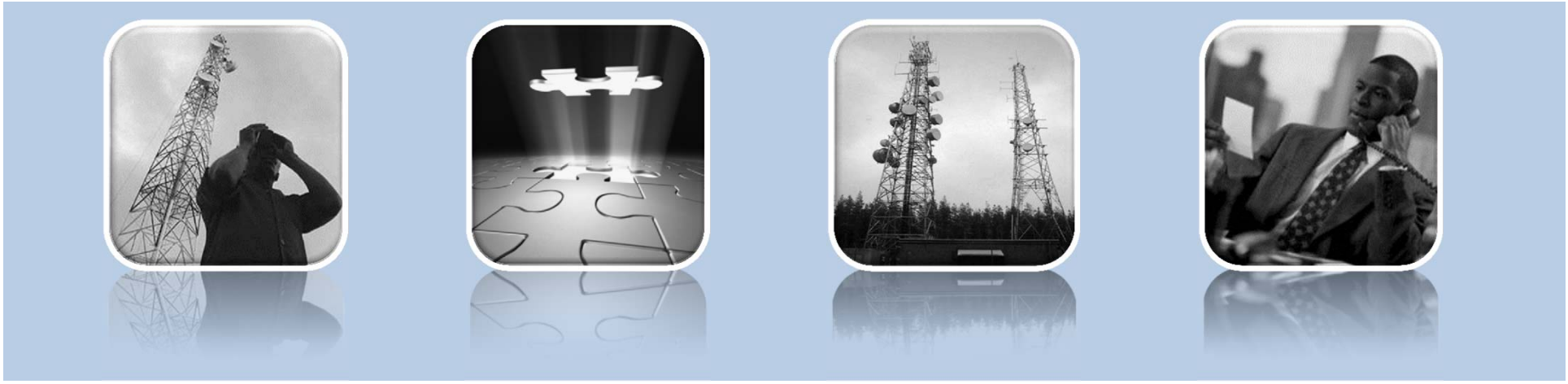
EatonTowers



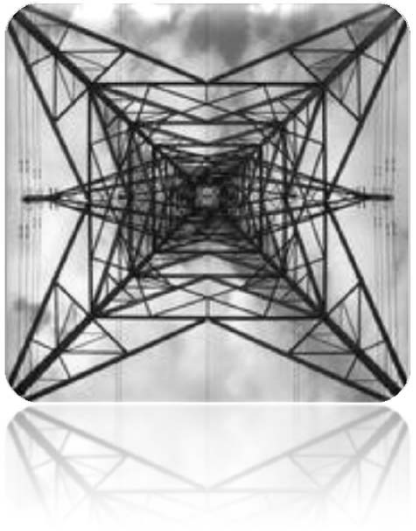
Community Power from Mobile

Prepared by : Sam Basson

Date : 05th November 2012

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Eaton Towers Profile

Eaton Towers is an independent tower company providing network infrastructure and related services to mobile operators in Africa.

- We provide outsourced shared site and tower services for telecoms network operators by building, acquiring, owning and maintaining telecommunications infrastructure assets for network operators.
- Our core value proposition for network operators is to:
  - ✓ Release value from existing sites (opex reduction and/or capital)
  - ✓ Drive operational efficiencies to generate cost savings (Opex + Capex)
  - ✓ Drive Operator co-location to maximise site utilization
  - ✓ Accelerate network roll-out
- Our key values are independence, responsible governance, integrity, environmental sustainability and development of the local communities in which we operate.
- Eaton is operational in Ghana, managing Vodafone Ghana's sites and their co-location rights for the next 10 years (750 sites and growing).
- In Uganda Eaton have recently acquired 680 sites from Orange and Warid and a further 300 sites are under a management arrangement .
- Business in South Africa kicked off earlier this year and Eaton have already constructed 23 sites, a further 11 are in the build process and it is anticipated that at least another 27 new sites will be completed before the year end.

