

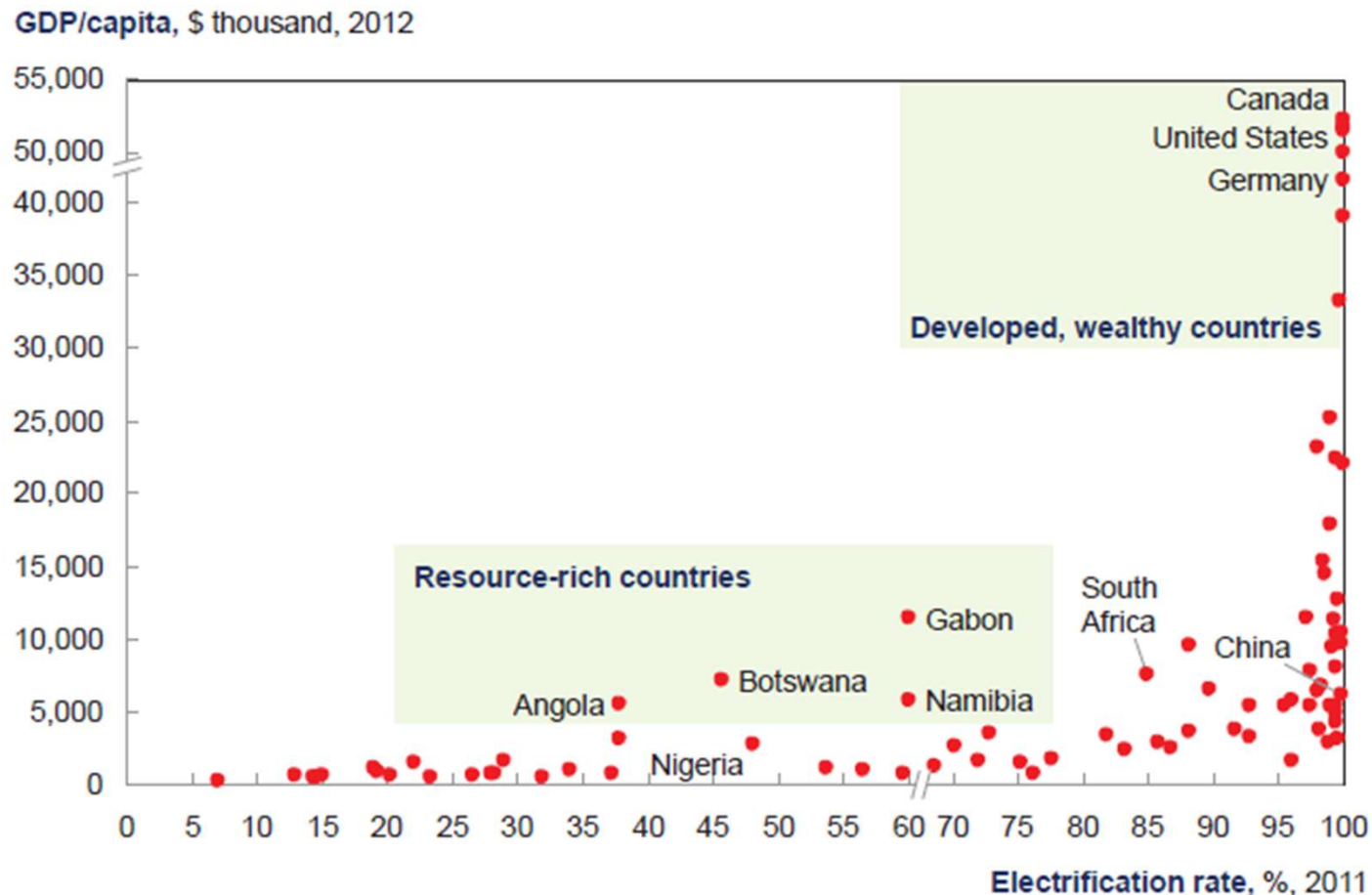
Measuring Impact to Unlock Capital for Energy Access

IMAP Lunch Seminar
November 20, 2025

Summary

- **Trap: nexus of poverty and lack of electricity in rural developing world**
- **Business innovation: solar-based energy access businesses that avoid costly electricity grid extension**
- **Problem: insufficient capital to energy access businesses**
- **Financial innovation: blended capital stack and impact metrics**
- **Question: how to unlock more and different sources of capital?**

