



# Clean Captive Installations in sub-Saharan Africa

Focus: Industrial clients in Ghana

**Kick-off meeting presentation**

FS-UNEP Collaborating Centre

September, 2019

Supported by:



based on a decision of the German Bundestag



Frankfurt School  
FS-UNEP Collaborating Centre  
for Climate & Sustainable Energy Finance



# Overview of project

Snapshot of the various stages in the project

## Initiating the project

- 1
- Desk study**
- through research
  - in-house & consultative expertise

- 2
- Stakeholder consultation**
- scoping missions
  - relationship building

## Assistance from FS-UNEP

- 3
- Development of tools**
- identifying business models
  - selecting financing mechanisms

- 4
- Identifying relevant & key partners

- 5
- Selection of replicable designs (best model); designing selection criteria for national showcase project

## Expected outcomes

- 6
- Implementing the best chosen showcase project and replicating the model

- ✓ Awareness creation within both public and private stakeholders, whose feedback will be integrated into project design

- ✓ Design process to monitor and verify performance of chosen model and showcase viability of said model for easy access to public

- ✓ Understanding best practices & replicability by increasing uptakes
- ✓ Help countries meet climate and development goals of the Paris Agreement

# Preliminary findings from the desk study

## What have we understood so far

1 Ghana has an over-supply of installed generation capacity but faces severe electricity supply challenges

- In 2018, peak demand was 2,525 MW against installed capacity of 5,082.6 MW (dependable capacity 4,592.7MW)
- However, Ghana faces severe electricity supply challenges **due to transmission constraints, gas supply risks from overdependence on thermal plants** amongst many others

2 RE development is a key pillar in Ghana's NDCs under the Paris Agreement

- T&D losses represent a high percentage in electricity consumption
- The target for universal access of 100% for Ghana has been revised **from 2020 to 2025**; Ghana is committed to achieving the objectives of the **Sustainable Energy For All (SE4All) by 2020**

3 There are a number of RE enabling instruments in place

- The RE Act, 2011; net-metering sub-code; guidelines for REPO; standardized PPA template; licensing framework for service providers in the RE industry; mini-grid policy
- The **total RE installed capacity is 71.35MW** mainly from large and small solar PV

4 Ghana has the highest electricity costs for C&I facilities in sub-Saharan Africa

- **Thermal generation capacity increased rapidly since 2010** (> power demand growth), which has led to a sharp increase of electricity tariffs
- In 2018, tariff cuts by 18-30% was decided; however, recently in 2019 tariff charges has increased by 11.2% for energy charges; **demand charges for industrial sector has been scrapped off** implying potential reduction in electricity bill for the industry by c. 30%

5 Ghana's financial sector is diverse & competitive, but has not yet taken a step into RE finance

- Factors that hinder local banks to provide long-term financing for more than 3-5 year maturity includes: **inflation, high interest rates (24-29%) and forex risks**
- Wide **gap between available financing options and specific financing requirement of RE projects** (lower rates, longer tenors, non-recourse financing)

# Preliminary findings from the desk study

## What have we understood so far

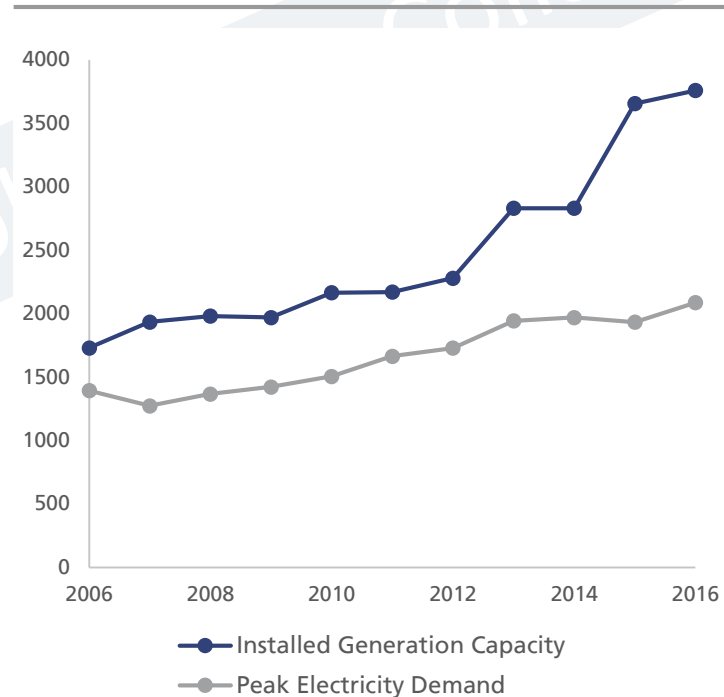
1 Ghana has an over-supply of installed generation capacity but faces severe electricity supply challenges/crisis

