



# The Swarm Electrification Concept

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# What is “electrification”?





- Background and motivation- (15 min)
- What is currently used? – (15 min)
- Workshop: **How to design a paradigm shift in rural electrification?** (30 min)
- Presentation of Workshop Results (20 min)
- Mini-Feedback (5 min)



According to the United Nations Foundation:

- 1.3 billion people worldwide lack access to electricity
  - Additional one billion people's access is of poor quality
- *off-grid* and *temporary on-grid* areas are a huge market

The “Energy for All Case” (IEA) expects:

- 30% of rural areas can be electrified via centralized grids
- 70% of rural areas can be electrified either with mini-grids or with small stand-alone off-grid solutions



The focus is micro empowerment from the bottom-up

- Individual households and businesses are the basis for the development
- Technology is based on the identified end-user needs
- Implementation with End-User Financing (Microfinancing)

# Change of perspective to a bottom-up process



*off-grid*

*far-from-grid*

# Energy Access?





## Utility- large scale

- Timeline is uncertain
- Supply is often unreliable
- Decision making is top-down

## End-User- small scale

- Often need (micro)-financing
- O&M mainly by the end-user
- Decision making is bottom-up



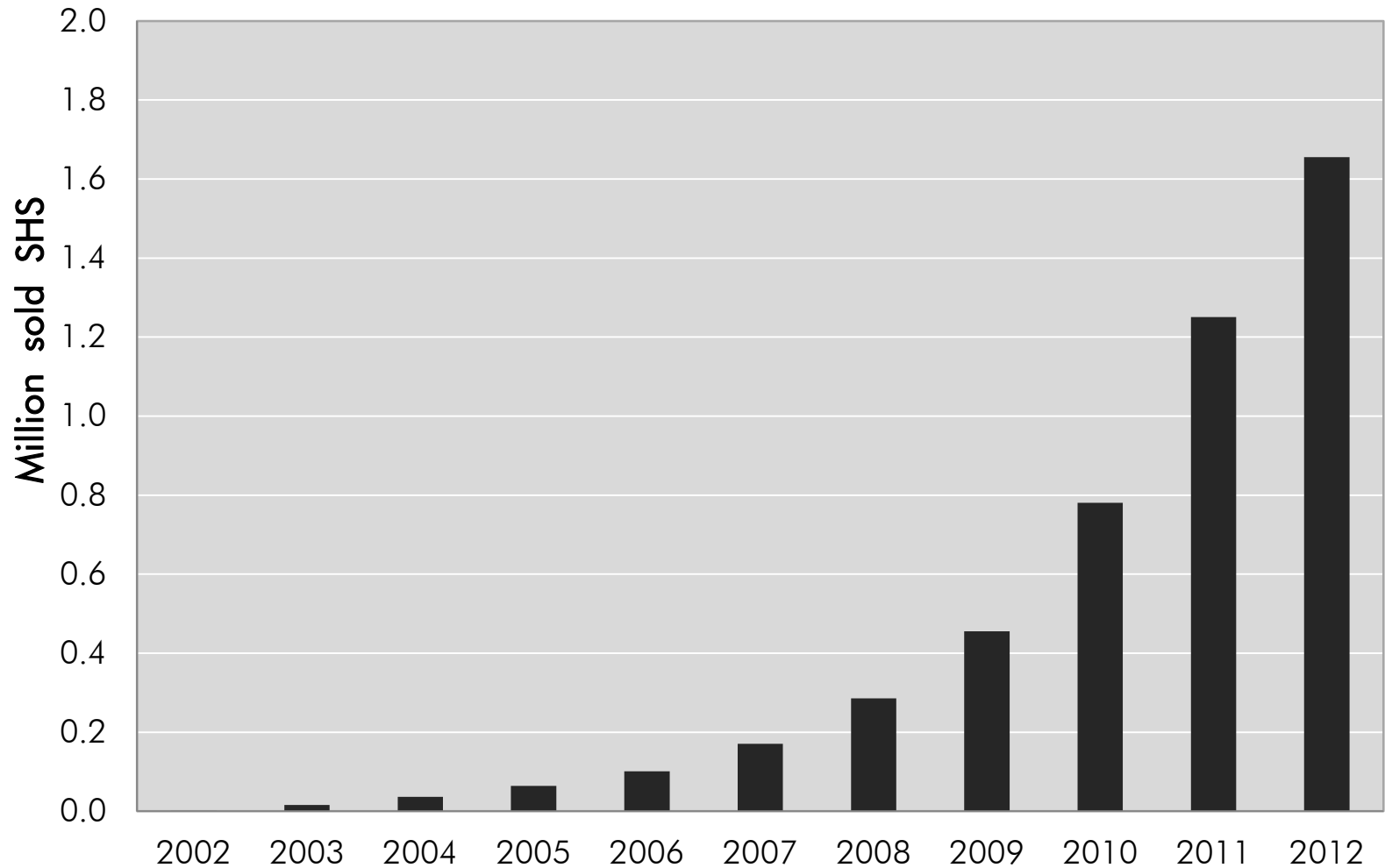
# A Standard Approach- Solar Home Systems



