

Uganda Country Window:

Energy System Transformation Outlook (ESTO)



GET.transform is co-funded by



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ABOUT GET.transform



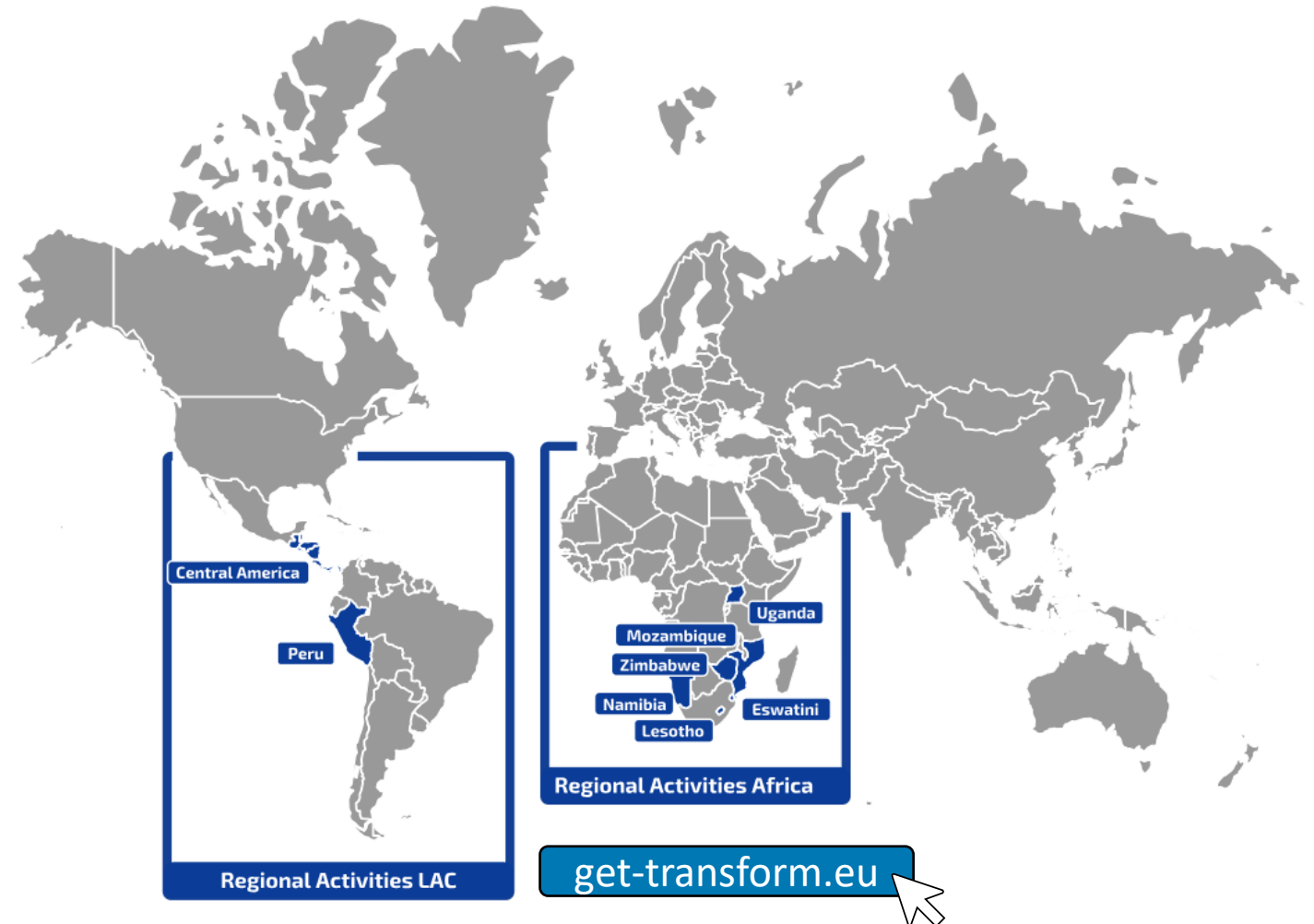
Abbreviations

Term	Meaning
EDT	Electricity Disputes Tribunal
EMDS	Energy Mix Diversification Strategy
ERA	Electricity Regulatory Authority
GDP	Gross Domestic Product
LCEEP	Least Cost Electrification Expansion Plan
MEMD	Ministry of Energy and Mineral Development
NDP III	National Development Plan III
NES	National Electrification Strategy
PUE	Productive Use of Energy
REMP	Rural Electrification Master Plans

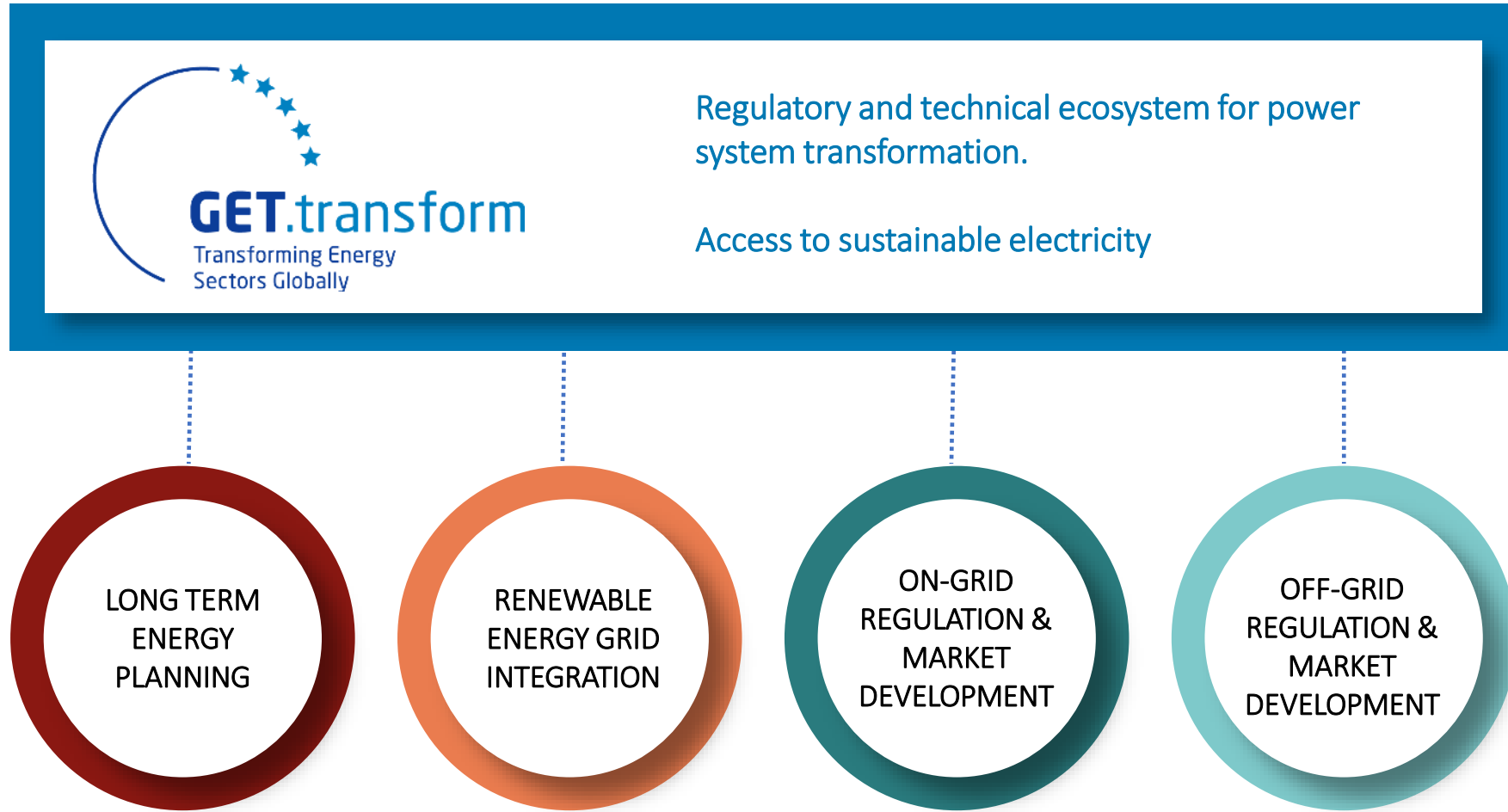
Term	Meaning
RfS	Request for Service
SPCC	Sector Planning and Coordination Committee
TA	Technical Assistance
ToR	Terms of Reference
UBOS	Uganda Bureau of Statistics
UEDCL	Uganda Electricity Distribution Company Limited
UEGCL	Uganda Electricity Generation Company Limited
UETCL	Uganda Electricity Transmission Company Limited
UETCL GDP	UETCL Grid Development Plan

