

Mini-grids and the Arrival of the National Grid

United Nations Foundation

*How some off-grid renewable energy
projects have adapted to grid arrival*

✚ Chris Greacen

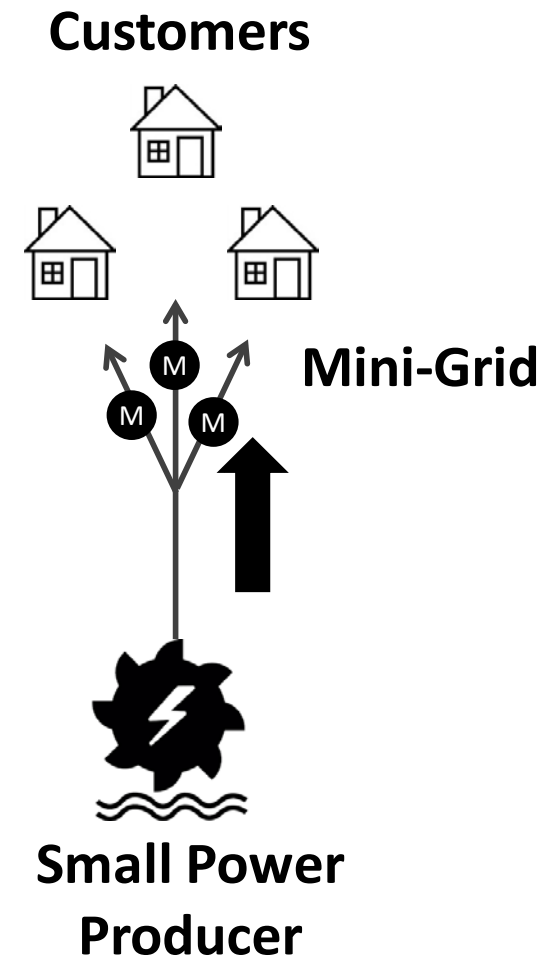
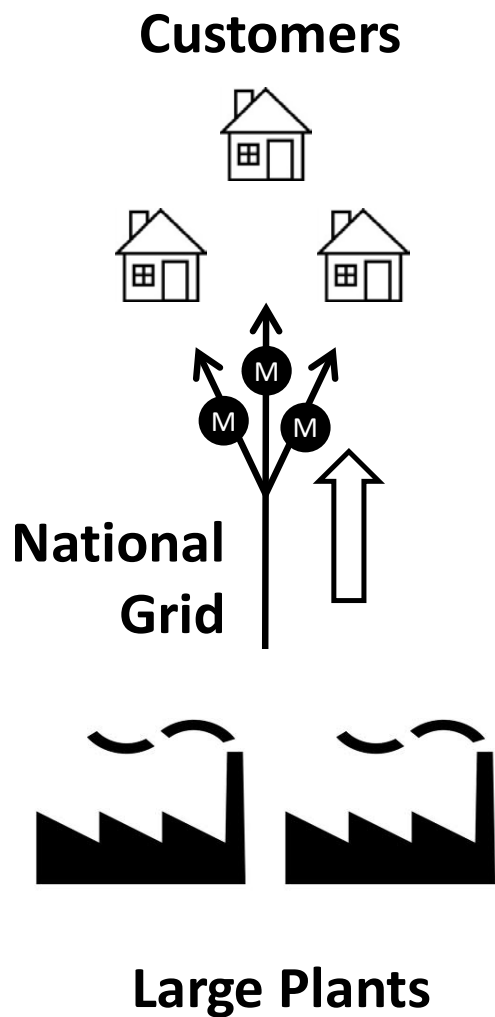
✚ 18 July, 2018



