
OFF GRID: ELECTRIC; *Lighting the World One Village at a Time*

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INTRODUCTION

When Erica Mackey left her California home to train rural health workers in Tanzania she had no idea she would discover an even bigger issue than access to health services. After discussions with local communities regarding their biggest development challenges she learned that most of the people she interacted with on a daily basis had no access to clean electricity. A born problem solver, Erica spent the next six years developing a plan to correct this issue and soon found herself connecting the dots studying business at Oxford University¹. Here she met Xavier Hegelsen, an established entrepreneur looking for a way into the sustainable energy market in Africa and Joshua Pierce, a renewable energy guru with fifteen years of experience. Together they created the company Off Grid: Electric and pitched their idea to USAID's U.S. Global Development Lab who granted the trio \$100,000 of seed money through the Development Innovation Ventures fund. With the seed money in their pocket they graduated from Oxford, moved to Tanzania, and began the long journey towards changing the way East Africa looks at energy².

GLOBAL ENERGY OVERVIEW

The world is facing an energy transformation. As a result, the world's demand for renewable energy has increased dramatically in the last 10 years (see exhibit 1). Among the renewables, Photovoltaic solar power in 2014 increased to 20% of the renewable energy base power capacity equivalent to a 40GW compared to 0.1% in 2002 (see exhibit 1). With an increasing world population this trend is predicted to continue for the next ten years.

As of May 2016, 1.2 billion people are living without access to the power grid. This population (found mainly in Africa (see exhibit 2) spends \$27 billion annually on lighting and mobile-phone charging with kerosene, candles, battery torches or other fossil-fuel powered stopgap technologies. In Tanzania especially taking on the reliance on kerosene is vital. Not only because 85 percent of its 50 million population do not have access to electricity and the country spends an inordinate amount of money buying kerosene, but the negative health benefits are staggering. An evening spent in a room lit by a kerosene lamp has the same effects as smoking two packs of cigarettes a day³. Solar-powered portable lights and home kits offer a better service at affordable cost.

Off Grid: Electric was created with with the hope of offering these sorts of solutions to underserved populations in Africa. Nowhere on the continent was the need so urgent and dire as in Rwanda (second only to Tanzania), making it an easy choice for the next market in which Off Grid: Electric will pilot its transformative, clean energy solutions and products.

¹<https://www.usaid.gov/news-information/frontlines/science-technology-innovation-and-partnerships/gridelectric-brings-solar>

² <http://offgrid-electric.com/about-us/#leadership>

³<http://www.renewableenergyworld.com/articles/2016/01/off-grid-electric-scoops-1-5m-zayed-future-energy-prize.html>

Official data from the Rwanda Ministry of Infrastructure shows dismal electrification (grid connectivity) figures. 21 % as of 2015.

While Off-grid solar has still barely scratched the surface of its global potential, it is no longer a niche product. With less than 10 years of actual presence, today more than 100 companies are now actively focusing on stand-alone solar lanterns and solar home system kits targeting those without modern energy access. By mid-2015 the industry had sold 20 million branded pico-solar products (defined as having PV panel smaller than 10 W), mainly portable lights.

Off-grid solar is advancing rapidly beyond just light and phone charging. Solar home systems capable of powering appliances such as TVs and fans are likely to capture increasing market share. About 7 million off-grid households will use solar-powered fans and 15 million households will have a solar-powered TV in 2020, according to the Off-Grid Solar Market Trends Report 2016.

BUSINESS MODEL

Given the unique nature of Off Grid: Electric's market and client base, innovating with business models and pricing was inevitable. In addition to debt financing and the incredible amount of capital it was able to raise in a short time, Off Grid: Electric entered into a lucrative deal with the Government of the Republic of Tanzania to power 1 million homes by 2017. Although the exact amount paid to Off Grid: Electric remains undisclosed, the money from the government coffers enabled the company to get started in Tanzania with ambitious operations.

Secondly, Off Grid: Electric came up with a good target costing plan, where clients made micropayments based on their energy needs and depending on the income available on-hand to pay for power (or Kerosene, pre-Off Grid: Electric). Flexibility in payment "Pay-As-You-Go" means that those without reliable income can pay one day at a time, and those with seasonal income (such as agriculture) can pay for several months in advance.

Off Grid: Electric does not sell solar products to customers, instead it leases them as a business service. Customers pre-pay for the service in increments as small as twenty cents a day, with monthly rates as low as \$5. Customers can top-up their accounts in small amounts and pay with their mobile phone or at a local kiosk. Rooftop panels are delivered by a local sales force and the customer has access to a 24/7 toll-free service line. If it's a repair, replacement, or upgrade, Off Grid: Electric's network of service agents provide in-home service at no cost⁴.

