OPPORTUNITIES WITHIN THE ENERGY SECTOR IN RWANDA

FACT PACK

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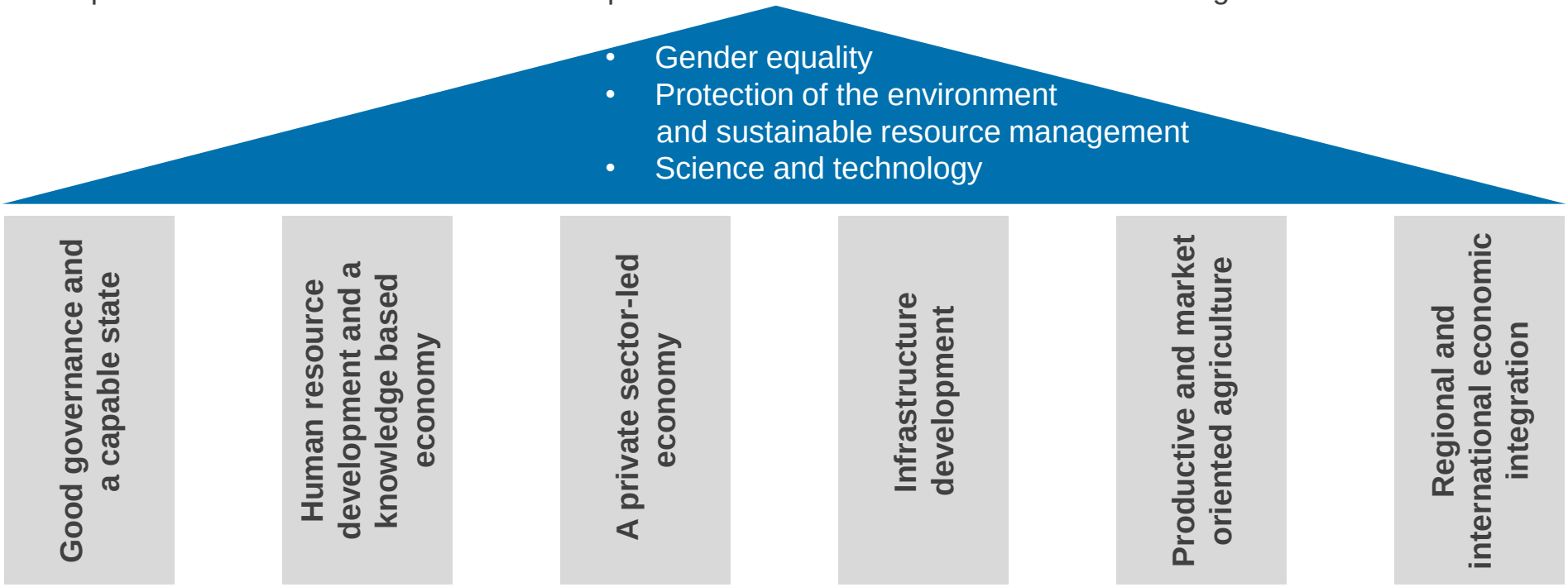
Business Sweden in Nairobi

RWANDA AIMS TO BE A MIDDLE INCOME ECONOMY BY 2020

- Rwanda's long term development goals are embedded in the strategic plan entitled Vision 2020, whose objective is to transform the economy into a knowledge based, service oriented economy with middle-income country status by 2020
- The plan is centered around the below six pillars and interwoven with three cross cutting issues

