

MINI GRIDS: REGULATIONS, SUBSIDIES, AND GRID INTEGRATION AND EXIT STRATEGIES FOR LOW COST AND TIMELY ACCESS TO ELECTRICITY SERVICES



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Topics in Mini Grid Regulation

Regulation is the supervision and control of economic activities of private entities by government, in the interest of economic efficiency, fairness, health, and safety (Bannock & Baxter, 2011, Penguin Dictionary of Economics)

Key topics in mini grid regulation include:

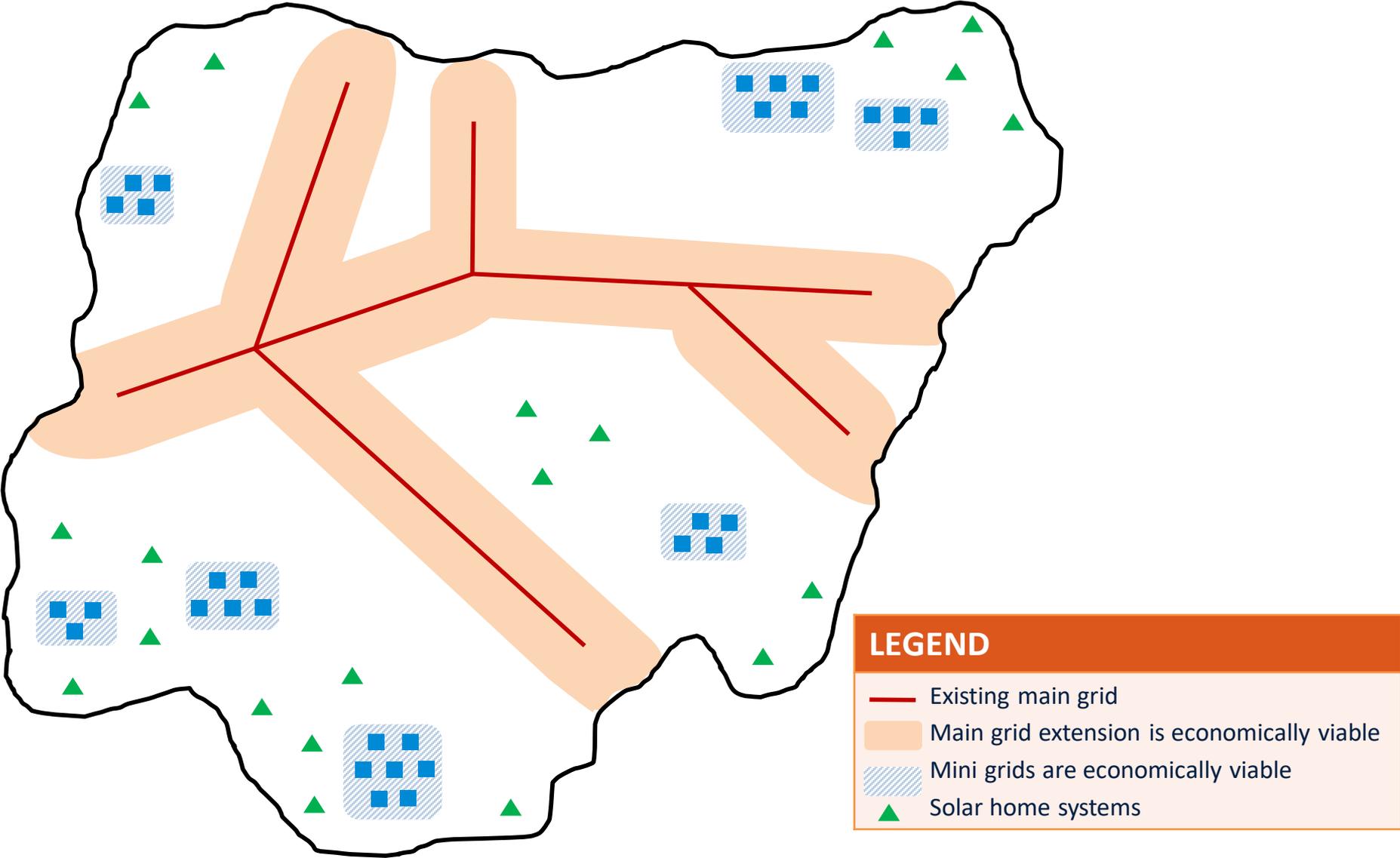
- **Entry** to the market
- **Retail tariff**—tariff charged to customers
- **Service standards**—quality of power, quality of supply, quality of commercial services
- **Technical standards**—safety, equipment or construction quality, connection with the main grid, environmental sustainability
- **Relationship with the main grid**—commercial options available for the mini grid developer when the main grid arrives

