

MINI GRIDS AND THE PRIVATE SECTOR

MINI GRIDS FOR A HALF-BILLION PEOPLE



WORLD BANK GROUP

Energy & Extractives

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Mini grids for half a billion people

Where we are today ... 47 million people connected to 19,000 mini grids

Where we need to be by 2030 ... 490 million people connected to 210,000 mini grids

10 building blocks needed to achieve scale ... (i) solar-hybrid technology and costing, (ii) geospatial portfolio planning, (iii) income-generating uses of electricity, (iv) community engagement, **(v) local and international industry**, (vi) access to finance, (vii) training and skills-building, (viii) institutional framework, (ix) workable regulations, (x) enabling business environment

Private sector participation in mini grids

- Why private sector? Incentives ... to obtain commercially-viable returns on delivering electricity and lower cost and supporting measures to increase demand
- Financial commitments stand only at half of needed investment to achieve SDG7 ... need to attract more diverse capital
- Money being spent by the off-grid population on energy solutions ... \$37 billion on kerosene and biomass, opportunity to tap into existing market
- Mini grids connect customers at ~50% cost of traditional grid ... still require \$220 billion investment
- Modern mini grids offer payback periods of <12 months on more than 30 productive use appliances
- Technology costs continue to decline ... key component costs down 62-85% over last 8 years, making mini grids more economic

Private sector positioned to offer cost-competitive solar-hybrid solutions that can underpin income-generating activities

Private sector participation across mini grid value chain



- Component manufacturing: solar, storage, diesel generator, power electronics, etc.
- Market assessment: evaluate viability, use geospatial data for portfolio approach; also factor in density, customer mix, etc.
- Permitting and finance: obtain license to operate, capitalize through grant/equity/debt
- Design and procurement: Use load profile estimate, run sensitivities in HOMER, validate business case, use volume purchases to drive down individual cost
- Integration and installation: System integrators can develop packaged / containerized systems, utilize local resources to expedite installation
- Operations & Maintenance: digital tools to monitor operations, pay-as-you-go billing
- After sales: operators should evaluate acting as a bundled service provider

As mini grids scale, value chain will evolve from vertically-integrated to specialized

Private sector participation across the mini grid value chain

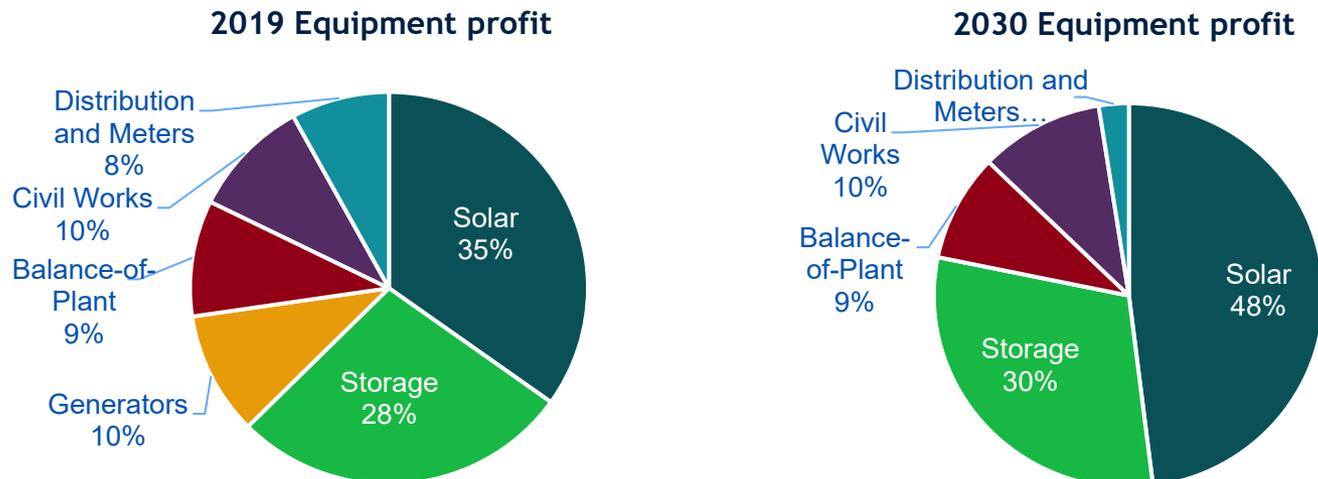
Type	Category	Select companies*	Value chain segment	Primary strategies to:	
				Generate revenue	Manage cost
Operator	ESCO	  	Site assessment, grid setup, O&M, after sales	Sell electricity, other products or services	Local staffing, bulk procurement, digital automation, mobile payment, prepaid meters, replicable processes, fuel hedging
	IPP subsidiary	 			
Utilities	  	Site assessment, grid setup, O&M	Sell electricity		
Facilitator	OEMs	  	Component manufacturing	Sell equipment for mini grids	
	SIs	  	System integration	Procure, design, and install mini grids	Local staffing, mass customized processes, replicable processes
	EPCs	  	Grid design, procurement & installation		
	Finance	  	Procurement & installation, operations & maintenance, after sales	Finance operators, projects, additional goods or services	Data analytics, standardized offerings