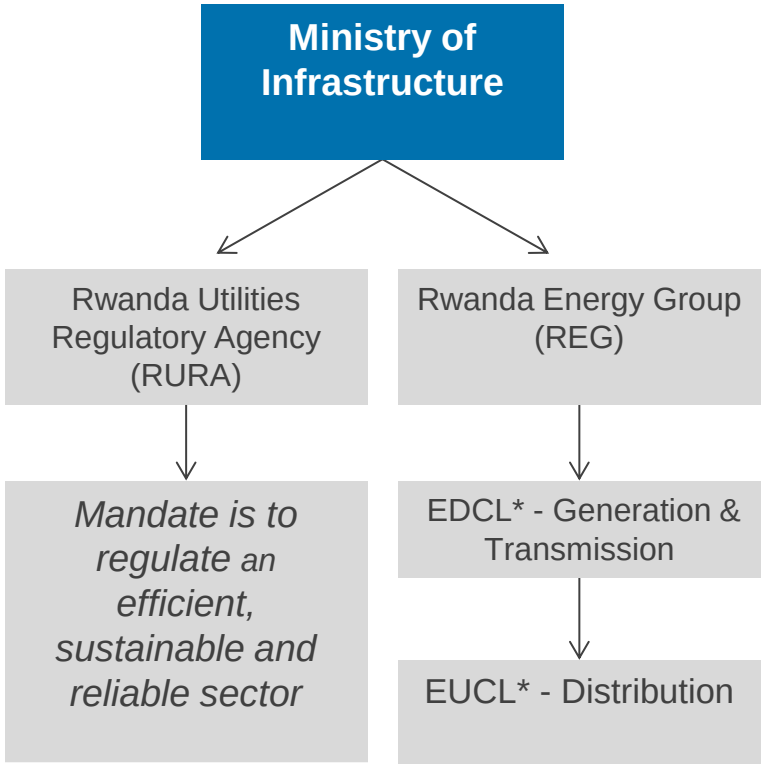


GOOD GOVERNANCE AND ECONOMIC GROWTH WILL CONTINUE TO DRIVE VISION 2020 IN THE LONG TERM

SOURCES: MINISTRY OF FINANCE AND PLANNING

RWANDA'S MINISTRY OF INFRASTRUCTURE HAS PRIMARY RESPONSIBILITY OVER THE ENERGY SECTOR

STRUCTURE OF THE ENERGY SECTOR



RWANDA ENERGY GROUP (REG)

- Rwanda's energy sector can be characterised as a semi-bundled system
- All functions of generation, bulk transmission and distribution are performed by the state owned utility Rwanda Energy Group through its subsidiaries Energy Development Corporation Limited and Energy Utility Corporation Limited
- The government has opened up the generation subsector to Independent Power Producers who can sell power to the utility

RWANDA UTILITIES REGULATORY AUTHORITY (RURA)

- The Rwanda Utilities Regulatory Authority regulates both the power and gas sectors
- It is responsible for:
  - Licensing Independent Power Producers (IPP´s)
  - Approving electricity tariffs
  - Approving Power Purchase Agreements (PPA´s)
  - Enforcing approved technical standards

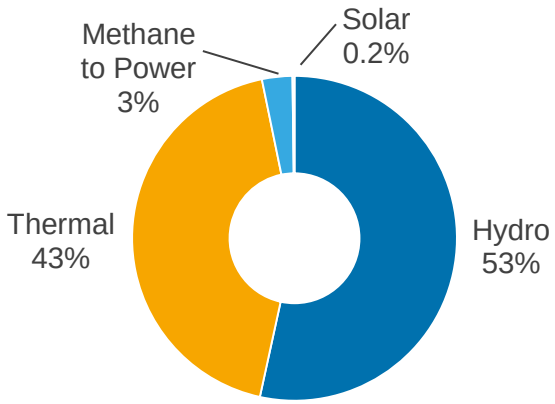
PRIVATE SECTOR ENGAGEMENT IS STILL RELATIVELY LOW