Mini grid options after arrival of the main grid

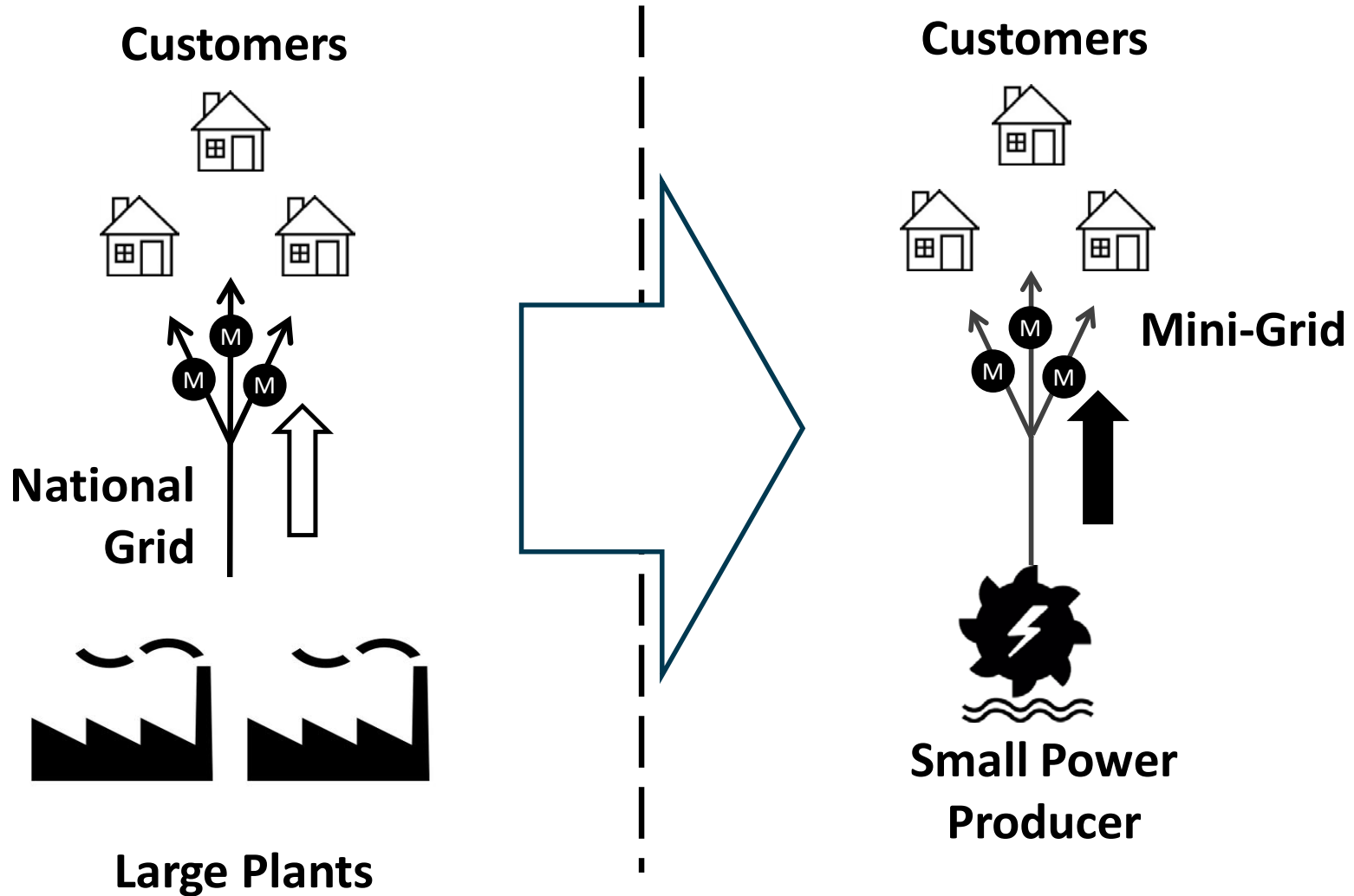
- + Small Power Distributor (SPD)**
- + Small Power Producer (SPP)**
- + Both SPD and SPP**
- + Separate systems in the same village**
- + Buyout by utility**
- + Assets abandoned**

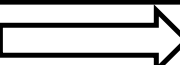


Arrival of the main grid



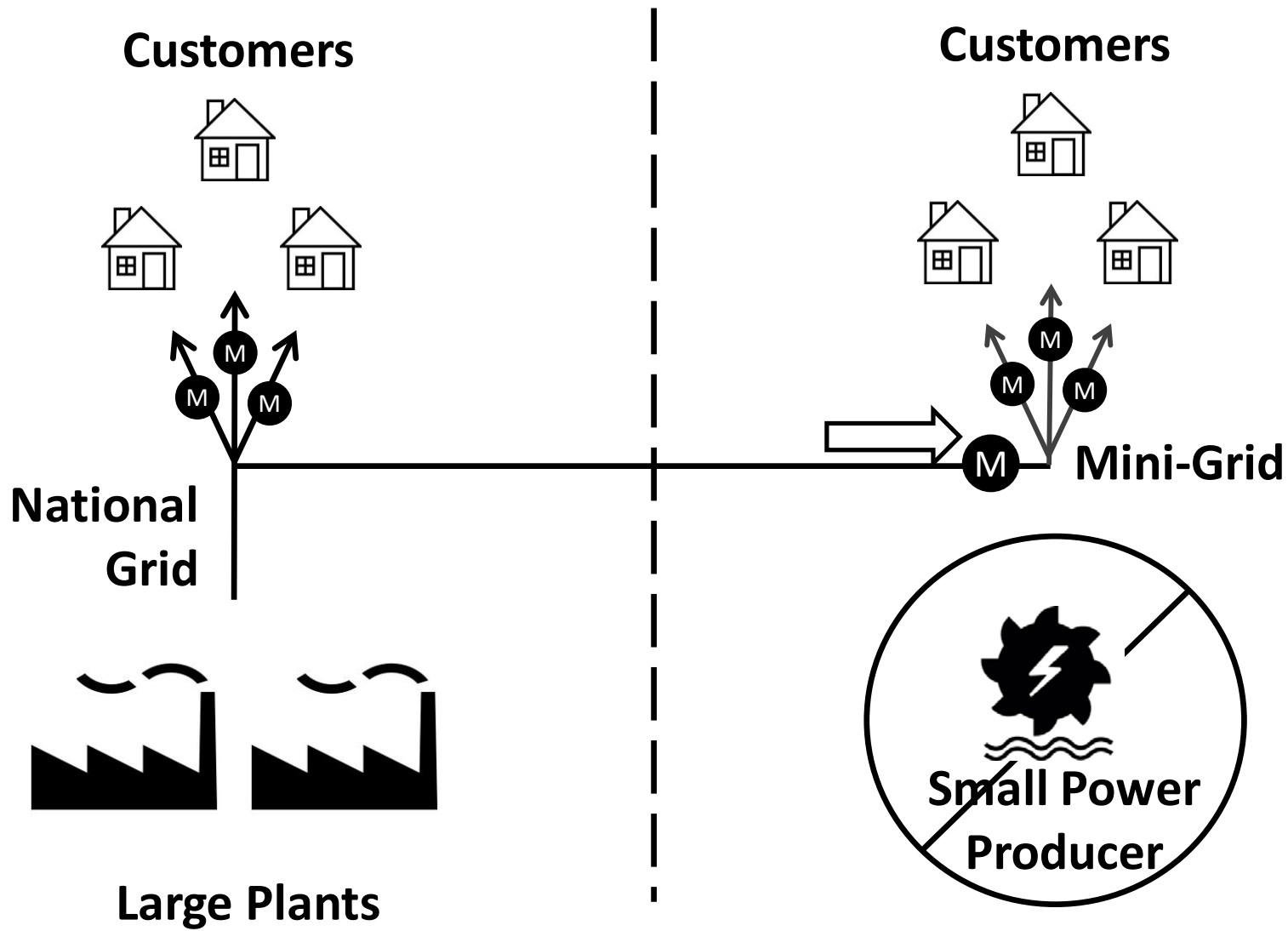
Key:  = power from utility  = power from SPP  = meter

