Smart Power Myanmar

RESEARCH SERIES

Closing the Financing Gap

Assessing Options for Decentralised Renewable Energy Mini-Grids in Myanmar

DECEMBER 2019

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Assessment conducted by: DELPHOS INTERNATIONAL

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Smart Power Myanmar

Smart Power Myanmar's goal is to accelerate the development of decentralized renewable energy solutions in Myanmar and transform the long-term economic potential of millions of people that lack reliable access to electricity.

Supported by The Rockefeller Foundation and managed by Pact, Smart Power helps unify and scale a wide variety of integrated electrification efforts across Myanmar. We help align the skills, resources and energy of private power developers and development and financing institutions to promote integrated electrification in Myanmar, and we help support policy and regulatory changes that are required for a conducive enabling environment. Through our extensive community footprint, we also help provide tangible resources and technical support to communities to help them connect to economically viable and reliable energy solutions, thereby linking an entire ecosystem of private developers, entrepreneurs, farms, and enterprises to boost incomes, grow businesses, and foster economic growth.

Delphos International

Delphos International, Ltd., based in Washington D.C., with offices in Hong Kong, is an independent financial advisory firm founded in 1987 specializing in project finance advisory, project identification and evaluation, feasibility analysis, valuation, mergers and acquisitions, bid preparation, project development, and transaction advisory services for energy and infrastructure projects in emerging economies.

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Abbreviations

Abbreviation	Description
AC	Alternating Current
ACEF	Asia Clean Energy Forum
ADB	Asian Development Bank
AFD	Agence Française de Développement
AIIB	Asian Infrastructure Investment Bank
ASEAN	Association of Southeast Asian Nations
CAR	Capital Adequacy Ratio
CBM	Central Bank of Myanmar
CfP	Call for Proposals
CGI	Credit Guarantee Insurance
DCA	Development Credit Authority
DFI	Development Finance Institution
DFID	Department for International Development
DRD	Department of Rural Development
DSRA	Debt Service Reserve Account
DSCR	Debt Service Coverage Ratios
EAC	Electricity Authority of Cambodia
E&S	Environmental and Social
ESG	Environmental, Social, and Governance
GIZ	German Society of International Cooperation
GoM	Government of Myanmar
HyCEM	Hydropower for Community Empowerment in Myanmar
IFC	International Finance Corporation
IMF	International Monetary Fund
IPP	Independent Power Producer
IREDA	Indian Renewable Energy Development Agency
IRR	Internal Rate of Return
JICA	Japan International Cooperation Agency
JICA TSL	Japan International Cooperation Agency Two-Step Loan
KfW	Kreditanstalt für Wiederaufbau Bankengruppe
KPI	Key Performance Indicator
LIFT	Livelihoods and Food Security Fund
M&E	Monitoring and Evaluation
MEB	Myanma Economic Bank
MMK	Myanmar Kyat
MoALI	Ministry of Agriculture, Livestock and Irrigation
MoEE	Ministry of Energy and Electricity
MoPF	Ministry of Planning and Finance
MREF	Myanmar Rural Electrification Fund
NEP	National Electrification Plan

Abbreviation	Description
NPL	Non-Performing Loan
PFI	Participating Financial Institutions
PIDG	Partnership for International Development Group
PMO	Project Management Office
PPA	Power Purchase Agreement
REF	Rural Electrification Fund
RF	Rockefeller Foundation
SME	Small and Medium Enterprise
SPV	Special Purpose Vehicle
TA	Technical Assistance
TSL	Two-Step Loan
USAID	U.S. Agency for International Development
USD	United States Dollars
VEC	Village Electrification Committee

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1 Executive Summary

Decentralized renewable energy mini-grids in Myanmar present a major investment opportunity with enormous development impact potential given an estimated 58% of the population, approximately 30 million people, are not connected to the national power grid.

To increase electricity access, the Government of Myanmar ("GoM") approved the National Electrification Plan ("NEP") in 2015, which sets an ambitious target of 100% electrification in Myanmar by extending the national grid to 7.2 million homes by 2030. However, it is widely recognized that the efforts to expand the national grid under the NEP[1] are behind schedule and other solutions are needed to meet its ambitious energy access goals.

Smart Power Myanmar recently commissioned an independent Decentralized Energy Market Assessment (the "Market Assessment"), which demonstrated that decentralized energy solutions offer not only the lowest cost connection option but are also the fastest route towards energy access for millions of under-served people in Myanmar.[2] In addition, these "grid ready" mini-grids support productive loads that drive economic activity and can be integrated into the national grid upon arrival. Therefore, these mini-grids can be viewed as part of the long-term national infrastructure base as opposed to stand-alone installations, which would allow for an interconnected future grid.

To date, mini-grids serving residential and local businesses are generally considered financially viable only when aided by the existing subsidy program. Under this program, developers are required to cover 20% of capital costs, the subsidy covers 60% of the capital costs, and the villages are required to contribute the remaining 20%. According to the Market Assessment, with the current subsidy budget availability and without any regulatory changes, the size of the market would be limited to approximately 230 mini-grids by 2025. However, if several key measures are introduced, the potential viable market is estimated to be 2,253 mini-grids by 2020, 8,000 mini-grids covering more than 5 million people by 2025, and more than 16,000 mini-grids covering 9.4 million people by 2030. Such a large-scale rollout would require $3.6 billion in investment and would correspond to 42% of the projected off-grid population in 2030.

Despite its massive potential, the formal mini-grid market is facing significant challenges and barriers to investment due to its nascent stage.[3] For the market to reach its full potential, these challenges and barriers need to be addressed. The key challenges to securing financing are (i) the unproven business model and (ii) the lack of a regulatory framework for mini-grids that governs national grid arrival.

Nevertheless, in addition to the large market need, there are several key developments that are favourable for the markets long-term investment prospects, including: (i) recent increases in government funding for decentralized energy solutions, (ii) strong interest from international donors and development finance institutions, (iii) and recent investment from international strategic energy players.

This Report recommends two potential financing solutions - and potential funding sources for these solutions - to help overcome the existing challenges and barriers to mini-grid growth and investment.

These Financing Solutions include:

1. Two-Step Loan ("TSL") Structure: A sovereign loan to GoM that is ultimately onlent to developers at favorable terms via local banks; and

[1] It is important to note that the World Bank approved the National Electrification Project in 2015 to support efforts to improve electricity access (both on-grid and off-grid) in Myanmar. This project has the same acronym - "NEP" - as the National Electrification Plan. The World Bank's NEP is scheduled to close in 2021.

[2] Smart Power Myanmar. "Decentralized Energy Market Assessment in Myanmar." Prepared by Roland Berger. May 2019. https://assets.rockefellerfoundation.org/app/uploads/20190604133012/Decentralised-Energy-Market-Assessment-in-Myanmar-Research-Report.pdf

[3] Informal mini-grids have long existed in Myanmar given limited coverage and poor reliability of the national grid; a key difference with the more recent formal mini-grid market is the ability to interconnect upon national grid arrival).

2. Direct Funding with a Credit Guarantee: Commercial (or blended financing to the extent needed) with a credit guarantee mechanism to allow for lender risk sharing.

These Financing Solutions could potentially support a rollout of as many as 2,200 mini-grids with total project costs of approximately $800 million and potentially benefitting two million people.[4] A single TSL as proposed under Financing Solution #1 can support as many as 850-1150 subsidized mini-grids based on the potential amount of funding donors indicated would be available. Financing Solution #2 has the potential to support hundreds of additional mini-grids not funded under the TSL including both subsidized and unsubsidized projects. The financing terms under Financing Solution #2 would not be as attractive as the TSL, and therefore the project payback periods for financeable deals would need to be shorter. Finanicng Solution #2 could potentially include financing of operating subsidized mini-grids and of more commercially viable unsubsidized mini-grids in the near-term while the TSL is still being implemented.

[4] This is not to suggest that this amount of mini-grids is financeable today. Achieving such estimates will require significant effort to address the key challenges facing the market including but not limited to the adoption of an appropriate mini-grid regulatory framework and the proving out of the business model as discussed further in this Report.

2 Introduction

This final report is submitted by Delphos International, Ltd. ("Delphos") as part of its provision of services to the Rockefeller Foundation ("RF") and Smart Power Myanmar under an agreement to provide a financing options assessment for decentralized renewable energy mini-grids in Myanmar (the "Engagement"). (Delphos, RF and Smart Power Myanmar are hereafter referred to as the "Team")

The focus of the Engagement, which commenced in March 2019, is (i) to produce an analysis of the barriers preventing private investment in distributed energy systems within Myanmar, (ii) assess the financing gap in the sector, (iii) provide detailed and actionable solutions with the potential to mobilize large-scale public and private capital to address the identified financing gap and market barriers, (iv) present these solutions to key donors and other potential funding sources, and (v) incorporate their feedback into viable financing structures.

Delphos's analysis and recommendations are based on its extensive experience arranging financing for energy and infrastructure projects in the global emerging markets including Myanmar, stakeholder input (including from developers, investors, donors, government officials, local and international financiers, etc.), market conditions, the relevant regulatory framework in Myanmar, initial financial analysis of available cost information, and donor and other independent reports. Delphos conducted three visits to Myanmar between March and June 2019 to conduct meetings with key stakeholders together with Smart Power Myanmar. Delphos also joined the Smart Power Myanmar team at the Asia Clean Energy Forum ("ACEF") hosted by the Asian Development Bank ("ADB") in June 2019 to conduct additional meetings related to the Engagement. The entities with whom Delphos met during these visits and/or spoke with via conference calls are listed in Appendix 1.

This Report builds from the previous deliverables and includes an updated version of the Detailed Financing Solutions in Section 4 of this Report. In addition, this Report puts these financing solutions in context through a discussion of the current investment landscape, financing challenges and market barriers, as well as the various financing solutions explored. It is important to note that financing structures are dependent on many specific issues that vary significantly on a deal-by-deal basis in an environment such as the nascent Myanmar mini-grid market. As such, the financing solutions described herein are being provided for illustration purposes for the benefit of developers, financiers and other market stakeholders and the ultimate terms and conditions of any financing supporting mini-grids will be subject to situational differences that will inherently exist from deal to deal and will be identified in a detailed due diligence by the ultimate funding source.

3 Investment Landscape

The Investment Landscape section of the Report has been divided into the following subsections: (i) background related to the current investment landscape in the mini-grid market in Myanmar, (ii) the large mini-grid market potential, (iii) challenges facing the market, and (iv) potential funding sources.

3.1 Background and Current Market

Rural Myanmar is severely lacking access to electricity given an estimated 58% of the population, approximately 30 million people, are not connected to the main power grid. To increase electricity access, the GoM approved the NEP in 2015. The NEP sets an ambitious goal of reaching 100% electrification in Myanmar by extending the national grid to 7.2 million homes by 2030. The NEP has received major support from the World Bank, which provided a $400 million commitment.

There are two key GoM entities with responsibility under the NEP: (i) the Ministry of Energy and Electricity ("MoEE") is responsible for operating the national grid rollout component; and (ii) the Department of Rural Development ("DRD"), which is under the Ministry of Agriculture, Livestock and Irrigation ("MoALI"), is responsible for the implementation of the off-grid component. The off-grid component received $80 million in funding from the World Bank.

To date, MoEE is well behind schedule on the planned extension of the national grid.[5] At the same time, Myanmar has been experiencing frequent power outages for the past several months due to the lack of supply of power on the national grid. Moreover, few utility-scale generation projects are projected to be connected to the national grid in the near term and projections estimate that supply will not keep up with demand growth over the medium-term. Therefore, even if the national grid were to be extended, there would not be adequate supply of electricity to meet demand and the supply-demand imbalance will only be exacerbated by further extension. In light of these dynamics, there is a major opportunity for decentralized mini-grid systems to help meet the overarching goal of universal energy access in Myanmar.

To support rural energy access via mini-grid development, the DRD has set up a "Call for Proposals ("CfP")" mechanism in which individual eligible projects receive a capital investment subsidy to cover 60% of project costs. The program also includes a contribution from community cooperatives (known as Village Electrification Committees) to cover 20% of the project costs and mini-grid developers are required to fund the remaining 20% of the project costs. The DRD off-grid project is funded with GoM funds and an $80 million co-financing from the World Bank (a portion of this funding was also earmarked for Solar Home Systems and $30 million of this was spent by the end of 2018). The GoM subsidy budget appropriated for DRD for 2018 was approximately $8.8 million. DRD expects this budget appropriation to remain at a similar level for the next several years. The World Bank is expected to commit approximately $8 million per year through 2021 (based on the most recent budget allocation for mini-grids of $24 million, which translates into $8 million per year for the remaining three years of the World Bank program). To date, DRD has launched 3 CfPs covering 135 villages.[6] The NEP categorizes unelectrified villages into 5 phases, with Phase 1 being the first villages projected to be grid connected and Phase 5 being the last villages to be grid connected. The DRD subsidy program focuses on Phases 4 and 5 villages, which are unlikely to be connected to the grid in the near future.