- In 2018, peak demand was 2,525 MW against installed capacity of 5,082.6 MW (dependable capacity 4,592.7MW)
- However, Ghana faces severe electricity supply challenges **due to transmission constraints, gas supply risks from overdependence on thermal plants** amongst many others

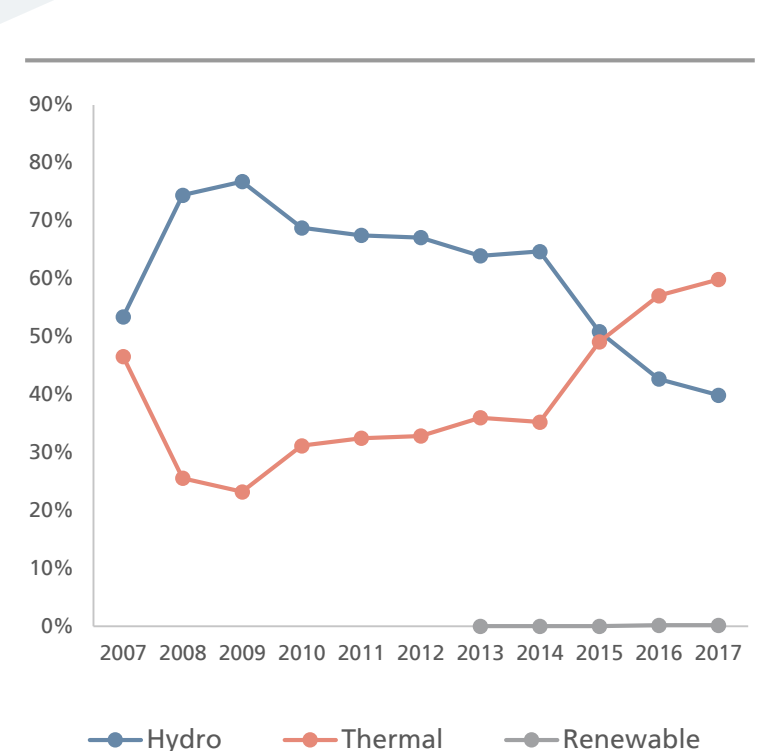
### The power situation in Ghana

- **Ghana peak electricity demand increased** from 1,393 MW in 2006 to 2,525 MW in 2019; while **the Installed Generation Capacity has more than doubled** during 2006 – 2019, from 1,730 MW to 4,892.6 MW (excluding captive back up generation)
- The country is occasionally **confronted with power supply shortage**, which can be attributed to **gas supply risks from overdependence on thermal plants, low head water levels of hydro sources for electricity generation, transmission line capacity constraints, and local currency depreciation** resulting in forex losses (as tariffs are denominated in Ghana Cedis while fuel & electricity purchases paid for in US dollars)
- **Renewable energy electricity** comes from utility-scale PV plants: a 2.5 MWp solar photovoltaic plant owned by the Volta River Authority (VRA), a 20 MWp solar plant owned by BXC Ghana, and 20 MWp solar Plant owned by Meinergy
- At the end of the second quarter of 2019, **the Ghana power system consisted of a number of hydropower and thermal plants** owned by the VRA (including TICO & TAPCo), Bui Power Authority (BPA), and twelve IPPs (Sunon Asogli, CENIT, AKSA, Karpowership, Trojan, Genser, Safisana, BXC, Meinergy, Amandi, Cenpower and Ameri)

