SABAH RE² roadmap

Mini-Grid Policy & Financing

by Gabriel Wynn, Green Empowerment

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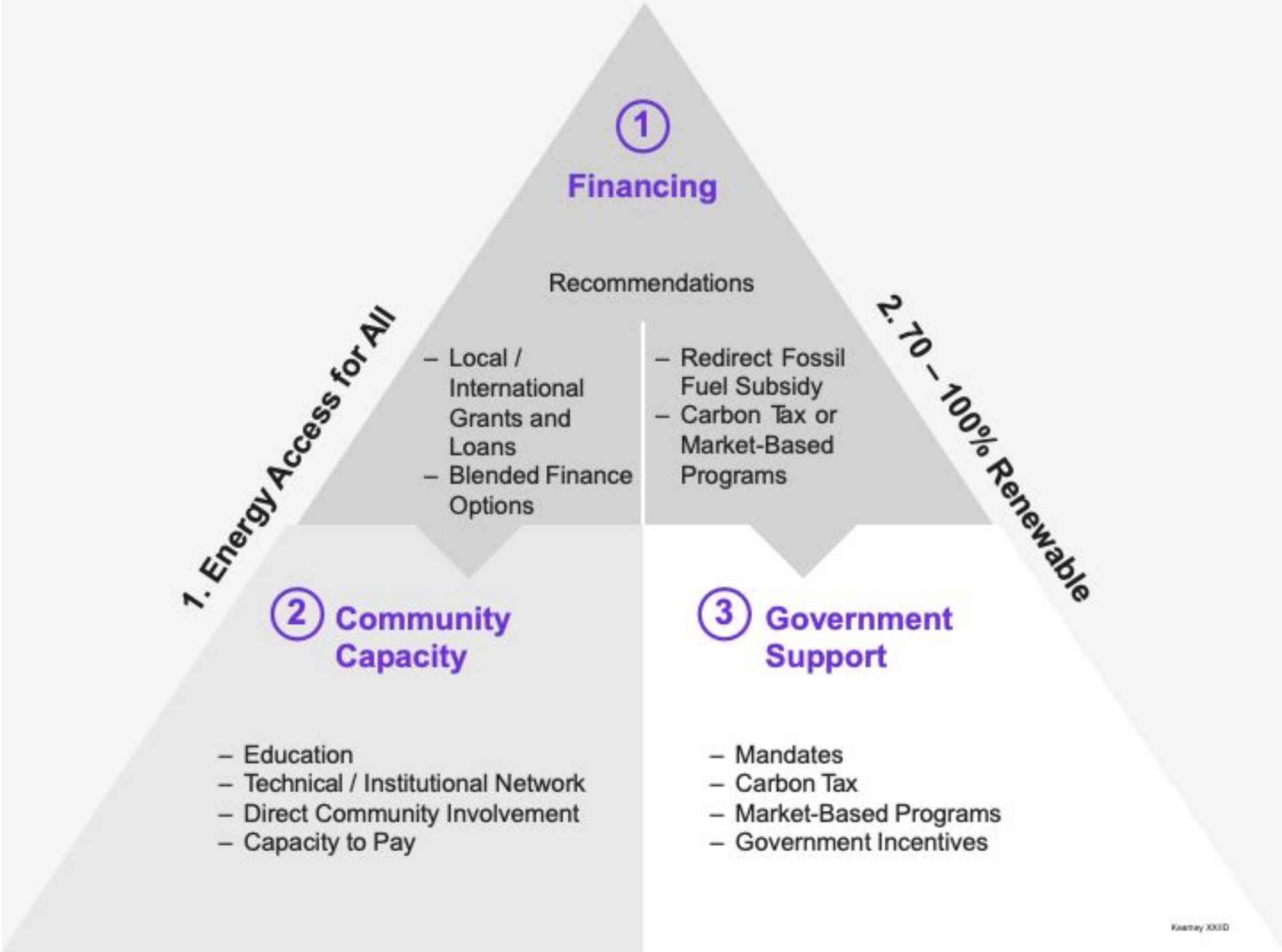
Financing is the key challenge to achieving our missions, while different stakeholder groups are important to meeting each of our missions