Mini-grids have long existed in Myanmar given limited coverage of the national grid and poor reliability in areas that are grid connected; however, most of the earlier mini-grids are not grid ready and provide a lower tier of service. The formal mini-grid sector, which is typically renewable energy-based and is

[5] According to World Bank statistics listed in its "Implementation Status & Results Report" published on July 19, 2019, the grid has been extended to 51,836 households from September 2015 to June 2019. The 2021 end target listed in the report is 3,212,500. Therefore, connected households are just 1.6% of the target.

[6] The breakdown is as follows: CfP1 in 2016/17 for 8 villages; CfP2 in 2017/18 for 27 villages; CfP3 in 2018/19 is ongoing and is expected to deliver mini-grids in 100 villages and 100 per year thereafter.

being supported by the DRD-backed subsidy program described above, is nascent. DRD-backed mini-grids are typically in the form of hybrid solar solutions but can also include mini-hydro and other technology solutions and are built to grid standards. The formal mini-grid market in Myanmar has had limited opportunity to scale up and currently lacks a proven business model due to limited operational and financial performance data to date. Such issues of scale can be at least partially addressed through actions facilitating economies of scale: i) centralizing project development, ii) establishing procurement around project "blocs" vs. one-off projects, and iii) market consolidation. All these actions would allow for large-scale private development, and the opportunity to develop multiple projects in parallel enhancing economies of scale. Since the market is not yet commercially viable in many villages, the market will continue to rely on investment subsidies administered by DRD in the near term. Soft funding will be critical in facilitating additional rollout in the near term, de-risking of the market, and allowing for developers to reach economies of scale.

Nevertheless, there is significant investor interest in the large market potential. Furthermore, investors' interest and participation in the market have continued to grow with more than 15 developers selected in the most recent call for proposals (CfP 3), up from 5 developers in CfP 1. In addition, at least one large international strategic investor has invested in the market. Earlier in 2019, Engie, a leading multinational electric utility company, invested in local developer Mandalay Yoma. The investment fits with Engie's larger strategy of decentralization, decarbonization, and digitalization of electricity. In addition, development finance institutions ("DFIs") International Finance Cooperation ("IFC") and The Norwegian Investment Fund for Developing Countries ("Norfund") invested in Yoma Micro Power in 2018 (approximately $28 million of equity and concessional debt). Yoma Micro Power is primarily focused on powering telecom towers, but IFC was able to channel a tranche of concessional debt (which it manages on behalf of the Government of Canada) to Yoma Micro Power to fund mini-grids for village electrification alongside its telecom tower installations. This low-cost concessional debt is priced well below interest rates available in the market and will allow Yoma Micro Power to prove out the co-location of village mini-grids. The community electrification does not rely on any cross-subsidies from the tower business, but it does benefit from economies of scale on capital and operating costs (Yoma Micro Power does not have village mini-grids operating as of July 2019 but plans to by the end of 2019).

The Team held discussions with many of the leading mini-grid developers in the market to understand their rollout plans and related funding needs and then develop financing solutions in line with the market needs and limitations. Specifically, the Team met or held calls with Yoma Micro Power, Mandalay Yoma, Techno Hill, Infra Capital Myanmar, Myanmar Rural Electrification Fund ("MREF"), SolarRiseSys, Sun Power, WEnergy Global, and the Hydropower for Community Empowerment in Myanmar ("HyCEM"), which is an association for mini-hydro developers in Myanmar. The Team also shared initial findings with these entities in the interest of information sharing with developers and to gather additional feedback to improve the financing solutions being recommended in this Report.

The Team also spoke with developers exclusively focused on the anchor tenant model such as OMC Power to gauge interest in adding village electrification alongside a hybrid solar solution for a telecom tower or other commercial use (several developers are pursuing both anchor tenant and village mini-grids models in parallel). The Team believes there is significant potential in models involving co-locating village mini-grids with anchor tenants (along the lines of what Yoma Micro Power is pursuing). This is due to the economies of scale that can be achieved and that anchor models allow for developers to set up in a community first, which provides significant credibility when approaching a community about their interest in electrification. However, developers with an anchor tenant focus often have difficulty in orienting their operations from a business to business ("B2B") model to a business to consumer model ("B2C") in terms of payment collections, customer service, marketing, and other areas. Therefore, the village electrification plans often take a lower priority than the anchor tenant model and it is difficult to meet village electrification projections. That said, we believe this model is worth pursuing for the aforementioned reasons and the financing solutions recommended in Section 4 can also be utilized by developers pursuing this model.

In sum, developers expressed a strong desire for external financing to help grow their operations and capitalize on the large potential discussed in Section 3.2, and generally noted that limited viable options

are available at present due to the nascent stage of the market and the other challenges discussed in Section 3.3 of the Report.

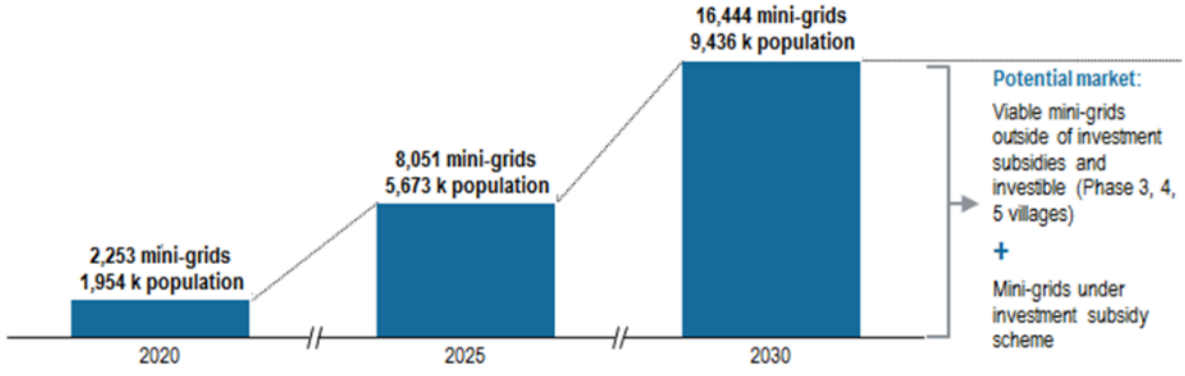
3.2 Market Growth Potential

The Market Assessment indicated that there is a potential for renewable energy mini-grids to serve approximately 2 million households by 2030, demonstrating a massive potential for market growth.[7] To unlock such large market potential, the Market Assessment indicated that five key measures would need to be implemented, including: (i) increasing the investment subsidies budget to 100 million USD to ensure sufficient initial market volume to support economies of scale, (ii) enabling economies of scale by pooling of development processes or through market concentration, (iii) decreasing the Internal Rate of Return ("IRR") threshold to 15% through financing support measures and by de-risking mini-grid development, (iv) increasing productive loads per capita by 35% on average through demand-side measures, and (v) enabling private developer investment in viable mini-grids in NEP Phase 3 villages through regulatory reform, thus de-risking grid arrival.

Based on the implementation of these key measures, the potential viable market is estimated to be 2,253 mini-grids in 2020, 8,000 mini-grids covering more than 5 million people by 2025, and more than 16,000 mini-grids covering 9.4 million people by 2030. This would correspond to 42% of the projected off-grid population in 2030.

Substantial investment would be required to implement such a large rollout of mini-grids. It is estimated that $1.8 billion is needed to fund all potential viable mini-grid projects in 2025 and $3.6 billion for the projects becoming potentially viable in 2030. The figure below illustrates the growth potential of the mini-grid market in Myanmar (it is important to note that the estimates are simply based on the viable potential market if the key areas mentioned above are addressed; they are not a rollout projection).

Figure 1: Mini-grid Viable Market Potential

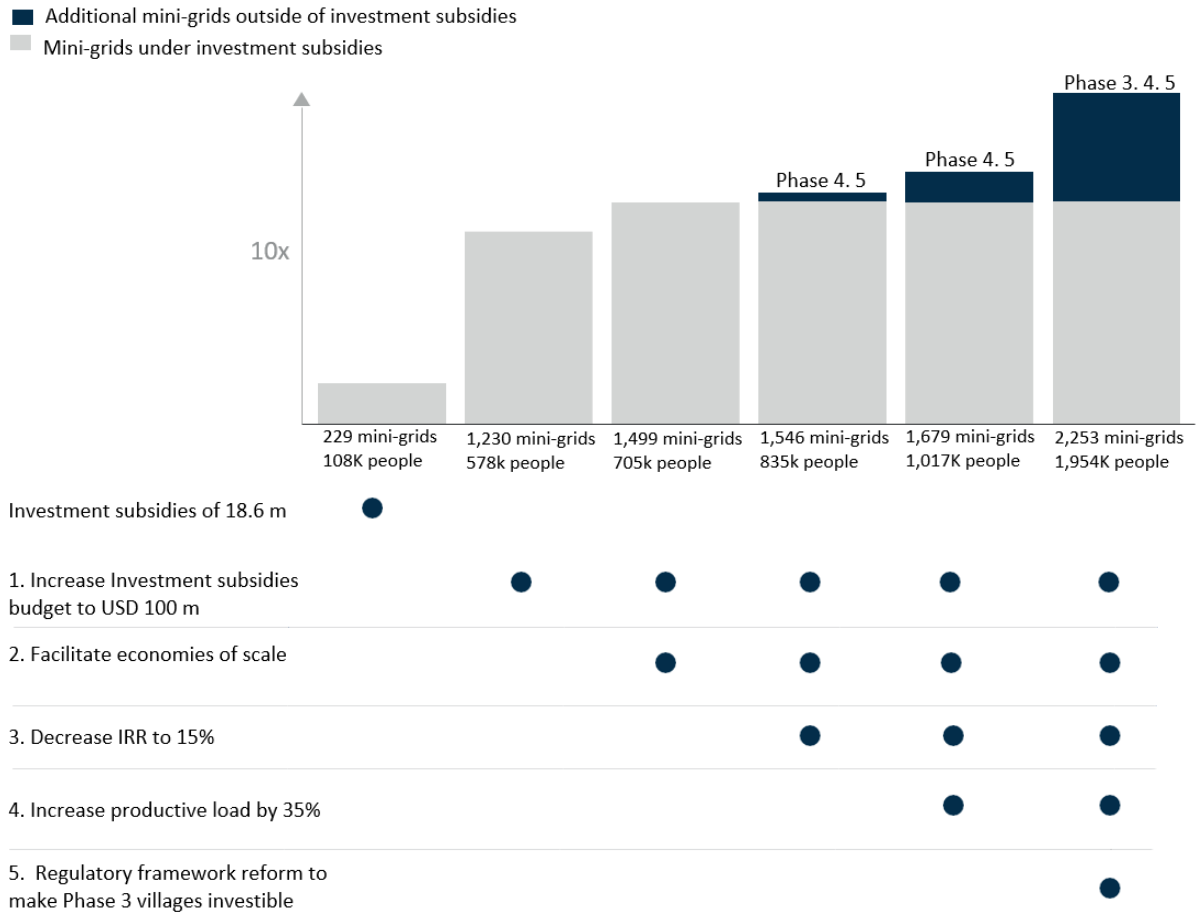


Source: Roland Berger

In addition, the Market Assessment evaluated the incremental impacts of key market levers on potential viable mini-grids by 2020. As shown below, the largest incremental impact would result from increasing the subsidy budget to $100 million.

[7] Smart Power Myanmar. "Decentralized Energy Market Assessment in Myanmar." Prepared by Roland Berger. May 2019.

Figure 2: Incremental Impact of Key Market Levers on Potential Viable Mini-Grids by 2020



Source: Roland Berger

The Team has prepared several potential rollout scenarios based on the Market Assessment (Scenario #1) as well as DRD rollout estimates (Scenario #2 and #3) and projected the funding needs based on these scenarios. We believe that Scenarios #2 and #3 are the more informative scenarios to analyse from a funding needs perspective given the Market Assessment was only assessing viable market potential rather than actual rollout projections[8]:

- **Scenario 1**: 1,499 sites are built, and the government subsidy portion covers 60% of the project costs. Community and private developers would each finance 20% of the project costs (this scenario simply follows the total viable subsidized site estimate as shown in the figure above).
- **Scenario 2**: Potential rollout based on initial DRD estimates and an expansion of the program through 2023. The subsidy structure remains the same as scenario 1 (this would rely on the subsidy program being extended and funded).
- **Scenario 3**: This scenario follows the same rollout as Scenario 2 but considers a lower capital cost subsidy of 40% from DRD. The developer contribution is consequently higher (from 20% to 40%), while community funding stays at 20% of total project costs. This scenario has been prepared to reflect that subsidy coverage is likely to be lowered over time based on conversation with various stakeholders. This would allow DRD to stretch its capital and match donor funding further and developers would be encouraged to bridge the financing gap.

[8] Furthermore, the economies of scale and lowering of IRR expectations envisioned in the Market Assessment will take time to come to fruition.

While site costs are expected to vary significantly amongst sites depending on technology, village size, load, location, etc., the base case costs included in the estimates below are based on the average costs provided in the Market Assessment. We also included a high case with a 35% increase in costs given that feasibility-level estimates are subject to increases of this nature and the likelihood of cost overruns for mini-grid projects in remote areas.