High Per Capita GDP Requires >95% Electrification



Source: Electricity Access Database, World Energy Outlook, International Energy Agency, 2011, worldenergyoutlook.org, © OECD/IEA 2013; IHS Economics; World Development Indicators, World Bank Group, worldbank.org

Source: McKinsey & Co, Brighter Africa: The Growth Potential of the Sub-Saharan Electricity Sector, 2015

Energy in the Rural Developing World



Electricity Service “Tiers” in Developing Economies

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3 ^a	TIER 4	TIER 5
Capacity	Power capacity ratings	Less than 3 W	At least 3 W	At least 50 W	At least 200 W	At least 800 W	At least 2 kW
	(W or daily Wh)	Less than 2 Wh	At least 12 Wh	At least 200 Wh	At least 1 kWh	At least 3.4 kWh	At least 8.2 kWh
	Services		Lighting of 1,000 lmhr per day	Electrical lighting, air circulation, television, and phone charging are possible			
Availability ^a	Daily Availability	Less than 4 hours	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	Less than 1 hour	At least 1 hour	At least 2 hours	At least 3 hours	At least 4 hours	
Reliability		More than 14 disruptions per week			At most 14 disruptions per week or At most 3 disruptions per week with total duration of more than 2 hours"	(> 3 to 14 disruptions / week) or ≤ 3 disruptions / week with > 2 hours of outage	At most 3 disruptions per week with total duration of less than 2 hours
Quality		Household experiences voltage problems that damage appliances				Voltage problems do not affect the use of desired appliances	
Affordability		Cost of a standard consumption package of 365 kWh per year is more than 5% of household income			Cost of a standard consumption package of 365 kWh per year is less than 5% of household income		
Formality		No bill payments made for the use of electricity				Bill is paid to the utility, prepaid card seller, or authorized representative	
Health and Safety		Serious or fatal accidents due to electricity connection				Absence of past accidents	

Source: ESMAR, 2015

Source: GEAPP, “Powering the Last Mile”

3+ orders of magnitude in wattage between grid power (Tier 5) and entry-level electricity access (Tier 0)

Solar Home Systems In Lieu of Grid Extension

Tier 0



- Small portable solar lantern with internal battery

Tier 1



- 10-50W Solar panel mounted on rooftop
- Indoor ceiling lamps, charging for cell phone & radio
- Wiring and controller unit (switch, battery)