SOURCE: RWANDA MINISTRY OF INFRASTRUCTURE, AFDB - RWANDA ENERGY SECTOR REVIEW

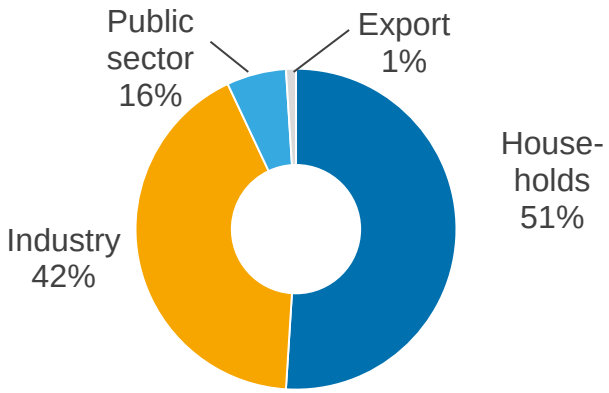
EDCL* - ENERGY DEVELOPMENT CORPORATION LIMITED, EUCL* - ENERGY UTILITY CORPORATION LIMITED

HYDROPOWER AND THERMAL SOURCES DOMINATE THE ENERGY MIX IN RWANDA

SOURCES OF ELECTRICITY IN RWANDA (2014)



CONSUMPTION OF ELECTRICITY IN RWANDA (2012)



CHARACTERISTICS

- Currently the electricity supply in Rwanda is sourced mainly from hydropower and thermal (diesel) sources
- Methane gas to power projects and solar power make up about 3.5% of the energy mix
- Electricity access is still low in the country, only around 16% of the population have access to electricity
- Rural electrification is prioritised and the government hopes to connect 22% of households through off-grid access by 2018
- Households remain the largest consumers of electricity and mainly use the electricity for lighting purposes
- Industry is the second largest consumer and major industrial consumers include companies in cement, mining, textiles and the agricultural sectors
- Merely one percent of the electricity is exported

SOURCES OF ELECTRICITY ARE EXPECTED TO DIVERSIFY AS DEMAND FOR ENERGY GROWS IN THE COUNTRY

SOURCE: MINISTRY OF INFRASTRUCTURE: ENERGY SECTOR STRATEGIC PLAN 2015, SE4ALL: RAPID ASSESSMENT & GAP ANALYSIS 2014, AFDB: RWANDA ENERGY SECTOR REVIEW, MININFRA.GOV.RW

THE COUNTRY IS ABUNDANT IN RENEWABLE SOURCES OF ENERGY

ELECTRICITY SUPPLY RESOURCES

Power supply source	Installed capacity MW 2014	Total potential MW
Hydropower	59.43	313
Methane gas	3.6	350
Solar Power	0.25	N/A
Thermal	47.8	N/A
Peat deposits	N/A	300
Geothermal	N/A	490
Total	**111.08**	**1453**

COMMENTS

- Rwanda's main sources of energy for electricity generation include:
  - Hydropower – cheapest form of generation in the long run
  - Methane gas – estimated reserves of 55 bcm* in Lake Kivu
  - Solar Power – average solar radiation of 4-6 kWh per square metre per day
  - Peat deposits – estimated reserves of 155 million tonnes of dry peat spread over 50,000 hectares
  - Geothermal – potential of about 700 MW but roughly 490 MW is economically recoverable
- Wind energy potential has in the past been explored, but has since been proved commercially unviable