Figure 3: Scenario 1: 1,499 Sites – 60% Subsidy

Sources of Financing	% of Funding	Base Case (in mm USD)	High Case (in mm USD)
Government Subsidy	60%	$110.0	$148.5
Community	20%	$36.7	$49.5
Developer	20%	$36.7	$49.5
Total Project Costs	**100%**	**$183.3**	**$247.5**

The following figure outlines a potential rollout scenario for subsidized sites reaching a total of 950 mini-grids by 2023, based on DRD's initial estimates, as well as the Team's estimate of potential expansion of the program over the subsequent years.

Figure 4: Scenario 2 & 3 Rollout and Project Costs[9]

Mini-grid Project Rollout	2019	2020	2021	2022	2023
Cumulative Site Rollout[10]	80	190	350	600	950
New Cumulative Project Costs (Base Case in mm USD)	$5.2	$21.6	$45.5	$82.8	$134.9
New Cumulative Project Costs (High Case in mm USD)	$7.0	$29.2	$61.4	$111.8	$182.2
Average Cost per Site: $149,151 (Base Case); $201,354 (High Case)					

The following two figures show the sources of funds that could be secured to meet the uses of funds laid out in the figure above. The developer contribution could come in the form of third-party financing. In this regard, the debt financing solutions discussed in Section 4 would be used to cover this funding need. Figure 6: Scenario 3 – DRD Rollout Funding with 40% Subsidy shows an example with a 40% subsidy as opposed to the current 60% subsidy structure. We expect that the subsidy will be lowered at some point as the market matures and lower subsidies are needed. This will have the added benefit of allowing the subsidy to benefit more villages. However, the timing and levels of reductions are unknown, so 40% is simply being included to show how the developer contribution, and therefore the need for third-party financing, will increase as and when subsidies are lowered.

Figure 5: Scenario 2: DRD Rollout Funding with 60% Subsidy

Sources of Financing	% of Funding	Base Case (in mm USD)	High Case (in mm USD)
Government Subsidy	60%	$80.9	$109.3
Community	20%	$26.9	$36.4
Developer	20%	$26.9	$36.4
Total Project Costs	**100%**	**$134.9**	**$182.2**

Figure 6: Scenario 3 – DRD Rollout Funding with 40% Subsidy

Sources of Financing	% of Funding	Base Case (in mm USD)	High Case (in mm USD)
Government Subsidy	40%	$53.9	$72.9
Community	20%	$26.9	$36.4
Developer	40%	$53.9	$72.9
Total Project Costs	**100%**	**$134.9**	**$182.2**

Additionally, the estimated financing need for developers pursuing mini-grids with no subsidy is illustrated in the figure below. The estimates are based on the Market Assessment. Viable unsubsidized

[9] Based on DRD estimates through 2021 and Smart Power/Delphos estimates for 2022-2023.

[10] The 2019 estimate includes the nearly 50 existing sites.

mini-grids are larger by nature - they have higher loads with improved economies of scale, which make them financially viable without subsidies - hence costs are notably higher than subsidized sites. The typical average capacity is 230 kW for the 754 unsubsidized sites shown in the figure below versus 45 kW for subsidized projects per the Market Assessment, although the initial sites under the DRD-subsidy program have been closer to 80 kW of capacity. We expect to continue to see sizeable differences in the capacity of mini-grids due to the significant differences in village size, demand, density, site conditions, etc.

Figure 7: Unsubsidized Sites Financing Needs

Sources of Financing	% of Funding	Base Case (in mm USD)	High Case (in mm USD)
Government Subsidy	0%	0	0
Community	0%	0	0
Developer	**100%**	**$407.4**	**$549.9**

The Team also prepared a simple financial analysis to evaluate the ability of a mini-grid developer to meet its debt service obligations for the sake of illustration. The following figure shows the high-level cash flows related to the rollout of 100 subsidized mini-grids. The analysis shows that the developer would be able to meet its debt obligations over the life of a 7-year loan (the average debt service coverage ratio illustrates that the cash available to pay debt service for a given period is more than sufficient to cover actual debt service due for the same period with a sizeable cushion under the assumed parameters). Other key assumptions have been summarized at the top of the analysis for ease of reference. The revenue and cost projections are based on the Market Assessment and these numbers will need to be proven in order for a financial institution to accept such projections.

Figure 8: Sample Project Economics

Assumptions	Unit	Value							
Cost per Mini-grid (High Cost Case)	USD	201,354							
Government Subsidy	%	60%							
Community Subsidy	%	20%							
Developer Contribution	%	20%							
Starting tariff	USD per kWh	0.34							
Tariff escalation	% p.a.	1%							
Interest Rate	%	8.50%							
Tenor	Years	7							
		2020	2021	2022	2023	2024	2025	2026	2027
Rollout of mini-grids	#	100	0	0	0	0	0	0	0
Capital Costs	USD '000	20,135	0	0	0	0	0	0	0
Source of Funds									
Gov't Subsidy	USD '000	12,081	0	0	0	0	0	0	0
Community Contribution	USD '000	4,027	0	0	0	0	0	0	0
Developer Contribution	USD '000	4,027	0	0	0	0	0	0	0
Total Sources of Funds	USD '000	20,135	0	0	0	0	0	0	0
Debt Calculations									
Beginning Debt Balance	USD '000	0	4,027	3,583	3,100	2,577	2,009	1,393	725
Debt Drawn	USD '000	4,027	0	0	0	0	0	0	0
Principal Paid	USD '000	0	(444)	(482)	(523)	(568)	(616)	(668)	(725)
Ending Debt Balance	USD '000	4,027	3,583	3,100	2,577	2,009	1,393	725	0
Interest	USD '000	(171)	(323)	(284)	(241)	(195)	(145)	(90)	(31)
Total Debt Service	USD '000	(171)	(768)	(766)	(765)	(763)	(761)	(758)	(756)
Tariff	USD per kWh		0.34	0.34	0.35	0.35	0.35	0.36	0.36
Consumption	MWh		7,847	8,481	9,125	9,780	10,446	10,968	11,484
Revenue	USD '000		2,668	2,912	3,165	3,426	3,696	3,919	4,145
Cash Flow Available for Debt Service	USD '000	0	1,277	1,638	1,830	2,029	2,235	2,442	2,650
Debt Service Coverage Ratio (DSCR)	#	n/a	1.66	2.14	2.39	2.66	2.94	3.22	3.51

3.3 Financing Challenges and Market Barriers

Despite its massive potential, the market is facing significant challenges and barriers to investment that need to be addressed in order to derisk the market and allow the market to reach its full potential. Several key challenges to securing financing are (i) an unproven business model, (ii) the lack of a regulatory framework for mini-grids, and (iii) exchange rate risk. These are generally in order of priority as the business model and regulatory framework are key threshold issues, whereas the exchange rate risk is generally less critical of an issue until there is progress on the the first two items. These challenges are described in the sections that follow.

3.3.1 Evolving Business Model

As mentioned above, the formal mini-grid market in Myanmar is nascent, with only around 50 formal mini-grids with villages as the primary off-taker developed to date. The targeted sites for village mini-grids under the DRD program (villages under Phases 4 and 5) are the furthest from the existing grid and generally have limited demand/productive use with uncertainty about demand growth.

Customers' ability to pay is also uncertain and subject to a negative bias due to a lack of data and the fact that the customer base is typically lower income, rural, and subject to seasonal variations in income.[11] At the same time, willingness to pay is hampered by the highly subsidized on-grid rates.

[11] Some operating mini-grids have yet to be officially commissioned as they await inspection from the DRD, which prevents them from being able to charge. Therefore, these developers are unable to verify willingness to pay for these sites.

These rates are well below actual levelized costs of electricity, and consumers compare the mini-grid tariff to the on-grid tariff even though they do not have the option to purchase power directly from the grid.[12] While the GoM increased electricity tariffs for the first time in four years in July 2019 (an important achievement for the energy sector), tariffs still remain heavily subsidized. Industrial and commercial entities with high demand for electricity invariably locate their operations on-grid in order to take advantage of the lower on-grid electricity prices whenever possible. However, there are agricultural, fishing and other industrial/commercial loads located near Phase 4 and 5 villages, which can help significantly with regards to economies of scale, predictable load and customer credit.

Annual per capita residential off-grid demand is estimated at 32 kWh. However, such demand can be difficult to estimate due to latent or suppressed demand. Nevertheless, increases in energy demand at the household level will need to go hand-in-hand with lifestyle/behaviour changes and increased use of appliances, which will take some time to materialize. Appliances represent a significant expense for many off-grid households with limited or no access to consumer financing products in the near-term, but microfinance institutions can help to meet this need in communities where mini-grids are being developed. Nevertheless, the Market Assessment estimates that Myanmar's rural electricity consumption will increase rapidly, with increasingly large appliances and longer usage patterns than current levels.[13]

Now that approximately 50 formal mini-grids are up and running, it is critical that developers demonstrate demand data, payment data, pricing sensitivities, and positive cash flow, in order to prove the viability of the business model and unlock debt financing options. In other words, local banks are generally not comfortable with the business model since it is unproven, and developers are not prepared to present the model to banks in a comprehensive manner that would alleviate lender uncertainty. Recommendations in this regard are discussed in Section 4 of the Report in the technical assistance section for developers.

3.3.2 Lack of a Mini-grid Regulatory Framework

The GoM does not have a regulatory framework to support mini-grids. Lack of mini-grid policies that encourage investment, combined with subsidized grid electricity tariffs, dampen interest in developing mini-grids in areas where grid electrification is uncertain and would negatively impact mini-grid profitability if it were to occur in the next decade. A framework that allows mini-grids to join the national grid or be acquired by the national grid, in the event of national grid arrival after mini-grid development, would significantly reduce this risk, not only stimulating equity investor interest but also helping in opening the market for potential debt financing. Equity investors to date have largely been able to get comfortable with this risk given the level of subsidy and that the sites included in the CfPs are Phase 4 and Phase 5 villages, which are the villages that are expected to be connected to the national grid last.[14] As such, it is unlikely that these villages will be connected in the near future, but it is difficult to estimate when they will be connected and if that would occur after the payback period. While equity investors may be willing to take this risk, debt financiers are generally not comfortable with the risk of grid arrival, since a developer is unlikely to be able to repay its outstanding debt if the grid arrives and the mini-grid is no longer earning income from the project. Therefore, an appropriate regulatory framework would be required before large-scale debt financing is expected to be made available.

In addition, the subsidy model has also resulted in uncertainty around the long-term ownership of the mini-grid assets given that any projects developed under a subsidy model ultimately require a handover to the VEC after 8 to 10 years (the exact amount of years depends on key project parameters such as IRR). It is also unclear who would manage the operations of the mini-grids following the handover. In addition, developers are unable to collateralize the asset as a result of the ownership issues, which

[12] The residential grid tariffs implemented on July 1, 2019 vary from 35-125 MMK per kWh depending on the level of usage. Tariffs for mini-grids vary significantly depending on a variety of factors but are significantly higher and range from 350 MMK to 700 MMK per kWh as per the Market Assessment. However, we understand that 500 MMK per kWh is now considered to be the maximum tariff for subsidized mini-grid projects.

[13] Smart Power Myanmar. "Decentralized Energy Market Assessment in Myanmar." Prepared by Roland Berger. May 2019

[14] The Team has been informed of an instance in Myaing, Magway Region where grid arrived early. We understand that ESE will purchase the mini-grid from the developer, but the final results remain to be seen.

creates further challenges for financing. The ownership regime and the handover process could be laid out in further detail in an overarching regulatory framework.

GIZ and others are actively engaging with GoM in order to devise an appropriate framework in the Myanmar context. The timing of when such a framework could be finalized remains uncertain. The sooner a comprehensive framework can be implemented, the sooner additional financing can be mobilized for the sector.

As an illustration, in Cambodia, the government implemented a clear regulatory framework, which led to a large-scale rollout of mini-grids; the number of mini-grids grew from 85 in 2005 to 327 by 2015. Mini-grid licensees made approximately one million new connections between 2005 and 2015. This example provides a useful case study of a potential regulatory framework that could be implemented to mitigate the risk of grid arrival and increase investor and lender appetite for the market.[15]

3.3.3 Exchange Rate Risk

The cost of hedging foreign currency loans in Myanmar can be prohibitively expensive. Hedging exchange rate risk is critical if developers were to source foreign currency loans given that their debt service obligations will be in a hard currency such as United States Dollar ("USD") but their revenues will be in Myanmar Kyat ("MMK").[16] This currency mismatch risk could be addressed by borrowing in local currency, but foreign lenders are generally unable to lend in MMK and there are several challenges related to local financing:

- Local lenders generally do not have the capacity or experience to provide project financing, which would typically be sought for infrastructure projects with a long pay-back period and limited collateral. Rather than looking at project cash flows as security, local lenders often require physical assets (e.g., land) as collateral, which is not conducive to mini-grid projects.
- Local loans are typically priced at 13% interest per annum and tenors are limited to three years (based on local lending regulations), thus making it difficult to secure local funding at the terms necessary to make mini-grid projects financially viable based on the mini-grid market conditions today.[17]

In order to provide more specifics on the cost of hedging foreign currency exchange risk in Myanmar, Delphos requested a hedging quote from MFX Solutions in April 2019.[18] For a USD $5M loan with a 3-year tenor and an interest rate of 7% p.a. with semi-annual interest and principal payments, MFX Solutions will pay USD 7% and receive MMK 17.04% (i.e. a ~10% hedging spread). For a 5-year loan with same payment terms, MFX would pay USD 7% and received MMK 18% (i.e. a ~11% hedging spread).

