

**GET FiT  
UGANDA**

ANNUAL REPORT

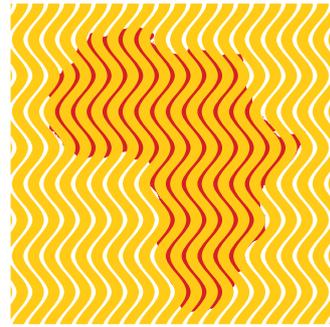
**2017**

SUPPORTED BY



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**GET FiT  
UGANDA**

# ANNUAL REPORT 2017

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## MESSAGE FROM ERA

The year 2017 has seen the Ugandan Electricity Supply Industry continue to shine as a perfect example of how best to leverage support from development partners to attract and harness private sector capital for infrastructure development. Through the GET FiT Programme, an installed capacity of 158 MW of clean renewable energy shall be added to the National Grid from 17 projects. The projects utilise various technologies for electricity generation, that is, hydropower, grid connected solar P.V and bagasse. I am happy to note that all projects in the portfolio have reached financial closure, with the exception of two hydropower projects which are expected to complete early during 2018, and have either been commissioned or are under construction.

To-date, six (6) of the seventeen (17) projects have been commissioned with significant construction progress registered on the majority of the remaining projects. The commissioned projects include three (3) hydropower plants of total installed capacity 18.1 MW, the two grid connected solar PV projects totalling 20MW, and 20MW of the Kakira Co-generation plant.

The technical assistance offered by the GET FiT Programme to the Electricity Regulatory Authority (ERA) has continued to bear fruit in form of a clear and well elaborated licensing framework with simplified and well explained licence and permit application forms which have eased the application and due-diligence processes. Project monitoring and evaluation continues to make significant steps of improvement. Capacity has also been enhanced in the financial and tariff modelling function of the ERA. The enhanced capacities and largely improved processes will ensure sustainability of the several achievements registered under the GET FiT Programme.

It is notable that the implementation of the GET FiT Programme saw Uganda become one of the best Renewable Energy investment destinations and gain international recognition. The Bloomberg ratings of 2016 rated the country 2nd best with regard to Renewable Energy investments in Africa. In an effort

to maintain the favourable Renewable Energy investment climate, the Authority with support from the GET FiT Programme revised the Renewable Energy Feed in Tariffs in July 2016 in order to sustain the level of financial viability of the potential projects, to ensure that the country remains one of the best investment destinations on the African continent beyond the GET FiT Programme.

In a special way, the Authority appreciates the continued support from development partners towards the construction of evacuation infrastructure for the GET FiT projects. As we approach the peak of construction and commissioning of the projects, the Authority shall continue to prioritise the proper monitoring and coordination of the construction activities for the evacuation infrastructure. This will enable a harmonized commissioning of the power plants and the evacuation arrangement.

The GET FiT Programme has further provided direct and indirect job opportunities across the local communities where the plants are being built as well as professional jobs for experts in the urban centres. Due to the skills constraints within the power and energy sectors, ERA has allocated funds aimed at training more engineers to enhance engineer retention within the sector.

With there now being a potential short-to-medium term surplus in energy supply in the Uganda electricity sector, and associated effects on the tariff path, there is a need moving forward to focus on coordinating and planning investments across the entire electricity supply industry value chain, including the transmission and distribution infrastructure.

The ERA is committed to ensuring efficient and effective implementation of the GET FiT Programme and shall continue to make every effort to achieve sustainable electricity supply for social economic transformation. The Authority looks forward to supporting development partners in sharing the experiences and lessons learned during the implementation of the Programme, as similar programmes are rolled out in other countries.



**Eng. Ziria Tibalwa Waako,  
Chief Executive Officer**



*“The GET FiT Programme has further provided direct and indirect job opportunities across the local communities where the plants are being built as well as professional jobs for experts in the urban centres. Due to the skills constraints within the power and energy sectors, ERA has allocated funds aimed at training more engineers to enhance engineer retention within the sector.”*

## MESSAGE FROM UK

In 2017, the GET FiT Programme has gone from strength to strength, securing its place as a leading private investment programme in Uganda's burgeoning renewable energy sector. With a growing portfolio of small-scale renewable energy generation projects promoted by private developers, GET FiT is moving ever closer to its objective of climate resilient, low-carbon energy generation, resulting in growth, poverty reduction and climate change mitigation.

In the last year, three hydropower plants have been commissioned - the first in the portfolio - as well as a second solar plant at Tororo. All GET FiT projects now have Power Purchasing Agreements and technical support. This, alongside the rigour of the Ugandan Electricity Regulatory Authority checking compliance and viability, means that the majority of projects are advancing well towards reaching commercial operation in 2018.

The UK is proud to be the largest donor within the GET FiT Programme. Alongside stable investment, the key to the lasting success of the Programme has been effective collaboration and support. Together, the EU and the governments of Uganda, Germany, Norway

and the UK have ensured that Uganda is working towards stabilising, diversifying and securing its energy production.

Despite the strides taken over the past four years, there are further obstacles to overcome. The success of the GET FiT Programme has highlighted wider issues within the energy sector. Including the new high power output hydroelectric generation being developed in Uganda, electricity generation programmes are likely to result in an electricity surplus in the short to medium term, whilst currently over 80% of Ugandans still lack access to electricity.

It's vital that this gap is bridged by opportunities to drive private sector development. Solutions, both on and off-grid, are at the heart of meeting the ever increasing demand for access to electricity in Uganda. There needs to be an increase in connectivity, access, and employment opportunities. Using innovation, continued collaboration, and by harnessing Uganda's young and growing population, the GET FiT Programme is well positioned to further increase the strength and sustainability of the ever more crucial renewable energy sector in Uganda.



Peter West, British High  
Commissioner To Uganda



*"Using innovation, continued collaboration, and by harnessing Uganda's young and growing population, the GET FiT Programme is well positioned to further increase the strength and sustainability of the ever more crucial renewable energy sector in Uganda."*

# EXECUTIVE SUMMARY

The year 2017 has been eventful, with substantial on the ground progress for the renewable energy projects supported by GET FiT Uganda. Commissioning of the first three hydropower plants in the GET FiT portfolio represented a major milestone, introducing a combined generation capacity of 18.1 MW. Furthermore, Uganda's second grid connected solar PV plant was successfully completed in 2017, and hence the two solar plants developed under the GET FiT Solar Facility are both operational, with a combined generation capacity of 20 MW.

The remaining eleven hydropower projects have commenced construction activities and although the majority of GET FiT supported projects are expected to be delivering power to the grid by the end of 2018 – the original Programme window – several projects are likely to overrun. Five projects are likely to achieve commercial operation within the first half of 2019 and one project is delayed until 2020. The causes of delays have varied, with some delays a result of external factors, beyond the control of developers and the Programme, and other delays firmly in the developer's control. For these projects, the continued support of GET FiT in 2018 will be contingent on the developers intensifying efforts, achieving considerable progress on the ground, and demonstrating a capacity and willingness to achieve commercial operation in a timely manner.

Implementation oversight of projects during 2018 will be, more than ever, critical to achieving Programme targets. GET FiT has introduced several tools to minimise the risk of further delays, including increased follow up on individual projects through additional supervision visits and financial penalties in the form of subsidy reductions. Efforts will be maintained and intensified in 2018 to bring as many projects as possible to completion within the year. With all projects now under construction and most having achieved financial close, the overall risk for delays or project cancellations is somewhat reduced. This is strengthened by all remaining projects having executed PPAs with UETCL during 2017, which is yet another key achievement for the Programme. Only two projects are yet to achieve

financial close, which is reportedly on track for the first half of 2018.

The need for intensified efforts in reaching Programme goals also applies to other sector stakeholders, particularly UETCL and REA. Critical grid infrastructure required to connect GET FiT projects to the national grid have experienced severe delays throughout 2017. There is currently a high risk that new generating plants, both within GET FiT and beyond, will be commissioned without adequate connection facilities in place in the coming one to two years. Unfortunately, this is likely to increase deemed energy obligations on the Ugandan Government. To minimise these impacts, GET FiT has provided additional funds for critical grid reinforcements and will continue to offer assistance, monitor progress, and attempt to facilitate a higher level of coordination for timely implementation of these investments.

Finally, it is encouraging to see that the technical assistance provided to ERA via the GET FiT TA Facility is indeed contributing to strengthening ERAs capacity as a regulator and the Ugandan investment climate as a whole. In 2017, a new grid connection code and framework for regulating wheeling of power (transmission through a third-party network) was established. An improved framework for compliance monitoring of transmission and distribution licensees is currently being put in place, and ERA recently launched a new GET FiT knowledge transfer programme that will aim to institutionalise experience and competence gained throughout implementation of the GET FiT portfolio. Adding to this, a new electronic regulatory system will be commissioned by ERA in 2018, further strengthening their position as one of Africa's most forward leaning and modern electricity regulators!

2018 promises to be a momentous year for the GET FiT Programme, with a significant proportion of the Programme's aims and objectives being realised in the form of installed power and the supply of clean, renewable energy to Uganda. Needless to say, the Programme is in for yet another exciting year!



Jody Lenihan, Managing Director Of  
Africa Ems Nyamwamba Ltd.



*“As we are successfully concluding the development and construction of 9.2MW Nyamwamba and preparing for the operations phase, we have been extremely pleased with the technical collaboration by our assigned GET FIT team. The abundance of information sharing and mutual respect, in both directions, among the GET FIT team, the SAEMS team, and our lender has resulted in a level of enrichment of all involved, and certainly in a facility of superb quality in all vital categories – environmental, social, technical, humanitarian, and economic.”*

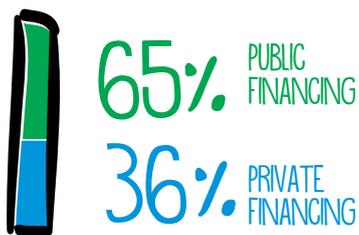
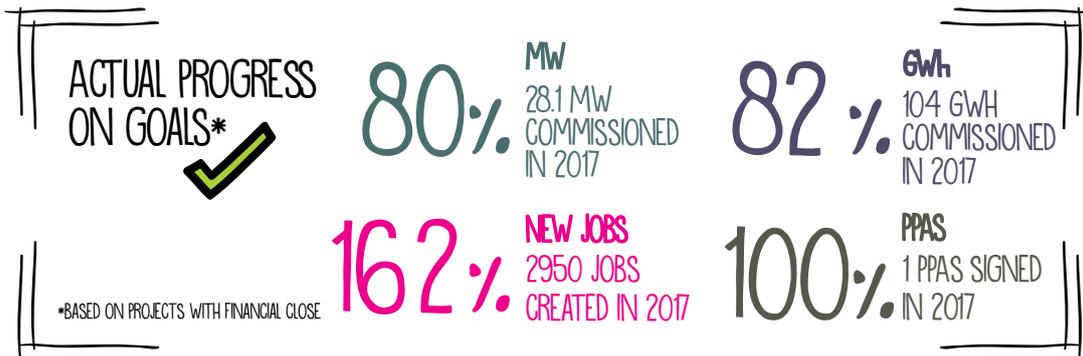
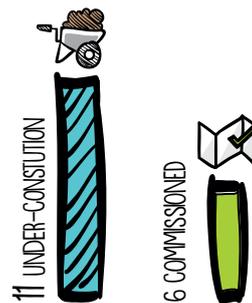


17 PROJECTS

158 MW

773 GWh

6800 JOBS



WE CURRENTLY HAVE  
**58 MW**  
OF POWER GENERATION  
COMMISSIONED AND ABOUT

**100 MW**  
UNDER CONSTRUCTION

THIS IS ALL SPREAD ACROSS

17 PROJECTS

HYDRO,

SOLAR AND

BAGASSE

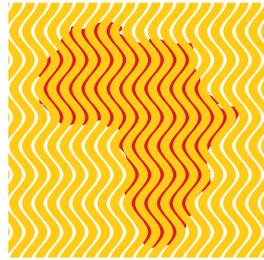
WE ARE MOVING TOWARDS OUR 158 MW TARGET

- 1 ABOUT GET FIT UGANDA
- 2 PROJECT PORTFOLIO PROGRESS
- 3 MANAGEMENT OF ENVIRONMENTAL & SOCIAL PERFORMANCE
- 4 OTHER ACTIVITIES AND ACHIEVEMENTS
- 5 CONNECTING TO THE GRID
- 6 THE LEGACY OF GET FIT
- 7 GET FIT 'ACADEMIC CORNER'
- 8 FINANCIAL STATUS
- 9 PROGRAMME MONITORING & RISK MANAGEMENT
- 10 OUTLOOK FOR 2018
- 11 STATUS OF GET FIT ROLL-OUT TO OTHER COUNTRIES

## LIST OF ABBREVIATIONS / ACRONYMS

<b>COD</b>	Commercial Operation Date
<b>CP</b>	Condition Precedent
<b>BEIS</b>	Department for Business, Energy & Industrial Strategy
<b>DFA</b>	Developer Finance Agreement
<b>DFID</b>	Department for International Development
<b>ERA</b>	Electricity Regulatory Authority
<b>GFPPM</b>	GET FIT Premium Payment Mechanism
<b>GoU</b>	Government of Uganda
<b>IA</b>	Implementation Agreement
<b>IC</b>	Investment Committee
<b>IDA</b>	International Development Association
<b>IFC</b>	International Finance Corporation
<b>MEMD</b>	Ministry of Energy and Mineral Development
<b>MoFPED</b>	Ministry of Finance, Planning and Economic Development
<b>M&amp;E</b>	Monitoring & Evaluation
<b>PPA</b>	Power Purchase Agreement
<b>PRG</b>	Partial Risk Guarantee
<b>RFP</b>	Request for Proposal
<b>SC</b>	Steering Committee
<b>SHP</b>	Small Hydropower Project
<b>TA</b>	Technical Assistance Facility
<b>UETCL</b>	Uganda Electricity Transmission Company Limited





**GET FIT  
UGANDA**

# 1 ABOUT GET FIT UGANDA

The GET FIT Uganda Programme was officially launched on May 31st 2013. The Programme, which has been jointly developed by the Government of Uganda, the Electricity Regulatory Agency (ERA) and KfW is designed to leverage private investment into renewable energy generation projects in Uganda. GET FIT is being supported by the Government of Norway, the United Kingdom, the Government of Germany and EU through the EU Africa Infrastructure Fund.

The main objective of the GET FIT Programme is to assist East African nations in pursuing a climate resilient low-carbon development path resulting in growth, poverty reduction and climate change mitigation. In Uganda, GET FIT is fast-tracking a portfolio currently of 17 small-scale renewable energy (RE) generation projects, promoted by private developers and with a total installed capacity of 158 MW. This will yield approximately 773 GWh of clean energy production per year, transforming Uganda's energy mix within a period of 3-5 years, and resulting in:

- emission reductions of roughly 10M tons of CO<sub>2</sub> in the 20-year lifespan of Power Purchase Agreements (PPAs);
- an increase in Uganda's energy production by about 20%, and thus a contribution to tackling anticipated supply shortage in the period up to 2020;
- facilitating (or significantly improving) access to energy for at least 200,000 additional households (approximately 1.2M people), also in rural areas due to strengthening of regional grids;
- leveraging of close to MEUR 400 in public and private investments for RE generation projects with a limited amount of results-based grant funding.

A more comprehensive description of the specific tools and approaches applied by GET FIT to address the challenges faced in the Ugandan power sector, the governance structure of the Programme and key activities and achievements so far, is found in the GET FIT Annual Reports produced since 2013 ([www.getfit-reports.com](http://www.getfit-reports.com)).

# 2 PROJECT PORTFOLIO PROGRESS

## 2.1 Portfolio Status

### Another Landmark Year

The year 2017 was another landmark year for the GET FiT Programme. Following the successes of 2016, another four projects supported by GET FiT were commissioned in 2017, providing a combined power output of 28.1 MW. These comprised the first three hydropower projects to commence operations – Siti 1 Small Hydropower Project (SHP), Muvumbe SHP, and Rwimi SHP – and the second, and final, solar project – Tororo SPV.

In total, six of the projects supported by GET FiT are now operational, with a combined installed capacity of 58.1 MW, and evacuated approximately 100 GWh of energy to the grid during 2017. This corresponds to around 2.5 percent of the total energy supplied in Uganda in 2017. As the newly commissioned projects all started delivering power during the year, and some have been running at reduced capacity, this percentage is expected to increase significantly during 2018.

### Progress on the Ground

Good construction progress was made during 2017 on most of the remaining hydropower projects. Whereas five projects commenced construction, three projects were nearing completion with the aim of achieving commercial operation early during 2018, and a further two projects anticipated achieving commercial operation in Q3 of 2018.

There was, however, notable variation in progress across the portfolio. One project was subjected to an enforced

construction stop for several months in order to cure a series of deficiencies and address health, safety, and welfare issues across the site. Another project, located on the border between Uganda and Tanzania, experienced substantial delays due to transboundary issues but had, nonetheless, mobilised to site.

All projects were on the ground before the end of the year – a substantial milestone for the GET FiT Programme – allowing the focus to shift predominantly to construction related activities and setting-up an exciting upcoming year.

### A Challenging Year Ahead

Despite the many achievements and progress of the Programme during 2017, 2018 will indeed be a challenging year for many of the hydropower projects under construction. Key challenges include particularly demanding construction schedules and the timely implementation of the power evacuation infrastructure necessary to connect the projects to the grid. For a number of projects, these issues will most likely seriously impact their ability to achieve commercial operation within the 2018 calendar year.

The table below provides a summary on the status of key project milestones across the portfolio. Light grey cells indicate that a milestone has been achieved. The expected dates for key milestones that have not yet been achieved are otherwise shown. Only two projects have yet to achieve financial close, which is expected to be closed-out early during 2018. With the exception of the Kikigati SHP, which experienced substantial delays



due to transboundary issues – further details provided in section on Project Status - the developers for all remaining projects are aiming to achieve commercial operation by the end of the 2018 calendar year. Based on the experience of the GET FIT implementation

team and the observed progress and capacity of the developers during 2017, however, some projects are likely to overrun into 2019, which is reflected in the table below.

