, but also allowed EAEP’s advisors to learn the intricate inner workings of the utility and how to best support their strategic plans.

SUPPORTING FINANCIAL CLOSE AND COMMISSIONING FOR TRANSMISSION

As mentioned in the challenges, transmission support in EAEP was delayed for multiple reasons but there were successes that supported the commissioning and financial close for transactions.

TARGET LINES FOR FINANCIAL CLOSE. EAEP recommends that Power Africa’s USAID interventions assess or initiate strategic alignments with infrastructure donors such as AfDB, the Agence Française de Développement, or the World Bank before endorsing national or cross-border lines for support. EAEP targeted national lines in Rwanda and Kenya for financial close, and although this approach succeeded in Rwanda, the lines in Kenya had not yet reached financial close as EAEP ended. In Rwanda’s case, the Government of Rwanda worked with donors to identify the costs to achieve their transmission goals, and the AfDB pledged to finance several transmission lines, under the condition that feasibility studies, ESIA, and RAPs be prepared, and that international standard tender documents be produced for a competitive procurement process. EAEP stepped in to support REG to develop the studies and produce the necessary documents for procurement. EAEP’s technical assistance still took two years to complete, however, and the lines reached financial close after AfDB approved the tender documents and REG awarded a contract for the EPC. In Kenya, EAEP worked with KETRACO to support three lines as PPPs through financial training and cost analysis. KETRACO was in earlier-stage engagement with Africa50 for funding but still had outstanding conditions and terms to agree on for support. Despite EAEP support since 2019, the KETRACO PPP lines still have steps to complete before financial close, which is anticipated given the new financing model.

PROVIDE ENVIRONMENTAL SUPPORT BEFORE COMMISSIONING. EAEP was able to successfully count 308 km of transmission commissioned with KETRACO after conducting an environmental and social impact audit of the right-of-way (wayleave) of a critical line. As part of the commissioning procedures, KETRACO needed to demonstrate that the ESIA had been enforced across the development. EAEP’s advisors supported the audit and the institutionalization of the Environmental and Social Management Framework within the organization. EAEP recommends that this type of support be offered during discussions with utilities for commissioning lines or planning for financial close.

CONTINUE TO PROVIDE CROSS-BORDER TRAINING AND COORDINATION. Despite EAEP having supported Objective 4 across the region since 2018, as the program ended, country stakeholders were still requesting basic training and simulations on cross-border power trade. It is critical to address country stakeholders' unfamiliarity with financial close and commissioning of interconnectors when there is turnover in ministries and utilities, and also to work to put EAEP in front of the country counterparts. Additionally, EAEP recommends that Power Africa continue to engage with donor working groups and with utilities on their early-stage support needs and then facilitate prompt technical or legal assistance from within the donor community.

TRENDS FOR THE REGION

Over the past four years, energy sector stakeholders shifted priorities away from building generation to attract industry and connect people, and toward increasing demand and affordability to retain customers. EAEP recommends that Power Africa integrate the following trends into future programming.

GROWING EMPHASIS ON AFFORDABILITY. EAEP supported two regulatory workstreams, one in Uganda and the other in Rwanda, focused on lowering the costs of infrastructure. Both regulators have been working toward cost-reflective tariffs, which are critical for attracting international investment—but now must bring their prices down to a range their customers can afford. EAEP recommends that Power Africa support countries to better understand their tariff methodologies and pricing modules. Power Africa can support programs for regulators to work with utilities to agree on market costs, look for opportunities to save, and build comfort with ministerial or other government bodies. The alternative of low tariffs would increase demand, but these low rates can create a cycle of financial instability for utilities that ultimately hurts customers.

DEVELOPING INTEREST IN NEWER TECHNOLOGY AND COMMERCIAL AND INDUSTRIAL USE. Toward the end of the program, EAEP received requests for input on utility-based technology developments that are newer to the region but have had some limited successes abroad, such as grid-scale battery energy storage, green ammonia/hydrogen conversion, and scaling up of e-mobility (electric vehicles). All these areas could be successful in the region and help utilities to lower generation costs while increasing demand with greener supply chains. The biggest hindrance to their introduction is affordable financing. EAEP recommends that Power Africa work with energy stakeholders to invest in pilot projects that could show financiers whether success is possible in an East African context. Power Africa has seen the success of e-mobility technologies in Rwanda starting to be replicated and financed in Kenya and Uganda; the same approach should be taken for other technologies to build the comfort of financial institutions.

