SUSTAINABLE ENERGY FOR ALL

POWER AFRICA
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DEEP DIVE #5

Delivery Models

Powering Healthcare – Nigeria Market Assessment and Roadmap

Deep-dive on Delivery Model and Financing Mechanisms

The Powering Healthcare Market Assessment and Roadmap for Nigeria was developed by Sustainable Energy for All (SEforALL), under the Power Africa-funded Powering Healthcare Africa Project. It includes a main report, and 5 technical deep-dives.

The main report is accessible here.

Market Assessment and Roadmap: deep-dives

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REA RURAL ELECTRIFICATION AGENCY ENERGY=EMPOWERMENT=EFFICIENCY
NPHCDA National Primary Health Care Development Agency

Delivery Models and Funding Mechanisms

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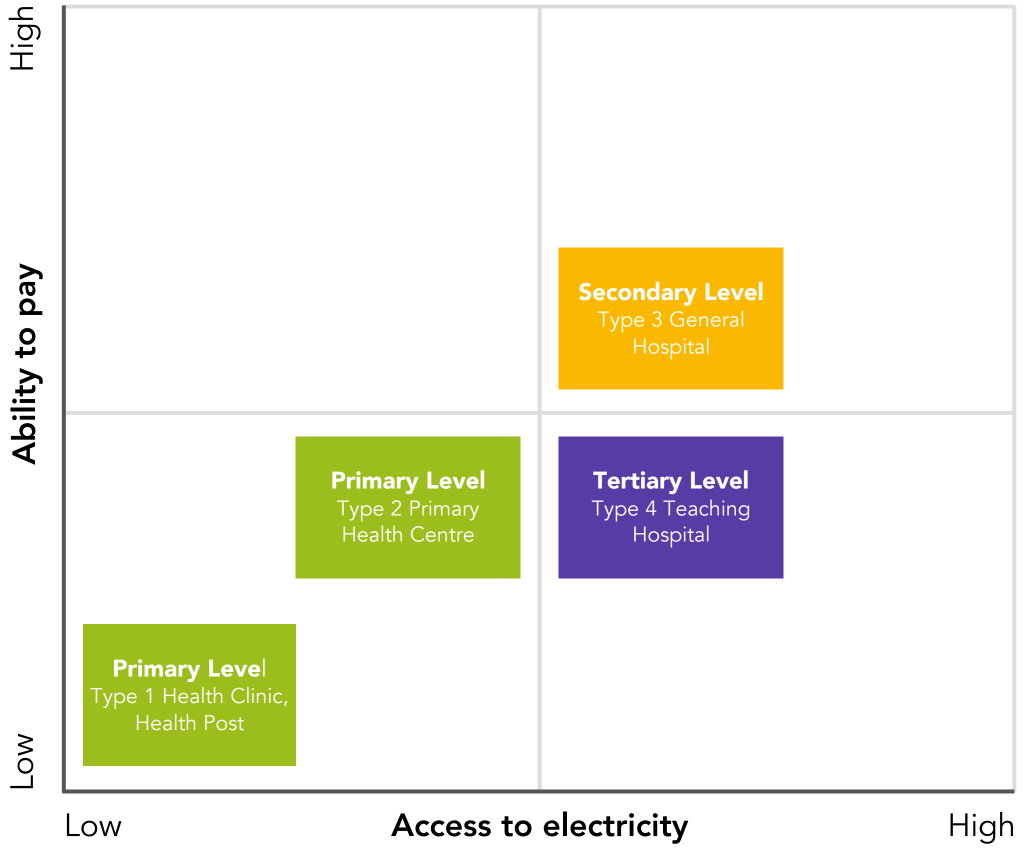
Access and Ability to Pay for Electricity

Access to electricity is gauged on connectivity to the grid or having an alternative source that provides at least 8 hours reliable electricity per day.

- ~ 40% of HFs lack access to electricity due to being off-grid, in remote locations or having no alternative. These facilities present little or no economic incentive for private energy service companies to set up operations.
- Majority of primary (and tertiary) level HFs are publicly owned with limited budgets for utility or alternative energy financing and repayments.

Ability to pay is gauged on whether the facility is private or publicly owned, availability of funds for utility payments, and the ability to repay commercial private energy service companies to provide electrification.

- Primary level health facilities have lower capacity to afford utility repayments, lower ability to invest in renewable energy systems and lower levels of funds to enable repayments to commercial private energy service companies. Primary level facilities are predominantly public owned.
- Majority of secondary level health facilities are privately owned and located in more urban/semi-urban grid-connected locations. These facilities have slightly better access to electricity and potentially better affordability profiles.
- Tertiary level health facilities are mostly publicly owned. While they still face similar affordability challenges, they are more able to afford alternatives.