**Table 1 – Project milestones overview**

No.	Project	Generation License	DFA	PPA	Financial Close	Construction start	Commissioning	
							Developer estimate	GET FIT estimate
1	Rwimi							
2	Nyamwamba						Q1 2018	Q1 2018
3	Waki						Q3 2018	Q4 2018
4	Siti I							
5	Siti II						Q3 2018	Q4 2018
6	Lubilia						Q1 2018	Q1 2018
7	Kakira Cogen							
8	Sindila						Q4 2018	Q1-Q2 2019
9	Muvumbe							
10	Soroti Solar							
11	Tororo Solar							
12	Kikagati				Q2 2018		Q2 2020	Q2 2020
13	Nyamughasani I						Q4 2018	Q1-Q2 2019
14	Nyamughasani II						Q4 2018	Q1-Q2 2019
15	Ndugutu				Q1 2018		Q4 2018	Q2 2019
16	Kyambura						Q4 2018	Q1-Q2 2019
17	Nkusi						Q2 2018	Q2 2018

<sup>1</sup> GET FIT recognises the unique challenges experienced by the Kikagati SHP as a result of transboundary issues and the impact this has had on the implementation time-frame. The timing of key Project milestones and their acceptability to GET FIT, ERA, and the donor organisations will be discussed further early in 2018.



# PROJECTS



## 2.2 Operational projects

## Hydro Projects

### Siti I

The Siti I SHP is a run-of-river plant with an installed capacity of 6.1 MW and estimated 29 GWh annual production, located in Bukwo District, Eastern Uganda. The Project secured investments of USD 14.8M, with USD 3.6M in GET FIT commitments. The Project has the longest waterway in the GET FIT portfolio at more than 5 km in length, comprising a short section of canal, nearly 3 km of headrace pipeline, and 2 km of penstock.

Construction commenced in March 2015 and concluded in March 2017, with the power station synchronised and evacuating power to the grid by April 2017 – the first GET FIT hydropower project to achieve commercial operation. However, due to issues with respect to the stability and quality of the power evacuation line, the Project was only able to evacuate power to the grid at between 2-3 MW. Improvements to the power evacuation infrastructure were subsequently implemented during October 2017, allowing the Project to evacuate power to the grid at full capacity. However, as evident in Figure 1 and 2 below, substantial grid outages continued throughout October and November and, to a lesser extent, December, with outages in December being partly attributable to planned grid maintenance activities.

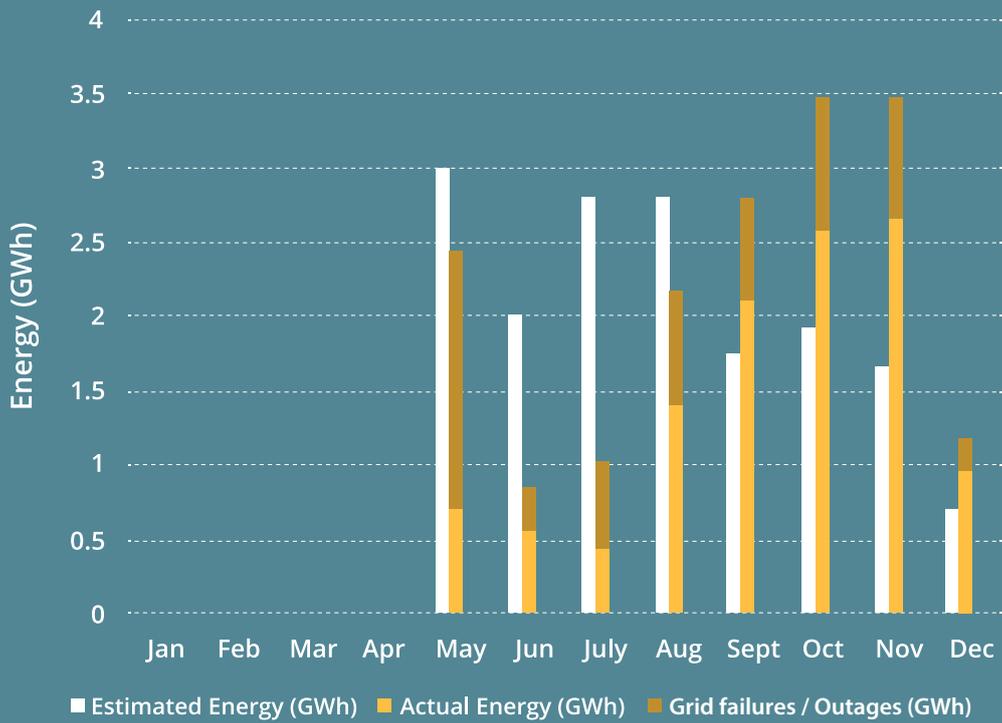
Grid failures and outages amounted to more than 127 days since achieving commercial operation and

were approximately equivalent to more than 53% of actual production, which is excessively high. The new 33 kV power evacuation line between the Project and Kapchorwa, and the existing line from Kapchorwa, experienced extensive faults. UETCL has since upgraded the line in sections and in September the line was able to hold the performance tests by the Project at 5 MW. The grid outages have gradually reduced, with the lowest outages experienced thus far occurring in December. Nevertheless, further improvements to the evacuation infrastructure are required to minimise outages and the potential for further deemed energy claims.

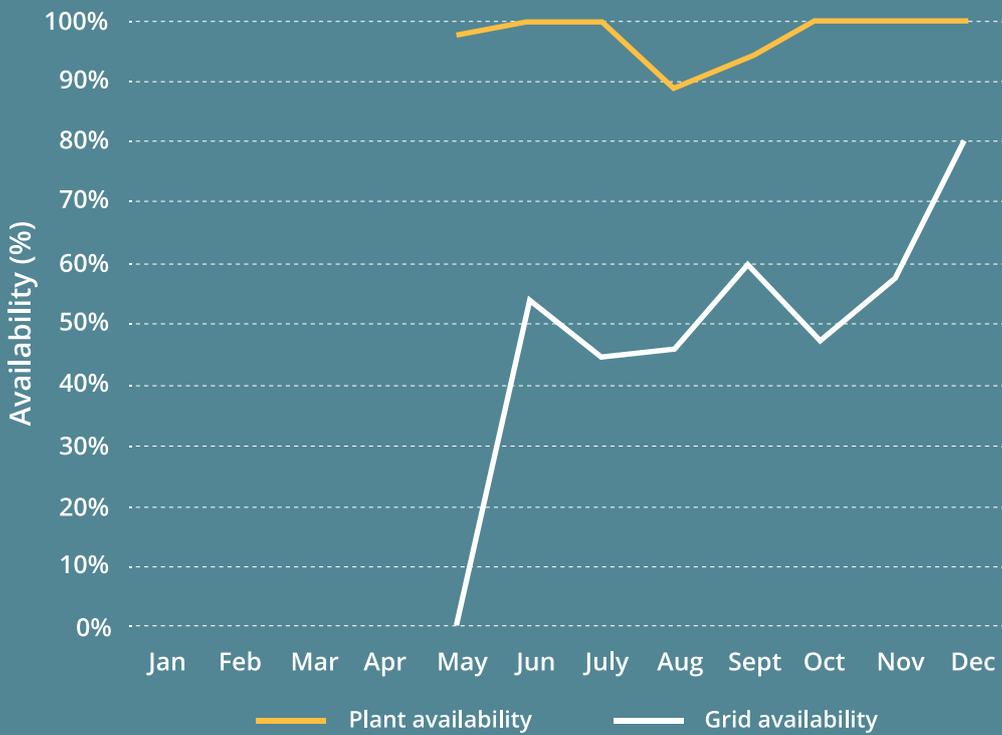
By the end of 2017, the Project had delivered 11.4 GWh of energy to the grid during its 8 first months of operations. An estimated 6.1 GWh could not be produced due to grid failures and outages out of the plant operator's control (deemed energy). Without these losses, the cumulative energy output would have been 17.5 GWh, based on available water and the plant's overall performance<sup>2</sup>. This is approximately 75% of the average production estimated at GET FIT application stage for the same 8 month period, indicating that flows during the production period were less than estimated. It is, however, too early to conclude if the energy production estimates are overly optimistic based on less than one year of production data and without any available analysis of the regional hydrology for 2017.

<sup>2</sup> The plant availability for the same 8 month period was on average 97.3%, which is considered good performance for the first year of operation.





**Figure 1** – Siti I SHP actual versus estimated energy output. Generation data shown from the first full month of operation – May 2017



**Figure 2** – Siti I SHP – plant versus grid availability

# Muvumbe

The Muvumbe SHP is a run-of-river hydropower project with an installed capacity of 6.5 MW and estimated 31 GWh annual production, located in Kabale District, South-Western Uganda. The Project secured investments of USD 14.1M and USD 4.5M in GET FiT commitments, under the second request for proposals for the GET FiT Premium Payment Mechanism (GFPPM) in Uganda.

Construction works commenced in September 2015 and were significantly ramped-up during early 2017 in order to achieve the construction programme. Commissioning tests of the power station commenced

during March 2017 but due to logistical and coordination issues with UETCL the Project did not formally achieve commercial operation until mid-May 2017, 20 months following the start of construction.

By the end of 2017, the Project had delivered 16.0 GWh of clean energy to the grid. Taking account of grid failures and outages, the cumulative energy output would have been 18.2 GWh, which is approximately 72% of the average production estimated at application stage for the same 9 month period. This is partly attributable to the availability of the plant, which was on average available for 98.7% of the time during the



first 9 full months of operation (April-December 2017) – considered good for the first year of operation – but mainly due to 2017 being a statistically drier year. It is, however, too early to conclude if the energy production estimates are overly optimistic based on one year of production data and without any available analysis of the regional hydrology for 2017.

The grid failures and outages amounted to more than 28 days since achieving commercial operation and were approximately equivalent to nearly 14% of production, which is relatively high. Lower grid failures and outages are expected following the implementation of transmission network upgrades anticipated in the region.

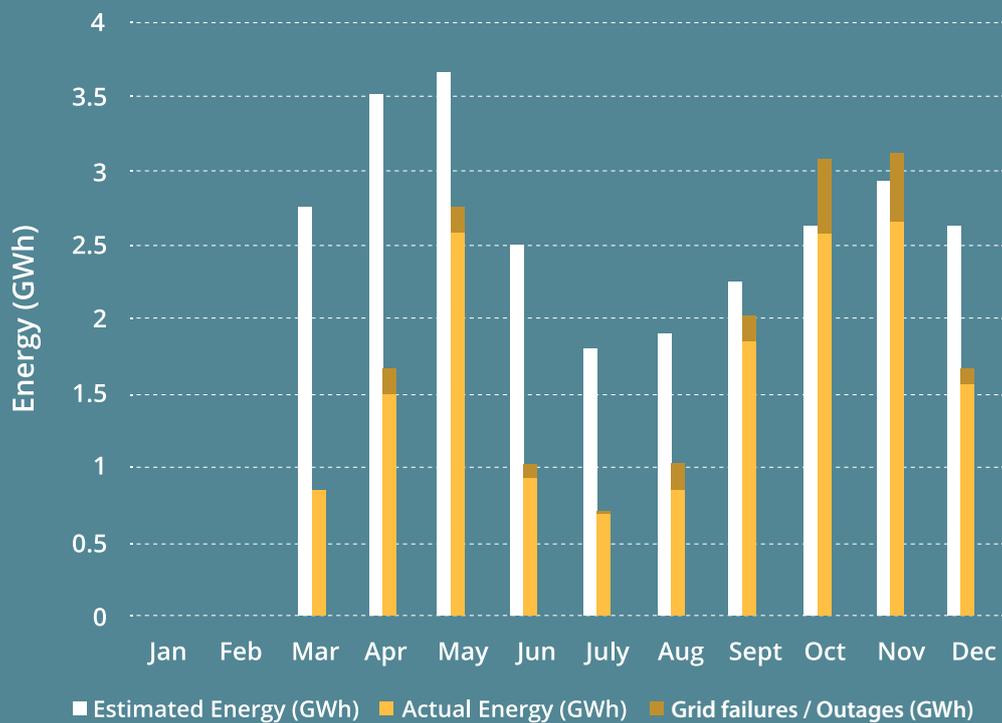


Figure 3 - Muvumbe SHP actual versus estimated energy output.



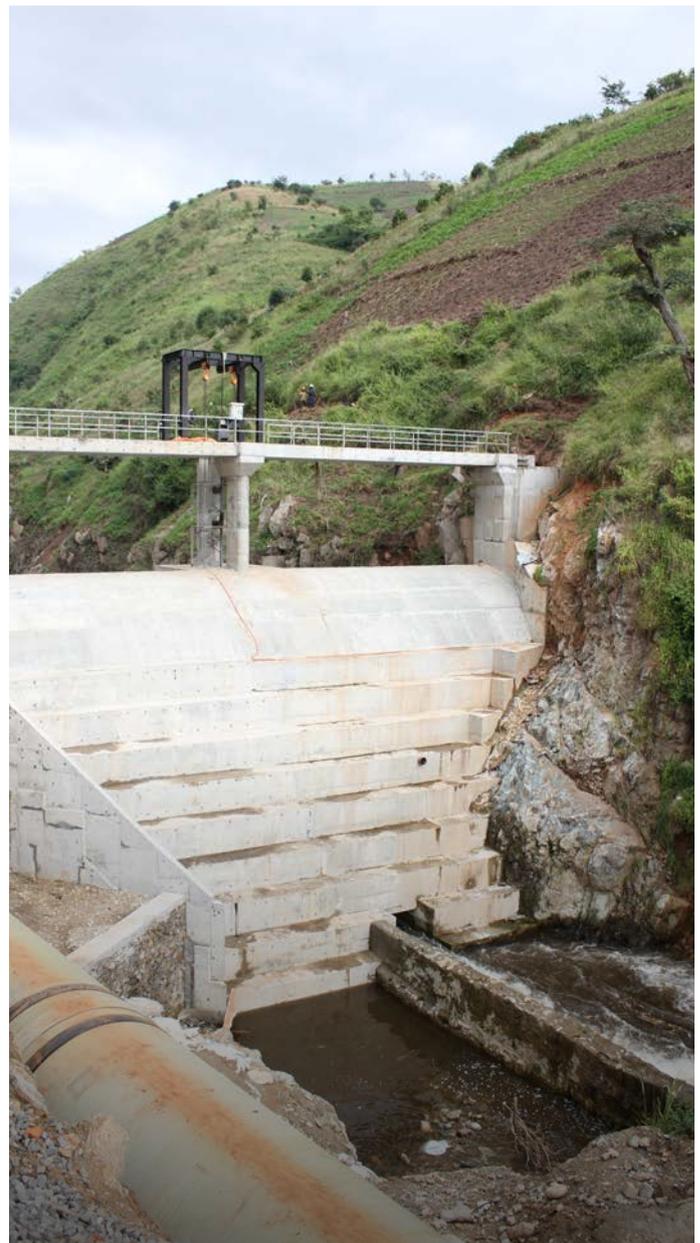
# Rwimi

The Rwimi SHP is a run-of-river hydropower project with an installed capacity of 5.5 MW and estimated 27 GWh annual production, located in Kasese district, western Uganda. The Project secured investments of USD 20.8M and USD 3.9M in GET FiT commitments, under the first request for proposals for the GET FiT Premium Payment Mechanism (GFPPM) in Uganda. The Project achieved financial close and commenced construction during July 2015.

The Project includes one of the largest concrete gravity dam structures in the portfolio, at approximately 13 m in height to spillway level, the construction of which

had been severely impacted and delayed by unusually high flows during the dry season. Nonetheless, the Developer made good progress during the last 6 months of construction to enable commissioning of the power station and commercial operation during October 2017, following 27 months of construction. The Project is located near to the Hima Cement plant, which is a big offtaker of electricity in the area and will benefit from the improved reliability in electricity supply.

By the end of 2017, the Project had delivered 6.9 GWh to the grid, which reflects the relatively short period of operation. Taking account of grid failures and outages,



the cumulative energy output would have been 7.5 GWh. The last two months in 2017 was approximately 101% of the average production estimated at application stage for the same 2 month period, while November was wetter and December dryer than average. The plant

availability for the first two full months of operation was approximately 99.4%, which is very high. Grid failures and outages for the same period was approximately 0.4 GWh, which was approximately equivalent to 8% of production.

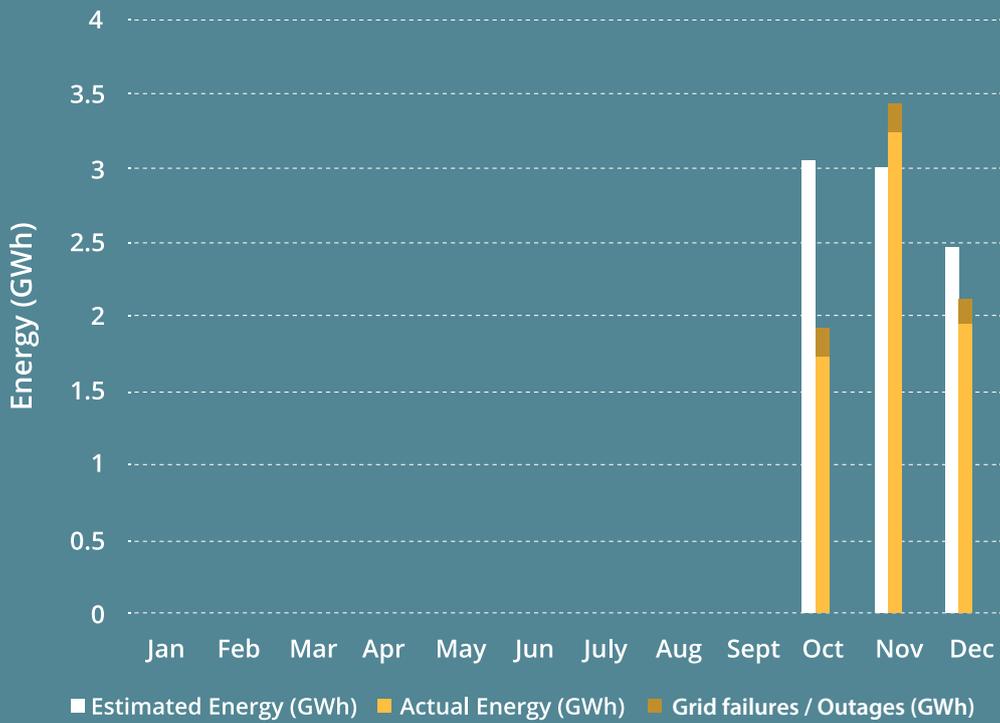


Figure 4 – Rwimi SHP actual versus estimated energy output.