Eaton Towers Senior Executive Team

Eaton Towers

Eaton's senior team has unrivalled experience with major international mobile operators



Sanjiv Ahuja: Chairman

- Orange S.A. COO (April '03 to March '04) and Orange S.A. CEO (March '04 to April '07)
- Orange UK Chairman – April '07 to September '08
- During his leadership, Orange increased countries of operation to 23, including 14 countries in Africa, and mobile customers from 48 million to over 100 million worldwide.
- Also CEO and Executive Chairman of LightSquared

orange



Alan Harper: CEO

- Group Strategy & New Business Director for Vodafone PLC from 2000 to 2007 responsible for corporate and regulatory strategy, business development, R&D and public policy.
- Managing Director of Vodafone UK from 1999-2000, 12m customers and more than 10,000 base stations at the time

vodafone



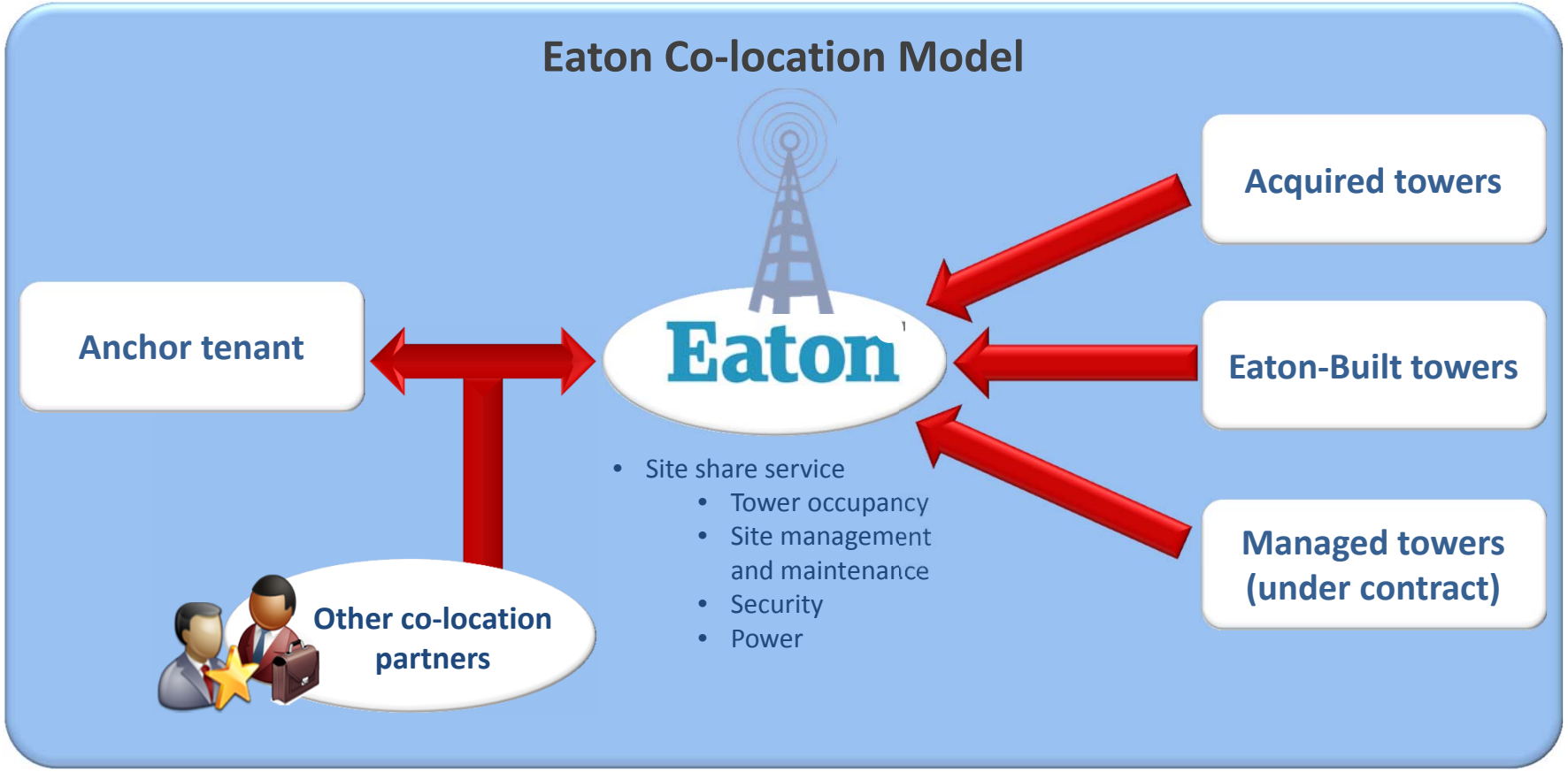
Terry Rhodes: Director

- Board member of Celtel Uganda from 1995 to 2005
- 1998 - founder Director of Celtel International BV which he helped grow from single operation in Uganda to a Pan African operation in 16 African countries .
- Board member of Celtel operations in Uganda, Tanzania, Zambia, Malawi, Sudan, Sierra Leone, Gabon, Congo-B