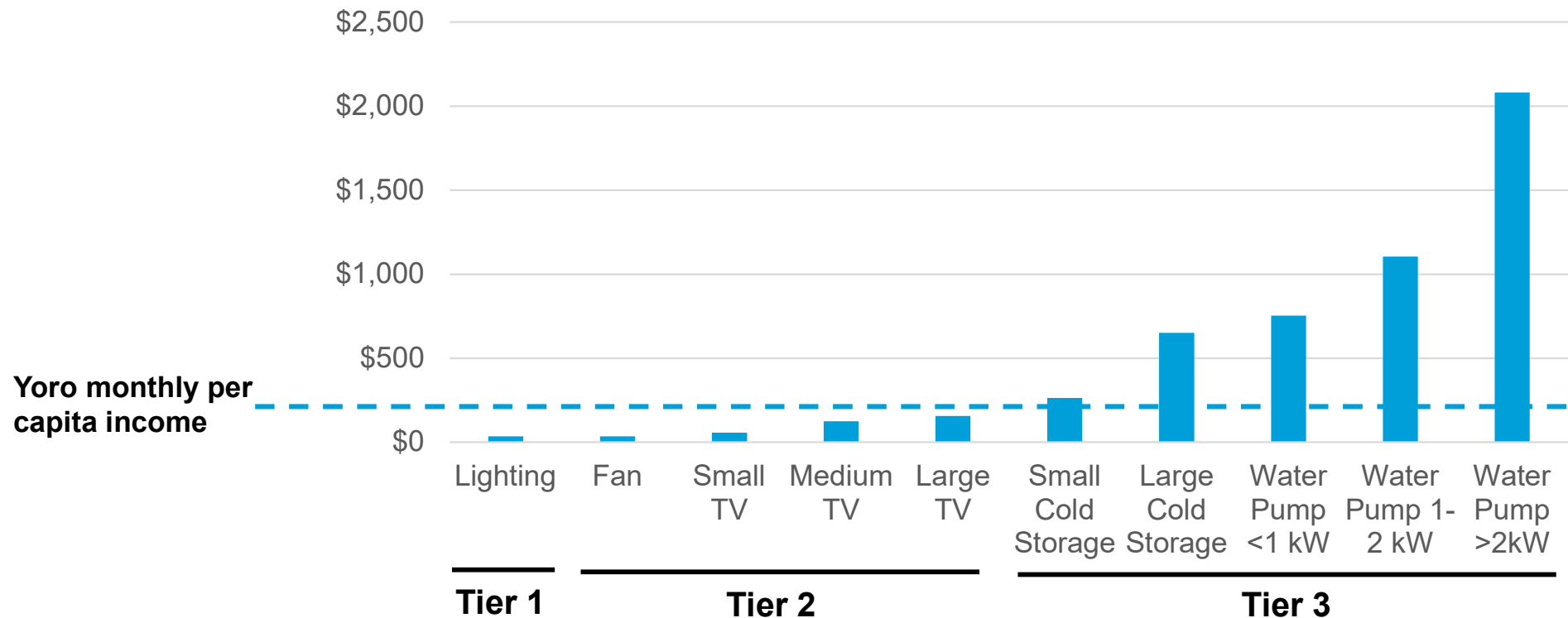
Tier 2



- Larger 50-200W solar panel, charge controller, and larger battery
- Able to power a few more devices (e.g., TV, fans, satellite dish, computer)