## Solar Projects

# Tororo: The Second Grid-connected Solar Power Plant in Uganda Starts Operations

**O**n September 3, 2017, the developer Tororo Solar North Ltd. (majority-owned by the multinational company Building Energy, a global integrated independent power producer) announced the commencement of commercial operations of the Tororo Solar Power Plant,

located just outside Tororo Town in Tororo District, Eastern Uganda. The 10 MW plant (32,240 solar modules on 14 hectares) became the second grid-connected solar power plant in Uganda. The Tororo Solar Power Plant will produce around 16 GWh each year.





It took approximately eight months to build and commission the 10 MW plant. During construction 350 jobs were created on site, of which 300 jobs were filled by Ugandan citizens. Four permanent jobs have since been created to assist with the operation and maintenance of the facility with training undertaken on a range of issues.

The Developer and EPC Contractor placed considerable priority on environmental and social (E&S) compliance and performed well in this respect. The E&S challenges were only moderate at this project site, but the approach and performance on E&S issues is among the

best in the GET FiT portfolio and a good example for E&S practice in Uganda.

The Solar Power Plant is connected to one of Uganda's largest electricity substations (close to large load centers), in order to reduce electricity loss that can occur with long-distance transmission.

The plant is generating largely according to forecasted output, and has already produced approximately 5.9 GWh of clean energy in 2017.





The inauguration ceremony on October 16, 2017, was attended by Uganda's Minister of State for Mineral Development, H.E. Peter Lokeris, together with; EU Ambassador, Attilio Pacifici; German Ambassador, Dr. Albrecht Conze and Norwegian Ambassador Susan Eckey, as well as representatives of other stakeholders including ERA and KfW.



Minister of State for Mineral Development H.E. Peter Lokeris (right) and Matteo Brambilla, Managing Director Building Energy South Africa (left) during the inauguration. (photo: Building Energy)

## Soroti: A successful first operational year

Commissioned in November 2016, the Soroti Solar Power Plant has been injecting power to the national grid for more than a year now. The 10 MW plant (32,680 solar modules on 13 hectares) developed by Access Uganda Solar Ltd. was, at the beginning of commercial operation, the first grid-connected Solar Power Plant in Uganda but also East Africa's largest (now challenged by Tororo, the second Solar Power Plant commissioned under GET FiT and also 10 MW).

From December 2016 to November 2017 inclusive (one year), the plant produced approximately 16.5 GWh.

The deemed energy due to failures from the grid was 0.7 GWh (corresponding to approximately 6.5 days of power outage), meaning that the plant should have produced 17.2 GWh in theory (no failures from the grid) which is at the level of the expected 17.5 GWh per year.

The local Operation and Maintenance team (4 men and 1 woman) did not report any major events since achieving commercial operation, and was mostly following normal operating procedures, both preventive and corrective.





## Kakira

Kakira is a 20 MW biomass (bagasse from sugar production) plant in Jinja District, Eastern Uganda. The plant is designed to deliver 147 GWh/year to the grid. Over the past two-three years, Kakira has been faced with a considerable reduction in availability of sugar cane, caused mainly by increased local competition in the sugar cane market due to additional sugar factories in the region. This has severely reduced fuel supply to the generation facility, as a significant share of the sugar cane is purchased from outgrower farmers. In 2016, approximately 60 GWh was delivered from the plant. The availability of cane has seen a further decrease in 2017, where delivered energy accumulated only to 43.5 GWh. This is less than one third of planned annual production. The low production level currently experienced at Kakira results in accumulation of undisbursed funds on the associated financing agreement with GET FiT. Only a

limited share of this could be retrieved through potential production above the stipulated level in later years. Therefore, money previously allocated to Kakira will be reallocated to projects within the programme that have so far not been allocated a full premium amount due to funding shortages. To increase cane supply, Kakira owners have invested in a new irrigation system and acquired additional land for sugar cane production. This will increase own supply and reduce dependency on outgrower farmers. On this basis, Kakira reportedly expects to be back at normal production levels by 2020. The future annual production levels for Kakira will also depend on the outcome of ongoing discussions regarding regulatory issues for the sugar industry and the level of competition for sugar cane among sugar factories.



## 2.3 Projects under construction

### Nkusi

Run-of-river SHP with a planned installed capacity of 9.6 MW and 46 GWh in annual production, located in the Kibaale and Hoima districts. The Project secured investments of USD 23M, with USD 6.5M in GFPPM commitments, and commenced construction in June 2015. The Nkusi SHP is the only GET FiT project designed with a tunnel that carries the full length of waterway. The tunnel breakthrough during Q1 2017 was a significant achievement for the Project, providing an improved, easier construction access between the dam/intake and power station sites for the remainder of the construction phase. The original access to the weir and intake was one of the most challenging in the portfolio, with pedestrian access only possible from steep escarpments from above the weir or from Lake Albert below.

The Project is on track to achieve a COD in Q2 2018. However, the interconnection solution remains a critical issue, with the previous option abandoned due to UETCL's lack of funds. A new 3 km line will now be constructed by REA to connect the plant to the existing grid. However, due to weaknesses of the general distribution grid in the project area, this grid extension will only have capacity to evacuate a maximum of 45% of the generated power from the Project. For a permanent solution that minimises the risk of deemed energy and associated payments by GoU, the Developer successfully solicited additional funding to construct a new 88 km line from the Project to Fort Portal. The timeline for implementation is 6 months, which will help to reduce the magnitude of deemed energy.





## Nyamwamba

Run-of-river hydropower plant with a planned installed capacity of 9.2 MW and estimated 39 GWh annual production, located in Kasese district. The Project secured investments of USD 26.8M, with USD 5.8M in GET FiT commitments, and commenced construction in Q4 2015. Construction progressed well during 2017, with the Developer working on multiple construction faces and within a relatively constrained footprint.

Most of the civil engineering structures were completed and the electromechanical installations in the power station were relatively advanced by the end of the year. Construction of the 17 km long power evacuation line was completed by REA during 2016, well in advance of the commissioning phase for the Project. The Project is now nearing completion and expects to achieve commercial operation early during Q1 2018.





## Lubilia

Run-of-river hydropower plant with a planned installed capacity of 5.4 MW and expected 25 GWh annual production, located in Kasese district. The Project secured investments of USD 18.7M, with USD 3.2M in GET FiT commitments, and commenced construction in March 2016.

Construction progress was generally good and the site team demonstrated a capacity during 2017 to manage critical construction activities and resources to fulfil key programme dates. The Developer, also responsible for the Siti 1 SHP, adopted an alternative approach at Lubilia SHP with respect to the penstock: a bespoke workshop was established at the Contractor's yard for the purpose of sandblasting and applying protective

coatings to the pipe sections, to reduce mechanical damage to the coatings in transit and to improve overall quality. Completion of the penstock installation, powerhouse construction, and electromechanical installations in the powerhouse were critical activities to achieving the COD.

REA completed construction of the relatively short 3.2 km long evacuation line, which will allow the Project to evacuate power once the COD is achieved, currently planned for early Q1 2018. However, improvements to the existing transmission infrastructure to improve reliability are not anticipated until later in Q1 2018, which may result in outages in power evacuation in the interim.





## Waki

Run-of-river hydropower plant with a planned installed capacity of 4.8 MW and estimated 25 GWh annual production, located in Hoima and Bulisa District, Western Uganda. The Project secured investments of USD 18.1M, with USD 3.6M in GET FiT commitments, and commenced construction during 2015.

This is only one of two projects in the portfolio with a tunnel section, through which a small portion of the headrace pipeline will pass, and the only project to attempt fabrication of the steel pipeline on site. For this purpose, the Developer established a bespoke workshop with steel plate rolling facilities on site, as well as facilities for sand blasting and applying protective coatings. Unlike most other GET FiT projects, the Developer has benefited from the power evacuation

line to the site already being completed, allowing the site to utilise grid-supplied electricity during the construction phase.

Construction progress was slow during the first half of the year, particularly at the weir site, where successfully implementing the river diversion works had taken substantially longer than planned. Slow progress and issues of non-compliance with IFC Performance Standards and Ugandan regulations resulted in an enforced construction stop by both ERA and GET FiT of several months during the year. The Developer addressed key issues and resumed construction works during Q4 2017 and is aiming to achieve commercial operation during Q3 2018.





## Siti II

Run-of-river hydropower plant with a planned installed capacity of 16.5 MW and estimated 72 GWh annual production, located in Bukwo District, Eastern Uganda. The Project secured investments of USD 33M, with USD 10.2M in GET FiT commitments, and commenced construction during August 2016.

The Project has the largest installed capacity of the GET FiT projects and is the downstream part of the cascade with the already commissioned Siti I SHP, one of only two cascades in the portfolio.

Following commissioning of the upstream Siti I SHP, the Developer diverted all available resources to the Siti II SHP, allowing improved focus on construction

progress. The key challenge to resolve during 2018 is the power evacuation solution. Umeme will construct an interim 33 kV line, which will follow the Siti I line corridor and extend to Mbale substation. Construction of the line is expected to commence in Q1 2018 and be completed in less than 12 months. A permanent 132 kV evacuation solution is being developed from Mbale-Bulambuli and is described later in this report in the chapter **Connecting to the Grid**.

The Project is aiming to achieve commercial operation by Q3 2018, although the risk of deemed energy is a real possibility given the uncertainties surrounding the power evacuation infrastructure.





## Kyambura

Run-of-river SHP with a planned installed capacity of 7.6 MW and 36.7 GWh in annual production, located in the Rubirizi district. The Project secured investments of USD 24M, with USD 5.4M in GET FIT commitments. The design of the Project changed markedly during 2017, with the originally proposed headrace tunnel being replaced with a headrace canal, realignment of the penstock, and the introduction of a pebble tank and desilting basin.

Only limited construction activity was undertaken prior to September 2017, following which access road construction and excavation works for the headrace canal commenced in earnest. The Developer made good progress during Q4 2017 and was making arrangements to engage multiple sub-contractors and to construct the Project on multiple faces from early 2018. The supply and installation of the electromechanical equipment was expected to be on the critical path. The Developer plans for a COD in Q4 2018 but, given the aggressive construction schedule, Q1-Q2 2019 seems more likely.





## Sindila

Run-of-river hydropower plant with a planned installed capacity of 5 MW and 27 GWh expected annual production, located in Bundibugyo district. The Project secured investments of USD 17M, with USD 3.3M in GET FiT commitments. The design of the Project changed considerably during 2017, including changes to the location, size, and form of key project structures, such as relocating the weir and changing the form of construction of the headrace waterway.

The EPC Contractor for the Project is also constructing the adjacent Ndugutu SHP, which shares the same penstock corridor and power station site. The

Contractor therefore benefits from sharing facilities and resources across both Projects, such as the main construction yard, construction plant, and some of the access roads. The steel pipe delivery and installation methodology are unique to the Sindila and Ndugutu SHPs, based on the Contractor's experience of installing many kilometres of steel pipeline in South Africa.

Construction activities commenced during early 2017 and the Developer plans to achieve the COD during Q3 2018. However, the construction programme and terrain are challenging and a COD during Q1-Q2 2019 appears more realistic at this stage.





## Ndugutu

Run-of-river SHP with a planned installed capacity of 5.9 MW and 26.5 GWh in annual production, located in the Bundibugyo district. The Project secured investments of USD 15M, with USD 3.2M in GFPPM commitments.

The Project designs changed significantly during 2017. The most notable changes were the relocation of the power station adjacent to the Sindila SHP power station, which will now share the same station facilities including loading bay and power station crane, and substantial changes in the waterway arrangement and alignment. As a result, the Project now has the shortest headrace section, at 0.1 km in length, and the longest penstock of any of the GET FiT Projects, with nearly 4 km of pipeline! As a result, the Developer had to acquire more land, as well as update and obtain new permits, licences and approvals necessary to proceed. The changes were introduced to improve constructability, achieve construction efficiencies, and reduce Project costs.

As well as substantial delays due to changes in Project designs, the Developer has also consistently and

repeatedly failed to comply with deadlines with respect to project development and environmental and social requirements. As a consequence, a financial penalty was imposed on the Project to incentivise the Developer to address the issues outstanding and to increase efforts to comply with Programme requirements. The penalty was applied by reducing the GET FiT subsidy allocated to the Project and is the first occasion during the implementation of the Programme that such a contractual mechanism has been utilised.

The EPC Contractor is common to both the Sindila and Ndugutu SHPs and, as mentioned earlier, benefits from sharing facilities and resources across both Projects. Construction activities commenced during Q2 2017, with the Developer aiming for commercial operation during Q4 2018. However, in addition to the ongoing Developer performance issues, the construction programme and terrain are challenging and a COD during Q1-Q2 2019 appears more realistic at this stage.





## Nyamagasani I

Run-of-river SHP with a planned installed capacity of 15 MW and 64 GWh in annual production, located in the Kasese district. The Project secured investments of USD 36.7M, with USD 9.4M in GFPPM commitments. The Project experienced substantial delays during 2017, in part due to changes in design, which included relocating the intake at the weir site and the first few hundred metres of headrace waterway, where there is particularly challenging terrain. Having finally achieved financial close at the end of Q4, however, the Developer plans to substantially scale-up resources and construction operations early during 2018.

The EPC Contractor for the Project is also constructing the Nyamagasani II SHP – the second cascade of schemes in the portfolio – and therefore benefits from sharing facilities and resources across both Projects, such as the main construction yard and construction plant. The Contractor also has the benefit of sharing the bespoke penstock workshop established for the Lubilia SHP for the purpose of sandblasting and applying protective coatings to the pipe sections. Nonetheless, the Project will face many logistical challenges during 2018 with respect to being able to deliver, install, weld,

and apply protective coatings to the nearly 5 km of steel pipeline – the second longest waterway in the portfolio!

Construction commenced during Q1 2017 and the Developer is aiming for commercial operation during Q4 2018. However, given the size of project structures and the challenging nature of the site and construction programme, a COD during Q1-Q2 2019 appears more realistic.

One of the key challenges for the Nyamagasani projects is the timely implementation of the power evacuation infrastructure, which is being implemented by REA, and will include the construction of a new 33 kV evacuation line. The procurement of an EPC Contractor for line construction was substantially delayed during 2017 and is now expected to conclude in January 2018. Line construction is expected to commence in Q1 2018, with an optimistic completion date estimated in March 2019. Further delays in concluding the procurement of an EPC Contractor and in implementing the infrastructure will substantially increase the risk of deemed energy for these projects.





## Nyamagasani II

Run-of-river SHP with a planned installed capacity of 5 MW and 25.5 GWh in annual production, located in the Kasese district just downstream of the Nyamagasani I SHP. The Project secured investments of USD 19.8M, with USD 3.7M in GFPPM commitments. Similar to the Nyamagasani I SHP, the Project experienced substantial delays during 2017, in part due to changes in design, which included changing the location of the intake to the right bank to avoid the need for a siphon across the river. The form of penstock was also changed from steel to GRP pipes, which has the benefit of substantially reducing competing pressures on skilled welders that are shared across the two Nyamagasani Projects. This is important given the remaining timescale available for construction within the GET FiT window.

The Developer plans to substantially scale-up resources and construction operations early during 2018, having finally achieved financial close at the end of Q4. The Contractor also has the benefit of sharing the concrete batching plant, which has been established to supply concrete to both Nyamagasani projects. Construction commenced during Q1 2017 and the Developer is aiming for commercial operation during Q4 2018. Many of the challenges, key programme dates, and ambitious construction programme are similar to the Nyamagasani I SHP and, therefore, a COD during Q1-Q2 2019 appears more realistic. The Nyamagasani projects will share the power evacuation infrastructure and, therefore, as for Nyamagasani I SHP, there is a real risk of deemed energy for this Project once the COD is achieved.





## Kikagati

Run-of-river hydropower plant with a planned installed capacity of 16 MW and 115 GWh annual production located in Isingiro district, Southern Uganda on the border with Tanzania. Investment of USD 51.1M with USD 12.3M in GFPPM commitments. The Kikagati SHP is unlike any other hydropower project in the GET FiT portfolio, being situated on the biggest river of any of the projects – the Kagera River – and in the location of a previous hydropower station, which had been destroyed many years previous as a result of civil unrest between the two countries. With the largest design flows and one of the largest power outputs of the projects in the portfolio, it also has the longest dam at approximately 170 m in length and the lowest design head, with a dam of approximately 6 m in height. There are also no waterways (headrace structures or penstocks), which means that the project structures are all located in the vicinity of the dam, giving the smallest footprint in the portfolio!

Following substantial delays due to transboundary issues and in executing a bilateral agreement between the Governments of Uganda and Tanzania, the Project mobilised to site during Q4 2017 – the last of the projects in the portfolio to commence site works and a substantial achievement for the GET FiT Programme. The Project plans to achieve commercial operation in stages, with the first unit reaching Commercial Operation Date (COD) on 14 April 2020; and the third unit achieving COD on 18 September 2020. The Project will substantially benefit from this site previously having been used for the purpose of hydropower generation as the power evacuation infrastructure is already in place, which means that the Contractor will be able to use grid-supplied electricity during construction.



## 2.4 Expected portfolio output

With six GET FIT power plants commissioned by the end of 2017, the total capacity added to the Ugandan grid by the Programme now totals 58.1 MW (20 MW bagasse, 20 MW solar and 18.1 MW hydro). This corresponds to a planned annual production of approximately 269 GWh. Thus, portfolio commissioning currently stands at 37 percent in terms of installed capacity and 35 percent on annual production.

Figure 5 below provides an overview of the total planned installed capacity of the portfolio and how it is distributed across the supported technologies. The

overall planned capacity actually increased slightly in 2017 due to a design change in one of the hydropower plants, raising the total to 158.4 MW. This is equivalent to approximately 93 percent of the original Programme target of 170 MW. The difference between the planned and original targets is partly due to a reduction in the overall Programme funding in earlier years combined with a lower share of bagasse/biomass than originally anticipated. Nonetheless, adding an installed capacity of nearly 160 MW to the Ugandan electricity supply network is a significant achievement and truly reflects the successful impact of the GET FIT Programme.