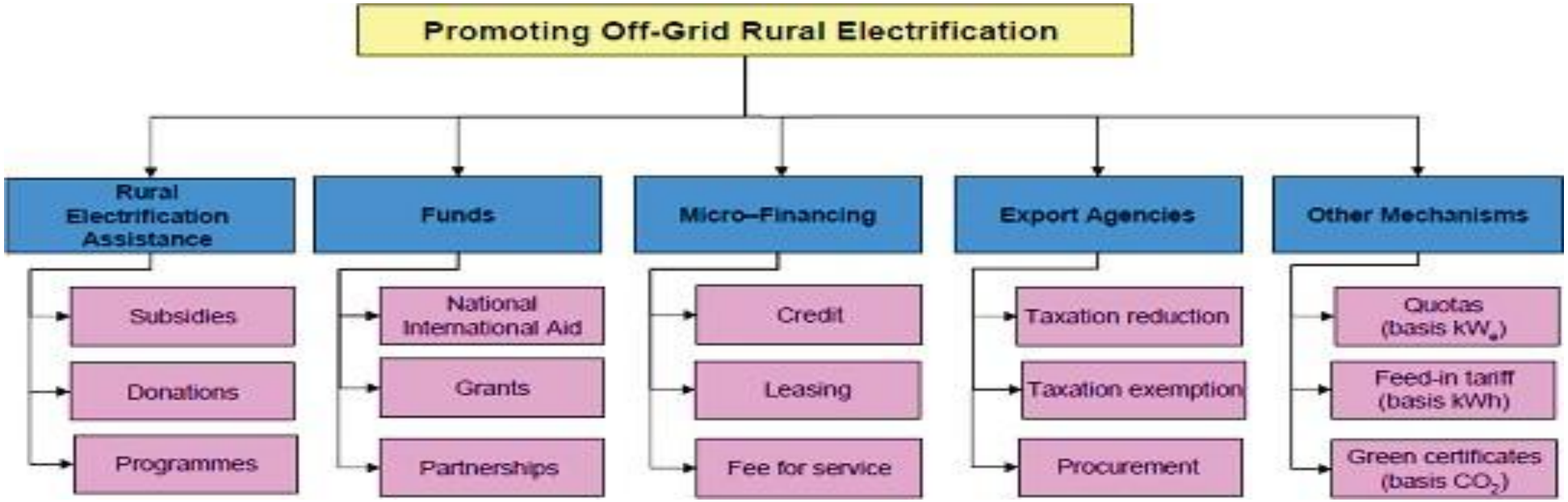


Key Challenges and Recommendations

Financial Barriers

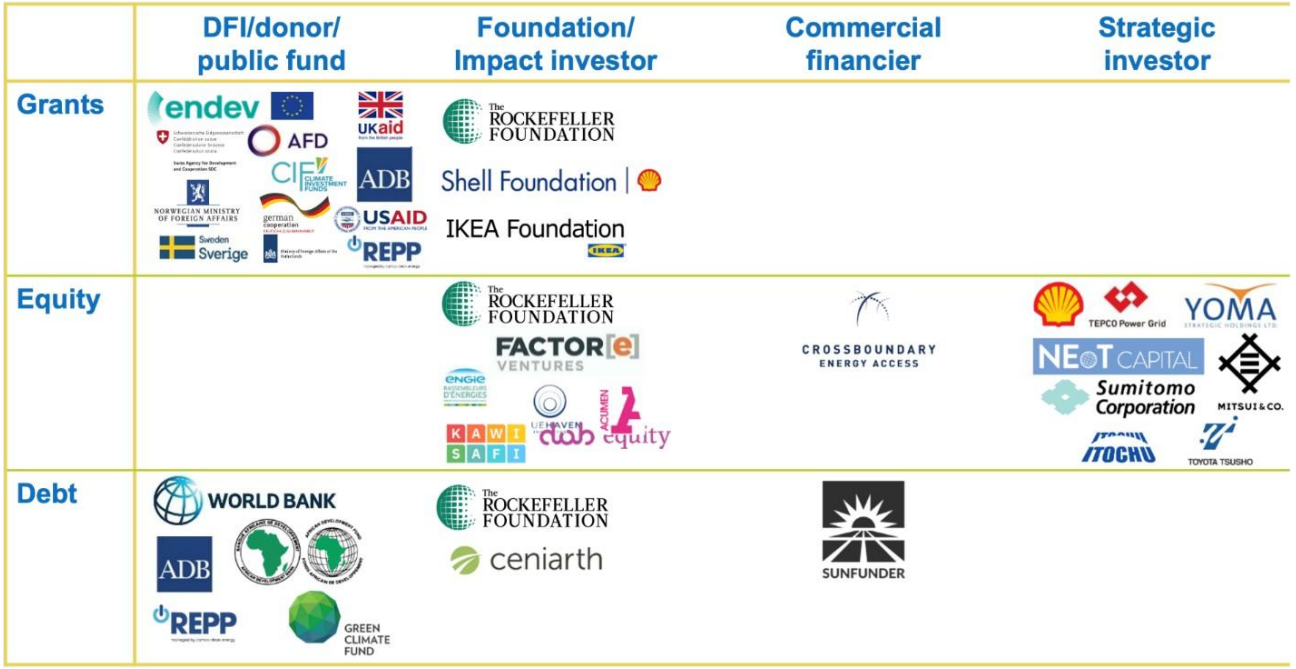
Financial Factors	Impact on Mini-Grids
• Greater initial cost of renewables.	The initial capital cost of renewable energy compared to the cost of a diesel generator can act as a barrier to energy transition.
• Lack of financially sustainable business models, plus banks' preference to lend to large projects especially those that are grid connected.	Mini-grid developers are forced to rely on government subsidies and grants from donors.
• Greater system design costs due to custom designed mini-grids with renewable energy sources.	Hybrid mini-grids typically use renewable energy sources and have custom designs that can be complex and act as a barrier to system design cost.
