SUSTAINABLE ENERGY FOR ALL

REPOBLIKAN'I MADAGASIKARA
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MADAGASCAR

Integrated Energy Access Planning

ELECTRIFICATION JUNE 2024

IN PARTNERSHIP WITH:

Global Energy Alliance for People and Planet

OPEC FUND for International Development

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Acknowledgements

This document was drafted by Sustainable Energy for All (SEforALL), with support from MECS and the consultancy teams at NRECA International, Arizona State University, D-GRID Energy, Fraym, JSI and AIDES. The Madagascar IEP was developed in close collaboration with the Ministry of Energy and Hydrocarbons (MEH), the Rural Electrification Development Agency (ADER), JIRAMA, and the Office of Electricity Regulation (ORE), as a part of a programme funded by the Global Energy Alliance for People and the Planet (GEAPP) and the OPEC Fund for International Development.

The Madagascar IEP was overseen by the Energy Planning Unit, with additional guidance and input from the National Clean Cooking Working Group. The project was supported by focal points from the Ministry of the Environment and Sustainable Development (MEDD), Ministry of Agriculture and Livestock (MINAE), Ministry of Industry and Commerce (MIC), the Ministry of Fisheries and the Blue Economy (MPEB), and the Ministry of Public Health (MSanP).

We would like to warmly thank government stakeholders from INSTAT, Ministry of Economy and Finance, and other ministries and public entities for their input and support, as well key development partners that provided data and feedback throughout the project including AfDB, EU, FCDO, GIZ, UNIDO, UNDP, USAID, World Bank, WFP and others.

Finally, we would like to thank the private sector, civil society, and research organizations that contributed to the development of the IEP by sharing data, experiences, and planning needs. These include AfricaGreenTec, ANKA, CIRAD, Project Gaia, WeLight, WWF, and others.

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O.R.E Office de Régulation de l'Électricité

Agence de Développement de l'Électrification Rurale

JIRAMA

Acronyms

ADER	Rural Electrification Agency/Agence de Développement de l'Electrification Rurale
AfDB	African Development Bank
ARELEC	Regulatory Electrification Authority/Autorité de Régulation de l'Electricité
ESMAP	Energy Sector Management Assistance Program (World Bank)
FNE	National Electricity Fund/Fond National de l'Electricité
FNED	National Sustainable Energy Fund/Fonds National de l'Énergie Durable
GIS	Geographic Information System
GLCEP	Geospatial Least-Cost Electrification Plan/Analyse des options d'électrification géospatiale au moindre cout
GoM	Government of Madagascar
IEP	Integrated Energy Access Plan
INSTAT	National Office of Statistics/Institut National de la Statistique
IPP	Independent Power Producer
HV	High Voltage
JIRAMA	JIro sy RAno MAlagasy is the Malagasy public electric utility
LEAD	Least-Cost Electricity Access Development Project
LV	Low Voltage
MECS	Modern Energy Cooking Services
MEH	Ministry of Energy and Hydrocarbons/Ministère de l'Energie et des Hydrocarbures
MINAE	Ministry in Charge of Agriculture and Livestock/Ministère de l'Agriculture et de l'Elevage
MV	Medium Voltage
NEP	New Energy Policy/Nouvelle Politique de l'Energie
ORE	Electricity Regulatory Authority/Office de Régulation de l'Electricité
PDMC	Least Cost Power Development Plan/Plan de Développement au Moindre Coût
PRIRTEM	Power Transmission Network Reinforcement and Interconnection Project in Madagascar
PV	Photovoltaic
SEforALL	Sustainable Energy for All
SSA	Sub-Saharan Africa
SSS	Standalone Solar PV System
UN	United Nations

Electrification challenge in Madagascar

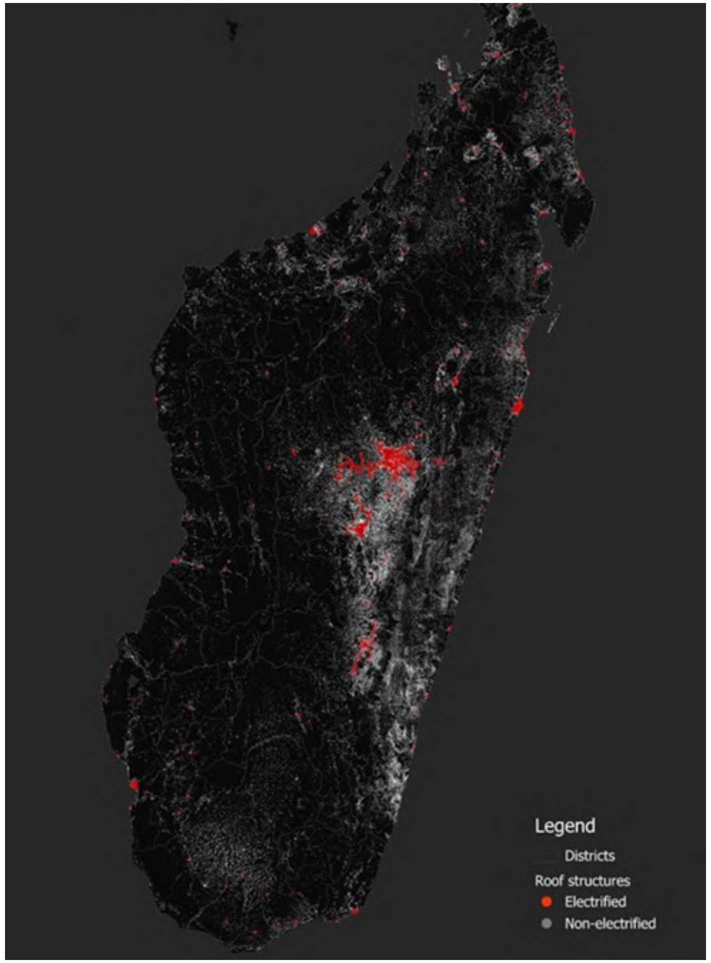
- The SDG7 Tracking Report for 2023 estimates an access to electricity rate of 35% for Madagascar.
- Taken together, JIRAMA and off-grid providers served approximately 1.93 million consumers in 2023, including some 620,000 grid-served consumers and 51,000 mini-grid consumers. The remaining 1.26 million consumers are estimated to be served by standalone solar solutions.
- 18.76 million people in Madagascar currently lack access to electricity. In addition, 2,400 healthcare facilities and nearly 23,000 schools also lack access to reliable power.
- Significant power quality and reliability issues face connected consumers. Insufficient power supply results in frequent outages; insufficient access to investment contributes to overloaded feeders and transformers.
- To achieve universal access to electricity by 2030, Madagascar will need to add around 9 million new grid and off-grid connections, at an estimated cost of USD 7 billion (excluding new grid generation and transmission investments).

Table 1: Estimated connections in 2023

Source: JIRAMA, ADER and MTF 2023

MODALITY	ESTIMATED CONNECTIONS IN 2023
JIRAMA customers	620 839
Isolated mini-grid customers	50 882
Standalone solar	1 260 000
Total	**1 931 721**

Map 1: Madagascar cluster electrification status (2023)



Data collection: Principal inputs for electrification planning

Table 2: Principal data layers and sources for the geospatial least cost electrification analysis