celtel

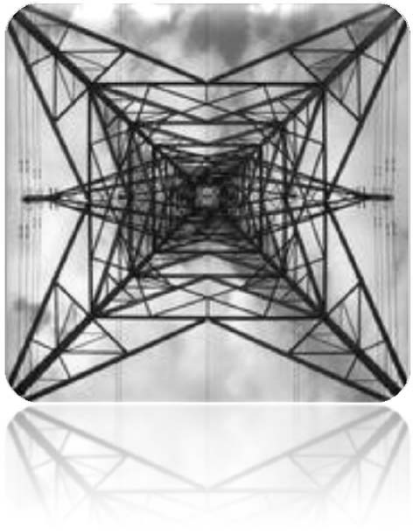
Eaton Towers Co-location Model

Site Sharing (or “Co-location”) lies at the heart of Eaton’s business model, helping operators to release value from existing sites and reduce the cost of ownership of new sites



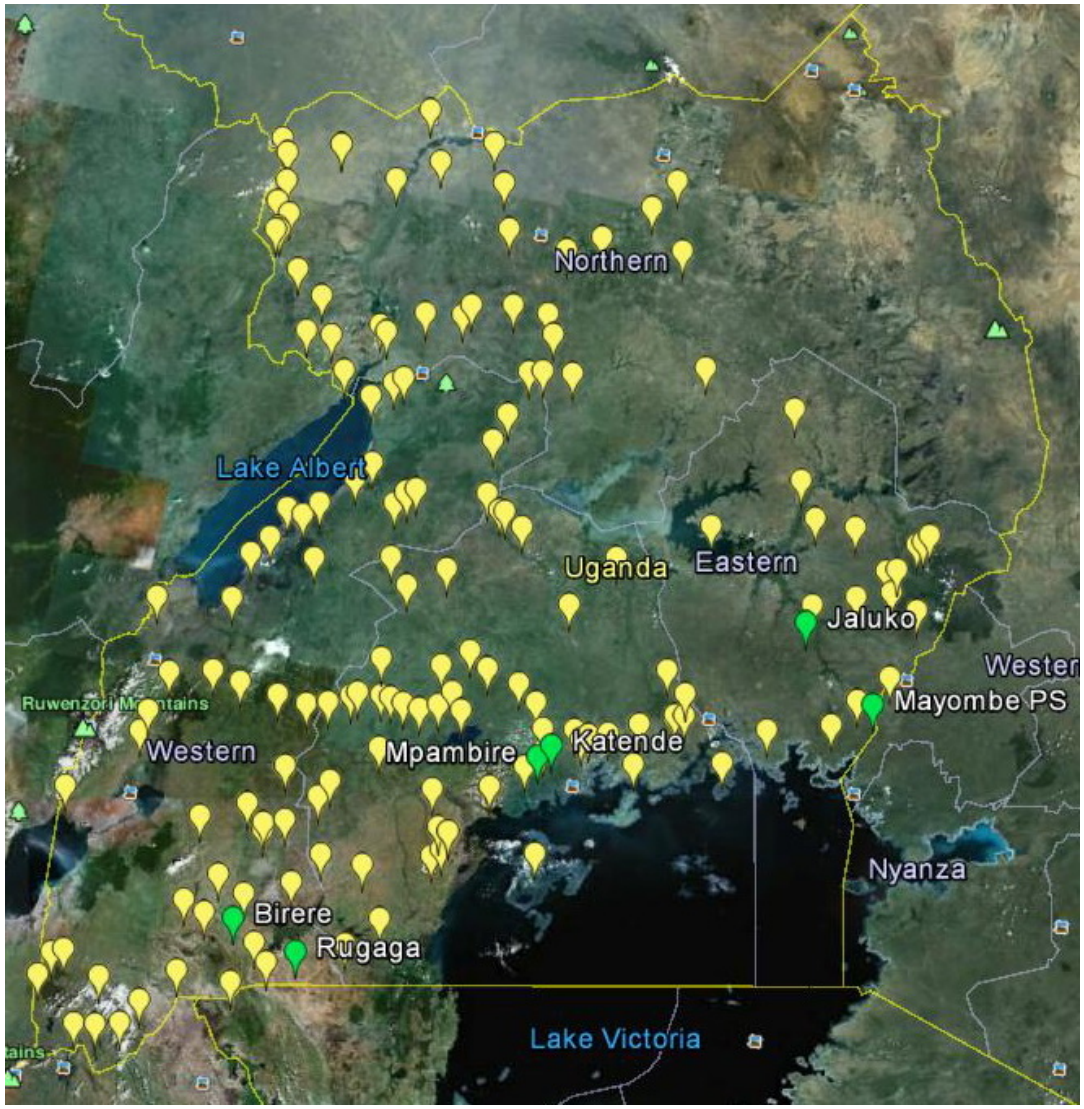
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Eaton Towers Uganda Off-Grid Sites