⁴ <http://techcrunch.com/2014/12/08/the-electrical-revolution/>

How the payment works

Customers pay a deposit of TZS 10,000 or 15,000 (US\$6 or 9) and daily fee of between TZS 300 and 1,000 (US\$0.18 and 0.63), depending on the level of service that they have chosen. (US\$1 = 2,178 TZS (Tanzanian shillings)). All payments are made using mobile money. For those without easy access to a phone, their Off Grid: Electric agent can take cash and make the payments for them. When payment has been made, the customer receives a code to activate their system via SMS. The minimum payment is for one day, but any higher amount paid is automatically pro-rated to the appropriate time period (down to the nearest minute!). When time runs out, the system is automatically disabled until it is topped up again. The customer receives an SMS reminder the day before this is needed. Those without reliable income can pay one day at a time – and can miss the odd day with no penalty. Others who earn seasonal income from agriculture may decide to pay for several months in advance. Off Grid: Electric covers all transfer charges to the mobile money provider, so there is no financial penalty for those who make small top-up payments

Marketing and Promotion

Off Grid: Electric works area by area to recruit customers. Work in an area starts with a publicity campaign and installation of some demonstration systems. Local people who are interested to become agents pay a (refundable) fee for training and become responsible for recruiting customers and installing systems in their neighborhood. After a system is installed, the payment control is set up by the agent, who shows the customer how to operate the system and make their first payment. Off Grid retains ownership of the system, and if needed, will replace or repair it at no cost, provided that the customer is paying for the service. The company designs small solar-home-systems in partnership with Fosera, a German solar company. The systems, with brand name 'M-Power' are currently manufactured in Thailand (see Exhibit 5).

Off Grid: Electric has more than an innovative business/sales model. It has taken an innovative approach to private-public sector financing and continues to calibrate its model through excellent customer service and unconventional ways of incentivizing its agents. Customers are encouraged to call in with any problems as well as when they want their service level changed (an extra light added, a solar-powered refrigerator to keep beer cold or a TV in future.) For any issue that can't be solved over the phone, a service request is sent to the customer's agent, along with hardware, if needed. The agent is responsible for meeting service requests, and has a financial incentive to do so promptly.

ENERGY POLICY AND REGULATION IN TANZANIA

Tanzania is an East African country with a population of about 51.82 million people⁵. Tanzania is surrounded by Kenya and Uganda to the north; Rwanda, Burundi and Democratic Republic to the West and Zambia, Malawi and Mozambique to the south (see exhibit 3)

⁵ "[World Bank Tanzania Country Page](#)". *World Bank*. Retrieved 24 November 2015.

The country's primary energy supply includes Biomass (90%), petroleum products (8%), electricity (1.5%), and the remaining (0.5%) which includes coal and renewable energy⁶ (see exhibit 4). More than 80% of energy delivered from Biomass is consumed in rural areas and this heavy dependence is leading to deforestation⁷. Tanzanian National Development Vision of 2025 includes moving the country into middle income status.

Power Sector Overview: The country's power sector is dominated by a single vertically integrated national utility; Tanzania Electric Supply Company Ltd (TANESCO). Tanzania's energy demand for heating, electricity, and transportation has been increasing with improved standards of living at 10 to 15 percent per annum⁸. Large hydropower serves as the main source of electricity for the country, with an installed capacity of 562MW⁹. To meet these growing demands, Tanzania has had to import a growing share of electricity from Zambia 5MW, Uganda 8MW and Kenya 0.85MW¹⁰ which is highly unreliable. The government plans to increase the connectivity level to 50 percent by 2025 and at least 75 percent by 2033. In order to do this, the government has enacted specific policies to increase energy access. An example of such a policy is the Rural Energy Act (REA) of 2005 which provides grants towards capital cost of projects implemented by private and public entities.

Renewable Energy in Tanzania; Tanzania's renewable resources remain largely untapped. Currently, the country's total generation capacity from renewable energy (excluding large hydro) is about 4.9%; this includes captive generation in sugar, tannin and sisal factories, solar and small hydro plants¹¹. Tanzania has high levels of solar energy, ranging between 2,800-3,500 hours of sunshine per year, and a global horizontal radiation of 4–7 kWh per m² per day. The government, through the REA and various donors, has supported a number of solar PV programs that target off-grid areas where the cost of lighting from solar is less than from a diesel generator or kerosene. For example, the Sustainable Solar Market Package (SSMP) is a contracting mechanism that bundles the supply, installation and maintenance of PV systems for public facilities with requirements and incentives for commercial sale to households and businesses.

⁶ Msyani, Christian. "Current Status Of Energy Sector In Tanzania". *United States Energy Association*. N.p., 2013. Web. 6 Apr. 2016.

⁷ Ibid.

⁸ Ibid.

⁹ African Development Bank Group,. *Renewable Energy In Africa; Tanzania Country Profile*. Cote d'Ivoire: The African Development Bank, 2015. Print.

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<http://www.iea.org/statistics/statisticssearch/report/?year=2013&country=TANZANIA&product=Balances>

¹¹ African Development Bank Group,. *Renewable Energy In Africa; Tanzania Country Profile*. Cote d'Ivoire: The African Development Bank, 2015. Print.