Peak electricity demand vs. installed generation capacity



History electricity generation mix



# Preliminary findings from the desk study

## What have we understood so far

1 Ghana has an over-supply of installed generation capacity but faces severe electricity supply challenges/crisis

2 RE development is a key pillar in Ghana's NDCs under the Paris Agreement

- In 2018, peak demand was 2,525 MW against installed capacity of 5,082.6 MW (dependable capacity 4,592.7MW)
- However, Ghana faces severe electricity supply challenges **due to transmission constraints, gas supply risks from overdependence on thermal plants** amongst many others

- T&D losses represent a high percentage in electricity consumption
- The target for universal access of 100% for Ghana has been revised **from 2020 to 2025**; Ghana is committed to achieving the objectives of the **Sustainable Energy For All (SE4All) by 2020**

### Is there a need for captive solar PV?

- Transmission losses account for an avg. of 3.9% and distribution and commercial losses by the ECG have the highest contribution and account for 16.2% of gross electricity supply
- **Ghana's electricity access rate as of 2018 is over 84%** which is within the target of universal access rate by 2025
- **However, cases of multiple load shedding still occurred** due to fuel supply challenges either low water levels at the main hydro source or natural gas shortages

### Renewable Energy Master Plan (until 2030)

RE Technology	Target by 2030 (MW)
Solar Utility Scale	447
Distributed Solar PV	200
Standalone solar PV	20
Solar Irrigation	49
Wind Utility Scale	325
Biomass Utility Scale	72
Waste to Energy Utility Scale	50
Small/Medium hydro	150
Wave Power	50
Mini-Micro Grid	12

### Transmission and distribution losses as % of gross electricity supply



# Preliminary findings from the desk study

## What have we understood so far

1 Ghana has an over-supply of installed generation capacity but faces severe electricity supply challenges/crisis

2 RE development is a key pillar in Ghana's NDCs under the Paris Agreement

3 There are a number of RE enabling instruments in place

- In 2018, peak demand was 2,525 MW against installed capacity of 5,082.6 MW (dependable capacity 4,592.7MW)
- However, Ghana faces severe electricity supply challenges **due to transmission constraints, gas supply risks from overdependence on thermal plants** amongst many others

- T&D losses represent a high percentage in electricity consumption
- The target for universal access of 100% for Ghana has been revised **from 2020 to 2025**; Ghana is committed to achieving the objectives of the **Sustainable Energy For All (SE4All) by 2020**

- The RE Act, 2011; net-metering sub-code; guidelines for REPO; standardized PPA template; licensing framework for service providers in the RE industry; mini-grid policy
- The **total RE installed capacity is 71.35MW** mainly from large and small solar PV

## Enabling environment for renewable energy

- **FiT scheme** – guaranteed rate for RE is purchased by distribution utilities for 10 years and subsequently reviewed every 2 years. **We understand that there is currently a moratorium on FiT**
- **Net metering scheme** – where RE generated onsite may be delivered to the local utility to offset the cost of electricity provided by the utility.
- **Purchase obligations** – distribution companies and bulk electricity consumers would be obliged to purchase a certain percentage of their energy required from electricity generated from RE sources. **Is Net – metering seen as a purchase obligation for the utilities?**
- **Off-grid electrification** – to promote mini-grid and stand-alone RE systems for remote off-grid locations

## Licensing for captive RE power generation

- Captive power means generation of capacity exceeding 1MW and for own-use and/or sale to an off-taker without a connection to the national grid
- Need to understand rules/regulations for installations smaller than 1MW (only registration required?; does less than 1MW include total capacity including diesel gensets?)