It would generally be difficult mini-grid projects to meet the debt service requirements associated with such an ~18% interest rate, and therefore hedged foreign currency loans are often considered to be prohibitively expensive. However, foreign currency loans could still make sense depending on the project specifics and the terms of the financing, particularly if a longer tenor was available.

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[15] Cambodia adopted the Electricity Law in 2001 requiring all electricity entrepreneurs to secure a license from the Electricity Authority of Cambodia ("EAC"), the regulator. Developers were required to adopt national technical standards and charge a tariff set by EAC. The Rural Electrification Fund ("REF") was set up to provide grants and technical assistance to developers. Under the law, mini-grids that interconnect to the main grid must decommission the generation assets, buy cheaper power from national utility, and resell it to their customers at a margin. This framework resulted in improved electricity access, supply quality, end-user tariffs while minimizing investor uncertainty. ("Mini Grids in Cambodia: A Case Study of a Success Story". World Bank Group. 2017.)

[16] We understand that one developer is seeking to denominate its tariff in USD, but we do not believe this is a generally viable solution for the village mini-grid market, since it will be difficult to pass currency risk to local communities.

[17] The interest rate cap in Myanmar for local currency loans is 13% p.a. for collateralized loans and 16% p.a. for uncollateralized loans. The caps serve as the effective interest rate for nearly all 3-year loans as there is generally minimal appetite to offer loans below the caps (outside of a TSL). It is possible for lenders to get a waiver to provide loans at higher interest rates.

[18] MFX Solutions is a US-based currency hedging company that has hedged over $1.5 billion in loans to small entrepreneurs (including in the off-grid energy space) in developing countries covering more than 45 currencies and it is open to hedging MMK (there are limited providers of MMK hedging given monetary restrictions and MMK volatility).

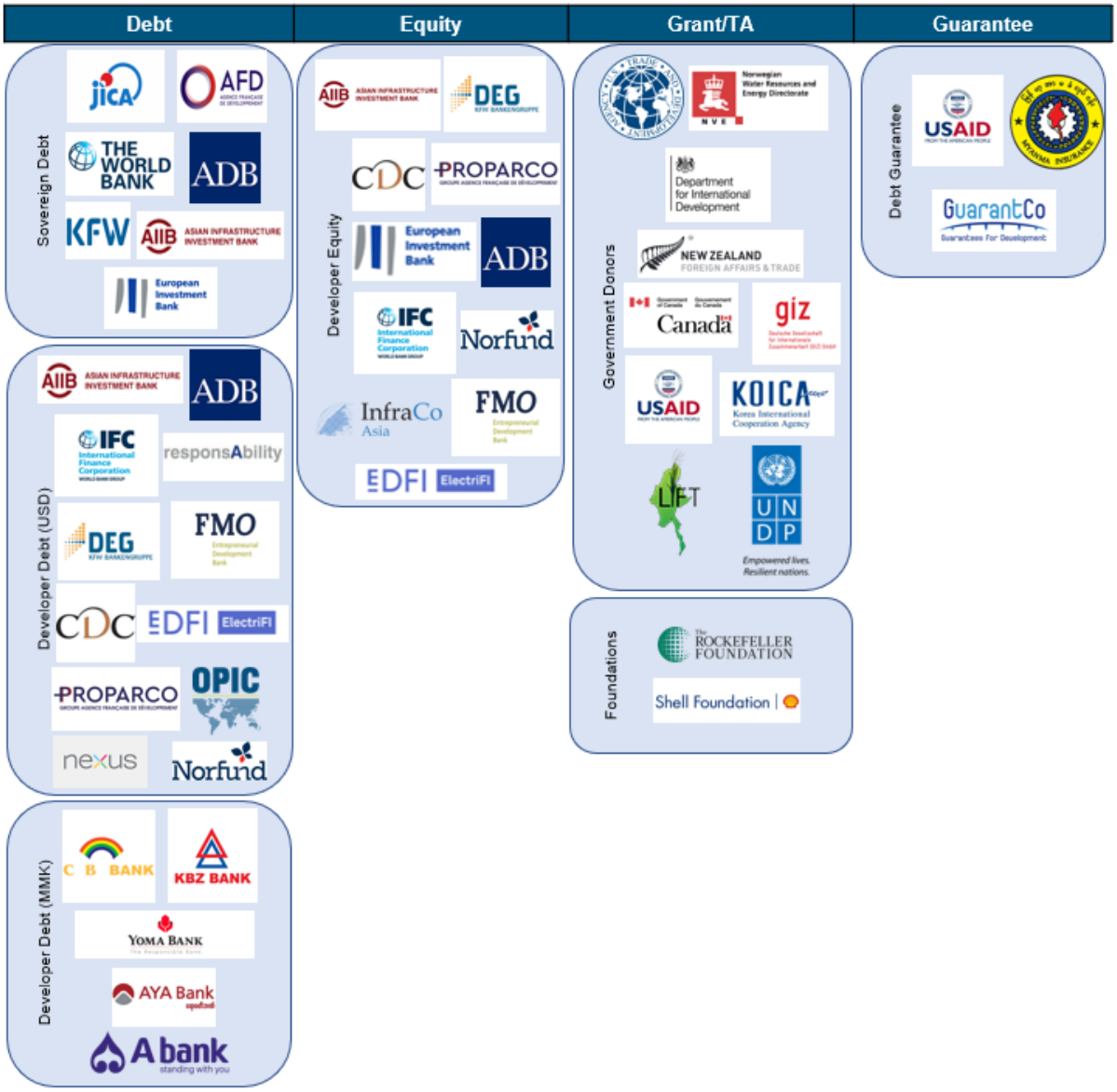
3.4 Potential Funding Sources

There are several types of funding sources that developers can potentially use to secure capital for mini-grid projects. These sources can be categorized as follows:

1. Grant Donors: Sources of grants typically include local government agencies, international multilateral or bilateral donors, private foundations, and non-profit development organizations. These institutions award funding that typically does not need to be repaid (although in certain situations, grants may be recoverable). Grant providers generally provide funds to achieve specific development objectives. Grant funds are often focused on project preparation advisory services but can also cover capital expenditures.
2. Equity Investors: Investors such as impact investors, philanthropic investors, venture capital, private equity funds, strategic investors, and multilateral or bilateral development finance institutions, who provide equity capital in return for partial ownership of the company or its project(s).
3. Debt Providers: Capital borrowed by a developer to be repaid over time with interest. Development finance institutions, export credit agencies, private debt funds and commercial banks are the most common source of debt, including both long-term senior loans and lines of credit.

The following figure is a non-exhaustive capital map that includes potential capital providers interested in the mini-grid market in Myanmar.

Figure 9: Capital Map for Mini-grid Investment in Myanmar



Source: Delphos

The list of funding sources that the Team held discussions with is included in Appendix 1. Note that the Team was not mandated to speak with the full potential funding source universe, but rather to focus on key likely funding sources. Nevertheless, in addition to focusing on key likely funding sources, the Team sought input from a representative sample of types of funding sources to gauge their interest and concerns. The following section details several potential debt and grant solutions for the mini-grid market and reflects the feedback received from these funding sources.

4 Detailed Financing Solutions

4.1 Overview

This section of the Report provides a more detailed description of several potential financing solutions for mini-grid developers. The solutions address financing challenges in the market and financing gaps in the sector to the extent possible. The Team looked at a wider range of potential financing solutions (including, for example, a revolving debt facility) but selected the following two solutions as the most appropriate to analyse in this Report largely based on the likelihood of implementation and funding source interest (given that we did not want to recommend solutions lacking interested funding parties and therefore limited likelihood of implementation). This is not meant to be an exhaustive list. In addition, these financing solutions are not mutually exclusive. The selected financing solutions include:

1. **Two-Step Loan ("TSL") Structure**:

This structure is called a "two-step loan" because funds are passed through two or more entities before the end borrower receives the funds. In this case, the TSL is structured as a sovereign concessional loan provided to the GoM, which then on-lends these funds to local banks or other participating financial institutions ("PFIs"), which in turn on-lend to mini-grid developers at favourable terms and conditions. Such favourable terms (specifically longer tenor and lower interest rates) are critical given the relatively long payback period (i.e. longer than the typical 3-year local loan tenor cap) related to mini-grids. These favourable terms are especially critical given the nascent state of the market as they can allow for the financing of projects that would not be financeable under purely commercial terms, thereby helping to bring economies of scale and further derricking to the market as further data on customer uptake and payments becomes available.

2. **Direct Funding with Credit Guarantee:**

One or several funders provides commercial or blended funding directly to mini-grid developers. Blended finance with a concessional or grant component could be leveraged to cover a portion of the financing, only to the extent needed to promote commercial viability of rural electrification as it is critical to ensure that any concessional component to funding does not distort the market. The structure could also include a risk-sharing mechanism via a partial credit guarantee. Such a guarantee can be provided on a local currency loan, which is important for financial viability due to the high cost of hedging foreign currency loans in Myanmar.

It is critical that the key challenges discussed Section 3.3 continue to be addressed in order to ensure these Financing Solutions are able to be mobilized to their full potential (this is discussed further in the recommended technical assistance ("TA") in Section 4.2.3 below). The sections that follow provide further detail on the structure of the above financial solutions, including structure charts, potential terms and conditions, lessons learned from past programs, associated TA, among others.

4.2 Two-Step Loan Structure

4.2.1 Contractual Structure

As noted in the previous section, the first financing solution that the Team recommends is a TSL, which includes a sovereign concessional loan to the GoM. The key reasons we recommend this solution are as follows: (i) it is a proven model in Myanmar as other donors have implemented TSLs as discussed below, (ii) it offers favourable financing terms with regards to interest rate and tenor, which is critical given the nascent stage of the market and the longer payback period for mini-grid projects, (iii) and the availability of funding (AFD is actively pursuing potential funding for a mini-grid focused TSL).

The loan is known as a "two-step loan" because under the process, funds pass through two or more financial institutions before the end-beneficiaries receive the funds:

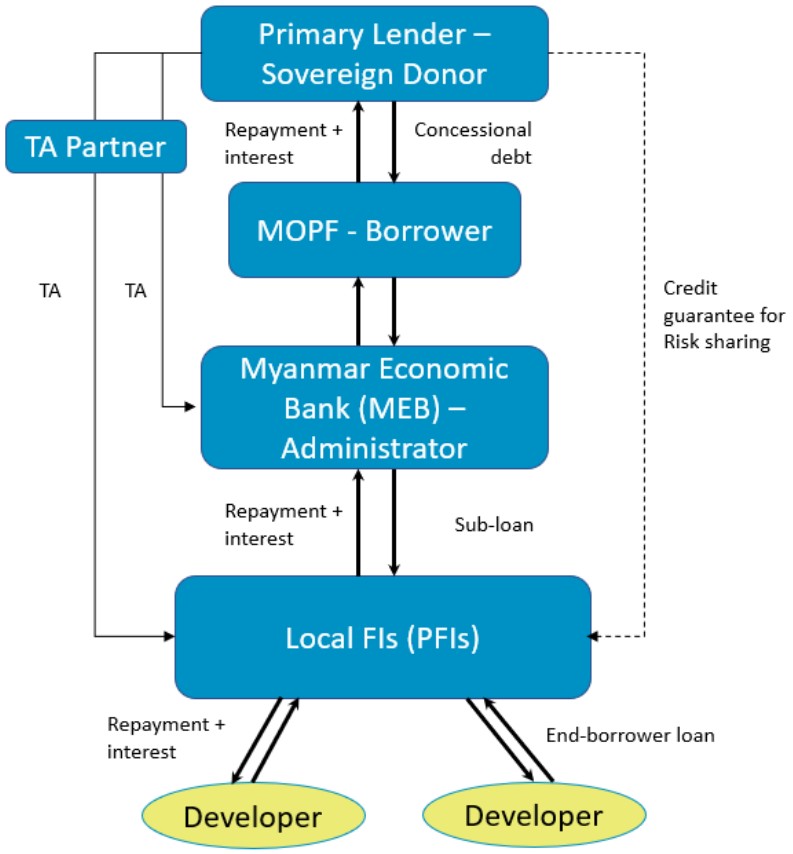
- **Step #1 – sovereign loan:** A Sovereign donor (e.g. AFD) disburses to the GoM in foreign currency based on a loan agreement between the Sovereign donor and the GoM (the "Concessional Debt").

The Ministry of Planning and Finance ("MoPF") would serve as the borrower on behalf of the GoM, and Myanma Economic Bank ("MEB") administers the loan on behalf of GoM (in this sense MEB would act as a co-implementing agency).

- **Step #2 – sub-loan:** MoPF exchanges the loan to local currency and MEB on-lends the funds to local PFIs under a secondary loan agreement (the "sub-loan").
- **Step #3 – end-borrower loan:** Finally, PFIs provide loans to eligible borrowers for their projects. The PFIs manage the project lending process and assess the credit risk of developers. The PFIs use the repayments by the borrowers to repay the sub-loan.