- 174 sites on the Eaton portfolio in Uganda do not have a grid connection.
- These off grid sites are spread across the country with the largest density (40%) within the South Western part.
- In Eaton's drive to reduce on operational expense various options are been explored to run these site more efficiently.
- Communities surrounding these sites have been neglected and Eaton would want to as part of its strategy of improving the current condition extend the renewed energy to benefit these communities.



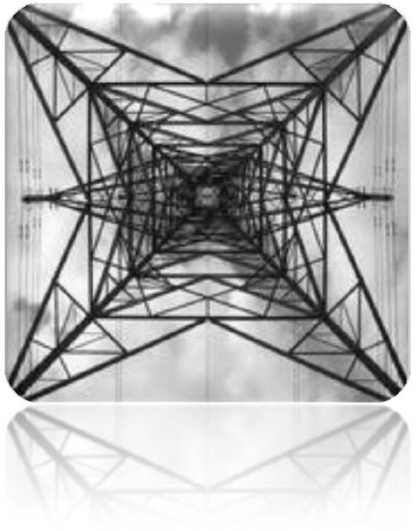
Eaton Towers Trial Sites

EatonTowers

- Eaton Uganda commissioned the services of Crystal Technologies and Consulting Engineers Ltd to conduct a feasibility study of six sites across the country identified to possibly be targeted by the “Community Power from Mobile” initiative.
- These sites are located in the remote areas of the Eastern, Central and Western parts of Uganda.
- All sites visited are running on generator and are far from the nearest source of commercial power supply.
- Surveys were conducted to determine the quantity of households that are within 100 – 200 meters proximity to each site and the availability of a communal facility ascertained.
- Technical measurements to confirm the site loads and the operational status of the generators (Source of power) at the sites were also conducted.
- Of the six sites visited it was found that Mayombe Primary School would be the most viable to target with the first trial deployment.

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Biography

EatonTowers

- Mayombe Primary School is approximately 188 kilometers from Kampala along the Jinja-Iganga-Busia road.
- The site is along the main road approximately 3 kilometer from Busia border post.
- The site hosts two operators (Orange and Warid).
- The equipment of Warid is housed within a shelter and that of Orange is outdoor.
- The site is surrounded by a relatively busy environment, i.e. shops selling merchandise and a school (Mayombe PS) on the opposite side of the road.
- Farming is also practiced by the residents of this area.
- There is need for a communal phone charging facility at this location.

Neighbourhood

EatonTowers

Population Density:

- There are a total of 41 households stretching from the left to the right hand side of the site over a total distance of 360 meters.
- There are 14 households in total across the road.
- The population distribution and density in this area is such that each household on average hosts at least two families with an occupancy of five to six people.

Economic Activity:

- The main economic activity of the people in this area is trading closely supported by subsistence farming.
- This area in particular turns into a trading center every evening as residents assemble here to trade in all sorts of items.
- The availability of power in this area will make the location (Trading center) more vibrant and fuel its economic development.
- There is a phone charging center in the area and video show “hall” all of which run on generator power.

