EXECUTIVE SUMMARY

Powering Healthcare in Rwanda

Market Assessment and Roadmap for Healthcare Facilities

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01 | Current Situation of Healthcare System and Facility Electrification in Rwanda

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Rwanda's health and energy sector at a glance

Health Sector

72%
HF with basic water services

2,139
Total HFs in Rwanda

203/100,000
Maternal mortality rate
Average global: 211
Average SSA: 533

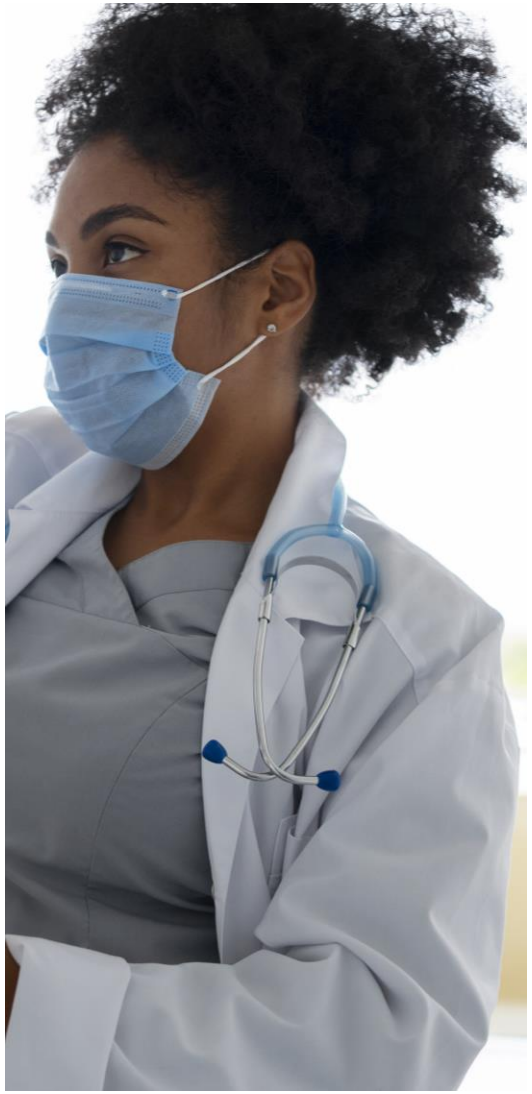
30/1,000
Infant mortality
Average global: 28
Average SSA: 50

Energy Sector

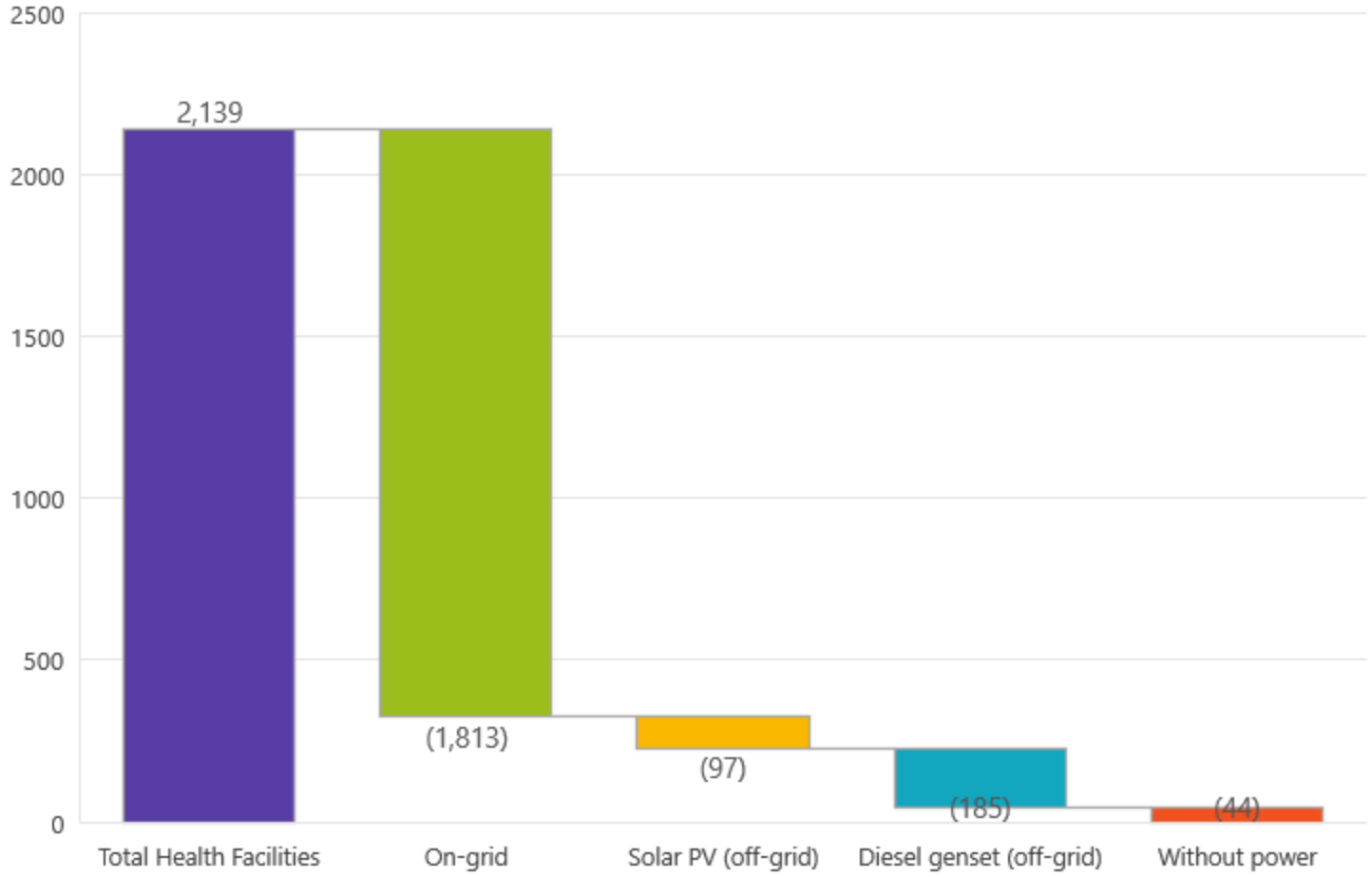
26% or 326
Share and absolute value of healthcare posts without a connection to the grid