• Greater upfront capital costs, fuel costs, and maintenance costs increases the power supply costs of mini-grid utilities.	Small scale operation raises power supply cost of mini-utilities and can exceed U.S. $1 per kWh. Many mini-grids close down after only a couple of years because financial sustainability is not achieved.
• Mini-grids are often considered transition solutions due to their lack of an anchor customer or grid connection.	Mini-grids are not seen as reliable for providing productive economic services. Mini- grids are viewed only as temporary solutions.

Financial Instruments to Support Rural Electrification



Commercial Financing Possible, If Public Funding is Available

- Increasing interests by foundations and impact investors.
- Strategic investors have diversified in the last two years.
- Majority of financing to date has been through grants and concessional loans, and some equity.

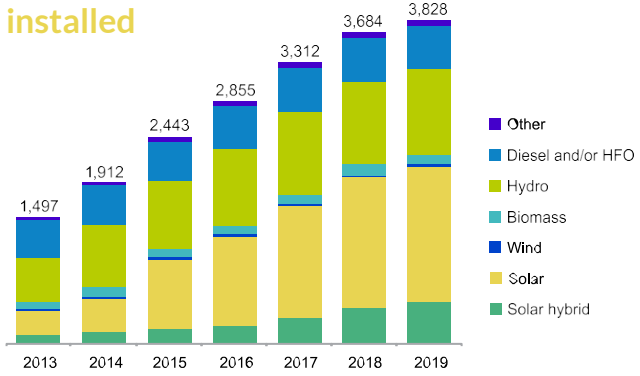


Source: BloombergNEF, company websites.