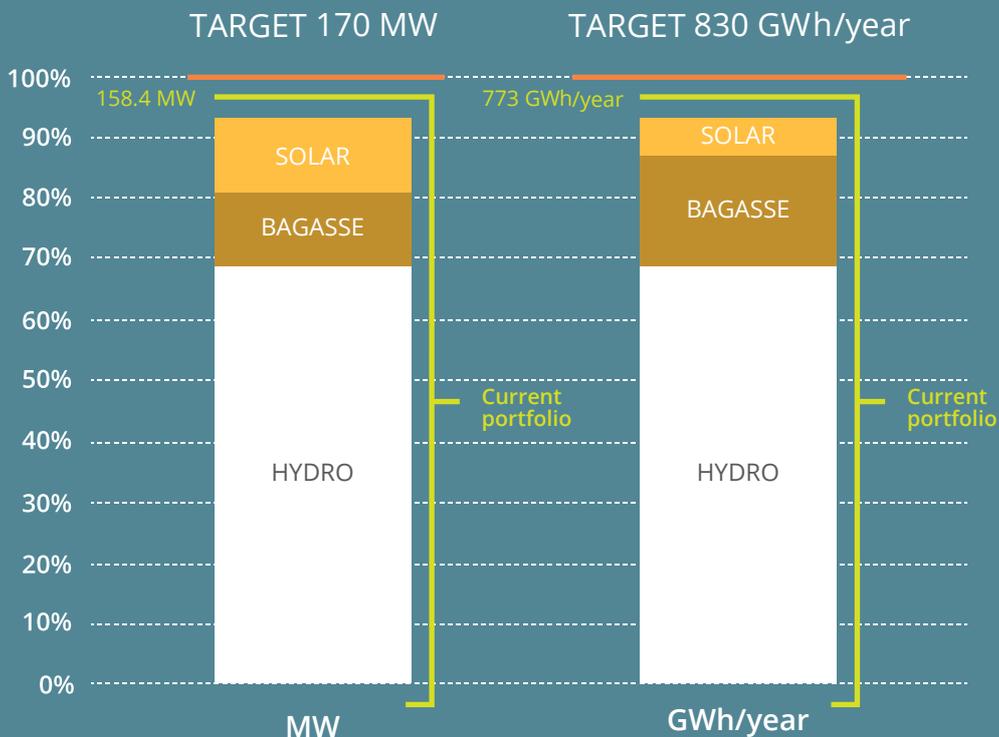


Figure 5 - GET FIT portfolio build up and original targets.

Figure 6 below provides an illustration of the anticipated portfolio build-up with time. It is noted that although the majority of GET FiT supported projects are expected to reach commercial operation by the end of 2018 – the original Programme window – several projects are likely to overrun into 2019. One of the projects – the Kikagati SHP – is also not expected to achieve commercial operation until later in 2020 due to substantial delays.

To improve implementation oversight of the remaining projects and minimise the risk of further delays, GET FiT introduced several tools to more closely monitor progress and incentivise the Developers.

For selected projects, this included increasing the frequency of supervision visits at the cost of the developer; undertaking unannounced site visits to check that developers were complying with Programme requirements; enforcing stops in construction where there were clear deficiencies in the developers' capacity to plan and implement the projects safely; and imposing reductions in the overall subsidy amount allocated to the project where there was continued non-compliance with Programme requirements or poor performance. Finally, a penalty mechanism for delayed commissioning after 2018 has also been introduced to limit further delays across the portfolio.

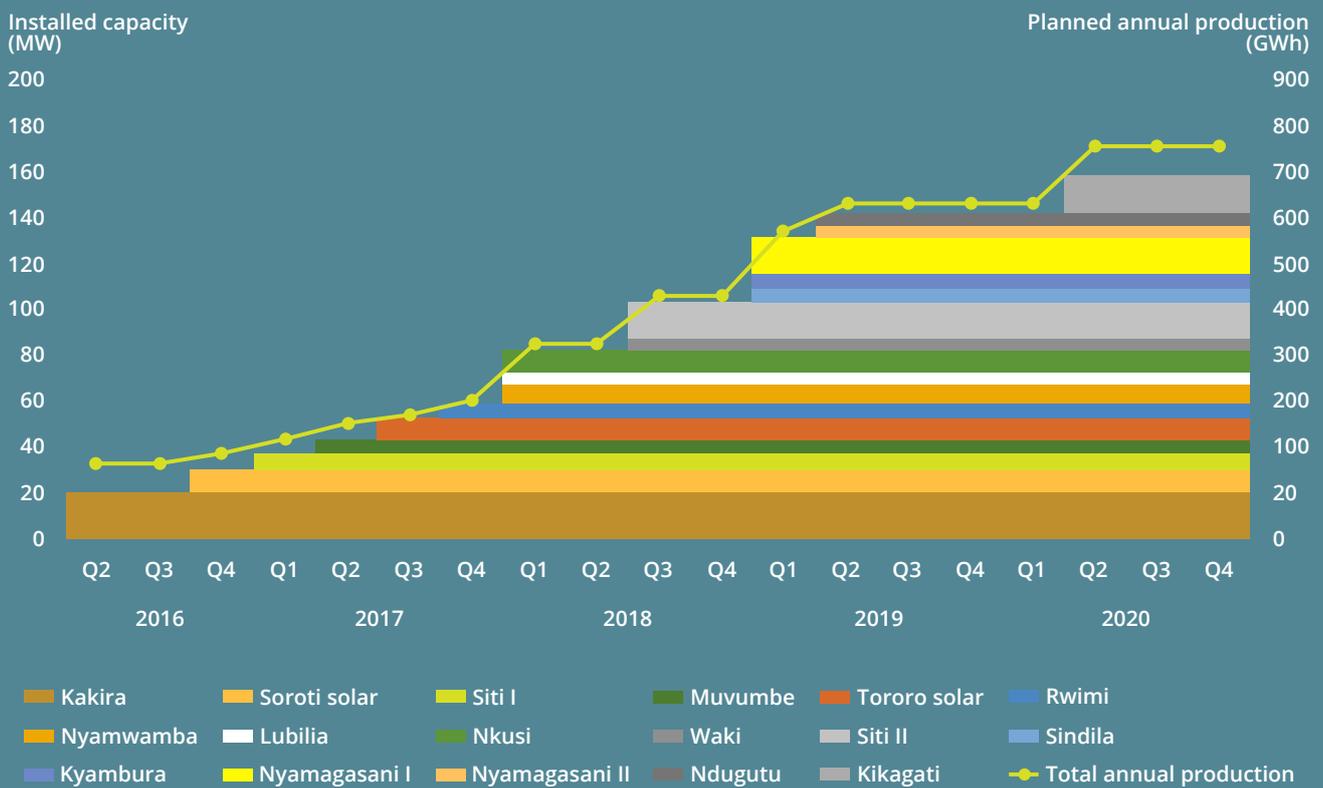


Figure 6 - GET FIT implementation timeline.

## 2.5 Re-appraisal of projects

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In early 2017, three projects which had previously applied for GET FiT without being granted support were re-appraised. This limited Request for Proposals (RfP) was conducted as a pro-active measure aimed at qualifying reserve projects which could be included in the GET FiT portfolio at short notice to maintain MW targets. Several projects that had already been approved for GET FiT support were performing unsatisfactorily and were considered at risk of losing support. Two projects, Bukinda SHP (6.5 MW) and Mahoma SHP (2.7 MW) were approved as reserve projects by the GET FiT Investment Committee. The

third project, Kakaka SHP (4.5 MW), was considered to be not sufficiently developed to receive GET FiT support and was not approved.

Thus far, the projects that were at risk of being dropped prior to the re-appraisals have all managed to increase efforts and remain part of the portfolio. Although there remains a risk that certain projects may still be excluded, none of the reserve projects are now likely to qualify for support due to the GET FiT time-frame and potential grid connection issues.



# 3 MANAGEMENT OF ENVIRONMENTAL & SOCIAL PERFORMANCE

## 3.1 Environmental and Social Benchmark

Sound management of environmental and social (E&S) risks protects the environment and safeguards project-affected people and workers. Sound risk management also secures a social licence to operate, a broad social acceptance within the project communities, and therefore guards against a variety of social risks during construction and operation.

Projects supported by GET FiT are required to comply with Ugandan regulations and international standards, particularly the environmental and social performance standards (PS) of the International Finance Corporation (IFC). The IFC PS act as a global benchmark and are

widely applied by international financing institutions and private investors, also making these a convenient common reference point in multi-donor funded initiatives like GET FiT. It is important to note that the Ugandan regulations and the IFC PS have many similarities, though there are also some important differences. For example, the IFC PS require that compensation for loss of assets is based on full replacement cost (market value + transaction costs) rather than Uganda's requirement of using the lower depreciated value. The IFC PS also requires biodiversity offsets when a project impacts a protected area such as a national park. The current Ugandan legislation does not require such offsets.



## 3.2 GET FiT follow-up and support

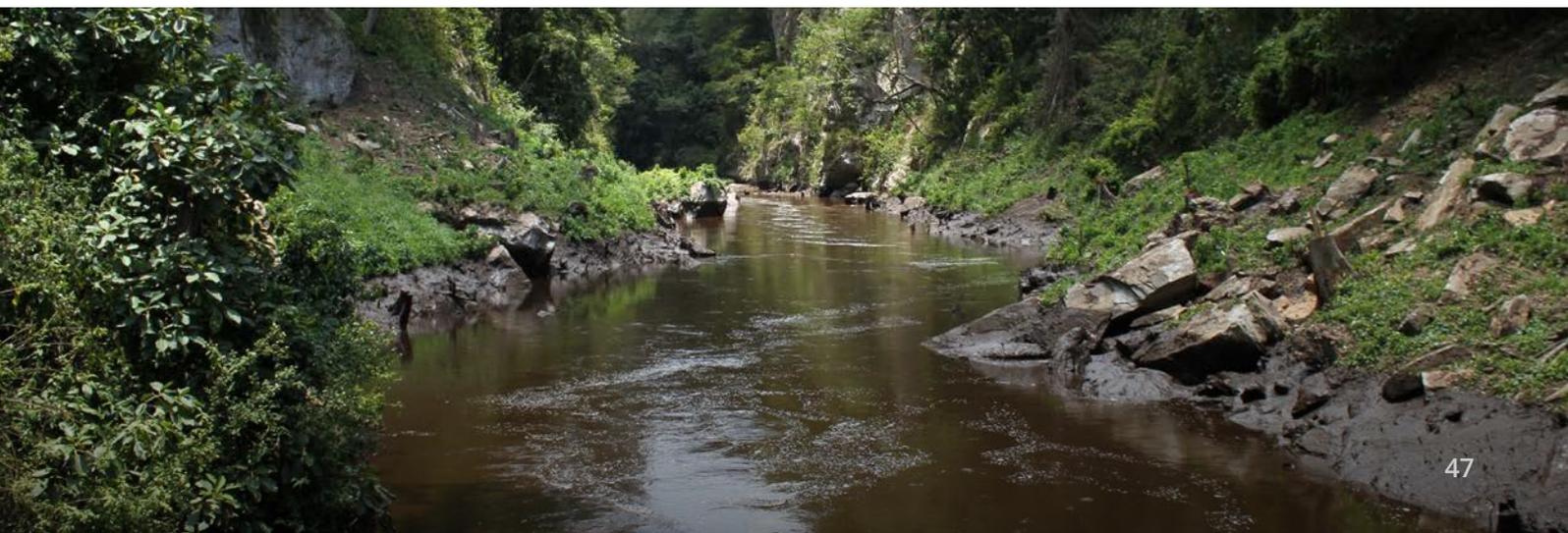
As highlighted in previous GET FiT Annual Reports, the capacity of developers to manage environmental and social risks, including health and safety, has been considerably lower than expected. Weak capacity was reflected in the low E&S scores during appraisals of applications for GET FiT support, also resulting in numerous conditions precedent (CPs) defined by the Investment Committee. An anonymous survey among developers in 2015 confirmed that few of the developers had experience from implementing projects in line with the IFC Performance Standards prior to GET FiT.

The GET FiT Investment Committee defined more than 50 environmental and social CPs across the three RfPs in 2013, 2014 and 2015. The large number of CPs reflected the overall low environmental and social capability of project developers and their consultants and in particular gaps in environmental and social impact assessments (ESIAs), resettlement action plan (RAPs), environmental and social management or action plans (ESMPs or ESAPs) and livelihood restoration plans (LRPs). No E&S CPs were cleared in 2017. Cumulatively across the portfolio to date, about 70 % of the environmental and social CPs have been cleared.

GET FiT has spent considerable time advising developers on E&S issues, for instance revisions of studies and

management plans and later when implementing plans during construction. Support from GET FiT also included environmental and social workshops for small hydropower, biomass and solar developers and their consultants in June 2014 and October 2015. In 2017, developers continued to express a demand for GET FiT engagement on the management of environmental and social risks. Additional resources have been provided by KfW, and GET FiT in cooperation with ERA continued to support developers in this respect.

With all projects having moved into construction and some entering operation, most of the E&S follow-up in 2017 was in the form of supervision visits to construction sites and preparation for achieving commercial operation and entering the operation phase. The GET FiT Implementation Consultant normally undertook a semi-annual one-day supervision visit to each project under construction to monitor and advise on environmental and social as well as engineering issues. Action points were identified in each visit. The supervision visits continue to prove useful and a necessary part of managing environmental and social risks. A total of 32 project supervision visits to 15 projects were undertaken in 2017. In addition, the first post-COD visit was made in 2017. For several projects, GET FiT shared information and coordinated feedback to developers with the lenders.





*"The close follow up and support from GET FiT of our project has greatly contributed to improving project quality, both in terms of planning and execution."*

Asa Katama, Project Manager,  
Nkusi Hydropower Project

## 3.3 Performance – improvements and remaining challenges

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Overall, most projects saw further improvements in environmental and social performance during 2017. But as in previous years, progress was uneven between projects. Most improvements were observed where the developers' internal environmental and social capacity was substantially strengthened, and where environmental and social standards were firmly embedded in developers' strategies and seen as a priority at senior management level. During the GET FiT Programme, some developers have made impressive improvements in their capacity to manage environmental and social risks and undertake practical measures to safeguard people and nature. As a result of the Programme, there is now a considerably higher degree of compliance with Ugandan regulations and international standards than would otherwise have been observed.

Prior to GET FiT, most developers had not gone through full project cycles from project development to operation following international E&S standards. This means new challenges arise as the projects move into the next stage of the project cycle. With all projects having reached construction, developers experience new challenges in the form of practical implementation of environmental and social management plans, including ensuring contractors understand and adhere to the developers' plans and standards. As projects move into operation, operation phase issues arise combined with challenges of a construction team handing over responsibility to an operations team, the latter who tend not to have been exposed to the project's E&S issues. It is positive to note that developers with multiple projects in the portfolio learn from one project to the next.

While each project has its unique challenges, the supervision visits documented some common issues across the portfolio. Among others, these included

damage during excavations, delays in compensation payments triggered by construction damage, workers' health and safety risks, inappropriate handling of minimum flow releases, and insufficient management of risks to national parks. Developers' monitoring of E&S issues during construction has also been a distinct weakness in most projects. In addition, resource constrained Ugandan government lead agencies have not been able to fulfil their intended roles in monitoring compliance.

Poor excavation methods and inappropriate handling of spoil material have been prevalent and resulted in damage to people's crops and other property as well as natural vegetation and rivers. Substantial compensation for damage has been triggered, and delays in compensation payments result in frustration among project-affected people. This led to legal proceedings against the developer and contractor in one project as well as a local community briefly blocking an access road in another project. Workers' health and safety risks remain a concern and additional measures have been required across the portfolio.

Virtually all projects have struggled to define appropriate minimum flows to be released into the river section that will experience reduced flow during operation (between intake and power house) and had to undertake design modifications to improve the minimum flow release arrangements (see next section). Management of risks to national parks remained a challenge for some projects. One project is located partly inside a national park and three projects are located close to another national park. New approaches to prevent negative impacts on protected areas and to monitor risks are under development and can provide a learning ground for future infrastructure projects that may impact protected areas in Uganda.

GET FiT sees environmental and social sustainability as key to overall project sustainability. Where a forceful response to persistent non-compliance is required, GET FiT has several tools available including increasing the frequency of supervision visits at the cost of the developer, unannounced site visits, construction stop, subsidy reduction, and even revoking the subsidy in extreme cases.

One approved project had its support revoked by the GET FiT Steering Committee in 2015 due to consistent serious environmental and social non-compliances. In 2016, two projects were requested to suspend construction until corrective measures were

implemented, and one project was requested to do the same in 2017. All projects resumed construction following substantial improvements. While only one project was subject to quarterly supervision visits in 2016, five projects were covered by quarterly visits in 2017, mostly due to E&S non-compliances and partly due to limited construction progress. One unannounced inspection was undertaken by GET FiT in 2017. Some projects still had substantial non-compliances at the end of 2017 and may face actions by GET FiT unless urgent corrective measures are implemented. Consequently, one project faced a subsidy reduction event in early 2018.



## 3.4 Minimum flow – an unresolved issue

As discussed in previous GET FiT Annual Reports, there have been major improvements in the regulatory frameworks and investment climate for renewable energy in Uganda in the past. There are, however, issues where further work is required to establish clear expectations on developers and clear frameworks for decision-making that balance various societal interests in a predictable and transparent manner. Assessing and determining minimum flow<sup>3</sup> requirements for hydropower projects is one such issue.

Fourteen (14) out of seventeen (17) projects approved under GET FiT are hydropower projects. By design, these projects result in a major reduction of the natural river flow between the intake and the power house. In the GET FiT projects, this river section is typically 3-4 km long. The release of a minimum flow is a normal mitigation measure to reduce impacts on people and ecosystems along the affected river section. The volume of the minimum flow also directly impacts on the economic viability of a hydropower project, as water that could otherwise be used for power generation remains in the natural river channel. Minimum flows have therefore been a challenging issue in all hydropower projects supported by GET FiT, with developers struggling to derive a clearly justified minimum flow level and develop appropriate designs to release and monitor it. The inadequate guidance from government agencies and lack of clarity on which methodologies should be applied to arrive at minimum flow releases have complicated the assessment of minimum flows for developers. This may have resulted in the inefficient allocation of water among competing societal interests (power production, ecosystems, other human water uses) and unequal requirements on developers.