# Preliminary findings from the desk study

## What have we understood so far

4

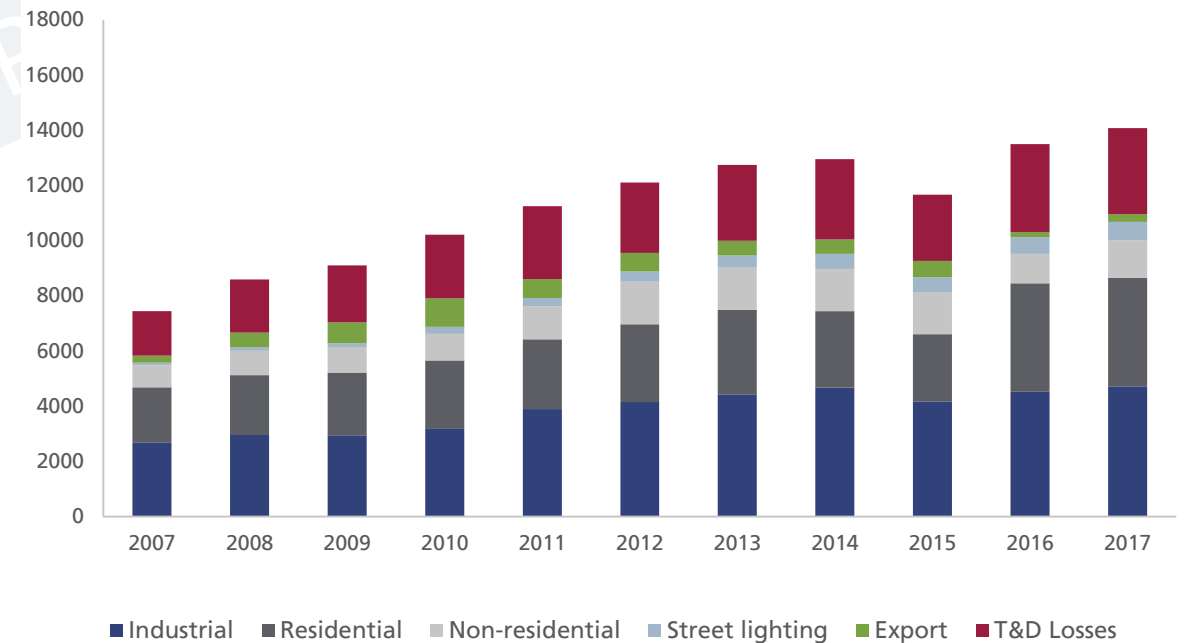
**Ghana has the highest electricity costs for C&I facilities in sub-Saharan Africa**

- **Thermal generation capacity increased rapidly since 2010** (> power demand growth), which has led to a sharp increase of electricity tariffs
- In 2018, tariff cuts by 18-30% was decided; however, recently in 2019 tariff charges has increased by 11.2% for energy charges; **demand charges for industrial sector has been scrapped off** implying potential reduction in electricity bill for the industry by c. 30%

### Industry sectors and power consumption

- The **industrial sector is the largest end-client** for consuming electricity. In Ghana, the **annual mean losses** of electricity in transmission and distribution (including commercial losses) **are 21.9% of total electricity consumption**
- The **heaviest power consumers** in Ghana are the 51 companies registered as bulk customers (as of July 2019). These are in majority in the **cement and steel manufacturing** and **mining** followed by **food processing and beverages**. Many of these are **concentrated in the Tema Export Processing Zones**, which is authorized by the government to promote industrial activities

### Electricity consumption pattern for Ghana from 2006 to 2016



# Preliminary findings from the desk study

## What have we understood so far

4

**Ghana has the highest electricity costs for C&I facilities in sub-Saharan Africa**

- **Thermal generation capacity increased rapidly since 2010** (> power demand growth), which has led to a sharp increase of electricity tariffs
- In 2018, tariff cuts by 18-30% was decided; however, recently in 2019 tariff charges has increased by 11.2% for energy charges; **demand charges for industrial sector has been scrapped off** implying potential reduction in electricity bill for the industry by c. 30%