Tanzania's Energy Policy as outlined in the country's vision 2025;

- Shift the energy mix away from an expensive, emergency, oil-based power supply to more efficient and lower-cost generation.
- Enhance the development and utilization of renewable energy sources and technologies
- Adequately take into account environmental considerations for all energy activities
- Increase energy efficiency and conservation in all sectors.

MARKET COMPETITOR -- M-Kopa Solar

M-Kopa Solar is the Kenyan market leader in pay-as-you-go energy for off-grid customer, founded in October 2012.¹² M-Kopa has connected more than 300,000 households in Kenya, Tanzania and Uganda to solar power as of January 2016.¹³ The company is adding over 500 new homes each day even now.¹⁴ M-Kopa says that the company will connect a million houses to its solar system by the end of 2017 and it looks like they are well on their way to achieving this goal.¹⁵

According to a 2014 study by M-Kopa and InterMedia, about 70% of Kenyans live in off-grid areas and 56% of Kenyans still depend on kerosene, batteries and candles.¹⁶ M-Kopa's power system costs about US\$200, including a solar panel, two LED bulbs, an LED flashlight, a rechargeable radio, and adaptors for charging a phone.¹⁷ Clients pay US\$35 as a deposit and make a daily payment of 45 cents for a year using a mobile money service, such as M-Pesa.¹⁸ If the customer stops payment, M-Kopa can switch off his or her system remotely.¹⁹ Most of M-Kopa customers live on less than US\$2, but this price, 45 cents a day, is still affordable and cheaper than kerosene in the long run.²⁰ M-Kopa estimates each household can save US\$750 dollars over the first four years by using the company's solar kit instead of using traditional kerosene lighting.²¹

M-Kopa achieved rapid growth and its estimated revenue is US\$30 million in 2015.²² The company expects that it will double in 2016.²³ M-Kopa's future growth plan is as follows: 1) expanding its customer base in East Africa; 2) broadening their business into other countries; 3) selling more products to its existing customers.²⁴ For instance, from 2015, the company started selling add-on products such as

¹² M-Kopa Solar, Company Overview, available at <http://solar.m-kopa.com/about/company-overview/>

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Katie Fehrenbacher, *Selling Solar to Rural Africa is Emerging as a Hot Market*, Fortune, December 22, 2015, available at <http://fortune.com/tag/m-kopa-2/>

¹⁶ M-Kopa, *Kenya Emerges as Solar PV Hot Spot*, February 26, 2015, available at <http://www.m-kopa.com/press-release/kenya-emerges-as-solar-pv-hot-spot/>

¹⁷ Stephan Faris, *The Solar Company Making a Profit on Poor Africans*, Bloomberg, December 02, 2015, available at <http://www.bloomberg.com/features/2015-mkopa-solar-in-africa/>

¹⁸ Ibid.

¹⁹ Ibid.

²⁰ Ibid.

²¹ M-Kopa, Our Impact, available at <http://solar.m-kopa.com/about/our-impact/>

²² Stephan Faris, *The Solar Company Making a Profit on Poor Africans*, Bloomberg, December 02, 2015

²³ Ibid.

²⁴ Ibid.

energy saving cooking stove, Huawei and Samsung smartphones to its existing customers.²⁵ In addition, in February 2016, M-Kopa has launched its first solar-powered digital flat screen TV, which is available on several different M-Pesa payment plans.²⁶ The company says, "this will help millions of Kenyan achieve their dream of TV ownership."²⁷

In order to adapt rapid growth, getting hold of good personnel is also important for M-Kopa, and the company is focusing on creating employment in East Africa. The company hired 650 full time employees and commission-based sales agents across Kenya, Uganda, and Tanzania, and it is trying to expand the employment size.²⁸ In January 2015, M-Kopa announced that it would launch a training and development program called M-Kopa University in Nairobi, Kenya, making use of funding.²⁹ M-Kopa estimates that the university will provide training to over 1,000 staffs and 3,000 sales agents across East Africa via onsite and remote curriculum.³⁰

As the above example shows, M-Kopa also succeeded in getting enough investments. The company announced that it has raised US\$19 million financing from consortium of private equity investors, led by Generation Investment Management.³¹ Including this investment, M-Kopa has raised more than US\$50 million funding since its founding.³²

COMPANY FINANCIALS AND GROWTH POTENTIAL

In December 17, 2015 Off Grid: Electric raised \$45 million in debt financing. This money is meant to serve for battery and solar power storage. Investors such as The Packard Foundation, Ceniarth, Calvert Foundation and other family offices make up \$40 million of the total amount. The rest is from the U.S. Agency for International Development that has provided \$5 through its innovation program. In October of the same year Off Grid raised \$25 million in a round C financing where some large impact investment firms were involved, including Omidyar Network, Vulcan Capital, and a private investment firm affiliated to Microsoft. This brings them to a total of \$70³³ million in debt financing.