An Analytical Framework Based on Six Case Studies

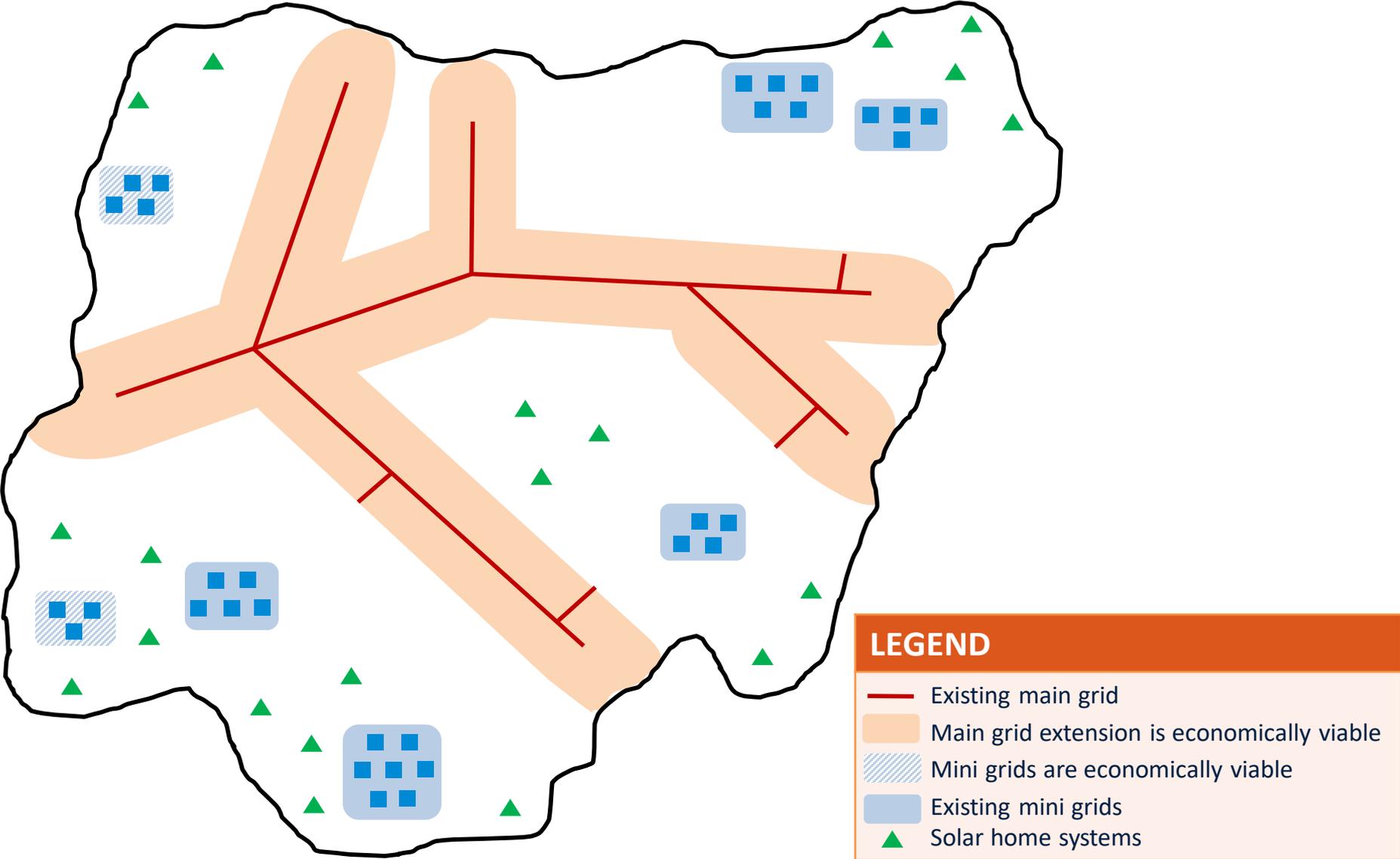
Location		People served by private mini grids	Average tariff for private mini grids
Bangladesh			21,000 US\$0.36/kWh
Cambodia			5,900,000 US\$0.24/kWh
Kenya			6,000 US\$1.89/kWh
Nigeria			9,000 US\$0.60/kWh
Tanzania			45,000 US\$0.97/kWh
Uttar Pradesh, India			230,000 US\$1.19/kWh