What is GET.transform?

- Technical assistance (TA) and capacity building for the **public sector** to establish conducive policy and investment frameworks for the transition of the energy sector
- Hub of expertise with > 50 renowned (inter)national energy experts
- Implementation through **regional** and **country windows** with expert staff on the ground incl. secondments
- **Scaling across countries** through collaboration with regional institutions and other TA initiatives



GET.transform Workstreams



Our Approach to Technical Assistance



LONG TERM ENERGY PLANNING

Developing **integrated energy and power system investment plans**, outlining development paths for energy sector transformation



RENEWABLE ENERGY GRID INTEGRATION

Updating of **technical power system planning and operational procedures** that enable the operation of renewable energy dominated power systems



ON-GRID REGULATION & MARKET DEVELOPMENT

Supporting **institutional reforms** that allow for new market actors and renewable energy participation: market model design, non-discriminatory grid access, cost-reflective services
Design and management of **solicited auctions** as well as **market-driven mechanisms** for procuring on-grid energy



OFF-GRID REGULATION & MARKET DEVELOPMENT

Supporting **off-grid electrification planning** and data management frameworks
Developing mini-grid **regulatory frameworks** and technical standards and designing award mechanisms for **procuring off-grid energy**

2

UGANDA ESTO

Foreword

The purpose of the Energy System Transformation Outlook (ESTO) is to document a **high-level summary of the electricity landscape** in Uganda and to present the outcome of a high-level overview and assessment that followed a 'review, interview, identify' approach.

REVIEW PHASE

Focused on a **desk-top review** of a multitude of publicly available energy and power sector publications.

1

INTERVIEW PHASE

Focused on further discussions with the key public sector actors (MEMD, ERA, UETCL, etc) to identify potential needs, opportunities and gaps, and culminated in the public sector actors formally expressing their key priority needs.

2

PHASES

IDENTIFY PHASE

The identify phase focused on defining potential technical assistance and capacity building projects that will strongly support the power transition in Uganda, and that GET.transform is well positioned to support. It also provides a starting point for further engagement with the public sector and other donor and development agencies.

3

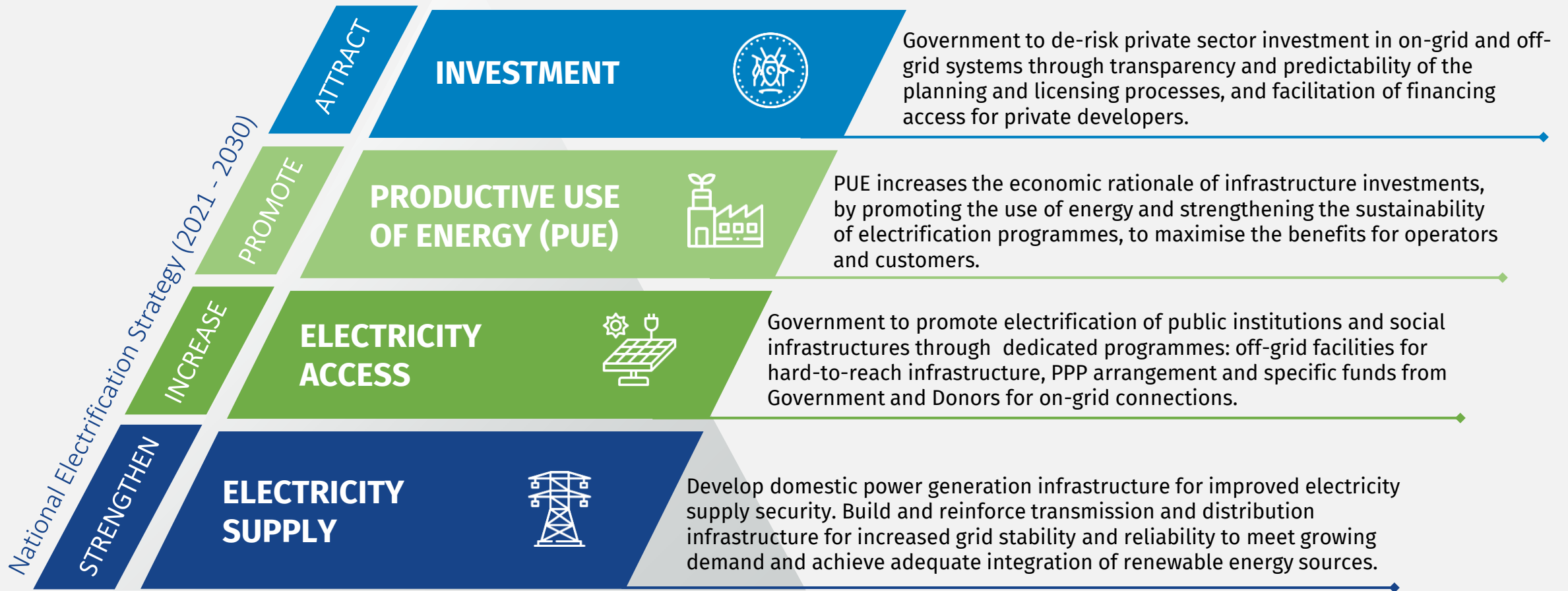
The ESTO is not a formula of what should be done by the country or the public sector actors.