²⁵ Kevin Mwanza, *Made In Africa: Cheap M-Kopa Solar Kits A Big Hit In Rural Kenya*, AFKInsider, February 23, 2016, available at <http://afkinsider.com/120016/made-in-africa-cheap-m-kopa-solar-kits-a-big-hit-in-rural-kenya/>

²⁶ M-Kopa Solar, *M-Kopa Launches Solar-Powered TV*, February 17, 2016, available at <http://www.m-kopa.com/press-release/m-kopa-launches-solar-powered-tv/>

²⁷ Ibid.

²⁸ M-Kopa, *Our Impact*

²⁹ M-Kopa, *M-Kopa Wins Zayed Future Energy Prize*, January 19, 2016, available at <http://www.m-kopa.com/press-release/m-kopa-wins-zayed-future-energy-prize/>

³⁰ Ibid.

³¹ Kevin van den Brink, *Microcapital Brief: M-Kopa Solar Raises \$19m in Private Equity Investment to Expand Pay-As-You-Go Model in East Africa*, Microcapital, January 12, 2016, available at <http://www.microcapital.org/microcapital-brief-m-kopa-solar-raises-19m-million-in-private-equity-investment-to-expand-pay-as-you-go-model-in-east-africa/>

³² Ibid.

³³ <http://www.greentechmedia.com/articles/read/Off-Grid-Electric-Raises-45M-in-Debt-For-African-Micro-Solar-Leasing-Platf>

The rapid increase in financing for off grid renewable electricity from 2014-2015 shows the potential for growth to both investors and solar energy companies. The growth in financing went from \$64 million in 2014 to \$200 million in 2015 which is a more than 3x increase in funding in just one year.

The choice that Off Grid: Electric now faces is a trade-off between scaling up in their current market, Tanzania or entering a new African market, Rwanda. The potential is there to do both. However, each decision comes with its own opportunity costs.

On the other hand, the potential to expand into Rwanda is huge. Looking at exhibit 9, we see that only 5% of the rural population has access to energy in Rwanda and there is a huge discrepancy in the division between rural and urban areas (urban electrification is 67%). The large discrepancy leads to the assumption that grid extension to rural areas is poor in Rwanda, which would support the case for off grid electricity to gain market share in Rwanda. Moreover, the solar energy market is getting more and more competitive which puts pressure on Off Grid: Electric to expand sooner rather than later.

The third option and the one the company is currently most interested in pursuing would be to do both: committing to the government contract in Tanzania and entering a new market: Rwanda. If Off Grid began sales in early 2012; by March 2014 they would have reached about 45,000 people or ~10,000 households in Tanzania, this translates to about 7000 households per year in the first 3 three years of operation. Based on this rate of success in Rwanda (see exhibit 9), Off Grid will be able to sell their products to an additional 7000 households or businesses per year. This would occur within its first year of entry into Rwanda--which coincides with the timing of the fulfillment of the Tanzanian government contract. With the deal of 1 million households by 2017 and a new market to enter and conquer the question becomes will Off Grid: Electric grow at a rate that is not sustainable to them? With the current number of employees amounting to only 1,000 serving about 10,000 new homes per month, the question remains: can Off Grid: Electric really do both?

In assessing each option that the company is dealing with we make the following assumptions:

1. That the contract with the Tanzanian government began January of 2016 (which in itself is a liberal assumption, considering that by mid-December 2015 the contract still had not entered into power).
2. Further, assuming that this contract is fulfilled in time, by December 2017. This gives them 24 months to power 1 million new homes.

$$1\text{MM} / 24 = 41,666.66$$

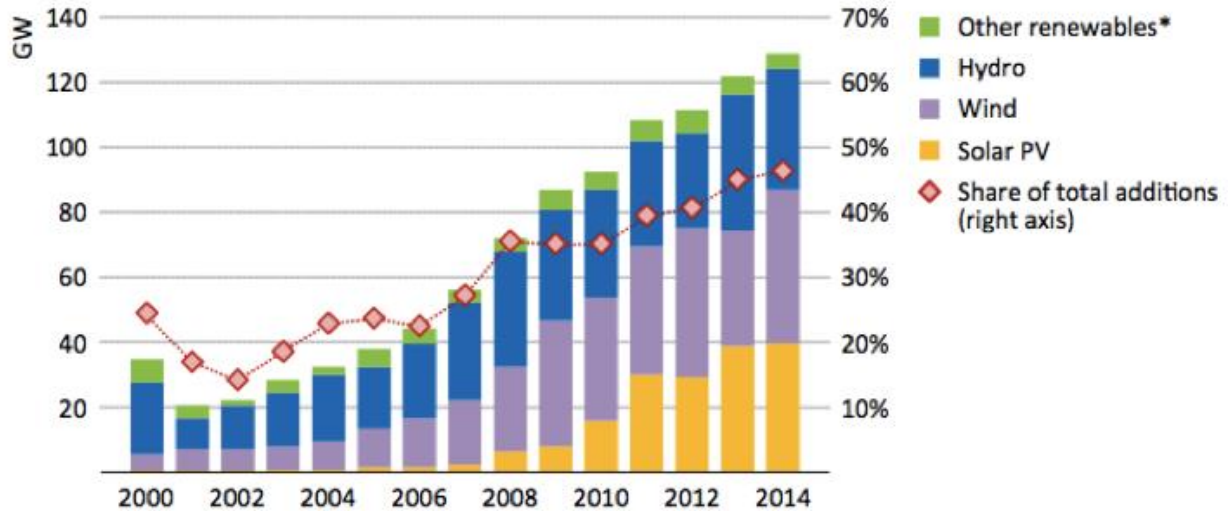
If their current capacity is at 10,000 new homes per month, this would mean that just in Tanzania Off Grid would have to increase their production by 4 1/2 times, while employing 800 people. Maintaining a business as usual approach towards an additional assumption that the number of solar grids they sell per month continues at a stable growth of ~10,000/ month just from private purchasers outside the government contract, that further amounts to ~51,666 new homes to serve per month in Tanzania alone.

