



**RESCO – RURAL ENERGY SERVICE COMPANY®**

# **Hybrid renewable energy sources in combination with PAYG mobile services for energy access**

Dmitry Tseitlin  
Microgrids Corporation LLC

**REENCON-XXI  
Moscow, October 13-14<sup>th</sup>, 2016**



# **ACCESS TO THE ENERGY IN SUBSAKHARA AFRICA**



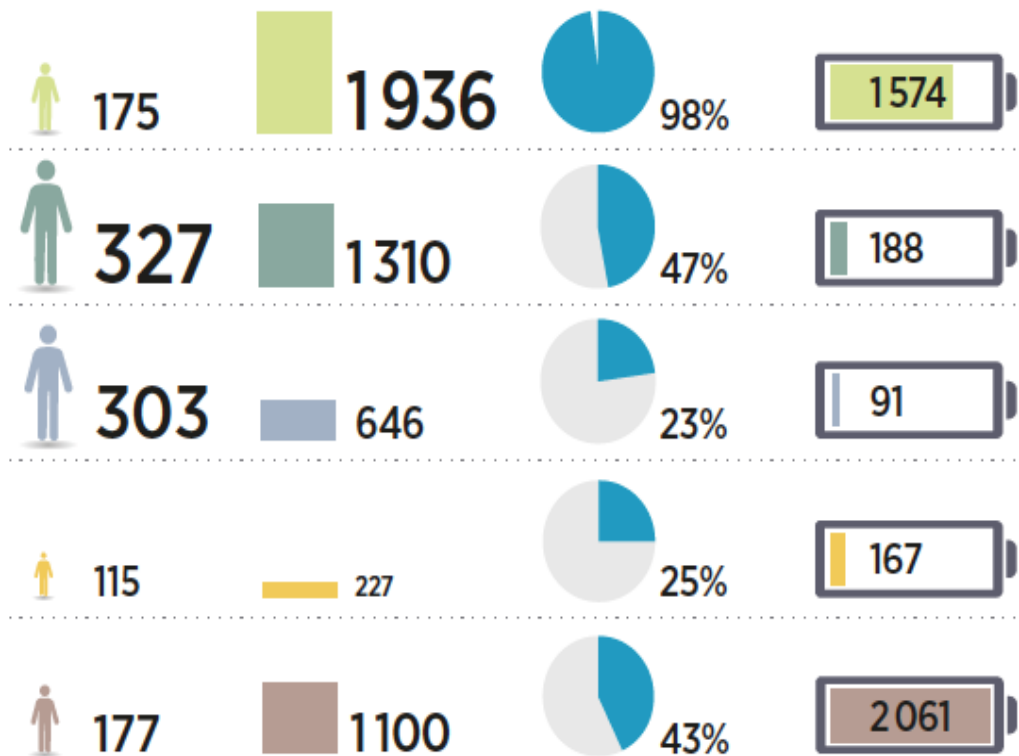
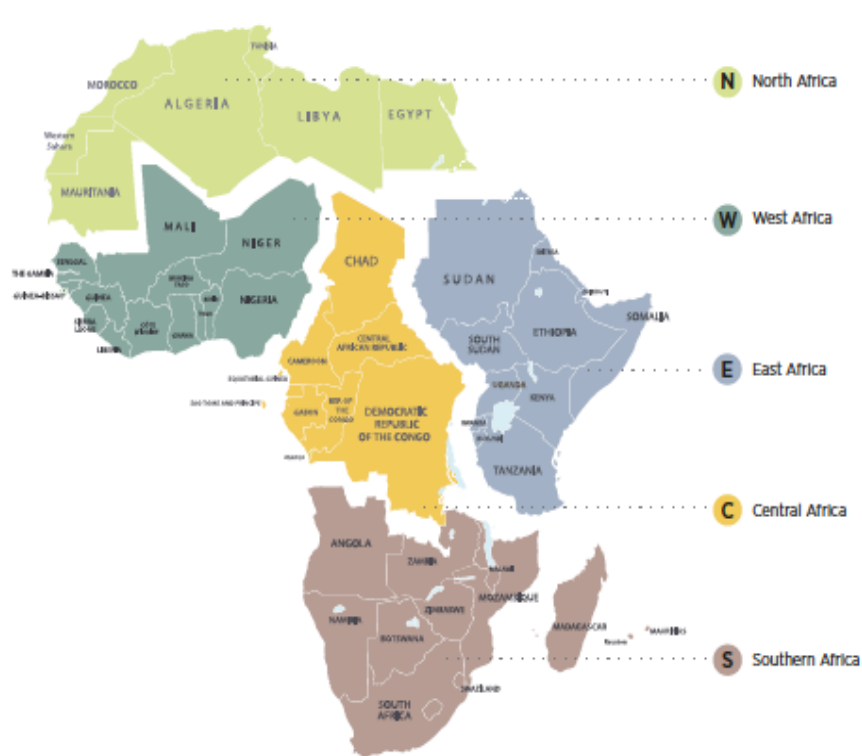
# THE PROBLEM – ACCESS TO THE MODERN SUSTAINABLE ENERGY IN SUBSAKHARA AFRICA

