

# Accelerating energy access through Public-Private Partnership Investment in Zambia

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**PAUWES**

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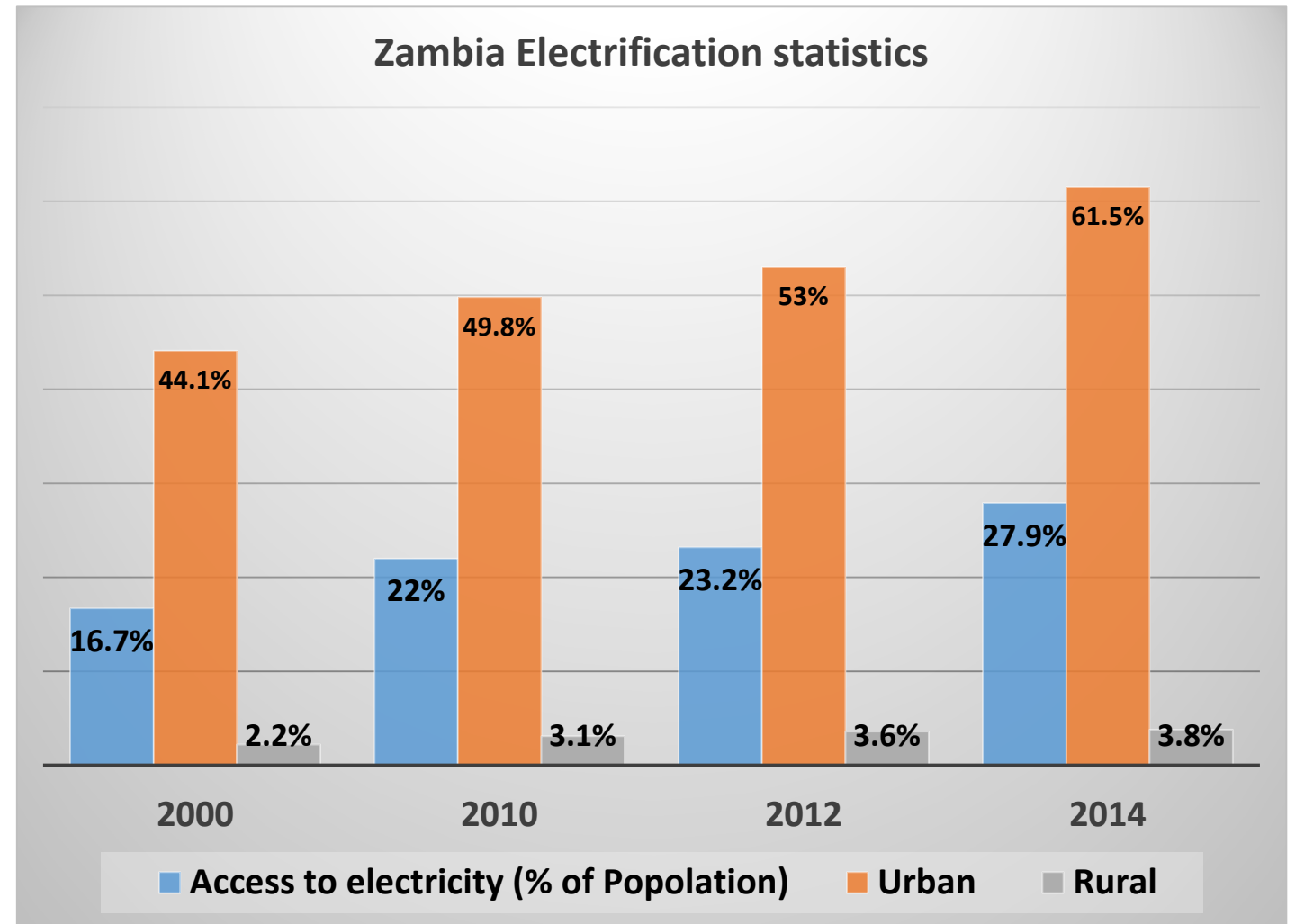
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## INTRODUCTION

- From 2000 to 2014 the country's electrification increased by 11%.
- Urban areas with 17% and rural areas 1.6% increase.
- Rural electricity access rate is at 4.4 % for grid power and 7.4 % for solar power.
- Currently the country total access to electricity is 27.9% (rural 3.8 % and urban population 61.5 %).