3 Conference case studies are available on the World Bank Open Knowledge Repository: <https://openknowledge.worldbank.org/>

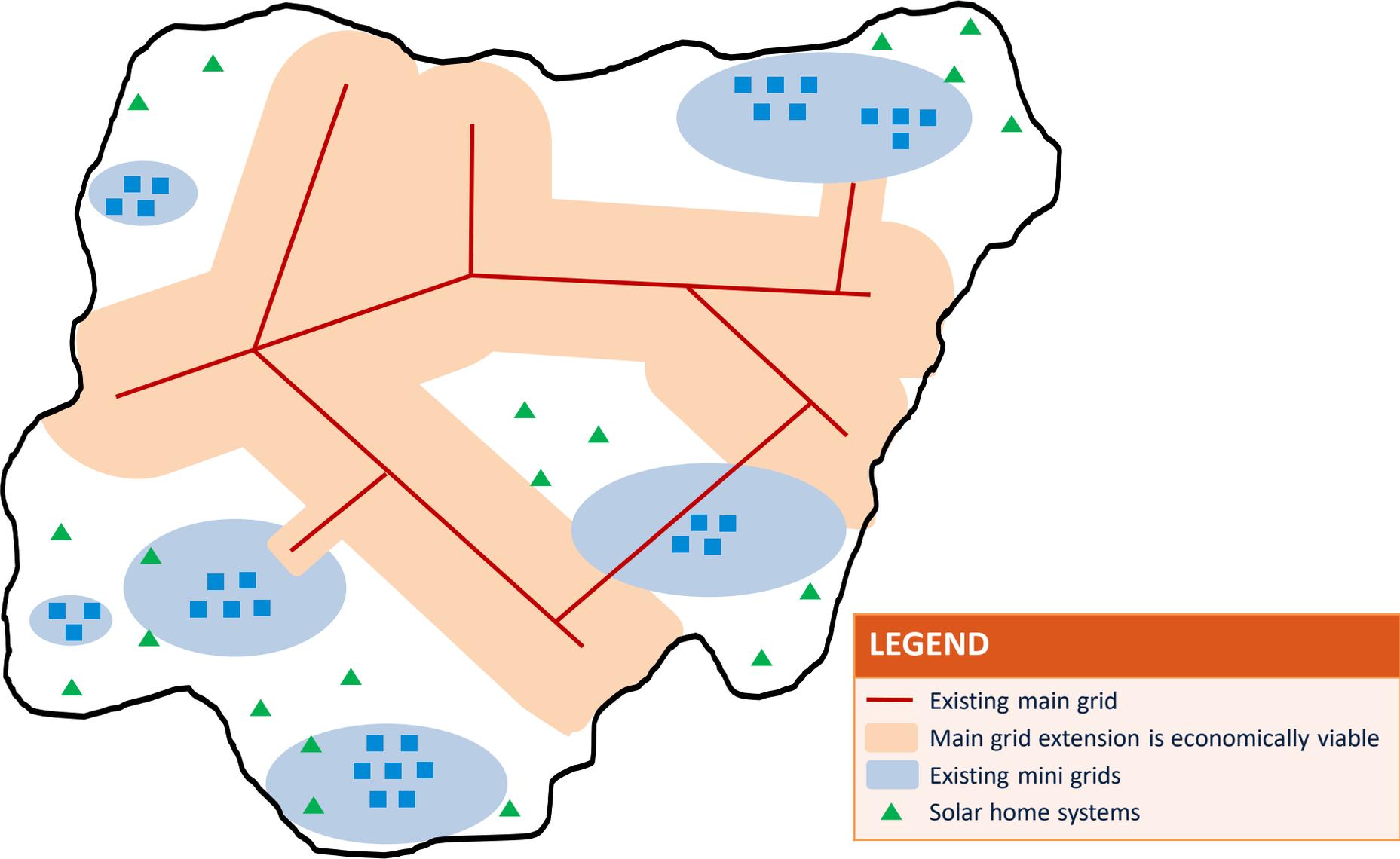
Mini Grids Evolve Over Time