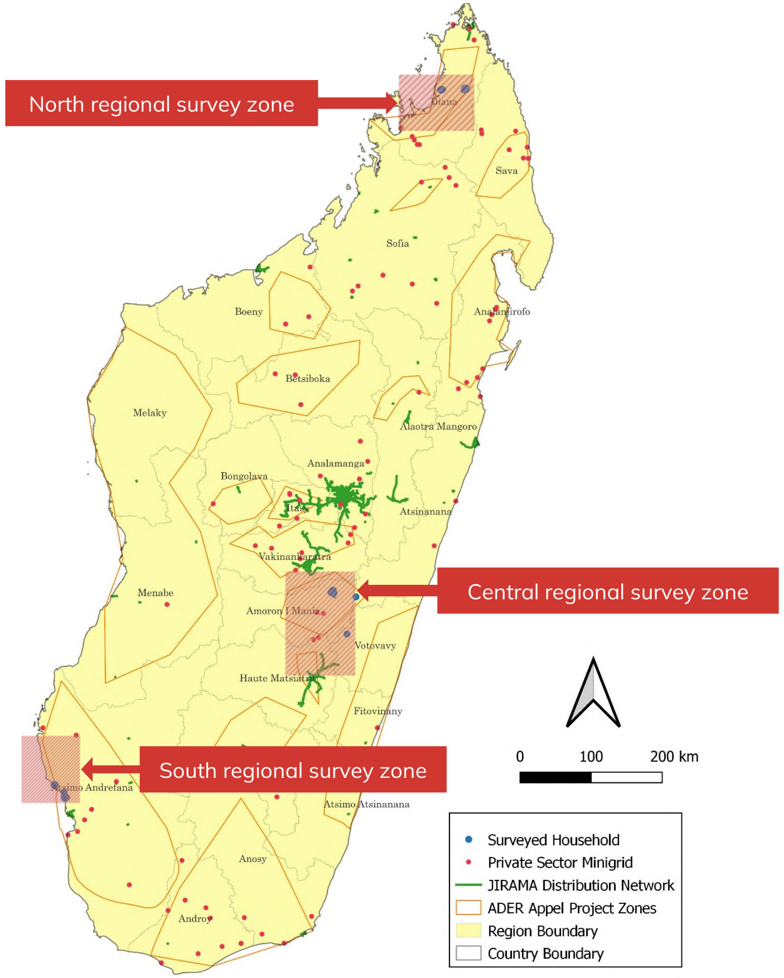
TYPE OF DATA	ATTRIBUTES	DATE	SOURCE	USE IN MODELLING
Administrative/ Political boundaries	These include regional, district, commune and fokontany boundaries	2023	HDX for districts, communes, and fokontany, and UN OCHA/UNIDO for regions	Provides administrative boundary extents, used to aggregate project and electricity access impacts by administrative boundary
Road network	Primary, secondary and tertiary roads.	2023	OSM	Used for least-cost routing path for MV and LV feeders
Population data	Population data derived from the most recent census mainly the “Troisième recensement général de la population et de l'habitation”, or RGPH-3	2018	INSTAT	Provides estimates of population and households, as well as inputs to growth rates.
Network data	Transmission grid and primary substation locations, MV line alignments, locations of isolated distribution networks, etc.	2023	ADER and JIRAMA	Required inputs for definition of electrified areas for densification analysis, as well as routing of new grid extension projects
Electricity consumption data	Electricity consumption data were derived from the 2022 JIRAMA commercial database, 2020 World Bank MTF survey. ADER demand estimation parameters exported from GEOSIM, and other donor-supported studies.	N/A	JIRAMA, World Bank ESMAP, ADER, AFD, among others	Required input to develop load assumptions for the clustering of structures into servable areas
Structures	Digitized points of structures in Madagascar based on recent satellite imagery	2023	Google Open Buildings	Required input, used as primary source of potential connection locations
Terrain or landbase features	Rivers, lakes, forests, national parks, etc.	2020	ADER and World Bank Small Hydro Atlas	Required input, used to limit or filter on-grid and off-grid line extension so as not to cross major terrain feature or protected areas
Material and construction costs	Unit costs estimates for conductors by voltage, transformers, service connections, among others	2023	NRECA developed cost database, various source, 2023	Required input to produce cost estimates for all electrification infrastructure and projects

Data collection: Energy expenditure survey

As part of the IEP project, an energy expenditure survey was carried out in June–July 2023 to evaluate energy consumption and expenditure and appliance-use patterns for off-grid consumers in recently-electrified or soon-to-be-electrified areas. These data were combined with existing consumption data from the JIRAMA customer database, and other energy expenditure evaluations conducted for ADER to validate the demand assumptions used in the geospatial least-cost electrification analysis.*

With a sample size exceeding 1,500, the surveys targeted identified three distinct zones (northern, central and southern) to assemble a representative sample of Madagascar's off-grid population throughout the country. Survey participants were selected from randomized housing structures to achieve a survey sample with a 95% confidence level and 5% error rate.

Each survey sample included residential, commercial and public facility consumers (health centres and schools) to determine the relative prevalence and willingness to pay (WTP) for these customer segments. Energy expenditure was evaluated for residential and SME populations; all public facilities in the survey area were also evaluated.



Map 2: Survey Locations for Energy Expenditure Surveys

*Note: Final demand and consumption estimates used in the geospatial least cost electrification model are available in the Madagascar IEP Electrification Technical Report

Table 3: Monthly energy expenditures by customer type and survey zone

		ELECTRIFIED USD/MONTH	UNELECTRIFIED USD/MONTH	ELECTRIFIED USD/MONTH	UNELECTRIFIED USD/MONTH	ELECTRIFIED USD/MONTH	UNELECTRIFIED USD/MONTH
RESIDENTIAL		NORTHERN		CENTRAL		SOUTHERN	
10%	High	$21.84	$5.41	$ 7.37	$5.35	$16.34	$5.87
20%		$14.67	$3.53	$ 4.74	$3.98	$9.76	$3.80
35%	Medium	$9.55	$2.61	$ 3.80	$2.88	$6.02	$2.70
50%		$7.25	$2.10	$ 3.46	$2.15	$4.83	$1.82
75%	Low	$6.91	$1.00	$ 2.43	$1.15	$2.95	$1.07
90%		$5.52	$0.72	$ 1.25	$0.70	$1.97	$0.38

COMMERCIAL AND PUBLIC FACILITIES		NORTHERN		CENTRAL		SOUTHERN	
10%	High	$85.49	$147.25	$40.28	$3.30	$43.40	$13.46
20%		$51.79	$10.59	$19.73	$2.65	$27.62	$6.91
35%	Medium	$23.02	$3.89	$11.51	$0.86	$18.15	$3.73
50%		$15.33	$2.50	$8.38	$0.53	$10.11	$2.77
75%	Low	$7.14	$1.27	$4.14	$0.01	$4.93	$1.04
90%		$5.18	$0.30	$2.49	$0.01	$2.58	$0.24

Photo: WeLight

Methodology: Stages of the least-cost electrification analysis

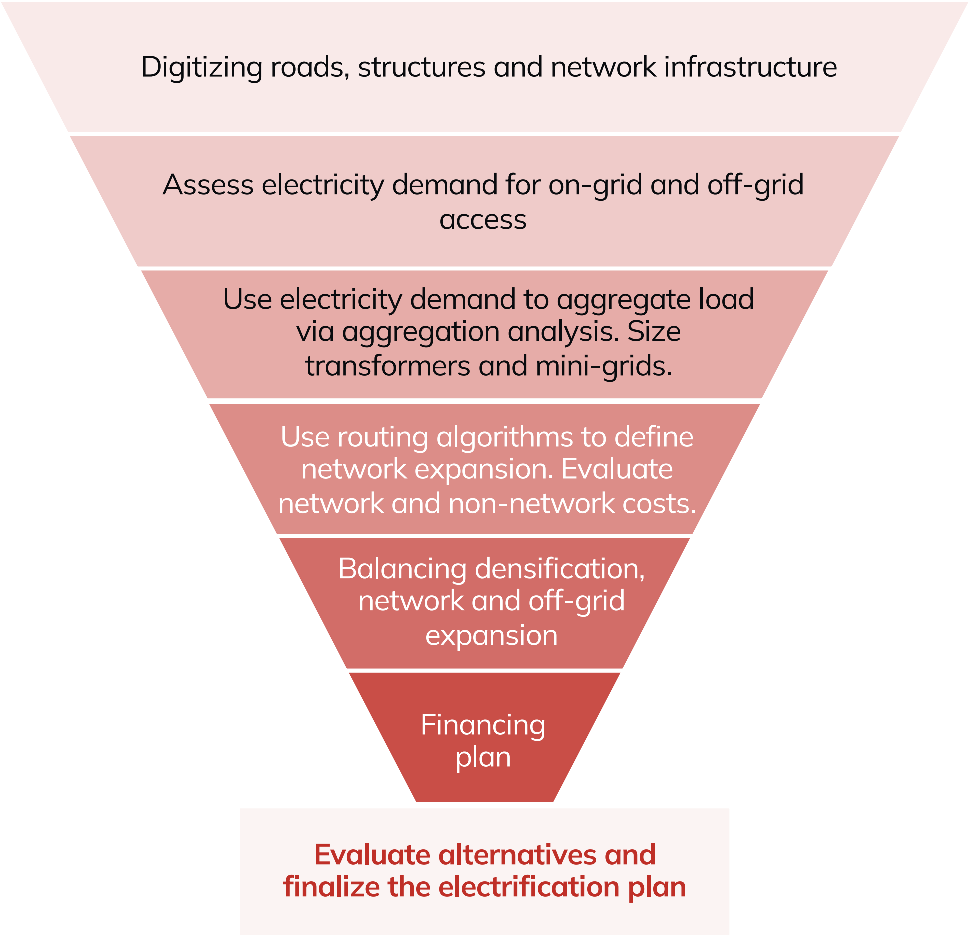
The Madagascar IEP assessed electrification potential using a geospatial least-cost electrification planning approach.