The contractual structure is illustrated in the figure below.

Figure 10: Two-Step Loan Structure



Source: Delphos

Under such a structure, the Sovereign donor (or another party) can also potentially offer a credit guarantee for risk-sharing as shown above. A credit guarantee can be structured as a first loss instrument for less bankable projects. The guarantee can serve as a further incentive for PFIs to lend to developers by lowering their risk exposure. As the ultimate lender to developers, PFIs make the decision for the loans through their internal credit committee and carry the repayment risk on their balance sheet.

As part of its efforts, the Team contacted several local banks to understand their interest in participating as a PFI in a TSL structure for mini-grids. Ayeyarwady Farmers Development Bank ("A Bank"), Co-operative Bank ("CB Bank"), Kanbawza Bank ("KBZ Bank") and Ayeyarwady Bank ("Aya Bank") all expressed in-principle interest in participating. Only one bank the Team contacted indicated that it would not be interested in participating. We believe this indicates more than sufficient interest in the market, and we expect that several of the other banks that participated in the Japan International Cooperation

Agency Two-Step Loan ("JICA TSL" – discussed below) would be interested in participating in this case as well.

Given the need for subsidies to ensure viability of mini-grids at present and that subsidy funding would run out ahead of completion of a TSL program, it is recommended that a TSL funding source consider providing a separate but related funding allocation to top up funds for the DRD-backed subsidy program.

4.2.1.1 Lessons from Precedent TSL Programs in Myanmar

Overview of the Program

In Myanmar, there are precedents in using two-step loans, including a TSL backed by Japan International Cooperation Agency ("JICA"), which previously launched a two-step loan structure for Small and Medium Enterprises ("SMEs"). The program is aimed at encouraging capital investment from SMEs and allows for favourable lending terms in two key areas:

1. a low interest rate of 8.5% per annum in MMK (versus the typical 13-16% per annum);[19] and
2. a longer maturity of up to 5 years (vs. the typical 3-year cap).

The GoM allows such favourable terms under the TSL given the underlying favourable terms of the sovereign concessional loan.

Figure 11: Comparison between typical local banks loans and JICA TSL end-user terms[20]

	Local Banks Loans	JICA TSL
Interest Rate	13.0% p.a.	8.5% p.a.
Amount	Max 20% of capital	Up to 500 million MMK
Currency	MMK	MMK
Maturity	Up to 3 years	Up to 5 years
Collateral	Required	Limited (with credit guarantee)

Approximately 4.8 billion Japanese yen (USD $44 million) was loaned to more than 260 local SMEs in Myanmar under Phase One, which started in June 2015.[21] Phase Two was launched in January 2019 and is expected to total 15 billion Japanese yen (USD $139 million, of which $30 million has been issued to date).[22] A survey[23] conducted by JICA in 2017 shows that many SMEs benefited from longer loan periods and lower interest rates: additional liquidity and increase in their business scales enabled them to make additional investments and to hire new employees.

For Phase Two, SMEs can apply for a JICA TSL from seven PFIs, including: AYA Bank, CB Bank, First Private Bank, KBZ Bank, MEB, Myanmar Citizens Bank and United Amara Bank. This is up from six PFIs that participated in Phase One.[24]

We would expect fewer PFIs for a TSL program developed by the AFD for mini-grid projects given that there would be fewer borrowers. Nevertheless, we recommend that several PFIs are included given that multiple PFIs will likely be needed to ensure adequate underwriting capacity.

[19] Delphos requested a hedging quote from MFX Solutions in April 2019. For a $5M USD loan with a 3-year tenor and an interest rate of 7% p.a. with semiannual interest and principal payments, MFX Solutions will pay 7% USD and received MMK 17.04% (i.e. a 10% hedging spread).

[20] "Preparatory Survey on Two-Step Loan Project for Small and Medium Enterprises Development in the Republic of the Union of Myanmar", Japan International Cooperation Agency, February 2014.

[21] "JICA SME Two-Step Loan" JICA. February 2019.

[22] "Signing of Japanese ODA Loan Agreement with Myanmar: Comprehensive support for socioeconomic development ", JICA website, March 2018

[23] "Data Selection Survey on SME Finance in Myanmar", Japan International Cooperation Agency, August 2017.

[24] For phase one of the loan, it can be secured from Small and Medium Industrial Development Bank, Myanmar Citizens Bank, Myanma Apex Bank, AYA Bank, KBZ Bank, and CB Bank.

Terms and Conditions

Key terms of each loan are described below:

- **Sovereign loan to the GoM**

The GoM entered into a loan agreement with JICA to support economic development in Myanmar.

- **Borrower:** MoPF; and the MEB administers the loans.
- **Tenor:** The loan is to be repaid over a 40-year period and includes a grace period of 10 years.
- **Interest Rate:** 0.01% p.a.
- **Fees:** The GoM also pays a fee of 0.01% p.a. for consulting services (including project implementation support and capacity-building for the executing agency and intermediary financial institutions).

- **Sub-loan to PFI**

The Borrower is a PFI and the lender is the state-owned MEB.

- **Interest**: Interest is paid annually on an agreed date. PFIs pay an annual interest rate of 4.0% p.a. to cover (i) the administrative cost of MEB: 1.0% p.a., (ii) the exchange rate risk taken by MoPF: 2.5% p.a., and (iii) the reserve fund for credit enhancements: 0.5% p.a.[25]
- **Revolving Fund**: When PFIs receive principal repayments from end-borrowers, they pool the repaid amount for future disbursement. A dedicated account is created for this purpose.
- **Other Conditions**: If PFIs are at fault for unauthorized/fraudulent fund transfer based on false or incorrect information or failure to repay on the repayment date, they can be penalized through the application of a doubled interest rate, or by sweeping the concerned funds back to a MoPF account in MEB.

- **Loan to end-borrowers**

SMEs borrow directly from PFIs under favourable terms as summarized in the following figure.

Figure 12: Terms and Conditions of a JICA TSL Structure for End-borrowers

Terms	Description
Borrower	Myanmar-based SMEs
Lender	PFI
Currency	MMK
Size	Up to MMK 500 million
Interest Rate	8.5% p.a.
Maturity	1 to 5 years from the date of disbursement to end-borrower
Repayment Schedule	The repayment schedule of the sub-loan principal is annual. The schedule of the interest payment is semi-annual.

Technical Assistance

Finally, along with the start of the TSL disbursement, JICA provided TA in October 2017 to assist MoPF and MEB in drafting the Operating Guidelines, improving project management and loan appraisal capacities, creating reports and budgetary requests, among other items.[26]

[25] "The Republic of the Union of Myanmar Two-Step Loan Project for Agriculture and Rural Development (Technical Assistance for ODA Loan)", Japan International Cooperation Agency, March 2018.

[26] The Republic of the Union of Myanmar Two-Step Loan Project for Agriculture and Rural Development (Technical Assistance for ODA Loan)", Japan International Cooperation Agency, March 2018.

4.2.2 Potential New TSL Program for Mini-grid Developers

AFD is currently evaluating a two-step loan to support the mini-grid sector in Myanmar. The program would aim to provide financing to cover a portion of mini-grid developer funding needs under the NEP supported by the World Bank and DRD-based subsidy program and potentially for unsubsidized mini-grids as well. The structure would be inspired by the JICA TSL program with the MoPF as the borrower from sovereign donors and MEB as administrator of the loan to interact with PFIs.

A guarantee scheme, managed by PROPARCO (a subsidiary of AFD with a private sector focus) could complement the structure, given that the eligibility of PFIs would need to be assessed on a case by case basis.

It is expected that the AFD TSL could be implemented by early 2021 with a total funding package of EUR 30-40 million including the two-step loan. We estimate that EUR 30 million of funding for mini-grid developers would cover the total project costs of 170-230 subsidized mini-grids (this amount could vary significantly but is based on a typical subsidized site funding need based on the Market Assessment).[27] If leverage were limited to 65% of total project costs, then the AFD TSL could support 260-350 mini-grids as shown in the figure below. However, the optimal leverage should take into consideration the level of subsidy as lenders would want to avoid allowing developers to essentially cash out of their investments. This could be done by simply limiting leverage to no more than the developer contribution amount. Under the current subsidy scheme, the developer funding need is limited to 20% of capital costs. However, there are development costs and other legitimate project expenses other than capital costs that could also be considered as part of the costs to be financed and it remains possible that the subsidies will be decreased over time thereby increasing developer funding need. At the same time, lenders may consider providing debt to operating projects to allow developers to put their funds into new projects and improve economies of scale. If lenders were to cap their loans to 20% of the capital costs, then they could potentially finance approximately three times the number of subsidized mini-grids as shown below when compared to 65% leverage.

Figure 13: Sample Project Cost and Funding Coverage (subsidized mini-grids)

	Item		Base Case		High Cost (+35%)
A	Total AfD amount available (EUR)	€	30,000,000	€	30,000,000
B	Total AfD amount available (USD)	$	34,200,000	$	34,200,000
C	Average mini-grid capex (based on Market Assessment)	$	149,000	$	201,000
D	Total mini-grids covered (B / C)		230		170
E	Total project costs assuming 65% leverage (B / 65%)	$	52,615,000	$	52,615,000
F	**Total mini-grids covered (E / C)**		**353**		**262**
G	Total project costs assuming 20% leverage (B / 20%)	$	171,000,000	$	171,000,000
H	**Total mini-grids covered (G / C)**		**1,148**		**851**

The AFD solution would also include a comprehensive TA program to provide much needed capacity building at various levels of the structure as described further below. Such TA will be critical to ensure successful implementation of the project. Tentatively, the TA is expected to cost up to EUR 7-10 million and to be financed by a grant from the European Union.

JICA is also evaluating how it may be able to use its existing TSL to support mini-grid developers. If JICA were pursue such an approach, this could have the benefit of making funds available much sooner than a new TSL given the time needed to approve a new facility. JICA organized a consultation meeting with developers, local financial institutions, donor partners and other key stakeholders in this regard, which was hosted by DRD in Nay Pyi Taw on May 31, 2019. At the same time, the current borrowing limit under the JICA TSL is MMK 500 million (USD $330K) per borrower, which would not be able to meet the funding need for a portfolio of mini-grid projects, suggesting the operating guidelines of the

[27] This amount is subject to significant variation depending on the size, location, irradiance and load for a given village as well as the level of subsidies going forward. This estimate assumes no decrease in the % of subsidy available.

JICA TSL would need to be adjusted. If AFD or others pursue a TSL of their own, it is therefore recommended that the accompanying feasibility study assess the amount of funding expected to be made available under the JICA TSL and how that would impact the funding need related to a new TSL.

4.2.2.1 Overview of the Project

AFD conducted an exploratory mission to Myanmar in December 2018 to investigate potential funding options and has conducted further assessment thereafter including a detailed Market Assessment that was commissioned by Smart Power Myanmar and co-funded by AFD[28].

AFD intends to launch a complementary feasibility study to further define the structure of the project and finalize the process of identifying the PFIs for credit lines and guarantees. The feasibility study will determine the feasibility – from an operational, technical, financial, institutional and administrative point of view – of the proposed project content. This section of this Report can help inform the baseline of the planned complementary feasibility study.

DRD confirmed its interest in initiating the feasibility study and has taken internal steps to secure the necessary internal approvals. For the feasibility study to start in Q4 2019, AFD had indicated that it will need to receive a letter of request by DRD in July 2019, at which point it will then submit a request to finance the feasibility study directly from its own budget. We believe that this timeline is achievable based on progress to date.

While it is expected that such a study will also look at borrower eligibility in greater detail, we have included initial recommendations here. Specifically, we recommend that funding be made available for both subsidized and unsubsidized mini-grid projects.

- Subsidized projects:
  - Subsidized projects refer to eligible projects that receive NEP subsidies, funded by the World Bank and the GoM. Under present conditions, the subsidy covers 60% of the project costs, the remaining costs are funded by developers (20%) and by villages (20%) through a Village Electrification Committee (“VEC”).
  - For the implementation of a program to support subsidy projects, it is possible to require that a minimum predetermined percentage (e.g. 50% or higher) of mini-grids financed fall under the subsidy program (or a successor government-backed program). If such a requirement is included, it is important to note that unsubsidized projects are generally larger by nature and the financing requirement would be a much higher percentage of the project costs given the lack of a subsidy. However, we would recommend not including a strict requirement in this regard given that it would be good to maintain flexibility to meet market needs in case the DRD program is unable to keep up with market demand or if subsidy funding is not fully allocated.
- Unsubsidized projects:
  - Many of the developers focused on the subsidy program are also looking to develop unsubsidized projects and financing unsubsidized projects could help the sector graduate into a more sustainable model over the long term.
  - We would recommend including minimum requirements for unsubsidized projects, including technical requirements to incentivize certain developer behaviours (including meeting all DRD technical requirements). The below includes a non-exhaustive list of technical requirements as an illustration.