Three delivery models emerged as relevant for HFE in Nigeria

Delivery model	Description	Application
Traditional equipment ownership model	Describes a model where a donor agency either directly provides grant funding and commissions an NGO or private sector actor, or grants a public agency funding to commission an NGO or private sector actor to design, purchase and install solar PV systems at a public institution e.g. health facility. The asset is owned by the public institution or agency. This has been the predominant model for most HFE interventions implemented in Nigeria	The traditional model is well suited for Type 1 health clinics and health posts, since they require smaller-sized SHS systems with minimal O&M requirements
Service-based model	Describes a model where a public agency selects a service provider (private sector or NGO) to provide electricity services (design, procure, install, operate and maintain solar PV systems) to public institutions e.g. health facility, typically over a 10- to 15-year period. The service provider raises investment capital (debt or equity) from investors and may also get subsidies and guarantees from donors. The service provider ensures that service levels are met for the contract period. The government pays the provider on a regular basis, as it would with other utilities directly or through a financial institution once a 3rd party verifies that the services have been rendered accordingly.	Secondary level Type 3 general hospitals are more suited to the commercial service-based model as the majority are privately owned, with good management capacity as well as ability and willingness to pay for electricity services from a private developer. The service-based model is suitable in instances where public sector financial management, compliance management and procurement management capacities are strong, with effective regulatory frameworks
Hybrid model	This combines elements of the traditional equipment ownership model and the service-based model. Given compliance management and procurement management capacity challenges in most settings, it however proposes a Programme Management Unit (PMU) or Compliance Management Entity through which service contracts and repayments for energy services are managed with the private sector ESCO. The role of donors in this model could be to provide grant funds for aggregated procurement of energy efficiency upgrades for the PHCs supply side subsidies to cover portions of system CAPEX. The private sector ESCO raises concessional funding through impact investors, DFIs, corporates or philanthropies.	Hybrid model is proposed for Type 2 PHCs and Type 4 Tertiary level teaching hospitals