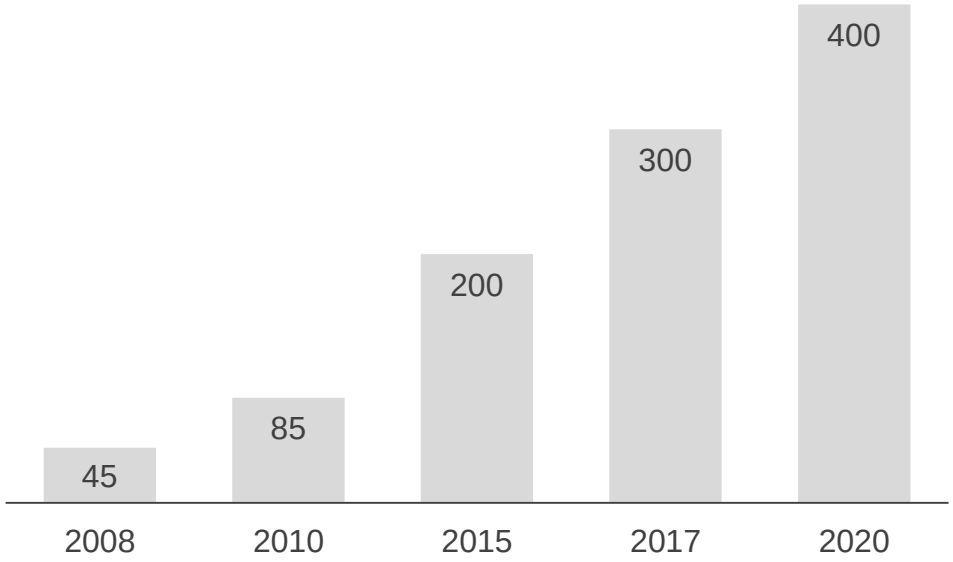
ROUGHLY 92% OF UNTAPPED DOMESTIC ENERGY RESOURCES PROVIDE NUMEROUS OPPORTUNITIES FOR SWEDISH COMPANIES

SOURCE: AFDB: RWANDA ENERGY SECTOR REVIEW, MINISTRY OF INFRASTRUCTURE: ENERGY SECTOR STRATEGIC PLAN 2015

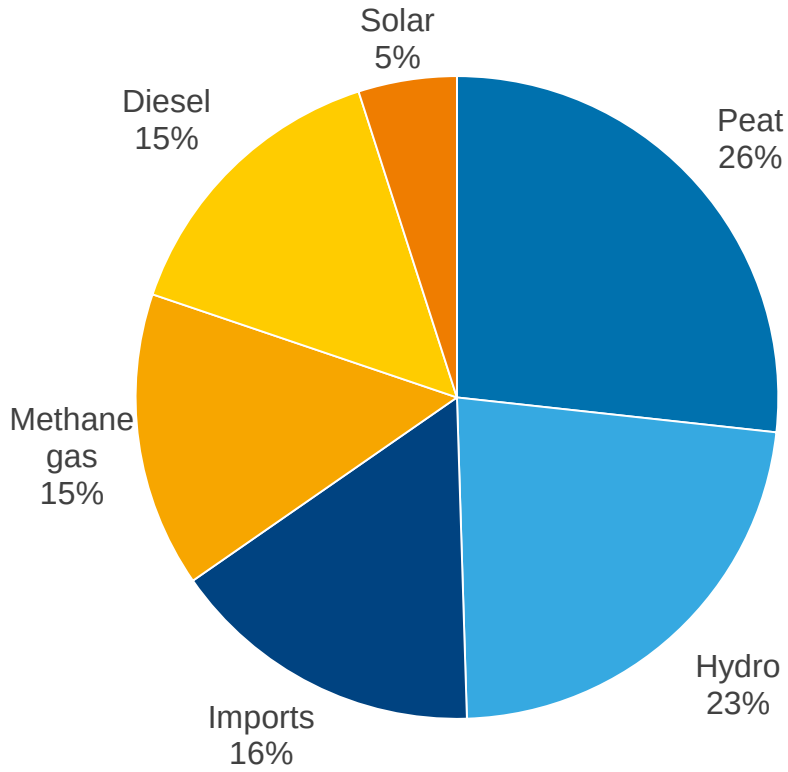
BCM* - BILLION CUBIC METRES

BY 2018, RENEWABLES ARE EXPECTED TO DOMINATE THE ENERGY MIX IN ORDER TO REACH SUPPLY TARGETS

VISION 2020 ELECTRICITY SUPPLY TARGETS (MW)