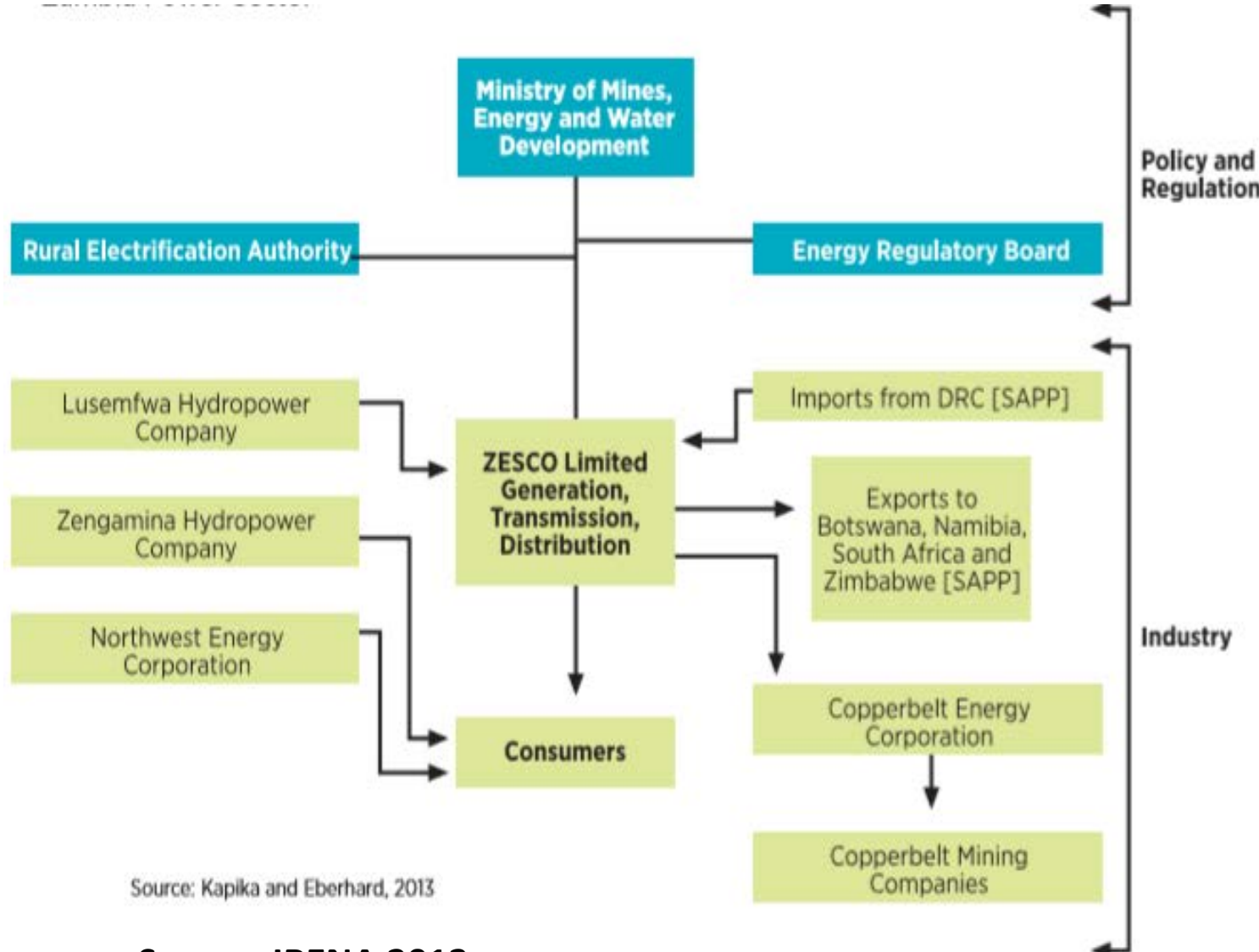
Source: World Bank (country statistics), 2016

## BACKGROUND

- Rural electrification introduced in 2003.
- Zambia's Rural Electrification Master Plan of 2008 to 2030 or vision 2030.
- Plan identified a total of 1,217 Growth Centres in rural areas throughout the country.
- Increase the electrification rate in rural areas from the current 3% to 51% by the year 2030 at a total of **US\$ 1.1 billion.**
- 3,401 Km of grid extended so far.
- 118,311 Solar Project beneficiaries
- \$50 Million dollars required yearly

## ZAMBIA'S ELECTRICITY SYSTEM

- System is composed of a state-owned, vertically-Integrated utility named ZESCO. With power generation 94% and transmission 69%.
- Projected demand for 2018 is mining 49%, industry/commerce 20%, residential 15%, agriculture 10%, social 5% and exports 2%.
- The current total installed capacity of 1,976 MW providing 1,650 MW of power, **peak demand is 1,800 MW and growing at 100 MW per year.**
- It can be seen that electricity demand has clearly outstripped generation.



