

# ***Grid Interconnection of Mini-Grids***

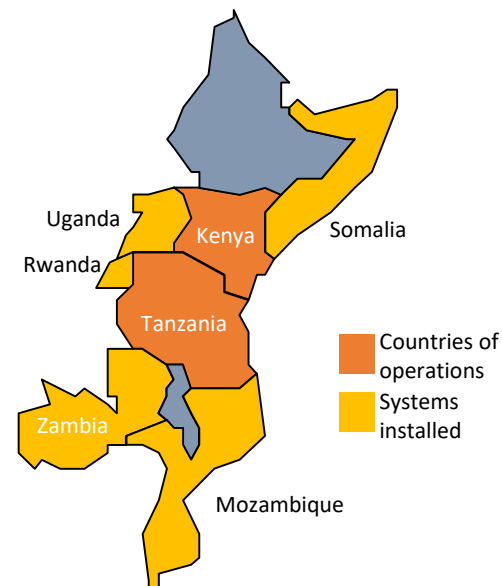
***EAPN Webinar***

***18 July 2018***

## PowerGen at a Glance

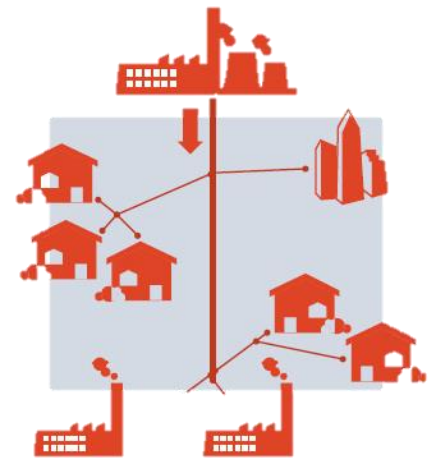
- Founded in **2011**
- **95+** full-time employees with offices Nairobi, Kenya and Arusha, Tanzania
- Leading micro-grid company in Africa, managing **>5,000 customers**
- **200+** renewable energy systems installed across **7 countries**
- Operational capabilities across the full project life cycle (develop, build, operate)

## Country Experience



# *Interconnected Mini-Grids as the Future of the Energy System*

# What does the future power system look like?



Mono-directional



**Multi-directional**

Centralized



**Decentralized**

Analog



**Digital**

Carbon-based

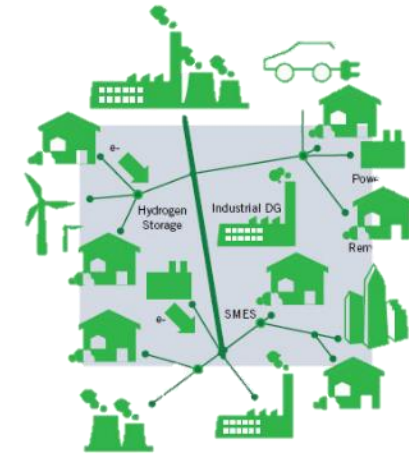


**Decarbonized**

Infrastructure-centric



**Consumer-centric**



## Technologies Driving this Transition

- Smart Metering & Controls
- Rooftop Solar
- Low-cost Energy Storage
- Electric Vehicles
- Micro-Inverters
- Blockchain

# Micro-grids are becoming the “building block” of this future architecture

## FINANCIAL TIMES

‘Mini-grid’ household energy sharing begins to take off

Network of 20,000 German homes selling to each other shows new distribution model

## Harvard Business Review

TECHNOLOGY

# How Utilities Are Using Blockchain to Modernize the Grid

Apple has just become an energy company, looks to sell excess electricity into the grid and maybe more

Seth Weintraub - Jun. 9th 2016 8:18 am PT @lisethy



SIEMENS

www.siemens.com/smartgrid

### Smart energy supply for the University Campus of Savona

University of Genoa, Italy

The Economist

Light-bulb moment

## Mini-grids may be the best way to illuminate the “bottom billion”

Governments need to rethink what is meant by a national grid

## Illinois Project Opens the Door for Non-Utility-Owned Microgrids

Statement from EDF's Christie Hicks and CUB's David Kolata

February 28, 2018

The Illinois Commerce Commission (ICC) today approved Commonwealth Edison's (ComEd) \$25-million microgrid project and agreement to create a first-of-its-kind tariff, which will give non-utilities the opportunity to use ComEd's existing wires to develop microgrids.