Using digitized rooftops, data on topology and existing electrical and road infrastructure as well as output from the demand assessments, the IEP developed a detailed electrification plan that identifies the lowest-cost technological option to provide electricity to each unelectrified building in the country.

The primary outputs of the analysis were:

- Comprehensive national least-cost electrification plan covering on-grid (densification and extension) and off-grid (mini-grids and standalone solar PV systems) modalities
- Digitized mapbooks with MV and LV routing, transformer placement and infrastructure sizing for grid and mini-grid solutions
- Investment costs per component and per project based on detailed equipment estimates
- High-level financing plan to estimate the amount of public and private investments required and the connection costs borne by consumers
- Spatial analysis of use-specific load potentials including e-cooking, social infrastructure such as schools and healthcare facilities and productive uses of energy including grain milling and cooling

Figure 1: Steps to achieve the geospatial least cost electrification plan



Electrification results: Densification

Grid densification, or adding additional connections through short, low-voltage line extensions and service drops, is considered within a 600-metre radius of existing JIRAMA MV networks. For each JIRAMA service centre, additional transformer capacity was evaluated to define the number of new transformers required. The estimated cost of densification is USD 375 per connection.

In total, nearly 1.6 million densification connections will be required to achieve universal access to electricity by 2030.

JIRAMA achieved an average rate of around 20,000 connections per year between 2018 and 2022. The average annual rate of densification connections will need to be increased by more than a factor of 10 to reach 220,000 connections per year to achieve universal access by 2030.

In absolute terms, Analamanga, the region that includes Antananarivo, represents 38% of the densification potential for the country. However, JIRAMA's isolated grids also present significant densification potential; connected consumer can be increased by nearly a factor of 4 relative to current customer numbers.

Table 4: Densification analysis results by region

REGION	STRUCTURES (2023)	ASSUMED ELECTRIFIED JIRAMA STRUCTURES (2023)	DENSIFICATION POTENTIAL (2023)	DENSIFICATION POTENTIAL 2030
Analamanga	783,903	271,888	512,015	609,895
Vakinankaratra	157,691	54,105	103,586	123,388
Itasy	80,684	27,999	52,685	62,757
Bongolava	11,180	3,307	7,873	9,378
Haute Matsiatra	81,089	22,018	59,071	70,363
Amoron I Mania	10,932	4,769	6,163	7,341
Ihorombe	13,635	3,298	10,337	12,313
Atsimo Atsinanana	10,953	3,826	7,127	8,489
Atsinanana	120,814	43,930	76,884	91,582
Analanjirofo	60,429	12,766	47,663	56,775
Alaotra Mangoro	60,300	12,004	48,296	57,529
Boeny	95,069	29,366	65,703	78,263
Sofia	47,164	9,834	37,330	44,466
Betsiboka	8,542	1,793	6,749	8,039
Melaky	7,962	2,779	5,183	6,174
Atsimo Andrefana	112,066	24,358	87,708	104,475
Androy	17,806	1,869	15,937	18,984
Anosy	21,849	5,629	16,220	19,321
Menabe	28,955	7,229	21,726	25,879
Diana	101,387	38,347	63,040	75,091
Sava	99,439	16,342	83,097	98,982
Votovavy	3,752	3,204	548	653
Fitovinany	12,124	5,043	7,081	8,435
Total	**1,947,725**	**605,703**	**1,342,022**	**1,598,572**

Electrification results: Grid extension

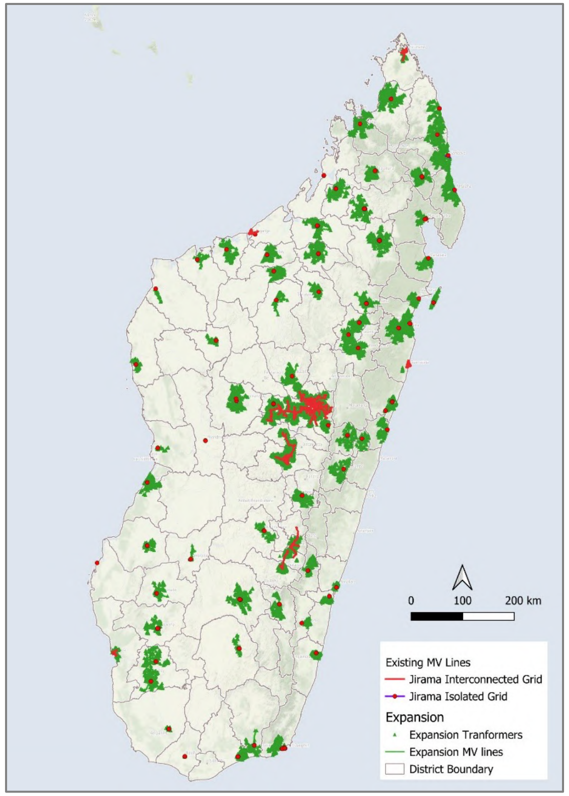
Grid extension projects were considered for areas surrounding JIRAMA's interconnected and isolated networks at a distance of less than 15 km from the existing medium-voltage (MV) grid to ensure sufficient power quality.

Grid extension projects were retained within the 15 km limit only if they met the infrastructure cost limit of USD 1,250 per connection. The 385 retained projects were split into three phased « Lots » based on overall costs per connection, as presented in Figure X below.

Over 1 million new grid extension connections at an average cost of USD 738 per connection would be required to achieve universal access to electricity by 2030, generating approximately 194 MW of additional demand on JIRAMA's network.

As for grid densification demand, GoM and JIRAMA will need to evaluate additional generation capacity that will be needed as consumers are added to JIRAMA distribution facilities both on the interconnected grid as well as in isolated distribution centres, as part of its pluriannual integrated resource planning (IRP) process. The customer, consumption and demand estimates calculated in the IEP can contribute directly to that process

Map 3: Results of least-cost grid extension



Map 4: Expanding the RIA network

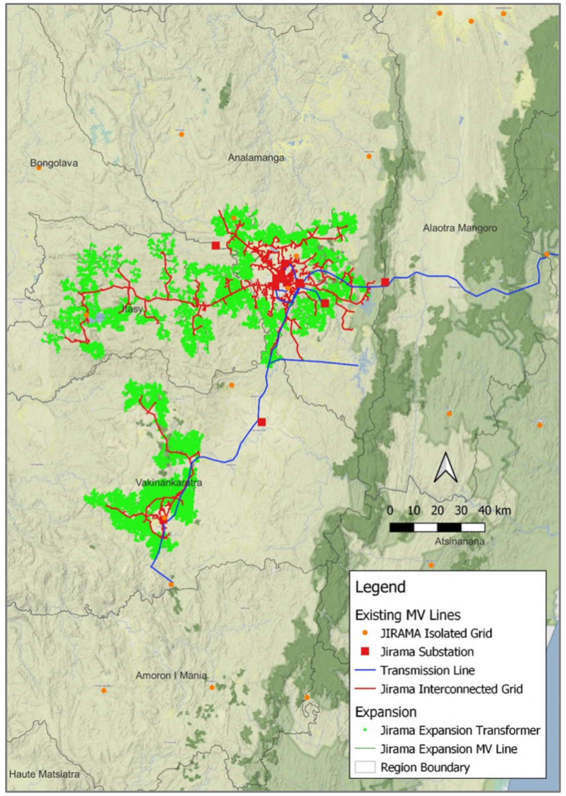


Figure 2: Results of least-cost grid extension by lot

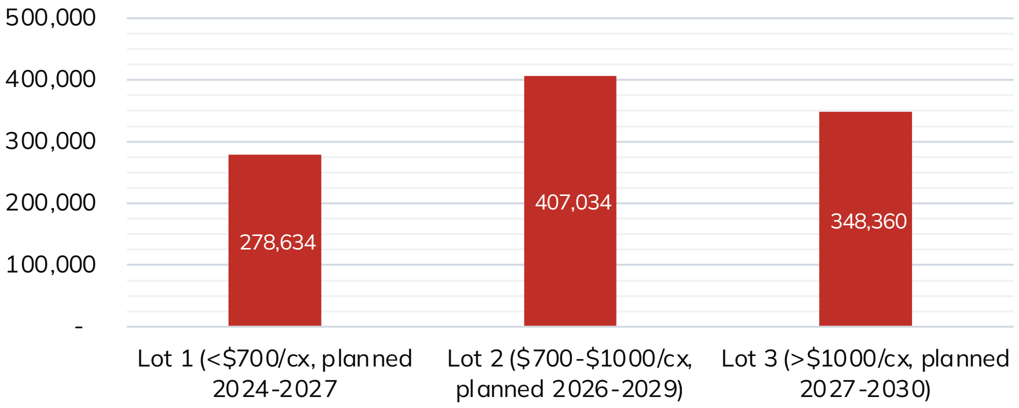


Table 5: Results of least-cost grid extension by JIRAMA distribution zone

	MV LENGTH (KM)	LV LENGTH (KM)	TRANSFORMERS (NUMBER)	NEW CONNECTIONS (2023)	DEMAND (MW)	TOTAL COST (MILLION USD)	AVERAGE COST/CONNECTION
JIRAMA Interconnected Grid	6,976	7,460	12,240	436,866	104	$363,980,623	$833
JIRAMA Isolated Grid	6,680	9,488	9,265	597,161	89	$398,682,207	$668
Total	**13,656**	**16,948**	**21,505**	**1,034,027**	**194**	**$762,662,830**	**$738**

Photo: WeLight

Electrification results: Mini-grids

When marginal grid expansion costs increase beyond 5–10 years of cumulative residential energy expenditures, rural consumers can often be served sooner and more affordably by decentralized mini-grid infrastructure development in local communities.