61%
Population with access to electricity:
- 47% connected to the grid
- 14% via off-grid systems

100%
Share of tertiary and upper level HFs with grid connection and fuel backup systems



Sizing the access gap – The market opportunity covers solar PV systems with different access status



Majority of HFs are on-grid

Opportunity: moving from diesel-based back-up systems to renewables should be explored through cost-benefit analysis.

About one-third of off-grid HFs are powered by Solar-PV systems, including standalone and mini-grid systems

Opportunity: System repowering for improving reliability and type of healthcare services could be explored*.

Majority of off-grid HFs are powered by diesel genset

Opportunity: moving from fossil fuel-based systems to renewables is an opportunity for sustainable HFE.

Minority of HFs are un-electrified

Opportunity: achieving 100% HFs with access to reliable electricity supply.

Current energy demand and expenditure of healthcare facilities

	HOSPITALS	HEALTHCARE CENTRES	HEALTHCARE POSTS
ELECTRICITY CONSUMPTION*			
Daily	825 kWh	5.2 kWh	2.1 kWh
Monthly	24,750 kWh	157 kWh	63 kWh
ELECTRICITY EXPENDITURE**			
electricity bill (monthly)	4,534,244 RWF ($4,172)	18,953 RWF ($17.4)	0
fuel-based backup (monthly)	166,005 RWF ($153)	26,183 RWF ($24.1)	29,692 RWF ($27.3)
Total (monthly)	4,700,249 RWF ($4,324)	45,137 RWF ($41.5)	29,692 RWF ($27.3)

* Data on the daily demand of the hospitals and health centres were gathered during the site surveys; electricity expenditure considers an electricity tariff equal to 186 RWF/kWh and diesel average price of 1591 RWF/litre.

** The exhange rate used is $0.00092/RWF (as per February 2023)

02 | Solutions and Recommendations

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Strategies for healthcare facilities are designed according to their current energy sources

	HOSPITALS	HEALTHCARE CENTRES	HEALTHCARE POSTS	
MAIN ELECTRICITY SOURCE	**100% ARE ON-GRID**	**100% ARE ON-GRID**	**74% ARE ON-GRID**	**26% ARE OFF-GRID, OF WHICH 70% HAVE A GENSET AS MAIN SOURCE**
BACKUP ELECTRICITY SOURCE	100% have a genset backup	Most have a diesel genset backup	Few have a diesel genset backup	No backup
PROPOSED SUPPLY STRATEGY	Replace backup gensets with battery banks	Replace backup gensets with battery banks	Replace backup gensets with battery banks	Install standalone PV
PROPOSED SOLUTION	Case-by-case assessment needed	Standardized grid-connected battery backup systems for all healthcare centres	Standardized battery backup systems for grid-connected healthcare posts	Standardised standalone PV systems for continuous supply of off-grid healthcare posts