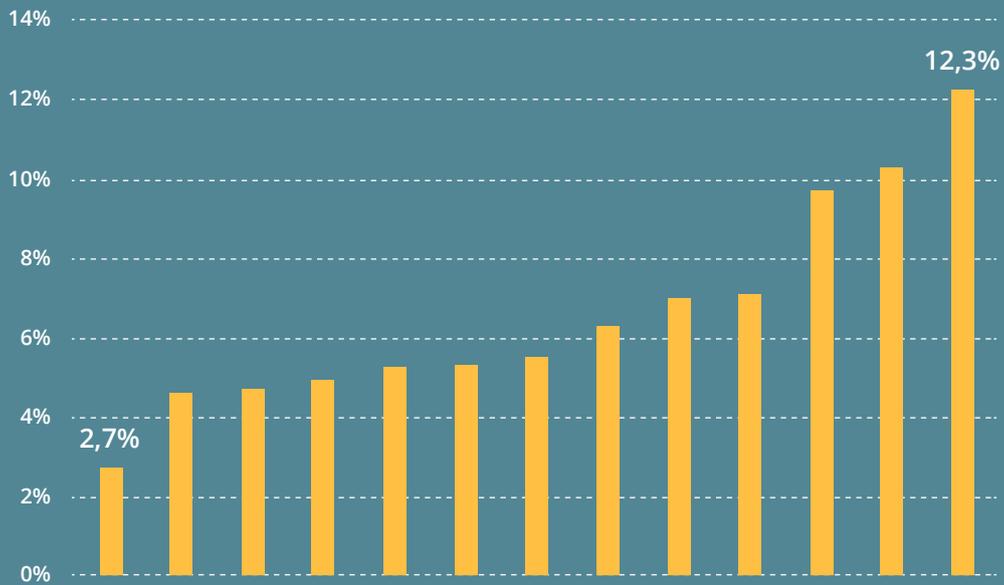
A simple comparison between the GET FiT supported projects can be made by calculating the minimum flow requirement defined by the Government as a proportion of the mean annual flow of the affected river. Figure 7 below shows that there was substantial variation between projects in terms of the minimum flow requirement as a proportion of the mean annual flow. Expanding the sample of projects to non-GET FiT supported hydropower projects in Uganda increases the variation further. The minimum flow requirements would normally include consideration of issues such as loss of power production, human water use interests along the affected river section (domestic water use, water supply schemes, irrigation, etc.), fish and other ecological concerns as well as whether any tributaries downstream of the hydropower intake contribute water to the affected river section, or the presence of alternative water sources. It is therefore important that minimum flow requirements are identified on a project-specific basis, so that the characteristics of the project setting are accommodated for. As a result, the minimum flow requirements will vary between projects.

Looking at the variation in minimum flow requirements within the GET FiT portfolio and the characteristics of the affected river sections, it is difficult to see any clear correlation between the level of the minimum flow requirement and the water use interests along the affected river sections. For all parties involved, it would be beneficial if there is greater clarity on the methodologies to be applied in assessing the level of minimum flow, including data requirements, assessment methods and procedures to be followed, including key stakeholders to be consulted. Without greater clarity on the above issues, developers will continue to struggle to derive sound minimum flows on a consistent basis. Furthermore, the allocation of water

<sup>3</sup> We refer to 'minimum flow' rather than the often-used concept of 'environmental flow' as the minimum flow requirements defined in Uganda (by the Directorate of Water Resources Management) usually do not have the characteristics of a true environmental flow, namely a description of the quantity, timing and quality of water flows required to sustain freshwater ecosystems and human livelihoods that depend on these ecosystems.

between competing water uses (power production, local water users, ecosystems) may not be the result of a predictable and fair process, where hydropower

developers and other stakeholders can engage in an efficient manner to support balanced decisions.



**Figure 7** - Minimum flow requirements for GET FIT supported projects defined by Ugandan authorities. The minimum flow requirements are shown as a proportion of the estimated mean annual flow.



# 4 OTHER ACTIVITIES AND ACHIEVEMENTS

## 4.1 GET FiT Visibility

### Donor Visit to Nkusi

GET FiT arranged a visit by GoU and development partners to the Nkusi SHP on 8 February 2017. The objective of the site visit was to witness the progress on one of the supported hydropower projects during construction. Nkusi SHP was selected due to its unique design that includes a 900 m long tunnel and its strategic location on the shores of Lake Albert in Western Uganda. The GoU was represented by the Ministry of Finance and Economic Development (MoFPED) whereas the development partners represented were Norway and DFID (London and Kampala). The visit was accompanied

by KfW and it provided valuable insights for the annual review of GET FiT by DFID as well as roll out planning by the London-based team.

### Tororo Commissioning Ceremony

The commissioning of Tororo PV, as Uganda's second on-grid solar plant, attracted several high level representatives from the Programme sponsors and good media coverage. See the chapter on **Project Status** for more details.



Uganda's Minister of State for Mineral Development, H.E. Peter Lokeris (no. six from the left), together with: EU Ambassador, Attilio Pacifici (no. 4 from the right); German Ambassador, Dr. Albrecht Conze (no. 5 from right) and Norwegian Ambassador Susan Eckey (no. 4 from left), as well as representatives of other stakeholders. Photo: KfW.



Joint stakeholder ribbon cutting at Tororo commissioning ceremony. Front from the left: Norwegian Ambassador Susan Eckey; Managing Director Building Energy South Africa, Matteo Brambilla; Uganda's Minister of State for Mineral Development, H.E. Peter Lokeris; EU Ambassador, Attilio Pacifici; MP for Tororo South County, Fredrick Angura; ERA Board member, Eng. Oteng Otogo. Photo: KfW.

## GET FiT at International Conferences

The GET FiT Secretariat was invited to give keynote speeches on the Programme at two international conferences during the reporting period. The Programme was presented at the Africa Renewable Energy Leaders' Summit held in Nairobi from 4-5 April 2017, as well as at the flagship utility conference – Africa Utility Week – held in Cape Town from 16-18 May 2017. The events provided a platform from which to share knowledge on GET FiT, increase visibility of Programme implementation by the GoU and development partners, and enhance awareness of a wider GET FiT rollout across Africa. An interview of the Secretariat with ESI Africa at the Africa Utility Week can be viewed ([here](#)).

## GET FiT in the Media

GET FiT attracts media attention on a regular basis, mainly in relation to progress on individual projects. Among others, a New Vision article covered ERA's visit to several GET FiT projects (commissioned or under construction) in August 2017. The article focused on progress and completion of multiple projects and their importance in terms of national and local power supply,

local job creation etc. It also focused on the opportunity provided by the portfolio for ERA staff to increase their competence on development of renewable energy projects, and how this was duly utilised by ERA through the field visits.

In order to document and promote GET FiT in a visually appealing manner, ERA in 2016 prepared a 27 minutes long video/documentary that provides a comprehensive presentation of the Programme. The documentary can be viewed ([here](#)). In addition to this, a video was prepared on the GET FiT Forum arranged in 2016. While summarising the Forum, the video also includes a general introduction to the Programme (5 minutes long). The Forum video can be viewed ([here](#)).

## 4.2 Development of GET FiT Lessons Learned

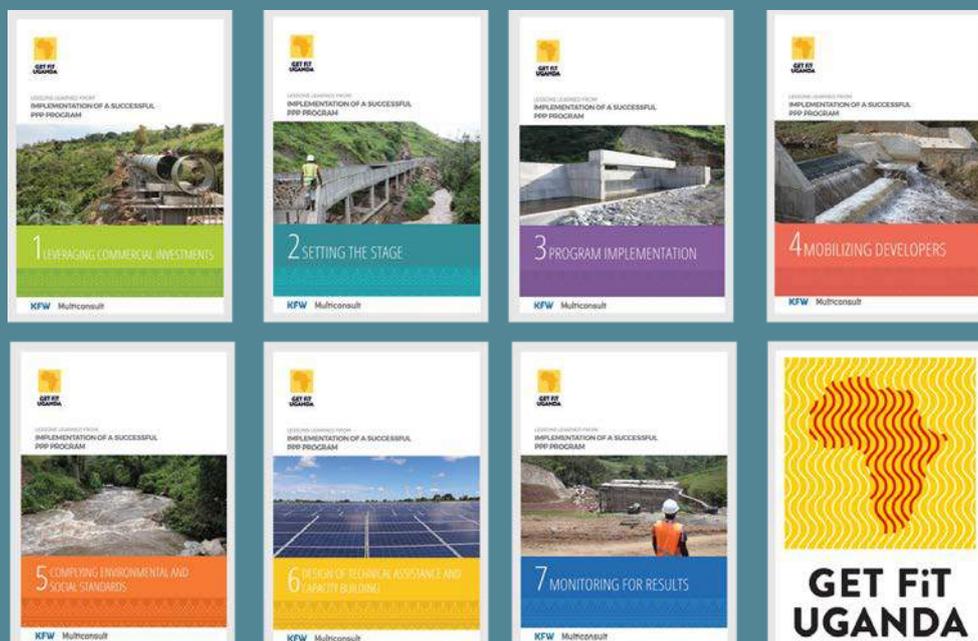
After three years of implementing GET FiT Uganda, the Programme is widely recognised as a successful mechanism in attracting private investment to the development of IPPs at a national scale. Throughout this period, experience has accumulated within the Programme community and among stakeholders. Many important lessons have been learned, which in turn should serve as critical input to developing the GET FiT concept and rolling out similar programmes in other countries.

While the main issues, challenges and success factors of the Programme are outlined in the annual and semi-annual reports, the GET FiT team felt it would be beneficial to clearly present and summarise lessons learned specifically. Not only will this help to develop the GET FiT concept and potentially improve performance in other countries, but also ensure that the key elements of unique institutional memory from GET FiT Uganda is well documented, shared and transferred to future policy makers. The Lessons Learned are also aimed at providing more general learning to Private-Public Partnership (PPP) programs – and it is believed that these could apply in other sectors as well.

Under the overarching title “Lessons learned from implementation of a successful PPP programme” a series of seven lessons learned briefing notes will be prepared. The brochures will cover the following areas of GET FiT implementation:

1. Leveraging Commercial Investments
2. Setting the Stage: The building blocks of a successful PPP programme
3. Program Implementation
4. Mobilizing Developers and Investors
5. Complying with Environmental and Social Performance Standards
6. Making the Impact Stick: Design of Technical Assistance and Capacity Building
7. Monitoring for Results

Lessons 1-3 are completed and will be published in Q1 2018. The remaining lessons are under development and are planned for publishing in Q2.



## 4.3 Cancellation of contract for performance review

In 2015 a Consultant was procured to conduct an independent evaluation and performance review of the GET FiT Programme. The first deliverable under the Terms of Reference was the First Performance Review and Baseline Report, due in 2016. An advisory group was assigned to review the technical quality of the evaluation and to ensure that the design and implementation were robust and credible and would stand up to external scrutiny. The advisory group comprised of representatives from KFW, the UK Department of Business, Energy and Industrial Strategy (BEIS) and the UK Department for International Development (DFID). Included in this group were evaluation specialists, economists and programme managers.

The advisory group provided feedback to the contracted evaluation team on their deliverables (October 2015 – August 2016), including specifically on the 'Evaluation and Performance Review of the GET FiT Uganda Program, Inception Report' and 'First Performance Review and Baseline Report for GET FiT Uganda'. Overall, the advisory group concluded that the report did not meet the minimum quality standards as outlined in the terms of reference. Although the report was published for transparency reasons, the contract with the engaged Consultant was cancelled. The full report is available on the [GET FiT website](#). Thus, the issue of further evaluation of the Programme and how and when this would be undertaken, remains subject to discussion.



## 4.4 GET FiT Knowledge transfer

Through GET FiT a sizeable and diverse sample of small RE projects are being developed and constructed within a limited time-frame. ERA acknowledges that this provides a unique opportunity for highly relevant and practical on-the-job training and has requested knowledge transfer in areas closely linked to the implementation of the GET FiT portfolio. The knowledge transfer will draw on the experience of the GET FiT implementation team. ERA has also requested technical assistance in operational areas which are not as directly linked to the on-the-ground implementation of the GET FiT projects, but focusing more on strengthening the enabling framework for RE development. The knowledge transfer is funded by DFID through the GET FiT interconnection component.

A Concept Note outlining a range of potential activities was prepared by ERA with support from the Implementation Consultant during 2017, and the following areas of knowledge transfer were selected:

1. Management of renewable energy projects under construction.
2. Follow up of environmental & social compliance for renewable energy projects.
3. Design optimisation for small hydropower plants.

4. Benchmarking the costs and performance of power producers.
5. Determination of Return on Equity in the Uganda Electricity Supply Industry.

The training on the economic regulation components (no. 4 and 5 above) will be implemented in Q1 2018, with a one week training in Kampala in February.

The remaining components (1-3 above) relate to technical, and environmental and social aspects of developing renewable energy projects (in particular hydropower) and will be carried out as part of the ongoing joint GET FiT construction supervision visits conducted by ERA and the Implementation Consultant. This will allow the supervision team to go into greater depth on selected issues, based on their joint experiences from implementing the GET FiT portfolio. A process of selecting specific subjects and activities is ongoing. Activities will to the extent possible be combined with the quarterly supervision visits. The activities may include various forms of workshops, joint preparation of papers/publications, preparation/revision of internal ERA guidelines, seminars, presentations to broader ERA staff, etc.



# 5 CONNECTING TO THE GRID

The success of a renewable energy feed-in tariff programme, such as GET FiT Uganda, critically depends on the efficiency of connecting new power plants to the main grid for timely and adequate power evacuation. Since its inception, the GET FiT Programme has supported the Government in the

development of policies and standards for connecting small renewable energy projects to the main grid. There have been challenges and lessons learned. This article highlights the challenges, mitigation measures, status update and experiences from 2017 of grid connection for GET FiT projects.

## 5.1 The Challenge

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Since commissioning of the Programme in 2013, connection to the grid of GET FiT power plants has emerged as the major risk to successful implementation. The vast majority of the power plants are located in remote rural areas, particularly in the mountainous regions of Eastern and Western Uganda, where existing grids, if any, were designed to supply low demand. Additionally, the distribution grids in the project areas are often operated by different concessionaires and the evacuated power needs to be wheeled through these intermediate networks (transmitted through a third party network).

To facilitate full evacuation of the power plants under development, new grid infrastructure needed to be built and existing distribution grids sufficiently reinforced. This required the effective coordination of Government agencies, private developers, utilities, and development partners for successful implementation. It was also necessary to develop new standards for grid connection and wheeling, as well as enhance regulatory capacity to ensure compliance by all the sector players.

In 2017, the overall risk relating to grid connection across the portfolio has increased. This is due to continued delays in implementation of required grid infrastructure managed by Government Agencies.

## 5.2 Addressing the Challenge

In order to proactively address the anticipated risks of delayed grid connection, the Government, through the ERA, established a Joint Task Force comprised of ERA, UETCL, Umeme and REA in 2014. The objective of the task force was to plan for adequate infrastructure to enable proper and full evacuation of the proposed GET FiT generation projects, in order to mitigate power shortages in the medium to long term and also avoid situations of deemed energy. The task force identified the key bottlenecks, infrastructure requirements and estimated budgets. The Government had previously committed to funding new lines longer than 5 km from a project's location to the nearest grid; shorter lines would be built by project developers. In all cases, developers were required to conduct detailed grid connection studies for each project.

The work of the joint task force enabled GET FiT development partners to identify areas of support for the implementation of critical grid infrastructure. Some of the grid infrastructure investments support was the result of direct sourcing through GET FiT, such as

the reinforcement of the 33 kV networks in Western Uganda and the upgrade of the Opuyo substation, both supported by UK DFID. The remainder of the grid infrastructure investments were provided by different development partners as part of the wider sector support, also benefitting GET FiT projects, such as the planned Mbale – Bulambuli transmission line financed by KfW; and Nkenda substation upgrade financed by the World Bank, to mention a few.

The lead agencies in the implementation of the infrastructure reinforcements have been REA and Umeme for the 33 kV networks, and UETCL for the high voltage (132/220 kV) infrastructure. ERA has played a coordinating role and facilitated regular high level meetings with the implementing agencies. KfW and the GET FiT Secretariat have also maintained close follow up with implementing agencies and developers to ensure that grid reinforcements are well aligned with expected project commissioning. The sections below give an update on the status of implementation for the different grid projects.



## 5.3 Interventions through GET FiT

Funding sourced through GET FiT for grid infrastructure development and Technical Assistance to ERA has been provided by UK DFID. The table below shows the considered interventions and budgeted investments, followed by a brief status update on each as of January 2018.

*Table 2 - Critical grid infrastructure investments and TA implemented under GET FiT governance*

Item	Required Intervention	Project owner	Source of funding	Estimated investment need (MUSD)
1	Opuyo Substation reinforcement	UETCL	UK DFID	5.8
2	Reinforcement of 33 kv networks in Western Uganda	UETCL	UK DFID	13
3	TA Support to ERA	ERA	UK DFID	3.7
<b>Total investment need</b>				<b>22.5</b>

### Distribution Grid Reinforcements in Western Uganda

The technical simulations work undertaken by the Joint Task Force revealed deficiencies in the capacity of the pre-existing 33 kV distribution grids in Western Uganda to fully evacuate power from the planned GET FiT hydropower projects in the area. Following the task force's recommendations, GET FiT proceeded to source and secure funding from DFID to support the government in the implementation of selected infrastructure developments. Under this initiative, new 33 kV lines and associated gear will be constructed to evacuate power from five projects, namely Lubilia<sup>4</sup> SHP (5.4 MW), Nyamagasani I SHP (15 MW) and Nyamagasani 2 SHP (5 MW) in Kasese, and Sindila SHP (5.3 MW) and Ndugutu (5.9 MW) in Bundibugyo and Kabarole districts. This initiative will therefore connect a total capacity of close to 38 MW to the national grid.

The implementing agency for the line works is REA, which procured a Supervision Consultant to undertake detailed line designs and prepare tender documents

for the procurement of the EPC contractors. This activity was completed in 2017, albeit with delays. REA subsequently launched the EPC tender in Q3 2017 to have the lines constructed in two lots, i.e. Lot A for evacuation lines for Sindila and Ndugutu SHPs, and Lot B for lines to evacuate Lubilia, Nyamagasani I and II SHPs. The best evaluated bidders for both lots were selected in December 2017. The EPC contracts are expected to be concluded in March 2018, with construction works commencing in Q2 2018. The estimated construction timeline is 12 months.

The timely implementation of the lines is critical to the Programme. Due to extensive delays in the procurement processes, the current timelines indicate a heightened risk of deemed commissioning, given that the said projects are already under development. All the agencies concerned are working concertedly to minimise the risk of further delays and to expedite construction of the line. A potential risk of further delay is the ability of the GoU to allocate the necessary resources for timely compensations to project affected persons along the lengths of the lines.

<sup>4</sup> Lubilia will initially be evacuated through the existing network, but an overall upgrade of the existing evacuation line under the planned reinforcements will ensure more stable evacuation.