Arrival of the main grid



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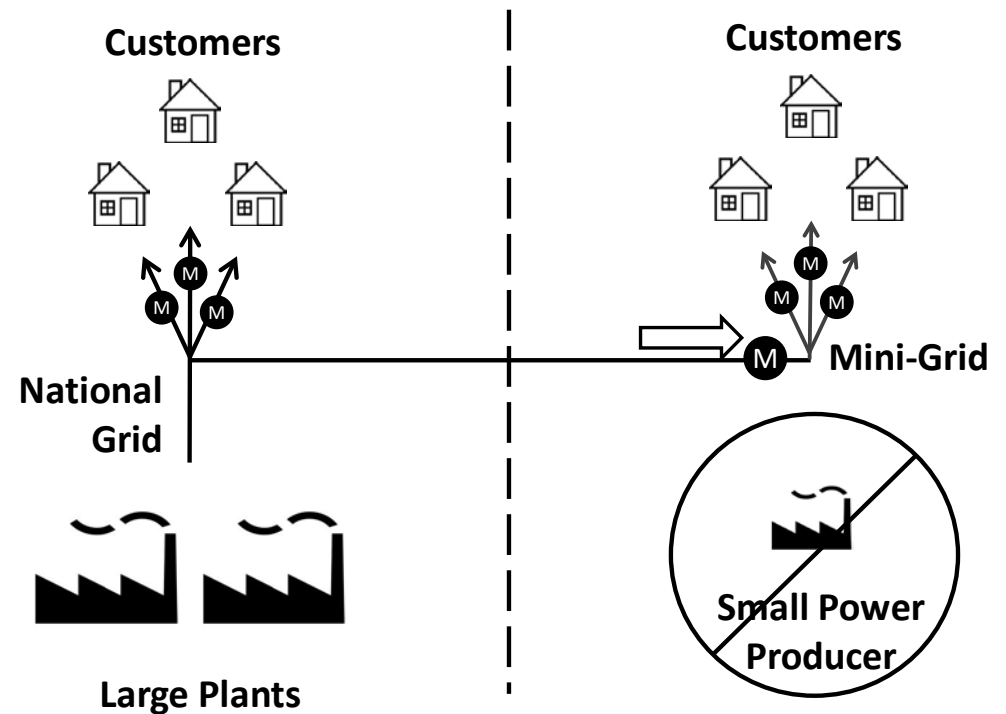
Small Power Distributor (SPD)