Traditional equipment ownership approach – illustration

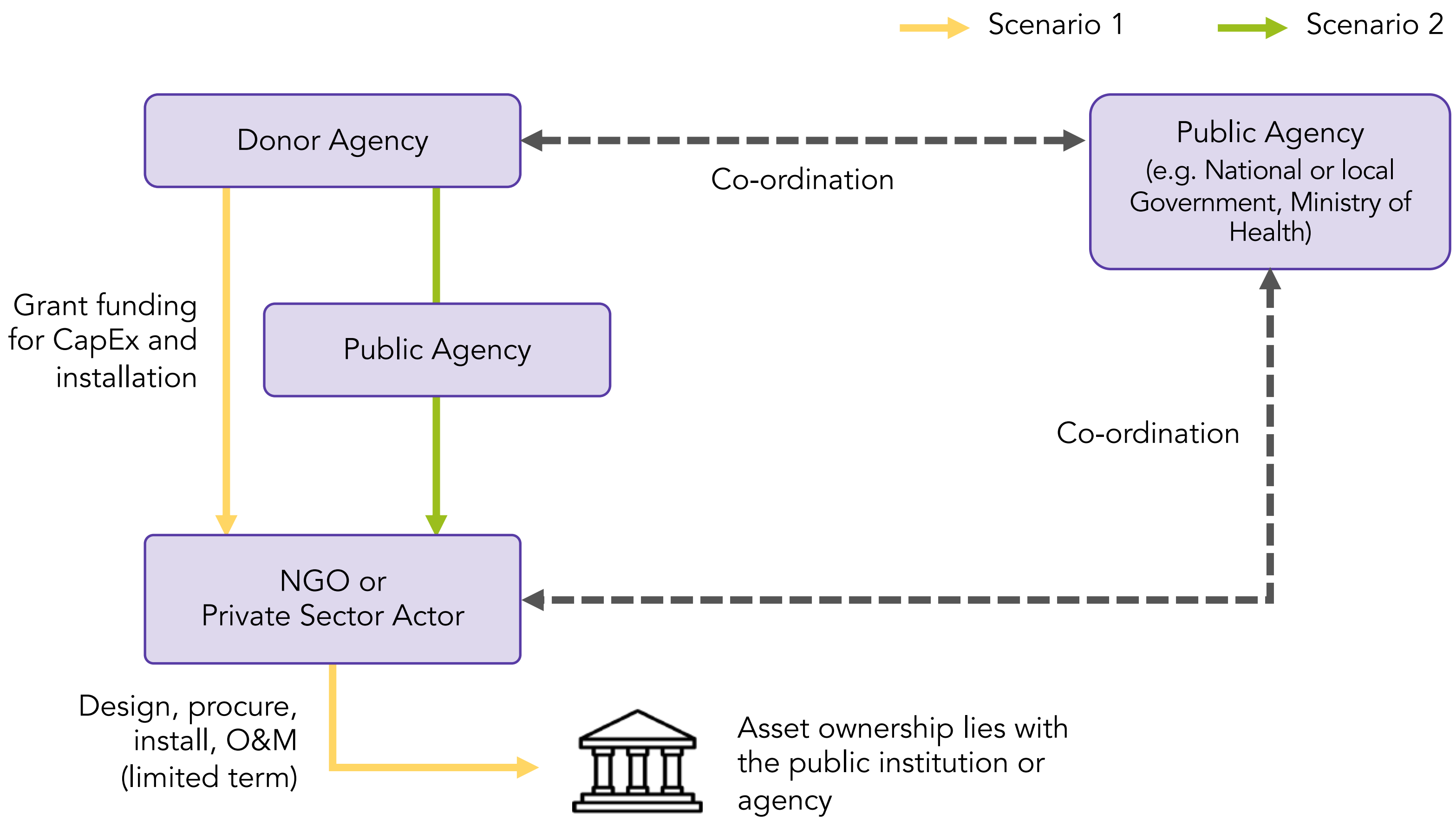
Scenario 1

A donor agency directly provides grant funding and commissions an NGO or private sector developer to design, purchase and install RE systems at a HF.

Scenario 2

A donor agency provides grant funding directly to an implementing public agency who commissions an NGO or Private sector developer to design, procure and install RE systems to a HF.

In both instances, a public agency plays a coordination role, and the asset is owned by the public institution or agency



Note: Illustration from SEforALL, WB, ESMAP (2021) 'From Procurement to Performance'.

Traditional equipment ownership approach – SWOT

Strengths

- Targeted funds making it easier for quick deployment.
- Removes or lessens burden of raising finance for public and private stakeholders.

Weaknesses

- Short-term scope (< 5 years).
- Limited term for O&M.
- Limited provision for replacements or repairs.
- Institutional capacity to manage and maintain systems limited.

Opportunities

- Aggregation of procurement and implementation.

Threats

- Free donations tend to be viewed as 'nobody's property'; limited sense of community ownership.

Applied Examples of Traditional Equipment Ownership Approach

Technology considerations:

- Small sized SHS for lighting, phone charging and/or basic appliances operation, DC or AC/DC, 50W range, e.g. solar suitcases.

Preconditions:

- Prequalification by ground-truthing; verification of status of HF as functional and having no access to electricity to generate list of potential locations
- Potential selection of prioritized locations by population density, health/electrification indices
- Sustainability; public agency, government commitment to putting aside funds for replacements beyond installations.

Funding Mechanism:

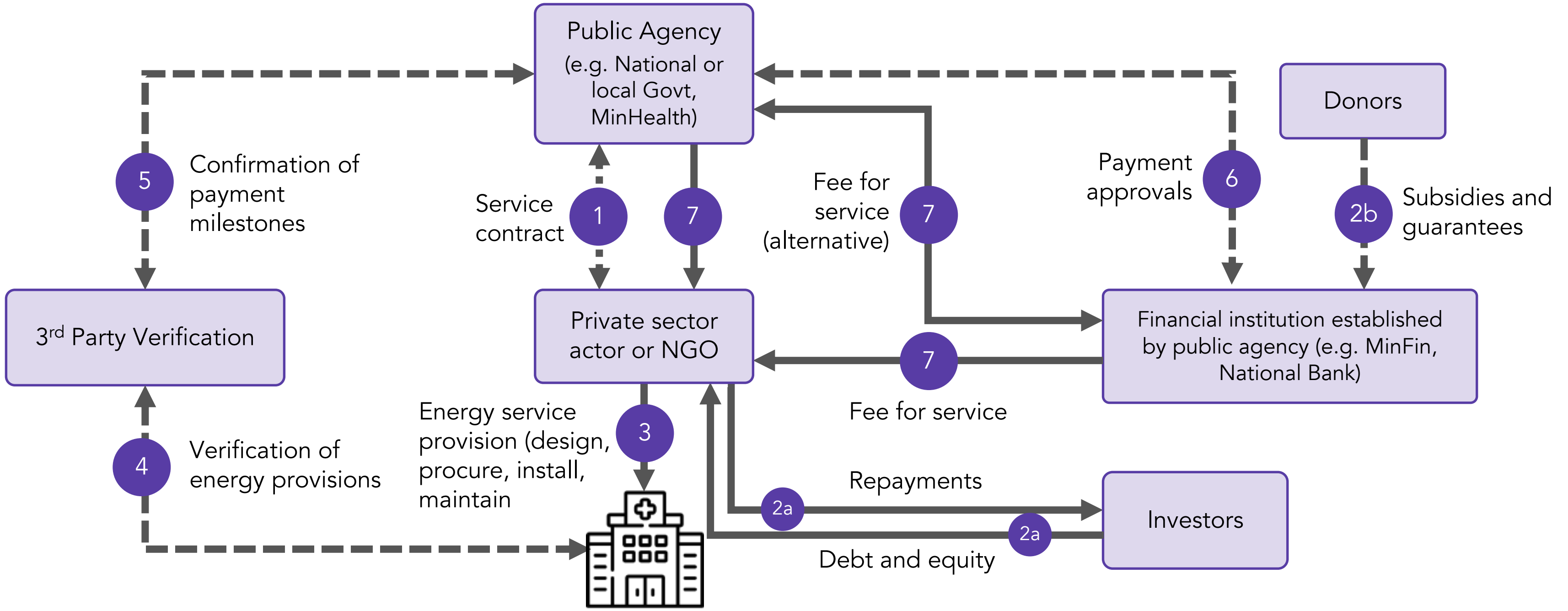
- Donor or FG grants for CAPEX and Installation
- NGO grants/contributions for limited O&M
- Government contributions for replacement of systems beyond end-of-life period