Proposed solutions and costs for healthcare centres and healthcare posts

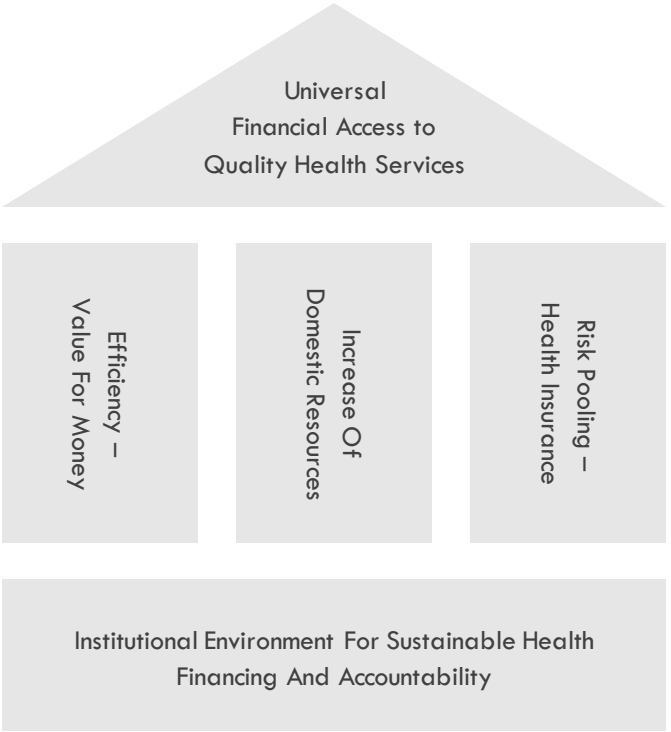
	HEALTHCARE CENTRES	HEALTHCARE POSTS	
	GRID-CONNECTED	GRID-CONNECTED	OFF-GRID
PROPOSED SOLUTION	11 kWh lithium-ion batteries	3 kWh lithium-ion batteries	800 Wp solar-PV + 2.4 kWh lithium battery
CAPEX REQUIRED	$9,483	$3,885	$6,451

Various healthcare sector financing strategies can be explored

RWANDA HEALTHCARE FINANCING STRATEGIES FOR ACHIEVING UNIVERSAL FINANCIAL ACCESS

EFFICIENCY – VALUE FOR MONEY	INCREASE OF DOMESTIC RESOURCES	RISK POOLING – HEALTH INSURANCE
• PBF • Decentralization • Performance contract system (imihigo)	• Community health cooperatives, performance-based financing • Public, private and community partnerships • Self-sustaining health facilities	• Community-based health insurance (CBHI) • Social health insurance • Voluntary health insurance

ARCHITECTURE OF RWANDA HEALTH FINANCING



Performance contract system (IMIHIGO)

Traditionally, *Imihigo* was a cultural practice where an individual would set targets or goals to be achieved within a specific period of time. The terminology is currently used to refer to a performance-*based* management tool, which is able to strengthen strategic planning, manage and improve service delivery in the local government system.