The ESTO is a means of obtaining feedback to enrich our understanding of the power sector in Uganda and to identify support activities and synergies with other donor and development agencies.

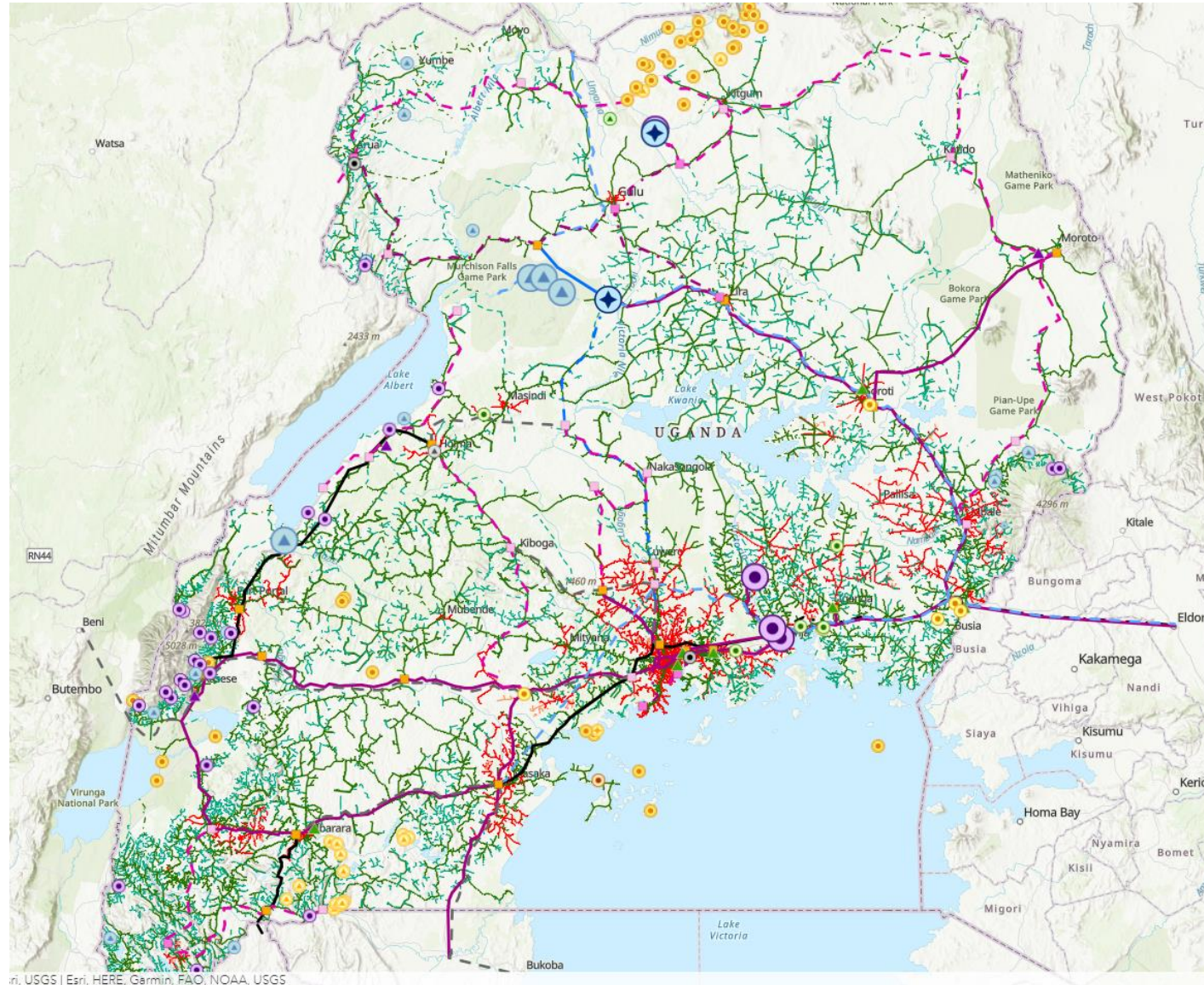
Uganda's Energy Vision

“Achieve universal access to sustainable, affordable and quality energy services for all Ugandans by 2040”.

National Energy Policy 2023



Energy Access: On-Grid and Off-Grid



Transmission Substations

- Operational
- Under Construction
- At Planning Stage

Power Transmission Lines

- 66 kV, Operational
- 132 kV, Operational
- 220 kV, Operational
- 400 kV, Operational
- - - 132 kV, Under Construction
- - - 220 kV, Under Construction
- - - 400 kV, Under Construction
- - - 132 kV, At Planning Stage
- - - 220 kV, At Planning Stage
- - - 400 kV, At Planning Stage

Distribution Lines - 33kV

- 33 kV, Operational
- - - 33 kV, Under Construction
- - - 33 kV, Proposed

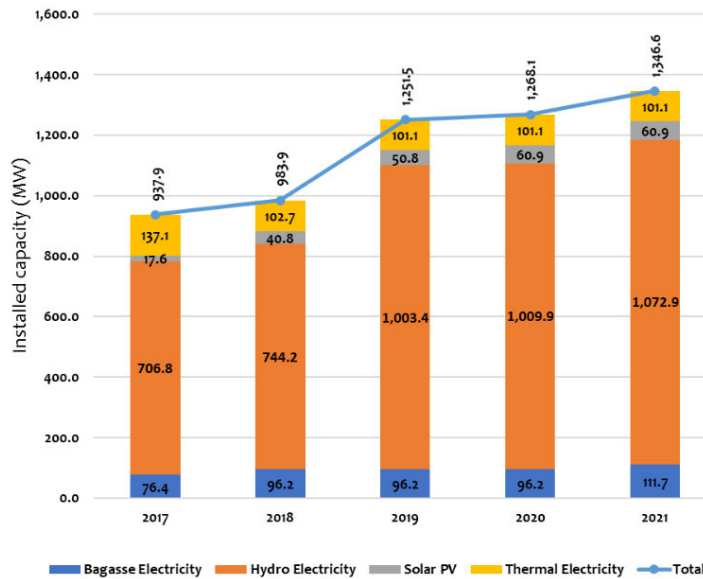
Distribution Lines - 11kV

- 11 kV, Operational
- - - 11 kV, Under Construction
- - - 11 kV, Proposed

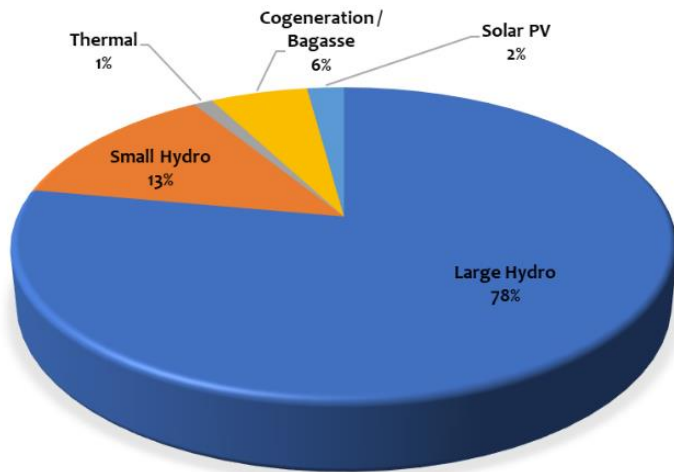
Source: *MEMD – Status of Electrification in Uganda (2022)*