## Opuyo Substation

The Opuyo high voltage substation evacuates power from the Soroti solar power plant, and is strategically located for the grid integration of a potential pipeline of solar projects in the Teso area in Eastern Uganda. The planned reinforcements include the replacement of the current single 10 MVA transformer with two new 32 MVA transformers and associated high voltage equipment. The upgrade will subsequently improve the grid reliability and provide flexibility for the substation,

whose single transformer is a risk to continued evacuation in case of failure.

The UETCL procurement processes for engaging a supervising consultant and EPC contractor for the project have been completed after substantial delays. The project kick-off meeting was held in December 2017 and the substation works are expected to start in Q1 2018 for a planned duration of 16 months.



Figure 1 - Opuyo Substation (credit ERA)

## TA Support to ERA

The capacity building support to ERA in 2017 through the grid connection support component (funded by DFID) was comprised of three components, as briefly described below. Although funded as part of the grid support initiative, these components are not restricted to grid related issues only, but also introduce wider strengthening of ERAs regulatory systems. Additional TA activities supported by GET FIT which were undertaken and completed prior to 2017 are outlined in previous **annual reports**.

1. *Interconnection Code and Wheeling Agreement:* This involved the procurement of a Consultant to support ERA in the development of an interconnection code and a wheeling agreement for the integration of small-scale renewables and the wheeling of electricity through the concession areas of various distribution and transmission licensees. The Consultant procured was Intec GOPA. This TA component kicked off in July 2016 and was successfully concluded in mid-2017.

**2. Compliance Monitoring of Distribution and Transmission Licensees:** Under this TA component, GET FIT aims to support ERA in enhancing its capacity in technical, economic and environmental aspects of regulating operational distribution and transmission licensees and to establish comprehensive licence compliance monitoring benchmarks and frameworks. The monitoring benchmarks and frameworks will be based on an assessment of the actual status of all individual licences and the respective power system networks. The consultant procured to implement this assignment was Azorom, and completion is expected in Q1 2018.

**3. Regulatory Information Management System (RIMS):** This TA component will support ERA to implement a state of the art Regulatory Information Management System (RIMS) to enhance its information collection and processing, automate regulatory analysis and compliance monitoring as well as an automatization of interaction with its licensees. A RIMS will ensure that data are collected at required intervals in a consistent format that allows for automated data analysis and improved efficiency of regulatory processes at ERA. The procurement of the consultant is ongoing that will subsequently develop the specifications of the system to be acquired.

## 5.4 Wider Sector Interventions

Planned and ongoing grid investments by development partners in the wider power sector will be important for the effective grid integration of selected GET FIT projects. Key among these are the Nkenda substation upgrade and the Mbale – Bulambuli 132 kV transmission line whose status update is summarised below. Aside from the investments presented below, the ongoing implementation of the Nkenda – Hoima 220 kV line, financed by the Governments of Norway and France, will further strengthen the national grid in Western Uganda and stabilise the performance and evacuation of several GET FIT projects in this area. Additionally, the planned 132 kV transmission grid extensions from Lira to Arua, funded by the World Bank, and Gulu to Agago, funded by the German Government, will strengthen the national grid in the Eastern and Northern regions.

### Nkenda Substation

The World Bank has committed to fund the upgrade of the Nkenda substation from the current transformation capacity of 40 MVA to 120 MVA at an estimated budget of MUS\$ 16. Given that six GET FIT projects with a combined maximum capacity of 48 MW will be evacuated through Nkenda after commissioning, between 2017 and 2019, the upgrade should ideally be ready within that time frame. However, according to estimates by UETCL, the implementation of the substation works will not be completed before 2020, which presents a risk of deemed energy to the GoU.

A consultant, AF Consult, was procured to prepare detailed designs and prepare tender documents for the EPC contractor. ERA and the System Planning Coordination Committee (SPCC) are currently discussing interim measures to ensure that the power plants are adequately evacuated when commissioned.

### Mbale – Bulambuli Transmission Line

The Mbale – Bulambuli transmission line will be important for the grid integration of the Siti 1 and 2 SHPs, as well as a host of other small hydropower projects in the Mountain Elgon area. The financing of the line will be provided by Germany through KfW at an estimated total budget of MUS\$ 40. EU ITF through KfW financed the feasibility study which was undertaken by Lahmeyer and completed in December 2017. EU ITF through KfW finances the feasibility study which is undertaken by Lahmeyer and will be completed in April 2018. The line is not expected to be completed before 2021.

In order to evacuate the 16 MW Siti 2 SHP, expected to commission in Q3 2018, ERA has approved the implementation of an interim 33 kV line from the project to Mbale substation. The line implementation will be led by Umeme which has undertaken field surveys and prepared a detailed cost estimate for the required works. The objective is to have the line ready in time for the Siti 2 SHP COD in August 2018.

## 5.5 GET FiT project experiences from 2017

Some of the risks of timely and adequate grid connection across the portfolio were realised as the first hydropower projects were commissioned in 2017. There were wide variations in the ease of grid connection for the projects commissioned in the past year. Rwimi SHP in Kasese and Tororo Solar were connected to the grid without delays or incident. In Tororo, line outages throughout December 2017 amounted to only 46 minutes in total, an indication of relatively strong grid performance in Eastern Uganda.

We present here some of the challenges faced by selected projects commissioned during the reporting period. It is hoped that these experiences and lessons learned will benefit other projects yet to commission.

### Muvumbe SHP

The construction of the 6.5 MW Muvumbe SHP in Kabale was completed in March 2017 when the project successfully synchronised to the national grid. Prior to that, the project required the construction of a new 33 kV line to connect the plant to the existing grid, approximately 6 km away. The line construction was implemented by REA. However, the implementation of the line was plagued by serious challenges that required proactive engagements by the developer, ERA, KfW and the GET FiT Secretariat.

The main challenge came from the local population who demanded, through their local leadership and the area Member of Parliament, that villages in the path of the evacuation line be electrified before the line can be built. Indeed, line construction was halted for a while as discussions and sensitisation of the community were ongoing. The community was informed that the developer's generation licence did not give mandate for construction of distribution infrastructure. The line works only proceeded after assurances from REA that distribution transformers would be installed to supply the villages in the near future.

As more projects proceed towards commissioning,

this scenario is likely to be played out again in the local communities. Discussions between REA and GET FiT development partners are underway on how rural communities close to renewable energy projects could be electrified.

### Siti I SHP

The 33 kV power evacuation line for the 6.1 MW Siti 1 SHP was completed well before the project was commissioned in April 2017. However, challenges emerged thereafter when the line could not fully evacuate power from the generating plant. Under voltages were recorded at the point of grid connection causing problems of fluctuating reliability so that less than 50% of the plant's capacity could be evacuated.

Through the work of the SPCC, technical simulations of the distribution network in the project area identified the necessary interventions, including the installation of switch-in capacitor banks and the improvement of the protection scheme of the backbone network. The required installations were successfully completed by UEDCL and Umeme, with coordination by ERA. By December 2017, the project was able to evacuate at full capacity. The effective coordination by the different stakeholders was crucial towards reaching solutions for the network challenges faced by the Siti I and Muvumbe SHPs. Developer proactivity was equally important in highlighting the issues.

### Nkusi SHP

The 9.6 MW Nkusi SHP is expected to be commissioned during Q2 2018. A new 3 km line is being constructed by REA to connect the plant to the existing grid. However, due to weaknesses of the general distribution grid in the project area, this grid extension will only have capacity to evacuate a maximum of 45% of the generated power from the project. This will result in potential deemed energy obligations to GoU.

In order to mitigate the anticipated deemed energy, the developer has taken initiative to solicit additional

funding for the construction of new lines to strengthen the grid in the project area, to facilitate full evacuation. The preliminary line designs have been completed for approval by the responsible agencies. If approved, the developer will be responsible for the construction of the planned distribution infrastructure. Discussions with funding agencies and the GoU are ongoing to confirm the plans. The timeline for implementation is approximately 6 months. The proactive problem solving by the private developer will most likely reduce

the magnitude of deemed energy obligations to GoU due to the weak local grid. While this case is certainly an exception, in light of the challenges currently experienced, a discussion on shifting obligations for grid connection away from government agencies to developers may be interesting for the future - to determine the advantages and pitfalls of such a policy change.

## 5.6 Connection status – project under construction

According to a study undertaken by Multiconsult in 2017, the delayed implementation of critical power evacuation infrastructure could lead to potential deemed energy obligations estimated at USDM 30 per

year for selected projects. The table below highlights the status of grid connection for different GET FiT projects and the associated level of risk for deemed energy if evacuation infrastructure is not fast-tracked.

*Table 3 - Status of interconnection of GET FiT projects still under construction*

No.	Project	Capacity (MW)	Expected COD	Status (January 2018)	Deemed Energy Risk
1	Nyamwamba	9.2	Q1 2018	On track. Line built by Umeme	Low
2	Kikagati	16.0	Q2 2020	On track. Line built by REA	Low
3	Kyambura	7.6	Q2 2019	On track. Line to be built by developer	Low
4	Waki	4.8	Q4 2018	On track. Line built by REA. Requires upgrade of protection scheme.	Medium
5	Lubilia	5.4	Q1 2018	On track. Line built by REA. Requires upgrade of protection scheme.	Medium
6	Sindila	5.3	Q2 2019	Potential Delay. Upgrades to existing line needed	Medium
7	Nyamagasani I	16	Q2 2019	Delayed. Line to be expedited by REA	High
8	Nyamagasani II	5	Q2 2019	Delayed. Line to be expedited by REA	High
9	Ndugutu	5.9	Q2 2019	Delayed. Line to be expedited by REA	High
10	Nkusi	9.6	Q2 2018	Inadequate evacuation	High
11	Siti II	16.5	Q3 2018	Delayed. Line to be expedited by Umeme	High

## New approaches needed to address grid connection risks?

GET FiT Uganda's approach to addressing the grid connection risks has mainly been to assist Government agencies to the extent possible in planning for the required infrastructure and timelines relating to the projects. Continuous efforts have been made to push progress and facilitate improved planning and coordination. Additional funding has also been solicited for implementation of grid infrastructure projects. While these efforts will contribute to reducing the level of deemed energy generation across the portfolio, the overall risk remains high due to extensive delays, as outlined above.

Based on the experiences from GET FiT Uganda, future roll-out of similar programmes should discuss and consider alternative approaches to addressing and mitigating grid connection risks. One GET FiT developer

has already taken initiative towards soliciting financing and undertaking construction of local network reinforcements far beyond the regulated responsibility of the developer<sup>5</sup>. While this may facilitate a more timely connection, successful delivery of power to end consumers will eventually require satisfactory grid planning and operations at a regional or national level. Adequate performance of government agencies is vital and cannot be bypassed. Therefore, mapping and identification of alternative models will require careful consideration of the existing regulatory framework and long term development targets for the sector. Nonetheless, there should be ways to adjust current arrangements in a given country to address grid connection more efficiently. Shifting more responsibility for construction of grid connection to developers might be one way to reduce pressure on government agencies and associated delays, without relaxing the need for sector-wide planning and coordination.

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<sup>5</sup> In GET FiT, developers with a connection distance to the existing grid of less than 5 km are required to construct their own grid connection, while connection lines exceeding 5 km would be Government responsibility.



# 6 THE LEGACY OF GET FiT

A key purpose of GET FiT Uganda is to leverage commercial investment in small- and medium sized renewable energy projects in Uganda. The Programme is widely viewed as an emerging success, with Uganda now among the top destinations for renewable Independent Power Producers on the African continent. The Programme has demonstrated the success of simultaneously targeting the framework, legal documentation, incentives and processes in a concerted effort to pave the way for an entire infrastructure portfolio. The programmatic strategy taken in GET FiT Uganda has overall been key to the successful financing of a significant RE project portfolio.

However, during the implementation of GET FiT, electricity demand in Uganda has not yet increased to the extent that was anticipated. With the GET FiT portfolio well underway and the large hydropower projects (Karuma, Isimba) reportedly on track for 2020 commissioning, Uganda is now facing a power surplus in the medium term. From the Government's perspective this represents a major financial risk, as excess power will generate deemed energy payment obligations to plant owners. As a result, UETCL has become reluctant to executing new PPAs with project developers in the wake of GET FiT, and new investments into on-grid renewable energy has slowed down.

How do these developments affect the impact and legacy of the GET FiT Programme? Here we discuss the GET FiT legacy and argue that impacts are likely to stick, regardless of shorter term fluctuations in the investment climate and political trends.

## Looking back: The Ugandan Power Crisis

In the years that followed the Ugandan power market reforms and the 1999 Electricity Act, the newly established ERA and the sector as a whole experienced major challenges. Private investment in power production and distribution did not occur as quickly or to the degree that had been hoped for, meaning that the sector remained dependent on state budgetary support to maintain existing power production. This resulted in a power crisis emerging in the mid-2000s.

In 2006 the crisis deepened due to poor regulation of hydropower plants on the Nile and critically falling water levels in Lake Victoria. Consequently, existing hydropower plants could no longer generate at full capacity. In order to help maintain a reasonable level of electricity supply, the Ugandan Government with support from development partners were forced to invest in heavy fuel oil power plants. These thermal plants provided nearly 40 per cent of Uganda's total electricity production in the period 2009–2011 (figure 8).



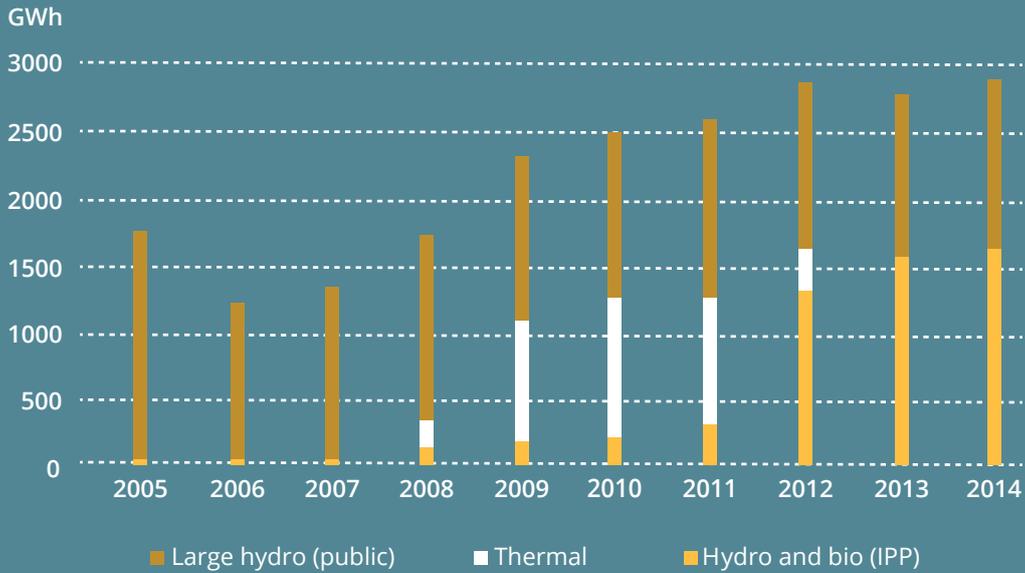


Figure 8 – Total electricity supply in Uganda by technology, 2005-2014.

In 2012 the Bujagali 250 MW hydropower plant was commissioned, enabling Uganda to significantly reduce consumption of expensive fossil fuels for electricity generation. Nonetheless, electricity demand projections for Uganda indicated that the country would face a steady and significant demand increase in the period 2013-2020. With new large hydropower schemes on the river Nile (Karuma, Isimba) expected to achieve commissioning around 2020, a gradually increasing production shortfall was again anticipated to arise within this period. How would Uganda mitigate the risk of entering into a new power crisis, and further investment into costly thermal power?

### The introduction of GET FiT

As a response to the anticipated capacity gap, the GET FiT Programme was introduced to bring a targeted 170 MW and 830 GWh/year of renewable energy to the

Ugandan grid, gradually commissioning in the period 2014-2017. This would increase the national production capacity by some 20 per cent, and was expected to displace most of the thermal production needed to meet the expected demand increase towards 2020.

After nearly 5 years of implementing the GET FiT, despite overall delays in its portfolio implementation, the Programme is well on track to achieving its targets, with nearly 60 MW of new capacity (solar, bagasse and hydropower) installed by 2017 and another 45.5 MW due for commissioning in 2018. To what extent GET FiT will actually contribute to displacing thermal power still largely depends on when the new, large hydropower plants will start generating power, as well as the development of electricity demand<sup>6</sup>.

<sup>6</sup> So far, according to UETCL, all energy delivered by the commissioned GET FiT projects have directly contributed to displacing thermal energy production. The latter is confirmed also by feedback from operations at GET FiT power plants; the UETCL dispatch centre generally take all the power they can get. This is due to a general supply shortage in Uganda occurring over the past few years; although the installed capacity on the Ugandan system may be higher than peak demand, the overall plant availability is generally significantly lower. GET FiT power plants have thus far countered the gap between plant availability and demand, a gap that otherwise would have to be met with thermal power. This situation is expected to be maintained until commissioning of additional GET FiT plants, and the new, large hydropower plants.

## Modest demand increase causes investor reluctance

With a looming power surplus commercial RE investments are indeed showing signs of slowing down. While Uganda was impressively rated the 2nd best renewable energy investment destination in Africa in 2016 by Bloomberg, the investment reluctance was reflected by the country dropping to 5th place in 2017, now by-passed by Rwanda, Senegal and Kenya. More importantly, the overall investment climate score dropped by nearly 30 per cent.

The fall in the Bloomberg rating can largely be attributed to the reduction in new RE investments following GET FiT, which is a direct consequence of the anticipated short-medium term power surplus. Importantly, the fall is not caused by any decrease in regulatory performance or policy. The regulatory framework for RE investments in Uganda is improving by the day, with ERA working to further streamline and standardize key regulatory aspects of RE development and overall sector performance as we speak. In the long term power sector development, this is far more important than fluctuations in the demand vs. supply balance. One could also argue that developing a power sector is a stepwise process. The inevitable chicken-and-egg nature of electricity supply and demand makes it challenging, particularly in a context with political uncertainty, to maintain a continuous and perfect balance. Whereas power generation is characterised by large up-front investment and provides instant capacity increase once commissioned, growth in electricity demand is more incremental in nature. In a small power system like Uganda this imbalance is particularly visible. For example, the Karuma hydropower project will likely represent more than a 50 percent increase in installed capacity if commissioned as planned in 2020.