[28] In May 2019, SPM published a comprehensive assessment of the Myanmar’s energy market with the financial and technical support of the Rockefeller Foundation, GIZ and Agence Française de Développement. The *Decentralized Energy Market Assessment in Myanmar* is based on the latest available data of the potential viable market for mini-grids in Myanmar, the projected size of the market by 2030, the key market drivers, and the measures that need to be simultaneously enacted in order to move towards Myanmar’s “Grid 2.0” – a future system in which the national grid is complemented by decentralized energy solutions to meet the country’s energy needs.

Figure 14 Requirements for Unsubsidized Mini-Grid Projects*

Category	Requirements	Description
Minimum Requirements	*Required Capacity*	Conventional energy capacity should not exceed renewable capacity in hybrid models.[29]
	Connection to the grid	Projects should be constructed such that they are technically compliant for grid arrival. It is understood that MOEE will be introducing low voltage standards in the near future. Therefore, we recommend considering requiring compliance with these guidelines to the extent they have been implemented.
	Performance Monitoring	Borrowers should submit plant performance data to DRD and its technical partner to be used for performance analysis for subsidized projects and we understand this may be required in the tripartite agreement in the future. In the absence of this and/or for unsubsidized projects outside the DRD subsidy scheme, it is recommended to consider requiring borrowers comply with the Quality Assurance Framework for Mini-grids published by NREL[30] or meet other key performance indicators ("KPIs") listed in the covenants under a loan agreement.
	Productive use power	Ensure the viability and sustainability of all mini-grid projects by meeting the following specifications: ○ The majority of residential connections will have the potential to deliver 1.2kW or more of alternating current ("AC") power, provided by at least [5A] smart meters, across at least [220V]. Productive use activities such as energy efficient grain mill, barber shop, refrigeration, cinema, bar, limited woodworking will have the necessary access to the supply via three phase voltage.
Technical Requirements	*Reliability*	○ Ensure that all connections stipulate an average daily uptime across the portfolio of at least [85%] per quarter. Other quality of service metrics could potentially be considered by the feasibility study to be commissioned. It is also suggested to consider World Bank's Tier [3] level of service or other similar level of service requirements.[31]

** Note: We understand that AFD will likely implement eligibility criteria related to subsidized projects as well based on additional criteria identified in their feasibility study. It is recommended that any technical requirements be checked with a technical specialist to ensure they are reasonable based on the latest market conditions. In this regard, any such requirements have been bracketed in the table above.*

To avoid any market disruption, it is expected that the AFD TSL would only be eligible to investments and developers lacking proper access to the local commercial banking sector (i.e., excluding purely commercial anchor tenant business models). However, it is expected that the AFD TSL would be

[29] We understand that AFD would like to support RE and hybrid systems and that it will study how to ensure that use of conventional energy is minimized. We recommend that any conditions in this regard provide some flexibility given the overarching goal of providing energy access and resource optimization.

[30] "Quality Assurance Framework for Mini-Grids". Ian Baring-Gould, Kari Burman, Mohit Singh, and Sean Esterly National Renewable Energy Laboratory and Rose Mutiso and Caroline McGregor U.S. Department of Energy. November 2016.

[31] "Beyond Connections: Energy Access Redefined." Energy Sector Management Assistance Program. The World Bank. July 2015.

available to developers that primarily focus on the anchor tenant business model, but that are also seeking funding for village focused mini-grid projects whether that be expansion of existing anchor tenant sites to a neighbouring community or for new sites.

4.2.2.2 Terms and Conditions

Indicative terms and conditions for a new TSL facility for mini-grid developers are provided in this section. As with the JICA TLS structure, separate agreements will be signed for the loan provided by the sovereign lender to the GoM, the GoM to PFIs (sub-loan), and for the loan provided by PFIs to mini-grid developers.

Figure 15: Indicative Terms and Conditions of a Concessional Debt Facility for the GoM

Terms	Description
Borrower	MoPF on behalf of GoM (funds to be administered by MEB)
Lender	Sovereign Lender (AFD)
Currency	EUR
Size	• Up to EUR 30 million for the credit line and guarantee; • An additional grant up to EUR 10 million would be considered for financing TA; and • Potentially a component to top up funding for the DRD-backed subsidy program.
Interest Rate	Concessional

Figure 16: Indicative Terms and Conditions of a Sub-Loan to Local Lenders

Terms	Description
Borrower	Local Lender (PFI)
Lender	Loan administrator appointed by the GoM (MEB)
Currency	MMK
Size	~EUR 5-15 million per PFI
Interest Rate	~4.0 % per annum
Eligibility Criteria	To be defined in the detailed feasibility study. Expected to include minimum non-performing loan (“NPL”) ratio, minimum capital adequacy ratio (“CAR”), compliance with Anti-money laundering standards, environmental, social and governance (“ESG”) standards (or willingness to implement appropriate standards if currently lacking), among others.

Figure 17: Indicative Terms and Conditions of a Loan to Mini-grid Developers

Terms	Description
Borrower	Mini-grid developers
Lender	Local Lender (PFI)
Currency	MMK
Size	TBD depending on developer needs, potentially up to EUR 10 million per borrower
Interest Rate	~8.5% per annum, interest is paid on a semi-annual basis
Tenor	~5-8 years
Repayment Schedule	Annual repayment schedule potentially sculpted according to standard debt sizing criteria to be agreed between lender and borrower

4.2.2.3 General Advantages of the Structure

There are several notable advantages of the TSL structure.

First, as discussed above, there is an established precedent for two-step loans in Myanmar: lessons learned from the JICA TSL structure show that such investment can contribute to the creation of employment and create a virtuous cycle of investment for SMEs.[32] The program developed by JICA offered a lower interest rate and longer tenor than local bank loans (loans are typically provided with a maximum maturity of 3 years and interest rates of 13% p.a.). With a lower financial burden, the end-borrowers have a lower likelihood of default and can reinvest profits into expansion of additional mini-grids, further improving economies of scale.

Sovereign donors and, critically, the end borrowers are not exposed to the risk of foreign currency rate fluctuations. The exchange rate risk is transferred to the MEB (on behalf of GoM), which undertakes the switch between the main currency and MMK. Generally speaking, host governments are best positioned to manage foreign exchange risk.

Finally, a TSL structure leverages local banks' local market knowledge:

- PFIs play a central role in the structure as they manage the project lending process with the developers.
- Also, the structure promotes capacity building of local banks to enable long-term development of project finance lending and further diversify the infrastructure asset classes that comprise their portfolio: the role of a TA can be essential in this type of structure as the capacity of potential PFIs (e.g. risk/credit assessment capabilities) is generally limited and there is a documentation burden associated with proper monitoring.
- Lastly, risk-sharing credit guarantees would help absorb the first losses for less-bankable and riskier projects: as PFIs have direct exposure to the credit risk of developers, a risk-sharing credit guarantee can lower the exposure of PFIs and increase their willingness to lend when financing risky projects with favourable terms. PFIs eligibility would need to be assessed on a case-by-case basis.

However, the solution has some disadvantages which include the following issues:

- A potential longer lead time given the complexity of the structure, the bureaucratic nature of various approval levels, and potential bottlenecks along the approval process.
    - First, AFD or other donors would need formal indication from DRD of their interest in pursuing such a structure in order to mobilize the corresponding budget;
    - Then, the donor would need to undertake a more detailed feasibility study, which would include retaining third-party experts to evaluate the funding need, design of the structure, TA, impact, and related elements. Thereafter, the TSL proposal would be taken through an internal approval process. AFD has indicated that this internal approval process could be undertaken by Q1 2020.
    - In addition, Parliamentary approval would be required, given the sovereign loan element. This will likely take several months, if not longer.
    - Thereafter, PFIs will need to be onboarded and the funds will need to be routed through MEB.
    - Finally, PFIs will underwrite loans to mini-grid developers, which could add another 3-6 months (but some of this work could be done in parallel to the previous step of onboarding).

  Taking the above complicating factors into account, we expect funds will be available under a TSL no earlier than Q1 2021, but the exact timing remains to be determined.
- The limited capacity of PFIs, which may not have appropriate capacity to evaluate project finance deals.
- MEB currently has limited bandwidth and is mainly focused on agriculture and SME financing and managing other two-step loans such as the current Phase Two of the JICA Program.

[32] "Data Selection Survey on SME Finance in Myanmar", Japan International Cooperation Agency, August 2017.

4.2.2.4 Potential Credit Enhancement for the Structure

The Central Bank of Myanmar ("CBM") announced that state-owned Myanma Insurance will provide insurance to partially cover losses resulting from a loan default under a new Credit Guarantee Insurance ("CGI") scheme for banks.[33] The scheme is expected to increase financial assistance to local businesses.

Key terms of the program are as follows:[34]

- Myanma Insurance will provide insurance cover for local banks in the event of a borrower default under the CGI Guarantee. If the debtor fails to repay, Myanma Insurance will be responsible for reimbursing 60% of the outstanding loan amount and the bank will only incur a loss for the remaining 40% of the outstanding loan balance.
- All loans not covered by CGI will be considered risk assets by CBM.
- CGI is available to businesses seeking bank loans with or without collateral. CGI covers businesses against non-payment of debts owed to them by business customers for goods or services provided on credit terms.

Figure 18: Key Terms of the CGI Scheme for SMEs

	Option 1	Option 2
Collateral	No	Yes
Insurance Premium	Year 1: 3% p.a. Year 2: 2.5% p.a. From Year 3 onwards: 2% p.a.	Year 1: 2% p.a. Year 2: 1.5% p.a. From Year 3 onwards: 1% p.a.

JICA is working with a technical expert to make CGI more accessible.

4.2.3 Technical Assistance

TA would be needed at several levels in order to help address key challenges for the mini-grid market and allow for successful implementation of a TSL, as detailed below. These recommendations are based on our meetings and interviews with key stakeholders, review of relevant reports and experience in the market.

- First, assistance would be needed at the GoM level, notably within MEB, to ensure that MEB does not become a bottleneck within the structure and that it is able to efficiently on-lend funds to PFIs.
- Second, assistance would be needed at the PFIs to help improve their risk management capacities. The TA will provide support to build capacity to evaluate cash flow lending (i.e. project financing) to mini-grid developers (which would have the added benefit of supporting project finance in Myanmar more broadly in the future) and ensure that they can meet the reporting requirements to MEB.
- Third, TA will be needed to ensure that developers understand how to prepare a bankable package for submission to PFIs. For example, by providing training to developers regarding how to best aggregate and present mini-grid operating data to demonstrate the predictability of cash flows and to demonstrate how data is being used to inform pricing (tariffs) and sizing (capacity) of mini-grids.
- Lastly, selected VECs could also potentially benefit from TA to ensure proper implementation and operations.

These areas are described in the subsections that follow.

[33] "Myanma Insurance to cover 60pc of CGI-backed loans", The Myanmar Times, July 2018

[34] "New insurance scheme to provide aid in obtaining loans", The Myanmar Times, September 2017

Lessons can be learned from the experience with JICA's TSL. For example, a survey led by JICA in 2014[35] highlighted several issues that could be addressed by a TA, as summarized in the table below. We believe that these issues are applicable to mini-grid developers as well.

Figure 19: Issues in the Implementation of a TSL Structure

Issue	Description
Institutional Framework	• Weak policy and institutional framework for SME development • Strict banking regulations from the banking crisis of 2003 are largely still in force despite some recent relaxations in banking regulations • Accounting systems exist but are not widely utilized
Lending Practices	• Conservative and less flexible lending practices by PFIs • Immovable property is still predominantly used as collateral in practice • Not many banks are aggressively marketing to SMEs
Knowledge of Borrowers	Lack of knowledge and experience by SMEs on: • Formal lending procedure • Modern business management

Several agencies are undertaking TA related to the sector and it is therefore recommended to coordinate further with key agencies closer to the time of formally earmarking any funding to minimize duplication of efforts (GIZ is conducting extensive TA for DRD and would be a key entity to coordinate with). We understand that the TA focus will be studied further in the upcoming feasibility study to be commissioned by AFD.

4.2.3.1 Technical Assistance for GoM

We recommend focusing on the following areas of TA for the benefit of GoM in support of the AFD TSL.

➢ **Capacity Development for DRD (or related institution)**

- DRD Project Management Office ("PMO"), is the main department which manages existing subsidized mini grid projects under NEP. The TA can provide support across various categories of responsibility undertaken by DRD, including:
    i. Project Management: the TA can support further development of DRD's project management capabilities to allow for more efficient management as rollout scales up in the next few years;
    ii. Financial Management: DRD is required to evaluate project costs and key financials of a project during the proposal stage and ensure financial soundness during the operation stage;
    iii. Technical Assessment: DRD's role also includes assessing technical aspects of technologies selected by developers and conducting verification processes of each project site before commissioning. DRD requires TA to improve both its financial and technical capabilities in order to manage this process more efficiently;
    iv. Monitoring and Evaluation ("M&E") Responsibilities: After projects are commissioned, DRD monitors and evaluates project sites together with project developers and VECs. TA to improve this M&E process and related capabilities is also needed;
    v. Subsidy Design: the TA can evaluate how to optimize the subsidy design to ensure investor interest while also maximizing the impact of subsidy dollars. This can include evaluating innovative and results-based mechanisms that also ensure developer alignment with impact goals;

[35] "Preparatory Survey on Two-Step Loan Project for Small and Medium Enterprises Development in the Republic of the Union of Myanmar", Japan International Cooperation Agency, February 2014

vi. Bloc Procurements: we recommend that TA helps to facilitate bloc procurements that can bring about economies of scale for developers, driving down levelized costs, and thereby improving the business model economics. This would include training on how to structure procurements and evaluate multi-site bids; and

vii. Regulatory Framework: a comprehensive policy framework that details how mini-grids will be absorbed into the main grid upon its arrival is critical as this is a key challenge to financing as discussed above.