### Media contact

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Contact

## MIT Technology Review

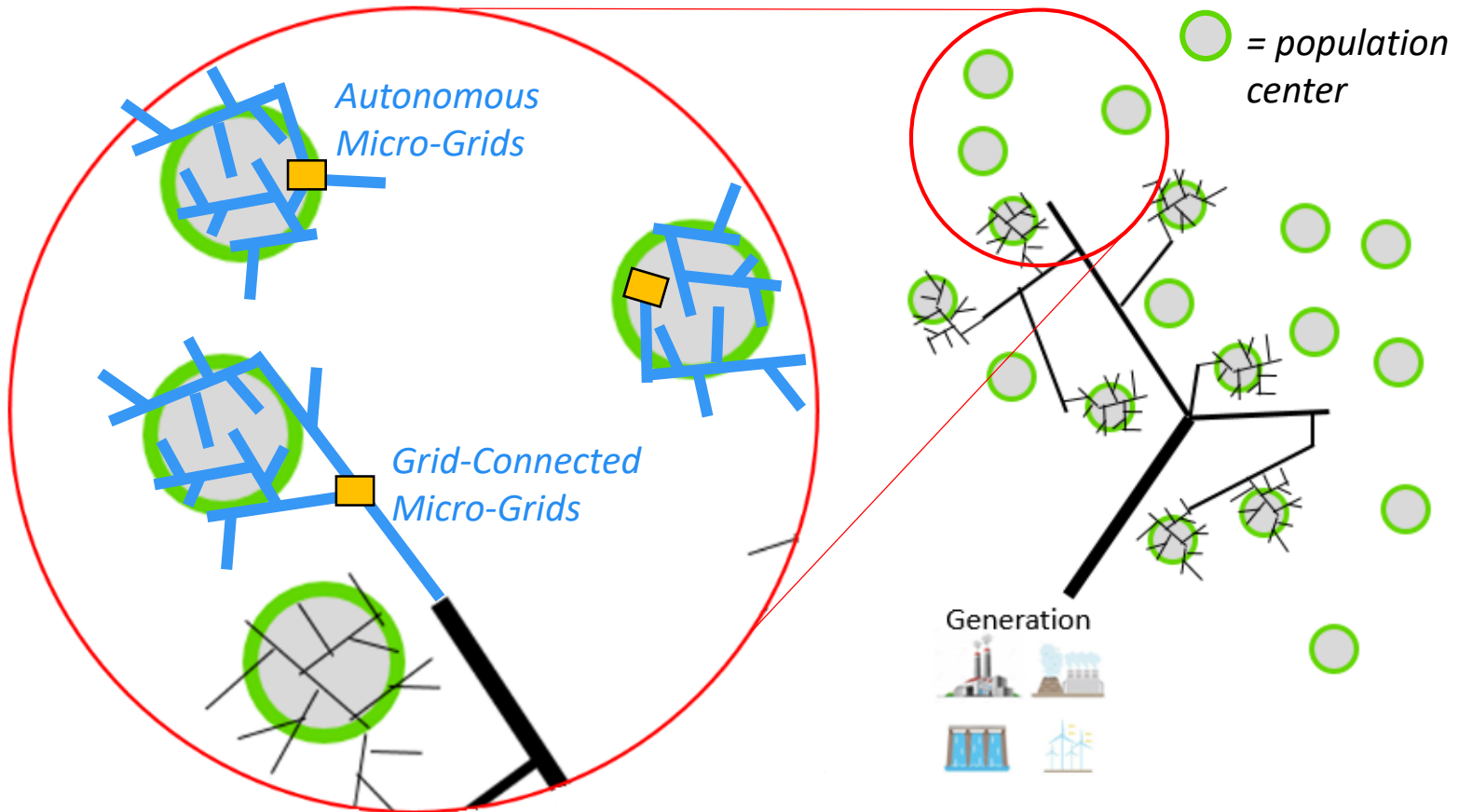
# Blockchain Is Helping to Build a New Kind of Energy Grid

Using the technology behind Bitcoin, participants in the Brooklyn Microgrid are buying and selling locally generated renewable energy over a peer-to-peer network.