## What will be the legacy of GET FiT in Uganda?

Looking beyond these short- to medium term fluctuations in the overall electricity supply and demand balance, GET FiT represents a considerable boost in the maturity of Uganda's power sector. The impacts of constructing 17 small renewable energy generation plants in a 5-7 year period go far beyond the mere power capacity added to the grid. The overall competence lift within government institutions and other stakeholders is considerable. While some results can be measured (such as number of jobs created), it is fair to assume that there are also several benefits which cannot be measured quantitatively.

Uganda has, through GET FiT, established and tested a solid institutional framework for development of grid connected RE generation for the future. Whether the Uganda demand growth requires new RE generation investments in the short- or medium term, future investors and developers will benefit greatly from the established institutional framework and standardisation of procedures and documents. Sponsors will also benefit from dealing in a more experienced and competent sector with substantially stronger institutions than before GET FiT was implemented.

One should also keep in mind that the GET FiT projects are built to last at least in the order of 30 years. The significant de-centralised power production capacity that they provide will be a key feature of the Ugandan power mix for decades to come. The GET FiT portfolio will thus significantly improve national supply security with reduced dependency on Lake Victoria and the Nile. It will also contribute to strengthening of the overall power system performance through reduced transmission losses and improved grid stability. The effects of these technical improvements are outlined in more detail in our [Academic Corner \(see below\)](#).



# 7 GET FIT 'ACADEMIC CORNER'

## Decentralised renewable energy production - Impact on national supply security and grid stability

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**T**his article investigates the potential benefits of combining the new GET FiT distributed power plants with the existing large centralised hydropower stations. It also considers the benefits of combining a diverse generation mix, including run-of-river hydro, bagasse and solar power, with regulated hydropower.

*Please note that this article only aims to illustrate the general advantages of adding decentralized generation to the Ugandan power mix grid in a long term perspective, but does not document the specific impact of GET FiT projects on the grid in its current state. This would require more*

*comprehensive studies, which would be more accurate following full implementation of the portfolio. While such studies may be undertaken in the future, this article can provide some general insight and basis for further discussion. The theory presented here is highly simplified for the readability of a wider audience.*

Figure 9 shows the transmission lines and substations in Uganda that form the backbone of the country's power system.





Figure 9 - Map of the transmission lines and substations in the Ugandan power system<sup>7</sup>

<sup>7</sup> Energy GIS Working Group, 2017, "Transmission Lines and Substations 2017", located at: <http://www.energy-gis ug/>

# 7.1 ABC of power system stability

In an electrical power system, loads<sup>8</sup> are switched on and off continuously and the power system must maintain a balance between supply and demand at all times. The ability of a power system to maintain this power balance is key to system stability. Electrical energy, once generated, cannot be practically stored within a supply grid and must be consumed the instant it is generated in real time. Available storage technologies involve the conversion of electricity into other energy forms, e.g. chemical energy in batteries. Historically, battery storage technologies have generally been prohibitively expensive on a grid scale, though the recent installation of a 100 MW battery system in Australia illustrates that this might be about to change.

Power system stability can be viewed in terms of voltage or frequency. With regard to voltage stability, the system voltage should be maintained within acceptable limits ( $\pm 10\%$  of the nominal voltage) under normal operating conditions. At more than 10% deviation, the voltage will eventually “collapse” and cause instability in the power system. This article focuses mainly on frequency stability.

## Frequency Stability

The frequency of a synchronous power system should be maintained as close to 50 Hz (or 60 Hz in North and South America) as possible. A synchronous power system is one where all power producers and consumers are connected to each other through transformers and transmission and distribution lines. Figure 10 below illustrates the balance between power supply and demand, where the balance is measured in terms of frequency. From the figure, we observe that an instantaneous increase in demand causes a drop in frequency, whereas a drop in demand increases the frequency. Excessive imbalance causes the acceptable frequency limits to be exceeded, resulting in instability and potential damage to important system components, unless load shedding or other mitigation measures are implemented immediately.

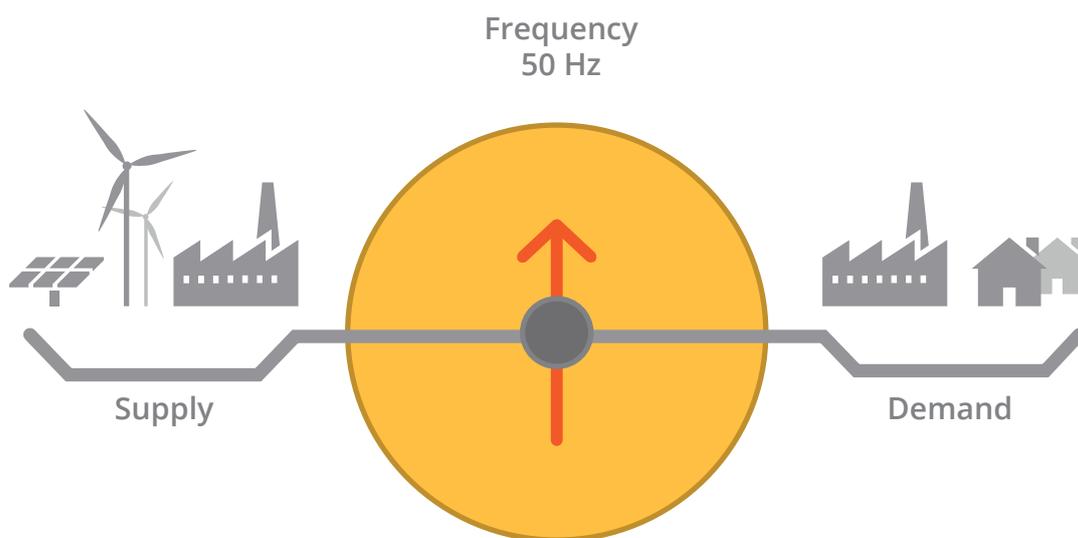


Figure 10 - Illustration of the balance between supply and demand in a power system<sup>9</sup>

<sup>8</sup> An electrical load is a component in the power system that consumes electrical power. Hence, the opposite of a generator, which supplies power.

<sup>9</sup> ETH Zurich, “Price of Power System Stability”, 2016. Located at: <http://www.esc.ethz.ch/news/archive/2016/11/price-of-power-system-stability.html>

It is important to understand the relationship between frequency and the operation of synchronous generators. Generators in a power system are directly connected to a turbine by a shaft, and they convert mechanical energy from the rotating turbine into electrical energy (Figure 11). There is rotational energy stored in all

synchronous generators connected to the system, more specifically in the rotors and connected turbine shafts. The power system frequency has a strong connection to the rotational speed of the connected synchronous generators. In principle, all generators in a synchronous grid rotate at the same average speed.

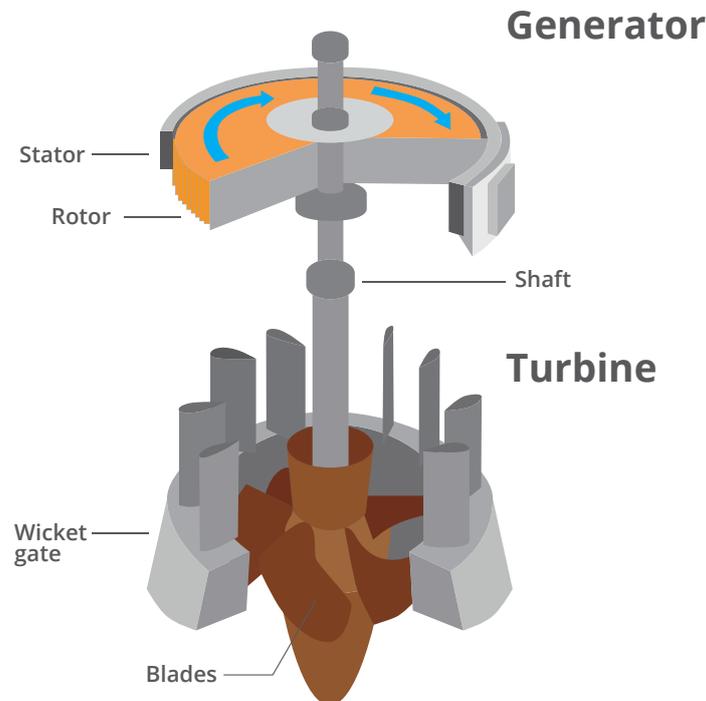


Figure 11 - Main Parts of a Turbine-Generator, here using a Kaplan turbine<sup>10</sup>

Assume that at one moment, a power system is in balance, that is, electricity generation and consumption are equal. What happens if more loads (power consumption) are suddenly added to the power system, while generation remains the same? In order to maintain the balance between generation and consumption, the generators will compensate for the load increase by using their rotational energy. The generator rotation will decelerate as a result and the system frequency will likewise drop. In order to restore the nominal system frequency after the change in load, more mechanical power is added to the turbines, increasing the generators' rotational speed, and hence grid frequency. Generators that can increase their generation when frequency decreases are called primary controlled units. Not all connected generators are primary controlled. The primary controlled units must have sufficient "spinning reserve", which is the

instantaneous available capacity from the online generators.

The above scenario assumes that a load increase triggered the frequency change. A similar course of events will occur if a generating unit in the system stops or fails while the consumption remains constant. Then the remaining generators will have to increase their generation. If the failed unit is too large, the available spinning reserve will be insufficient to cover the lost generation. In this case the frequency will drop below the acceptable limits and cause load shedding or black out to protect system components. This scenario was played out in reality on 9th January 2018<sup>11</sup> when the loss of a generating unit in Kenya caused widespread blackouts in Uganda and Kenya whose synchronous power systems are interconnected. On the other hand, a load decrease or generation increase will cause the

<sup>10</sup> Wikipedia. Water turbine. URL:[http://en.wikipedia.org/wiki/File:Water\\_turbine.jpg](http://en.wikipedia.org/wiki/File:Water_turbine.jpg)

<sup>11</sup> <https://www.independent.co.uk/east-african-blackout-uganda-disconnected-kenyan-grid/>

other generators to compensate by reducing their generation through increased rotational energy, hence an increase in system frequency.

## Power system stabilizing functions and sequences

Primary control is not the only action performed to stabilize a power system. Figure 12 shows the four different control actions that are needed for system stability, in the order and time scales in which they are implemented. “Spinning reserve” described above is part of Turbine Control, and “non-spinning reserve” is part of System Control Centre Action. Non-spinning reserve means power plants that are not rotating (offline), but are ready to start when needed. In Uganda

it takes 5 minutes for hydropower and 30 minutes for thermal power to start producing power<sup>12</sup>. This overall system control is very complex but due to the different time scales, the different control actions are virtually decoupled from each other and can be viewed separately (Andersson, 2007)<sup>13</sup>

The first three control actions are located at each power plant, including plant protection, voltage control and turbine control. The overall frequency control is done by the System Control Centre Action which is responsible for production planning and operation, as well as automatic safety systems in the grid, such as load shedding. This action is performed by the System Operator which is UETCL in the Ugandan power system.

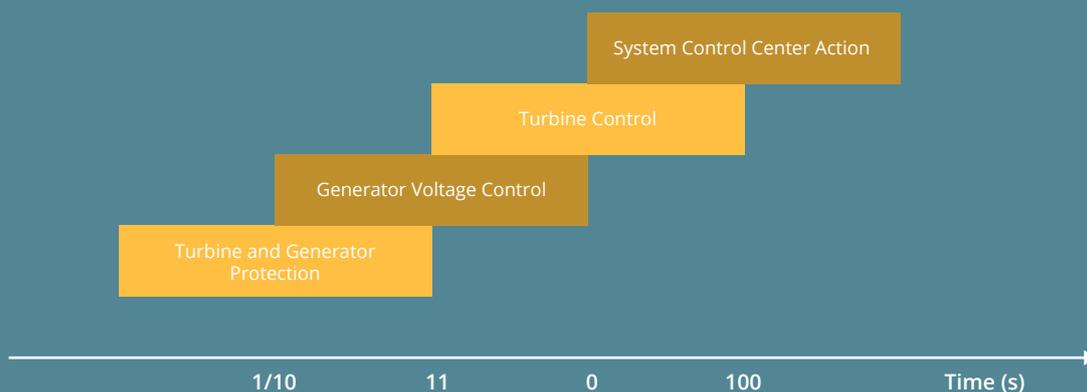


Figure 12 - Different time scales of power system controls (Andersson, 2010)

<sup>12</sup> UETCL GDP (Grid Development Plan) 2015

<sup>13</sup> ANDERSSON, G. 2007. Dynamics and control of electric power systems. ETH Zurich.



## 7.2 Benefits of Distributed Power Generation

There are several benefits of combining small decentralised power plants - such as the 17 small 5 – 20 MW plants being implemented under GET FiT – within the power generation mix. These include reduced power losses as a result of having more generating plants with a greater geographical coverage, improved security of supply, and improvements in the power system stability, both locally and nationwide.

### Improved power system stability

As mentioned above, a sudden load change that is larger than can be accommodated by the spinning reserves within a few seconds can cause serious grid instability. For example, consider that a major power line supplying towns in Western Uganda from Kampala disconnects due to a fault, and the spinning reserves of the distributed power plants in the West are limited. In this case, the Kampala area will suddenly have a power surplus and the generators in this area will quickly reduce power production to compensate for reduced consumption, as described above. On the other side of the faulty line, the loads of the Western grid will start to disconnect as local load shedding starts after the frequency goes below a certain limit. Load shedding will continue until the loads are low enough to be balanced out by the available local power production in the 'islanded' (isolated) part of the system. Hence, the distributed generation will continue to provide power to parts of the islanded grid until the faulty main line has been fixed and re-connected.

When, on the other hand, the distributed power plants produce power in excess of the load of the nearby towns, a different scenario ensues. Consider, for example, Western Uganda, where the GET FiT hydropower plants Sindila (5.25 MW), Ndugutu (5.9 MW), Rwimi (5.45 MW), Nyamwamba (9.2 MW), Lubilia (5.4 MW) and Kyambura (7.6 MW) and the Nyamagasani

plants (20 MW total) are being developed. In many cases, this area will have a power surplus, due to lots of hydropower production located in a relatively lightly populated area. If the transmission line supplying this area were disconnected due to a fault, these power plants would have sufficient capacity to supply the local demand, and the inhabitants would not notice the fault.

In addition, local power production improves the local grid stability with regard to voltage levels. The distributed power plants in the GET FiT portfolio are all equipped with their own voltage controllers, which help to control the voltage levels in the local grids. This will contribute to improved local grid stability in many rural areas.

### Reduced power loss

Another benefit of GET FiT distributed power is the reduced power loss in power lines. In 2018, the expected total power loss target is 18.1%<sup>5</sup> in Uganda. Power loss increases with the length of the lines and varies with the line voltage level. Higher voltage levels result in lower losses and vice versa. Take for instance the GET FiT supported 6.5 MW Muvumbe hydro power plant in Kabale, South Western Uganda. Since its commissioning in Q2 2017, the plant supplies part of the demand in Kabale town. Therefore, it is no longer necessary to transmit the full power required for Kabale town all the way from Mbarara over the existing long 33 kV line. This directly reduces the line losses. Power plants with a greater geographical distribution generally contribute to a large reduction of the grid power losses.

### Improved security of supply

GET FiT increases security of power supply in Uganda. Mixing decentralised run-of-river hydropower<sup>14</sup> and solar power production with regulated hydropower makes it possible to improve the utilization of stored potential energy in the water reservoirs, like Lake

<sup>14</sup> The GET FiT hydropower projects are «run-of-river», meaning that they do not have significant reservoir/storage capacity, and thus cannot be used for energy storage.

Victoria. After commissioning of the additional large hydropower plants on the Nile, Karuma and Isimba (totalling some 780 MW), more than 75% of power production in Uganda will come from large Nile-fed hydropower plants. This means that the Ugandan power system will be increasingly exposed to hydrological variations, making the country more vulnerable to the potential effects of future dry periods.

The GET FiT power plants are spread across different parts of the country, and thereby contribute to reducing the pressure on Lake Victoria as Uganda's main source of energy. As mentioned in the above sections, they contribute to this both through reducing losses and stabilizing the grid. However, they also contribute to increasing supply security by being able to displace power production from large hydropower plants on the Nile if needed.

For example, when solar energy is being produced and can supply the grid in preference to regulated hydropower, the water that would otherwise be used for hydropower generation can be stored and used later, either during periods when solar power cannot be harnessed or during drier periods. In this

way, storing the water, and the potential energy, in a reservoir is analogous to the power stored in a battery. With respect to bagasse thermal power plants, such as Kakira in the Get FiT portfolio, this type of generation makes it possible to use cheap bio waste from sugar production to produce power. This additional source of power further contributes to balance of power sources and complements the supply of power to the grid from e.g. hydro and solar.

## Uganda well on track with VRE approach

Solar power plants are categorized as Variable Renewable Energy (VRE). It is beneficial to have VRE's located in different geographical areas, as has been done in Uganda so far, because different parts of the country are likely to experience different weather conditions at a given time. For example, it may be cloudy in Tororo but sunny in Kabulasoke on the same day. The total solar power production will then have a smoother overall output, which makes VRE plants easier to manage. In Uganda, the GET FiT solar projects, Soroti (10 MW) and Tororo (10 MW) Solar in the East, as well as the planned Xsabo solar plant (20 MW) in Kabulasoke, Central Uganda, are good examples of this geographical spread.



# 8 FINANCIAL STATUS

## 8.1 Funding commitments

**G**ET FiT Uganda is a results-based programme – that is, a subsidy is paid following the successful installation of power capacity and the delivery of power – and is therefore dependent on predictable commitments from sponsors to be successful. Since commencement of the Programme in 2013, several changes to the portfolio structure and significant project delays have necessitated active follow-up and flexibility from all stakeholders. This requirement has indeed also been met by the GET FiT funders to date, enabling the

Programme to deal with any arising uncertainties and risks in a relatively comfortable and pro-active manner. To this end, four development partners have taken up the challenge and provided GET FiT with the necessary funding: Government of Norway, Government of UK (through BEIS and DFID), Germany (BMZ, BMU) and the EU (through EU ITF).

To date, EUR 93.6 million has been committed to the Programme.