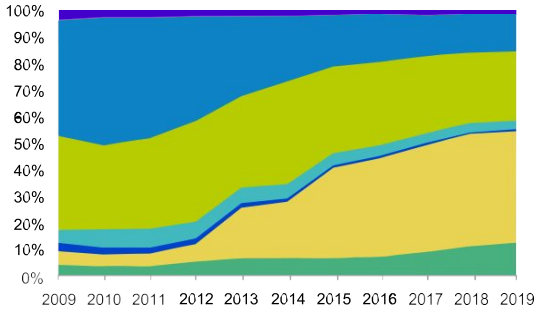
Solar Mini-Grid becoming the Norming, Lithium-ion share is increasing

- Solar/solar hybrid mini-grids have been steadily increasing their market share through the last decade – nearly 5-fold increase in the market share seen between 2009 and 2019.
- Lead-acid remains dominant battery choice, but lithium-ion share has increased.

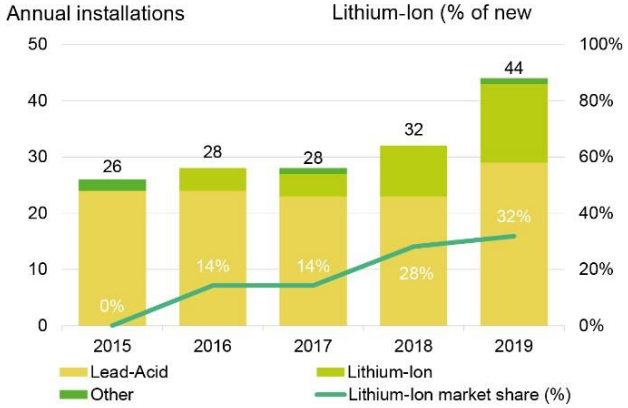
Cumulative number of mini-grids installed



Technology share of mini-grids in operation

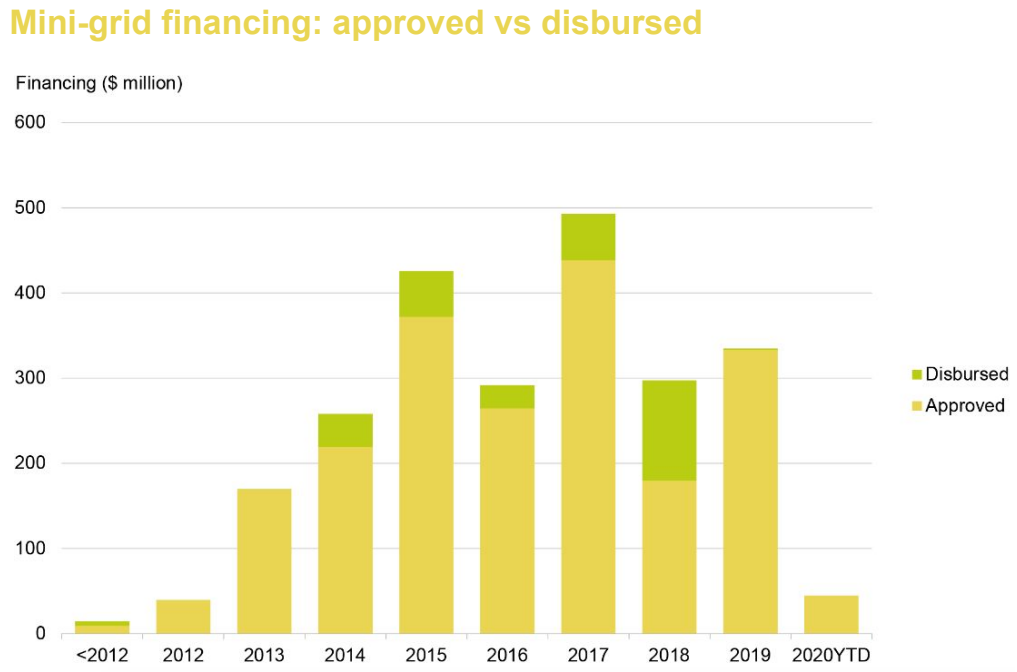


Battery storage penetration within new mini-grids



Source: BloombergNEF, Carbon Trust, CLUB-ER, GIZ, surveyed developers. Note: Includes only mini-grid asset data with 'operation year' available.