PLANNING WILL BECOME EVEN MORE IMPORTANT. EAEP started with a heavy emphasis on improving planning, predominantly with grid management, generation planning, and even master planning. Even in the last year of the program, requests continued to come in for capacity building on transmission, distribution, generation, and ancillary service planning. EAEP recommends that Power Africa continue to invest in planning because financiers often want to see how a transaction fits into the country's big-picture plan, especially a plan that is based on evidence.

EAEP MEL RESULTS

All data in this subsection are reported with December 2018 as the starting point and September 2023 as the endpoint.

Number of MW from transactions that have not yet achieved financial close (PA #6)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
4,651 MW	4,861.34 MW	104.5 %

Number of transactions that have not yet achieved financial close (PA #7)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
79 transactions	77 transactions	97.5%

Generation capacity reached financial close: Number of MW from transactions that achieved financial close (PA #8)—Generation

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
1,500 MW	294.65 MW	19.6%

Generation capacity reached financial close: Number of MW from transactions that achieved financial close (PA #8)—Transmission

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
2,300 MW	0 MW	0%

Transactions reached financial close: Number of transactions that have achieved financial close (PA #9)—Generation + Transmission

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
41 transactions	9 transactions	22%

Generation capacity commissioned: Number of MW that have been commissioned (PA #10)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
750.5 MW	481.8 MW	64.2%

Transactions commissioned: Number of transactions that have been commissioned (PA #11)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
13 transactions	8 transactions	61.5%

Number of competitive procurement processes for new generation capacity implemented with USG Power Africa assistance (PA #24)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
21 processes	13 processes	61.9%

Electricity access: Number of new grid actual direct connections (PA #3) (including tariff class disaggregate)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
4,000,000 connections	5,176,390 connections	129.4%

ATC&C losses reduced as a result of EAEP support

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
5 percentage-points	23 percentage-points	460%

Revenue by utilities increased through EAEP support

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
12 percentage-points	36.54 percentage-points	304.5%

Number of additional TWh of cross-border power traded among East African countries through EAEP support

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
2 TWh	2.38 TWh	119%

Regional electricity trade: New electricity capacity committed for regional trade through bilateral agreements (PA #12) through EAEP support

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
484 MW	200	41.3%

Training and capacity building activities: Number of people trained in technical energy fields supported by EAEP (PA #18)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
4,131 people	4,624 people	111.9%

Kilometers of power lines constructed or rehabilitated: The sum of linear kilometers of new, reconstructed, rehabilitated, or upgraded transmission and distribution lines that have been energized, tested, and commissioned/ installed with EAEP support (PA #19)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
1,324.6 km	1,530.19 km	115.5%

Kilometers of transmission and distribution power lines reached financial close with EAEP support (PA #20)

TOTAL TARGETS (DEC 2018 – SEP 2023)	CUMULATIVE ACTUAL (DEC 2018 – SEP 2023)	% ACTUAL VS. TARGET (DEC 2018 – SEP 2023)
496.7 KM	109 KM	21.9%

Policy reforms: Number of laws, policies, regulations, or standards to enhance energy sector governance formally proposed, adopted, or implemented as supported by EAEP assistance (PA #23)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
83 reforms	95 reforms	114.5%

Number of private sector companies, government entities, and utilities that establish and/or implement new or revised existing community-engagement plans, policies, or strategies with EAEP Power Africa assistance (PA #25)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
13 entities	10 entities	76.9%

Number of host-government power sector strategic planning documents adopted, implemented, or revised, with EAEP support (PA #26)

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
24 documents	32 documents	133.3%

Number of women interns who receive EAEP gender and capacity building support

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
264 interns	256 interns	97%

Increased membership of women in national energy networks through EAEP support

TOTAL TARGET	CUMULATIVE ACTUAL	PERCENT ACTUAL VS. TARGET
28 percentage-points	137 percentage-points	489.3%