Annex

Exhibit 1

Global renewables-based power capacity additions by type and share of total capacity additions

Source: World Energy Outlook 2015



* Includes geothermal, marine, bioenergy and concentrating solar power.

Exhibit 2

Share of population without grid access (percent of total)

Source: World Bank, Bloomberg New Energy Finance. Note: Figures refer to 2012 data.

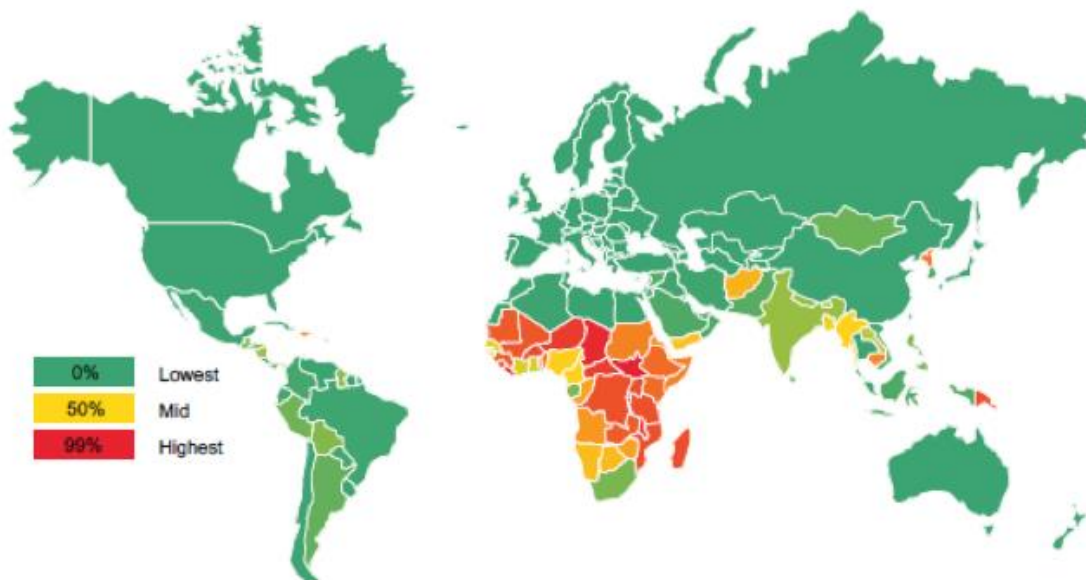


Exhibit 3

Map of East Africa

Source Google Maps 2016



Exhibit 4

Electricity generation by fuel

Source International Energy Agency

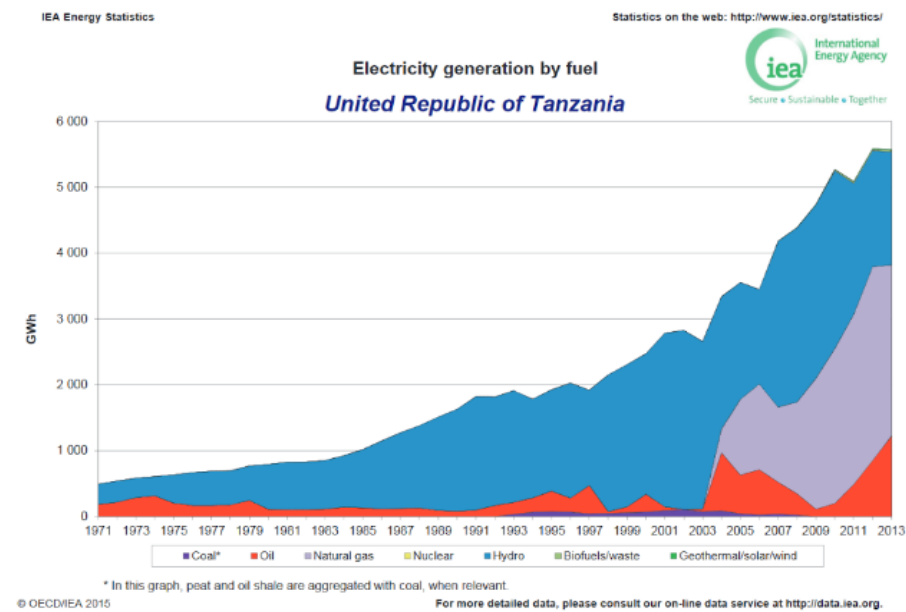


Exhibit 5

Tanzania Electric Supply Company Limited Grid Power Network

Source United States Energy Association

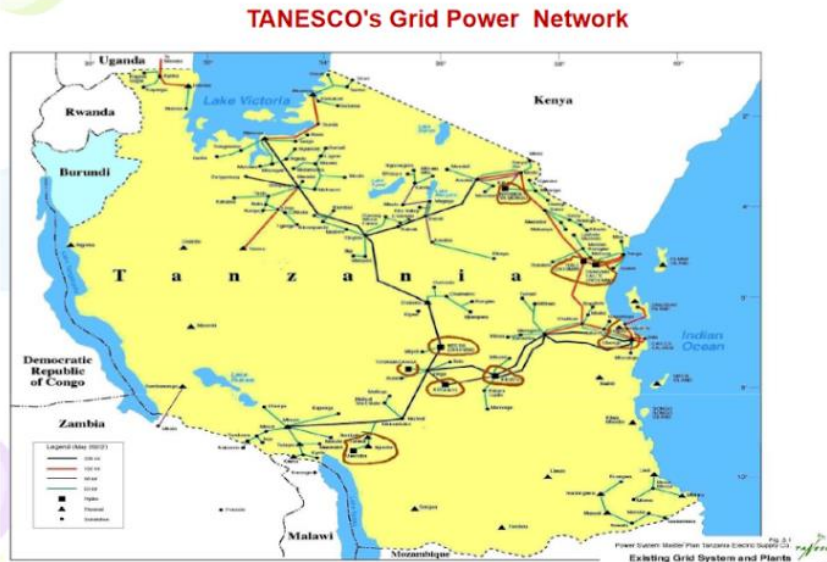


Exhibit 6

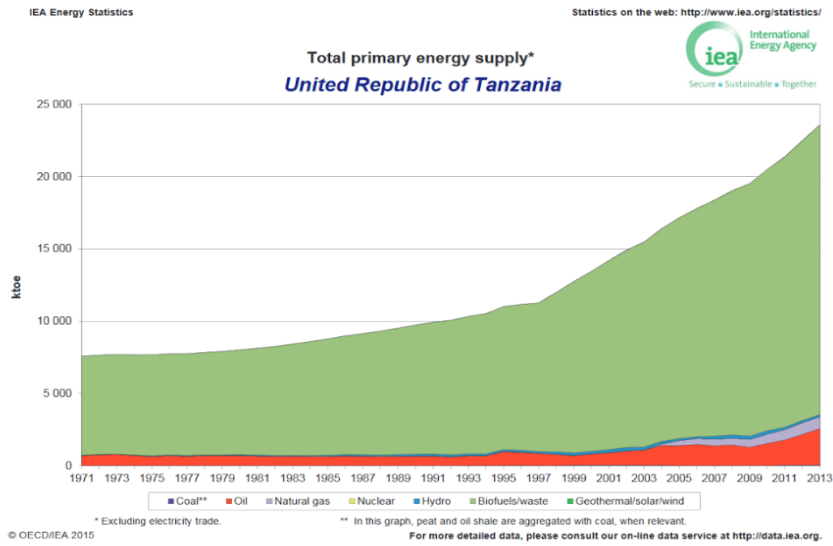


Exhibit 7