Only 13% of approved mini-grid financing has been disbursed



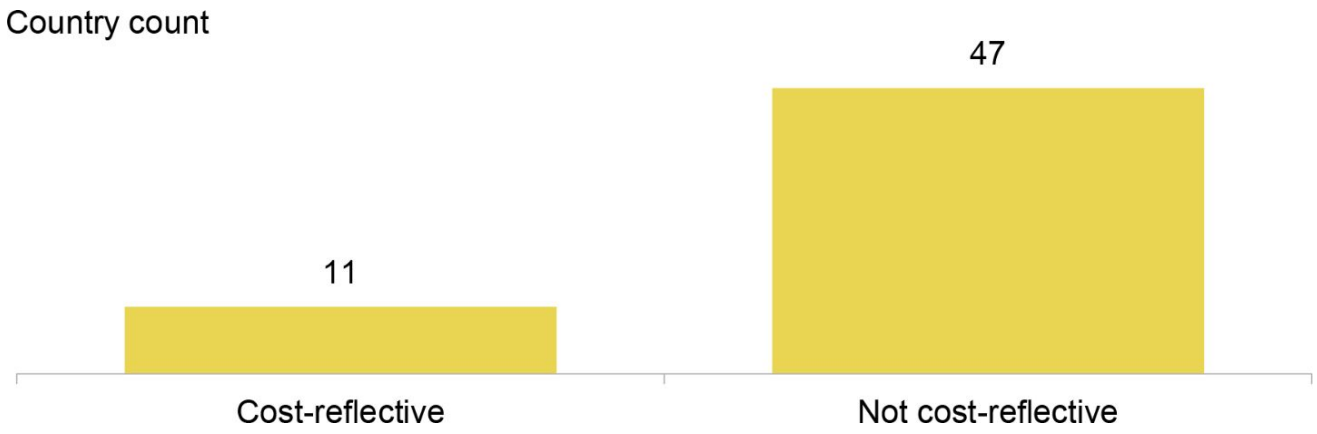
- 14 funders in the Mini-grid Funders' Group approved a total of more than $2 billion by the end of February 2020.
- Only $297 million or 13% has been disbursed in the mini-grid sector.

Source: Mini-grid Funders' Group, Carbon Trust, BloombergNEF. **Note:** YTD = February 29, 2020. the World Bank's $150 million for Nigeria's results-based subsidies in 2019 is not counted as 'disbursed'

Tariff setting flexibility is critical for mini-grid projects to be viable

- Many governments limit power prices to protect poorer rural customers.
- Even if developers are allowed to impose cost-reflective tariffs, true cost of a solar hybrid mini- grid is expensive for rural customers in general. In either cases, subsidies are mostly required.
- The past research shows electricity consumption increased when tariffs were lowered by subsidising developers.