Key:  = power from utility  = power from SPP  = meter

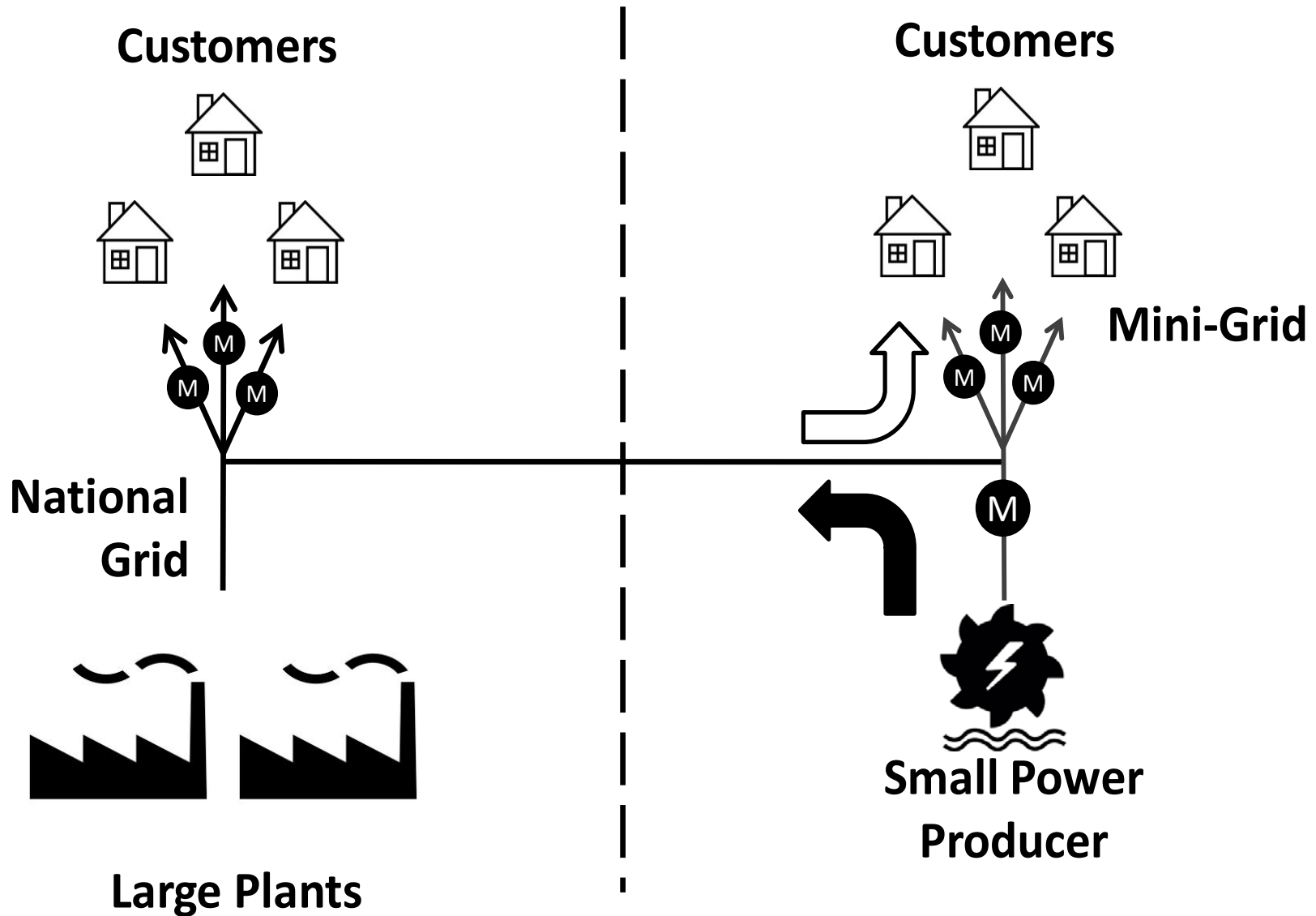
Cambodia: from isolated mini-grid to SPD

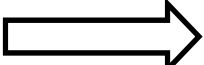


- + >250 mini-grids became SPDs
- + Electricity Authority of Cambodia (EAC) put in place a comprehensive program:
 - Long-term distribution licenses required...
To acquire one a mini-grid must:
 - Invest in utility-quality distribution network
 - Extend network thru service territory
 - Grants and loans
 - Retail tariffs standardized and cross-subsidized for distribution franchisees.



Key: = power from utility = power from SPP = meter

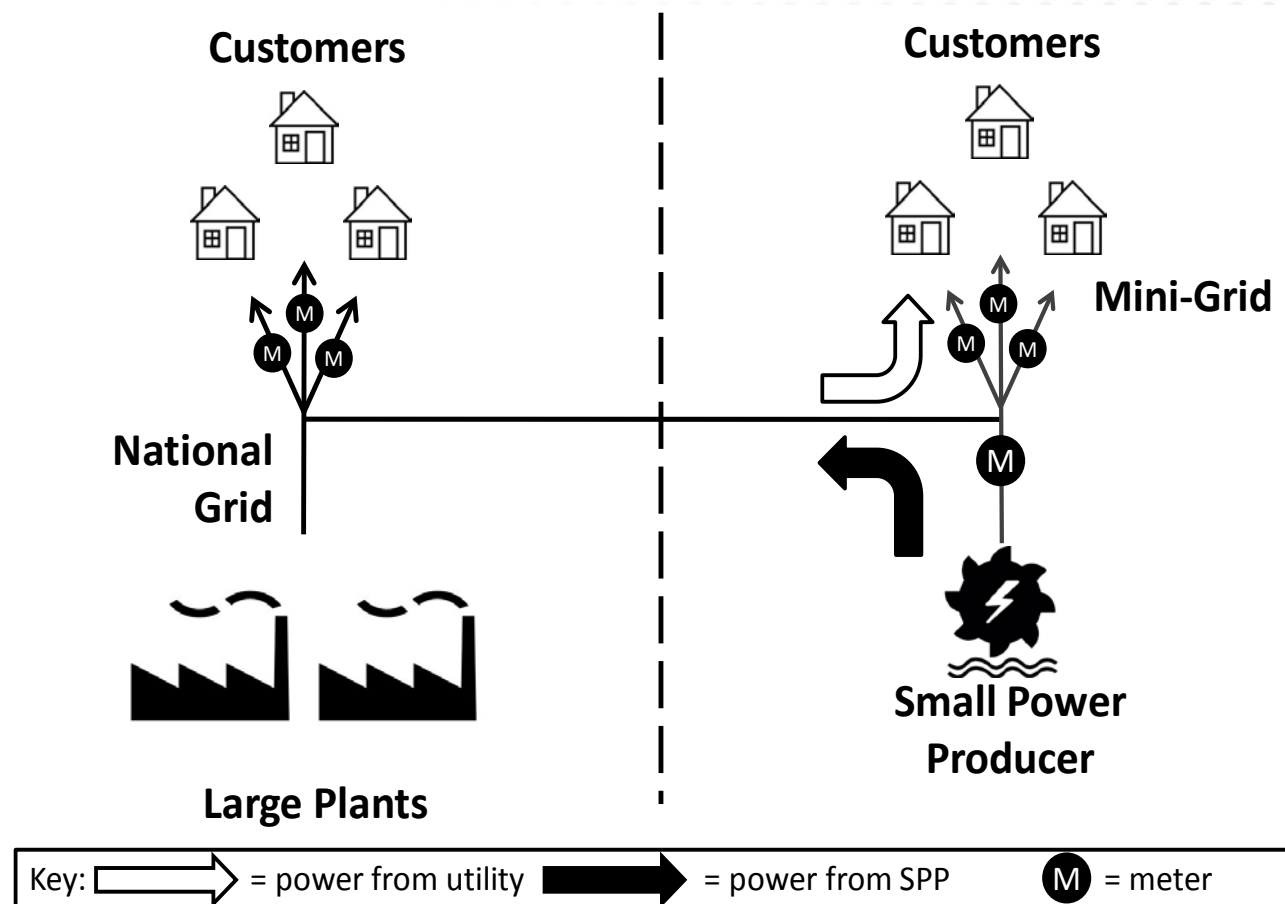
Small Power Producer (SPP)