Population  
1097 Mln people

GDP  
US\$ Bln

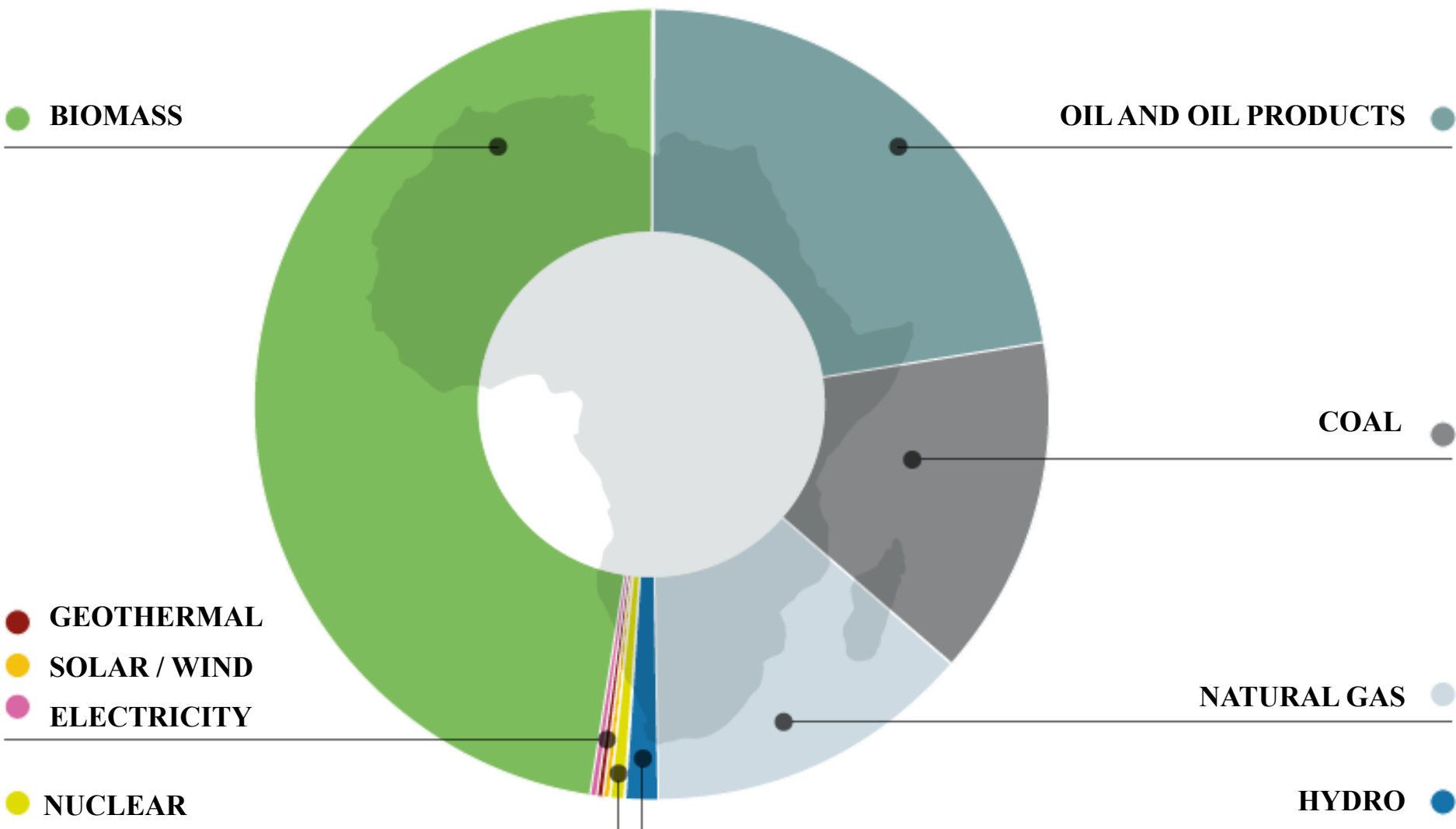
Population with  
electricity access %

Consumption  
κW/h a year



**597 MLN PEOPLE - 54 % OF THE POPULATION  
HAVE NO ACCESS TO ELECTRICITY**

# PRIMARY ENERGY BALANCE IN SUBSAKHARA AFRICA

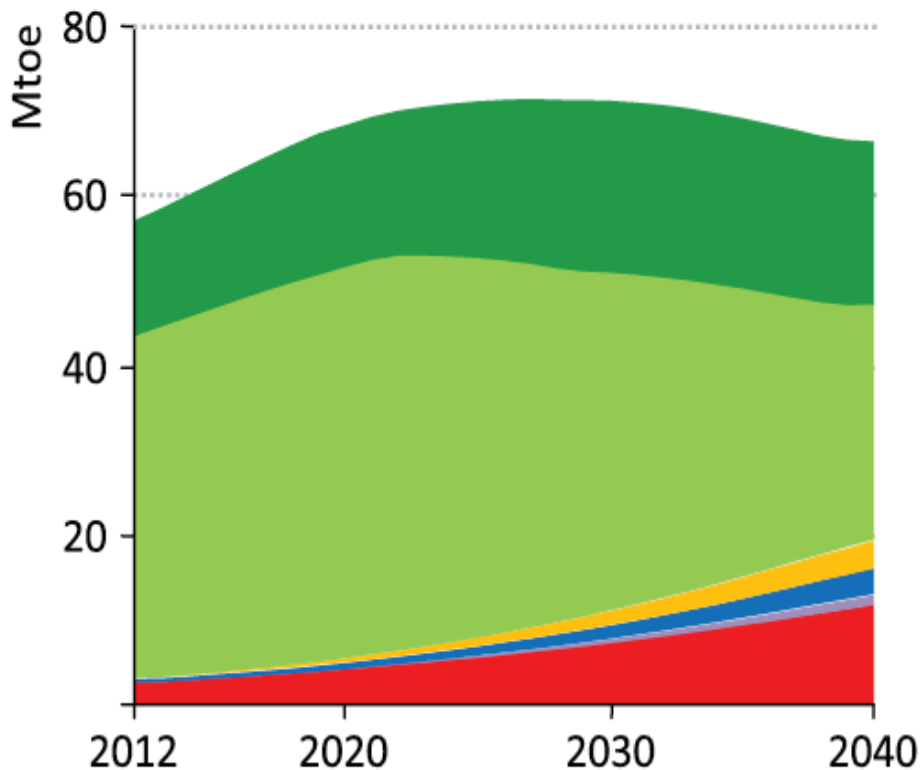


