Solar for Health (S4H) innovative financing feasibility study: Malawi summary report

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1. Energy demand and financing need

Many healthcare facilities in Malawi lack access to electricity entirely or struggle with its limited reliability, and off-grid solutions have yet to scale

The Government of Malawi (GoM) targets full electricity access by 2030: 30% via grid energy access and 70% via off-grid solutions. Currently, only 11% of the population can access the main grid (and only 4% in rural areas); it is estimated an additional 13% of the population has access to any off-grid solar energy solution. Thanks to its relative political stability, Malawi has benefited from significant donor capital inflows, many of which focus on electrification initiatives: the World Bank's Malawi Electricity Access Project, a multi-donor Energy Sector Management Assistance Program (ESMAP), and the European Union's Sustainable Energy for Rural Communities (SE4RC). Even despite these, achieving universal access by 2030 remains an ambitious goal that will necessitate a more concerted push on off-grid energy development.

While GoM's Malawi Rural Electrification Programme (MAREP) has specifically identified off-grid strategies as the lowest-cost electrification solution to reach peri-urban and rural populations, large energy initiatives in Malawi still prioritise on-grid strategies. Similarly, although the Ministry of Natural Resources, Energy and Environment (MNREM) and its National Energy Policy (2018) are committed to strategic planning and development in the renewable energy sector, these efforts have also predominantly focused on large independent power producers (IPP) and mini-grid strategies (for example, the Salima Solar mini-grid developed by Community Energy Malawi) that may be less economically viable for smaller and more rural communities.

In the healthcare sector, specifically, achieving universal and reliable energy access remains an ever-present challenge. According to the Ministry of Health (MoH), 13% of Malawi's 568 public healthcare facilities lack any electricity access, with another 32% depending solely on unreliable and high-polluting diesel generators. Nevertheless, even the electrified facilities (i.e., the 34% grid-connected and 21% equipped with solar systems) struggle to provide high-quality healthcare services to patients due to lack of reliable and uninterrupted energy access, including from: insufficient grid-power generation, frequent grid outages, insufficient solar PV sizing for facility needs (i.e., only covering refrigeration and basic lighting), and premature system failures due to lack of proper maintenance being the norm rather than the exception.

UNDP's Solar for Health (S4H) programme aims to address these issues and bring reliable and clean energy to healthcare facilities across Malawi. By strengthening access to reliable solar energy, the S4H programme can significantly impact the quality of public healthcare, particularly for the most disadvantaged and remote populations, whilst also supporting local green growth and climate action. Specifically, S4H directly contributes to the following social, economic, and environmental Sustainable Development Goal (SDG) outcomes in Malawi:

- Social: SDG3 (Good Health and Well-being); SDG10 (Reduced Inequalities);
- Economic: SDG8 (Decent Work and Economic Growth); SDG9 (Industry, Innovation, and Infrastructure); and
- Environmental: SDG7 (Affordable and Clean Energy); SDG13 (Climate Action).

An estimated US$21m in financing is urgently needed to provide reliable solar energy access to healthcare facilities

An estimated US$21m in investment capital is needed in Malawi to finance the capital expenditures required to provide energy access to healthcare facilities, over an initial 7-year investment timeline.

The investment sizing assumes the following:

- Healthcare facilities within scope: on-grid facilities with diesel generators as backup and off-grid facilities without energy access. Facilities with existing off-grid solar solutions were excluded, though a further assessment should be conducted by MoH during programme implementation to determine if additional capacity may be needed for these facilities. Finally, small health posts were assumed to be out of scope for solar PV systems, given their small size and limited range of healthcare services. For these facilities, solar lanterns may be relevant and sufficient, though these are not included within the S4H programme;
- Energy needs, O&M, and autonomy assessment: an average energy needs and O&M assessment is assumed for different categories of healthcare facilities (from rural clinics to large hospitals) based on regional usage benchmarks. The exact needs assessment of each target facility will need to be conducted by MoH in collaboration with a local ESP to determine exact solar PV system sizing and investment need. Additionally, autonomy (i.e., through lithium batteries) is estimated at a one day for on-grid facilities and two days for off-grid facilities. Incorporating a hybrid solution with a diesel generator as a back-up solution, where financially relevant, can reduce total investment need;
- Diesel versus off-grid solar for energy needs: although the estimated levelised cost of energy (LCOE) of solar PV systems (US$0.71/kWh) is greater than that of diesel generation (US$0.48/kWh) over the initial contract period, the investment sizing assumes the social and environmental benefits from providing off-grid solar energy to all public healthcare facilities within scope outweigh this unit cost difference. Furthermore, this conservative costing analysis: (i) is based on benchmark retail prices for diesel in urban centres and does not factor in transportation and other middlemen costs that may increase transaction costs to rural healthcare facilities, (ii) does not incorporate CAPEX costs for generators (as it is assumed many healthcare facilities may already have the relevant systems; this, however, is often not the case), and (iii) estimates unit cost based on 7-years of operation (given minimal marginal operations cost, unit costs should decline further as solar PV systems are used past this initial investment timeline and as replacement battery costs decline). Finally, diesel value chains may also experience other unreliability/unavailability supply issues that can generally hinder reliable energy access. Consequently, this can make any costing analysis an unfair comparison as off-grid solar costs are typically greater given the inherent systems needed to ensure continuous and reliable energy access; and
- Investment timeline: an initial 7-year timeline covering initial capital expenditures and long-term O&M. A properly maintained solar panel can last up to 25-30 years, a lithium-ion battery lifetime ranges between 5-15 years. Investment financing is structured on an 7-year timeline, though this may be extended if investors show a preference/appetite for longer investment horizons (i.e., in which case, a new battery might have to be purchased prior to a new financing cycle).