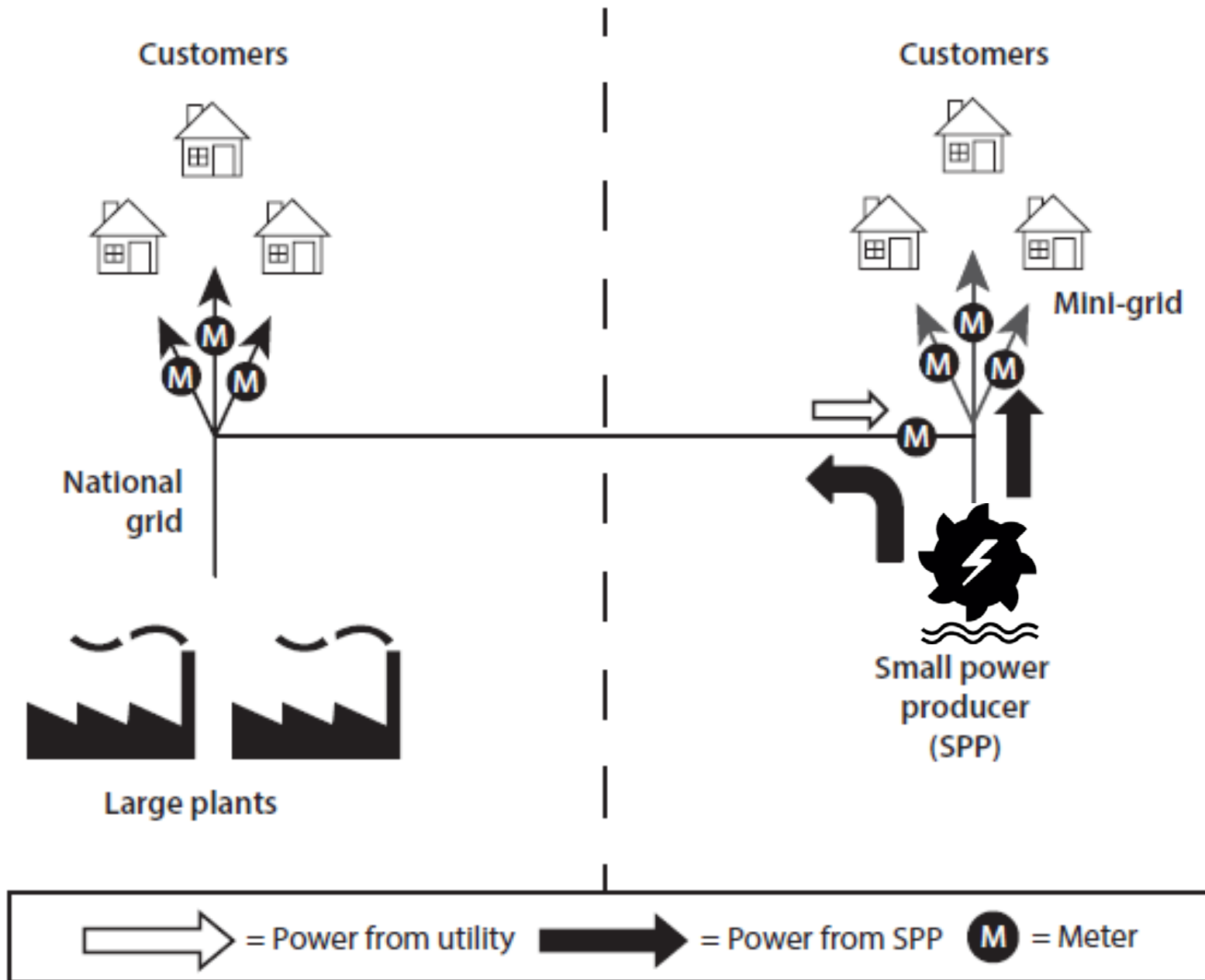
Key:  = power from utility  = power from SPP  = meter

Sri Lanka: from isolated mini-grid to SPP (sometimes)

- + >250 isolated community-owned hydropower built with financial support from GoSL, GEF and World Bank
- + With arrival of national grid >100 mini-grids abandoned
- + Three projects: 12 to 45 kW converted to SPPs
 - Five more in pipeline
 - No longer provide retail sales to village