*Building the Energy System of the  
Future in Africa from the  
Grid Edge Inwards*

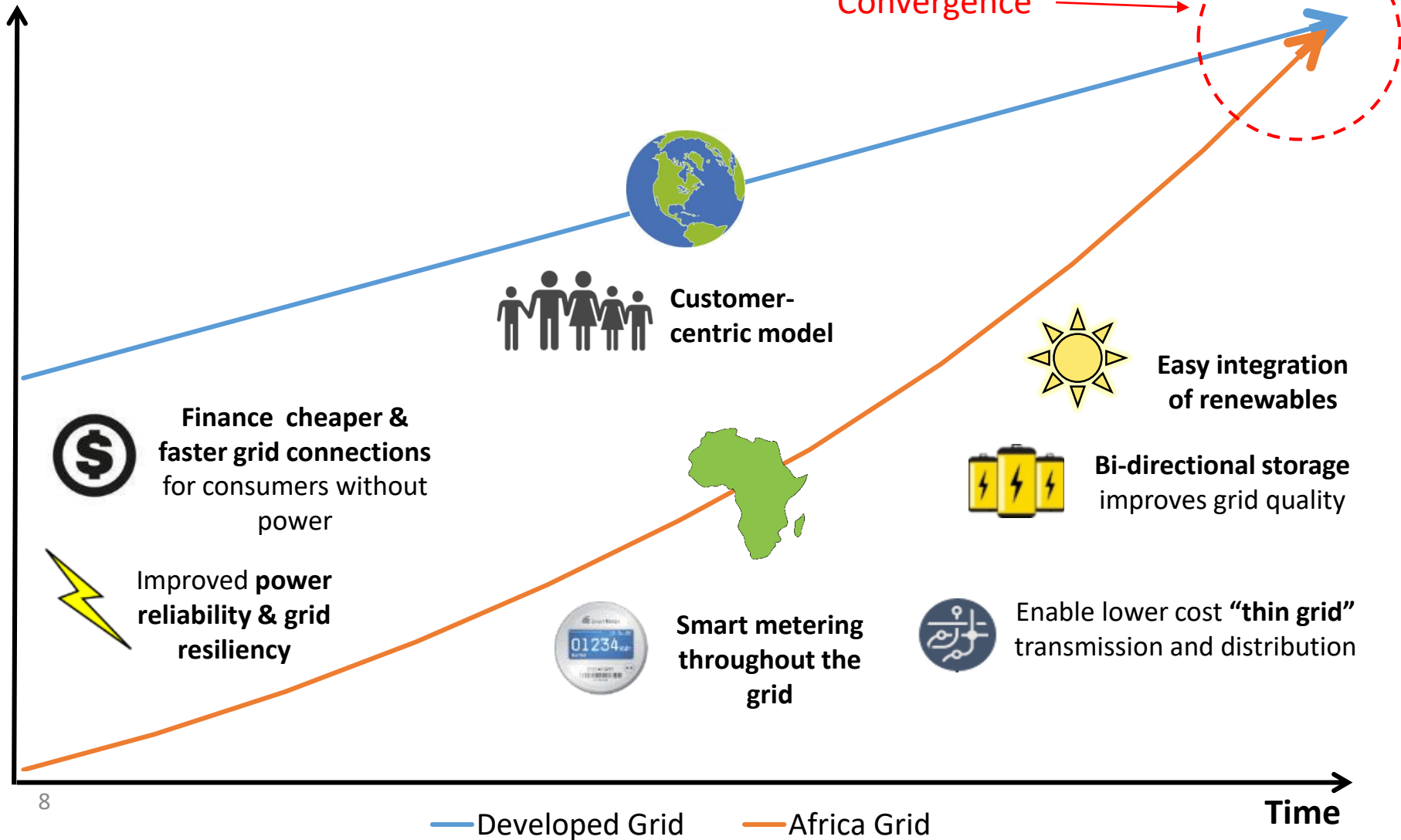
And in Africa we can build this grid of the future from the grid edge, inwards – using micro-grids