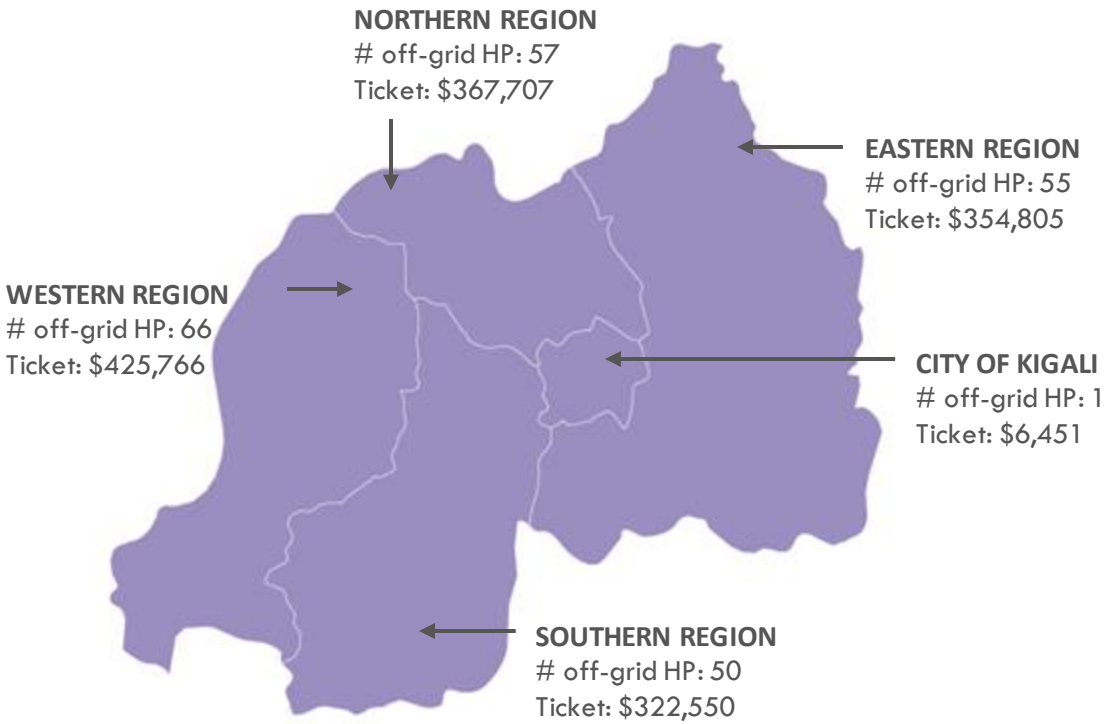
In a more practical way, any institution is required to sign a performance contract yearly with its supervising body outlining the key results and targets it will be expected to achieve over the year.

Source: WHO, 2017. Primary health care systems (PRIMASYS): comprehensive case study from Rwanda; AfDB, 2012. Performance contracts and social service delivery – Lessons from Rwanda

Investment ticket size for off-grid PV for HP is $1.5 million

$1.5 million
Investment ticket size of standalone PV for off-grid HP

OFF-GRID HP DISTRIBUTION		EXISTING MINI-GRIDS	EXISTING STANDALONE SYSTEMS	HFE POTENTIAL
West	85	3	16	**66**
South	72	2	20	**50**
East	89	6	28	**55**
North	78	0	21	**57**
City of Kigali	2	0	1	**1**
TOTAL	**326**	**11**	**86**	**229**



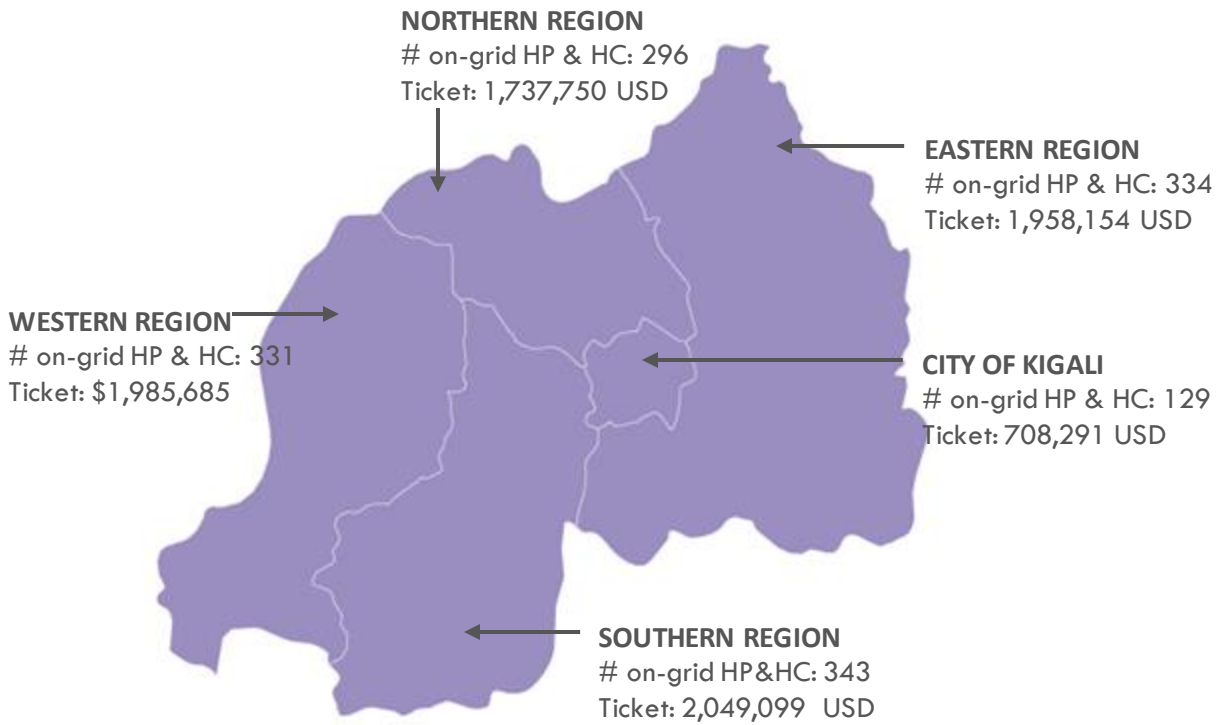
Notes:
- Data include public and private HPs
- Out of the 11 existing mini-grids, 7 are operational as per EDCL