ACRONYMS AND ABBREVIATIONS

ABER	Agence Burundaise de l'Électrification Rurale (rural electrification agency, Burundi)
AfDB	African Development Bank
Africa50	Africa50 Infrastructure Fund
ARE	Agence de Régulation de l'Électricité (Electricity Regulatory Agency, DRC)
AREEN	Autorité de Régulation des Secteurs de l'Eau Potable et de l'Energie (regulatory agency, Burundi)
ATC&C	aggregate technical, commercial, and collections (losses)
BEC	Berbera Electricity Company (Somalia)
BESS	battery energy storage system
BTFA	bilateral trade framework agreement
CLDP	Commercial Law Development Program (of the US Department of Commerce)
COVID-19	coronavirus disease 2019 (SARS-CoV-2)
CREC	CR Energy Concepts (CREC Energy)
DFC	US International Development Finance Corporation
DRC	Democratic Republic of the Congo
EAEP	East Africa Energy Program
EAPP	Eastern Africa Power Pool
EARP	Electricity Access Rollout Program (Rwanda)
ECP	Electricity Connections Policy
EDCL	Energy Development Corporation Ltd. (Rwanda)
EEA	Ethiopian Energy Authority
EEP	Ethiopian Electric Power
EEU	Ethiopian Electric Utility
EKT	Ethiopia–Kenya–Tanzania
EPC	engineering, procurement, and construction
EPRA	Energy and Petroleum Regulatory Authority (Kenya)
ERA	Electricity Regulatory Authority (Uganda)
ESIA	environmental and social impact assessment
ESP	electricity service provider
EUCL	Energy Utility Corporation Ltd. (Rwanda)
EWiEn	Ethiopian Women in Energy (network)
GDC	Geothermal Development Company
GIS	geographic information system
GWh	gigawatt hour
HICD	human and institutional capacity development
IFC	International Finance Corporation
IP3	Institute for Public–Private Partnerships
IPP	independent power producer
IR	Intermediate Result
JICA	Japan International Cooperation Agency
KenGen	Kenya Electricity Generating Company Ltd.
KETRACO	Kenya Electricity Transmission Company Ltd.

KIL	Kilembe Investments Ltd.
km	kilometer
KRECS	Kyegegwa Rural Electricity Cooperative Society Ltd. (Uganda)
kV	kilovolt
kWh	kilowatt-hour
LCPDP	least-cost power development plan
LEAP	low-emissions analysis platform (software)
MEL	monitoring, evaluation, and learning
MEMD	Ministry of Energy and Mineral Development (Uganda)
MEMWR	Ministry of Energy, Minerals, and Water Resources (Puntland, Somalia)
MoEM	Ministry of Energy and Minerals (Somaliland)
MOU	memorandum of understanding
MoWIE	Ministry of Energy, Water, and Irrigation (Ethiopia)
MW	megawatt
MWh	megawatt hour
N/A	not applicable
NARUC	National Association of Regulatory Utility Commissioners
NECSOM	National Energy Corporation of Somalia
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
O&M	operations and maintenance
PA	Indicator code: Power Africa
PACO	Power Africa Coordinator's Office
PATRP	Power Africa Transactions and Reforms Program
PATT	Power Africa Tracking Tool
PAUESA	Power Africa Uganda Energy Sector Accelerator
PEDA	Puntland Electricity Development Agency (Somalia)
PEPCO	Puntland Electric Power Company
PESRM	Power Africa Environmental and Social Review Methodology
POWERHer	network of Rwandan women energy engineers
PPA	power purchase agreement
PPP	public-private partnership
PPPDG	Public-Private Partnership Directorate General (Ethiopia)
PSS@E	Power System Simulator for Engineering
PSS@SINCAL	Siemens proprietary simulation software for analysis and planning of electric and pipe networks
PTF	Partenaires Techniques et Financiers
PUE	productive use of energy
PV	photovoltaic
QTAT	qualified transaction assistance tool
RAP	resettlement action plan
REA	Rural Electrification Agency (Uganda)
REG	Rwanda Energy Group
REGIDESO	Régie de Production et de Distribution de l'Eau et de l'Electricité (national utility, Burundi)
REP	Rural Electrification Programme (Uganda; formerly the Rural Electrification Agency of Uganda; now a division of the Ministry of Energy and Mineral Development)

RFP	request for proposals
RTI	RTI International (registered trademark and trade name of Research Triangle Institute)
RURA	Rwanda Utilities Regulatory Authority
SCADA	supervisory control and data acquisition (system)
SEforALL	Sustainable Energy for All (forum)
SNEL	Société Nationale d'Électricité (DRC National Electricity Company)
TANESCO	Tanzania Electric Supply Company Ltd.
TMGO	Tulu Moyo Geothermal Operations
TWh	terawatt hour
UETCL	Uganda Electricity Transmission Company Ltd.
USAID	United States Agency for International Development
USG	United States Government
WIRE	Women in Rwandan Energy
ZECO	Zanzibar Electricity Corporation
ZESTA	Zanzibar Energy Sector Transformation and Access Project
ZURA	Zanzibar Utilities Regulatory Authority

