Status of the Hydropower Sector in Rwanda

Achievements and trends by December 2016

Over the last decade, Rwanda's hydropower sector on and off grid showed tremendous progress, tripling the domestic Installed capacity from 26 MW to 84 MW.

- The Grid connected hydropower capacity reaches approximately 99 MW (figure 1) with the regional projects of Rusizi I and II included. This growth was also accomplished through the involvement of private investors in the sector.

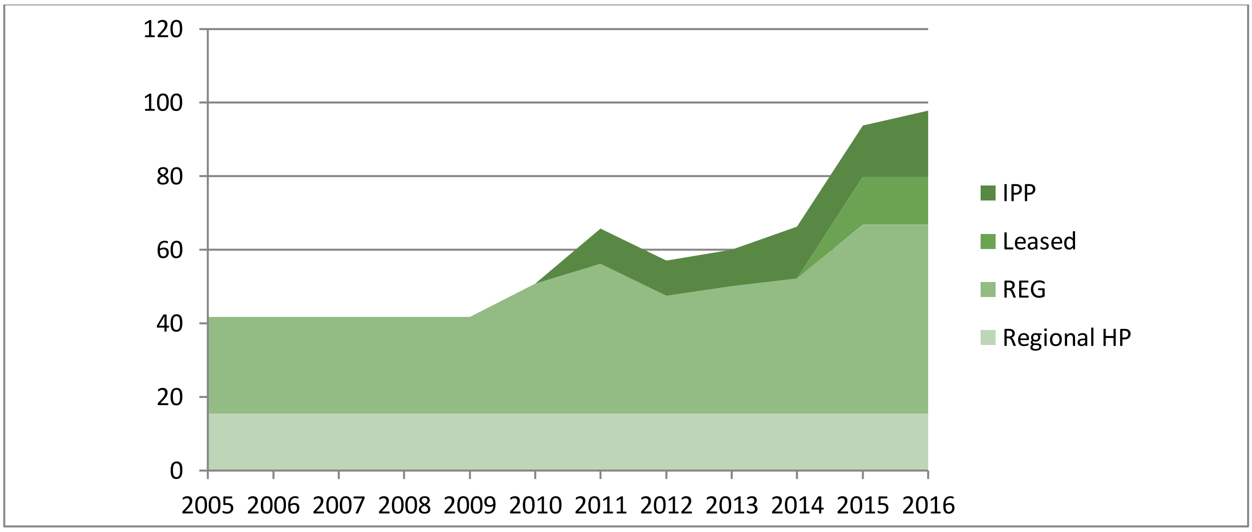

Figure 1: Installed hydro capacity from 2005 to 2016 in MW

- Currently, **8 off-grid micro hydropower plants** with a total a capacity of **1.311 MW** are operational in Rwanda. Five of these sites were leased out to private developers in 2015 and all are planned to be connected to the grid.
- By December 2016, **4 privately developed hydropower plants** with a total capacity of **10 MW** were under different phases of construction, with commercial operation dates (COD) planned in 2017 or 2018.
- Additionally, some **40 hydropower projects** at different development stages are foreseen by the private sector for a total capacity of about **85 MW**. Among those, **11 projects** (**23 MW**) already have a concession agreement approved by the GoR, whereas **29 projects** (**62 MW**) are considered to be at an early to mid-stage. Feasibility studies have also been conducted on behalf of REG for 32 smaller sites (7 MW).
- Recent developments in the overall **legal and regulatory framework are yet to be communicated to all stakeholders in the sector** The current imbalance between supply and demand have stalled all new projects and generated some confusions among developers. The former feed-in regulation which expired in March 2015 has not been renewed and more generally the renewable energy law has been delayed. It has also to be noted that the new law for water usage licence and fees is not yet approved.

Grid connected hydropower plants

With a total installed capacity of 206 MW (including the Rwandese shares of the regional projects Ruzizi I&II),

Funded by:

Coordinated and implemented by:

hydropower makes up for approx. 50% of the total installed capacity of Rwanda. Solar power (5%) and thermal power plants (45%) fuelled with HFO, diesel, methane and peat complete the picture. In total, 19 grid connected hydropower plants are currently operated.