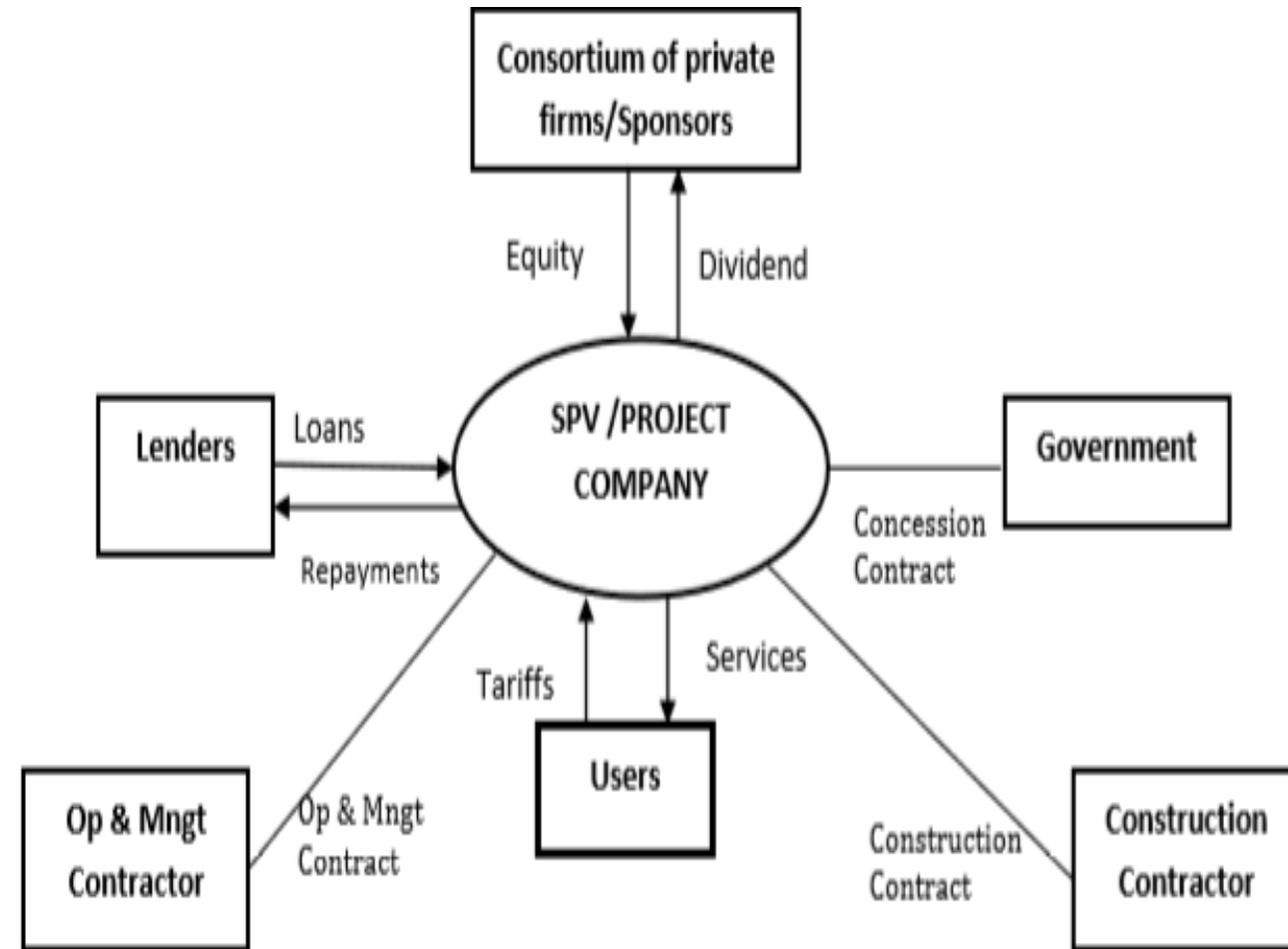
Source: Kapika and Eberhard, 2013

Source: IRENA 2013

### ► CONCEPT OF PUBLIC PRIVATE PARTNERSHIP (PPP)

- Introduced in December 2008 in Zambia
- PPPs refers to collaboration between the government/or its agencies and profit driven individuals or corporate entities.
- **This is to share the benefits and risks in undertaking specific projects.**
- Government has limited resources to invest in infrastructure.
- The financing gap for energy projects is wide due to limited funding from cooperating partners reduced to 6%.
- Private sector invest their own **Finances/resources** in the development of energy projects.
- Therefore allows Government to have access to private capital and speed up the delivery of energy projects.

### BOOT Model for a Power Plant Project: Relationship Diagram



Source: Zambia Development Agency, 2014

**PPP Investments by REA**

- 60 kWp Solar Mini Grid in benefiting 480 households.
- 423 stand-alone Solar Home System projects.
- During the period 2006 to 2015, a total of 3,524 households comprising 2,803 households at schools, 358 at Rural Health Centers (RHC's), 42 at Chief Palaces and 321 at other public facilities were electrified.