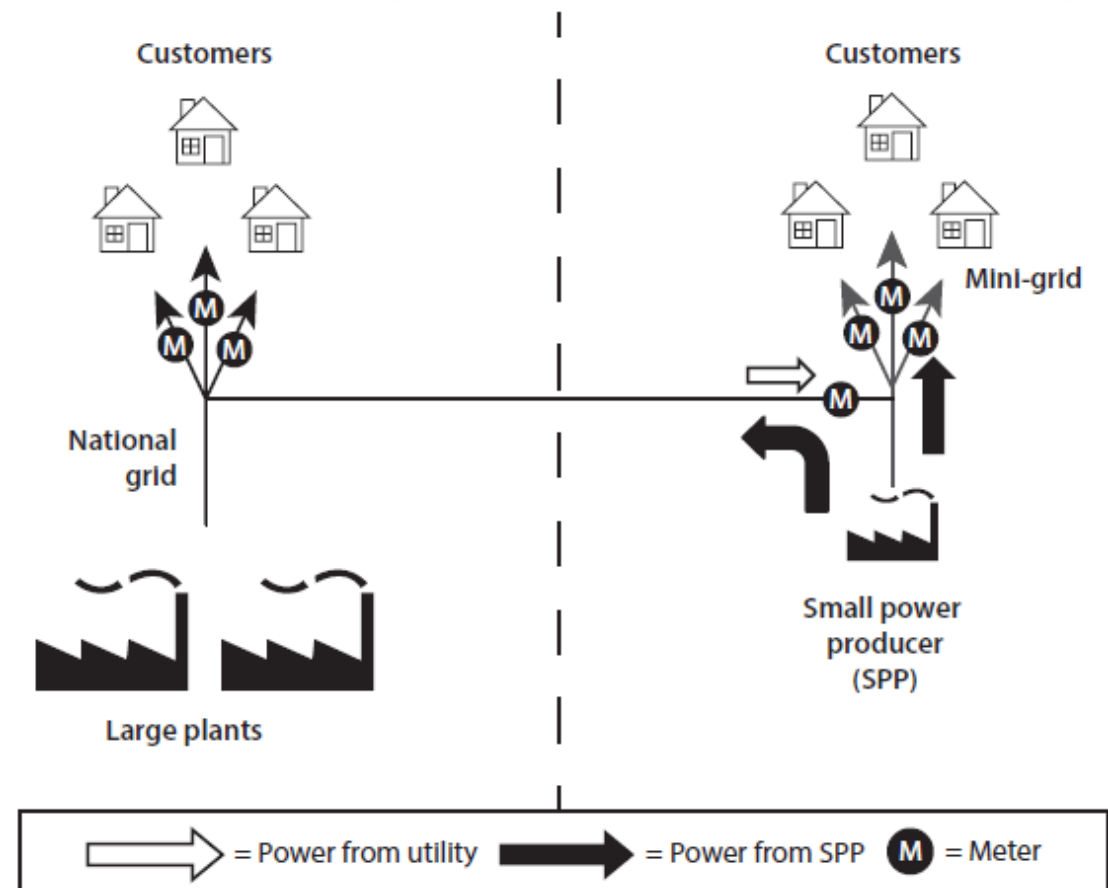
Both SPP and SPD



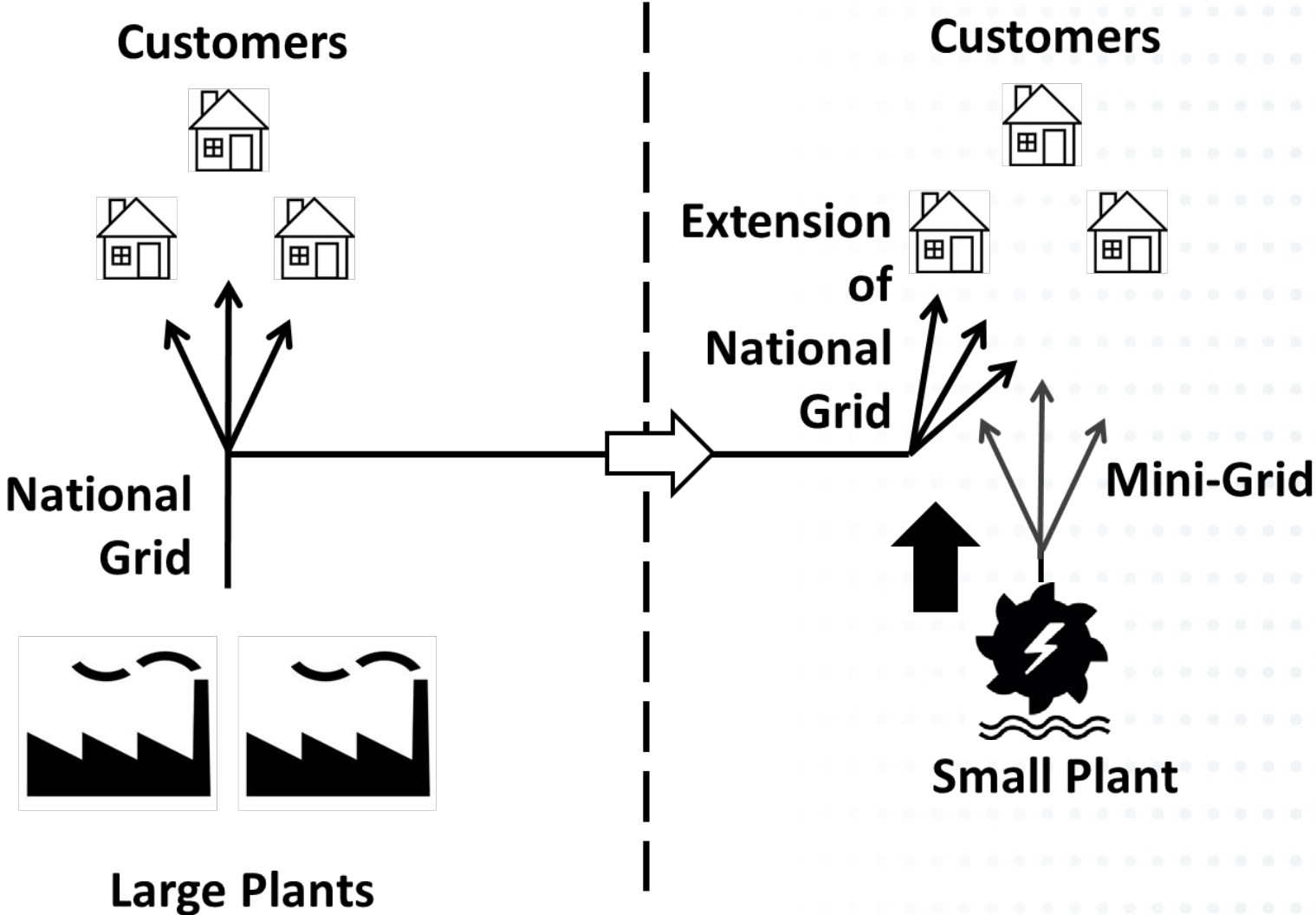
Indonesia: SPD + SPP

+ Of 200 community-owned mini-grids where national grid has arrived...