	Project name	Installed capacity (MW)	Year of commissioning	Ownership	Company	Grant support by
1	Ruzizi I (DRC)	3.5	1957	public/ SNEL	SNEL/DRC	
2	Ntaruka	11.25	1959	Public	REG/EUCL	
3	Mukungwa	12	1982	Public	REG/EUCL	
4	Ruzizi II (regional)	12	1989	Public/SINELAC	SINELAC	
5	Nshili	(0.4)	2012	Public	REG/EUCL (out of operation)	
6	Nyabarongo I	28	2014	Public	REG/EUCL	
7	Gisenyi	1.2	1957	Leased	Prime Energy ltd	
8	Gihira	1.8	1984	Leased	Rwanda Mountain Tea ltd	
9	Keya	2.2	2011	Leased	Energicogel & Adre Hydropower	BTC
10	Nkora	0.68	2011	Leased	Energicogel & Adre Hydropower	BTC
11	Kimbili	0.3	2011	Leased	Energicogel & Adre Hydropower	BTC
12	Mukungwa II	2.5	2013	Leased	Prime Energy ltd	
13	Rukarara II	2.2	2014	Leased	Prime Energy ltd	EU & BTC
14	Rugezi	2.2	2011	Leased	Rwanda Mountain Tea ltd	
15	Murunda	0.1	2010	Private	REPRO ltd	GIZ EnDev Rwanda
16	Rukarara I	9	2010	Leased	Ngali Energy ltd	
17	Mazimeru	0.5	2012	Private	Energie Nyaruguru ltd	GIZ EnDev Rwanda
18	Musarara	0.4	2013	Private	SOGEMR ltd	GIZ EnDev Rwanda
19	Giciye I	4	2014	Private	Rwanda Mountain Tea ltd	
20	Giciye II	4	2016	Private	Rwanda Mountain Tea Ltd	
21	Mutobo	0.2	2009	Leased	REPRO ltd	UNIDO
22	Nyabahanga	0.2	2012	Public	GoR	
23	Janja	0.2	2012	Leased	Rwanda Energy UK Ltd & Africa Energy Services Group ltd	
	Total	**99.03**				

Table 1: On-grid hydropower plants in operation **Source REG/MININFRA**

The hydropower plants are either publicly owned and operated, leased to private companies, or privately owned (IPP). The publicly owned ones are managed by the national utility REG. These include larger plants such as Ntaruka, Mukungwa I and Nyabarongo I with a total capacity of 52 MW. 10 plants (19 MW) are privately operated through 25 year leasing agreements with the national utility. Finally, IPPs own and operate 5 plants (10 MW) out of which 3 were supported by EnDev Rwanda (the first 3 privately owned and operated plants in Rwanda: Murunda, 96 KW; Mazimeru, 500 kW and Musarara, 438 kW). EnDev is also supporting and financing 5 additional plants which are all under construction or at advanced development stage (Kavumu, 334 kW, Muhembe, 323 kW, Nyirantaruko, 1.450 MW, Nyirahindwe I and II, 1.293MW).

Off-grid micro hydropower plants

There are currently 8 off-grid micro hydropower plants supplying isolated networks in Rwanda for a total capacity of 1.311 MW. These projects were originally developed by the GoR and handed over to local administration for management and operation. Following recurrent operation problems, most of these sites were leased out to private developers in 2015 and are planned to be connected to the grid at a later stage. There is also a number of non-inventoried pico hydropower plants in the range of 1-10 kW which are either publicly owned, operated by local communities or entirely private.

	Project name	Installed capacity (MW)	Year of commissioning	Ownership	Company	Grant support by
1	Nyamyotsi I	0.1	2007	Leased	Energicogel & Adre Hydropower	UNIDO
2	Agatobwe	0.2	2010	Leased	Carera-Ederer & Tiger	UNIDO
3	Nyamyotsi II	0.2	2011	Leased	Energicogel & Adre Hydropower	UNIDO
4	Rushaki	0.04	2011	public	GoR	
5	Gashashi	0.2	2013	Leased	Prime Energy ltd	
6	Nyirabuhombohombo	0.5	2013	Leased	Rwanda Energy UK Ltd & Africa Energy Services Group ltd	
7	**Coforwa-Nyakabanda**	0.06	1987	private	Coopérative des Fontainiers du Rwanda	
8	**Nyakiramba**	0.011	2016	private	ECOS Ltd	**GIZ**
	Total	**1.311**				

Table 2: Existing Off-grid hydropower plants **Source REG/MININFRA/EnDev RW**

Hydropower plants under construction

Today, privately driven hydropower projects for a total capacity of 12 MW are at different phases of construction, with commercial operation dates (COD) between 2017 and 2018 (see table 3).