Assessing financial profitability of operators

	ESCO 1	ESCO 2	ESCO 3	ESCO 4	ESCO 5	IPP 1	IPP 2	IPP 3
Revenue	\$46	\$85,050	\$1,564	\$40	\$145	\$73.9 M	\$43.7 M	\$10.5 M
Gross Profit	-\$251	\$63,168	\$985	\$4	-\$36	\$32.1 M	\$9.9 M	\$2.5 M
Net Income	-\$2,600	-\$33,448	\$672	-\$11,100	-\$148	\$2.2 M	\$4.8 M	-\$148,000
Net Profit (% of Revenue)	-5454%	-39%	43%	-2744%	-102%	2%	10%	-11%
SG&A (% of Revenue)	2,700%	15%	16%	370%	88%	16%	8%	2%
Asset turnover	0.01	0.15	0.12	0.01	1.88	0.43	0.69	0.32
Return on Assets	-65%	-6%	5%	-32%	-191%	1%	7%	-4%
Current Ratio	7.14	0.81	1.82	0.32	0.04	1.06	1.12	1.06

- Profitability remains challenged: high personnel expense, other revenue (e.g. grants) key to offset more loss, need to incur initial CAPEX, target 1-10% net profit
- Cost containment: SG&A high relative to comps ... focus on hiring local resources, using digital tools to drive productivity
- Low asset turnover / ROA: driven by high investment needed over low revenue base; identify other monetization opportunities
- Capital constraints vary: current ratio varies from low to very high, indicating different available liquidity positions, and thus different focus areas

Equipment value chain profit potential



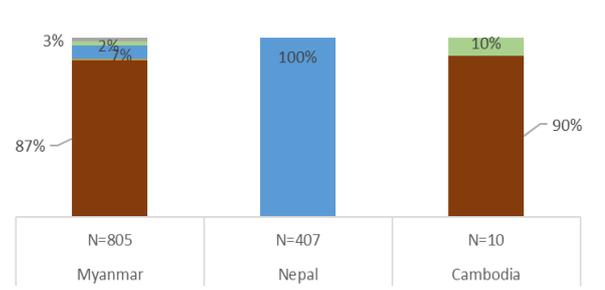
- Profit spans local & international industry; however, international industry better positioned to capture largest equip. profit categories
- Largest mini grid profit associated with developers / operators, for which local industry is positioned ... >\$3 billion annual potential profit by '30
- Generator profit pool eliminated in '30 estimate due to declining solar and storage costs
- Profit share of civil works, distribution and metering compress due to increased competition, little hardware differentiation

\$100B+ equipment opportunity to develop mini grids ... longer-term potential as demand scales

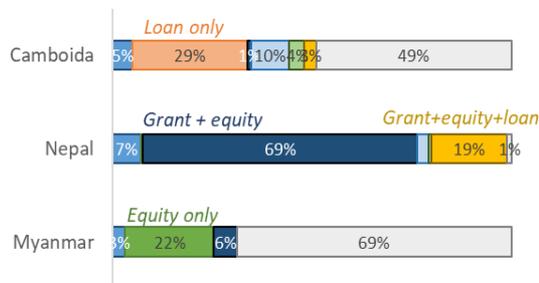
Results from ESMAP's first ever survey of mini grid operators

Select findings

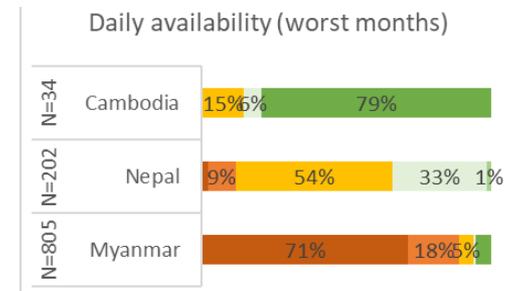
Majority of mini grids diesel-powered; all hydro powered in Nepal



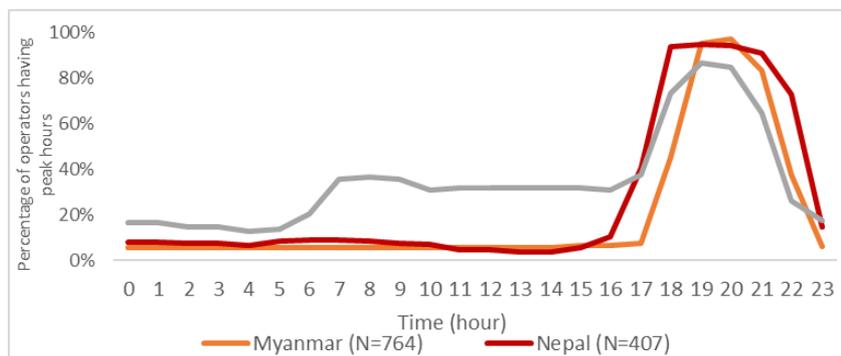
Most capitalized w/ grant & debt; use grant & equity in Nepal