Mini-grids were evaluated where grid expansion capital costs exceed USD 1,250 USD per connection and/or for areas beyond the 15 km limit from the existing MV networks.

Mini-grids were assessed for clusters of building structures with more than 100 connections within a radius of 1,000 meters. The mini-grid electrification modality encompasses both peri-urban areas and small, isolated communities. To account for this diversity, Madagascar IEP models both LV mini-grids and larger MV mini-grids.

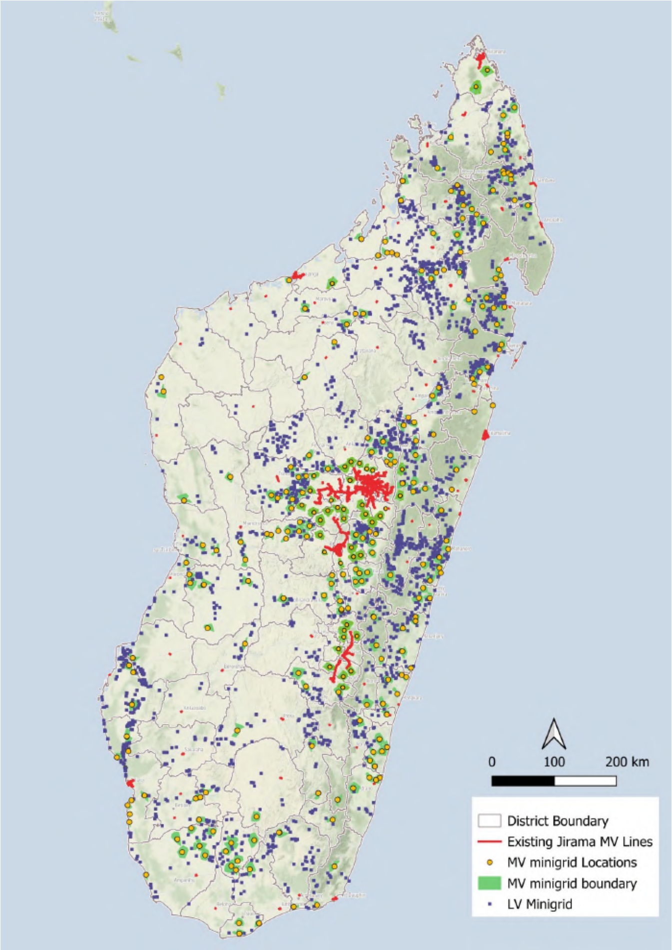
For MV mini-grids, MV distribution is used to interconnect rural communities with larger service territories than can be reliably served by LV infrastructure, allowing multiple population clusters to be served by a single generation point.

There are strategic advantages and economies of scale to be gained by connecting large clusters of unelectrified consumers via an MV network. Nevertheless, significant safety challenges are associated with operating MV distribution systems in rural areas, which requires specific training for personnel responsible for operations and maintenance of network systems. Mini-grids modelled as MV clusters can also be decomposed into multiple smaller LV generation-distribution systems.

All mini-grids are modelled twice: once as a fully renewable mini-grid with larger solar and battery arrays to eliminate diesel generation entirely, and again as solar photovoltaic-battery charging systems with supplemental diesel generation. A sensitivity analysis was also conducted to test identified mini-grid sites proximate to viable hydroelectric potential as hydro-powered mini-grids. *

*Note: Hydroelectric potentials sourced from the Madagascar Small Hydro GIS Atlas, World Bank via ENERGYDATA.info, under a project funded by the Energy Sector Management Assistance Program (ESMAP)

Map 5: Least-cost planning results for mini-grids



Medium Voltage (MV) mini-grids

The Madagascar IEP identified 371 potential MV mini-grid projects as least-cost electrification (LCOE) solutions. These projects account for 1.4 million new connections by 2030, with a total demand of about 175 MW.

MV mini-grids have been designed with solar-diesel hybrid technology optimized for LCOE that generally result in a renewable fraction over 85% but that rely on diesel generation to supplement solar generation when necessary.

MV mini-grids are diverse geographically and technically. The smallest MV mini-grids have fewer than 500 consumers and peak demand in the same range as the LV mini-grids.

By contrast, of the 371 MV mini-grids in the model, 294 are anticipated to have more than 1,000 consumers by 2030 and peak demand of several MW. Many of these MV mini-grid candidates could host successful small utility companies, provided that the regulatory and subsidy environment is favourable for rural utilities.

99% of MV mini-grids result with costs below USD 2,000 per connection, which is generally regarded as the limit of viability for mini-grid development. Economies of scale for larger MV mini-grids however may be limited by the larger service territories these grids are expected to cover as shown by Figure X below.

Figure 3: MV Mini-grid frequency distribution by PV Capacity (kWp)

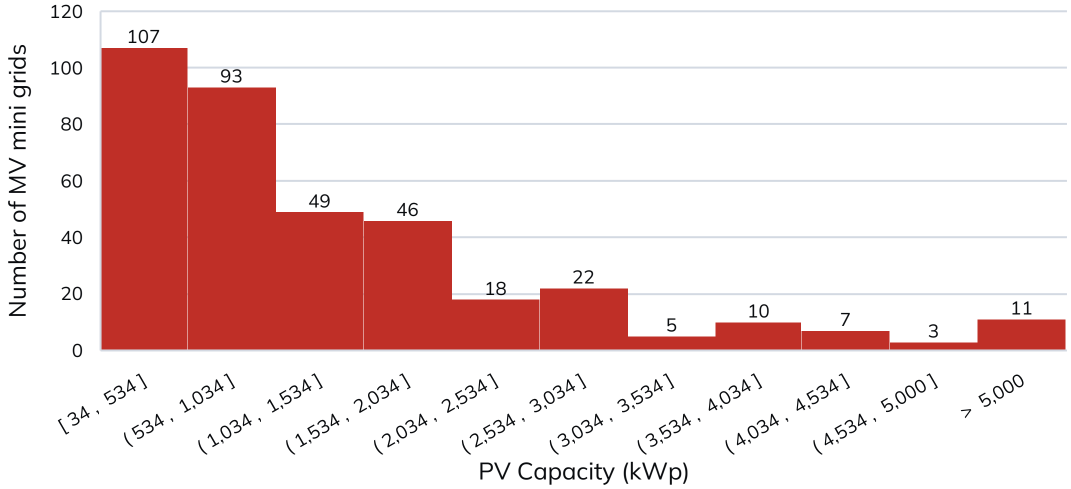
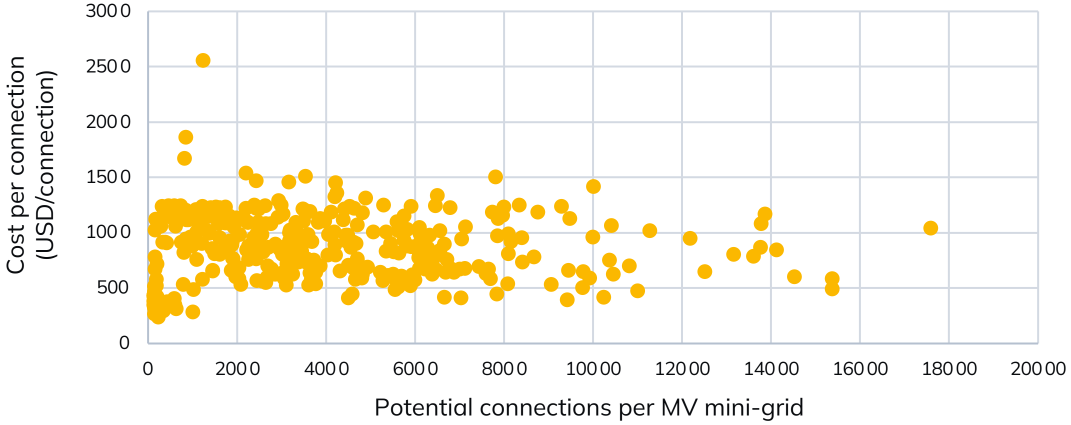


Figure 4: MV Mini-grid costs per connection and number of potential connections



Low-voltage (LV) mini-grids

For rural communities where consumers reside in clusters of at least 100 structures within a 600-meter radius, customers can be served by a small mini-grid power plant and LV distribution network.