Operating Model	Stakeholders	Funding/ Financing Me chanism	Asset Ownership	Asset Ownership
Donation/ Equipment ownership model	Donor agency	Fully donor funded	State Government	SNP
	Donor agency, NGO	Fully donor funded	State Government	We Care Solar
	Government	Public funds	State Government	REA-ESP
	Private sector	Private contribution/ CSR	Public HF	Arnergy, VAYA
	Donor, Govt.	Fully donor funded	State Government	SNP
EPC model	Donor, Private Sector	Grants, Private contribution	Public HF or Agency	All-On/GVE
	Donor, Government, Private Sector	Grants, Public contribution, Private contribution	Public HF or Agency	REA- COVID-19 with Private Sector Developers

Service-based model approach – illustration

Funding/ Finance, Repayments

Information



01 A service contract is signed between the service provider and the public agency

2a The service provider raises capital from investors; direct grants to the investors (for e.g., RBF) are not included in this figure

2b Subsidies and guarantees are deployed; these are in addition to existing funds and finance going to public health, public education, etc.

03 An energy solution is deployed, and the end user starts using power as a service

04 A third party verifies that energy is being provided and consumed, including through remote monitoring technologies

05 The third-party verifier sends confirmation that payment milestones have been met to the public agency

06 The public agency sends payment approval to the financial institution

07 The financial institution (e.g., fund manager) issues payment in accordance with the contract and the service delivered

7 alt The financial institution releases funds, which the public agency uses to pay the service provider. Note: these funds can be provided up front.

Service-based model approach – SWOT

- In the service-based model, the government or development partner selects a service provider to provide electricity services (installing and operating the solar photovoltaic (PV) systems) to public institutions, typically over a 10- to 15-year period.
- The service provider raises investment capital and ensures that key performance indicators (KPIs) are met during the contract period.
- The government pays the provider on a regular basis, as it would with other utilities

Strengths	Weaknesses
• Technical capacity to manage systems post-implementation. • Generation assets can be subsidized. • Revenue generation from service provision, O&M. • Ownership and responsibilities clearly defined.	• High risk of non-repayment for electricity by public institutions. • Not enough incentive exist to make PHCs entry points/anchors for community electrification.

Opportunities	Threats
• Entry point to communities to provide other energy-related services. • Opportunity for aggregation of clusters.	• For standalone SHS, may become irrelevant when mini-grids or grid arrive. • Highly dependent on long-term agreements with government agencies.

Applied Examples of Service-based Model Approach

Technology considerations:

- Large sized SHS systems, mini-grids serving Tier 3 and above

Preconditions:

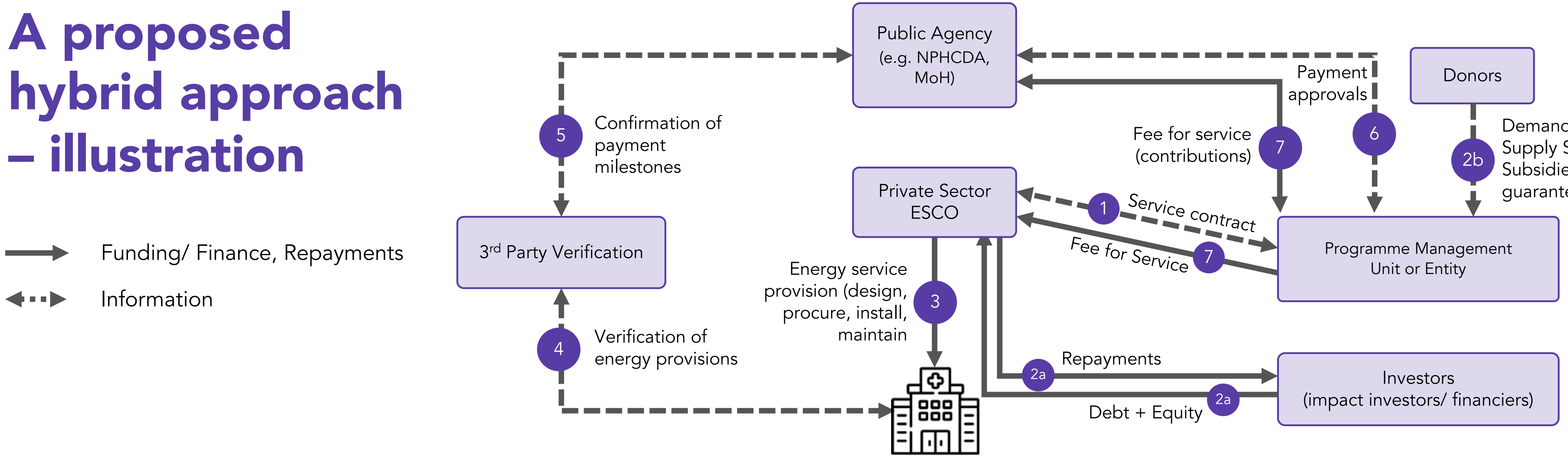
- Government / customer demonstrate willingness to pay for energy service, and energy services must be prioritized appropriately in the budget planning for the health sector
- Public-sector finance management and procurement capable of long-term service contracting consistent with the lifetime of solar PV assets
- Active off-grid industry in the country/region, ideally already involved in investing in service-based models
- Lenders and local banks supporting access to longer-term financing, ideally with precedents for lending to similar projects like mini-grids.
- Regulatory frameworks or tested agreements in place around operations of service-based models or mini-grids