- GEOTHERMAL
- SOLAR / WIND
- ELECTRICITY
- NUCLEAR

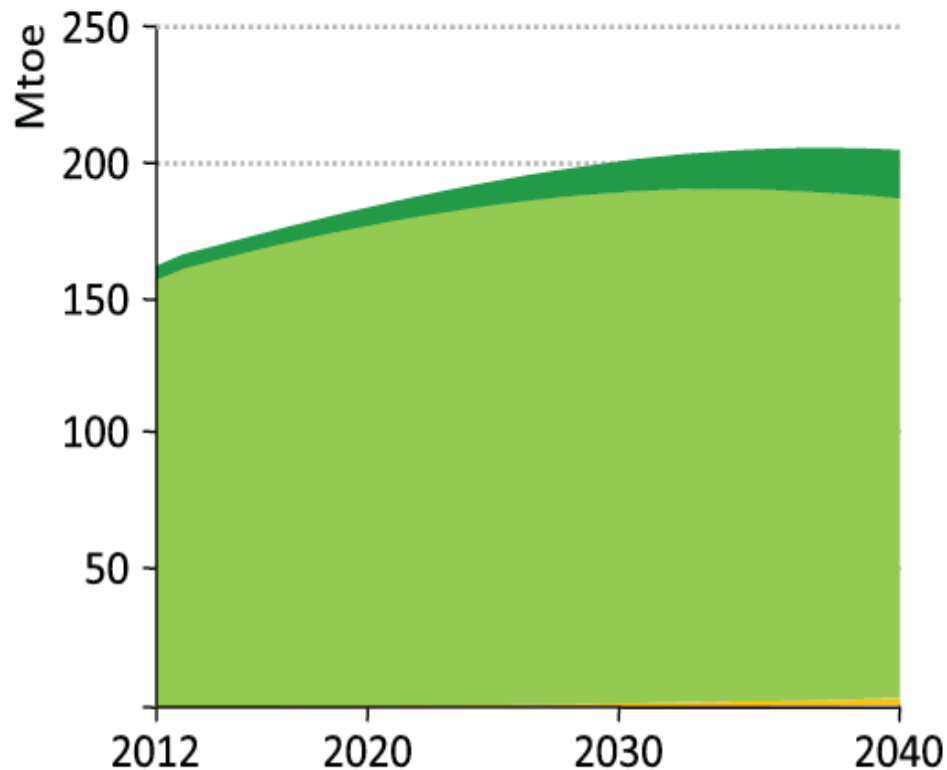


# PRIMARY ENERGY BALANCE IN SUBSAKHARA AFRICA 2012 - 2040

## Urban



## Rural



Oil Gas Electricity Other renewables\*\* Fuelwood\*\*\* Charcoal

\* FORECAST EXCLUDING SOUTH AFRICA

# CHARCOAL PRODUCTION

## IMPORTANT ENERGY SOURCE IN SUBSAKHARA AFRICA



MLN T	2000	2010	2014
WORLD	36,9	46,8	50,9
AFRICA	20,4	28,8	31
	55%	61%	61%

MLN T	2014	POPULATION
NIGERIA	4,2	173,6
ETHIOPIA	4,1	94,1
DR CONGO	2,2	67,5
GHANA	1,7	25,9
TANZANIA	1,5	37,5
KENIA	1,0	44,3
UGANDA	1,0	49,2
ZAMBIA	1,0	14,5