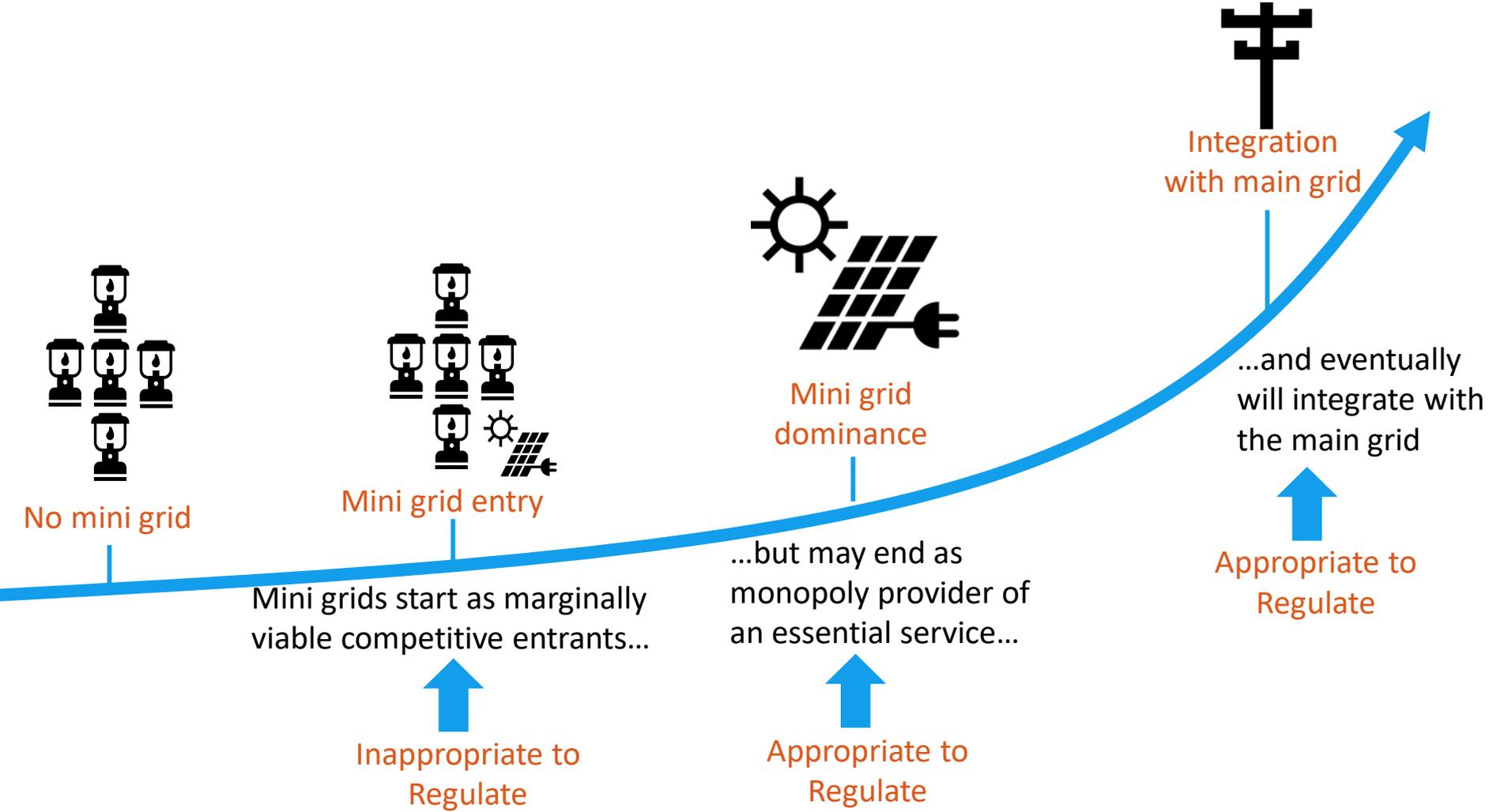
Mini Grids Evolve Over Time



Mini Grids Evolve Over Time

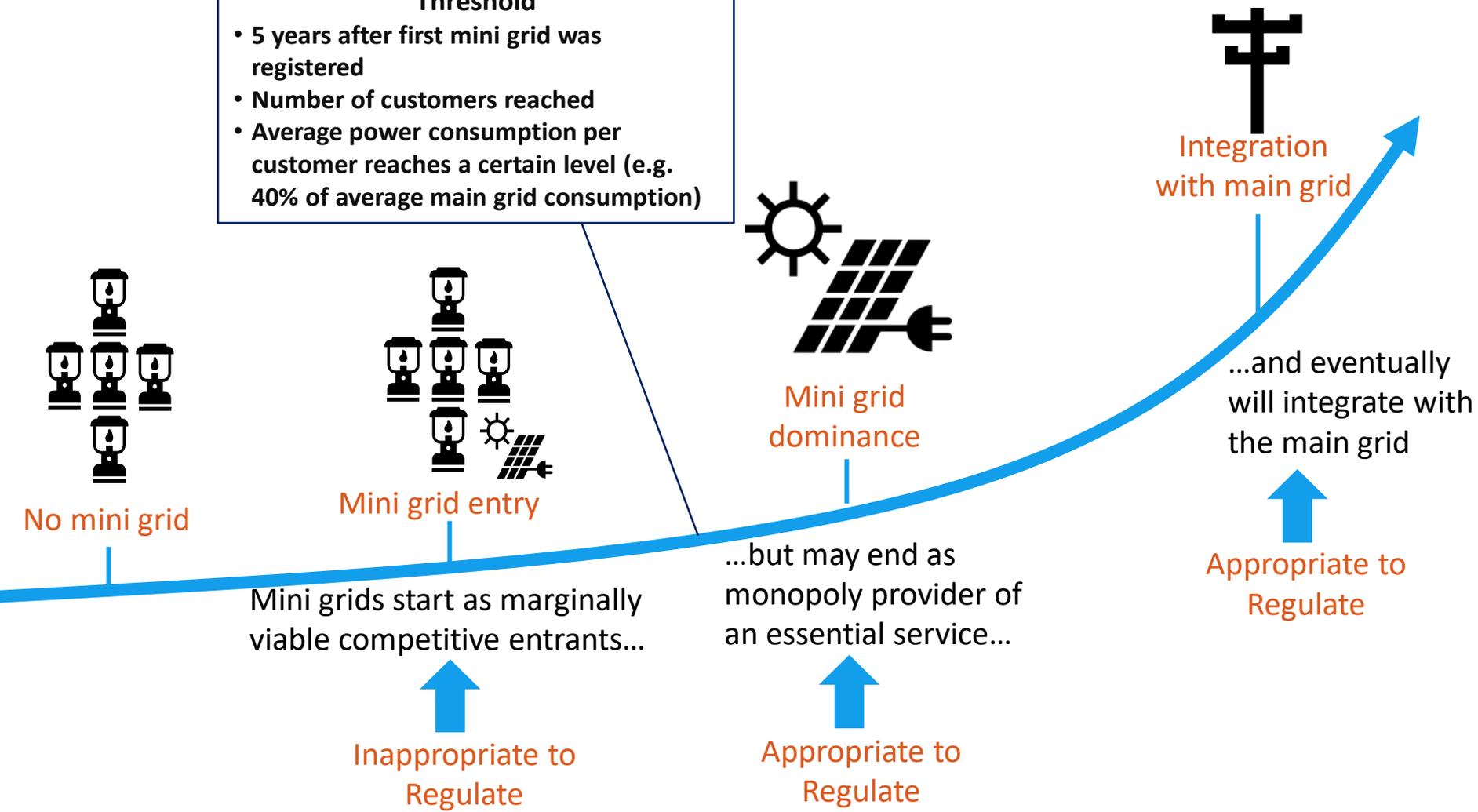


Regulations Should Evolve Too



Regulations Should Evolve Too

- Threshold**
- 5 years after first mini grid was registered
 - Number of customers reached
 - Average power consumption per customer reaches a certain level (e.g. 40% of average main grid consumption)