Neighbourhood

EatonTowers

Physical household layout:





View on the left hand side of the site



View on the right hand side of the site

Neighbourhood

EatonTowers

Physical household layout:

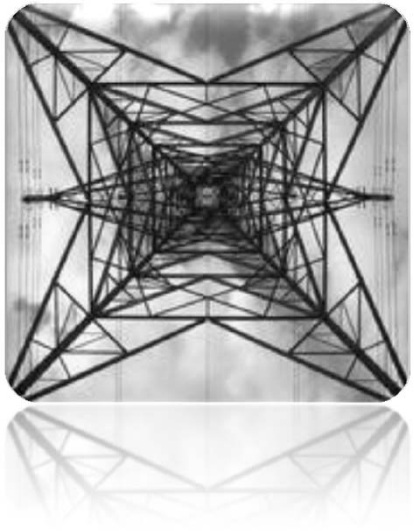




View across the road from the site

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Condition of Generator

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- There is no generator maintenance log at site and as such it was difficult to ascertain the last time the generator had been serviced/maintained.

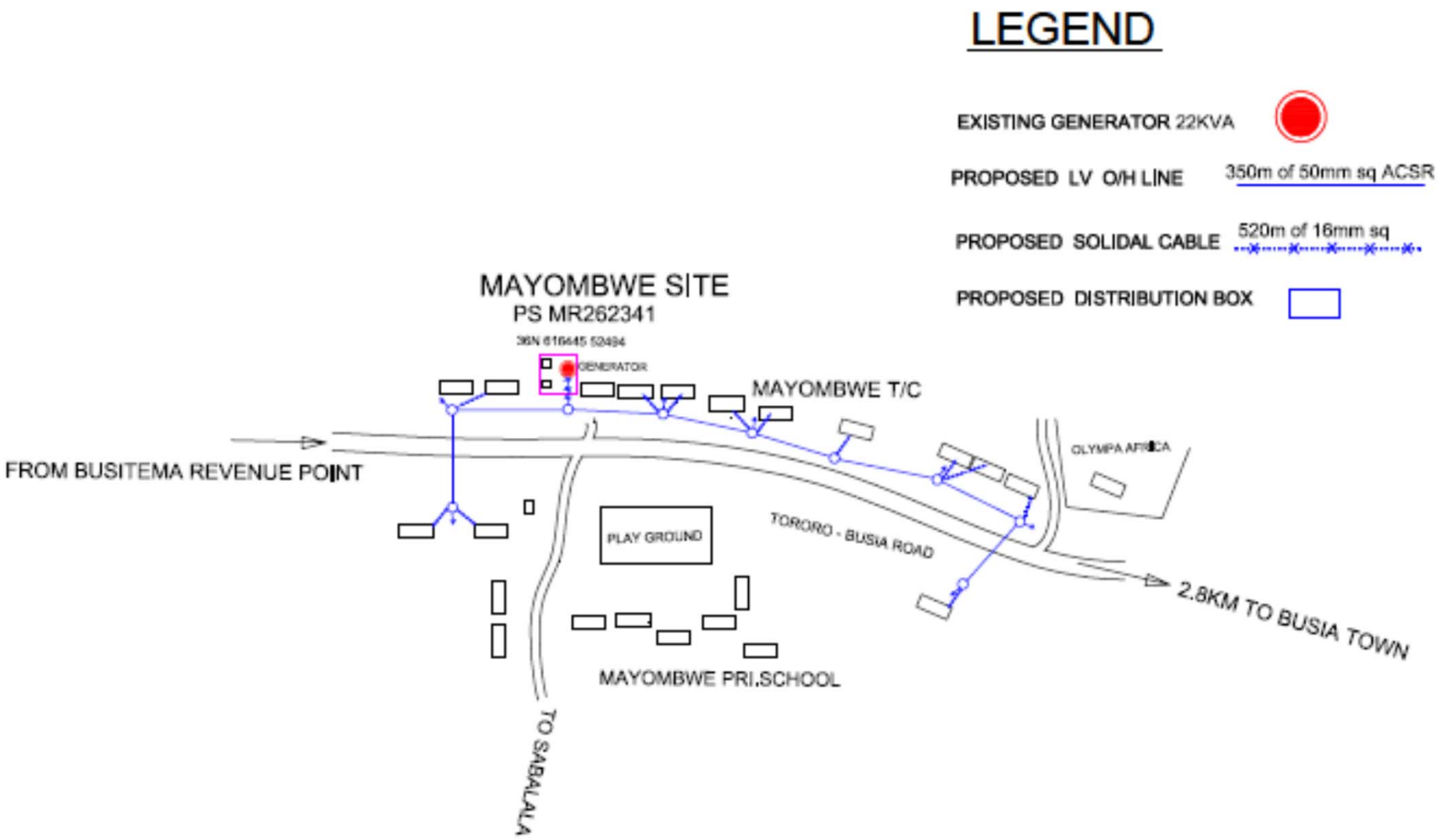
- Owing to the site load requirements the available power for distribution is 11KVA, three phase from the generator.