Solar Home Systems Unaffordable w/o Financing

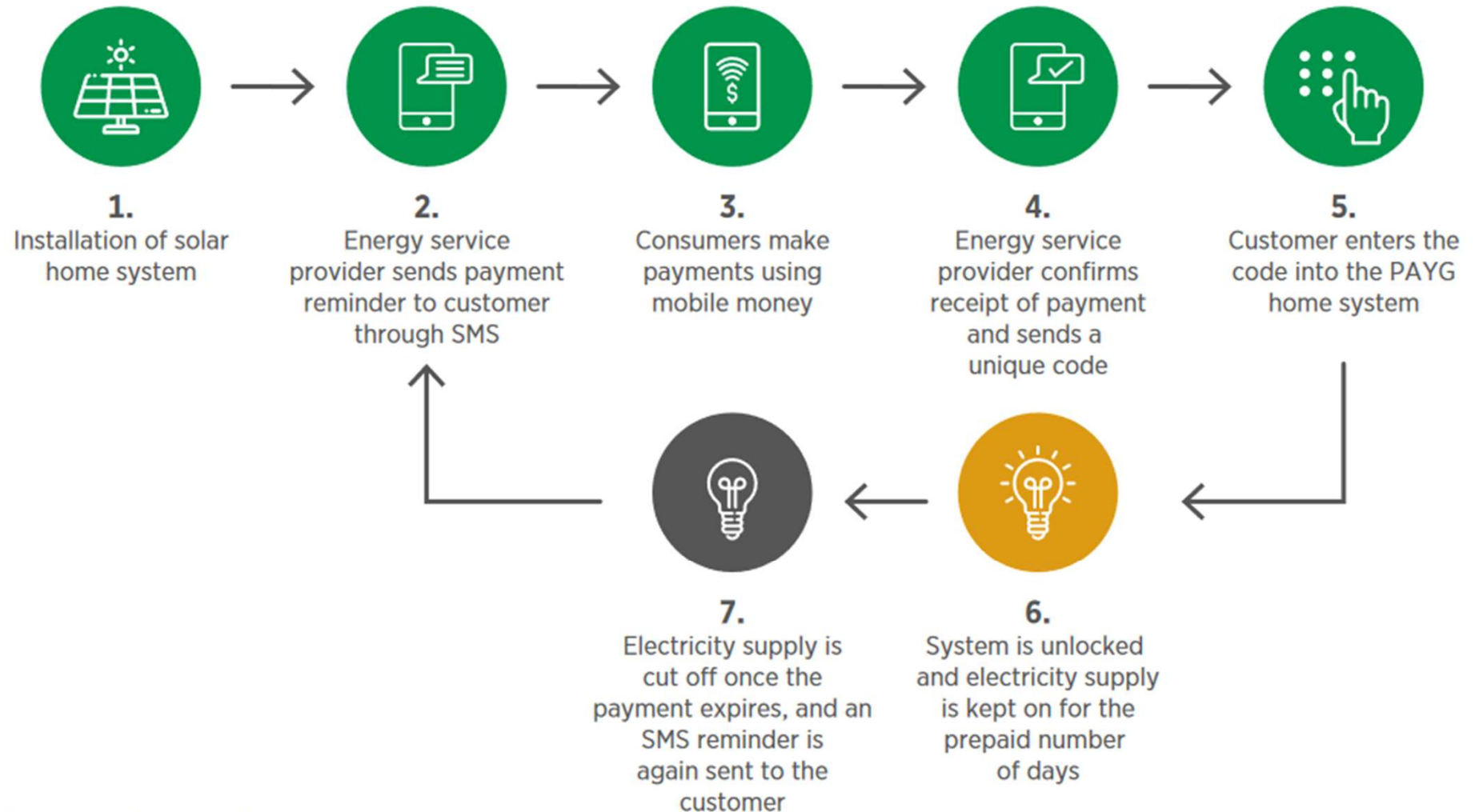
Median Cash Prices for Solar Appliances



Financing required...but from where/whom?

Source: GOGLA, "Off-Grid Solar Market Trends Report 2022"