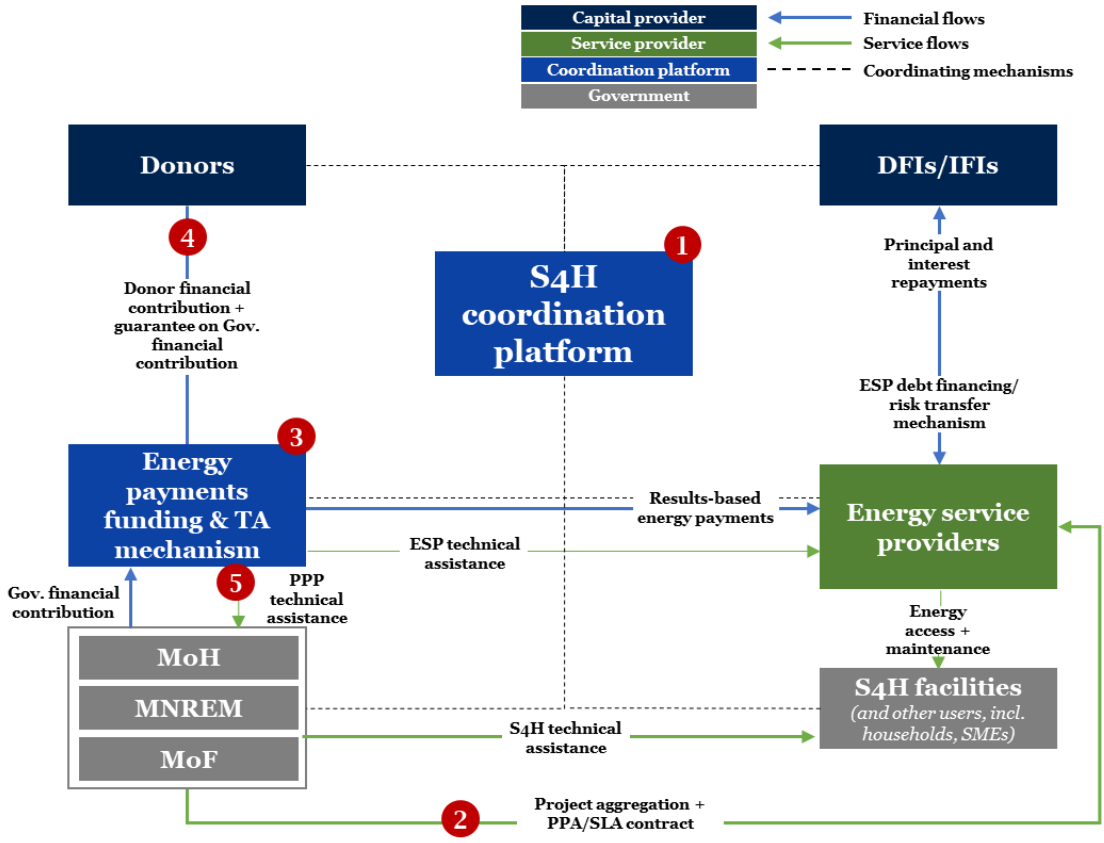
	Clinics (off-grid)	Clinics (on-grid)	Heath centres (off-grid)	Health centres (on-grid)	Smaller hospitals (off- and on-grid)	Larger hospitals (on-grid)	TOTAL
Initial investment outlay (unit)	US$38k	US$19k	US$57k	US$35k	US$116k	US$166k	
Annual O&M cost (unit)	US$1,510	US$1,366	US$1,690	US$1,660	US$2,800	US$4,300	
Number of facilities	**84**	**52**	**119**	**98**	**55**	**39**	**447**
Total hardware cost	US$2.4m	US$0.7m	US$5.3m	US$2.6m	US$5.1m	US$5m	US$21.2m
Total turnkey cost	US$3.2m	US$1m	US$6.8m	US$3.5m	US$6.4m	US$6.5m	US$27.3m