POWER SOURCE CONTRIBUTION BY 2018



MOST OF THE OPPORTUNITIES WILL COME FROM HYDROPOWER, PEAT AND METHANE GAS POWER GENERATION

SOURCE: AFDB: RWANDA ENERGY SECTOR REVIEW, RWANDA ENERGY GROUP: EXPANDING AN ENERGY SECTOR THROUGH DYNAMIC DEVELOPMENTS

THE GOVERNMENT HAS OUTLINED A RENEWABLES INVESTMENT PROGRAMME RUNNING FROM 2013-2025

Hydropower	There are plans to build more than 50 MW of mini or small hydro projects Larger hydropower plants include Rusizi 3 & 4 on the border with DRC of which only Rusizi 3's feasibility studies has been completed
Methane gas to power projects	KivuWatt 2 with capacity of 75 MW is under consideration but has taken some time to reach financial closure There are considerations for additional schemes of up to 200 MW but no specific plans have been formulated yet
Geothermal	Geothermal development will start with an initial 10 MW development in Karisimbi to be followed by Karisimbi I and II (each 75 MW), and Gisenyi I and II (each 75 MW) A Geothermal Act is being prepared which will allow for private sector participation
Solar	Currently, approximately 0.25 MW of solar power is operational from Kigali solar Rwanda has attracted private investment in this sector and will likely continue to attract the private sector to develop Solar PV projects
Peat deposits	The plan envisages 200 MW by 2017 but currently two projects seem to be moving forward The first is a public sector plant – Gishoma Peat (15 MW) to be constructed under an EPC arrangement. The second is an IPP with an estimated capacity of 100 MW for which a PPA has been negotiated

THE OBJECTIVE OF THE INVESTMENT PROGRAMME IS TO INCREASE DOMESTIC ELECTRICITY PRODUCTION FROM MULTIPLE SOURCES

SOURCE: AFDB: RWANDA ENERGY SECTOR REVIEW

OPPORTUNITIES HAVE BEEN IDENTIFIED IN THE FOLLOWING AREAS

Hydropower Generation Development	▸ Potential hydropower plants are spread out across 333 sites across Rwanda's river ▸ This includes large, medium, small, mini and micro hydropower projects ▸ Opportunities lie in: consultancy, feasibility studies and EPC* contracting
Geothermal Power Development	▸ Still in the infancy stages ▸ The government plans to add 300MW of geothermal power by 2017 at an estimated cost of MUSD 900 ▸ Opportunities lie in: exploration & prospecting, feasibility studies , EPC* contracting
Development of Methane Gas to Power Projects	▸ Phase two of the greenfield KivuWatt project is planned, will need financing of about MUSD 260 ▸ Total capacity will be 75MW ▸ Opportunities lie in: consultancy, feasibility studies and EPC* contracting
Financing	▸ An estimated BUSD 7 is required to finance the sector's investment plans from 2013-2025 in generation, transmission and distribution ▸ External financing will be required due to the constraints on the domestic budget
Development of Transmission Infrastructure	▸ In order to accommodate the increase in capacity and the increase in regional power trade, investments in the transmission system are planned ▸ An estimated MUSD 400 is required between 2013 and 2025
Distribution	▸ An estimated BUSD 2.2 will be required to improve the distribution network for urban and rural electrification ▸ Opportunities lie in: smart grids, smart metres and off-grid solutions

SOURCE: AFDB: RWANDA ENERGY SECTOR REVIEW, MINISTRY OF INFRASTRUCTURE: ENERGY SECTOR STRATEGIC PLAN 2015, MINISTRY OF INFRASTRUCTURE: ENERGY - THE OPPORTUNITY IN RWANDA

EPC* - ENGINEERING, PROCURING & CONTRACTING

CONTACT US

BUSINESS SWEDEN IN KENYA

Business Sweden
Eden Square, 3rd floor, off Westlands road
Box 13799, 00800 Nairobi
T +254 20 3749760
kenya@business-sweden.se
www.business-sweden.se/kenya