- Micro-financed solar home systems (SHS)
  - 20 Wp to 85 Wp panels (or bigger)
  - Lead acid batteries
  - Efficient 12 V direct current loads (e.g. LED lights)
- Three day autonomy in case of cloudy conditions
- Payback period of 1 to 3 years

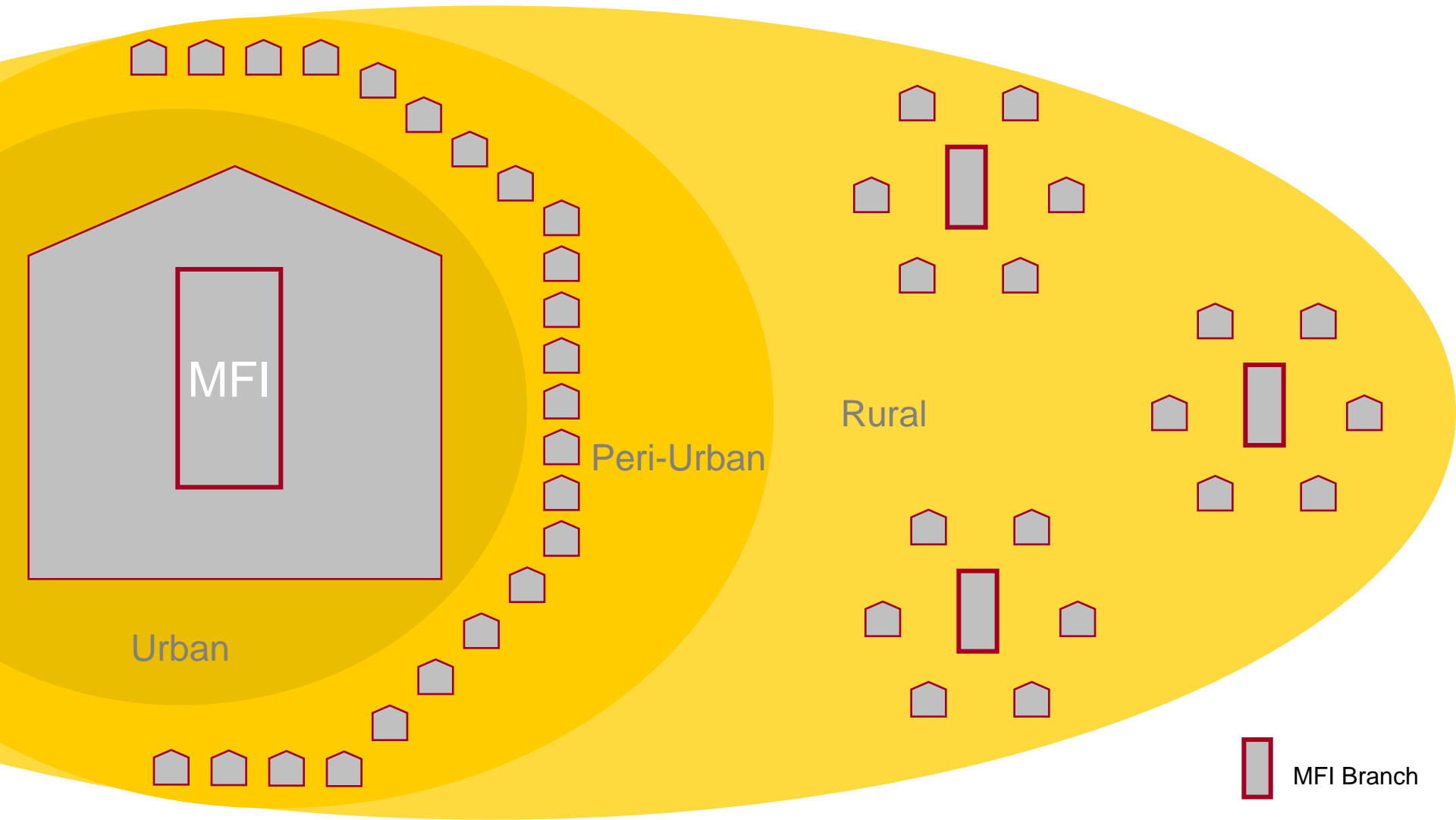


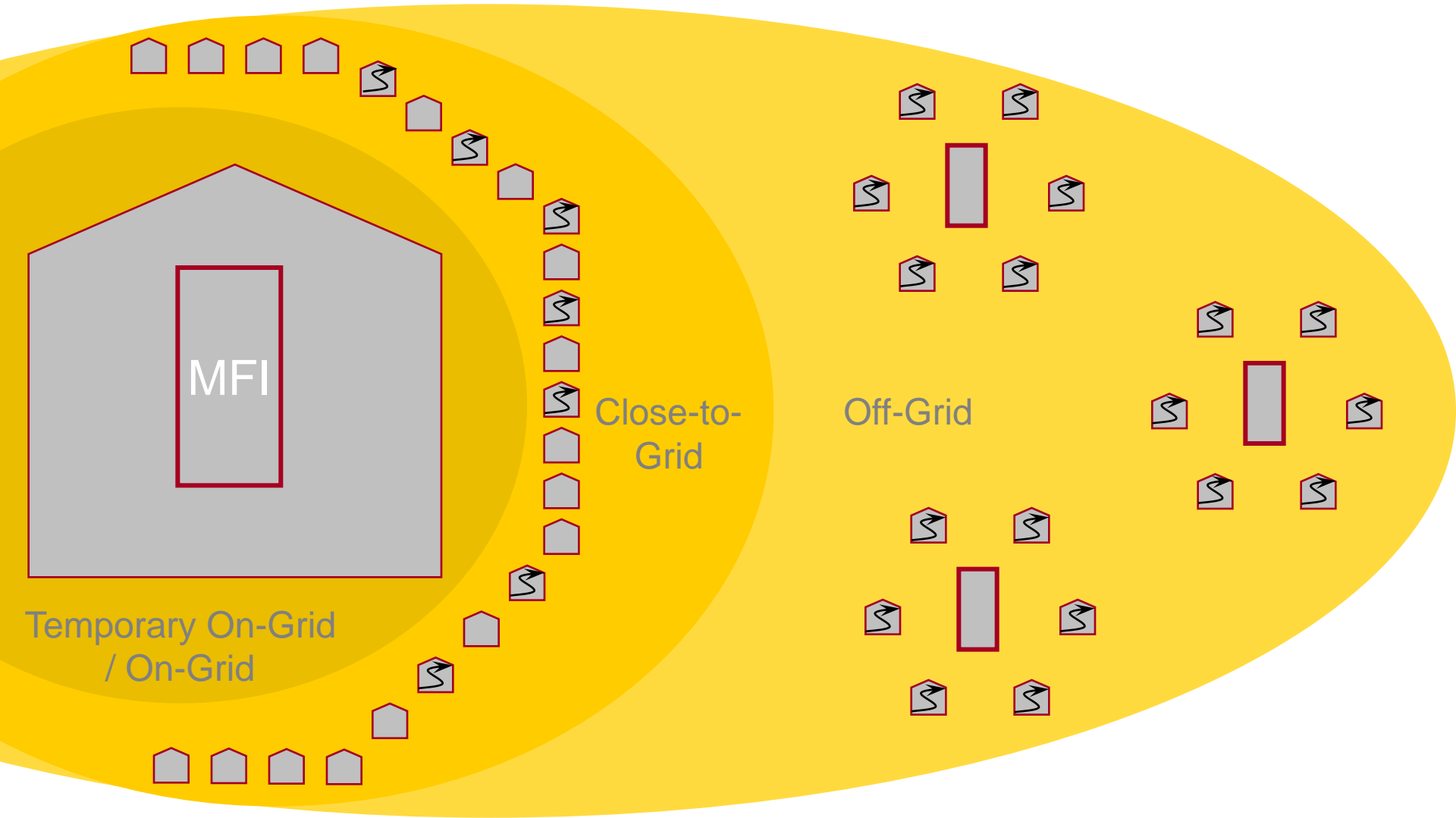
# Solar Home Systems installed in Bangladesh