Agent ready to install Off Grid: Electric solar home system

Source offgrid-electric.com



Exhibit 8

Figure1: World energy access investment by type and source, 2013

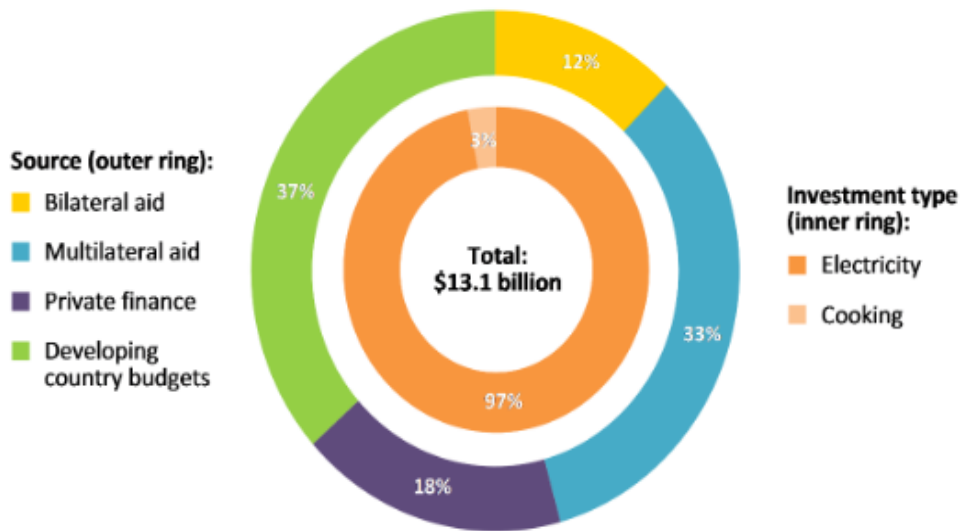


Exhibit 9

SOURCE: IEA, World Energy Outlook 2015

Electricity access in Africa - 2013

Region	Population without electricity millions	National electrification rate %	Urban electrification rate %	Rural electrification rate %
Africa	635	43%	68%	25%
Sub-Saharan Africa	634	32%	59%	17%
Angola	15	30%	46%	18%
Benin	7	29%	57%	9%
Botswana	1	66%	75%	54%
Burkina Faso	14	17%	56%	1%
Burundi	10	5%	28%	2%
Cameroon	10	55%	88%	17%
Cabo Verde	0	94%	100%	84%
Central African Republic	5	3%	5%	1%
Chad	12	4%	14%	1%
Comoros	0	69%	89%	62%
Congo	3	42%	62%	5%
Côte d'Ivoire	15	26%	42%	8%
Democratic Republic of Congo	61	9%	19%	2%
Djibouti	0	50%	61%	14%