Mini Grid Regulation: Scenario Recommendations

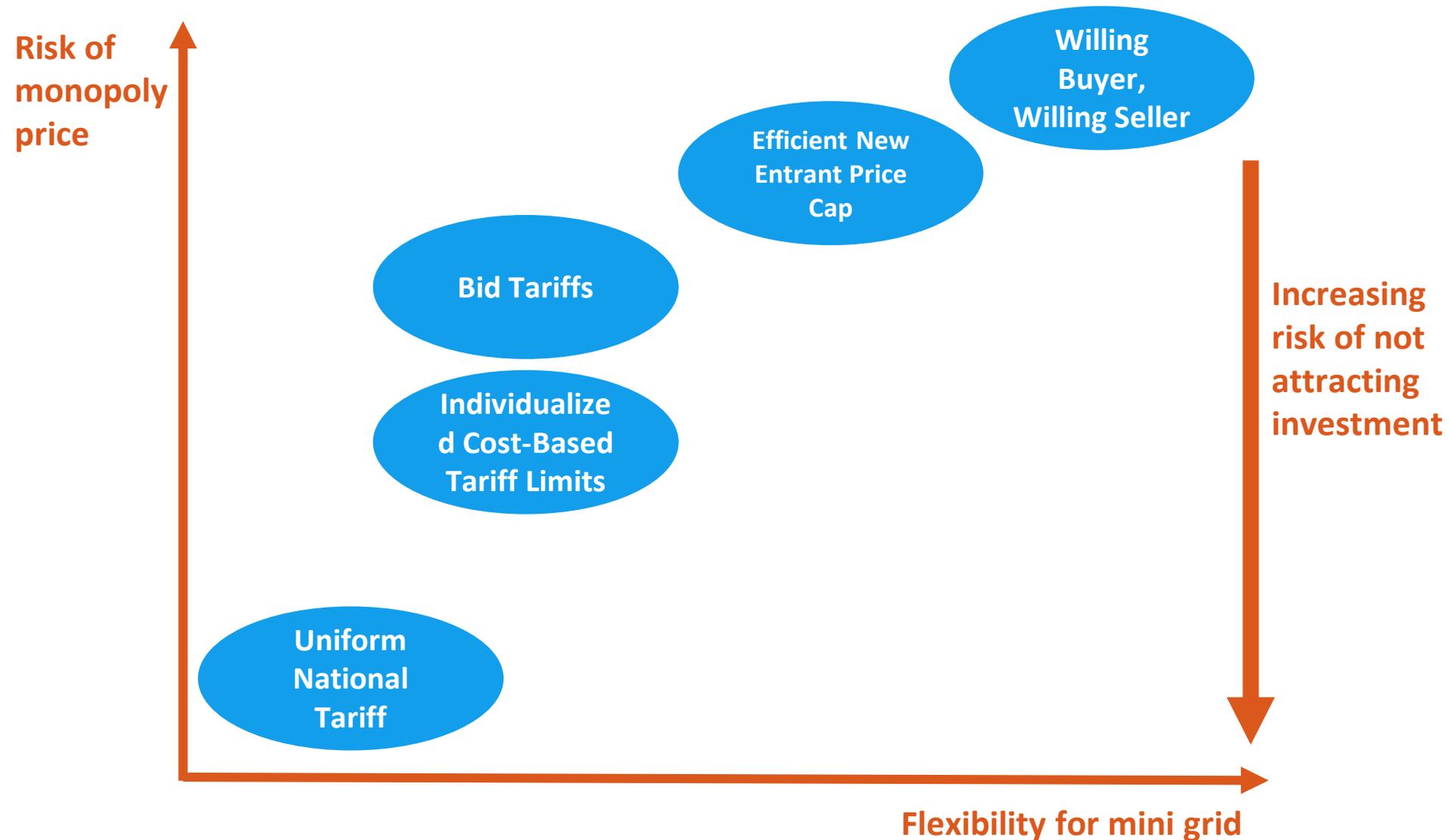
Scenario: rapid electrification goal, low government capacity, low fiscal capacity

Topic	Entry	Dominance	Integration
Entry	Registration	Permit/license	Permit/license
Tariffs	Willing buyer, willing seller	Individualized cost-based tariffs	Individualized cost-based tariffs
Service standards	Reporting	Uniform mini grid-specific standards	Main grid-level standards
Technical standards	Safety standards Optional grid compatible standards	Safety standards Optional grid compatible standards	Safety standards Grid compatible standards
Commercial options for integration	SPP, SPD, SPP+SPD, asset buyout	SPP, SPD, SPP+SPD, asset buyout	Mini grid chooses one option among SPP, SPD, SPP+SPD, asset buyout