Unlocking the quantum of investment capital needed to scale-up the S4H programme remains challenging given inherent financing and operational challenges in Malawi

- Low MoH ability-to-pay: high levels of public debt (63% of GDP in 2018; an increase of US$550m year-on-year) and budgetary mismanagement have resulted in decreasing allocations for healthcare spending. Additionally, past cases of budgetary leakage (e.g., $US32m in fraud in 2013) from government accounts have reduced donor appetite in providing direct financial support to MoH. Indeed, in 2015 the largest bilateral donors in the health sector in Malawi (i.e., USAID, DFID, KfW and the Kingdom of Norway) set up the Health Services Joint Fund (HSJF) to fund healthcare independently from GoM. Under this budget shortfall, MoH prioritises payment of staff salaries and medicines, while other ancillary expenses, including energy access, are funded by HSJF. Consequently, low MoH ability-to-pay and creditworthiness creates high payment default and public counterparty risk for potential S4H investors;
- Lack of access to local financing to develop local markets: traditional commercial off-grid energy investors have expressed little appetite for undertaking public counterparty risk in Sub-Saharan Africa, including Malawi. This has significantly limited access to affordable capital for local energy service providers (ESPs) that may focus on public infrastructure, including healthcare facilities. Where local financing may be available, it can come at prohibitively onerous terms (typically only offering rates >20%). With a relatively stable currency and inflation since 2016, Malawi does not represent a particularly high macroeconomic risk, however, private investors are also often discouraged by the lack of investment opportunities in the country;
- Poor incentives for long-term operational and environmental sustainability: existing grant-financing models fail to incentivise long-term sustainability. Due to donor programmatic timelines (typically 3-5 years), specific priority mandates and funding processes, and shorter-term impact metrics, many donor-funded projects prioritise disbursing funding upfront to cover initial capital expenditures (CAPEX) versus financing longer-term annual commitments. This often results in premature failure of solar PV systems within the first few years and reduces potential for impact. Importantly, from a donor perspective, this CAPEX-only financing represents low value-for-money: it can often be the case that a revolving set of donors will finance new off-grid solar initiatives for the same healthcare facility every few years; and
- Lack of coordination and technical capacity to support project development: short-term donor mandates and preference for direct financing of technical assistance and/or discrete projects can often create ad-hoc and short-term focused initiatives that fail to deliver long-term impact. This lack of coordination between different government ministries, donor agencies, and project implementers (in this case, often large international players with limited local presence) prevents effective implementation of national off-grid energy strategies and increases transaction costs related to project procurement, aggregation, due diligence, and delivery.

2. Solar for Health platform financing model

A holistic approach bringing together stakeholder coordination, long-term de-risked financing, and technical assistance can be instrumental in scaling the S4H programme



1. An S4H coordination platform will support MoH with procurement and tendering to aggregate projects that can attract development finance institution (DFI) financing

The S4H coordination platform will coordinate a partnership between MoH, GoM's PPP Commission (PPPC), MNREM, Malawi Energy Regulatory Authority (MERA) local representatives, commercial investors, and local ESPs. UNDP, through its facilitation role, will supervise and support the entire investment process from procurement through to investment monitoring to ensure proper quality standards and successful implementation of the programme.

- PPP procurement and tendering to support project development:
    - *Coordination with PPPC*: GoM has established PPPC as an independent implementation agency for PPPs in Malawi. PPPC works closely with the Ministry of Finance (MoF) on development/updating of a standardised PPP framework, as well as assessment of PPP project feasibility and value-for-money. So far, energy PPP initiatives have predominantly targeted on-grid generation, though there are opportunities for MoH and other S4H coordination platform stakeholders to leverage PPPC's and MoF's experience with PPPs and adapt relevant best practices for procurement and tendering;
    - *Coordination with MNREM and MERA*: the S4H coordination platform will coordinate with MNREM, MERA, and MoH to ensure alignment between MAREP, existing and planned power investments, and priority healthcare facilities that may overlap with other ministries' development plans. Additionally, MoH can leverage MNREM's expertise and technical knowledge, and MERA's experience with private power investments, IPP contract negotiations, and energy project management;
    - *Coordination with local representatives*: project selection, energy needs assessment, project preparation, and community engagement will be conducted in close collaboration with community leaders and MoH national and district representatives

to ensure buy-in, adapt projects to local context and needs, and allocate budgets to the programme;