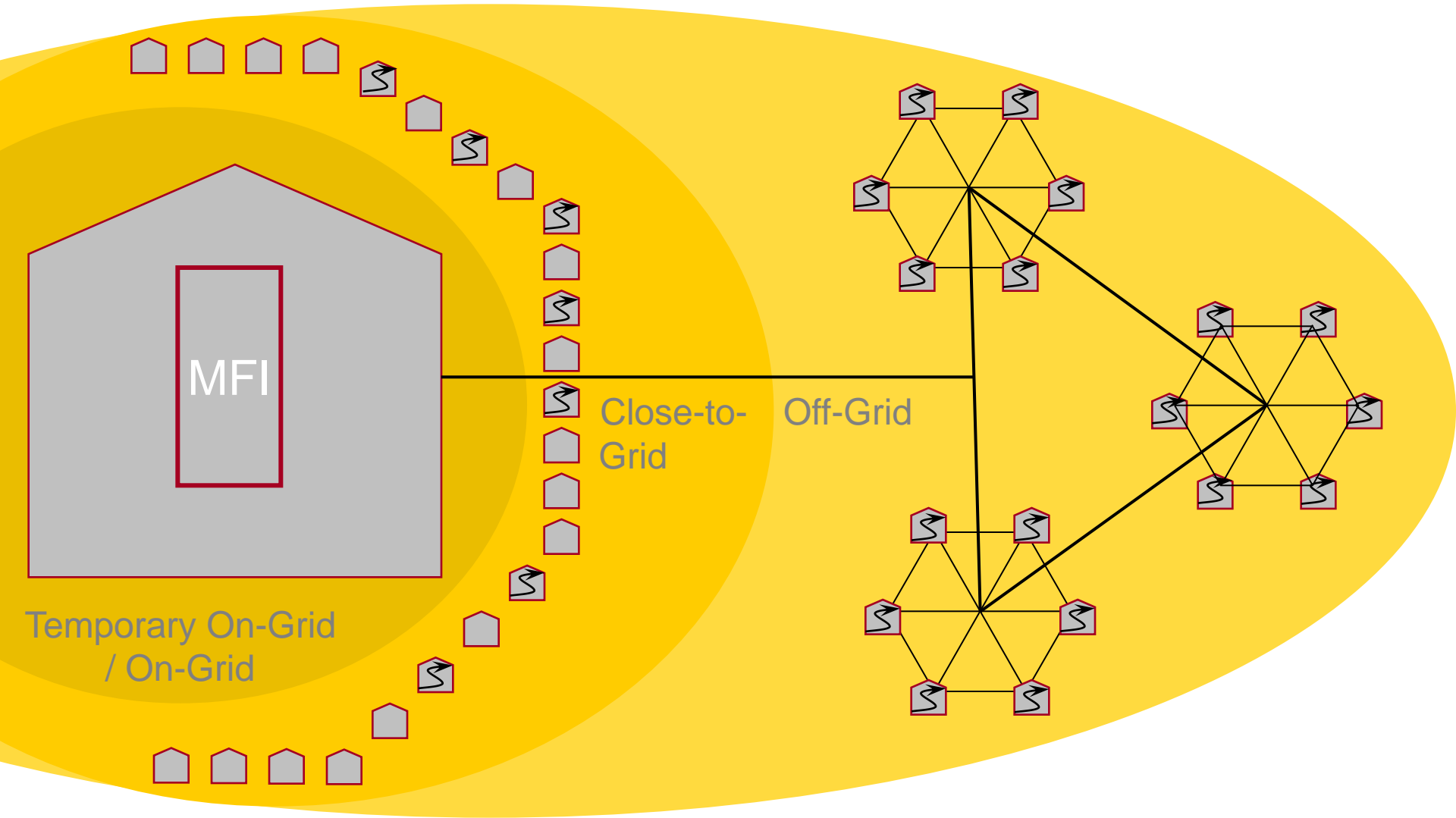
Data from IDCOL (2013)

# Where are the Clients of an MFI?





# Swarm Building





# Inspirations from the field

Bangladesh, Namibia, Tanzania, Philippines



## SHSs

- Serve only basic needs
- Productive use is limited
- Excess generation is dumped