The Madagascar IEP assessed LV mini-grids as the least-cost electrification option for 2,582 communities serving a total of 468,159 customers by 2030. A typical LV mini-grid site has 150 connections and a PV capacity of about 55 kWp.

The sites vary widely by population density, and there is no clear trend line to indicate that more populous communities require more LV infrastructure. In fact, the LV mini-grid candidate with the greatest number of households (437 households) requires less than 2 km of LV network, while the mini-grid that requires the largest LV network (approximately 5 km) will serve just 132 households.

97% of the assessed sites have costs per connection below USD 2,000 which is generally regarded as the limit of viability for mini-grid development.

Map 6: LV mini-grids in Madagascar, including a detailed view of an example in the Maevatanana district, Betsiboka region

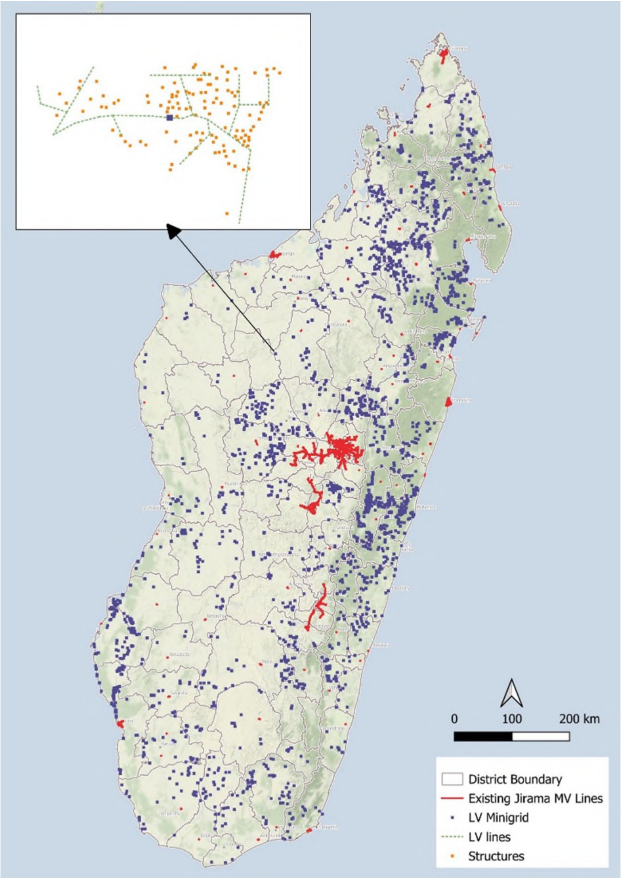


Figure 5: LV Mini-grid frequency distribution by PV Capacity (kWp)

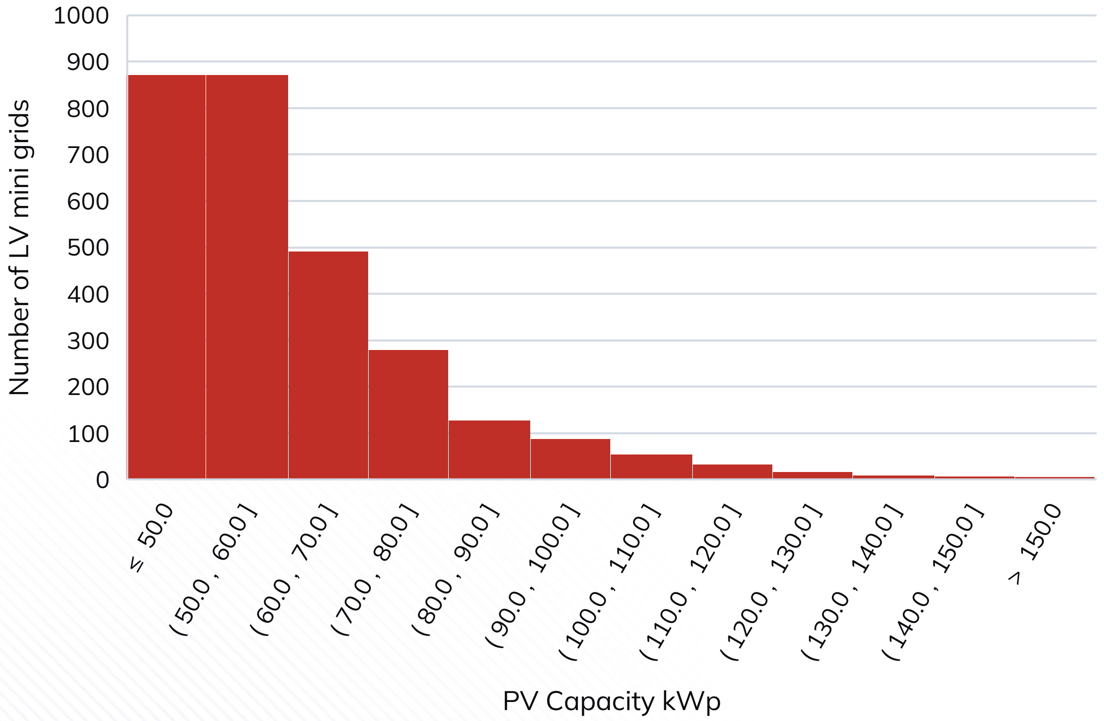
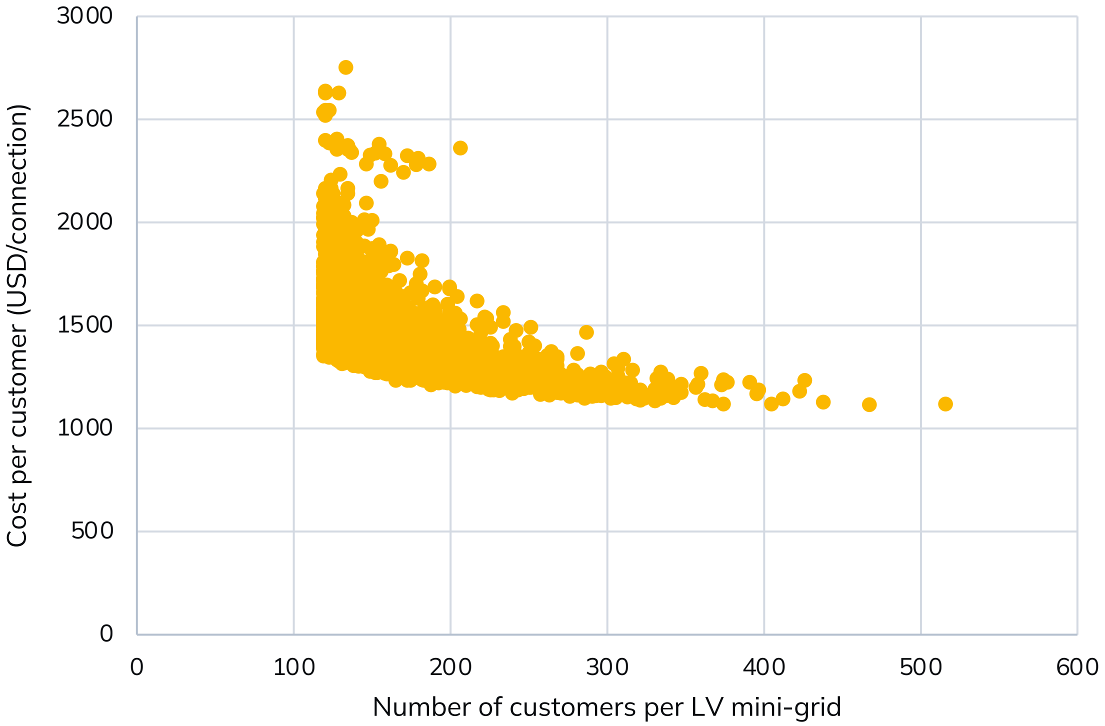


Figure 6: LV Mini-grid costs per connection and number of potential connections



Standalone Solar Systems

Standalone solar solutions were considered in areas that cannot be served by grid densification, grid expansion and mini-grid service. The standalone solar system deployment potential is shown in the map at right.

Localities eligible for standalone solar electrification are spread throughout Madagascar, with at least one potential customer in each of the country's 119 districts.