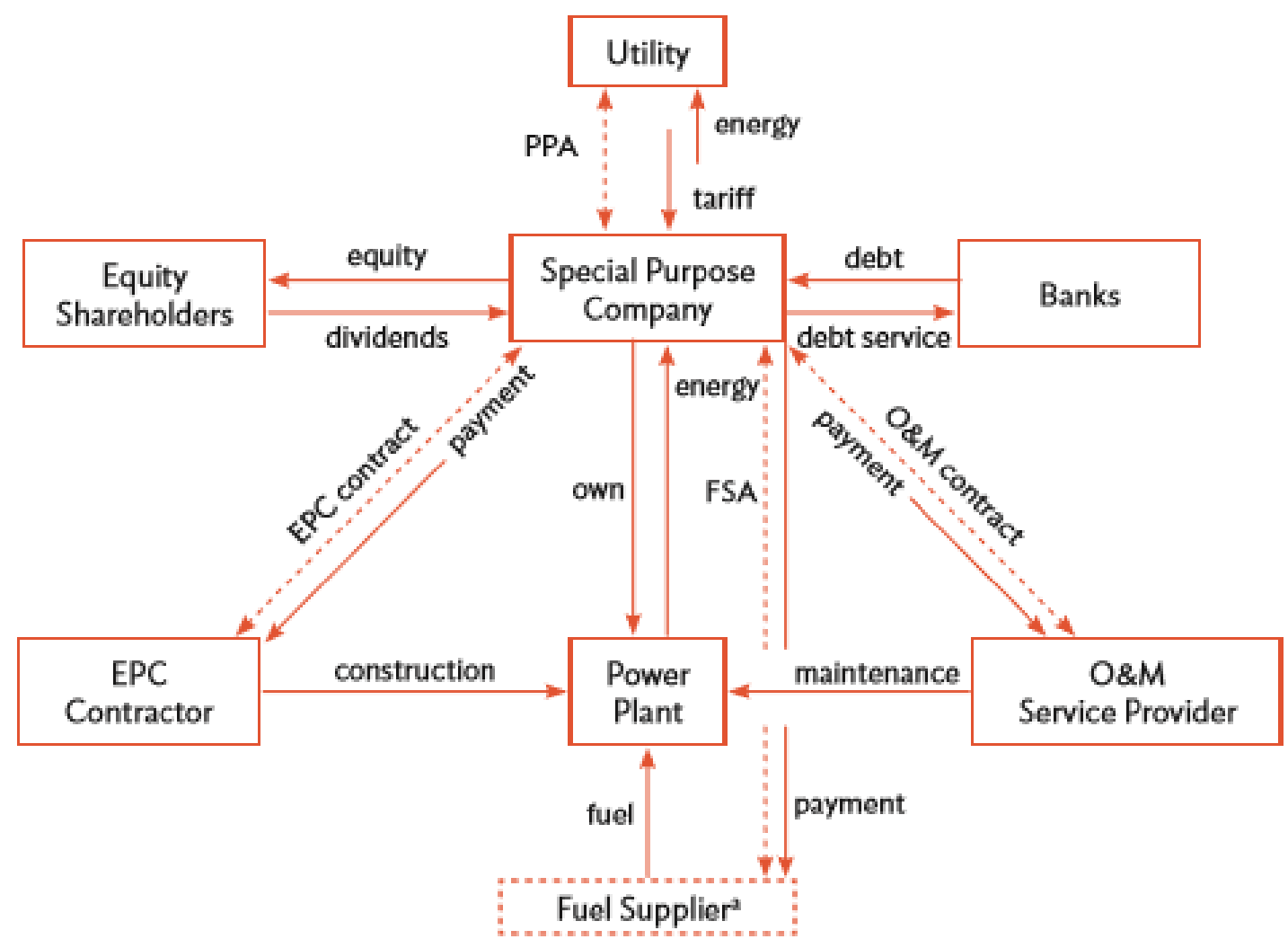
| Project Item          | US\$ millions | Output       |
|-----------------------|---------------|--------------|
| <b>Grid extension</b> | <b>600</b>    | <b>161</b>   |
| <b>Solar</b>          | <b>2.6</b>    | <b>1021</b>  |
| <b>Mini-Hydro</b>     | <b>8.7</b>    | <b>12000</b> |
| <b>Wind</b>           | <b>0</b>      | <b>0</b>     |

## PPPs in the energy Sector

### 1. Build Own Operate Transfer (BOOT)

- ✓ This form of PPP is usually favoured for large infrastructure projects because of their complexity and high overhead costs.
- ✓ An SPC or SPV is created to develop, build, maintain, and operate the plant.
- ✓ A PPA is established between the SPC or SPV and a public or private utility.