SPP : Small Power Producer

SPD: Small Power Distributor

Regulating Retail Tariffs



Regulating Retail Tariffs

Option	Description	Examples
Willing Buyer-Willing Seller	<ul style="list-style-type: none"> Tariff set at a price that the mini grid and the customer agree on Variants include: i) individually-negotiated agreement; ii) tariff set by mini grid and customer chooses to sign up or not; iii) tariff agreed between mini grid and community 	<ul style="list-style-type: none"> Cambodia (pre 2001) Uttar Pradesh (mini grids without state subsidies—all as of 2017) Nigeria (isolated mini grids below 100kW of distributed power) Tanzania (below 100kW)
Efficient New Entrant Price Cap	<ul style="list-style-type: none"> A single benchmark tariff is used for all mini grids Regulator sets this benchmark tariff at a level estimated to be the cost of service of an efficient new entrant in the market 	<ul style="list-style-type: none"> Bangladesh (all solar PV-diesel mini grids must charge a tariff capped at BDT 30 (US\$0.36) per kWh)
Individualized Cost-Based Tariff Limits	<ul style="list-style-type: none"> Regulator sets limits on tariffs for each mini grid individually, based on an estimate of the cost-recovery tariff for that mini grid 	<ul style="list-style-type: none"> Cambodia (as of 2017) Nigeria (isolated mini grids above 100kW of distributed power) Kenya (all mini grids as of 2017) Tanzania (mini grids above 100kW)
Bid Tariffs	<ul style="list-style-type: none"> Mini grid investor gains the right to serve an area by bidding the lowest tariff in a competitive tender 	<ul style="list-style-type: none"> Madagascar (as of 2015, 65 mini grids projects bid out) Uganda (one tender in 2003, and one in 2017 to electrify 25 villages)
Uniform National Tariff	<ul style="list-style-type: none"> Mini grid tariff is set at the national main grid tariff 	<ul style="list-style-type: none"> Cambodia (grid-connected SPDs as of 2017)