Equatorial Guinea	0	66%	93%	48%
Eritrea	4	32%	86%	17%
Ethiopia	71	24%	85%	10%
Gabon	0	89%	97%	38%
Gambia	1	36%	60%	2%
Ghana	7	72%	92%	50%
Guinea	9	26%	53%	11%
Guinea-Bissau	1	21%	37%	6%
Kenya	35	20%	60%	7%
Lesotho	2	17%	43%	8%
Liberia	4	10%	17%	3%
Madagascar	20	15%	37%	4%
Malawi	15	9%	32%	4%
Mali	11	26%	53%	9%
Mauritania	3	28%	47%	2%
Mauritius	0	100%	100%	100%
Mozambique	16	39%	66%	27%
Namibia	2	32%	50%	17%
Niger	15	15%	62%	4%
Nigeria	96	45%	55%	37%
Réunion	0	99%	100%	87%
Rwanda	9	21%	67%	5%
Sao Tome and Principe	0	59%	70%	40%
Senegal	6	55%	90%	28%
Seychelles	0	97%	97%	97%
Sierra Leone	6	5%	11%	1%
Somalia	9	15%	33%	4%
South Africa	8	85%	90%	77%
South Sudan	11	1%	4%	0%
Sudan	25	35%	63%	21%
Swaziland	1	27%	40%	24%
Tanzania	37	24%	71%	4%
Togo	5	27%	35%	21%
Uganda	32	15%	55%	7%
Zambia	11	26%	45%	14%
Zimbabwe	9	40%	80%	21%