— Less-Developed Country Grid —



Ultimately this will allow African grids to converge with their evolving developed market counterparts

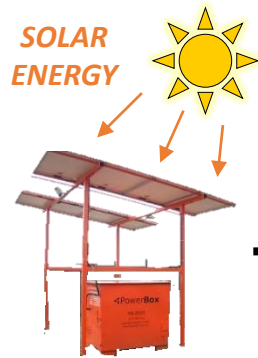
Distributed/  
Smart



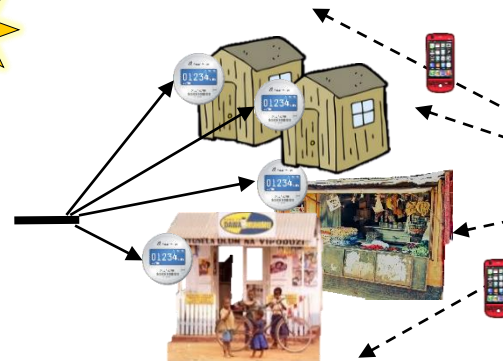


# Standalone Micro-grids are the current focus of Private Utilities, but long-term they will grid-integrate...

## A: Autonomous Solar Micro-Grid



## MICRO-GRID NETWORK with homes & businesses



Usage data helps quality customer service

Mobile money payments from the customer and system communication to the customer

Smart metering manages payment processing and usage data tracking

Faster than main grid; eventual integration (15+ yrs) with appropriate Regulatory Environment



## B: Grid-Connected Solar Micro-Grid

### TRANSFORMER



### SUBSTATION



### GENERATION



... Private Utilities may also offer “Smart Grid-as-a-Service” to legacy distribution networks

# *Challenges to Overcome*

# Key elements of integration

1

Technical – **Not an issue**

2

Legal – **Unresolved**

3

Commercial – **Unresolved**

# Legal

**A**

Legal right for grid-connected mini-grids (sometimes called “SPDs”) to distribute power

**B**

Legal right to set tariffs

**C**

Legal protection from main grid building lines “over the top” of SPD

**D**

Right to buy/sell power from/to main grid

# Commercial

*SPDs won't be able to compete with the main grid unless there is a level playing field for subsidies*

*This is the most important issue*

A

Subsidy parity: Capex and Opex subsidies

B

If public sector insists on asset purchase, fair price setting for that purchase (asset purchase from public grid is generally not the preference of developers)

C

Buying price of power from the main grid

D

Selling price of power back to the main grid

# Steps to Levelling Subsidy Playing Field

**Create Effective Results Based Financing** from Direct-to-Market Donors to Create Capex Subsidy Parity (See AMDA's [SMART RBF](#) proposal for guidance)



**Get Private Utility Traction** in Key Markets to Show Governments and Bilateral Donors the Efficacy of a Multi-Actor Utility Market



**Institutionalize RBF Subsidies** so that Governments and Bilateral Donors Support Them (at this point Capex Subsidy Parity is Achieved)



**Solve Opex Subsidy (Cross-Subsidy) Challenge** by Creating Mechanisms to Redistribute Urban Load Center Surpluses Among Utilities, not just Within a Single Utility

## Bottom line

Grid-connectable mini-grids are the cheapest way for governments and donors to connect African consumers to power while building the energy system of the future from the grid edge inwards.

Compared to the main grid, private utilities offer:

**Lower cost of infrastructure** (more value per invested dollar)

**Higher level of service** for consumers (reliability and demand stimulation)

Vector for bringing **future technologies** into the African grid

However, as long as public grids continue to receive massive subsidies (both capex and opex) while private grids do not, private utilities will not be able to grid-connect, and the future for private mini-grids becomes severely challenged.

*We need to level the subsidy playing field if we hope to harness the benefits of private utilities and mini-grids.*



*Thank you!*



[www.powergen-re.com](http://www.powergen-re.com)