Assumptions:
- Each existing mini-grids electrifies an off-grid HP, for a total of 11 HPs
- Ticket size includes all EPC contract costs; it does not include soft costs (e.g.,project development and management, financing and legal costs, complementary activities such as capacity building, etc.)

Investment ticket size for grid-connected back-up power for HC & HP is $8.5 million

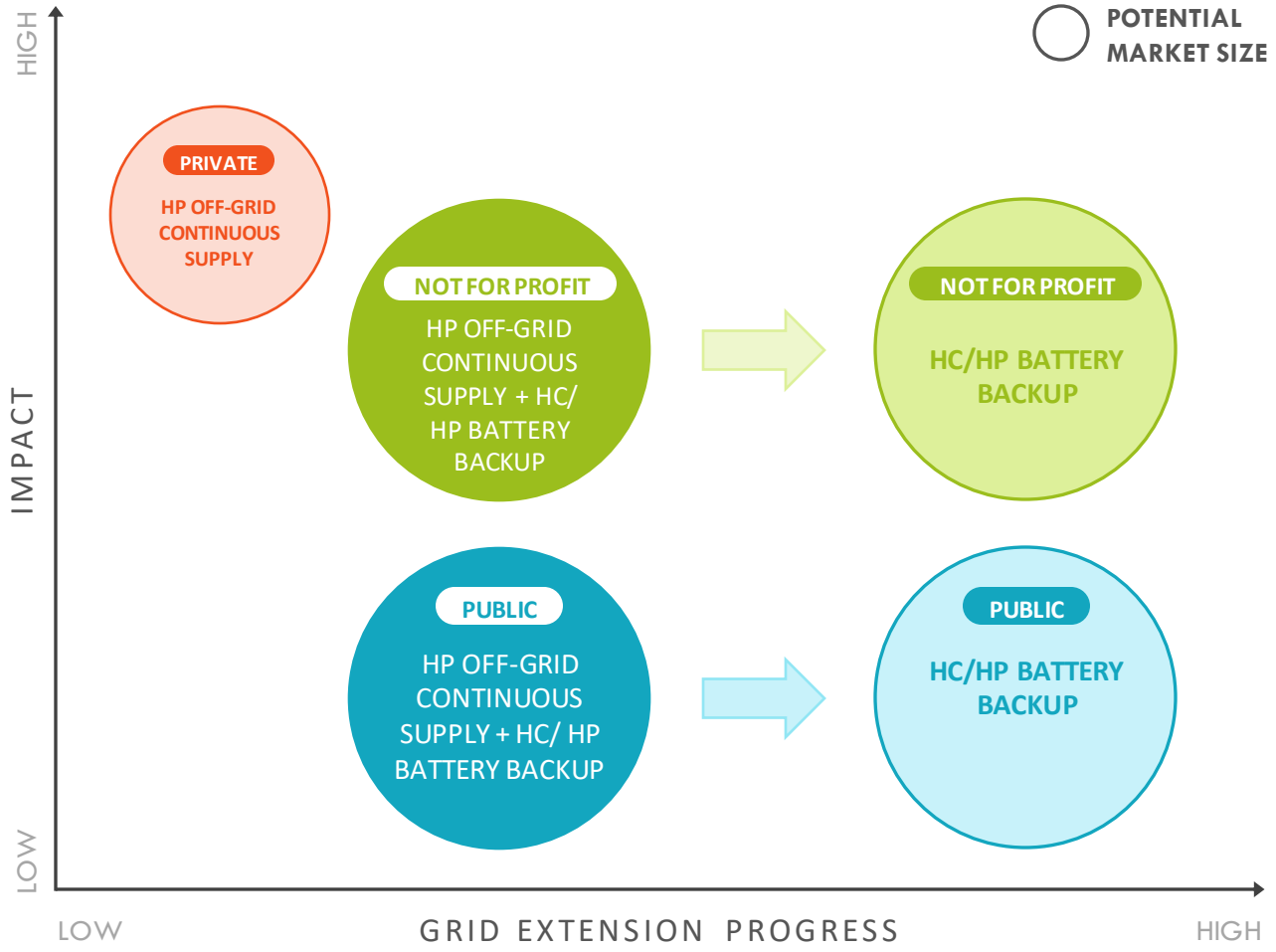
$8.5 million
Investment ticket size of battery backup for grid-connected HC & HP