Pay-As-You-Go Financing of Solar Home Systems

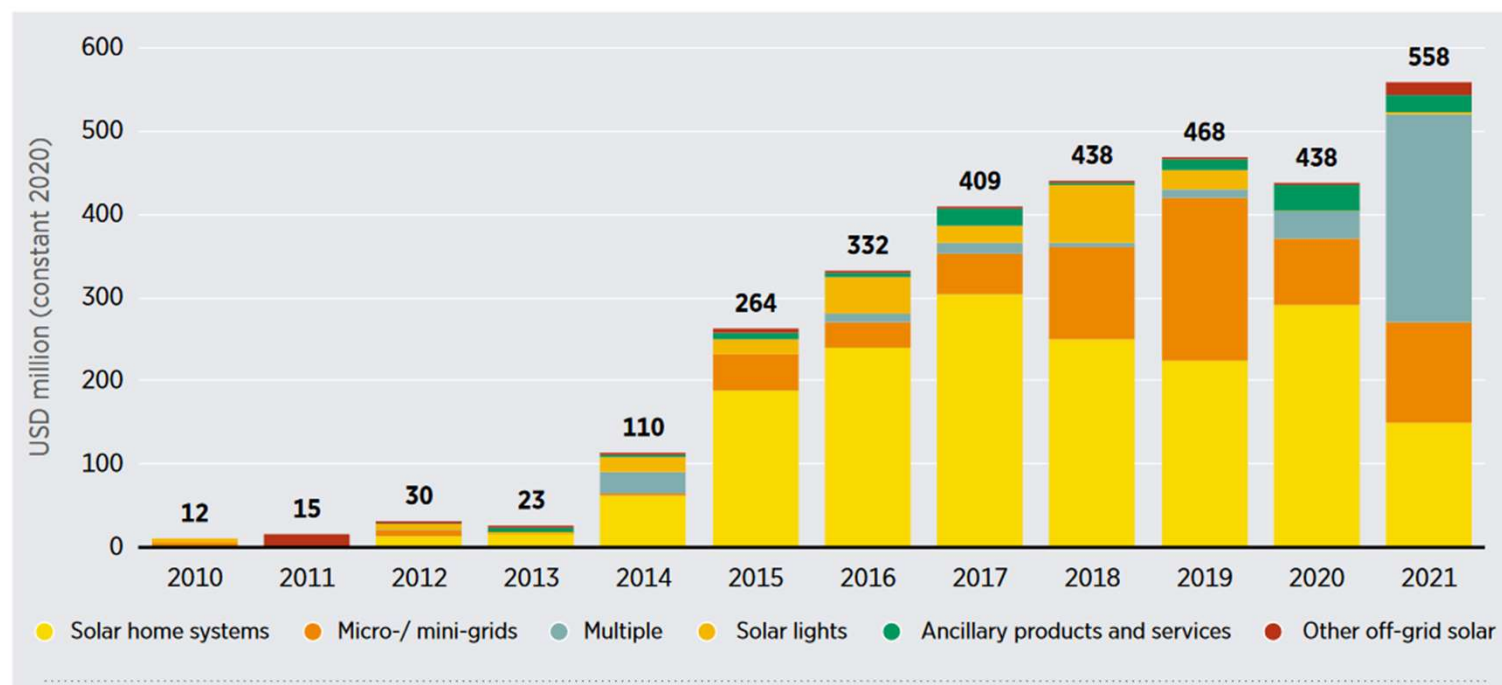


Based on: Energypedia (n.d.).

Source: IRENA, "Pay-As-You-Go Models", 2020

Energy Access Capital Gap

Figure S.6 Annual investment in off-grid renewable energy, by off-grid product, and energy use, 2010-2021



Far below
\$1 billion
per year
globally

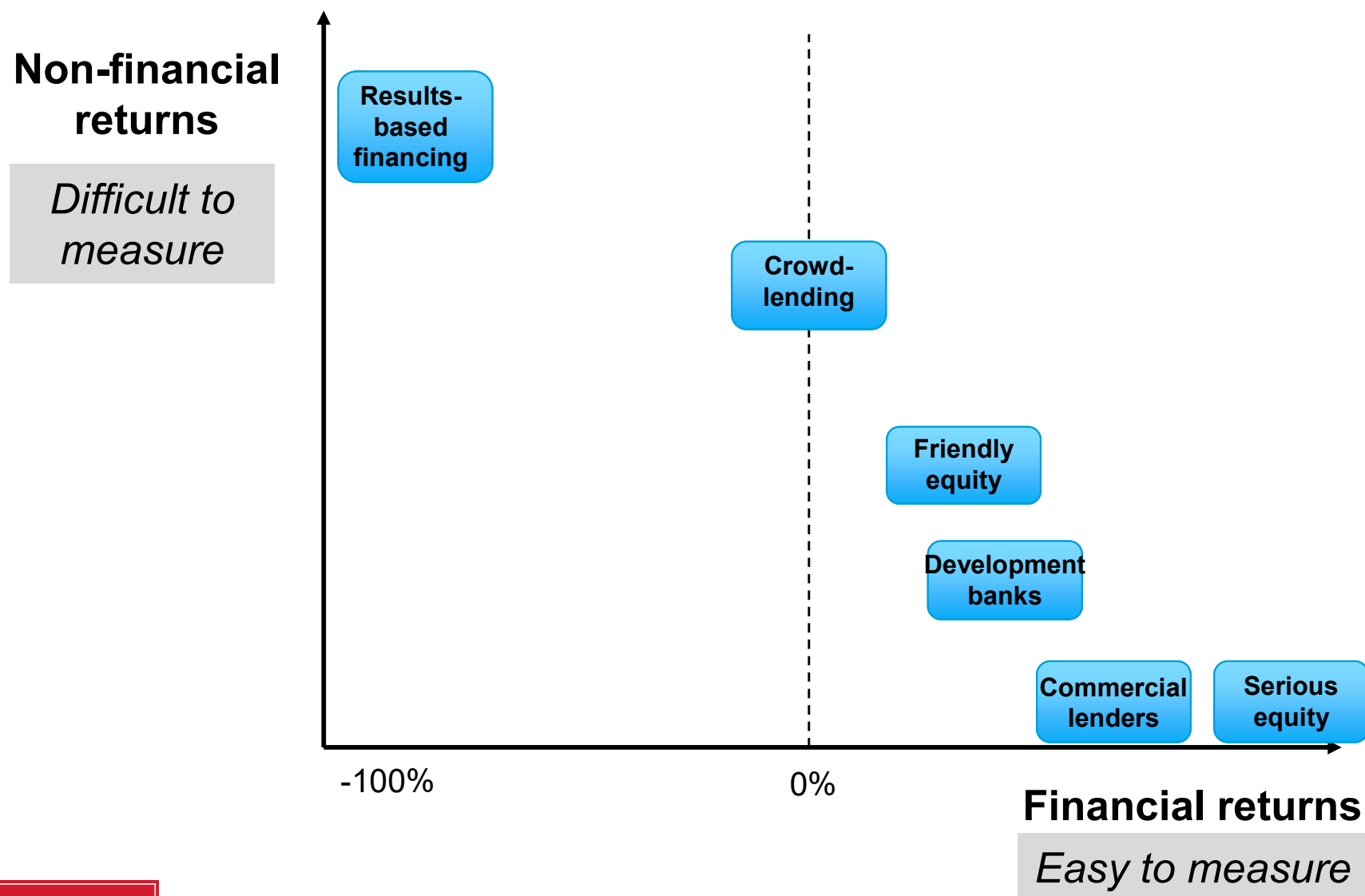
<\$1.00 per
person
lacking
energy
access