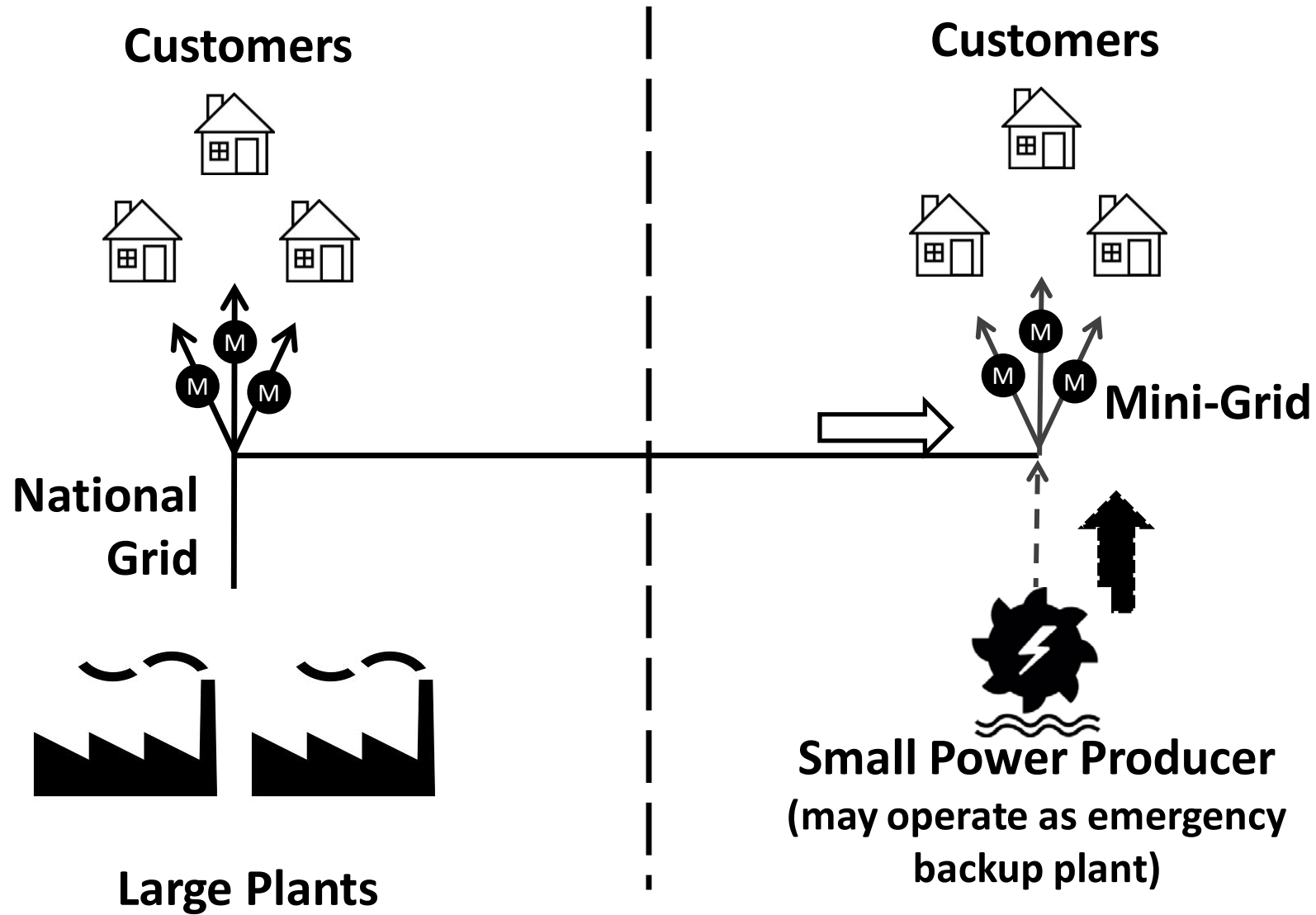
- 150 abandoned, PLN takes over.
- 9 have become SPPs/SPDs.
 - Sell all or some electricity to national grid