	ON-GRID HP	HP TICKET SIZE ($)	ON-GRID HC	HC TICKET SIZE ($)
West	206	800,310	125	1,185,375
South	215	835,275	128	1,213,824
East	216	839,160	118	1,118,994
North	191	742,035	105	995,715
City of Kigali	92	357,420	37	350,871
TOTAL	**920**	**3,578,085**	**513**	**4,874,262**



There in no one-model-fits-all solution

- Impact of **private** delivery model is higher than others thanks to the WEF nexus and PUE approach, however the potential market size only targets off-grid healthcare posts.
- **Public** and **not-for-profit** delivery models target off-grid HPs and on-grid HPs/HCs.
- The impact a **not-for-profit** delivery model has is higher than the public one since, unlike the public entity:
  - A **not-for-profit** entity can raise additional funds for the initial investments and O&M of the facilities.
  - Given that the **not-for-profit** entity should be already engaged in healthcare services (pre-condition), there might be synergies between health and energy projects.
  - The **not-for-profit** entity can supervise the O&M in the start-up phase, given (i) its vocation for training courses and capacity building and (ii) its presence in the HFs already delivering healthcare services.
- **Public** and **not-for-profit** delivery models can be shifted into a back-up system once the grid arrives.
- **Private** delivery models cannot be sustainable if shifted into a back-up system once the grid arrives.



Three delivery models are proposed for Rwanda

The public delivery model (or traditional ownership model): where a public entity provides grant funding and commissions an NGO or private company to design, purchase and install solar PV systems at the HF. The O&M is outsourced as well. The asset is owned by the public institution or agency. This is only applicable to standalone PV systems.

The not-for-profit delivery model: where a not-for-profit entity receives grants to build the power plant and transfers the assets to the public entity. This is only applicable to standalone PV systems.

The private model: where a private entity builds, owns and operates the power plant under a public-private partnership with the MoH. This model can be applied to both standalone systems and mini-grids. This is only applicable to standalone PV systems.

Each one of these three models serves a particular segment of health facilities and has its advantages and drawbacks. To achieve global access by 2024 and exploit all types and sources of funds that can support HF electrification, the GoR could consider combining these three models and study case by case, as per the appetite of the different funders and the country's regulatory framework.

03 | Roadmap towards Powering Healthcare Facilities

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Four challenges need to be tackled to reach health electrification goals

CHALLENGES	RECOMMENDATIONS	PROPOSED ACTIONS	STAKEHOLDERS
01 COORDINATION & COMMUNICATION ENGAGEMENT To ensure effective implementation of the integrated strategies for healthcare facility (HF) electrification and energy efficiency, with a focus on the engagement of decentralized authorities.	Recognizing good coordination among institutions in terms of integrated strategies and policies, a margin for improvement is identified to properly train/shadow/enhance decentralized authorities in implementing policies and strategies in an effective manner. Even if local stakeholders are involved in the decision-making process, sign *Imihigo* and can follow-up updates on institutional websites, a lack of awareness and initiative has been identified in the HFE sector, including energy efficiency. Communication channels could be improved between institutions/government and decentralized authorities.	Define a communication plan, which is a policy-driven approach to ensure all parties have the latest updates on projects and objectives and are encouraged/driven to adopt practical actions. A communication plan may include follow-up events at regional/district level, newsletters, web conferencing, blogs, etc.	MoH, MININFRA, REG
	Recognizing good coordination between the Ministry of Health (MoH), the Ministry of Infrastructure (MININFRA) and the Rwanda Energy Group (REG) to integrate healthcare and energy strategies, as well as productive use of energy (PUE) and the socioeconomic impact of rural electrification, including HFE, sharing priorities and planning with international donors, would allow for the alignment of financial resources and actions.	Priority communication channel between the GoR and select international donors.	MoH, Rwanda Development Board (RDB), donors
	Increase coordination between donors and practitioners with different objectives (e.g., health, energy power systems, energy efficiency).	Arrange a harmonization roundtable for active and potential donors in HFE projects, including cross-cutting sectors, such as water-energy-food (WEF) nexus projects.	Donors