Mini-grid tariff regulations, 2018



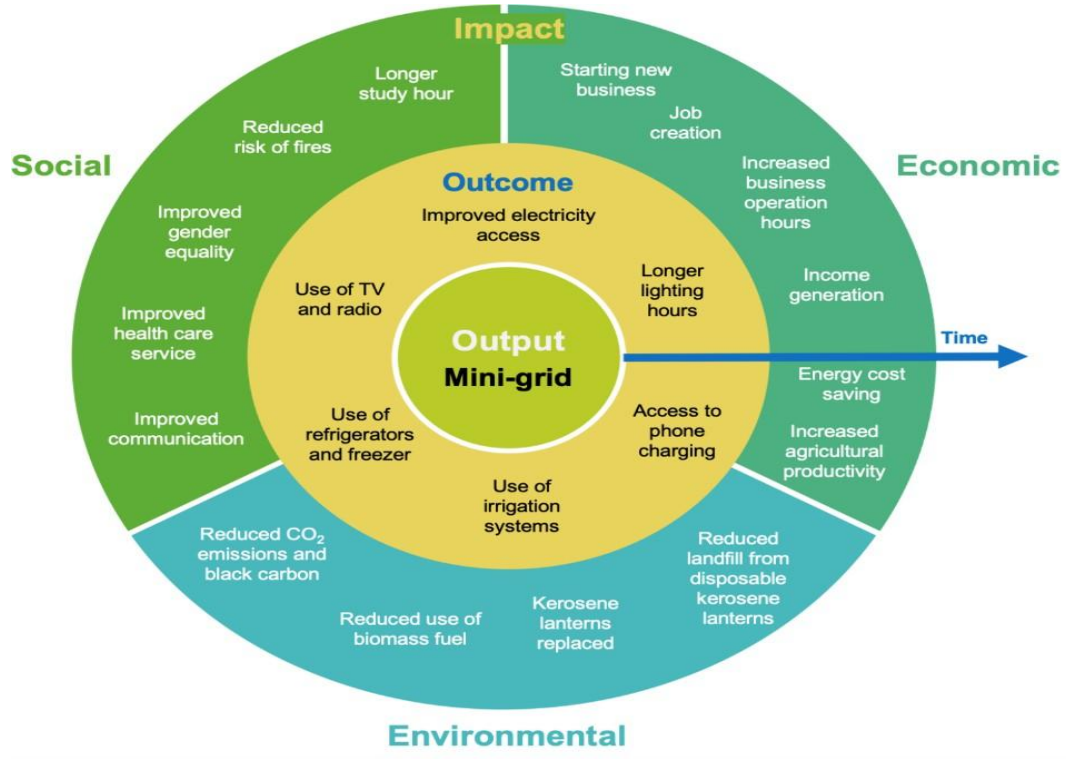
Cost reflective: Bangladesh, Cambodia, India, Philippines, Nigeria, Rwanda, Sierra Leone, South Africa, Tanzania, Togo, Zambia

Source: BloombergNEF, Climatescope 2019.
Note: Countries surveyed are 39 in sub-Saharan Africa, 12 in Asia, 7 in Latin America and Caribbean.

Advancing impact metrics focus on change in quality of life

- Measuring impacts is difficult as they can be diverse.
- No single impact metrics is standardized and used by many organisations in the mini-grid sector.
- There are some advanced metrics developed for electricity access projects (e.g., GOGLA, 60 Decibel).

Mini-grid output, outcomes and impacts



Source: BloombergNEF, GOGLA, Lighting Global, World Bank Group. **Note:** Positions of outcomes are not correlated with those of impacts.

Financing Solutions

LONG TERM FINANCIAL SUPPORT

In the form of subsidies, loans, grants and investments in renewable energy service companies

ENCOURAGE CLUSTER-BASE MINI GRID DEVELOPMENT

To ensure bankability and commercial viability

FACILITATE CONSUMER FINANCING

Through M2M connectivity

EASIER ACCESS TO BANK FINANCE

Encourage capacity building of financial institutions and local banks

EASIER ACCESS TO BANK FINANCE

Hybrid mini-grids typically are the least-cost solution among mini-grids for most locations and natural- resource conditions over the long-term. Also, technology is evolving rapidly and initial costs are decreasing for many renewable sources of power.

Financing Solutions (Part 2)

PAYMENT FOR SERVICES

Consumers must pay for the service, including operations, maintenance, and replacement costs.

CREATION OF PRODUCTIVE ECONOMIC SERVICES

Support parallel creation of productive economic services within the project. Productive uses can help to ensure financial viability, long-term project sustainability, and revenues.

INVOLVE THE LOCAL COMMUNITY

Involve the local community through financial participation, such as binding service contracts that secure revenues.

LIFELINE TARIFFS

Provide “lifeline tariffs,” or minimal affordable rates, to those who cannot afford the full cost of energy. Subsidized rates can be removed as economic growth increases consumers ability to pay.

Recommendations

Government

- Take a least-cost approach for rural electrification.
- Set electricity access targets and roadmaps by technology.
- Outline clear “grid arrival” rules to protect value of mini-grids.
- Identify and disclose potential sites for mini-grid development.