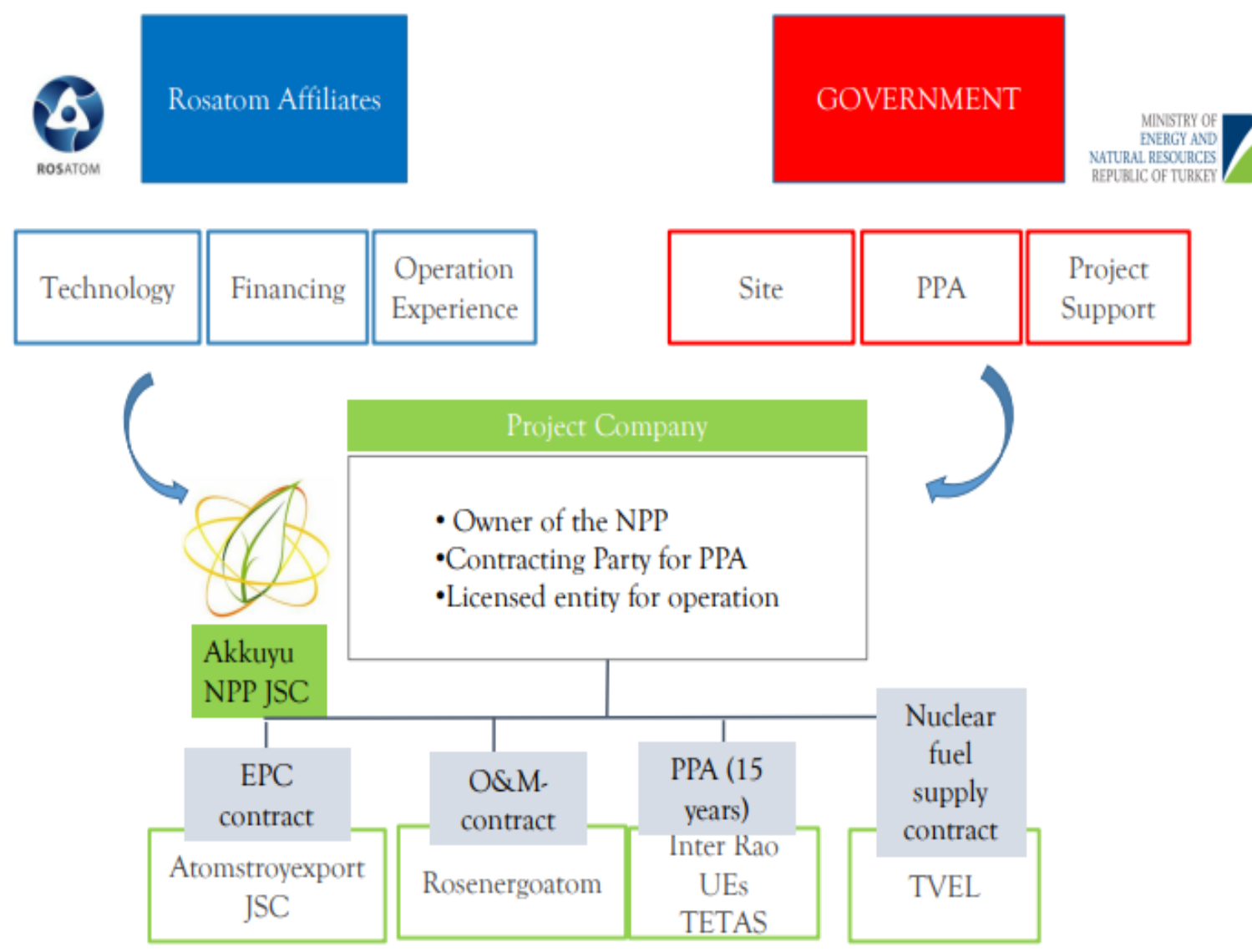
EPC = engineering, procurement, and construction;  
FSA = fuel supply agreement; O&M = operation and maintenance; PPA = power purchase agreement. SPV = Special Purpose Company,



Source: Asian Development Bank, 2015

## 2. Build Own Operate (BOO)

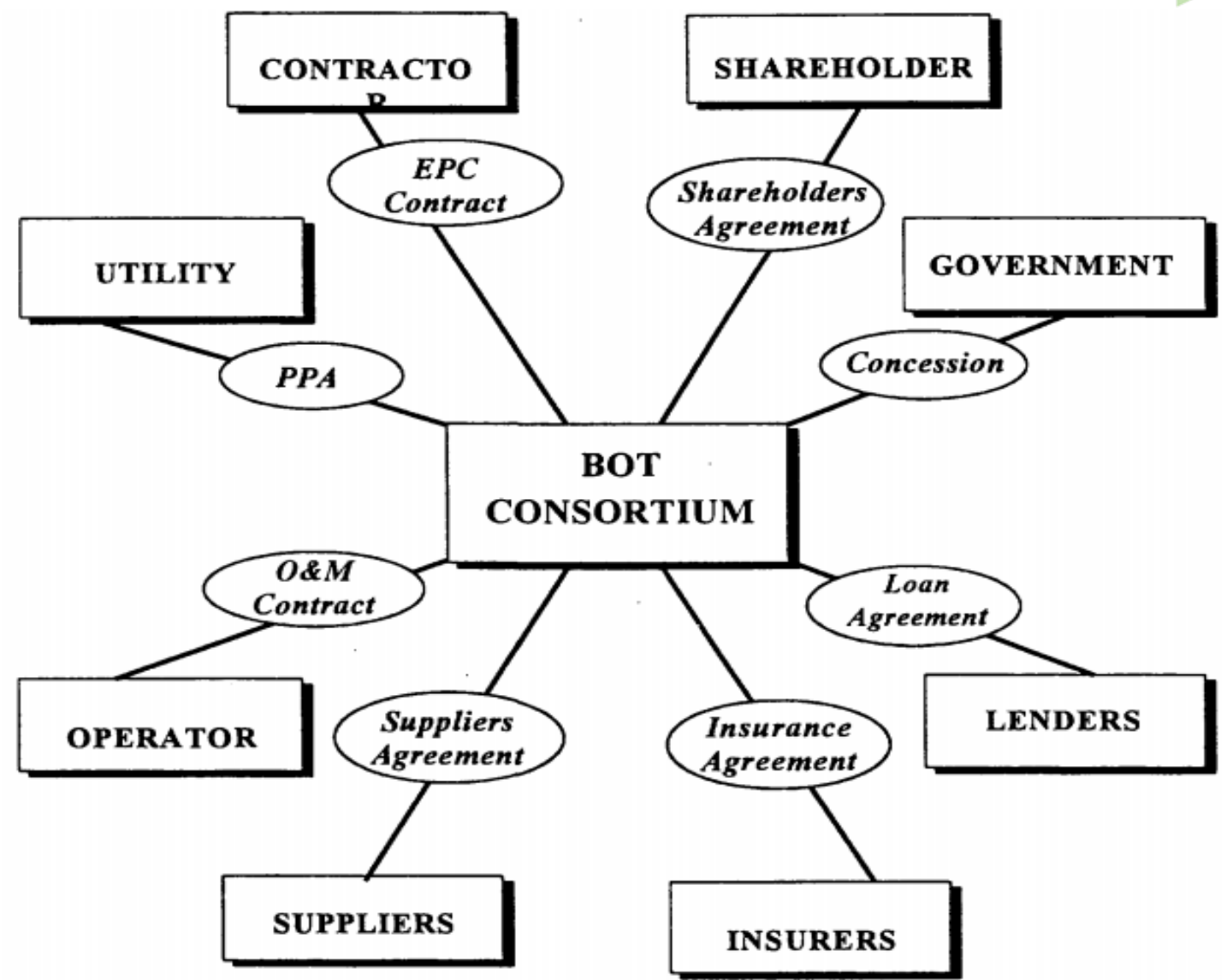
- The private sector builds, owns and operates a power facility, and sells the product/service to its users or beneficiaries.
- This is common for Independent Power Producers (IPP).
- Suitable application for Solar Microgrids, Hydro minigrids, nuclear power plants.
- For a BOO power project, the Government (or a power distribution company) may or may not have a long-term power purchase agreement (commonly known as off-take agreement) at an agreed price from the project operator.
- This has been the case between ZESCO and CEC and Mining companies in Zambia.