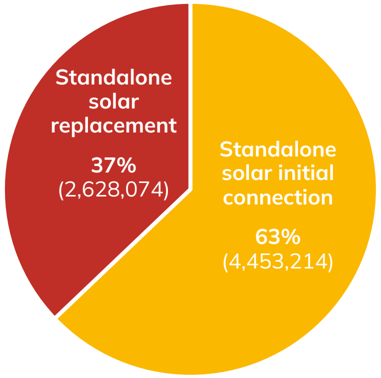
The total number of standalone solar system connections to be deployed to achieve universal access to electricity by 2030 is 4.5 million, equivalent to 50% of all electricity consumers forecast for 2030, more than double the contribution of any other modality.

Some households and businesses may choose to purchase solar home systems (SHS) to increase reliability of grid service if load shedding is frequent and problematic. These elective purchases are not represented in the electrification analysis.

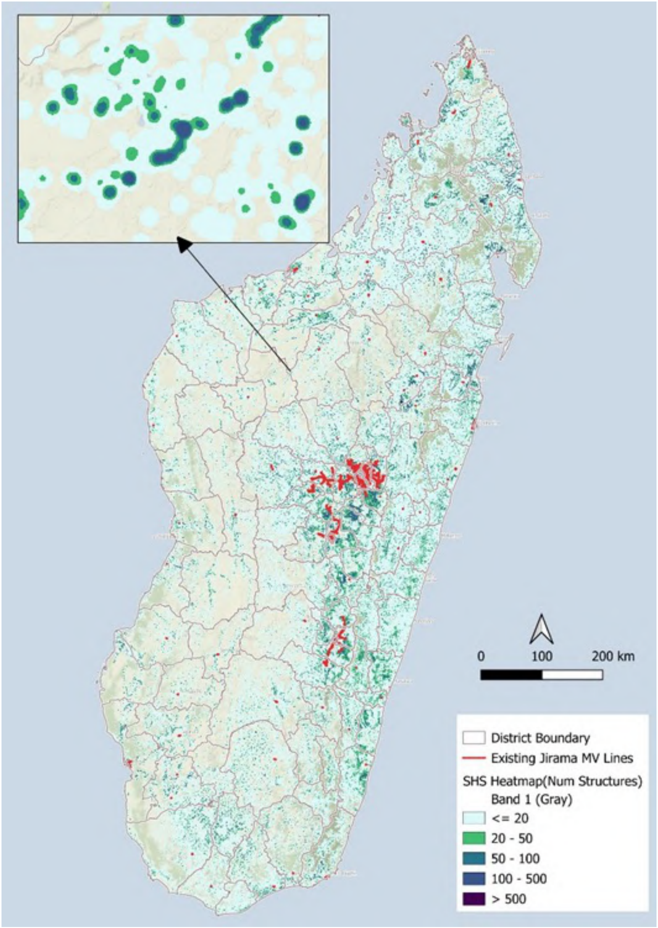
Given that standalone solar PV systems have useful lives of 3-5 years, it will be necessary to replace aging solar PV systems to continue to grow toward universal access by 2030 without attrition. For this reason, the solar standalone deployment model includes system replacement in the fifth year of service, implying the deployment of an additional 2.6 million replacement systems during the planning period.

All systems in the model are tier 1 and tier 2. Affordability limitations will need to be considered to define incentives and, in some cases, consumer subsidies.

Figure 7: Total market for standalone solar system deployment to achieve universal access to electricity by 2030



Map 7: The thermal map uses darker colours to indicate higher deployment density



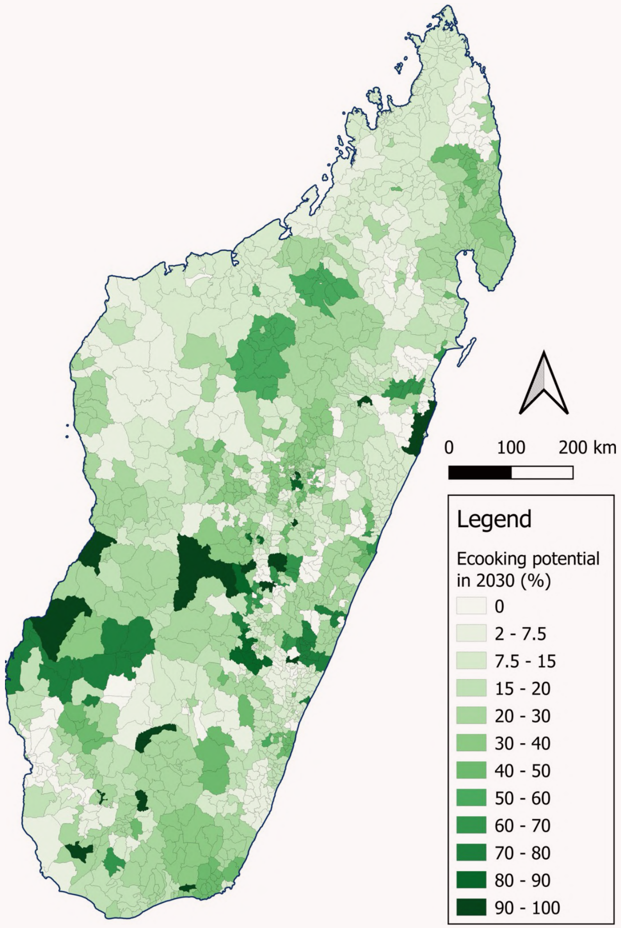
Electrification of selected energy end uses

The Madagascar IEP also evaluated several use-specific load potentials through a disaggregated approach that seeks to characterize and geographically distribute specific types of power demand associated with energy end uses such as:

- Electric cooking
- Cooling and refrigeration for key agricultural and fisheries value chains as well as for the healthcare sector
- Social infrastructure (including healthcare facilities and schools)
- Productive uses of energy such as grain milling that may have important implications for the socio-economic impact of electrification and/or for consumption levels and load profiles in the areas where they occur

Examples of these outputs are shown in maps 8-11, with additional details and end-use analysis available in the full technical reports.

Map 8: E-cooking potential in Madagascar



Map 9: Cold chain energy demand (Example value chain - dairy)