	Project name	Installed capacity (MW)	Year of commissioning	Company	Grant support by
1	Gaseke	0.5	2017	Novel Energy ltd	ESME (Worldbank)
2	Kigasa	0.2	2017	LED Solutions ltd	ESME (Worldbank)
3	Nyundo	4	2017	Amahoro Energy	ESME (Worldbank)
4	Ntaruka A	2	2018	Ngali Energy	
5	Rukarara V	5	2017	REFAD	
6	Kavumu	0.3	2017	Mwange Kavumu MHP ltd	GIZ EnDev Rwanda
	Total	**12**			

Table 3: Hydropower plants under construction **Source REG/MININFRA/EnDev RW**

Projects under development

. By December 2016, **11 hydropower projects** (**23 MW)** had their concession agreement approved by the GoR (see table 4). Most of these projects are currently in the process of sourcing funds.

	Project name	Installed capacity (MW)	Company	Grant support by
1	Gakenke Base I	2.9	Ngali Energy ltd	
2	Gakenke Base II	2.9	Ngali Energy ltd	
3	Ngororero	2.4	Ngali Energy ltd	
4	Rwondo	2.31	Ngali Energy ltd	
5	Muhembe	0.325	LED Solutions and Green energy Rwanda ltd	GIZ EnDev Rwanda
6	Nyirahindwe I	0.909	Mecamidi & DC Hydropower ltd	GIZ EnDev Rwanda
7	Nyirahindwe II	0.359	Mecamidi & DC Hydropower ltd	GIZ EnDev Rwanda
8	Nyirantaruko	1.263	Kochendoerfer FEE & LYV ltd	GIZ EnDev Rwanda
9	Rubagabaga	0.28	Rubagabaga ltd	EEP
10	Rukarara VI	6.7	Prime Energy ltd	
11	Rwaza-Muko	2.6	DC Hydropower ltd	
	Total	**23.246**		

Table 4: Hydropower projects at an advanced stage of development **Source REG/MININFRA/EnDev RW**

Large hydropower projects under development

Rwanda is increasing its power capacity by exploiting both national and regional hydropower resources. **Ruzizi III** and **Rusumo** are developed as regional initiatives, while the GoR is currently investigating the feasibility of **Nyabarongo II.**

- **Nyabarongo II 37.5 MW multipurpose project:** Feasibility studies are completed, the project consists of a hydroelectric plant, a large irrigation component and a water supply component.
- **Rusumo falls hydropower project:** The joint development of this project on the Akagera river bordering Rwanda, Burundi and Tanzania started in February 2012. The project is a run-off river scheme set to generate 81MW to be equally shared between the three partner countries. The project development is supported by AfDB and World Bank. The project has started and is planned to be commissioned in 2020.
- **Rusizi III regional hydropower project:** The project is developed by the EGL (Energie des Grands Lacs) the entity in charge of energy development within the CPGL (Communauté Economique des Pays des Grands Lacs). The project has a total capacity of 147MW out of which the Rwandese share represents 49 MW. The development process is supported by AfDB, AFD, EIB, EU, KfW and the WB. In March 2016, the GoR and AfDB signed a financing agreement of US$ 24.17 million to support the construction of Ruzizi III.

Legal and regulatory framework

In general, Rwanda provides favourable investment conditions as regularly demonstrated in the international ranking. Private investments in Rwanda are most prominently governed by the following laws:

- **Public-Private Partnership Law** was recently gazetted. The law specifies options such as lease-operate-develop (LOD), build-operate-transfer (BOT), and build-operate-own (BOO) for infrastructure concessions.
- **Law on Investment Promotion (2015)**, defining preferential tax rates for target sectors including energy, as well as accelerated depreciation, VAT exemption and tax holidays for larger investments.
- **Company Law (2010)**, providing the regulatory frame for company set-up and operation in Rwanda.
- **Law on Direct Tax on Income (2005) and VAT (2015)**, defining taxation levels for companies, products and services.