- Project aggregation to create investable portfolios: although investment in S4H and the public sector is a non-starter for most commercial investors, DFIs have explicit development mandates (often coupled with an appetite for public sector exposure) and large balance sheets for investment in larger-scale infrastructure and energy projects. The investment needs of an individual healthcare facility, however, cannot meet the minimum investment ticket sizes for DFIs (>US$10-100m versus typical individual healthcare facility investment needs of US$25-190k). By aggregating a portfolio of projects through a S4H coordination platform, the S4H programme can create larger investment ticket sizes of sufficient relevance for DFI capital.

  There are promising examples of other financing initiatives that have similarly leveraged DFI capital (in the form of concessional loans, equity, or grants) for the renewable energy sector in Malawi. For example, the European Union provided a grant of €7.3m to enhance the socioeconomic well-being of rural populations through the SE4RC program; a consortium consisting of Austria, DFID, Sida, SDC and the World Bank provided US$70m in the form of grants in the ESMAP framework; and the World Bank is currently funding a US$150m Malawi Electricity Access Project, providing technical assistance and capacity-building to develop both on-grid and off-grid energy infrastructure in the country.

- Mobilisation of private capital to finance local ESPs: the S4H coordination platform will also be responsible for coordinating the financing and investment due diligence processes with different GoM stakeholders, DFIs, and local ESPs. Specifically, the S4H coordination platform will develop investment due diligence criteria as part of its support to MoH during the procurement and tendering process to local ESPs, as well as explicitly coordinating with different DFIs and incorporating respective investor considerations. DFIs may still run separate investment due diligence processes as part of their own organisational processes in parallel to the S4H coordination platform. But already incorporating their investment considerations as part of the PPP procurement can (i) help streamline the investment process for both DFIs and local ESPs and (ii) ensure linkages between the tendering process and investor capital mobilisation. For example, by making S4H tenders contingent on a satisfactory DFI investor due diligence of the project bid and of the local ESP, the S4H coordination platform ensures that winning bidders necessarily also receive access to affordable financing.

2. A power purchase agreement (PPA) and leasing mechanism will align financial incentives and smooth payments over time to ensure long-term financial, operational, and environmental sustainability

A PPP/PPA and leasing mechanism will set out the contractual and financial obligations between DFIs, MoH, and the local ESP over the 7-year contract lifetime to ensure long-term sustainability:

- Financial sustainability and local market development:
  - *Investor returns matching respective risk-return appetites*: the financing capital structure is expected to blend senior debt at USD-denominated market returns (i.e., DFI capital) with concessional climate finance funds and/or donor grant capital. This blended finance approach will match interest rate returns to the respective risk-return appetites of different capital providers, whilst ensuring that access to financing remains affordable for local ESPs (versus current local financing rates >20%). The interest rate returns will depend on the expectations of committed capital providers identified during financial structuring negotiations, as well as the degree of blending between commercial and concessional financing;
  - *MoH and donor affordability/value-for-money*: as the contracted off-taker for energy access to public healthcare facilities, MoH will be liable for payment obligations under the PPP. Currently, high upfront CAPEX can be prohibitively expensive and reduce the number of healthcare facilities that can targeted. By spreading the total energy access costs across a series of smaller leasing payments, MoH and/or donor funders can reduce their monthly costs and improve affordability. Additionally, financial incentives for long-term operational sustainability will support increased impact and value-for-money. Donor mandates focused only on upfront CAPEX funding, however, will need to be adapted to support these recurring payments. Malawi's existing donor-funded HSJF may potentially be repurposed for these objectives;

- *Local ESP market development*: monthly leasing payments will be paid to the local ESP by a coordinated energy payments funding mechanism comprised of donors and MoH over the 7-year contract duration. These leasing payments will be priced to include capital expenditure, long-term O&M, cost of capital, and local ESP commercial margins to support local market development. Additionally, access to affordable blended financing through the S4H coordination platform will enable solar PV asset ownership to remain with the local ESP throughout the PPP contract duration (before ownership transfer to MoH). By bearing this financing risk, the local ESP will also benefit from earnings on leasing financing margins. This can support the financial sustainability of local ESPs, as well as strengthen their track record and ability to access capital markets in the future.