Electricity Snapshot

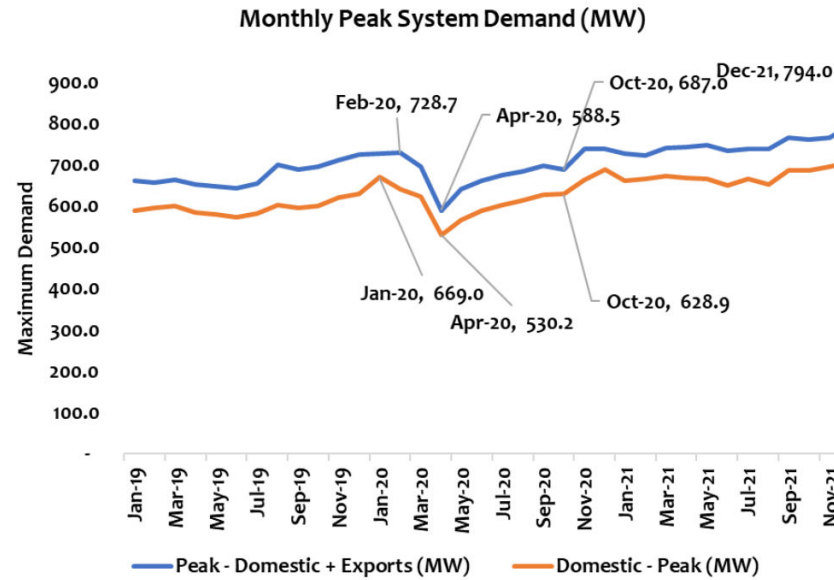
Generation Installed Capacity (MW)



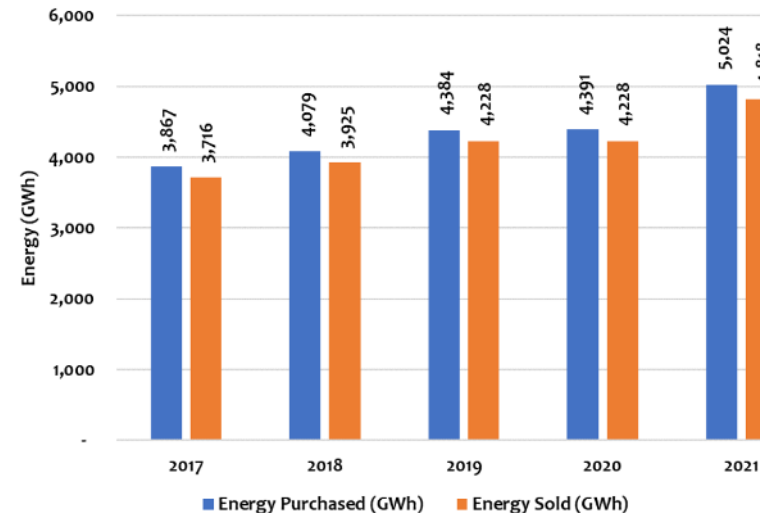
Generation Mix



Installed Capacity vs Peak Demand



Energy Purchases and Sales (2021)



Source: ERA

Key Figures

Economy

Population: 44.2 million ([UBOS 2022](#))

GDP per capita (current US\$): 1,007 ([UBOS 2022](#))

GDP growth: 4.7% ([UBOS 2022](#))

Environmental

CO₂ emissions: 1.06 metric tons per capita ([UNEP 2022](#))

Electricity carbon intensity: 44.1-53.9 gCO₂eq. / kWh ([2021](#))

Energy

Per capita electricity consumption: 109 kWh/person ([UBOS 2020](#))

Access to electricity: 57% ([UBOS 2019](#))

Grid electrification: 19% ([UBOS 2022](#))

Market Segments in Uganda

Market Segment	On-Grid (Densification)	On-Grid (Grid Extension)	Off-Grid (Solar Mini-Grids)	Off-Grid (Stand-Alone Solar Systems)
Total Investment required for universal access in the next 10 years (up to 2030)				
Estimated Market Potential (USD million)	2,509	1,398	356	418

Status of Electricity Sector Transformation in Uganda

The restructuring of Uganda's electricity supply industry (ESI) started in 1999, with the unbundling of the sector.

The unbundling introduced private sector participation through independent power producers and concessioning of distribution network assets. The restructuring resulted in several achievements, e.g. increased renewable generation capacity, reduced technical losses and increased customer connections.

However, challenges such as high returns on private investments, limited private interest in rural electrification, and fragmentation of distribution concessions have led to the proposed second sector reforms of the ESI.

Key legal and policy instruments developed to implement the 2nd ESI reforms include the Electricity (Amendment) Act 2023 and the Energy Policy 2023.

The development of accompanying regulatory instruments is underway, including:

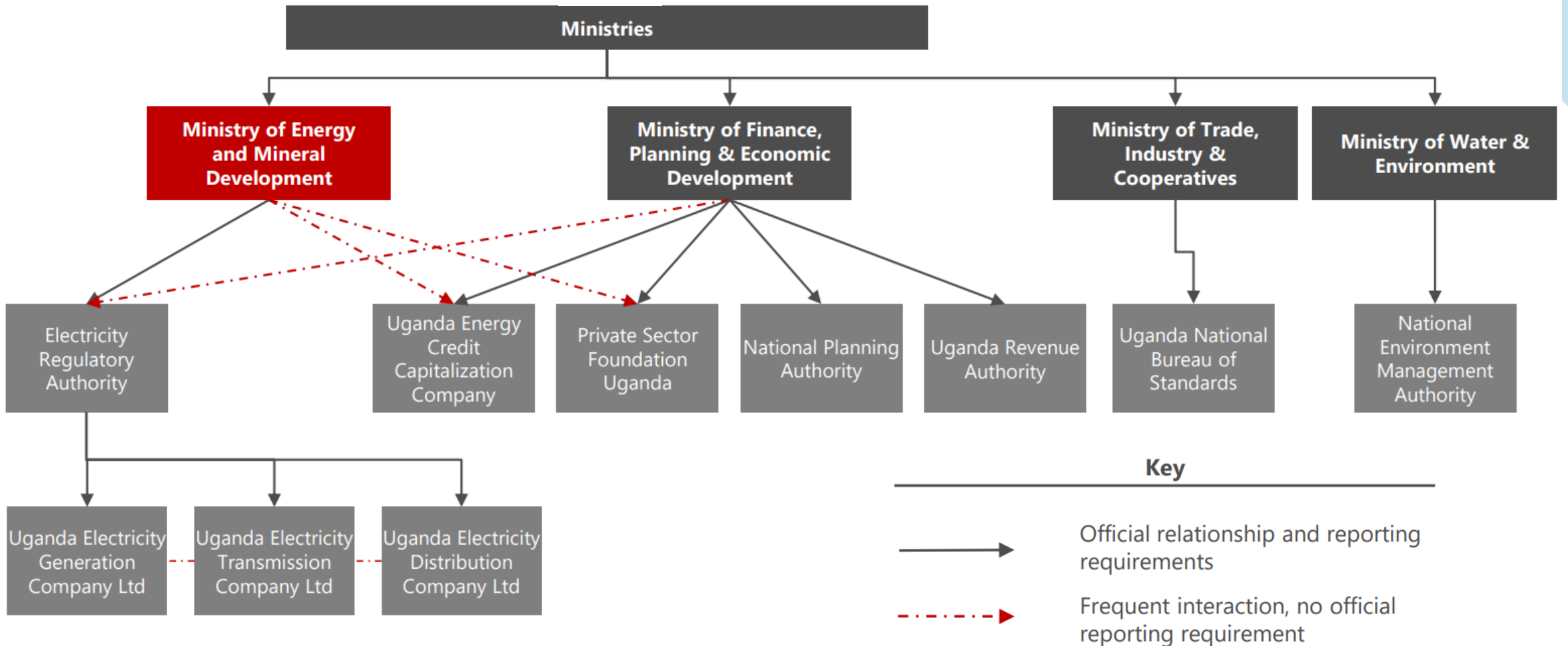
- Direct purchase from the transmission grid,
- Net metering regulations,
- Independent power transmission framework
- Regulations on long distribution feeders, and
- Mini-grid technical standards.

Sector Reforms





Restructuring	2001 Vertical Unbundling of UEB and Rural Electrification Board 1999 Rural Electrification Fund	2003 Rural Electrification Agency			2021 REA merged back into Ministry 2021 Cabinet decision to re-bundle sector into one company Uganda National Electricity Company (UNEC)
Private Sector Participation		2005 Concession 20-Yr Umeme Ltd 2003 Concession 20-Yr Eskom Ltd	2006 Umeme concession restructured	2012 Bujagali IPP 250MW online	2023 Eskom Concession comes to natural end
Regulation and Tariffs	2000 Electricity Regulatory Authority (ERA)	2003 Electricity Disputes Tribunal 2003 Quality of service code, Primary Grid Code, Safety code	2007 Renewable Energy Feed in Tariff (REFiT)	2012 REFiT review	2020 Electricity (Isolated Grid Systems) regulation
Legislation & Policy	1999 Electricity Act	2002 National Energy Policy	2007 Renewable Energy Policy	2011 Power Sector Investment Plan (PSIP)	2023 new National Energy Policy 2022 Electricity (amendment) Act 2018 Electricity Connections Policy
Period	1998 - 2001	2002 - 2005	2006 - 2010	2011 - 2016	2017- 2023

Source: GET.transform




Government Stakeholders in the Power Supply Market



Key Stakeholders in Current Power Supply Market

Institution		Description
Ministry of Energy and Mineral Development (MEMD)		<p>The Ministry of Energy and Mineral Development (MEMD) provides overall policy direction and guidance in the development and exploitation of energy, mineral, oil and gas resources.</p> <p>The Ministry also acquires, processes and interprets technical data to establish the energy resource potential of the country. It is also mandated to inspect, regulate, monitor and evaluate activities of private companies in the energy sector to ensure rational and sustainable development, exploitation and use of energy.</p>
Electricity Regulatory Authority (ERA)		<p>The Electricity Regulatory Authority (ERA) is a statutory body that was established under the Electricity Act, 1999 (Cap. 145) as an independent regulator of the power sub-sector. Its main function is to regulate the generation, transmission, distribution, sale, export and import of electricity. ERA is also responsible for issuing and regulating compliance with licenses, establishing tariff structures, approving rates of charges and terms and conditions for electricity services.</p>
Electricity Disputes Tribunal (EDT)		<p>The Electricity Disputes Tribunal (EDT) was established by the Electricity Act, 1999 to undertake arbitration of cases in the electricity sector. Stakeholders that are dissatisfied with ERA's decisions may appeal to the tribunal.</p>
Uganda Energy Credit Capitalization Company (UECCC)		<p>The Uganda Energy Credit Capitalisation Company (UECCC) was operationalized in 2009 to manage and administer the Uganda Energy Credit Capitalization Trust. A major objective of the Trust is to provide financial, technical and other support to unlock renewable energy and/or rural electrification projects for development.</p>

Key Stakeholders in Current Power Supply Market

Institution		Description
Uganda Electricity Generation Company Ltd. (UEGCL)		UEGCL is a state-owned company responsible for; establishing, acquiring, maintaining and operating electricity generation facilities, and promoting research and development.
Uganda Electricity Transmission Company Ltd. (UETCL)		UETCL is a state-owned company responsible for operating the transmission infrastructure above 33 kV. It is also responsible for the transmission, dispatch, bulk electricity purchases from generators and the export and import of electricity. Another function under transmission is coordinating the power system to achieve balance between supply and demand.
Uganda Electricity Distribution Company Limited		UEDCL is a state-owned company that owns and operates the grid-connected electricity distribution infrastructure operating at 33 kV and below. It is responsible for the operation and maintenance of non-concessioned distribution network infrastructure, as well as the retail function that includes metering and billing.