Funding Mechanism:

- Donor subsidies and guarantees
- Commercial investors debt and equity

Operating Model	Stakeholders	Funding/ Financing Mechanism	Asset Ownership	Asset Ownership
Outright purchase or Lease models, Build-Own-Operate	Private Sector	Private sector funds	Private HF for Standalone SHS, Private ESCO for mini-grids	GVE, Juststandout, PASolar all installed solar PV assets at PHCs for which the facility pays a fee or tariff in case of mini-grid
EPC model	Government, Private Sector	Public funds, Private equity/debt	Private, Public institution	REA- COVID-19 with Private Sector Developers
Build-Own-Transfer, Build-Own-Operate-Transfer models	Government, Private, Donor	Public funds, Private equity/debt, Grants or Subsidies	Private, Public institution	

A proposed hybrid approach – illustration



01 A service contract is signed between the service provider (ESCO) and the PMU/Entity

2a The ESCO raises capital from investors

2b Subsidies and guarantees are deployed through the PMU/Entity to be further disbursed to private ESCO

03 An energy solution is deployed for SHS, while connection is made for mini-grid, and the end user starts using power as a service

04 A third party verifies that energy is being provided and consumed, including through remote monitoring technologies

05 The third-party verifier sends confirmation that payment milestones have been met to the public agency

06 The public agency sends payment approval to the PMU/entity

07 The PMU/entity (non-financial institution) receives contributions from public agency, combined with 2b, issues upfront payment in accordance with the contract and the service delivered to private ESCO

A proposed hybrid approach – SWOT

Strengths

- Private sector ESCO dependence on contracts with public agency limited, reduced risk of failed contracts in case of change of administration.
- Funds and repayments managed and disbursed by dedicated PMU/entity.
- PMU/entity can function independently.

Weaknesses

- Applies mostly for SHS type interventions, less capital intensive for expected repayments.

Opportunities

- Aggregation of locations by geo-political zones.
- Aggregation and procurement of energy efficient upgrades/retrofits as part of demand side interventions.
- Opportunities for bundled services provision (e.g. productive uses).

Threats

- PMU/Entity needs to be established.
- Consistency of contributions from public agency required for sustainability and building confidence of private sector ESCOs and investors.

Technology:

- Large SHS and mini-grid serving Tier 3-5.

Preconditions:

- Independent non-financial PMU/Entity to manage programme implementation, funding and repayments disbursements to private ESCOs.
- Buy-in from government and donor stakeholders to operate through a PMU or entity (e.g. WB-REA through NEP PMU).
- Strong commitment from government to follow through with contributions to payments for electricity services provided. Must be prioritized appropriately in the budget planning for the health sector.

Funding mechanisms:

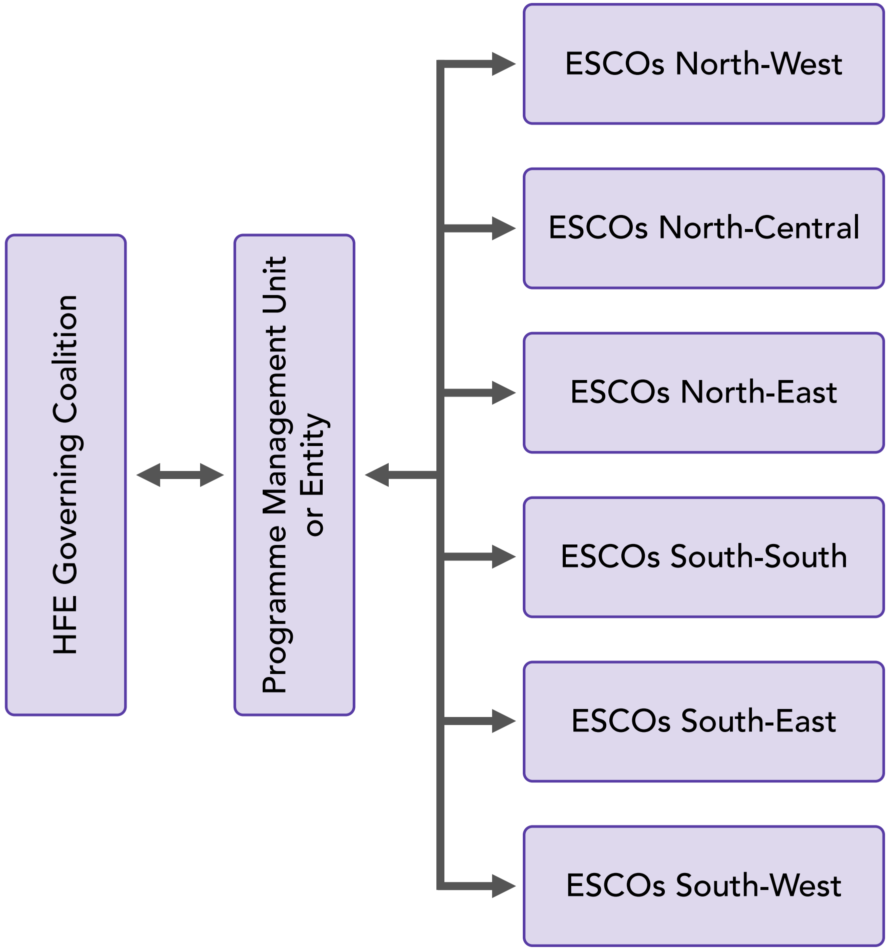
- Donor grants, subsidies, concessional loans.
- Donor and government guarantees.
- Debt and equity from impact investors.

A Proposed Hybrid Approach: Institutional structures and roles

HF Electrification Governing Coalition Framework – need to define governance structure, constitution, roles and responsibilities e.g Coalition consisting of Donors, Health Sector- NPHCDA, Public Sector -govt agencies such as REA, RE Private Sector, CSOs, Financial Institutions, Impact Investors, Budget office/Min. of Finance, State (by geo-zone) and Federal government representation, Technology suppliers, Digitalization/Aggregation stakeholders such as Odyssey

HFE Program Management Unit (PMU) or Entity

- Identify and update data on functional HFs to include electrification status and audits for targeted HFs, demand growth modelling over next 10 years with variables such as population growth, Health workers needed, etc. The outcome of this activity would be a current status report on HFs.



- Technical assistance to revalidate system design, size range and aggregate by zones. The outcome of this activity would be guidelines on appropriate systems for each category of HF.
- Select delivery model, develop and facilitate bidding processes and agreements. The outcome of this would be bid allocations.
- Manage funds/financing aggregation and disbursement. The outcome of this would be ready pool of funds (could be revolving or targeted from donors, government funds e.g. consolidated revenue contributions, renewable energy credits)
- Manage Quality control on technology choices and regulatory adherence e.g. SON standards, NEMSA guidelines, MoE Used Battery and Electronics waste disposal
- Manage aggregate procurement
- M&E – systems performance, SLA targets monitoring, program targets indicators, contributions to national targets e.g. NDCs
- Manage Assets Management Visualization platform, HF electrification information management
- Manage Scale-up

Private sector-driven ESCOs

- Installations, 10,000 operational HFs electrified
- Community involvement in O&M through staff hiring from community etc, at least 2 jobs created per HF X 10,000 = 20,000 steady maintenance technician jobs created

Pre-implementation

Donors lead on TA, Data- Feasibility studies, HF selection, Solution/System design and sizing, Aggregation in preparation for project development by either govt, private sector

NPHCDA (ED/CEOs office, PHCSD, PRS), State govts, REA-REUCS support

Implementation

Private sector - Installation, testing, commissioning, O&M, end-of-life decommissioning and recycling – ESCOs (x no's per zone)

Private sector, Donors - Capacity building/ trainings on load management, energy efficiency, systems use guidelines and first level maintenance, safety measures, for govt. staff, HF staff, NPHCDA Zonal offices, community groups (e.g. GIZ Solar PV installation/supervisor trainings, OEM specific trainings e.g. Schneider, developer tailored trainings)

PMU – project/interventions management, bid-process mgt, funds disbursement/aggregation, procurement

PMU - Demand side management equipment aggregation - implement energy efficiency measures (standard wiring, EE lightbulbs, EE fans, Solar water heaters, water pumps at barest minimum) – This could be from REA-NEP Energy Efficient Appliances grants

Post-implementation

Private sector – Operations and maintenance, remote monitoring, replacements

State govt, NPHCDA Zonal offices, Donor – project verification

PMU/Entity – oversight, project live dashboards e.g. Odyssey's asset management platform, impacts reporting