- Operational and environmental sustainability:
  - *Long-term local ESP operational performance obligations*: under the current grant-based model, donors typically only finance the upfront cost of solar PV panels and initial installation. Long-term O&M (and proper disposal) is often not priced into contracts. Although MNREM's Department of Energy Affairs (DEA) has the necessary expertise to provide training on and manage solar PV systems, its capacity to cover all the healthcare facilities in the scope remains insufficient, thus leaving these obligations with the ESP.

    Under the S4H coordination platform model, the local ESP (in collaboration with MoH) will conduct an energy load needs assessment across its project portfolio and provide appropriately-sized solar PV systems and installation services. The local ESP will then be responsible for long-term O&M and will need to ensure solar PV system availability and achievement of minimum-service level operational performance criteria, as defined under an SLA. Additionally, given the potential geographic spread of project portfolios, local ESPs may need to train healthcare staff or community-based technicians for more frequent and basic maintenance (e.g., cleaning panels).

    The PPP/PPA will specifically aim to incentivise long-term operational sustainability by pricing in O&M into the contract over its 7-year term. Monthly leasing payments will be conditional on achieving the SLA operational performance standards to provide financial incentives for high-quality service over the full life of the PPP/PPA contract. In the event solar PV systems fail to meet minimum service-level performance standards required by the healthcare facility, for example, payments to the local ESP may be reduced and/or withheld. As the S4H coordination platform envisions an initial 7-year investment timeline, the PPP/PPA contract will need to be extended with a new long-term O&M contract (including coverage of any replacement parts) after this investment horizon to maintain on-going sustainability after eight years; and
  - *Local ESP environmental sustainability and disposal obligations*: the PPP contract might additionally price in disposal costs as part of the local ESP's long-term sustainability obligations. From a technical perspective of disposal, however, there are no standardised best-in-practice guidelines and little practical experience with disposal and recycling of components from medium- to large-scale solar energy systems. There are no hazardous materials in silicon PV panels and lithium batteries (as opposed to lead acid batteries) that should present an environmental concern. The details of where and how it should be disposed (as well as the existence and/or capabilities of relevant ecosystem players), however, need to be further developed. Encouragingly, recycling PV panels and battery components can have economic value and is of relatively low complexity. The market for local recycling value chain actors is expected to grow as these technologies further develop.

3. An energy payment funding mechanism will coordinate healthcare energy contributions from donors and MoH to support ability-to-pay on payment obligations under the PPP

The energy payments funding mechanism will coordinate financial contributions from international donor agencies and local public institutions (i.e., MoH), including incorporating existing budgetary allocations for healthcare energy spending. Malawi's existing donor-funded HSJF may potentially be repurposed and/or incorporated into this coordinated funding mechanism to achieve similar objectives.

The donor funded contribution to the local ESPs through monthly leasing payments as part of the PPP/PPA contractual frameworks are fundamental to mitigating MoH payment default risk (in order to attract DFI investor capital):

- Support for MoH ability-to-pay through coordinated donor funding: donor contributions within the coordinated energy payments funding mechanism will cover a pre-defined proportion of the monthly leasing payments to local ESPs. MoH will be contractually obligated to finance the remaining balance, with covenants in place in the event of default. These can include removing defaulting healthcare facilities from the S4H programme and/or reduced future donor funding to MoH as penalties.

  Currently, healthcare facilities do not receive any direct cash allocations; instead, their expenditures are managed by MoH's District Health Offices (DHO), either in the form of direct payments (such as staff salaries or utility bills) or provided in-kind (such as medicines and diesel for generators). Theoretically, DHOs could reallocate these existing sources of energy financing to cover its financial obligations under the PPP/PPA contracts. As budgetary allocations, however, often do not cover full energy access (i.e., amount of diesel received is often not sufficient; and in some instances, no diesel is provided due to GoM budget shortfall), potential budget reallocations from switching to off-grid solar solutions may not be sufficient to cover monthly leasing payments of full energy access. This existing funding amount is nonetheless not negligible: US$14.5m, or 48% of the total investment need in Malawi.