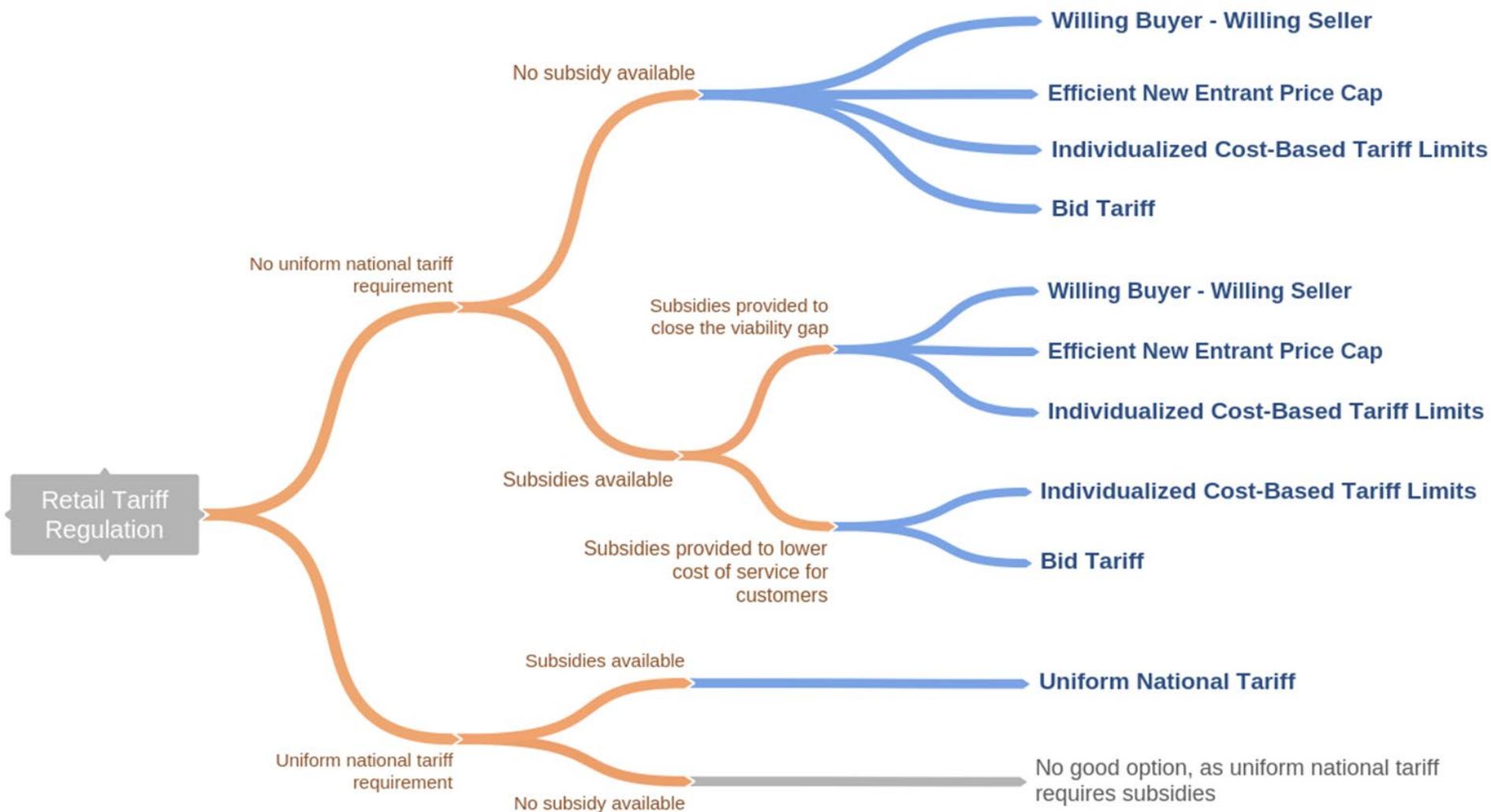
Regulating Retail Tariffs

Option	Suitable Where	Disadvantages
Willing Buyer-Willing Seller	<ul style="list-style-type: none"> ✓ Mini grids are unlikely to make supernormal profits if given pricing freedom ✓ Policy objective to expand electrification quickly ✓ Distribution company provides unreliable supply of electricity ✓ Willingness to maximize tariff flexibility and investors' returns ✓ Low administrative capacity 	<ul style="list-style-type: none"> x Could result in monopoly pricing x May be difficult to adjust tariffs over time x Asymmetry between customers and developer x One-sided adhesion contracts difficult politically
Efficient New Entrant Price Cap	<ul style="list-style-type: none"> ✓ Cost of service expected to be uniform across communities ✓ Monopolies need to be controlled without the cost and complexity of individualized utility-style control ✓ Moderate to high administrative capacity 	<ul style="list-style-type: none"> x Costs will vary between service areas, so a single tariff will not reflect cost everywhere x Monopoly pricing may remain in some areas x Level of tariff may be controversial
Individualized Cost-Based Tariff Limits	<ul style="list-style-type: none"> ✓ Monopolies need to be protected against while allowing reasonable returns ✓ Cost of service not expected to be uniform across communities ✓ High regulatory capacity 	<ul style="list-style-type: none"> x Setting individual tariffs is labor and time intensive x Creates risk of misuse of regulatory discretion

Regulating Retail Tariffs (cont.)

Option	Suitable Where	Disadvantages
Bid Tariffs	<ul style="list-style-type: none"> ✓ Centrally coordinated approach to scale up electrification through mini grids ✓ Monopolies need to be protected against while allowing reasonable returns ✓ Enough mini grid developers to compete for each area ✓ High administrative capacity 	<ul style="list-style-type: none"> x Changing the tariff over time cannot be done through bidding x Running a tender can be costly and complex
Uniform National Tariff	<ul style="list-style-type: none"> ✓ Strong political pressure for uniform electricity prices ✓ Subsidy provider is creditworthy ✓ Expanding electrification quickly is not a priority ✓ High administrative and financial capacity that can be sustained over time 	<ul style="list-style-type: none"> x Requires ongoing subsidy x High risk of not attracting investment and not sending efficient price signal x Administratively complex x Driven by political considerations

Regulating Retail Tariffs



Main Takeaways

1. **Mini grids are complementary to the main grid**—regulation may be designed to ensure that mini grids built now can be integrated to the main grid later
2. **Mini grids evolve from competitive entrants to monopoly providers of an essential service**—regulation should evolve too
3. **There is no one-size fits all solution to mini grid regulation**—regulation should be adapted to a country's electrification objectives, maturity of mini grid market, government administrative and fiscal capacity

CONTACTS

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