Proposed Power Distribution

EatonTowers



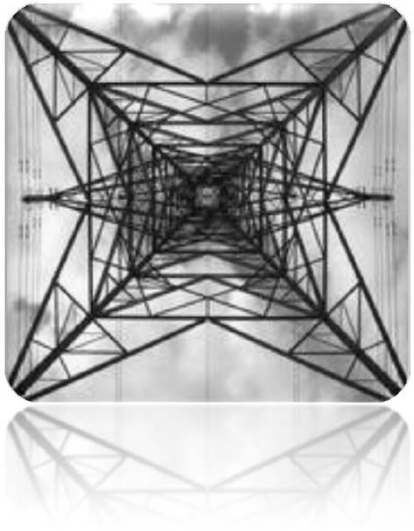
Bill of Materials

EatonTowers

- A Bill of Materials was derived from both the load flow results obtained using PSS Sincal software and the power distribution network design.
- Each household will be limited to a maximum current feed of 0.2 kW which should allow for a 25” television and 3 of 13W CFL lights to be used simultaneously.
- It is assumed that the residents of this area will provide for the internal wiring within their houses . They would also provide for one domestic socket and two to three lamp/bulb fittings per household.
- Since the anticipated power demand per household is very low, specific network nodes would need to be created during network construction where supply isolation can be done. Circuit breakers are proposed to be the isolation mechanism.
- Junction distribution units will be required to distribute supply from the network node to the socket and the lighting circuits. It is assumed that if this is done at the time of network implementation it will be a way of ensuring that the lighting and socket circuits are existent as unique independent circuits. There is a tendency to create make shift circuits as and when necessary by people living in such areas rendering the supply very unsafe.

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Capital investment

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- The generator at site would need to be upgraded from 22kVA to 30kVA to ensure available power for future tenant upgrade and that the total load on the existing generator does not exceed 75% of it's design capacity.
- A second backup generator would need to be installed to ensure the reliability of the power provided to the community.
- Upgrading of the existing generator to 30kVA would attract a cost of US$ 25,316 to procure. Deployment of generator to site would cost US$ 4,320.
- Installation of a second backup generator would attract the same cost for upgrading of the existing generator.
- Construction of power line distribution network is expected to cost US$ 10,000.
- A total investment of US$ 69,272 is anticipated to allow for the electrification of households in the Mayombe area.
- Cleaner energy production and reduction in load demand is currently been investigated.

Operations and Maintenance Charge

EatonTowers

- To ensure that there is reliable power supply in this location a small charge to sustain the operation and maintenance cost of the mini-grid network should be charged on a monthly basis.

- This is purely to ensure that any broken or damaged network components as a result of either technical or nontechnical reasons are replaced immediately to restore the power supply.

- The most suitable option considered was to derive a reasonable flat charge to be collected monthly from each registered user.

- A management committee to police the utilization of this facility would need to be setup with clear guidelines of management and administration of the network to ensure minimal failure.

- This location is 2.8KM from the nearest three phase power supply source and it is anticipated that it will be on the national grid in a period not exceeding two years from now. It was therefore not tenable to technically devise a monthly flat operations and maintenance tariff charge that is based on the life span of the network infrastructure.

Operations and Maintenance Charge

EatonTowers

- It is proposed that each household would contribute **Five thousand Uganda shillings** (US$ 2.00) per month towards the facilitation of the operation and maintenance costs.

- This figure was arrived at after thorough scrutiny and analysis of the economic welfare and financial expenditure capabilities of the residents of this area.

- The expected annual revenue from these collections is **Three Million Uganda shilling** (US$ 1,200.00) a figure that is considerable comfortable for the operation of this network when compared to the cost of network construction.

- A mechanism to manage these resources still needs to be determined.