Source: IRENA, “Global Landscape of Renewable Energy Finance”, 2023

Potential Capital Sources to Fill Gap

Capital source	Motivation	Main concern
Equity investors (“friendly”)	Support a business founded by a friend	Will the business survive and produce impact?
Equity investors (“serious”)	Gain future upside from business (dividends + exit)	Will a financial return ever be generated?
Commercial lenders	Earn market-based financial return on a structured loan	Will cash flows be sufficient to cover monthly payments?
Development banks	Sponsor economic development while producing positive ROI	Will both loans be repaid and economic development occur?
Below-market loans from crowdlending platform (e.g., Kiva)	Allocate small portion of wealth to sequentially lend to improve prospects of underprivileged individuals	Will my loans really create promised impact to sponsored individuals?
Results-based financing (individual donors, NGOs & philanthropies)	Bridge affordability gaps to increase social impact of interest to capital provider	Will the business produce desired social impact?
Customers	Achieve household and livelihood improvement (financial and non-financial)	Will the product I obtain (under a loan) produce expected benefits?

Dimensions of Investment Returns



Unlocking Greater Access to Impact Capital

Individual contributors want to know:



How much would this family's quality of life really improve if a Kiva user decided to lend \$50 towards a solar home system?

Larger donors want to know:



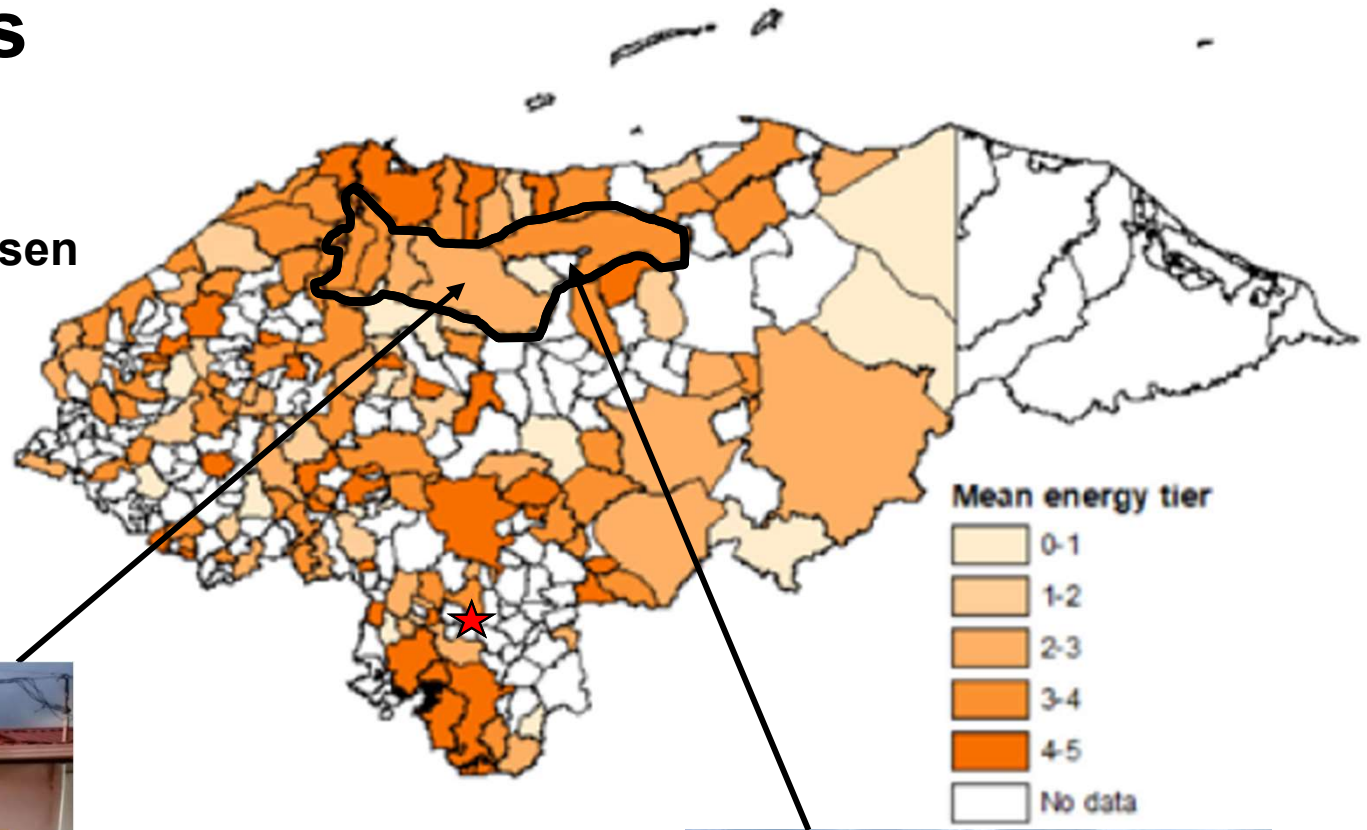
How much would social outcomes in this community really improve if a donor decided to contribute a \$50,000 RBF donation to an energy access business serving villages in this area?