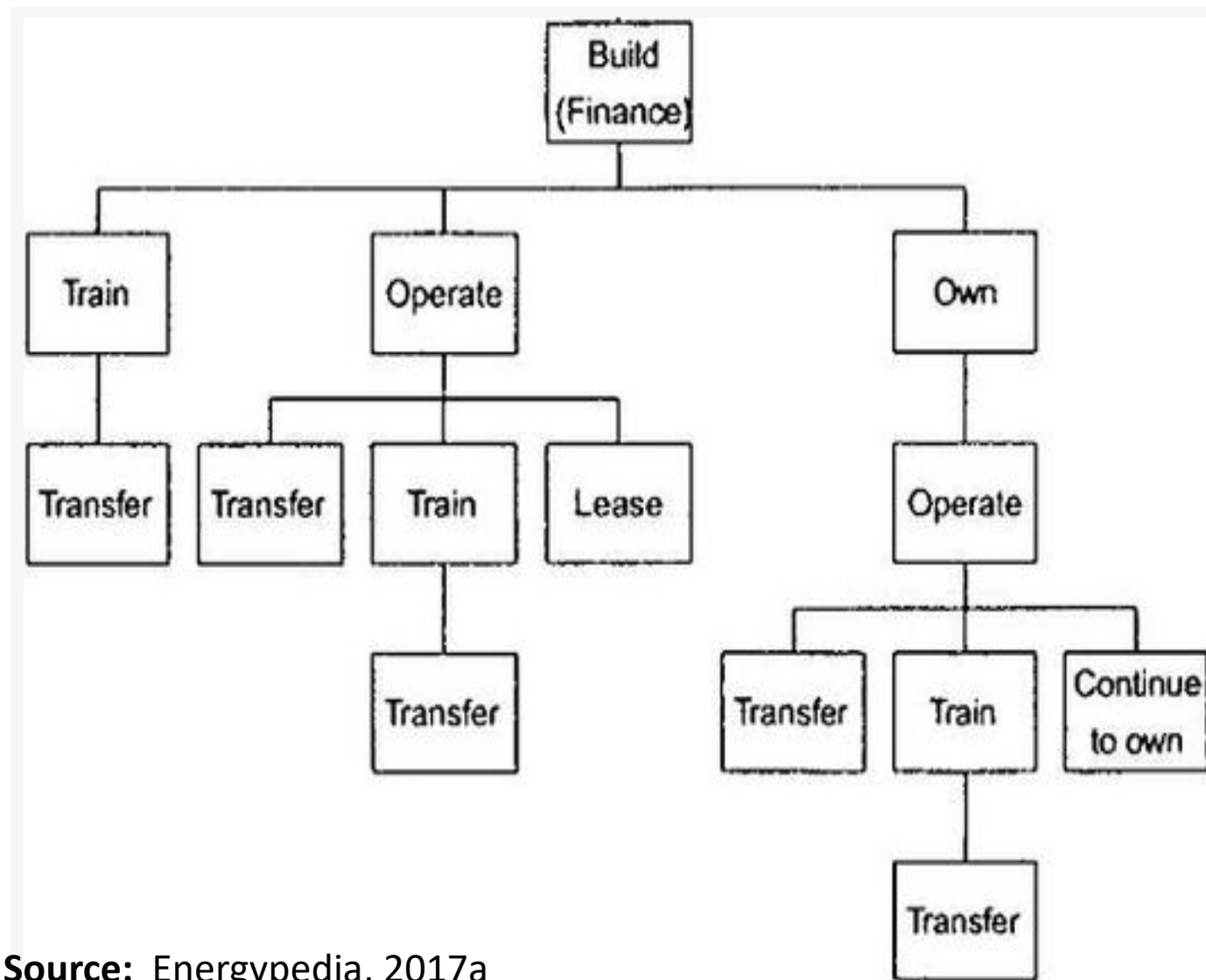
## 3. Build Own Transfer

- The power facility is transferred to the host government after a certain period.
- Brings private capital into construction of infrastructure like power plant.
- The project company or operator generally obtains its revenues through a fee charged to the utility/ government rather than tariffs charged to consumers.
- Ideal for Hydro projects to finance, design, construct and operate for a concession period of 15 to 25 years.