GIZ and other donors are actively working in several of these areas. As such, it is highly recommended that the upcoming feasibility study (to be commissioned by AFD) examine whether there are expected to be any gaps related to assistance on these topics closer to the time that TA funds will be available and to ensure coordination of effort amongst key donors. It will also be important to assess what, if any, role AFD should play in influencing mini-grid policy.

➢ **Capacity Development for MEB**

- It will be critical to provide TA to MEB to ensure that it is able to efficiently act as an administrator of the TSL program and move funds to PFIs (MEB is one of four state-owned banks in Myanmar and is controlled by MoPF and largely acts on behalf of MoPF.)
- TA would be expected to cover preparation of operating guidelines related to the TSL, PFI appraisal standards and practices, reporting requirements for PFIs and best practices for monitoring such reports, more general project management, among others.

4.2.3.2 Technical Assistance for PFIs

We recommend TA for PFIs in the following areas:

- Developing an understanding of the DRD subsidy program and the risk implications to financing mini-grid projects, as well identifying risk mitigation strategies. Local banks need improvements in many aspects of their operations, especially in credit evaluation skills. Other areas for potential assistance include governance and service modernizations, strategy setting and system modernization.[36]
- Develop capacity-building specifically in evaluating energy projects: provide trainings and analytical tools in order to promote and improve the banks' capacities in terms of project finance (through cash-flow financing) compared to corporate finance.
- Support the banks in identifying a pipeline of projects to be financed through the credit line and/or guarantees and facilitate the appraisal process with standards contracts and assistance.
- Provide assistance in getting PFIs more comfortable with forms of collateral other than land.

In parallel with the launch of a new TSL program, it will be critical to educate potential PFIs and borrowers about the structure and the process to help ensure maximum utilization of the funding. This process could begin in the coming months with a direct consultation with the banking sector in Myanmar. Smart Power Myanmar could potentially help facilitate such a consultation.

The TA recommendations included in this subsection would also be applicable for the Direct Funding financing solution in this Report.

4.2.3.3 Technical Assistance for Developers

Previous TSLs have also been constrained by borrowers' limited ability to present bankable financing applications. The situation is similar with mini-grid developers, given the nascent stage of the market. In this regard, technical assistance for developers related to accounting, finance, risk management, analysis of existing mini-grid data, and business planning (including preparation of financial statements and financially viable business plan) would be particularly relevant. Even if financial statements are

[36] GIZ, and Friedrich Naumann Foundation of Germany have already established offices in the SME development center in Yangon, and developed a two-year technical assistance program for banks, which includes assistance to the regulatory bodies such as CBM, and a financial reporting system for the development of SMEs. Seven banks applied to this program, and three banks were selected.

prepared, they generally do not reflect the true ownership of assets or liabilities. Support on the modernization of business management of potential borrowers would be beneficial.

A viable business proposal should include:

- An accurate financial analysis of the business with:
  - Detailed proforma financial projections with an income statement, balance sheet and cash flow statement for 10+ years. This should also include actuals of existing operations.
  - Return metrics such as Internal Rate of Return ("IRR"), sufficient debt service coverage ratios ("DSCR") to ensure repayment capacity of any debt financing, and leverage ratios.
- The analysis should also show projections around demand uptake, connections over time, tariff setting and tariff collection. It will be critical to use data from initial projects to inform these projections and related sensitivity analyses of key project parameters.

The TA can also help ensure the success of mini-grids by providing support on site selection criteria and helping to stimulate demand of productive use. This not only allows for greater economies of scale, more predictable loads, but also allows villages to move up the energy ladder, which improves their income and ability to pay for additional electricity over time. The TA in this regard can initially focus on village demand surveys and education programs for villages on potential productive use options in agro-processing and other areas.

The TA could also work in disseminating good practices in terms of technical and environmental and social ("E&S") standards, notably complying with the future energy policy on mini-grids to be compatible with the conventional grid arrival.

The TA recommendations included in this subsection would also be applicable for the other financing solutions in this Report.

4.2.3.4 Technical Assistance for VECs

In addition to DRD and project developers, VECs play a pivotal role from project conceptualization through commissioning to operations. Therefore, TA for VECs is also critical. TA could include establishing and improving standard operating procedures for working with project developers and promoting understanding on financial literacy about matters including tariffs payments, payment collection, and cashflow (this would focus on the VEC capacity, keeping in mind that developers have obligations in this regard as well, but also that VECs may have full responsibility upon transfer of the mini-grid from the developer to the community). Therefore, TA could also focus on accounting systems and tools to effectively manage each project site. However, it is possible that such TA could be handled outside a TSL given it is less directly related to the TSL.

In addition, and as discussed in the previous section, properly forecasting and stimulating demand of productive use will be critical to the success of mini-grids. In this regard, it is expected that TA related to this area will need to focus on villages via VECs in addition to developers given that community members will ultimately be driving productive use applications.

The TA recommendations included in this subsection would also be applicable for the other financing solutions in this Report.

4.3 Direct Funding with Credit Guarantee

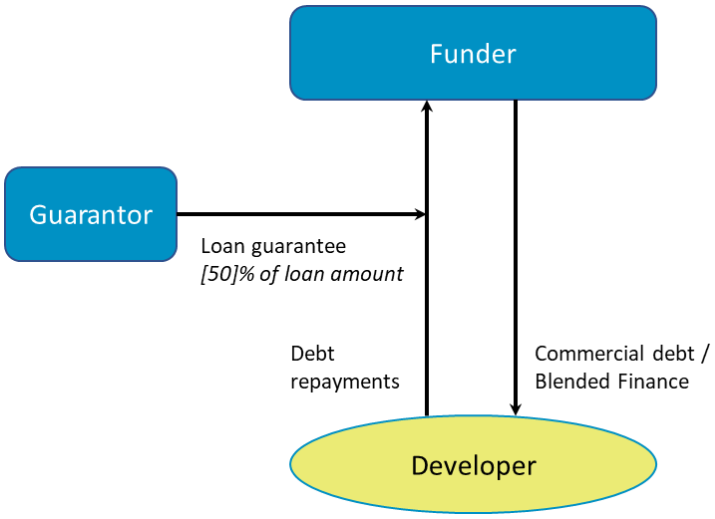
4.3.1 Contractual Structure

The second recommended financing solution is direct debt funding with a potential risk-sharing guarantee. In this structure, commercial debt funding (potentially blended with a portion of concessional debt funding or grant funding)[37] is provided directly to developers. Developers then repay the financing to funders directly. The lenders can potentially share the repayment risk via a guarantee mechanism,

[37] Concessional funding should only be used to the extent needed in the nascent stages of the market and should not distort the market.

wherein a third-party guarantor will guarantee a percentage of the loan amount. While the financing terms under this solution are not expected to be as favourable as the terms of end-user loans under a TSL (due to the underlying low-cost concessional funding), the benefits are that this solution could be implemented faster than a TSL, could be funded by lenders that may not be eligible for the TSL (PFIs under the TSL are expected to be limited to local banks), and total financing available would not be limited to the funds provided by a concessional lender (and in this regard, unlocking a more commercial financing model such as this will be important in developing sustainable financing solutions to address the long-term financing needs of the market).

Figure 20: Direct Concessional Funding



Source: Delphos

This structure presents several advantages in comparison to a TSL:

- It is a relatively simple structure, which should allow for faster implementation than a TSL structure that requires sovereign approval. While there has been very limited direct funding in the sector to date in Myanmar, the addition of a guarantee mechanism could help to crowd in commercial funding.
- Direct funding also provides an opportunity for funders interested in smaller ticket sizes to support a developer in the sector (e.g., a funder looking to deploy several million dollars or less).

On the other hand, financing terms are generally expected to be less favourable than under a TSL structure given the underlying concessional basis of the TSL structure, which can be challenging given the payback period of mini-grid projects is longer than the typical 3-year tenor in Myanmar.

This Report focuses on longer tenor structures to support the development, construction and operation of mini-grids. Given the nature of mini-grids as infrastructure and the longer-term payback period, cashflow lending and project finance will be critical to ultimately unlocking financing to support the market in reaching its full potential. However, it is important to note that direct funding, potentially with a guarantee structure, could also be used to address shorter term funding needs of mini-grid developers. Developers face challenges due to upfront capital requirements related to the purchase of equipment and the need to provide a performance security for the construction of the mini-grid. With minimal collateral requirements, interventions that provide bridge financing for equipment sourcing (until subsidies are received) and for performance guarantees could enhance liquidity that will ensure effective and efficient project execution. As such, shorter term funding options are discussed briefly in this section as well.

The Team have had initial discussions with local banks interested in providing funding to mini-grid developers with a guarantee structure in place since this would lower their total exposure to a particular deal but also allow them to fund relatively larger deals that benefit from additional scale. Yoma Bank has already provided 5-year financing to a mini-grid developer. Risk sharing in the form of a guarantee

from U.S. Agency for International Development ("USAID") Development Credit Authority ("DCA") is expected to further increase its appetite to finance mini-grid projects.

4.3.1.1 Long-Term Direct Funding

This structure would provide senior debt financing to a developer, which would be repaid in regular principal repayments over a several year period. As background, Independent power projects ("IPPs") in emerging markets are typically financed on a non-recourse or limited-recourse project finance basis. These projects have long-term power purchase agreements ("PPAs") with take-or-pay arrangements for renewables projects or capacity payments for thermal projects that allow for strong predictability of cash flow over loan repayment periods of up to 18 years. Under such a structure, equity financing would typically cover the entire cost of the development phase of the project and a portion of the construction costs altogether totalling 25-35% of the total project costs. Senior debt would cover the remaining 65-75% of the project costs and would come in during the construction phase of a project.

However, given the nascent nature of the mini-grid market and limited predictability of cash flow, it is expected that at least in the immediate term, long-term direct funding would either come in as senior debt on a corporate finance basis or come in as take-out financing for a project (or bundle of projects) once operational (as opposed to during the development/construction phase) and would allow the developer to use this financing to reinvest in additional mini-grids or expand existing mini-grids. Also, a project financing approach requires significant due diligence work and most lenders will require the hiring of independent consultants to assess risks. This would incur additional costs and potentially a longer process. Therefore, project finance tends to make sense for larger projects. Project finance capacity is expected to be needed to ultimately reach the full mini-grid market potential, but we believe that corporate finance and take-out finance will be an important step in developing the market capacity further.

4.3.1.2 Short-Term Direct Funding

Two types of shorter-term facilities would also be relevant for developers and could potentially serve as near-term financing solutions in the market:

- **Equipment Sourcing Bridge Facility**: an equipment sourcing bridge facility would give developers a possibility to borrow short term funds to purchase the required equipment for the mini-grid.
- **Performance Security Facility**: this facility will enable developers to provide the Performance Security with less collateral.

Figure 21: Advantages of Short-term Facilities

Facility	Description

Equipment Sourcing	• Developers only receive a partial payment upon the submission of the Bill of Lading (i.e. 50% of the imported good price).[38] The balance is paid by the DRD upon the acceptance of imported material to site.
	• Procurement contracts usually include:
	  ○ a portion in local currency[39] for the purchase of local material, charges for transportation and logistics, labour costs, project management and consultancy costs, and
	  ○ a portion in USD for importing items
	• The equipment procurement cycle is usually between 6 and 12 months

Performance Security	• Unconditional, irrevocable and on-demand bank guarantee to be issued by a bank in favour of DRD in either USD or MMK • Covers 10% of the project costs • Release upon receipt of the Defect Liability Release Certificate from DRD • The process can be from 6-15 months in duration

[38] For a local good, the developer will receive full payment only when the good arrives at the project site.

[39] CBM exchange rates of the date of payment will apply.

Smart Power Myanmar is working to help develop local lender interest in these shorter-term facilities, but these are not covered in detail here given longer-term solutions are the focus of this Report.

4.3.2 Guarantee Mechanism

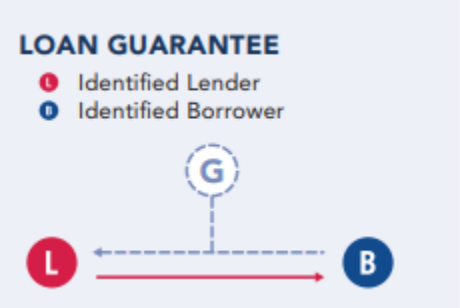
A guarantee helps to reduce risks taken by lenders. Guarantees are provided by a variety of bilateral and multilateral DFIs as well as GuarantCo, which is a member of the multi-donor backed Partnership for International Development group ("PIDG"). This section of the Report focuses on USAID DCA as a provider of such a guarantee for illustration purposes given that it specializes in providing local currency guarantees and has interest in the Myanmar mini-grid market, but other parties could play this role.