Soluz Honduras



Richard Hansen
(MBA, '81)

- 40 years of advancing off-grid solar solutions in developing economies
- **Founder, Soluz Honduras**



Source: The Energy Access Dividend in Honduras and Haiti, IADB, 2019

Soluz Blended Capital Stack

Capital source	Use of funds	Desired returns
Equity investors	Startup capital and working capital for business	“Warm glow” from supporting Soluz + prospect of future upside
Commercial lenders	Working capital for procuring product inventory	Market-level financial returns from impact investors
Crowdlending (Kiva)	Principal for Soluz loan agreement with customer (24 months, 2% per month)	Demonstrated results aligned with social mission of Kiva and their lenders
Philanthropic donors	Up-front price discount to customer + buy-down of Soluz logistical costs to serve last mile households	Return of capital (to be recycled) + “warm glow” from helping identified household
Customers	Initial down-payment plus monthly loan payments for obtained solar home system	ROI from reduced ongoing expenditures (batteries, candles) + improved quality of life

NEWS

The Missing Metric: Why Measuring Impact Return Is Essential to Ending Energy Poverty

Debora Hoffman • August 12, 2025



By Jesse Colman, Richard Stuebi, and Nalin Kulatilaka

“...much of Soluz’s impact is non-financial. Families enjoy healthier indoor air. The risk of fire is reduced. Children can study after dark. Women report feeling safer in their homes and more empowered. Some families only purchased cell phones once they had in-home solar power. Entire villages benefit from improved communication and commerce. These changes ripple outward – contributing to rural stability, reducing migration to overburdened cities, and enabling broader economic development.

Yet these non-financial benefits remain largely invisible in standard financial analysis. As a result, most traditional capital providers overlook opportunities like Soluz – not because they are unviable, but because traditional financial metrics fail to fully reflect reality.”

Envisioned Research Program

Goal

Increase
capital flows
to energy
access
businesses

Outputs

- Case studies for teaching
- Thought-leadership documents for energy access market
- Event on global finance for energy access
- Financial innovations leading to fund for energy access?

Next Research Project Under Development

Goal

Improve non-financial metrics and measurement

- Select cohort of energy access companies from multiple geographies with long track records of survival (including Soluz) willing to be profiled
- For each company in the cohort:
 - Develop clear understanding of blended finance capital stack being utilized
 - Survey customers to obtain data on household-level quality-of-life improvements
 - Assess macro-level social impacts of business over its history
 - Estimate historical non-financial returns to capital providers
 - Document in a case study
- Use case studies to synthesize unified set of conclusions for energy access businesses globally
 - Identify success drivers that are common to many/all cohort companies
 - Surface business model adaptations/variations potentially required to accommodate differences in local operating environment
 - Describe recommended approach for measuring non-financial impact for use by capital providers not driven solely by financial return metrics