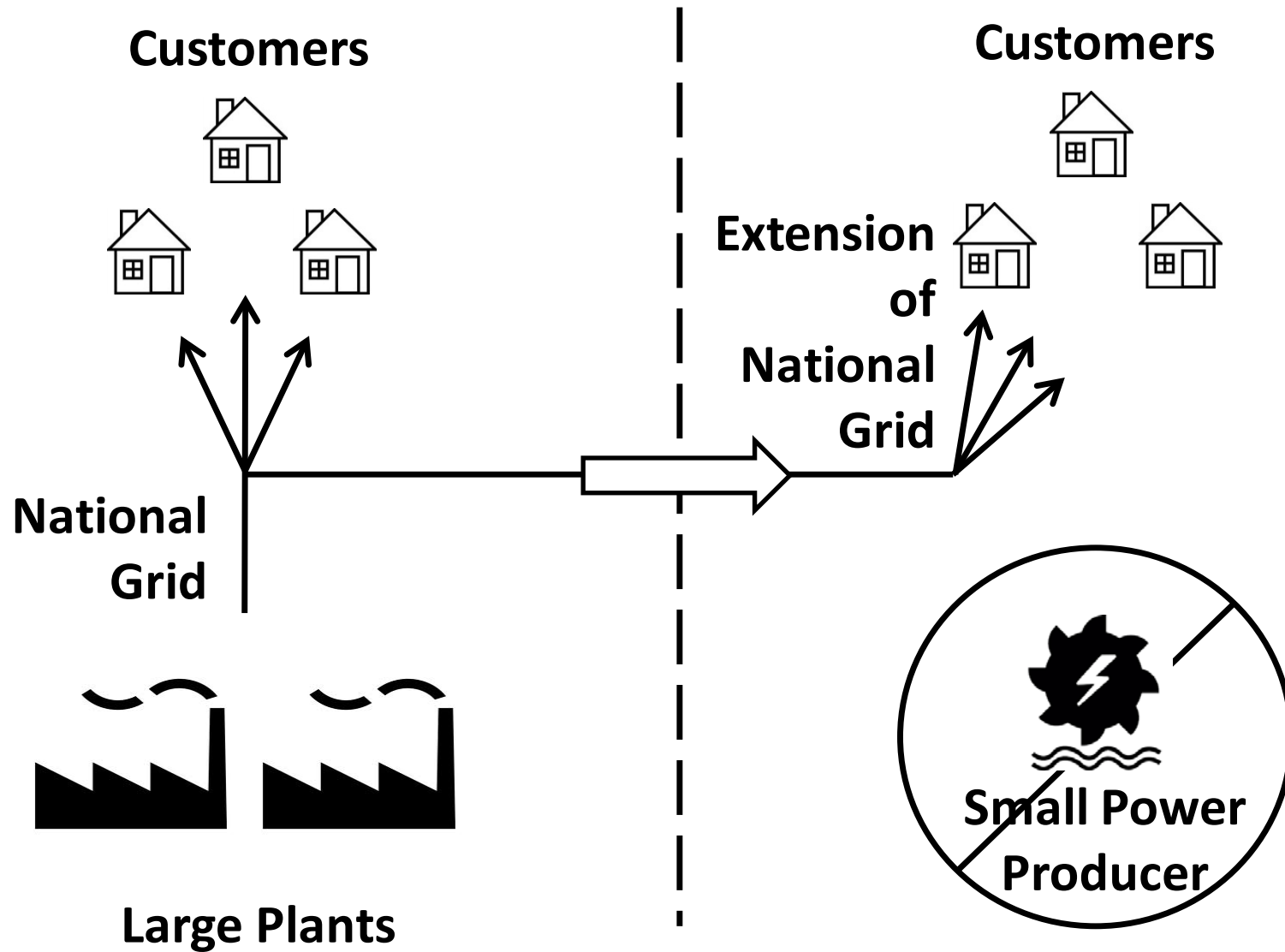
Co-existence



Buyout



Assets abandoned



Lessons

+ **Viable examples of formerly isolated village mini-grids connecting to main-grid exist...**

- Hydropower able to remain financially viable selling wholesale to utility (Sri Lanka & Indonesia)
- Mini-grids with utility-grade distribution networks transitioning to small power distributors (Cambodia)

+ **... but are rare**

- Most mini-grids abandoned when utility arrives

+ **Cost of interconnection depends on business model**

- (e.g. SPP interconnection more costly than SPD)

**A Guidebook on Grid Interconnection and
Islanded Operation of Mini-Grid
Power Systems Up to 200 kW**

Chris Greacen
Richard Engel
Thomas Quetchenbach



Photo credit: Chris Greacen

April 2013



tiny.cc/MG_interconnect



DIRECTIONS IN DEVELOPMENT
Energy and Mining

From the Bottom Up
*How Small Power Producers and
Mini-Grids Can Deliver Electrification and
Renewable Energy in Africa*

Bernard Tenenbaum, Chris Greacen,
Tilak Siyambalapatiya, and James Knuckles



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MINI-GRIDS AND ARRIVAL OF THE MAIN GRID

LESSONS FROM CAMBODIA, SRI LANKA, AND INDONESIA



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Thank you

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