CHALLENGES	RECOMMENDATIONS	PROPOSED ACTIONS	STAKEHOLDERS
02 PRIVATE SECTOR ENGAGEMENT To favour an enabling environment and provide tangible opportunities for private actors willing to invest and operate in the HFE sector, including developers and specialized O&M service providers.	Favour cross-sector partnerships to support innovative private delivery models focused on the WEF nexus and PUE for broader access to electricity interventions than HFE alone, with a view to sustain the project viability and decrease the O&M costs for HFE as well.	Publish and update a comprehensive framework of donor funding windows for HFE projects, including cross-cutting sectors, such as WEF nexus projects, with a regional target.	Donors
	Favour origination of multi-country projects to attract investments and developers in Rwanda, which has a small off-grid HFE sector.		
	The National Electrification Plan is regularly updated to achieve universal access to electricity by 2024 (to date, 30% of people will be connected by off-grid solutions). This means that off-grid initiatives suffer from unclear delineations between on-grid and off-grid areas. Changes in this delineation have created uncertainty that has deterred private investment, especially in small countries like Rwanda. Thus, the government should urgently adopt adequate de-risking mechanisms to cover the gap between the cost of service and the "revenue requirements“.	Adopt effective and urgent enabling mechanisms (e.g, PPP, compensation, subsidies and other de-risking mechanisms) and procedures to attract private investments and developers in the off-grid sector.	MININFRA, Ministry of Economics and Finance (MINECOFIN), REG, RDB, donors
	Private actors may play a role for promoting business models based on public-private partnerships (PPPs) and/or active engagement of private actors in HF management, new income generation activities, energy systems provision and operation. Considering that PPPs are duly regulated, even if there is poor adoption in the HFE sector, donors should support demonstrations to encourage private sector engagement (PSE) and validate PPP models.	Donor-funded demonstration projects based on relevant PSE, including PPPs, in the HFE sector.	Donors, private stakeholders

Sources: REG; CIF, 2022. Evaluation of the Scaling up Renewable Energy Program in Low-income

CHALLENGES	RECOMMENDATIONS	PROPOSED ACTIONS	STAKEHOLDERS
03 RELIABILITY & SECURITY OF ELECTRICITY SERVICE Provide reliable, clean, sustainable and safe electricity services for HFs to effectively enable high-level healthcare delivery services	Seek investor/donor support in improving the power supply quality through HF network supply reinforcements.	Installation of power transformers or transformer rings to boost voltage.	REG
	Leverage on PSE to boost the energy transition from inadequate and diesel-based solutions to sustainable, reliable and clean electricity services for HFs.	Outsource the energy system O&M (both power and back-up systems) to private actors by means of public tenders or PPPs.	MoH, private actors
	Reliable and affordable back-up solutions could notably improve the quality of healthcare services. Taking into consideration high expenditure and reliability of current diesel-based back-up, alternative options should be explored.	Define a set of sustainable back-up solutions on the basis of a reference cost-benefit analysis.	MoH, donors
	Ensuring 24/7 reliable electricity services is needed to provide high-level healthcare delivery services. Energy expenditure and consumption should be disaggregated by water data, and duly gathered and analyzed.	Allocate adequate resources for O&M of energy systems and electrical equipment, including maintenance of sustainable back-up solutions and energy efficiency devices. Depending on the delivery model adopted, the HF budget should be revised to cover such expenses, otherwise the MoH should manage the O&M service at central level.	MoH, donors, private and not-for-profit actors
	Energy demand management and energy efficiency are crucial to optimize operations of small-size power systems, and specifically for solar-PV systems. Technology (EMS, BMS) plays a role, but it is complementary to the offtaker's behaviour. Such integration is relevant in HFE applications, since it may directly affect battery storage lifespan as well as daily energy availability.	Provide training courses for stakeholders (at institutional and HF level) on demand-side management (DSM) strategy to optimize energy resources and promote energy efficiency.	MoH
	Investigate the wiring installations of existing hospitals to avoid potential accidents in case of old infrastructure or poor cabling installations.	Carry out detailed electrical installation design reviews for vulnerable HFs.	MoH, MININFRA