### CHARCOAL INDUSTRY IN AFRICA (2013)

7 Bln US\$, 7 Mln PEOPLE EMPLOYED

### EXPECTED IN 2030

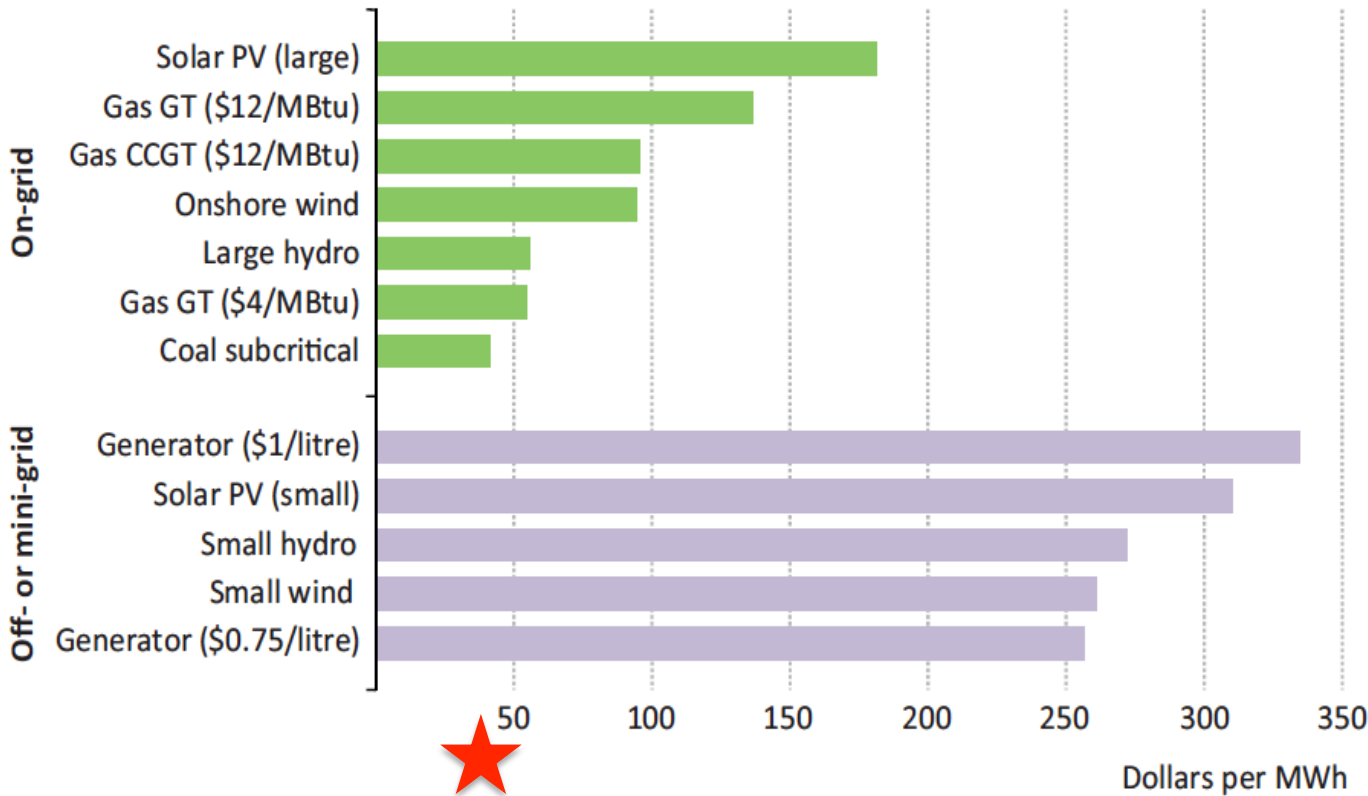
12 Bln US\$, 11 Mln PEOPLE EMPLOYED



# OUR BASIC TECHNOLOGY

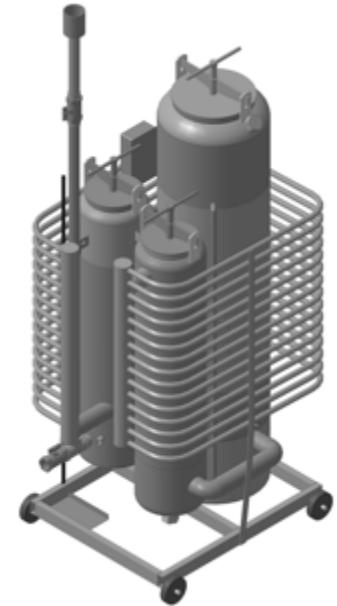
## CHARCOAL SINGAS ELECTRIC GENERATION

### LEVELIZED COST OF ENERGY ( LCOE)



**LCOE US\$ 44 / MWh**

- Capital cost - US\$ -12
- Fixed O&M - US\$ - 2
- Variable O&M - US\$ - 10
- Fuel Cost - US\$ - 20