  The proportion of donor funding versus MoH contributions to the leasing payments will thus need to be negotiated amongst relevant stakeholders during structuring of the PPP to ensure ability-to-pay. Donor commitments are an essential component needed to balance MoH's low ability-to-pay and should be sufficient in size to reduce payment default risk (and attract investor financing). A partial donor funding mechanism, however, can still face a funding shortfall: as donor programmatic mandates are typically shorter-term (i.e., 3-5 years), many donor agencies are unable to commit to the full 7-year investment horizon and can only conditionally commit to funding in later years if programmatic mandates are renewed. This risk can be partially addressed by (i) putting MoH contributions into escrow during the first years of a secured donor mandate and using only donor capital during this period for PPP payments (if applicable), with MoH funding from escrow released in later years and/or (ii) using guarantee mechanisms (though these can be costly). Alternatively, certain donor funding windows, such as the Green Climate Fund, may be able to provide funding commitments up to 7 years;

- Potential additional revenue streams to minimise MoH liabilities: MoH, with implementation support from local ESPs, TA providers, and UNDP can explore additional revenue streams to help off-set payment obligations, including selling excess energy generation to local communities, feeding into the grid or net metering (for grid-connected healthcare facilities; regulations for feed-in-tariffs will need to be developed), and/or carbon credits in global carbon markets. For example, the S4H programme can reduce carbon emissions by an estimated 9.9k tCO_2e per annum (assuming full off-grid solar energy access for target facilities versus current energy mix of diesel and grid power by facility type). Under Article 6 of the Paris Agreement, there may be potential for these internationally transferred mitigation outcomes (ITMO) carbon credits to be sold in global carbon markets: at benchmark prices of $10-$15 per tCO_2e, MoH can potentially reduce its payment obligations by up to $99-149k per annum. Although these additional revenue streams will likely remain small and unable to cover full payment obligations, they are nonetheless welcome upsides to help offset MoH liabilities;

- Partial foreign exchange risk mitigation: as international donor contributions are typically denominated in hard currencies (e.g., USD, EUR), such funding will partially mitigate foreign exchange risk (up until the proportion of its share of the leasing payment) on financing liabilities (i.e., repayments to investors) that are also denominated in hard currencies;

- Reduced budgetary leakage: building upon the donors' past learnings in Malawi, donor contributions being paid directly to the ESP will minimise risk of leakage into GoM's general budgetary allocations and spending outside of the S4H programme. Ensuring a direct link between financial contributions and repayment to investors will additionally reduce investor perception of public counterparty risk; and

- MoH buy-in and long-term asset ownership: although MoH's partial financial contributions to the leasing payments will expose investors to a measured level of public counterparty risk, it is

also important to ensure MoH has financial obligations as part of the PPP financing. This skin-in-the-game will incentivise MoH's commitment to the long-term sustainability of the solar PV systems (versus often-limited buy-in under the current grant-based funding model).

4. Guarantees will be necessary to backstop MoH contributions to the leasing payments and further mitigate GoM public counterparty risk for DFI capital

Despite donor contributions to the leasing payments through the energy payments funding mechanism, a complementary set of contingent grants/guarantees may still be required to de-risk investor capital against MoH public counterparty exposure and short-term donor commitments. Specifically:

- MoH public counterparty risk: guarantees to backstop energy payment obligations can mitigate partial exposure to MoH defaults on its payment obligations under the PPP and provide credit enhancements to investors. As guarantee mechanisms can be costly and donor contributions do not fully mitigate investor risk, a structured combination of both financial tools may be more effective at attracting DFI capital. These guarantees can be structured to either backstop payments to the ESP or directly on payment obligations to investors. The specific terms and payment coverage will depend on the cost and availability of guarantee mechanisms and donor capital; and
- Short-term donor commitments: guarantees can play an additional role at temporarily backstopping donor commitments to energy leasing payments in later years of the PPA. This risk that the coordinated energy payment funding mechanism may fail to renew its donor funding source in later years may need to be covered by a partial guarantee to attract longer-term investor capital.

5. Technical assistance and capacity-building will support GoM's regulatory and PPP framework development and strengthen procurement, project development, investment due diligence, and project delivery and monitoring capabilities

MoH, given its limited expertise with PPP and energy procurement tenders, will require technical assistance (TA) and capacity-building from procurement through project management. Additionally, a nascent local off-grid ecosystem will depend on international/regional partnerships and S4H coordination platform support to strengthen local market capabilities. Specifically, a TA provider financed by donor grant capital through the coordinated TA funding mechanism (managed by the same executing entity for the energy payments funding mechanism) can support MoH and local ESPs with the following:

- Project preparation support: healthcare facility selection and prioritisation, specific energy needs assessment, scope of work definition, and investment sizing across hundreds of potential facilities will need to be completed in an initial phase of S4H implementation;
- Procurement and tendering process: although MoH can leverage on the initial learnings from the S4H programme pilot (i.e., 85 healthcare facilities equipped with solar PV installations during the programme's pilot and three other energy initiatives implemented under PPPs), additional TA is still essential to adapt best practices to scaling S4H (i.e., tendering aggregated portfolios of healthcare facilities in large procurement contracts);
- Contract and project management: TA can additionally be provided to support PPP contractual and term sheet negotiations with DFIs and local ESPs, PPP governance, and portfolio management; and
- Local ESP project delivery capabilities: the local market ecosystem is slowly growing in Malawi (currently c.20 locally-licenced solar companies), but it still remains nascent. Larger local players (such as Sky Energy Africa, Atlas Energies or Danforth Solar) primarily focus on urban markets for solar home systems. Otherwise, most local ESPs are small enterprises that are not of sufficient size and/or technical capability to bid for large public procurement tenders. Consequently, large international actors (such as Phanes Group or Droege Energy) continue to play an outsized role in Malawi's energy initiatives. Technical assistance financing will encourage development of the local market by supporting business plan development, contract procurement, and technical project delivery capabilities (including the upskilling of local and community-based O&M technicians). A large regional player or international joint venture may be relevant in an initial phase to bring in necessary technical expertise.

3. S4H social, economic, and environmental impact

Scaling up the S4H programme in Malawi is expected to deliver better healthcare quality, strengthen local economic green growth, and support climate action

1. Improved energy access and healthcare quality (especially for patients in rural areas)

- Improved healthcare quality for patients across 447 facilities: S4H is estimated to provide access to reliable energy to 447 healthcare facilities with a total catchment population of up to 15m individuals. This improved availability and strengthened resilience of healthcare facilities are expected to significantly improve health outcomes across the board, from quantitative indicators (e.g., earlier diagnosis and better treatment of malaria, better response to local outbreaks of infectious diseases such as Covid-19) to softer qualitative indicators (e.g., improved patient comfort); and
- Reduced inequalities in health services: lack of access to reliable energy disproportionately affects rural healthcare facilities located in areas where the poorest populations live. Bringing reliable energy access to rural areas can reduce the healthcare quality gap between rural and urban communities in terms of healthcare quality.

2. Economic green growth and job creation

- Local economic development through green growth: S4H can catalyse foreign direct investment inflows (an estimated US$21m for this programme alone), develop the local energy ecosystem, and create green jobs (particularly in rural communities);
- Renewable energy sector capacity-building: technical assistance and capacity-building of government ministries and local ESPs will contribute to further market transformation and national implementation of off-grid solar technologies; and
- Creation of new value chains: the recycling and disposal of solar PV systems can create demand for new value chains and develop new local green enterprises.

3. Cleaner energy and environmental benefit

Moving from providing full energy access to public healthcare facilities through off-grid solar (versus equivalent diesel usage) will reduce carbon emissions by approximately 9.9 ktCO2e per annum:

	Total	Health clinics	Health centres	Smaller hospitals
Diesel efficiency	23%	15%	20%	30%
Diesel MWh	4,110	767	1,737	1,606
Grid MWh	4,658	380	1,431	2,847
tCO2/year	**9,890**	**1,775**	**3,794**	**4,321**

4. UNDP role and implementation roadmap

UNDP can play three key roles to support implementation of the S4H innovative financing S4H coordination platform in Malawi

- Create a convening platform for stakeholder coordination and buy-in: given its networks and track record in Sub-Saharan Africa, UNDP is uniquely-positioned to play a convening role through the S4H coordination platform with all relevant public (i.e., MoF, MNREM, MoH, community leaders, donors) and private (i.e., DFIs, local ESPs) stakeholders; ensure stakeholder buy-in and alignment of respective mandates and incentives with S4H objectives; and provide oversight of roles and responsibilities for successful collaboration;
- Support capacity-building and strengthening of regulatory frameworks:
    - *Off-grid/renewable energy regulatory frameworks*: while some large-scale energy initiatives exist in Malawi, these have predominantly targeted on-grid generation

and/or transmission (such as the Mozambique-Malawi Regional Interconnector Project aiming to link transmission systems of the two countries to allow bilateral and regional power trade). UNDP can support MNREM and MERA in strengthening their off-grid development strategies and incorporating clearer targets and timelines into MAREP and MNREM's other national electrification initiatives. As part of these development strategies, UNDP can further strengthen incentives and favourable policies for the renewable energy sector based on global best practices (including, for example, implementation and promotion of feed-in tariffs and net metering for smaller grid-connected users). And through off-grid initiatives like S4H, UNDP can support GoM in developing new off-grid/distributed energy models that could be scaled up under the relevant national master plans;