The **investment process for hydropower development** specifying required steps, procedures, and approvals such as PPA, concession and generation licence, is currently being harmonised to align with provisions of the new PPP Law. From 2012 to March 2015, a **Regulation on feed-in tariff** (REFIT) for hydropower facilitated the PPA negotiations setting tariff levels and defining responsibilities for the grid connection. A new REFIT regulation with increased tariffs and a standardised PPA template was proposed by RURA and is still under review. On the other hand, MINIRENA issued the **Surface Water Abstraction Authorisation** and the new law on **Water Usage Fee** is not yet approved. However, an improved coordination with other upstream water use activities is already in place to mitigate the risk of future water usage conflicts.

The lack of standardised processes and documents, as well as the questions around the long term vision of Rwanda for energy generation, are still big issues for the sector as this lack of visibility prevents companies from looking for funding and/or start preparing new projects. A general reflexion process would be needed in the hydro sector with all stakeholders involved to agree on a joint approach and give long term clarity to all. Ultimately, long term planning as well as a transparent and streamlined contracting process in the sector with fixed procedures, documents and tariff is essential to move away from this situation.

Public tenders for hydropower development

Of the 69 hydropower feasibility studies developed in 2013, some have been awarded to private developers, whereas **9 sites have been tendered out** jointly by EWSA/REG and EnDev Rwanda in 2014. Following a twostage tender process, 4 investors have been awarded the development of 6 sites. However, their development process was heavily delayed due to several factors including new regulation reforms in the energy sector such as the transformation of EWSA. In June 2016, PPAs and concession agreements have been signed for 4 of the six sites. EnDev, EDCL and the3 companies are working toward a grant agreement which is expected to be signed in April 2017

Following the success of the first IPPs in 2010, MININFRA requested GIZ/EnDev Rwanda to conduct a study to assess the viability of privatising publicly owned and operated MHPs. The study was carried out on five pilot MHP plants and examined the viability of these plants from both the private investor and government perspectives. In 2015, after a competitive selection started in 2014, the GoR successfully leased out 15 MHPs for 25 years to five companies including to partner companies of EnDev Rwanda such as REPRO for Mutobo MHPP, Kochendoerfer for Gisenyi, Mukungwa II and Rukarara II MHPP and CARERA for Agatobwe. The leasing agreements included clauses regarding investments that the companies are required to make in order to improve the plants' efficiency and reliability. The concessions' negotiations for most of the off-grid plants are also being conducted. The delay taken by this process is mainly due to the fact that no agreement on tariffs could be reached, given the significant amount of investment required for the plants' rehabilitation and connection.

Private sector investment in hydropower

About **30 companies, both Rwandese and international** are currently involved in hydropower projects in Rwanda. In 2006, EnDev Rwanda started the PSP Hydro programme and between 2010 and 2013, Rwanda's first privately build, operated and owned MHPs started operations. In Total EnDev, through its different phases has provided around EUR 4 Mio and leveraged EUR 12 Mio of investments by the private sector. Furthermore, several joint-ventures between local and international companies were formed to respond to call for tenders to build, operate and own MHP plants. Partnerships between local and international companies mean a win-win situation mitigating the international companies' investment risk, while providing access to financing and technical expertise to Rwandese companies.

Some of the companies who have invested in one or more MHP projects are looking to increase their portfolio and have gained confidence and experience in developing, building and managing plants. Consequently, the total investment volume for private sector driven hydropower plants in construction and advanced development stage can be estimated at USD 150 Mio.

The energy private developers' association, EPD, working under the umbrella of the Private Sector Federation (PSF) of Rwanda is a legal professional association regrouping more than 80 companies operating in energy sector in Rwanda. EPD focuses on advocacy of its members, encouraging good collaboration and partnership among members and attracting foreign companies and investors to work with local companies.

Acronymes

AfDB	African Development Bank	**MININFRA**	Ministry of Infrastructure
COD	Commercial Operation Date	**MINIRENA**	Ministry of Natural Resources
EDCL	Energy Development Corporation Limited	**PPA**	Power Purchase Agreement
EPD	Energy Private Developers Association	**PPP**	Public Private Partnership
EUCL	Electricity Utility Corporation Limited	**REFIT**	Renewable Energy Feed-In Tariff
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit	**REG**	Rwanda Energy Group
GoR	Government of Rwanda	**SINELAC**	Société Internationale d'Electricité des pays des Grands Lacs
HFO	Heavy Fuel Oil	**SNEL**	Société Nationale d'Electricité / DR Congo
IPP	Independent Power Producer	**UNIDO**	United Nations Industrial Development Organisation
KfW	Kreditanstalt für Wiederaufbau		

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