Exhibit 10

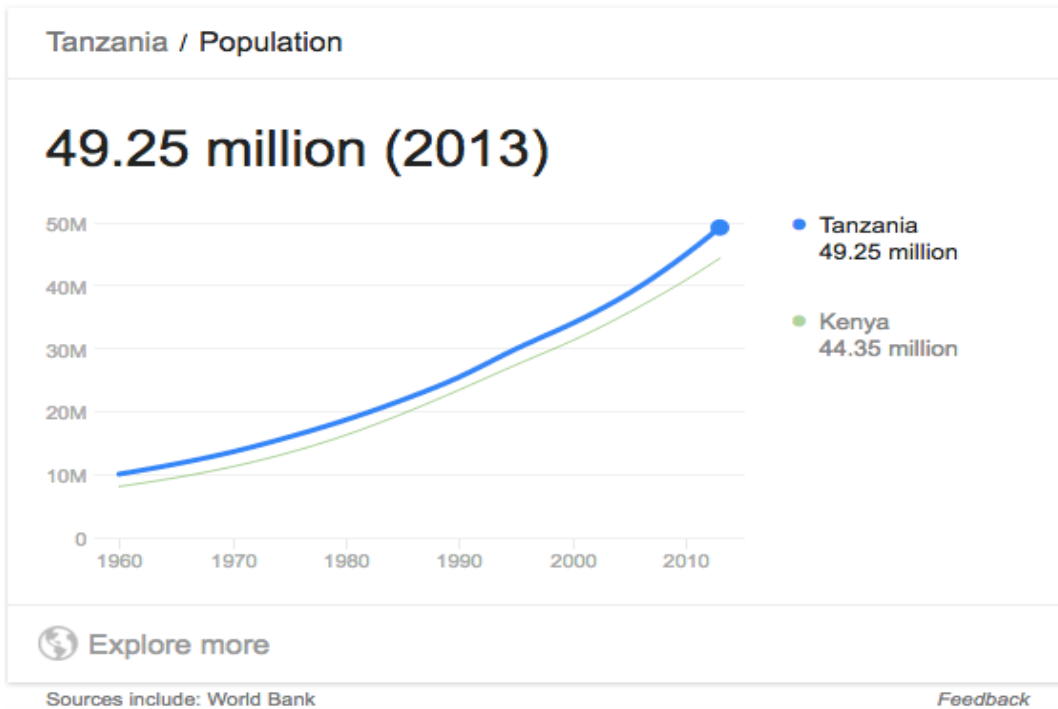


Exhibit 4

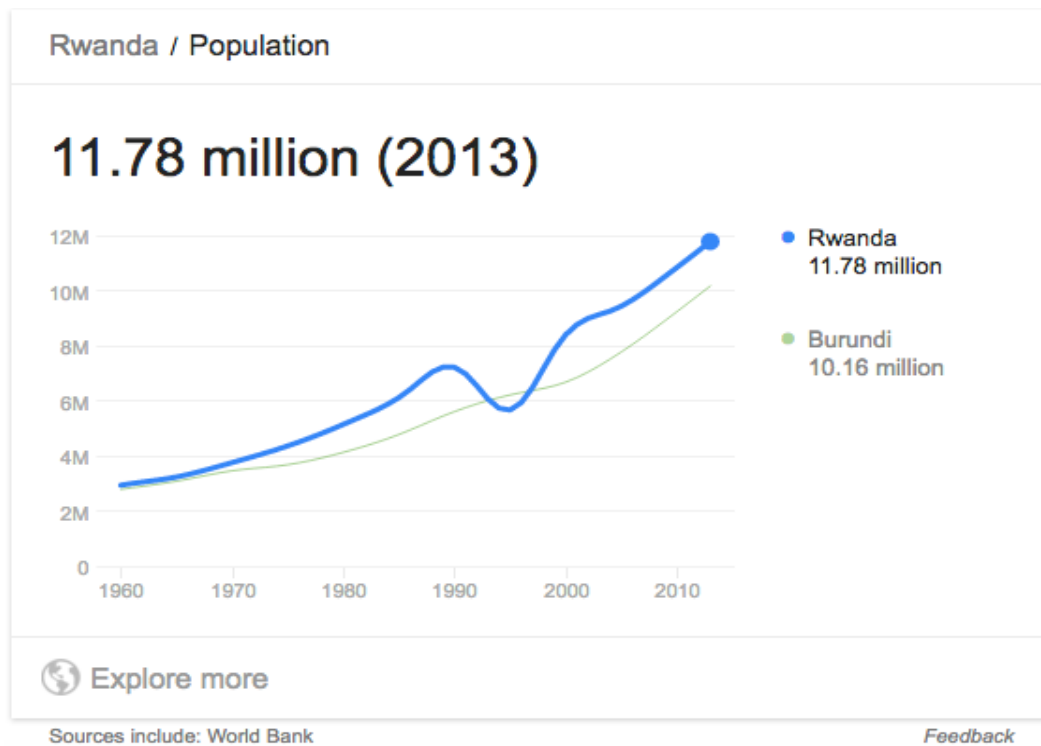
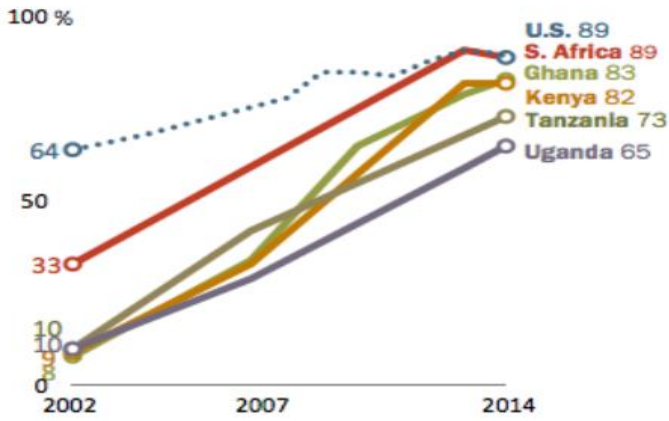


Exhibit 11

Cell Phone Ownership Surges in Africa

Adults who own a cell phone



Note: U.S. data from Pew Research Center surveys.

Source: Spring 2014 Global Attitudes survey. Q68.

PEW RESEARCH CENTER

Exhibit 12



21% of Rwandans are active mobile money users

³⁴ <http://www.slideshare.net/CGAP/financial-inclusion-insights-rwanda-2015-56173533>

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