Financiers

- Finance mini-grid portfolios to increase potential economic return, and diversify operational and regulatory risks.
- Employ advanced impact assessment metrics to collect social, economic and environmental impact data and use them to evaluate results.

Development Finance Institute/Donors

- Set up a results-based financing programme to scale mini-grids or provide more financial support for existing ones.
- Provide partial-risk guarantees to financiers to insure against non-payment from utilities or governments.
- Consider cross-sector collaboration.

Developers

- Apply data analytics solutions throughout various stages of a project’s lifetime.
- Focus on opex reduction and demand stimulation
- Involve operational and customer support service providers.

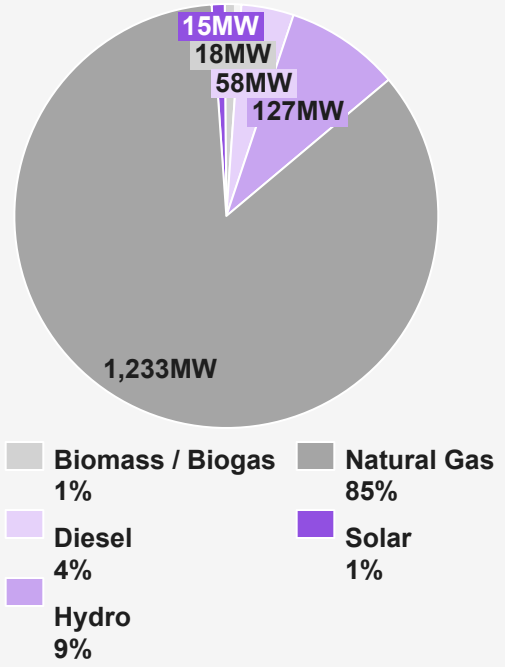
There is potential for Sabah to go 100% renewable electricity generation by 2040

Using an annual growth rate of 1.8%, peak demand is expected to be ~1,450MW by 2040

2 70 - 100% Renewable Electricity Generation Statewide by 2040

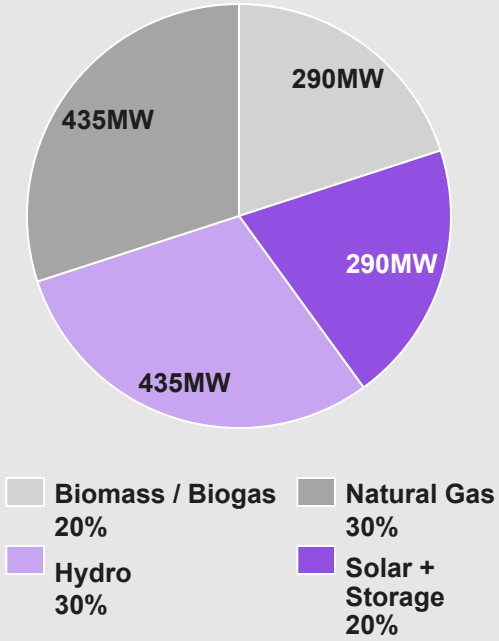
2040 Scenarios

1. Current Projected Plan



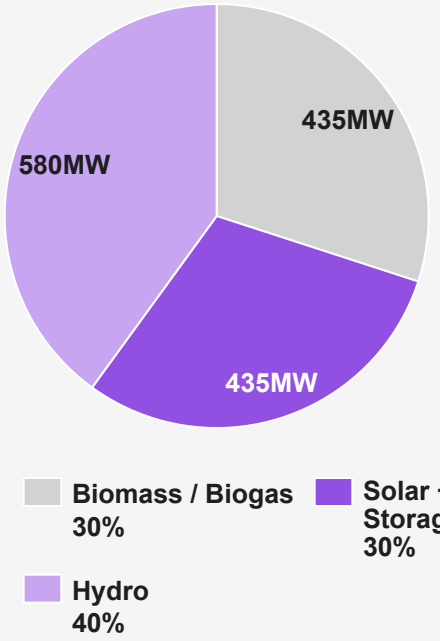
– Current projection with limited focus on achieving renewable energy generation