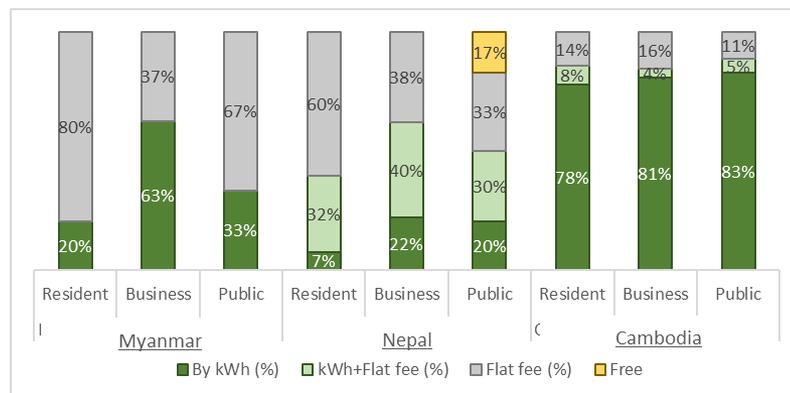
Cambodia: 24 hrs; Myanmar: 0-4 hrs., Nepal: <12 hrs.



Large evening peak, with some productive uses driving day load in Cambodia



Large portion of developers use flat fee in Myanmar & Nepal; volumetric in Cambodia



Full results available in "Mini grids for half a billion people" report

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Partnership among local and international industry

- As market matures, expect increasing specialization across the value chain
- Local and international industry will focus on parts of value chain that align most with their respective competencies:
 - Local industry: aspects which require “boots on ground,” engagement w/ community, labor-intensive processes such as installation
 - International industry: aspects that benefit from scale, low-cost manufacturing footprint, cross-geography replicability, automated processes
- Various partnership structures between local and international companies, including buyer-supplier, channel partner / distributor, cross-channel distribution, investment
- Ultimate goal of partnership is to maximize revenue potential (e.g. new business adjacencies) and minimize cost (e.g. low-cost manufacturing)

Critical to remove barriers such as tariffs, local content requirements, etc. that will hamper collaboration among local and international industry

Thank You!

Please read ESMAP's report "Mini Grids for Half a Billion People" or reach out to me (rickybuch@gmail.com) for questions

Aaron Leopold

CEO, Africa Minigrid Developers
Association (AMDA)

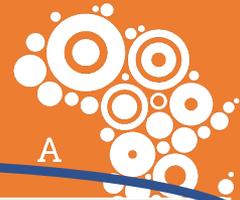
Two contrasting approaches to minigrids

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	Senegal	Nigeria
Approach	<ul style="list-style-type: none"> Public ownership of generation and distribution to retain energy as a publicly provided service. Government dictates mini-grid location Government determines price 	<ul style="list-style-type: none"> Private ownership to maximize speed and efficiency of rural electrification. Minigrid firm (<i>decentralized utility</i>) bids on concessions Decentralized utilities negotiate price w/ communities
Role of minigrid (companies)	<ul style="list-style-type: none"> Minigrids are a tool of the government to reach underserved areas. Minigrid companies are government service providers, and do not own the minigrids. 	<ul style="list-style-type: none"> Decentralized utilities reduce rural burden for governments so they can focus on improving “big” grid. Decentralized utilities are private sector owners and operators of grids they build.
Advantages	<ul style="list-style-type: none"> Easy access to finance for grids (government backed) Potentially easier to cross subsidize rural connections 	<ul style="list-style-type: none"> High incentive to improve demand / rural economies High incentive for good quality energy service High incentive for good customer service High incentive to improve efficiency / reduce costs High incentive to bring external investment High incentive to expand and create jobs
Disadvantages	<ul style="list-style-type: none"> Little incentive to improve demand / rural economies Little incentive to improve quality Little incentive for good customer service Little options for communities left behind Little incentive to increase efficiency / reduce subsidy Little incentive to bring external investment Little incentive to expand and create jobs 	<ul style="list-style-type: none"> Difficult for companies to access finance (new sector) without support Pricing can be political – but mostly happens only when politicians make it political – not a community issue.

Key takeaways



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	Private sector as consultant & operator	Private sector as owner & operator
Advantages	<ul style="list-style-type: none"> • Easy access to finance for grids (government backed) • Potentially easier to cross subsidize rural connections 	<ul style="list-style-type: none"> • High incentive to improve demand / rural economies • High incentive for good quality energy service • High incentive for good customer service • High incentive to improve efficiency / reduce costs • High incentive to bring external investment • High incentive to expand and create jobs
Disadvantages	<ul style="list-style-type: none"> • Little incentive to improve demand / rural economies • Little incentive to improve quality • Little incentive for good customer service • Little options for communities left behind • Little incentive to increase efficiency / reduce subsidy • Little incentive to bring external investment • Little incentive to expand and create jobs 	<ul style="list-style-type: none"> • Difficult for companies to access finance (new sector) without support • Pricing can be political – but mostly happens only when politicians make it political – not a community issue.

Disadvantages of service provider model involve significant government & utility change, and are much more difficult to overcome than overcoming challenges in partner model.

Nicole Poindexter

CEO, Energinity Corp.