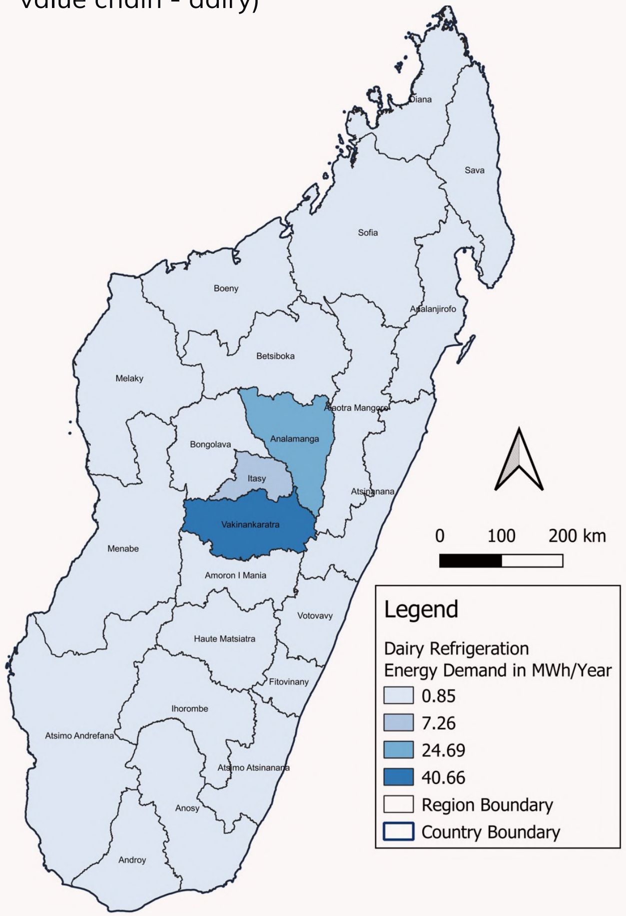
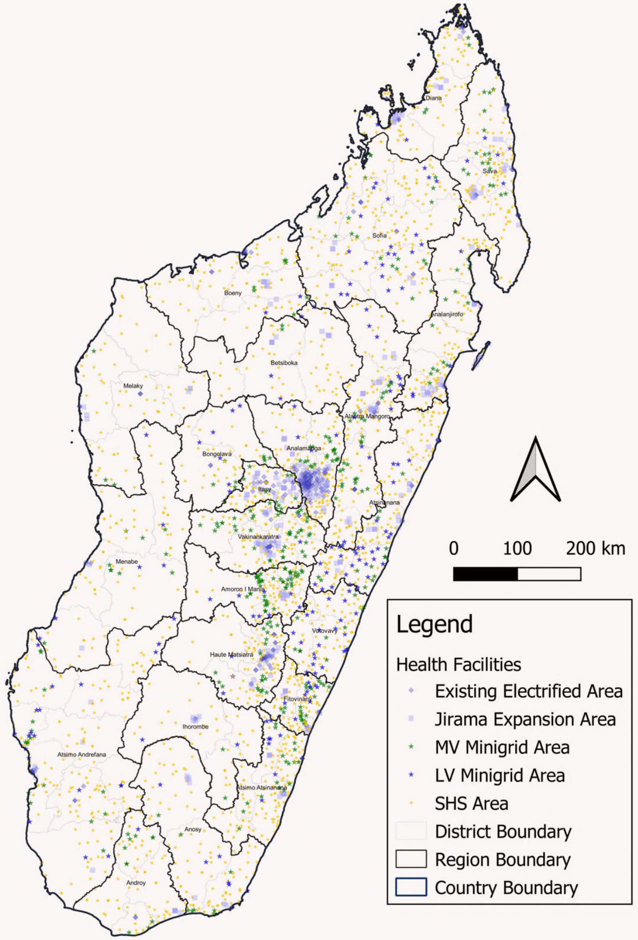
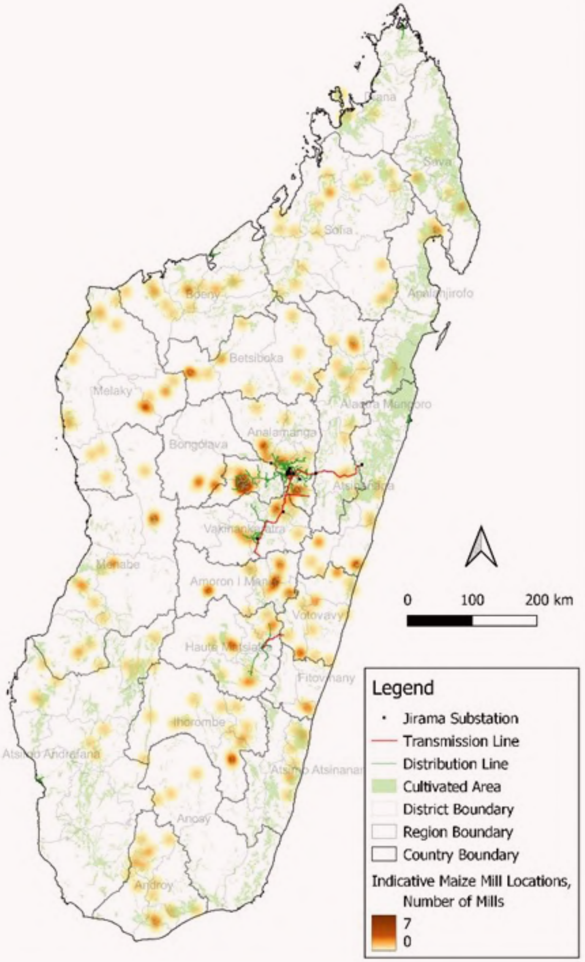


Photo: WeLight

Map 10: Healthcare facilities by least-cost electrification modality

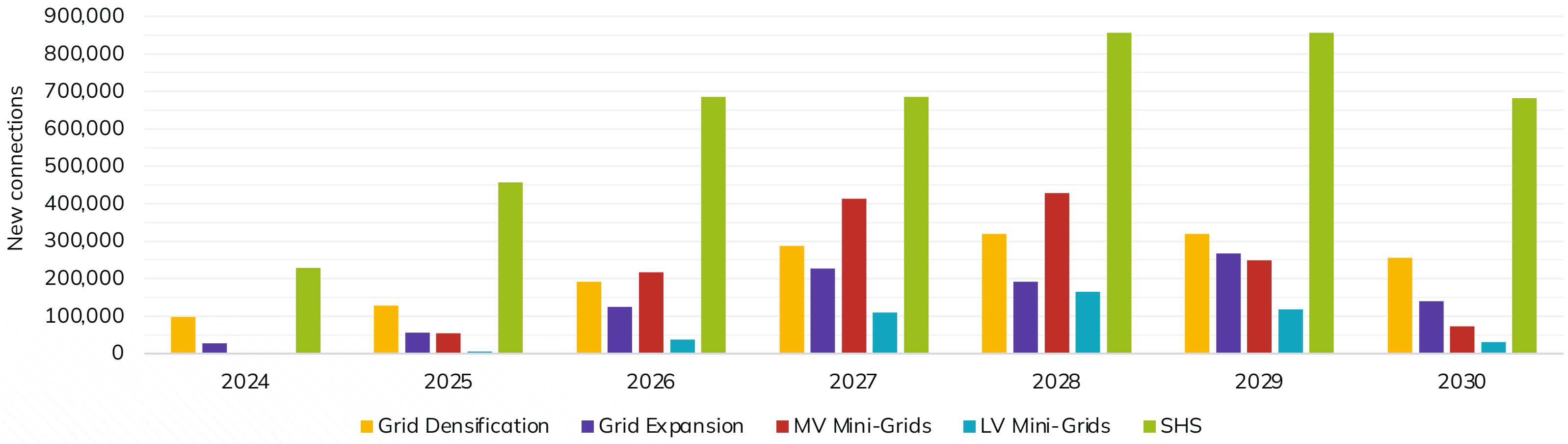


Map 11: Grain milling potential in Madagascar



Least-cost electrification scenario: Universal access to electricity by 2030

Figure 8: Annual deployment plan to achieve universal access to electricity by 2030



Map 12: Least-cost electrification modalities – Universal access in 2030

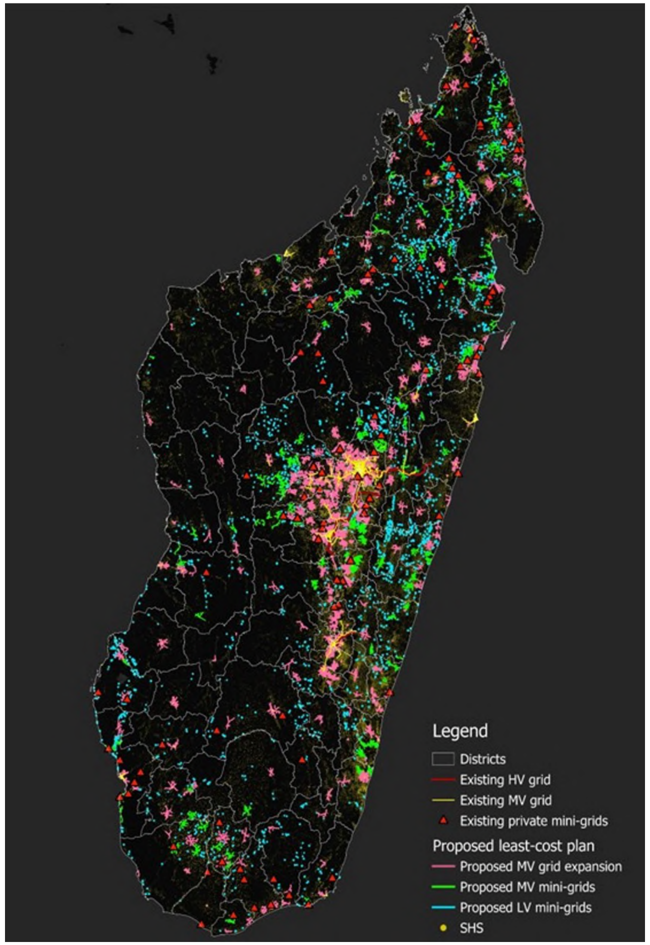


Table 7: Annual deployment plan to achieve universal access to electricity by 2030

MODALITY	2024	2025	2026	2027	2028	2029	2030	TOTAL
Densification	97,087	128,776	192,152	287,216	318,905	318,905	255,531	1,598,572
Expansion	27,863	55,727	124,294	227,696	191,782	267,321	139,344	1,034,027
MV Mini-Grids	-	54,938	217,250	413,188	428,003	249,384	72,256	1,435,019
LV Mini-Grids	1,852	5,556	37,111	109,371	165,707	118,226	30,336	468,159
SHS[1]	228,528	457,056	685,584	685,584	856,981	856,982	682,499	4,453,214
Total	**355,330**	**702,053**	**1,256,391**	**1,723,055**	**1,961,378**	**1,810,818**	**1,179,966**	**8,988,991**

Note [1]: Excluding replacement systems

Financing plan: Universal access to electricity by 2030

Table 8: Estimated financing requirements and sources to achieve universal access to electricity by 2030