Regulatory and Policy Instruments

Legislation



The Electricity (Amendment) Act, 2023
The Electricity Act, 1999
Public Finance Management (Amendment) Act 2015
The National Environment Act 2019

Regulations



Electricity Isolated Grid System Regulation 2020
The Electricity (Code of Quality of Service) Regulations, 2020
The Electricity (primary Grid Code) Regulations 2003
The Electricity (Tariff Code) Regulations, 2003

Policies



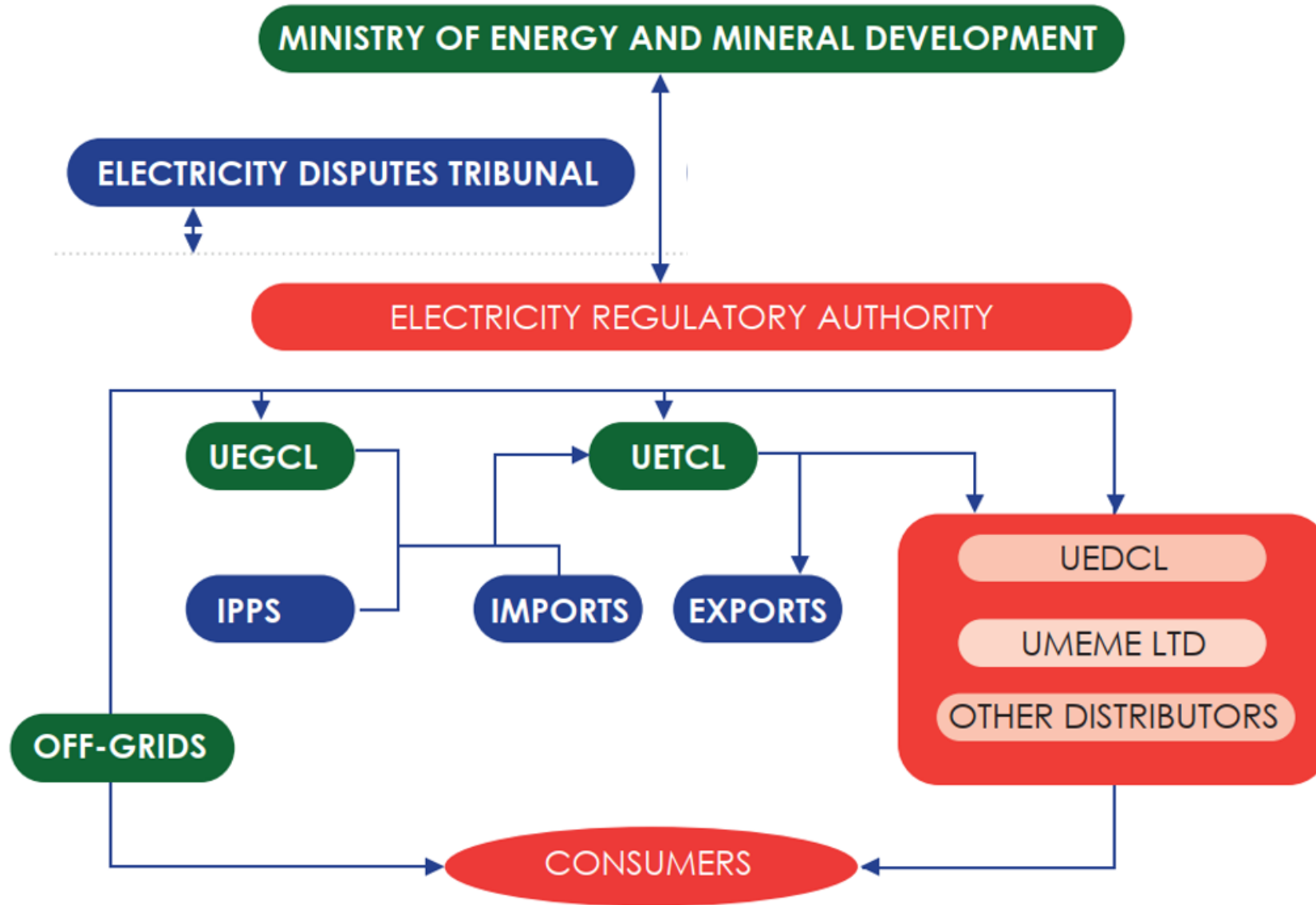
The Energy Policy of Uganda 2023
The Electricity Connections Policy 2018
The Uganda National climate Change Policy 2015
The Renewable Energy Policy for Uganda 2007
The Energy Policy of Uganda 2002

Key Takeaways

Uganda has one of the most robust electricity supply industries which has undergone changes both from a policy and regulatory front.

Overall, the electricity supply industry in Uganda is a key enabler for achievement of Uganda's Vision 2040 and sustainable development goals.

Market Structure



GET.transform Advisory Services



LONG TERM
ENERGY PLANNING



RENEWABLE ENERGY
GRID INTEGRATION



ON-GRID REGULATION &
MARKET DEVELOPMENT



OFF-GRID REGULATION &
MARKET DEVELOPMENT

Overarching
Activities

Capacity Building

Technical Assistance

Key Topics

Planning Governance

Grid Codes

Power Sector Strategy

Integrated Electrification
Planning

Scenarios and Modelling

Transmission System
Planning and Operation

Governance

Mini-Grid Framework

Adoption and Implementation

Distribution System
Planning and Operation

Market Mechanisms

Public Mini-Grid Incentives

State of Play



LONG TERM ENERGY PLANNING



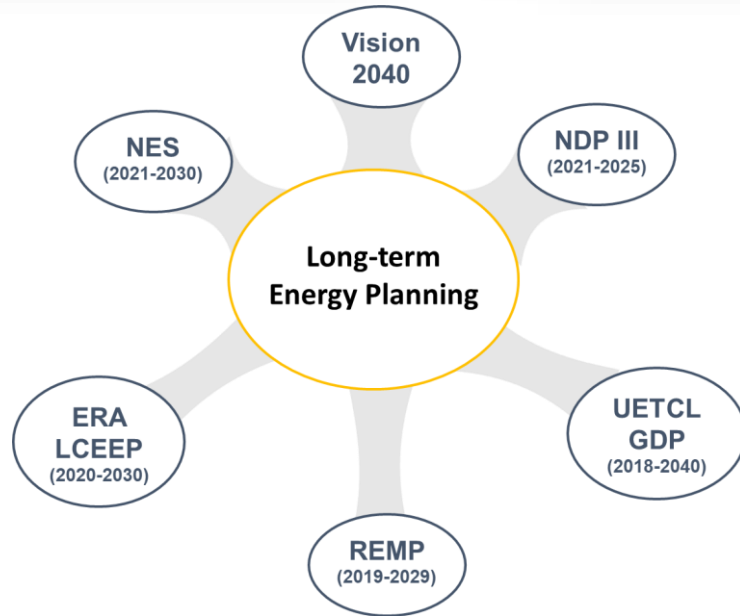
RENEWABLE ENERGY GRID INTEGRATION



ON-GRID REGULATION & MARKET DEVELOPMENT



OFF-GRID REGULATION & MARKET DEVELOPMENT



Electricity sector long-term planning documents
(Source: GoU)