- Example Feed-in-Tariff program for Solar,



## 4. Build-Operate-Lease (BOL)

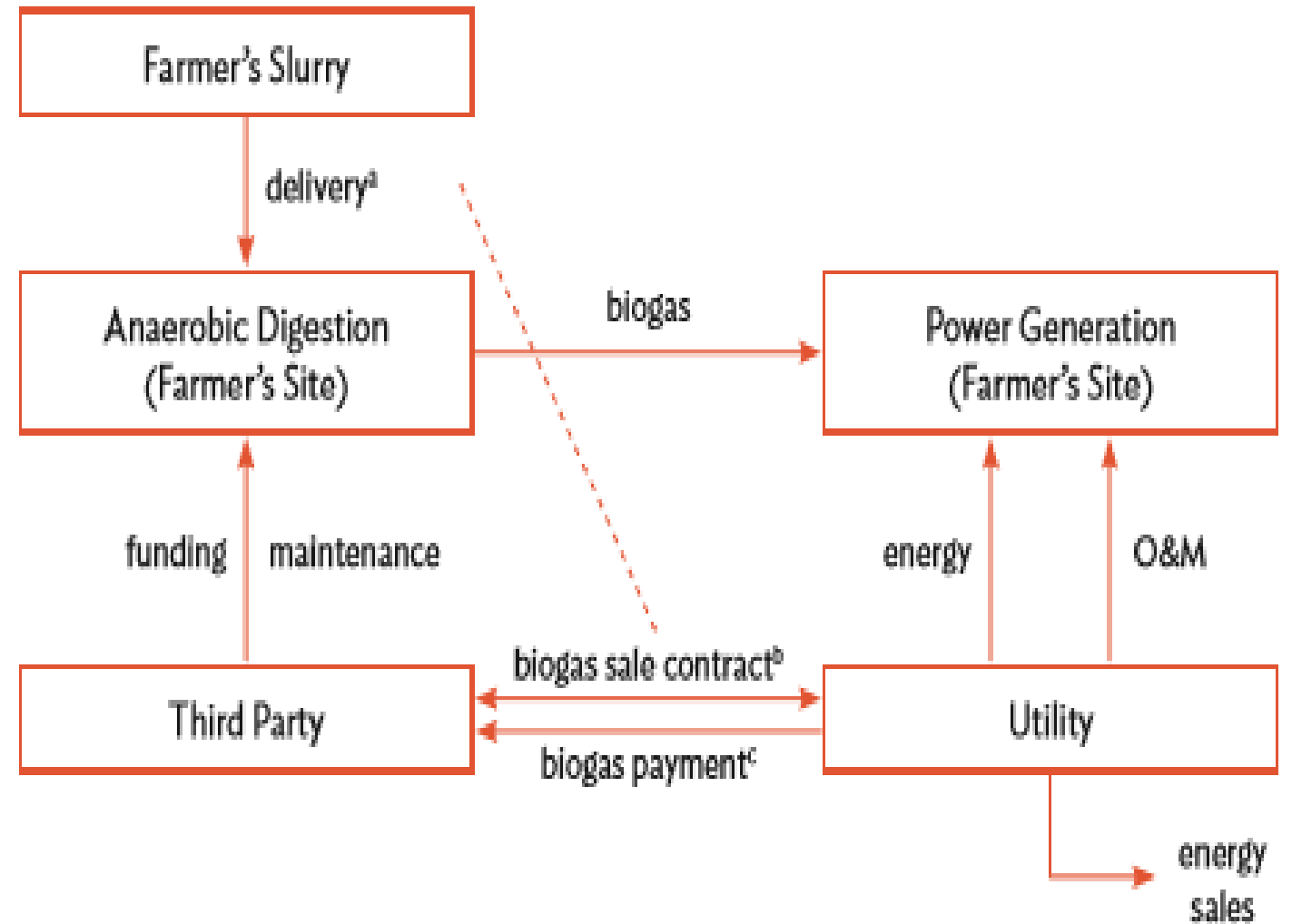
- plant is built for and owned by the local utility, or by the ultimate owner
- leased back either to the original turnkey supplier or to an operator working in consort with this supplier.
- This is idea for solar home system in peri-urban set-up.
- Similar applications such as Pay-As-You-Go solar has been used in similar models.