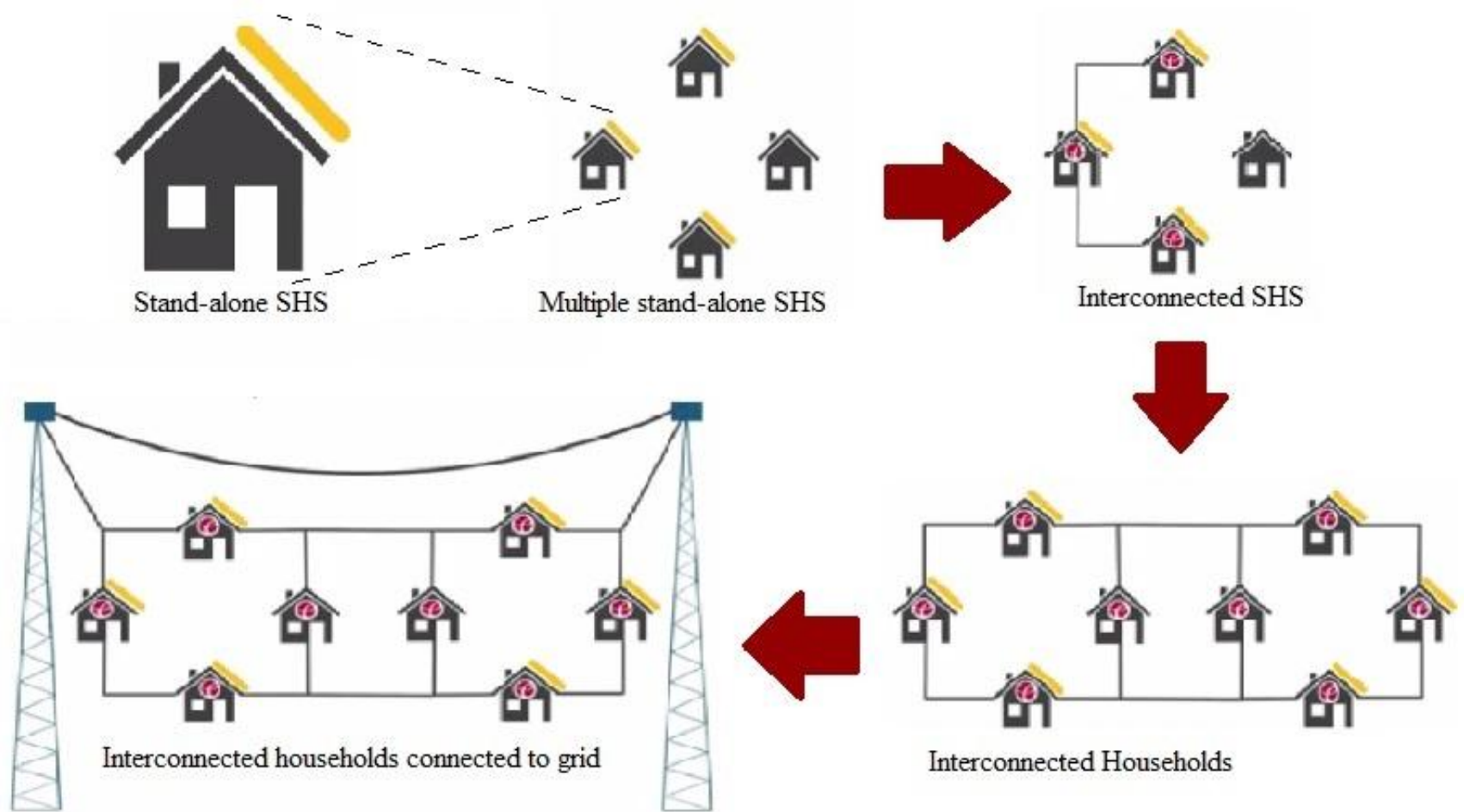
## Minigrid

- Unable to recover capital costs
- Capacity is quite inflexible
- High risks are associated for investor

## Grid Extension

- Timeline is uncertain
- Frequent outages occur
- Large amounts of capital are required

# Our proposition:







# Workshop

Group 1: AC or DC? About safety, appliances and flexibility- Daniel.

Group 2: Mesh or bus? How topology matters. – Hannes.

Group 3: Smart swarms?- The role of ICTs- Brian.

Group 4: Link the interlinked?- How to grow the swarm.- Joseph.



# Group 1: AC or DC?

About safety,  
appliances and  
flexibility- Daniel.



Group 2:

Mesh or bus?

How topology matters.

– Hannes.



Group 3:  
Smart swarms?  
The role of ICTs.  
-Brian.



Group 4:  
Link the interlinked? -  
How to grow the  
swarm.- Joseph.



# Presentation of Results

Group 1: AC or DC? About safety, appliances and flexibility- Daniel.

Group 2: Mesh or bus? How topology matters. – Hannes.

Group 3: Smart swarms?- The role of ICTs- Brian.

Group 4: Link the interlinked?- How to grow the swarm.- Joseph.



- Starting from the Status Quo
- Flexible development, supply follows demand closely
- Enhanced productive use
- Three phase bottom-up process
- Multiple financing options
- Research ahead

Thank you for your participation!



Source: NY Times