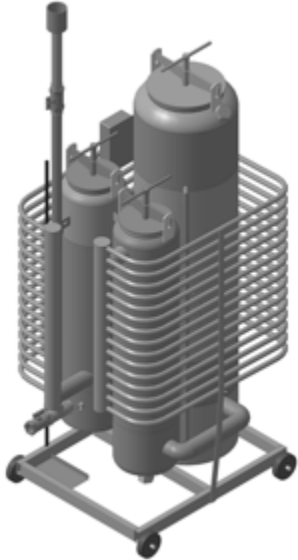


**3 - 5 kW charcoal singas electric generators – capital cost US\$ 1200/kW**

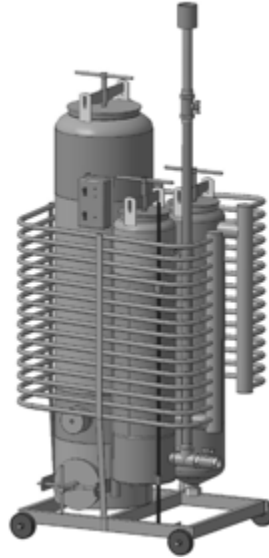
# HYBRID GENERATION TECHNOLOGY ROADMAP



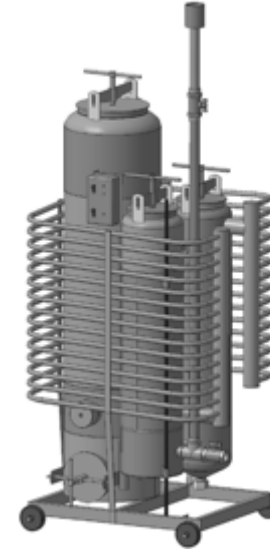
**Singas 3 kW**



**Singas-diesel 5 kW**



**Singas-diesel 5 kW**



**Solar 3 kW**



**MCG-03.02**  
3 kW charcoal singas  
electric generators –  
capital cost US\$ 1200/KW  
LCOE 44 / MWh

**MCG-05.03 (D)**  
5 kW charcoal - diesel singas  
electric generators –  
capital cost US\$ 1200/KW  
LCOE 55-60 / MWh

**MCG-08.04 (H)**  
8 kW hybrid singas - solar  
electric generators –  
capital cost US\$ 1500/KW  
LCOE 70-80 / MWh



# PILOT IN RWANDA EASTERN PROVINCE 150 KM FROM THE CAPITAL KIGALI





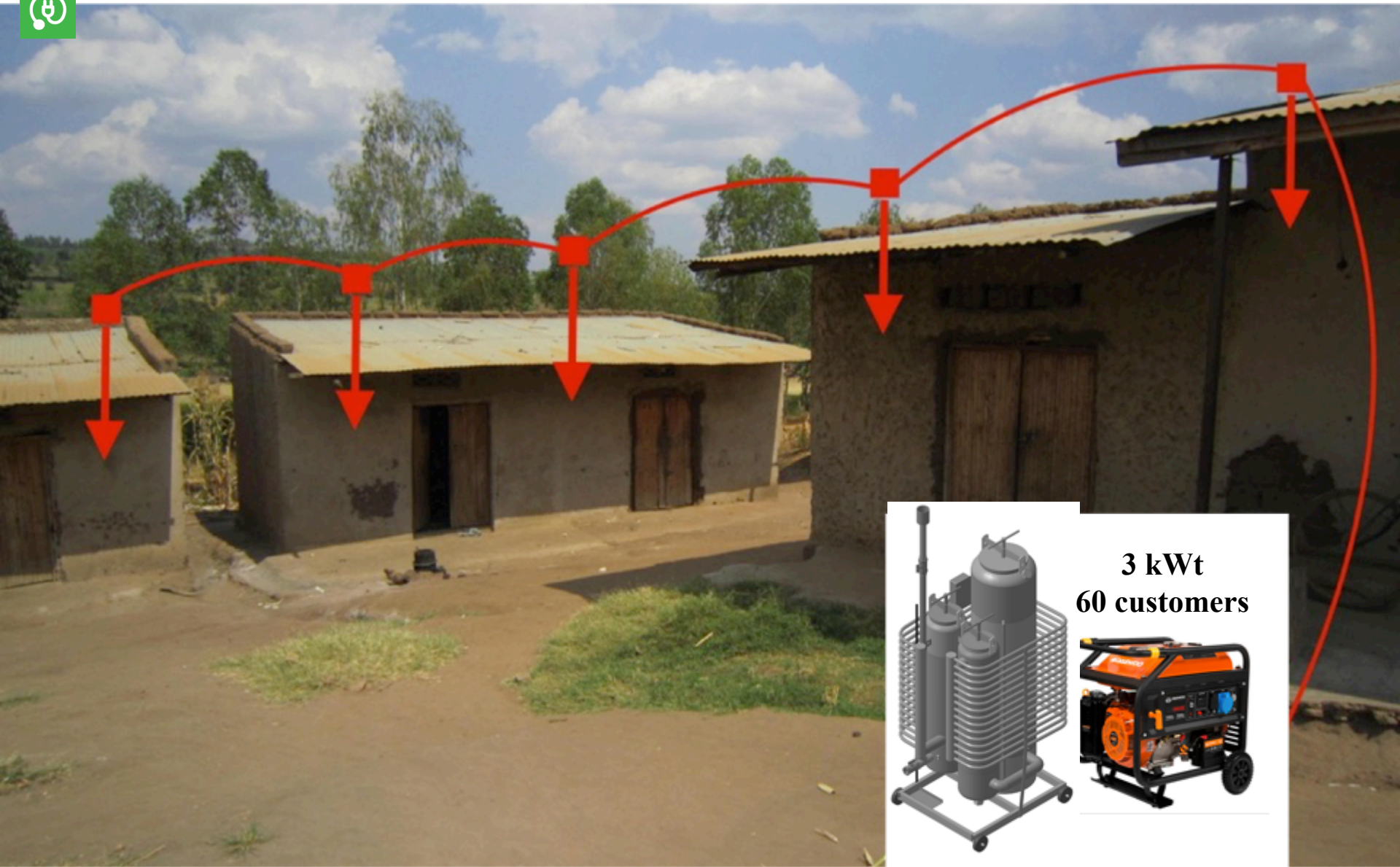




# PILOT MICROPOWER PLANT AND CONNECTION TO THE MICROGRID



# HOUSEHOLDS CONNECTION TO THE MICROGRID



**3 kWt**  
**60 customers**

The complex block contains two images of microgrid equipment. On the left is a grey battery bank consisting of several cylindrical cells mounted on a metal frame with wheels. On the right is a portable generator with an orange and black casing, also on a frame with wheels. The text '3 kWt' and '60 customers' is positioned between the two images.



# SE4ALL ELECTRICITY ACCESS LEVELS AND OUR MICROGRID SOLUTION

	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
<b>Quantity (peak available capacity)</b>	-	>1W	>50W	>200W	>2.000W	>2.000W
<b>Duration of supply (hours)</b>	-	>4	>4	>8	>16	>22
<b>Evening supply</b>	-	>2	>2	>2	4	4
<b>Affordability (of a standard consumption package)</b>	-	-	Affordable	Affordable	Affordable	Affordable
<b>Legality</b>	-	-	-	Legal	Legal	Legal
<b>Quality (voltage)</b>	-	-	-	Adequate	Adequate	Adequate