2. 70% Renewable



– A SESB study showed a limit of 22% solar penetration (without storage), meaning there is the potential for **at least ~320MW of solar** in 2040 (not accounting for any advances in technology)

3. 100% Renewable



– According to the Renewable Energy Transition Roadmap, Sabah has a **bioenergy potential of ~750MW** and **mini hydro potential of ~590MW**

Source: "Peak demand" and "projected plan" demand extend SESB's projections to 2040, RETR (2019)

There are a variety of policy options used around the globe to encourage the reduction of carbon emissions

Mandates

Example: 25% renewable electricity generation by 2025, 50% by 2030, 75% by 2035, and 100% by 2040

Pros:

- Ensures renewable energy targets are met through wide-spread obligations
- Little cost to government and relatively straightforward to implement

Cons:

- If targets are not met, there is no mechanism in place to hold the state to these promises

Carbon Tax

Example: Tax retailers for each ton of CO2 emitted annually above a certain limit

Pros:

- Generates revenue for the state to re-invest in building renewable energy infrastructure and development

Cons:

- Limits retailers in how they can adjust their carbon emissions and hurts small businesses who can not afford the tax

Market Based Programs

Example: Require certain industry retailers to buy credits for each ton of CO2 emitted annually above a certain limit

Pros:

- Puts money in the pockets of renewable energy retailers who can sell their credits
- Encourages job creation as well as new market entrants

Cons:

- Complex to design and implement

Government Incentives

Example: FiT, tax credits, grants, low-interest financing, etc.

Pros:

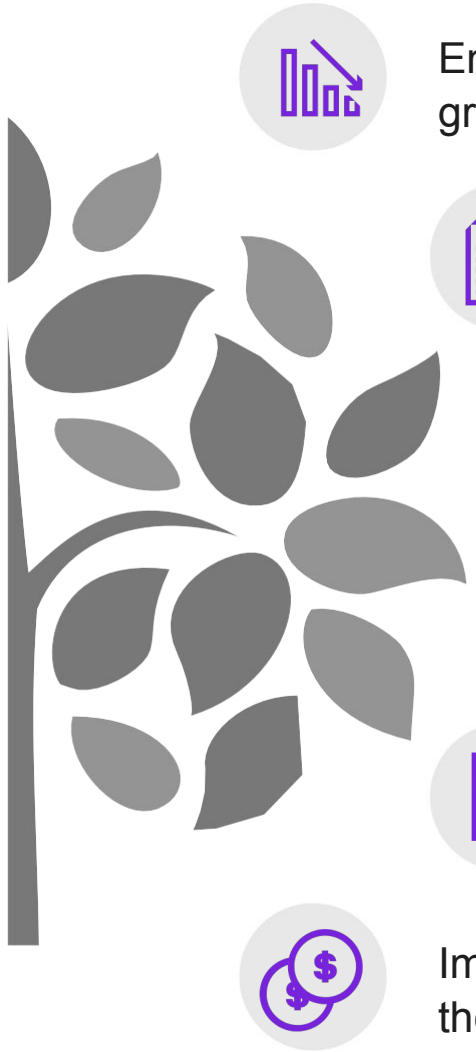
- Direct incentive for investments into renewable energy research, development, and infrastructure

Cons:

- Costs the state (and taxpayers) money, especially challenging after COVID

The successful transition to renewable electricity generation requires legislation

Sabah Legislation Recommendations for the Transition to Renewable Energy



Encourage private investments in renewable energy generation and greater energy security by **gradually removing the fossil fuel subsidy**

Set mandates for 100% renewable energy generation by 2040, with achievable steps in-between

Implement green credit market-based incentive program for utility and forestry industry

Impose green and renewable energy requirements for new residential and industrial construction

Develop a government financing or grant program to encourage renewable energy research as well as the development of co-owned mini grids for remote areas

Improve communication and coordination amongst ministries and include the above in the **12th Malaysian Plan and Budget for 2021**

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Thank You!

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Village Solutions for Global Change since 1997