*Table 4 - Overall donor commitments to GET FiT. Net amounts are based on funding disbursed to the Programme thus far, projected exchange rates for undisbursed funds and deduction of management fees*

DONOR	NET AMOUNT COMMITTED (EUR)
Norway (NOK)	15 590 475
UK BEIS (GBP)	28 394 469
UK DFID (GBP)	14 128 113
Germany BMZ (EUR)	15 000 000
Germany BMU (EUR)	496 605
EU ITF (EUR)	20 000 000
<b>TOTAL</b>	<b>93 609 662</b>

## 8.2 Foreign exchange rate developments

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Foreign exchange rate developments reduced the overall budget within the financial structure of the Programme by approximately 13 % as of mid-2015. Subsequently, a 1.5 million Euro budget buffer was introduced to cushion future decline in the EUR/GBP rate until remaining disbursements were made to KfW and converted in EUR. Reference

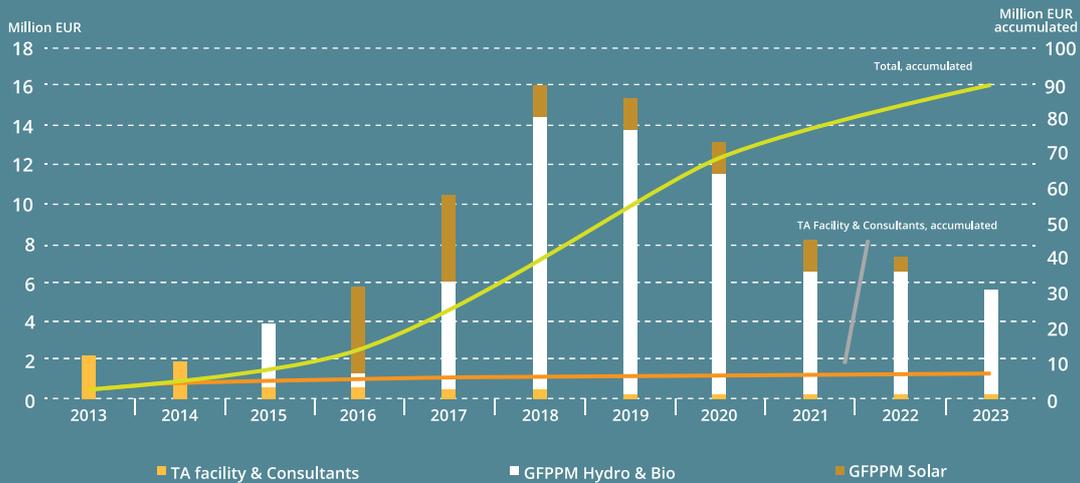
is made to previous **GET FiT annual reports** for more details on these issues. A limited amount of donor funds remains undisbursed at this stage, currently equivalent to approximately 8% of the total GET FiT budget, and are therefore still subject to forex risk. GET FiT regularly monitors the relevant forex developments to allow for proactive action if needed.



# 8.3 Disbursement projections

Committed disbursements from the GET FIT Programme go towards four purposes: i) payments to approved projects, with 50% paid at commercial operation date and 50% paid in the form of results based support over the first five years of operation, subject to actual production; ii) payments to consultants under the Technical Assistance Facility for ERA; iii) advisors and consultants for the overall management and monitoring of the Programme; and iv) management fee to KfW.

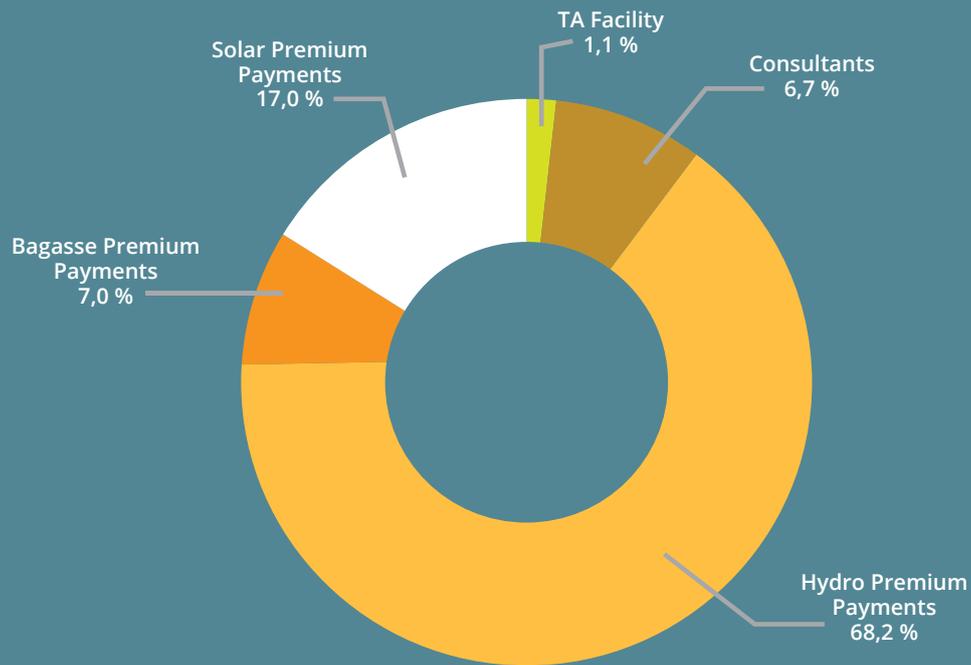
Figure 13 illustrates the actual (up to and including 2017) and projected disbursements from the Programme. The projections are based on the status of the project portfolio and expected progress. The majority of commercial operation date payments are expected within the 2017-2019 period. Due to the provision of results-based disbursements during the first five years of operation for each project, the final payments from GET FIT will not occur before 2024.



**Figure 13** - Projected annual payments (premium payments and consultants) under GET FIT. Projections are subject to uncertainty, mainly related to individual project progress.

For the disbursement projections, the main uncertainty relates to actual COD for the various projects. Delayed implementation of the portfolio has already shifted the disbursement profile of the Programme considerably. With most projects now financially closed and under construction, future changes in the disbursement profile will be linked predominantly to construction related risks. There is also some uncertainty tied to the annual result-based payments for each project. Since the developers will only be paid for what they

are producing (with a cap at their planned average), significant under-production across the portfolio may lead to accumulation of excess funding. Figure 14 shows the relative shares of the various cost components under the GET FIT Programme, based on current budget reservations. Overall, approximately 10 percent of the overall funds are tied to management, implementation and the Technical Assistance Facility, while 90 percent of the total commitments are expected to be disbursed as premium payments.



**Figure 14** - Approximately 90 % of commitments to GET FiT are projected to be disbursed as premium payments.





# 9 PROGRAMME MONITORING & RISK MANAGEMENT

## 9.1 Programme monitoring

The GET FIT Monitoring and Evaluation framework monitors the outputs, outcomes and impacts generated by the Programme through one or several quantitative indicators, which are collected from project developers and key sector stakeholders semi-annually.

*Table 5 - GET FIT targeted outputs, outcomes and impact*

<ul style="list-style-type: none"> <li>▶ Time Between Inputs And Observable Results</li> <li>▶ Impacts On Lives And Poverty Reduction</li> <li>▶ Degree Of Direct And Measurable Influence Of Program</li> </ul>		
OUTPUTS	OUTCOMES	IMPACT
1. Increased small scale RE capacity & generation.	1. Improved private sector investment environment for renewable energy in Uganda.	Uganda pursues a low carbon, climate resilient development path, resulting in growth, poverty reduction and climate change mitigation.
2. Balanced portfolio of RE technologies.	2. Improved financial stability of energy sector.	
3. Reduced GHG emissions.	3. Improved local grid stability.	
4. Increased number of Ugandan national jobs.		
5. Increased capacity of ERA.		
6. Finance mobilised for GET FIT portfolio.		

In the early years of Programme implementation, the focus of the reporting was mainly on expected results based on the current portfolio status, since results could not be attributed at early development stages. With a range of projects now at financial close and under construction, it is encouraging to present

considerable progress on a range of indicators following a progressive period over the last two years. The logical framework table below presents the progress achieved over the past year<sup>15</sup>. For historical progress, refer to the previous **GET FIT annual reports**.

*Table 6 - GET FIT targets and results – status after 2017*

OUTPUTS			OUTCOMES		
Indicator	Target 2023	Status 2017	Indicator	Target 2023	Status 2017
MW installed <sup>16</sup>	170	137	Net change in GHG emissions (Cumulative MtCO <sub>2</sub> e) <sup>17</sup>	4	0.27
GWh delivered to national grid <sup>16</sup>	830	632	Number of commercial banks that invest in renewable energy with project finance	3	4
Number of technologies supported by GET FIT	4		No. of development permits and generation licenses issued by ERA per year	8 permits / 4 licenses	5 permits / 5 licenses
Number of direct national construction and O&M jobs created in relation to the power plants	4200	6803	Number of sub-regions with GET FIT projects	5	4
Time taken by ERA to review generation license for 1-20 MW RE application	3 months	2,5 months	REFIT adjusted to be cost-reflective (%) <sup>18</sup>	100 %	100 %
Private investments (MUSD) leveraged by GET FIT <sup>16</sup>	500	353	Subsidy paid (excluding capacity Charge) by GoU for UETCL to cover thermal power use	0	0
		Leverage ratio 1: 4.2	GWh purchased by UETCL from thermal stations (2018 target)	319	231
Private finance mobilised for GET FIT (MUSD) <sup>16</sup>	200	128	Cost reflective retail tariffs in place <sup>19</sup>	100 %	92 %
Public finance mobilised for GET FIT (MUSD) <sup>16</sup>	300	225			

<sup>15</sup> Reported outputs based on projects that have commissioned or achieved financial close.

<sup>16</sup> Counting commissioned projects and projects with financial close

<sup>17</sup> Based on commissioned projects

<sup>18</sup> Tariffs adjusted to be cost reflective after a tariff review in mid-2016. The review was carried out by ERA with technical assistance provided through the GET FIT TA Facility. Next tariff review is due in 2018.

<sup>19</sup> Since GoU still pays capacity charges to thermal generation facilities, retail tariffs are not fully cost reflective.

## 9.2 Risk management

**R**isk management is a continuous process running through the lifetime of a programme, where risks are identified and categorised, and measures introduced to reduce or eliminate the risks. For more information and detail on the risk matrix and methodology adopted for categorising risks for the GET FiT Programme, please refer to earlier **GET FiT reports**.

The semi-annual monitoring undertaken by GET FiT measures progress on key indicators for the Programme. Effectively, this contributes to identifying and addressing risks as it helps the ERA, KfW, development partners, and other stakeholders to keep track of progress and see periodical development. However, the day-to-day management of the Programme is the primary source for risk identification and follow up. Close communication with project developers and power sector institutions and stakeholders, access to

key ERA staff via the GET FiT secretariat (which is hosted by the ERA), active participation in joint power sector planning by KfW and the secretariat and engagement of development partners are all key arenas that enable GET FiT to continuously identify and assess risks to Programme implementation. This approach has proved vital to achieve progress, as it has allowed the Programme to proactively address and mitigate risks across a wide range of issues and areas of the sector. These include both financial, legal and regulatory risks. However, this close interaction and follow-up has also contributed to increased management costs by KfW and need for additional consultant support.

In terms of the ability to follow up on project specific technical, environmental and social risks, the supervision of construction is the key tool, focusing on pro-active and flexible support and follow up of all projects until they reach commercial operation.



# Key risks and ongoing GET FiT efforts

Based on the overall developments throughout 2017, GET FiT risk management efforts are currently largely focused within the following main areas of concern:

**Grid connection** remains the key risk and barrier to reaping the full benefits and impacts of the GET FiT portfolio. Despite comprehensive efforts undertaken by GET FiT over the past 2-3 years in the form of i) infrastructure finance, ii) technical assistance, iii) studies on deemed energy implications and iv) efforts to facilitate improved sector coordination, the risk remains high in 2017. The risk of failure to achieve GET FiT targets due to lack of timely grid connection remains with high probability and high consequence in 2017, and requires continued follow up. More details on this risk and associated efforts are found in the chapter on **Connecting to the Grid**.

**Project construction delays** is the other main risk towards achieving GET FiT capacity targets in a timely manner. While some developers have shown dedicated efforts and impressive progress on outstanding issues (E&S or technical), others have failed to address key issues and meet deadlines tied to the GET FiT support.

As highlighted throughout this report, GET FiT has introduced additional construction supervision at developer cost, and other penalty mechanisms to limit further delays. Certain projects are still at risk of losing their GET FiT support. The risk of further delays occurring in 2018 is rated with high probability and high consequence for the overall portfolio output. The latter high rating is due to remaining projects under construction representing a high share (more than 60 percent) of total portfolio capacity in MW.

**Health, safety and environment (HSE)** risks across the portfolio have become increasingly real over the past year, with all projects now under construction. Despite projects being pushed on maintaining timelines, it is absolutely crucial that this does not compromise HSE in any way. GET FiT is not positioned to supervise or control the quality of developers' HSE work on a daily basis, and therefore not formally part of the GET FiT risk control framework. Nonetheless, GET FiT supervision visits focus on monitoring general HSE performance to the extent possible, discussing HSE with developers and creating awareness around potential risks.



# 10 OUTLOOK FOR 2018

Despite the many achievements and considerable progress during the past two years, challenges lie ahead for the upcoming year. Several projects are still presenting construction delays and failing to address outstanding environmental and social compliance issues, with five projects likely to achieve commercial operation within the first half of 2019 and one project delayed until 2020. For these projects, the continued support of GET FiT in 2018 will be contingent on the developers intensifying efforts, achieving considerable progress on the ground, and demonstrating a capacity and willingness to achieve commercial operation in a timely manner.

Implementation oversight of projects during 2018 will be critical to achieving Programme targets. Projects will continue to be closely monitored through the ongoing construction supervision visits. Efforts will be maintained and intensified during 2018 to help developers further and to bring as many projects as possible to completion within the year. Where appropriate, this may include increased follow up on individual projects through additional supervision visits and by incentivising developers through contractual tools, such as financial penalties in the form of subsidy reductions.

Construction of critical grid infrastructure for power evacuation of GET FiT projects will be key. To safeguard GET FiT targets and ensure viable grid interconnection for all projects, KfW and the GET FiT Secretariat will

further intensify pressure on the implementation of components within the interconnection support scheme. This includes the comprehensive infrastructure reinforcements and TA support which require a high level of coordination between all stakeholders. The GET FiT team will support GoU entities and project developers by facilitating joint planning and continuous dialogue throughout the process. Continued efforts in this regard will be critical to avoid project delays and legal issues related to grid interconnection for the range of projects.

If the challenges outlined above are addressed through joint efforts by all stakeholders, 2018 indeed has the potential to be another momentous year for the GET FiT Programme. All of the biomass and solar technology projects from the GET FiT portfolio are now operational, and therefore all remaining projects under construction are hydropower. Of these, at least five projects are expected to achieve commercial operation before the end of the 2018 calendar year, adding a further 45.5 MW of installed capacity and raising the total installed capacity of GET FiT projects to 103.6 MW. In terms of energy output, this translates to an estimated increase in 2018 of 202 GWh to a total energy supply to the grid from GET FiT projects of 470 GWh. Hence, it is expected that a large proportion of the Programme's aims and objectives will be realised in the form of installed power and the supply of clean, renewable energy to Uganda.

# 1 STATUS OF GET FIT ROLL-OUT TO OTHER COUNTRIES

**GET FiT Zambia** is designed to assist the Zambian Government in the implementation of its REFiT Strategy which was adopted by Cabinet in October 2017. In line with this strategy, GET FiT Zambia aims to procure 200 MW of renewable energy projects within the next three years. GET FiT supports small- to medium-scale Independent Power Producer (IPP) projects up to 20 MW, in line with the REFiT Strategy.

The initial phase of the GET FiT Zambia Programme will be a tender for up to 100 MW of solar PV capacity, to be launched before the end of Q1 2018 (the pre-bid meeting has been scheduled for 7 February 2018). The REFiT Strategy has also allocated 100 MW of capacity to small hydro projects. GET FiT intends to launch the hydro tender in late 2018. Subsequent tenders could call for other technologies including biomass and geothermal.

In addition to diversifying Zambia's power mix, GET FiT Zambia aims to strengthen the Zambian power market by encouraging private sector participation by a wider range of developers, construction firms and financial institutions. In partnering with Zambian stakeholders, GET FiT Zambia also strives to boost institutional capacity and the policy and regulatory framework for renewable energy IPPs in Zambia. The German Government through KfW has committed EUR 31 million in support of GET FiT Zambia. KfW will be approaching other development partners during the course of 2018 to raise additional capital in support of the Programme.

The Interim Renewable Energy Feed-in Tariff Program (Interim-REFiT) was introduced in **Namibia** in 2015 and will contribute to mobilising private investments into small-scale energy projects with a total capacity of 70 MW. However, the Namibian Interim REFiT Programme attracted investments mainly into solar energy, whereas investments into other renewable

energy resources did not materialize as expected. Namibia is particularly interested in supporting the utilization of encroacher-bush, as more than one third of Namibia's surface is covered as a result of intensive farming. The bush encroachment suppresses the growth of grass, reduces biodiversity and reduces the penetration of rainwater required to recharge the all-important underground water resources.

In order to explore the utilization of encroacher bush as a renewable resource for electricity generation, the Government of Namibia has requested KfW to undertake a detailed design and implementation readiness study to develop a programme concept for a GET FiT Programme 'bush-to-electricity' in Namibia. The study is financed by the Government of Germany and will be concluded during the third quarter of 2018.

A Renewable Energy Feed-in Tariff (REFiT) was introduced in **Mozambique** in 2014. However, private investments in renewable energy projects have not materialized as expected. In order to operationalize the REFiT, the Government of Mozambique has requested KfW to undertake a detailed design and implementation readiness study to develop a programme concept for a GET FiT Programme in Mozambique. The study will be financed by the Government of the United Kingdom and Northern Ireland. It will be carried out during the course of 2018.

Based on an earlier commitment by the German Government, in December 2017 KfW signed a financing agreement with the Government of **Vietnam** over EUR 14.5 million for the Renewable Energy Development Facility GET FiT Vietnam. Additional financing of EUR 14 million will be requested from the EU. Implementation details remain to be discussed with the main Implementing Partner, the national power utility Electricity of Vietnam, so that the GET FiT facility is expected to be operational by the end of 2018 or early 2019.

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# **GET FIT UGANDA**

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## **ANNUAL REPORT 2017**

[www.getfit-reports.com/2017](http://www.getfit-reports.com/2017)