Support Projects Identified by Public Sector Actors

- Support for the development of modelling tools for long-term energy planning to validate the NDP and Vision 2040 targets
- Support the development of centralised energy data monitoring and dissemination within MEMD and across Government agencies
- Support to Sector Planning and Coordination Committee (SPCC) for improved sector coordination
- Support inter-ministerial coordination across interrelated sectors: strategy and linkages between Energy, Health, Education, WASH and Gender
- Study on Uganda's readiness for regional integration

CHALLENGES

- Lack of a fully coordinated integrated sector planning framework
- Funding limitation to make and implement long-term plans in (smaller) utilities
- Limited tools and models for long-term planning available in MDAs
- Lack of a centralised energy data management and monitoring system across sectors (within the energy sector and across different Ministries and agencies, e.g. NPA)
- Inadequate coordination and communication between multiple development partners and MEMD on planned support initiatives for the energy sector

State of Play



LONG TERM
ENERGY PLANNING



RENEWABLE ENERGY
GRID INTEGRATION



ON-GRID REGULATION &
MARKET DEVELOPMENT



OFF-GRID REGULATION &
MARKET DEVELOPMENT



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Support Projects Identified by Public Sector Actors

- Customisation of the standardised wheeling and power sales agreements to the technical requirements of rural grids for renewable energy integration.
- Additional support to direct purchase, modification of single buyer model, and direct exports

CHALLENGES

- Inadequate infrastructure to evacuate power from embedded renewable energy generators.
- Standardized wheeling agreements developed by ERA are not fully suited to the realities of distribution companies.
- Lack of a regulatory framework to enable generation companies to sell excess power to **direct purchasers**.

State of Play



LONG TERM
ENERGY PLANNING



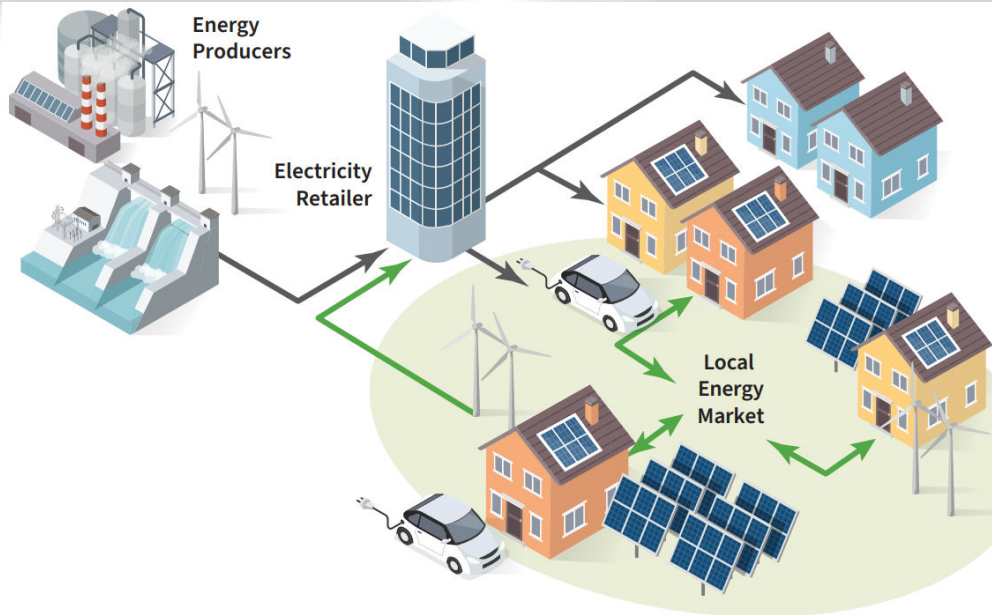
RENEWABLE ENERGY
GRID INTEGRATION



ON-GRID REGULATION &
MARKET DEVELOPMENT



OFF-GRID REGULATION &
MARKET DEVELOPMENT



Local Energy Market Dynamics (Source: RMI)

Support Projects Identified by Public Sector Actors

- Review of the grid code regulations in line with the investment limitations on rural distribution grids
- Capacity building of generation companies on direct sales of excess capacity to private third-party entities, and development of according guidelines
- Development of more automated reporting tools to ease the reporting burden for utilities
- Capacity building on the use of Artificial Intelligence to curb vandalism of electricity infrastructure
- Support to distribution companies on Long-term planning for network performance improvement and on-grid regulatory compliance

CHALLENGES

- The grid code regulations are too stringent and onerous for smaller utilities, including UEDCL
- Personnel limitations on utilities due to tariff constraints on hiring new staff
- High reporting requirements on utilities with limited personnel budgets
- Re-integration of smaller utilities into UEDCL may present management challenges if not well coordinated

- High unreliability of the grid due to faults and outages
- Limited capacity of generation companies to take advantage of direct purchases introduced by the amended Electricity Act
- Rampant vandalism of electricity infrastructure

State of Play



LONG TERM
ENERGY PLANNING



RENEWABLE ENERGY
GRID INTEGRATION



ON-GRID REGULATION &
MARKET DEVELOPMENT



OFF-GRID REGULATION &
MARKET DEVELOPMENT



Mini-grid in Lamwo, Northern Uganda (Source: [New Vision](#))

Support Projects Identified by Public Sector Actors

- Support to the development environmental regulations and standards for e-waste from renewable energy mini-grids
- Study on the use of DC low voltage networks for solar PV networks. Capacity Building on off-grid Renewable Energy market
- Recommendations for reviewing IGS regulations, specifically on grid arrival compensation
- Definition of a more structured process for mini-grid applications (solicited / unsolicited)
- Provide analyses and recommendations to guide decisions regarding the application of the mini-grid tariff cap; financial modelling tool for financial planning, subsidy calculation and tariff setting of mini-grids also including PUE costs
- Training on mini-grid sizing and demand forecasting taking into account PUE activities

CHALLENGES

- The mini-grid tariff ceiling has created uncertainty in the mini-grid sub-sector
- Lack of maintenance of off-grid solar systems installed in public institutions, e.g., schools, hospitals
- Lack of clear and binding environmental regulations and standards on e-waste

Prioritisation of Technical Assistance Options



LONG TERM ENERGY PLANNING

Support the development of a centralised energy data monitoring and dissemination system within MEMD and across Government agencies

Support enhanced sector coordination through capacity building of the Sector Planning and Coordination Committee (SPCC) & GIS Working Group

Support for the development of a long-term strategy for the transition to smart grid technologies on rural distribution networks

Study on Uganda's readiness to integrate into the regional electricity power pool



RENEWABLE ENERGY GRID INTEGRATION

Customisation of the standardised wheeling framework for transport of electricity across networks, and the technical interconnection requirements for Distributed Generation

Review of the grid code regulations in line with the investment limitations on rural distribution grids



ON-GRID REGULATION & MARKET DEVELOPMENT

Additional support to direct purchase, modification of single buyer model, and direct exports

Capacity building of generation companies on direct sales of excess capacity to private third-party entities, and development of according guidelines

Support to distribution companies on grid distribution planning to enhance grid integration and improve regulatory compliance



OFF-GRID REGULATION & MARKET DEVELOPMENT

Review the IGS regulations, specifically on grid arrival compensation, and develop supporting amendments

Preparation of a mini-grid project development/market guideline

Provide analyses and recommendations to guide decisions regarding the application of a mini-grids tariff cap; Financial modelling tool for financial planning, subsidy calculation & tariff setting of mini-grids, also incorporating PUE costs

Support MEMD/ERA with the evaluation of mini-grid applications/bids, and with negotiations with prospective awardees

Integration of PUE activities in mini grid planning and site allocation.