  - *PPP regulatory framework and management*: UNDP can support MoH to leverage expertise from PPPC and incorporate global best practices to existing PPP regulatory frameworks. By supporting capacity-building of PPPC to include healthcare off-grid energy infrastructure, UNDP can strengthen MoH's PPP and contractual frameworks, increase private sector investor appetite through budgetary allocation ringfencing, and reduce transaction costs on PPP procurement and management;
  - *Local ESP capabilities*: although the local ESP ecosystem is growing steadily in Malawi, it still remains underdeveloped and will require support to reduce dependence on large international off-grid solar actors. Through UNDP-supported TA providers, UNDP can encourage development of the local market and its project procurement and delivery capabilities (including the upskilling of local and community-based O&M technicians outside major urban areas); and

- Align and mobilise donor and investor capital to S4H objectives: UNDP can leverage its partnerships development and fundraising platforms to mobilise global development capital providers (i.e., donors, DFIs, climate funds, guarantees providers) to provide grant, guarantees, and investor capital for the S4H innovative financing facility.

  Additionally, UNDP may also play a key role as an executing entity with international donor agencies to align existing and future off-grid energy programmatic initiatives with S4H objectives (including coordinating the energy leasing payments and TA grants and/or incorporating flexibility into short-term funding timelines and mandates). In Malawi, the existing donor-funded HSJF may potentially be repurposed and/or incorporated into the coordinated funding mechanisms. For this, UNDP would need to play a coordinating role with the Kingdom of Norway, DFID, USAID and KfW to redefine respective mandates for contributions into the HSJF, if appetite for participation exists.

  Finally, UNDP can support global alignment around the development of ITMO carbon markets under Article 6 of the Paris Agreement, to mobilise climate finance as a potential additional revenue stream for S4H healthcare facilities.

Initial feedback from a consultative workshop with GoM stakeholders indicate interest in further developing the S4H programme

The MoH representatives have confirmed the need for reliable and sustainable energy source for healthcare facilities in Malawi and therefore a programme such as the S4H initiative is of great interest to them. However, the recent change of Government requires that the new MoH representatives get familiar with the programme and all the details of the proposed solution to confirm their willingness to move to implementation.

A challenge identified during the consultative workshop is the complexity of the PPP procedure under the PPP Act. Substantial technical assistance to support the MoH in the tendering process and the legal and contractual arrangements will be a key element to ensure the feasibility of the proposed solution. UNDP has confirmed that support will be provided to the MoH and that lessons learned from previous PPPs will be considered during the implementation phase.

A task force composed of government representatives (including MoH, MNREM, MERA), UNDP and other key stakeholders (such as development partners or DFIs) has been established and will continue the discussions on the way forward. The task force is coordinated by UNDP Country Office and all

reports will be made available to the task force to allow for more detailed analysis and an informed decision making.

UNDP has identified the Green Climate Fund (GCF) as a potential donor to support the leasing payments and Malawi is particularly well placed to benefit from GCF support for this programme given the GCF primary focus on least developed countries and Africa. UNDP has been working on a concept note for the GCF that shall be endorsed by the GoM to launch the programme implementation.

UNDP will be organising a set of follow-up calls with relevant ministries to continue engagement and align on next steps.

Based on these learnings, the following are recommended next steps and an implementation roadmap

- Draft and execute a Letter of Interest for the Green Climate Fund (GCF): as a concrete outcome of the country consultative workshop, UNDP is to coordinate with relevant government ministries to execute a Letter of Interest supporting a proposal request for funding from the GCF and its Project Preparation Facility (PPF);
- Develop memorandums of understanding between GoM and UNDP: UNDP through the S4H taskforce will formalise partnership with relevant GoM stakeholders (including MoH, MNREM, MoF) setting out guiding principles for engagement on S4H innovative financing programme;
- Define S4H programme scope: UNDP and MoH will conduct a comprehensive ecosystem analysis/action plan, energy needs assessment, project selection and prioritisation, and budget sizing across its portfolio of healthcare facilities, in collaboration with UNDP and MNREM; and
- Engage with donors, DFIs, and other capital providers: UNDP, relevant GoM stakeholders, and its financial transaction advisor will engage with donors and investors to mobilise early interest and/or commitments for the S4H programme; and
- Design and structure the S4H coordination platform financing model: based on the initial design of the PPP model in this feasibility study and MoH's operational design requirements, UNDP and its financial transaction advisor will develop a financial model and investment term sheet to fundraise with donors, DFIs, and other investors. The full design and launch of an S4H innovative financing facility in Malawi is expected to take 1-1.5 years.