Source: Energypedia, 2017a

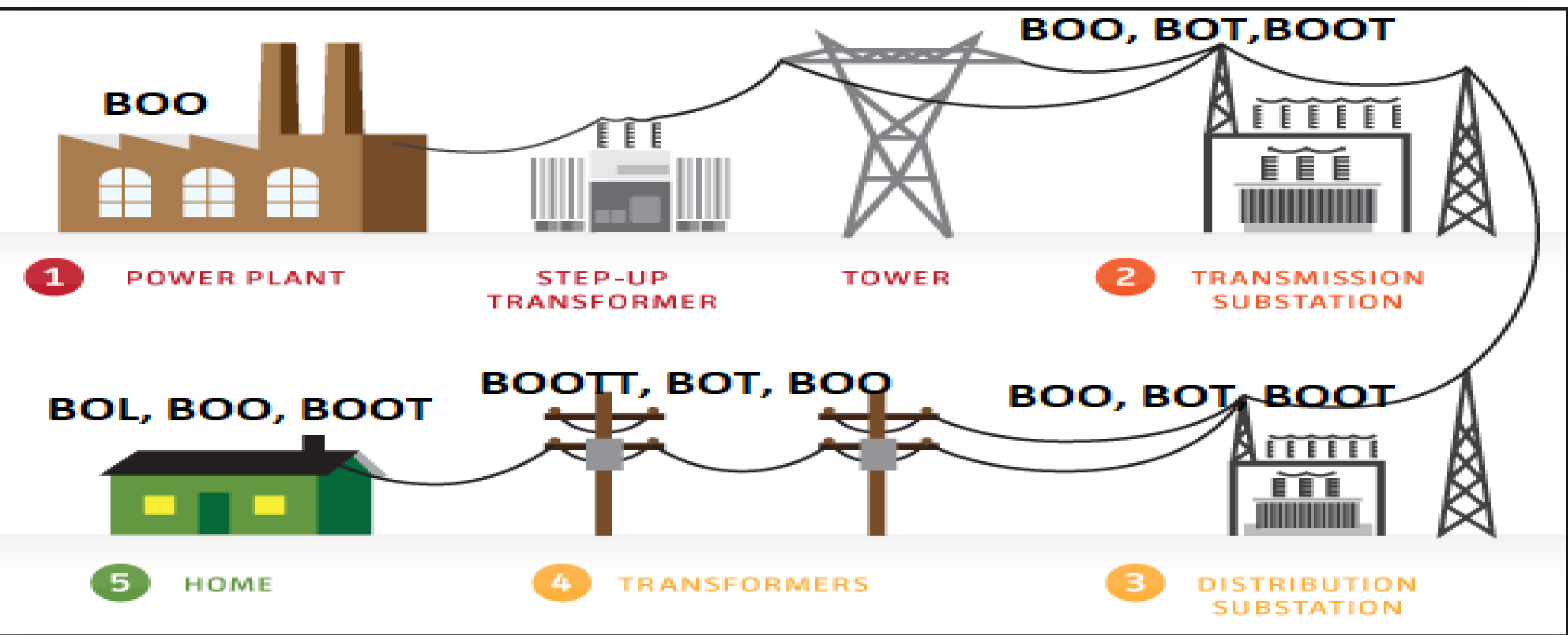
## 5. Build-Own-Operate-Train-Transfer (BOOTT)

- Similar to BOOT, but include a training component prior to transfer for the plant to the ultimate owner.
- Training is intended to ensure that local operating personnel becomes fully familiar with the characteristics of the plant and is able to run it safely and effectively.
- These ensure capacity building on the local people.
- Suitable for Solar microgrids for rural and remote areas and applicable to biogas digesters.



Source: Asian Development Bank, 2015

## PROPOSED PPP INVESTMENT MODEL



### CONCLUSION

- Although the country is attracting massive energy projects, the energy markets needs to adopt PPP Models in order to offset the initial costs of Renewable energy Projects.
- 1.1 Billion US dollars needed to increase access of electricity from 27% to 69% by 2030 in Zambia is unrealistic if REA only depends of BOOT model for all renewable energy projects.
- Attempts of the governments to accelerate energy access should be intensified from grid extension to focus on the renewable energy resources available in all parts of the country.
- Further there is need for bridging the cooperation gap between govt and private sector, protecting investments from grid encroachment.

As researchers or practitioners what are the possible interactions/collaboration with practitioners resp. researchers to improve/upscale your activities

## ► Public Private Partnership in Energy

# FEASIBILITY ANALYSIS



- **Cooperation with PAUWES**
- PhD research on the development of renewable energy specific PPP models for Africa
- Linkages to potential stakeholders and investors
- Mentorship for small start-ups
- Transforming the research to practice



**What are the potential aspects of the research that can be transformed into practice?**

- ▶ It will be relevant to develop PPP models for each renewable energy technology based on an African perspective.
- ▶ Hybrid models will be relevant to increase private sector funding for Energy projects.
- ▶ The on-going Renewable energy Investments in Africa should be used as baseline examples for assesing the strenght and weakness of PPP models.
- ▶ Business models need to developed to help realize the potential of Renewable energy investment in Africa perspective.
- ▶ PPP models need to be applied on energy effiience projects.





**THANK YOU**

**Sechaba Energy**