5

**Ghana's financial sector is diverse & competitive, but has not yet taken a step into RE finance**

- Factors that hinder local banks to provide long-term financing for more than 3-5 year maturity includes: **inflation, high interest rates (24-29%) and forex risks**
- Wide **gap between available financing options and specific financing requirement of RE projects** (lower rates, longer tenors, non-recourse financing)

### Ghana's financial sector

- Bank of Ghana (BoG) – comprised of 23 commercial banks – 9 local banks and 14 foreign banks
- Ecobank, GCB, and Barclays Bank of Ghana are the three biggest banks according to operating assets followed by Fidelity Bank, Stanbic Bank and Standard Chartered Bank of Ghana
- Most important MFIs in terms of loans are the Fidelity Bank of Ghana, ProCreditGHA (now acquired by Fidelity), First Allied S&L



# Stakeholder consultations

## What information do we need to streamline the process of installing captive PVs

1 Ghana has an over-supply of installed generation capacity but faces severe electricity supply challenges

2 RE development is a key pillar in Ghana's NDCs under the Paris Agreement

3 There are a number of RE enabling instruments in place

4 Ghana has the highest electricity costs for C&I facilities in sub-Saharan Africa

5 Ghana's financial sector is diverse & competitive, but has not yet taken a step into RE finance

Bridge gap in data and information...

... through customised and tailored approach in reaching out to potential stakeholders

**Energy policy**

- What the government's general policy or position is in regards to clean captive systems?

**Energy laws and regulations**

- We are aware of various laws and regulations that apply to captive power systems, e.g. in the energy sector

**Captive power licencing and approvals**

- For a captive system <1 MW for self consumption only, even if the power was distributed around a commonly

**Private financiers/ESCOs**

- Please give us a brief overview of your business

**SUNREF going into the future**

- o We are aware AFD secured GCF financing under Transforming Financial Systems for Climate Project, which is

**EPCs/suppliers**

- Please give us a brief overview of your business
- o When was it established and for how long have you have been operating in Kenya?
- o Are you a Kenyan company or an international business with operations in Kenya? Other countries of operations if any?
- o Who are usually your target customers?
- o If an EPC, what types of systems do you work on, e.g. hybrid (diesel/solar), battery storage, other RE technologies
- o If an EPC please give us your record of accomplishment in terms of number of projects you have done, size and if possible client and plus the projects you have in the pipeline.

# Streamlining the process

How does the FS-UNEP collaborating centre help?

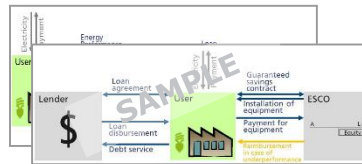
1

## Development of tools

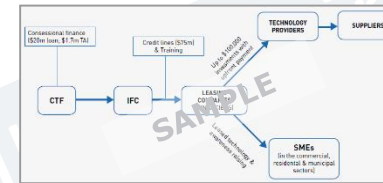
- identifying business models
- selecting financing mechanisms