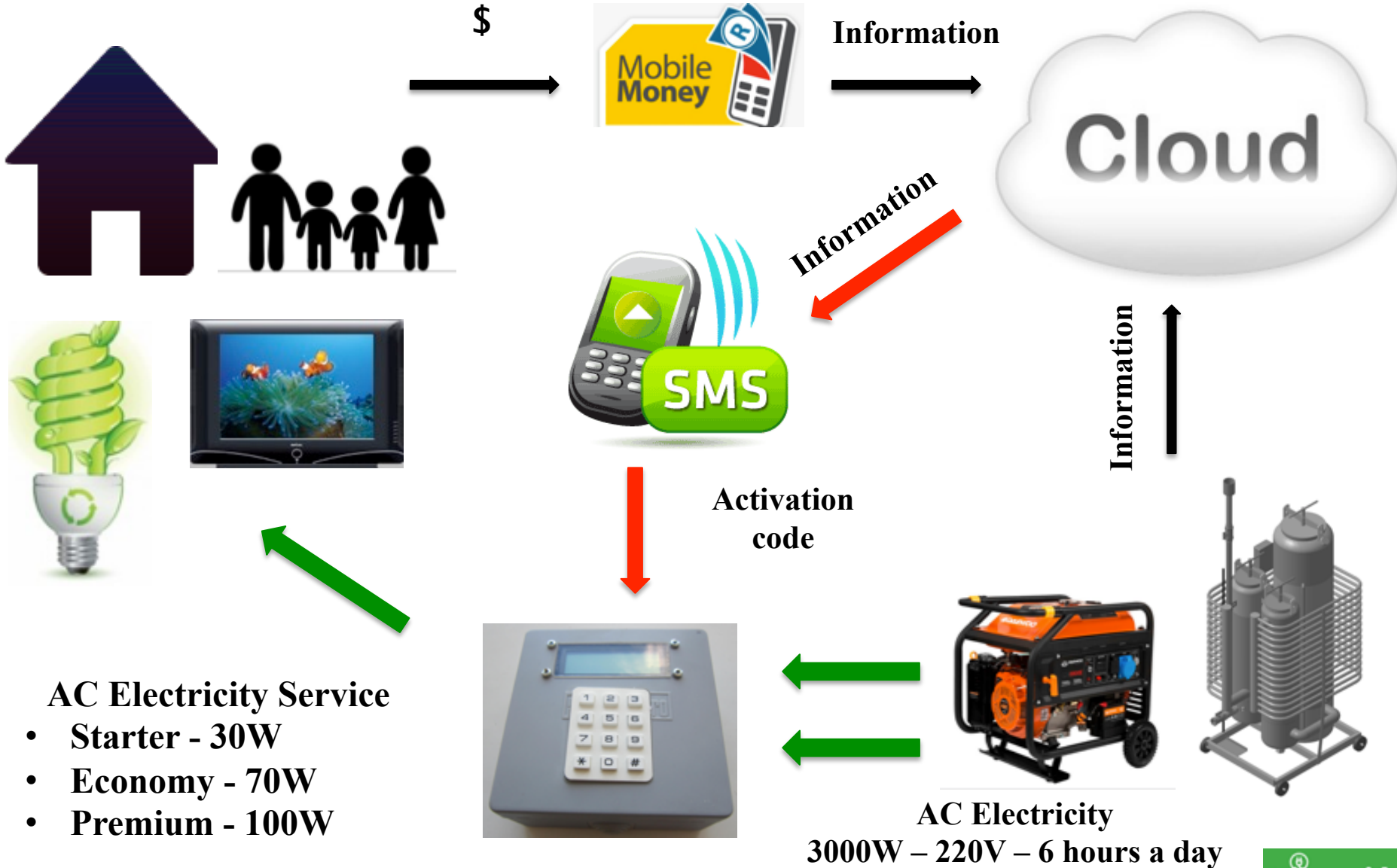


## SE4ALL

**Tier - 1 and above Up to 2025**

**Tier - 2 and above Up to 2030**

# MICROGRID ELECTRICITY SERVICE BUSINESS MODEL



## AC Electricity Service

- Starter - 30W
- Economy - 70W
- Premium - 100W

AC Electricity  
3000W – 220V – 6 hours a day

# OUR PRODUCTS, SERVICES AND SOLUTIONS



**CHARCOAL SINGAS ELECTRIC GENERATORS**



**SOFTWARE AND MOBILE PAYMENTS**



**ELECTRICAL APPLIANCES AND METERS**



**LPG APPLICANSES AND METERS**