ELECTRIFICATION METHOD	TOTAL FUTURE CONNECTIONS	TOTAL CAPEX	AVERAGE COST / CONNECTION (USD)	GOM FINANCING REQUIREMENTS (USD)	OFF-GRID FINANCING BY PRIVATE-SECTOR DEVELOPERS (USD)	CONNECTION CHARGES PAID BY END USERS (USD)
Densification	1,598,572	$599,464,500	$375	$559,500,200	-	$39,964,300
Network extension	1,034,027	$762,662,830	$738	$736,812,153	-	$25,850,677
MV mini-grids	1,435,019	$2,522,679,025	$1,758	$ 855,271,062	$1,631,532,500	$35,875,464
LV mini-grids	468,159	$667,221,243	$1,431	$277,808,605	$377,759,592	$11,653,046
Standalone solar	4,453,214	$1,558,624,896	$350[1]	$801,578,518	$645,716,029	$111,330,350
Standalone solar replacement	2,628,074	$919,825,844	$350	$473,053,291	$381,070,707	$65,701,846
Total	**11,615,027**	**$7,030,478,338**	**$605**	**$3,704,023,830**	**$3,036,078,827**	**$290,375,682**

Notes [1]: Assuming a Tier 2-equivalent system of least 50 W of solar capacity and at least 200 Wh of battery capacity. These systems are capable of powering multiple lights and DC outlets or charging ports for mobile phones, radios, etc. The Madagascar IEP also modelled results with Tier 1 minimum systems at an estimated cost of USD 180 per unit. Tier 1 systems have at least 3W of solar capacity and at least 12 Wh of battery capacity, capable of powering multiple points of light, a service outlet and USB-mobile phone charging.

Figure 9: Connections by least-cost modality

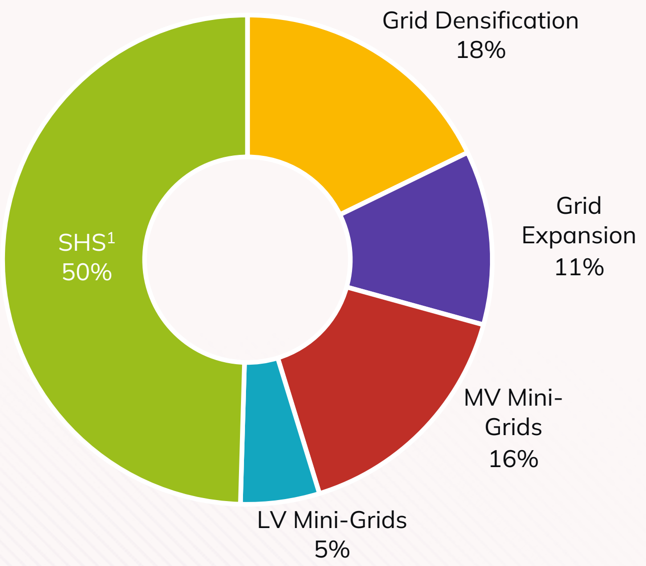


Figure 10: Capex by least-cost modality

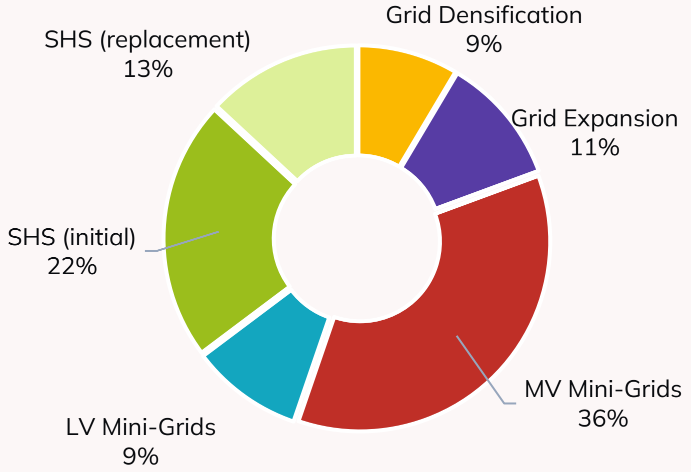
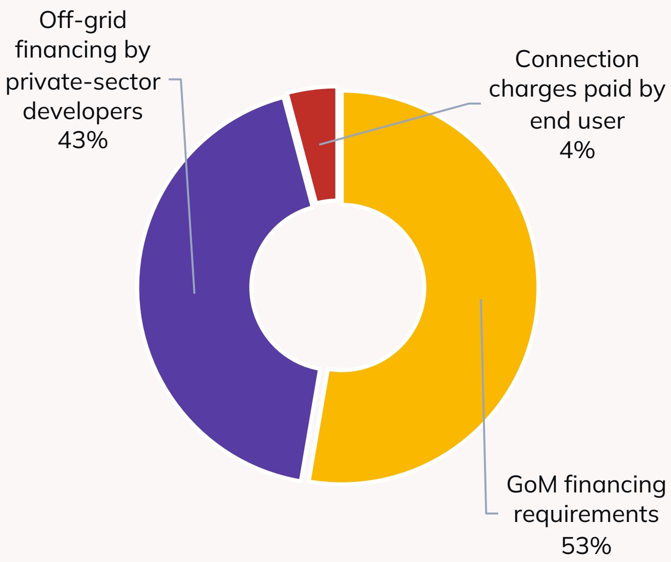


Figure 11: Total Capex by presumed source



[1] Excluding replacement systems

Conclusions

DENSIFICATION

The densification CAPEX requirements are estimated at just under USD 560 million, which accounts for nine percent of the total CAPEX budget need to meet the 2030 universal access goal. Notably, this 9 percent of total CAPEX can add an estimated 1.6 million connections, or 14 percent of the total future required connections. The financial efficiency of densification among electrification modalities demonstrates the priority for JIRAMA to actively develop and pursue a densification programme, as is considered under LEAD. However, expansion of connections must come with equal expansion of generation, transmission and distribution infrastructure improvements to ensure power quality and availability of supply – both in JIRAMA's interconnected networks as well as in isolated systems.

GRID EXPANSION

Grid expansion has the potential to serve over 1 million new connections as the grid is currently constituted. Similar to densification, expansion of connections must come with equal expansion of generation, transmission and distribution infrastructure improvements to ensure power quality and availability of supply. In order to expand its existing networks into more remote areas, JIRAMA may need to consider mechanisms for voltage support on its distribution feeders, including but not limited to distributed generation and reactive power equipment.

MINI-GRIDS

The results of the IEP show that there is significant potential for both large-scale MV mini-grids at the Megawatt scale and community-sized LV mini-grids. A considerable share of the total CAPEX budget for universal access could be dedicated to both MV and LV mini-grid developments: about 45 percent of the total CAPEX requirements corresponding to over USD 3.1 billion.

Prior to making such large investments, several strategic steps should be taken to ensure investments in mini-grids have the lasting impacts they are designed for, which include evaluating and standardizing system design standards and materials specifications, developing a comprehensive service territory delineation approach building off of the AP process currently underway within ADER, as well as continuing to rationalize mini-grid tariffs and developing a tariff methodology that is transparent and equitable across developers and consumers alike. Furthermore, it is important to note that the IEP-modelled mini-grids have been identified as the least-cost solution, but that this does not necessarily mean that 100 percent of the identified mini-grids will be commercially viable or attractive for private developers. Additional analysis will be required to understand the commercial potential of various sites and identify appropriate concession and incentive designs to support effective rural electrification.

STANDALONE SOLAR

Standalone solar solutions will likely play a pivotal role in meeting universal electrification goals. Their ability to be easily replicated and distributed to suit the electricity needs of a variety of loads, combined with the ability to provide power in any setting – urban, rural, remote – unlock a powerful tool in solving the access challenge. The private sector will play an important role in providing the standalone solar solutions to the market; however, their effective deployment requires policies and programmes that ensure that high-quality products are bought and sold, replacement of antiquated systems is both accounted for in programme financing and in waste management policies for systems that are retired, and that appropriate incentives are in place to reach rural and remote consumers, among other considerations.

SUSTAINABILITY

A clear and effective electrification strategy and programme management framework is needed to ensure that multiple and complementary activities can be effectively implemented in a coordinated manner to result in a steady progression of electrification progress. Through the Planning Unit, this mechanism has been established within the MEH, but the mechanisms, procedures and practices needed to effectively plan, finance and scale-up electrification expansion have not yet been put into practice. To support future planning and coordination, an holistic and integrated energy-sector GIS and data management infrastructure is needed to guide the electrification access and expansion planning across MEH, ADER, JIRAMA and ORE.

Photo: WeLight

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