CHALLENGES	RECOMMENDATIONS	PROPOSED ACTIONS	STAKEHOLDERS
04 ACCESS TO ENHANCED DATA RELATED TO HFE	Open access to reliable data about the HFE sector is crucial to attract practitioners and investors since it reduces efforts in pre-feasibility studies, planning and access to finance, whereas data are not easily accessible and quite fragmented, and open-source databases have limited information.	Develop more advanced and comprehensive databases and IT platforms.	MoH, REG, donors
	Geolocate all HFs in the country to facilitate planning for basic infrastructure deployment.	Collect all the geo coordinates of HFs and include termination points for basic infrastructures such as water, electricity & network fiber.	MoH
	Regular data updating on projects and pipelines is crucial for all the stakeholders and gives institutions greater trustworthiness.	Plan a structured updating activity, assigning a specific task to public entity feeding data.	MoH, REG, donors
	Responsible institutions/agencies should undertake actions to better support both healthcare facilities and customers to access information.	Adopt simple, user-friendly and cost-effective solutions that can support both patients and healthcare members and facilitate its diffusion.	MoH
	Donors should be focused on promoting impactful data collection to support blended fundraising and advocacy actions.	Activate an integrated monitoring, evaluation and learning (MEL) platform for HFE projects, which interacts with HFE-related database.	donors
	Regular training can potentially enhance the knowledge and skills of technical and clinical personnel by increasing work efficiency and effective utilization of ICT technology.	Deliver public staff training on ICT technology.	MoH
	Digitalization of HFs allows for remote monitoring of HF infrastructure, including but not limited to energy power systems, and thus notably contributes to access to HFE-related data.	Invest in computers and internet access across HFs.	MoH

Proposed implementation phases for HF electrification by 2027

	PHASE 1: 2023 - 2024 Feasibility and tendering	PHASE 2: 2024 - 2025 Piloting and demonstration	PHASE 3: 2025 - 2027 Scale up
KEY ACTIVITIES	• Public entities engagement to define a communication plan for effective implementation of HFE projects • Commit public and donor funds for sustainable HFE projects' implementation and operation • Develop master documents for public tenders and PPP in the HFE sector, including technical specification for sustainable backup solutions • Integrated data collection for HF energy-related data • Improved access to HFE-related information by integrating and correlating existing databases, with guidelines for easy access • Implementation and coordination of donor-led existing programmes for HFE project and their potential link with WEF nexus projects • Develop an integrated MEL platform for HFE • Establish a priority communication channel between the GoR and international donors • Define effective and urgent enabling mechanisms for the off-grid sector	• Piloting of new HFE projects adopting one or more proposed delivery model, including provision of computers and internet access • Piloting PPP for PSE • Piloting public tenders for O&M services targeting small HF clusters in different regions • Activate an integrated MEL platform for HFE projects • Assuring a regular update of the HFE database • Following-up the priority communication channel • Design and delivery of training courses on the DSM strategy and ICT	• Scaling-up of HFE projects adopting one or more proposed delivery model, including provision of computers and internet access • Scaling-up previous PPP or signing new PPP for PSE • Launch, award and implement public tenders for O&M services targeting large HF clusters at regional or national scale • Assuring a regular update of the integrated MEL platform for HFE projects • Assuring a regular update of the HFE database • Following-up the priority communication channel • Arrange a follow-up workshop on the DSM strategy and ICT
KEY OUTPUTS	• Communication plan • Financing framework • Public tender and PPP format in the HFE sector • MoH database updated with energy-related datasets • HFE databases and IT platforms improved • Guidelines for easy access to comprehensive HFE-related data • Coordinated notices of donor funding windows for HFE projects • MEL platform for HFE projects designed • Priority communication channel established • Enabling mechanisms for the off-grid sector adopted	• HFs electrified by pilot projects adopting one or more proposed delivery model (public, not-for-profit, private) • Pilot PPP signed in the HFE sector • Pilot O&M service contracts completed to operate a cluster of HFs • MEL platform for HFE projects adopted • HFE databases regularly updated • Priority communication channel active • DSM/ICT training courses delivered	• 100% HFs electrified (on-grid or off-grid) • Scaled-up PPP signed in the HFE sector • 100% of primary HFs covered by O&M service contracts (if not adopting a private delivery model) • MEL platform for HFE projects regularly updated • HFE databases regularly updated • Priority communication channel active • DSM/ICT follow-up workshop

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About SEforALL

Sustainable Energy for All (SEforALL) is an inter-national organization that works in partnership with the United Nations and leaders in government, the private sector, financial institutions, civil society and philanthropies to drive faster action towards the achievement of Sustainable Development Goal 7 (SDG7) – access to affordable, reliable, sustainable and modern energy for all by 2030 – in line with the Paris Agreement on climate.

We work to ensure a clean energy transition that leaves no one behind and brings new opportunities for everyone to fulfil their potential.

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