### A. Ownership model

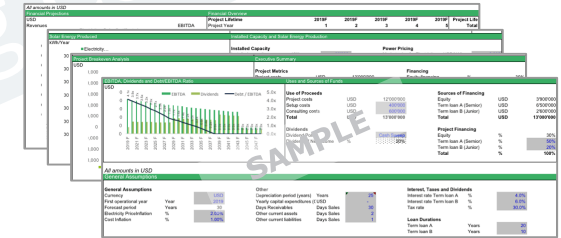
### B. ESCO financing model



### C. Equipment leasing model



### Financing mechanisms



2

## Identifying relevant & key partners

### Public institutions



### Banking sector



### Genset suppliers



### RE private sector



### Power sector



### Existing industrial users



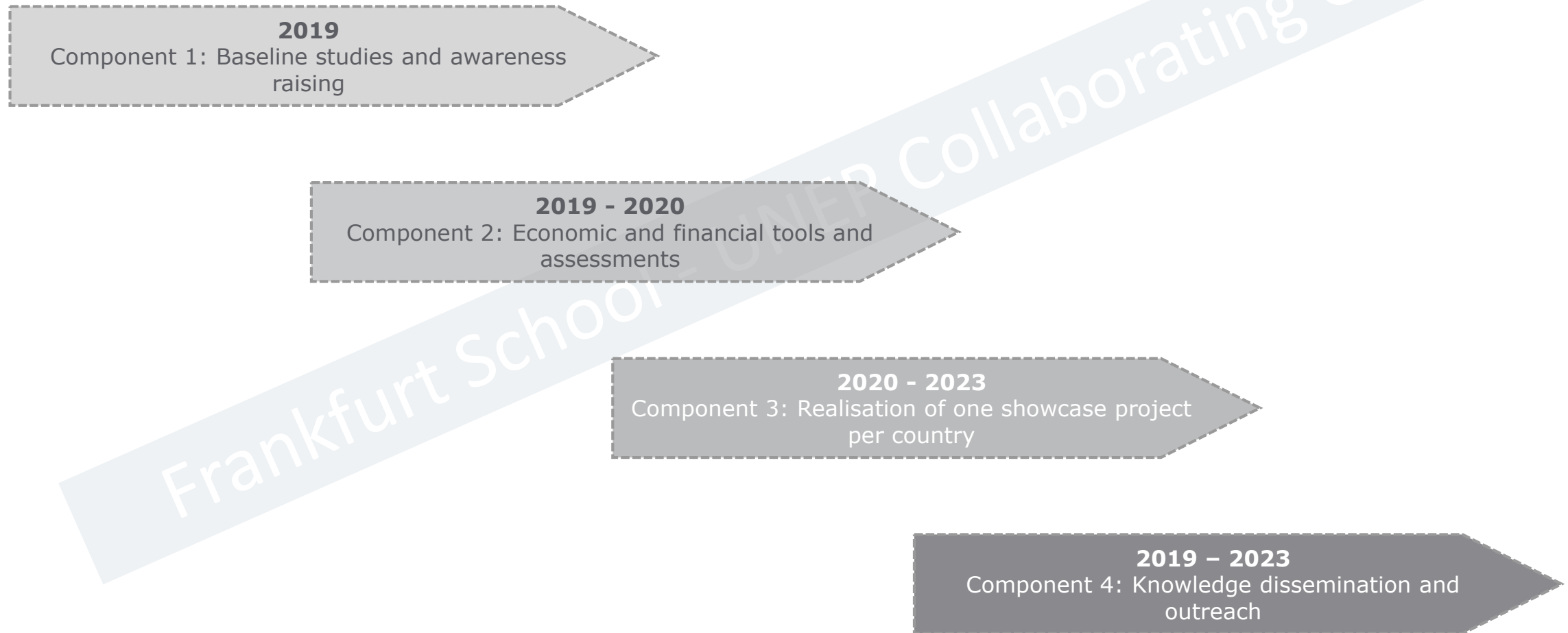
3

## Selection of replicable designs (best model); designing selection criteria for national showcase project

- Currently, there is a **lack of monitoring and verification of installed captive PV projects**
- There is also **not enough publicly available information** explaining the advantages of captive solar PV and potential risks that exist (e.g. for industrial users: payback period of installations, savings per year, etc.)
- Implementing one project to **showcase it as a replicable model** will **improve transparency** in this captive PV market. **Monitoring performance** of the selected model will **prove it to be used as a viable design** for other industrial users

# Final expected outcomes and timeline

Project will run from 2019 - 2023



# Thank you for your patience!



For further information please visit:

[www.captiverenewables-africa.org](http://www.captiverenewables-africa.org)

**Tobias Panofen**

Email: [t.panofen@fs.de](mailto:t.panofen@fs.de)

**Hirak Al-Hammad**

Email: [h.al-hammad@fs.de](mailto:h.al-hammad@fs.de)

**Madhumitha Madhavan**

Email: [m.madhavan@fs.de](mailto:m.madhavan@fs.de)

Supported by:



based on a decision of the German Bundestag



Frankfurt School  
FS-UNEP Collaborating Centre  
for Climate & Sustainable Energy Finance