A Proposed Hybrid Approach: Funding Mechanisms

- Donor grants and subsidies can facilitate purchase of energy efficient appliances and retrofits for health facilities, cover a portion of CAPEX expenses for private ESCOs, and fund the PMU management. In the hybrid model, donation of equipment can be applied to demand side support for PHCs in the form of energy efficient appliances and retrofit which can be standardized for the different categories of HFs. Procurement of these can be aggregated. Donor funding applies at pre-implementation, during and post-implementation.
- Guarantees could come from donors or government and go towards de-risking repayment obligations for electricity supplied and minor O&M expenses. These types of funds are required pre-implementation, during and post implementation.
- Impact investments from concessionary financiers in the form of long-term, low interest concessionary (local currency) loans (e.g. REA-NSIA climate smart infrastructure investments) can be made accessible to private sector ESCOs planning on health facility electrification in rural areas, to cover CAPEX expenditure for the renewable energy assets. These types of funds are required pre-implementation.
- Government contributions from appropriated OPEX budgets such as the BHCPF, or direct payments from government's consolidated revenue funds, can support private ESCO repayments through the PMU to cover for electricity bill payments and O&M expenses. These types of funds are required post-implementation.
- A blend of the above-mentioned funding mechanisms, based on the unique financing needs and capital structure profiles of different States and interventions, can support in catalyzing and scaling HFE in Nigeria.

Comparison of three model approaches

	Traditional equipment ownership approach	Hybrid approach	Service-based approach
Description	Government or donors provide capital/ installation cost of power system which is constructed by private sector EPC or NGO.	Private sector ESCO funds capital expenditure/installation of standalone solar or mini-grid and charges a service fee/tariff to independent PMU for the provision of power and ongoing maintenance to health facility. Less dependence on public agency or public agency established financial institution.	Same as hybrid approach with strong dependence on public agency and public agency established financial institution.
Ownership	Public agency, health facility	Private ESCO	Private ESCO, public agency
Financing mechanism	Grants	• Blended financing, concessional debt and equity, grants, subsidies. • Potential for other instruments to be leveraged upon.	Commercial debt and equity, subsidies, guarantees

Technology

- Standalone system, solar PV-battery or solar-PV-battery-diesel generator
- Mini-grid, solar PV-battery or solar PV-battery-diesel generator

Challenges for all models and possible solutions

Key factors	Challenges	Possible solutions
Affordability and ability to pay	• Government budgetary constraints, adverse creditworthiness and lack of trust in public institutions can deter private sector from providing services.	• Additional funding needed for public agencies to cover monthly service costs or address risk of repayment. • To reduce credit risk, deploy de-risking instruments, focusing particularly on payment and termination risks.
Private sector willingness/ability to raise capital	• Unwillingness/inability of private sector to raise capital due to difficulty in creating bankable projects, or limited absorption capacity of off-grid companies.	• Create enabling policy framework such as long-term electrification targets and strategies, clear and transparent contract templates, and policies that include clear 'grid arrival' clauses.
Transaction costs	• Underserved public health providers are one part of the overall off-grid solar market. • Public facilities are dispersed and can result in small ticket sizes and high transaction costs.	• Aggregation of projects could help to reduce financing cost and make projects more attractive to investors and energy service providers.
Risk of grid extension	• The risk of grid extension exists for standalone systems and the traditional equipment-ownership model.	• Select facilities that are likely to use a stand-alone system long enough for firms to recoup their investment.
Continuation of grant-based model	• Given that donors continue to support with grants, government agencies may not have the incentives to promote service-based model that encourages private-sector participation and sustainability.	• Advocacy and sector-wide buy-in of the importance of sustainability and service-based model. • Source of funding for government from development partners should be structured to promote sustainability.

Contextual challenges across different stakeholder groups

Government PHCs

- Budgetary provision for health sector service priorities too low to further accommodate RE electrification CAPEX or OPEX.
- Lack of consistency and availability of funds to operate HFs services optimally and pay for utility costs such as electricity.
- High upfront cost of capital for RE generation assets.
- Limited technical capacity for oversight, performance monitoring and maintenance of RE systems.
- Maintenance costs for RE systems, replacement costs too high for PHCs to manage on their own.
- Varying levels of commitment across different states on prioritizing healthcare provision and HFE, therefore coordination between State Government and private sector slow process.
- Reactionary uptake of support rather than strategic based on long-term institutional and national development plans.

Private sector/developers

- Health facilities lack consistent and adequate funding streams to repay service charges to profit-driven organization, therefore default approach is social good service provision.
- Risks of non-repayments for services rendered is high, especially where institutions and agreements are weak.
- Economics of commercial cost of capital is not feasible for social good provision such as HF electrification on a fully commercial basis, making access to finance difficult.
- Provision for spare parts or replacements of RE components not prioritized due to nature of past delivery models, e.g. donor-funded and EPC model.