USAID implements DCA guarantees to generate more lending to underserved markets and sectors by reducing risks, and to demonstrate the long-term commercial viability of lending in developing markets.[40] Through DCA, more than 600 guarantees between financial institutions and USAID have made up to $5.5 billion in private financing available globally. This guarantee is backed by the full faith and credit of the U.S. Treasury and is applicable for non-sovereign debt capital only.

The guarantee is typically used for term loans. Different mechanisms exist:

- **A loan guarantee**: a loan guarantee covers the repayment of disbursements to be made by a borrower under a loan agreement with an identified lender. DCA evaluates the size of each loan guarantee on a stand-alone basis depending on the characteristics of each project.

Figure 22: Loan Guarantee

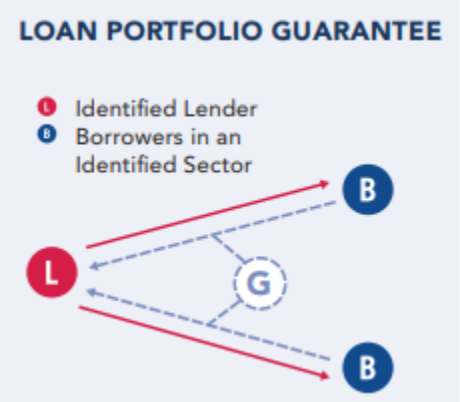


Source: DCA

- **A loan portfolio guarantee**: a loan portfolio guarantee covers the repayment of disbursements to be made by several borrowers in an identified sector, under a loan agreement with an identified lender. Pre-approval is not required for the guarantee of individual loans placed under loan portfolio guarantees. This structure is advantageous given a lender could support several mini-grid developers (and likely a larger number of projects) under the same loan portfolio guarantee.

[40] Based on initial discussions with DCA, the Team understands that a traditional cash flow lending facility would be easier to cover than a project finance loan. DCA does not have the technical capacity to assess risk in a project finance structure and would need to hire an independent engineer at an additional cost. Therefore, DCA requires a minimum loan amount of $50 million to amortize this cost.

Figure 23: Loan Portfolio Guarantee



Source: DCA

Two other mechanisms have also been implemented by DCA in the past (these are being mentioned here for completeness, but these are less relevant for the mini-grid sector):

- **A portable guarantee**: the guarantee covers the repayment of disbursements to be made by a borrower under a loan agreement with an unidentified lender.
- **A bond guarantee**: loan proceeds are placed in a trustee, which provides funds to the bond issuer. The guarantee covers: (i) the repayment to the trustee of the funds lent to the bond issuer, and (ii) the repayment of the loan to the lender.

4.3.2.1 Terms and Conditions

Note that while this section focuses on a DCA guarantee, such a guarantee could also be provided by other parties.

Based on initial discussions with DCA, key aspects of a DCA guarantee would need to be structured as follows:

- While a DCA guarantee usually covers 50% of the debt amount, DCA could accept to cover up to 80% of the debt but at least 20% must remain at the risk of the lender.
- The process requires an extended legal conversation between DCA and the lenders to assess when exactly the guarantee might be called. In particular, DCA needs: (i) to understand the monitoring of the loan and frequency of publication of financial reports and: (ii) to review the claim process of each lender separately.

DCA is open to working with international or local lenders, depending on the market needs and conditions. Generally speaking, the process to get a DCA guarantee approved is much easier when working with partners whom DCA has an existing relationship as that it will be faster to get deals approved by the Credit Committee due to familiarity with the product and related terms and conditions. In this regard, DCA has worked with several international lenders active in the region including BNP Paribas, Société Générale and Standard Chartered. However, international commercial banks have limited ability to operate in Myanmar at present. The sector has been slowly opening, with IFC becoming the first foreign shareholder in a local bank when it converted its $5 million loan into a 5% stake of Yoma Bank earlier in 2019. As such, we would expect that likely partners for a DCA guarantee in the near term would be local commercial banks, but this may change as the sector continues to evolve.

DCA would conduct a detailed due diligence of any future partners, which would include detailed review of ESG policies (DCA follows the guidelines of the IFC and WB), financial health (capital adequacy ratio etc.), anti-money laundering standards, ownership structure, among others.

While the terms of a direct loan and an accompanying DCA guarantee vary significantly depending on deal specifics (for this reason DCA does not publish extensive information on its terms), we have prepared some indicative terms for reference purposes in the figures below.

Figure 24: Sample Terms and Conditions of a Direct Loan

Terms	Description
Funder	Local Bank
Currency	Local currency
Interest Rate	Commercial rate (typical interest cap in Myanmar is 13% p.a. for collateralized loans and 16% p.a. for uncollateralized loans)
Maturity	Up to 3-5 years
Fees	• Origination fee: A one-time, up-front fee, generally to cover costs of underwriting the loan

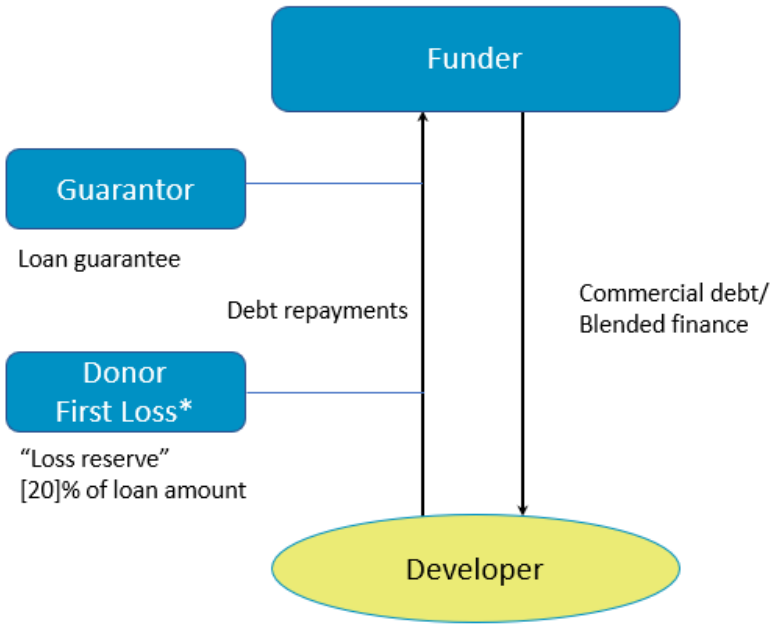
Figure 25: Sample Terms and Conditions of USAID DCA Guarantee

Terms	Description
Funder	Local Bank
Guarantor	DCA
Guarantee Percentage	50% *pari passu* guarantee on loan principal
Claim Procedures	Guarantee of realized losses, requiring the following claim procedures: • Wait 90 days after the final letter of demand is sent to the borrower • Certify that reasonable collection efforts have been pursued • Write off the loan or take a minimum 20% provision if a legal impediment exists
Fees	• Origination fee: A one-time, up-front fee based on the facility size • Utilization fee: A semi-annual fee based on the value of loans placed under the guarantee

4.3.3 First Loss Mechanism

The direct loan with guarantee structure discussed above could also potentially benefit from the inclusion of a donor first loss mechanism. Under such a structure, a donor provides a grant (potentially recoverable) to cover a set amount of first-loss. If there is a loan default, the grant is effectively used as a reserve to absorb the principal repayment loss related to the default. As a result, the funder can be enticed to provide a larger loan amount given that the donor covers the amount which is exposed first to any loss suffered on the repayment of the loan. The mechanism would function similar to a credit insurance product, but potentially without the additional cost to the borrower.

Figure 26: Donor First Loss Mechanism



Source: Delphos

A first loss mechanism could help crowd in a funder and guarantor by improving the risk-return profile of the transaction. Such a credit enhancement tool is described as "catalytic" because the goal is to provide just enough protection to entice financing from a funder. To ensure that it plays a catalytic role, this tool should be used to prove commercial viability of the projects rather than just as a donor mechanism.

A variation of a pure first-loss facility would be to provide an interest rate subsidy along the lines of the EUR 20 million Indian Renewable Energy Development Agency ("IREDA")-KfW "Access to Energy" facility for mini-grid developers in India. The facility includes a milestone-based incentive, wherein once 80% of households are connected, IREDA provides a grant equal to 5% of the loan amount. In addition, IREDA also funds a debt service reserve account ("DSRA") of 10% of the loan. The borrower keeps the residual unused amount in the DSRA at the end of the loan repayment period (which is 7 years in the case of the IREDA-KfW facility). Such a results-based financing mechanism can help to incentivize target outcomes while also seeking to minimize market distortions and other unintended behaviour.

4.4 Additional Financing Solutions and Funding Sources

The financing solutions discussed above can cover a significant amount of rollout of mini-grids in the near- to medium-term. For example, a TSL funded with $34 million (EUR 30 million) could cover nearly the entire $36 million developer funding need through 2023 under the high cost case scenario shown in Figure 5: Scenario 2: DRD Rollout Funding with 60% Subsidy and approximately 50% of the developer funding need shown in the high cost case in Figure 6 (both figures are in Section 3.2). Financing solution #2 would also be helping to meet this same funding need so could cover funding gaps under Financing solution #1.

However, additional funding sources will of course need to be tapped to cover the unsubsidized market and reach the full market potential given the overall $3.6 billion potential funding need estimated in the Market Assessment. In this regard, the Team has been requested to provide additional details as to when it would be appropriate to approach the likes of the Asian Infrastructure Investment Bank ("AIIB") and ADB. It is important to note that these institutions have two main funding windows: (i) a public sector funding window and (ii) a private sector window.

Public sector funding could come in the form of a TSL as discussed above. Given AFD is relatively advanced in its preliminary work on a TSL (and JICA is also considering extending its TSL to the mini-grid market), we do not believe it would make sense to engage another donor at present to pursue a separate TSL given that (i) it would likely take a funding source that has not yet begun its screening process much longer than AFD to mobilize funds, and (ii) the AFD TSL could address a significant amount of the subsidized market in the next several years (in which case it would be inappropriate to recommend the GoM take on additional sovereign debt that may go unused at least in the near term).

However, if a separate government scheme (e.g., backed by MoEE) to support renewable energy mini-grids were to be established and this results in increased near- to medium-term rollout projections, then it would make sense to engage the GoM on its interest in securing sovereign funds to support such a TSL. This would only be necessary to the extent the AFD TSL would be unable to support such a new scheme based on its eligibility rules or if the projected rollout under such a program were to exceed the funding capabilities of the AFD TSL. Assuming the GoM confirms in-principle interest, it would then make sense to engage the public sector window of AIIB or ADB to undertake an initial screening. Smart Power Myanmar, the GoM or other stakeholders could help complete a project screening template with the basic project details and funding parameters for review by the potential sovereign funder.

Funding from the private sector windows of these agencies (or other DFIs) will be contingent on a bankable deal structure involving an acceptable borrower (developer) and a meaningful ticket size (likely upwards of $10 million). Therefore, developers will need to be able to present proven business models with long term cash flow projections, detailed demand data, payment history, tariff setting rationale, and related information. In addition, a viable regulatory framework as discussed earlier will need to be in place. While DFIs have a mission to support highly developmental projects and to step in where the private sector is unwilling or unable to do so, DFIs still have stringent credit standards and require a high likelihood of payback. However, DFIs can often offer attractive financing terms, such as longer tenors, which may not be available from commercial lenders (and terms such as longer tenor can make the difference with regard to financial viability). Typically, it would make sense for developers to either directly approach these agencies or to do so through a mandated financial advisor. However, we expect that Smart Power Myanmar can play a critical role (i) helping to facilitate introductions between developers and funding sources and (ii) assisting developers in preparing financing packages that meet lender expectations.

Appendix 1

The Team spoke with the following funding sources as part of the Engagement and would like to thank each of these entities for their valuable input as well of the input of the developers mentioned in the body of the Report and DFDL:

ORGANIZATION	FUNDING TYPE
Livelihoods and Food Security Fund (LIFT)	Donor (backed by various donors)
Japan International Cooperation Agency (JICA)	Donor (Japan)
Asian Development Bank (ADB)	Sovereign and private-sector DFI (multilateral)
Yoma Bank	Local lender
NVE/Norfund	DFI (Norway)
Nexus for Development	Impact lender
European Climate Foundation	Donor (multilateral)
AFD	Donor (France)
Asian Infrastructure Investment Bank (AIIB)	Sovereign and private-sector DFI (multilateral)
Department for International Development (DFID)	Donor (UK)
International Finance Corporation (IFC)	DFI (multilateral)
The World Bank	Sovereign Donor/lender (multilateral)
USAID DCA	Guarantor (USA)
A Bank	Local lender
KfW	Donor (Germany)
DEG	DFI (Germany)
CB Bank	Local lender
Yoma Bank	Local lender
One to Watch	Impact investor
Overseas Private Investment Corporation (OPIC)	DFI (USA)
Government of Canada	Donor
Government of New Zealand	Donor (via its consultant Andaman Capital)
GIZ	TA provider (Germany)