*PRIORITY KEY



3

COUNTRY WINDOW SETUP



Country Window Setup

Country

- 1 x Country Coordinator
- The Uganda Country Window is implemented in alignment with the GIZ Energy & Climate Cluster of Uganda, premised at the Ministry of Energy and Mineral Development.

GET.transform HQ

- 1 x Africa Partnerships coordinator for overarching CW strategy support.
- 1 x Advisory Services Focal Point for LTEP and RE-Integration.
- 1 x Advisory Services Focal Point for Policy and Regulation.

Technical Assistance Partners

- Expert Consulting Pool for LTEP and RE-Integration.
- Expert Consulting Pool for Policy and Regulation.

Alignment with Other Development Partners

EU-SUPPORTED						
GET.TRANSFORM	EU-TAF	KfW	WORLD BANK	AFD	USAID	BGFA
Energy Policy and Regulation	Sustainable Energy	Off-Grid Systems, RES, Energy Efficiency, Regional Interconnections	Access, Infrastructure, Policy, Capacity Building	Generation, Transmission and Distribution	Productive Use of Energy, Mini-Grids, Powering Agriculture	Off-Grid Systems
<p>Long-Term Energy Planning</p> <ul style="list-style-type: none"> Developing a centralised energy data monitoring and dissemination system within MEMD <p>Renewable Energy Grid Integration</p> <ul style="list-style-type: none"> Technical interconnection guideline for embedded generation <p>On-Grid & Off-Grid Regulation and Market Development</p> <ul style="list-style-type: none"> Support to distribution companies on grid distribution planning Support MEMD/ERA with the evaluation of mini-grid applications/bids 	Support to MEMD to develop energy efficiency standards for public buildings	<p>Support to MEMD to develop renewable energy projects through GET FiT programme</p> <p>Support development of transmission lines from Uganda to Tanzania and DRC</p> <p>Support to MEMD for Pro Mini-Grids and GET Access mini-grid programmes</p>	<p>Capacity Building for connections and integrated planning</p> <p>Construction of the Lira – Gulu – Nebbi – Arua 132kV transmission line</p> <p>Grid extension to rural areas and last mile connections</p> <p>The upcoming Electricity Access Scaleup Project (EASP) will involve off-grid electrification with focus on PUE</p>	<p>Support to MEMD to develop the Energy Transition Plan (ETP) through the IEA</p> <p>Concessional loans for infrastructure in generation, transmission and distribution</p> <p>Support to UEGCL to do a financial sustainability study</p> <p>Support to UEGCL to develop a tool to optimize generation at the large hydro plants on R. Nile</p>	<p>Implemented the Utility 2.0 mini-grid project, with funding from the Rockefeller Foundation</p> <p>Promoting PUE in the agri-food business to break down barriers for productive use in agriculture</p> <p>Electrification of health centers using solar energy</p> <p>Developing a Collaboration Accelerator for PUE at MEMD, towards a PUE working group</p>	<p>Promotion of off-grid systems development through results-based financing of SHSs and mini-grids</p> <p>Technical Assistance for off-grid systems development</p> <p>Set up of the Off-Grid Task Force (OGTF), a dialogue and coordination platform for the off-grid sector</p>

Alignment with GLZ Energy and Climate Cluster Portfolio

GET.transform	Promotion of Energy and Energy Efficiency Programme (PREEEP)	Promotion of Mini-Grids for Rural Electrification in Uganda (DKTI)	Energising Development (EnDev)	Green People's Energy (GBE)	Promotion of Global Carbon Markets in Uganda/ East Africa (GCM)	Energy Solutions for Displacement Settings (ESDS)
Developing bankable policy and regulatory tools for accelerated energy sector transformation	Improving framework conditions for access to clean energy in rural and peri urban areas	Improving framework conditions for scaled up private sector RE mini grid electricity distribution	Facilitating market-based energy access to modern energy technologies & services	Facilitating expansion and securing supply of sustainable energy in rural Africa, with the participation of citizens and enterprises.	Strengthening capacities of public & private sector decision makers in use of new & existing market-based climate protection instruments for national & regional climate action	Support to UNHCR and MEMD in implementation of the Comprehensive Refugee Response Framework (CRRF) in the Energy Sector
<p>Developing a centralised energy data monitoring and dissemination system</p> <p>Technical interconnection guideline for embedded generation</p> <p>Support to distribution companies on grid distribution planning</p> <p>Support MEMD/ERA with the evaluation of mini-grid applications/bids</p>	<p>Policy support to MEMD; Integration of clean energy into sectoral strategies,</p> <p>Market development to promote the uptake of renewable energy and energy efficient (RE&EE) technologies</p> <p>Skills development for trainers and solar technicians, with vocational training institutions</p>	<p>Integration of mini grids in government electrification policies and plans</p> <p>Development and application of instruments for scaled up implementation of RE mini grids in relevant institutions</p> <p>Electrification of 40 villages with RE mini grids by a private sector partner</p>	<p>Promotion of productive & institutional use of off-grid solar & access to solar for last-mile customers</p> <p>Promotion of access to modern cooking technologies for households and businesses</p> <p>Promotion of modern energy access for refugees & host communities</p> <p>Strengthening the enabling environment for increased energy access</p>	<p>Technical training & skills development in decentralised renewable energy supply</p> <p>Promotion of decentralised renewable energy for productive use and for social institutions</p> <p>Fostering investments into decentralised renewable energy technologies</p> <p>Improving framework conditions and availing advisory services to facilitate an increase in RE investments</p>	<p>Providing public decision makers with policy advice on carbon market instruments</p> <p>Building private sector capacities on carbon markets to increase market readiness</p> <p>Supporting climate policy development</p> <p>Promoting regional cooperation on carbon markets and climate finance in Eastern Africa</p>	<p>Policy support to MEMD in development of the Sustainable Energy Response Plan for Refugees and Host Communities (SERP)</p> <p>Develop private sector models for the solarisation of UNHCR infrastructure</p> <p>Access to sustainable clean energy for households of refugees & Ugandan nationals, social institutions and micro/small enterprises</p> <p>Mainstreaming issues: Gender and do-no harm</p>

Thank You for Your Attention



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