Collection of Monthly Remittances

EatonTowers

- A management committee consisting of the local leaders would need to be constituted.
- The committee would be tasked to manage the collection of the monthly charge from each household/power consumer and remit the collection to the management of Eaton Towers.
- The management committee would among other duties be required to:
  - Register all users and maintain a registry of the users and their different loads.
  - Ensure that each user subjects a load on the network not exceeding approximately 200W. Only Compact Fluorescent Lights (Energy saver bulbs) must be used with a rating not greater than 18W. The maximum number of lighting connections for each household will be three.
  - Ensure that the materials used for connection of the different household loads onto the network are of the approved standard.
  - Continuously sensitize the community on energy efficiency utilization practices.
  - Manage the addition of an additional user onto the network.
- In return, the management committee could be exempted from these monthly charges and/or also be entitled to a quarterly allowance from the management of the collections they will have submitted.

Operations and Maintenance Costs

EatonTowers

- The cost associated with operating and maintaining the constructed power distribution network could be recovered from the monthly charge to the households on the network.
- Consumption of fuel is anticipated to increase from the current 3.0 litres per hour to 5.2. With the generator running permanently (current condition) it is anticipated that an additional 1,584 litres of fuel will be required. Delivered to site this will add **US$ 2,566** to the current cost of fuel supply.
- Generator will be serviced according to the current schedule (every 250 run hours). Additional cost on larger capacity generator is anticipated at US$ 57 per service. 2.88 services per month will add **US$ 164** to the current spend.
- End of life generator replacement is anticipated every 21 months. The additional cost for a 30kVA generator replacement is US$ 6,489. This will add **US$ 309** per month to the current cost.
- During the lifecycle of the generator it is anticipated to have to perform 1 minor and 1 major overhaul. The added cost to the current spend is anticipated at US$ 2,383. Calculated monthly this relates to an additional cost of **US$ 113.**
- The monthly operations and maintenance cost running the generator/s 24 hours a day, 365 days a year is anticipated to increase by **US$ 3,152.**

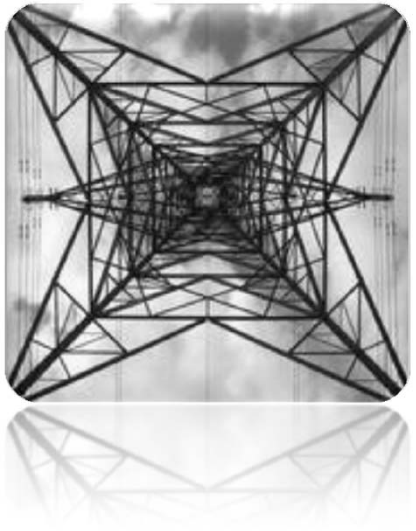
Charges for Electricity Consumed

EatonTowers

- Initially no metering was considered for power consumed by individual households and therefore a mechanism of charging the individual users based on the quantity of power consumed was ignored.
- Determining a flat fee for consumption however posed challenges in that certain households would consume more than others and still be charged the same rate that lower consuming residents would pay.
- A metering system in conjunction with one of the mobile operators is currently been explored.
- Ensuring that 10kW of power is generated for 24 hours a day and assuming that all this available power is consumed would attract a production fee of (3152/(10*24*30)) **US$ 0.45 per kWh**. (Average generator hourly consumption of 5.2 liters)
- Considering that residents will only be utilizing 10 hours of electricity consumption per day and this at maximum allowed load of 10kW would attract a cost of (2392/(10*24*30)) **US$ 0.34 per kWh** to produce. (Average generator hourly consumption of 4.5 liters)
- The current tariff charged by the ERA for households is (524/2500) **US$ 0.21 per kWh** which is considerably less than what Eaton can achieve.

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Way Forward

EatonTowers

- Building a mini-grid is the solution that would provide the largest impact to the community of Mayombe, however also constitutes the most challenges.
- Eaton has received keen interest from organizations and equipment providers whom whish to invest in this initiative.
- To enable this project to be viable Eaton could consider engaging the services of a Rural Electrification Organisation (ESCO) who could better manage a project of this magnitude.
- Eaton is also considering downscaling on the ambitious approach such that a communal facility or the school be targeted.



For more information about EATON TOWERS visit: **http://www.eatontowers.com**