Donors

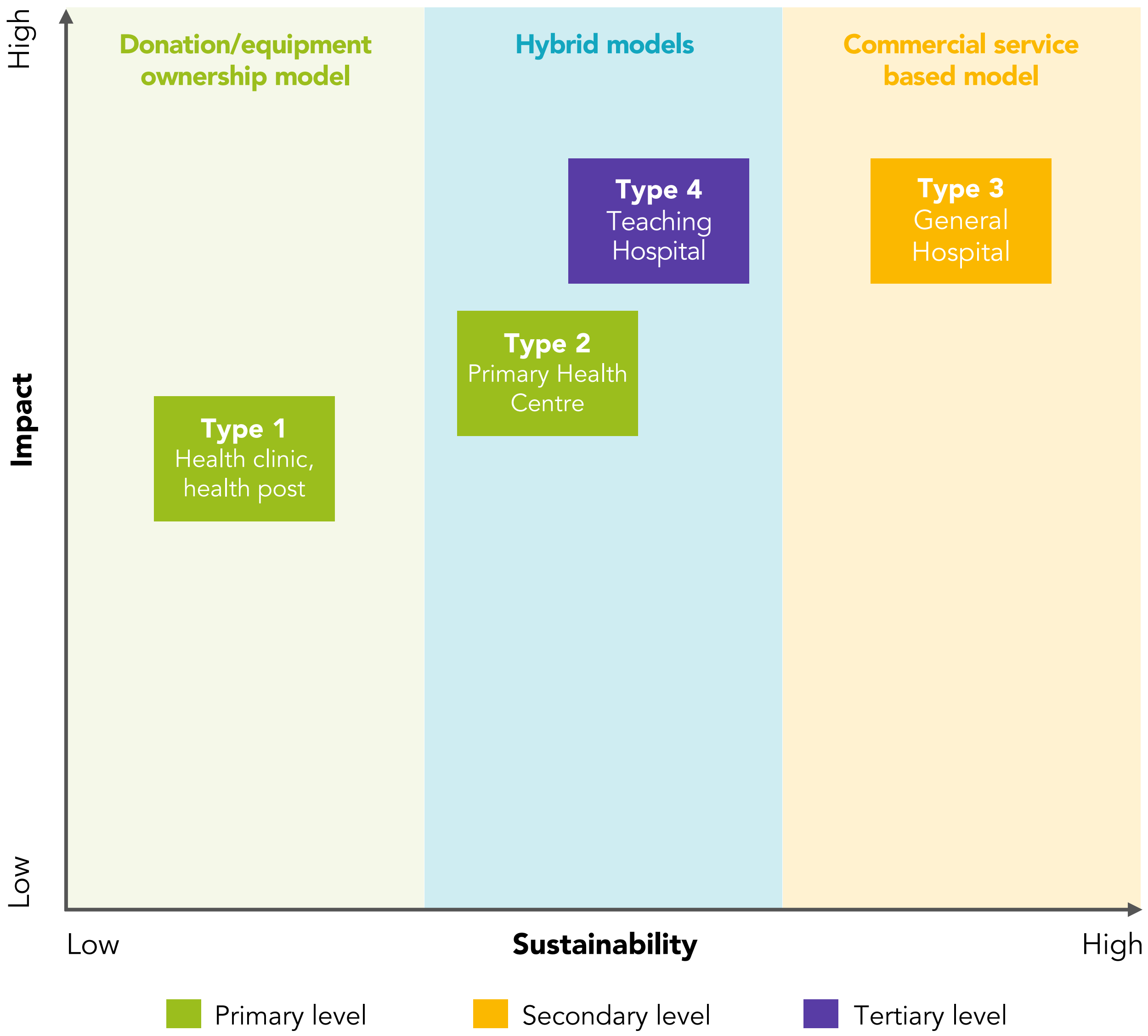
- Quick wins focused due to transient nature of programmatic interventions, therefore most implement equipment procurement models or EPC models.
- Challenge of balancing impacts and value for money.
- Framework for O&M and component replacement beyond warranty period often lacking.
- Low incentive to end user for system upkeep and performance.
- Reliance on government for OPEX could prove challenging.

Long-term sustainability profiles of delivery models

Type 1 PHCs and health posts are better suited for interventions that deliver electrification on a donation/ equipment ownership delivery model basis because they have a very low ability to pay. They offer health services that can typically be covered by low power plug-play kits (e.g., fans, light bulbs, vaccination fridges). Due to their remote locations, more complex cases are ideally to be referred to PHCs for which a higher tiered power solution is being recommended.

Type 2 PHCs and Type 4 Tertiary health facilities can leverage interventions that deliver electrification based on hybrid models that combine donations and semi service-based models.

Type 3 Secondary health facilities are better suited for commercial service-based models as majority are private sector owned and are more likely to have a larger ability to pay.



Measures of impact and sustainability

Impact is gauged based on the number of HFs that can be electrified, the speed at which solutions can be deployed, the potential for improvement of health services, as well as the potential for the model to deliver value for all stakeholders involved, given the funding/financing options that are currently available or that can be implemented successfully.

Sustainability is gauged on the ability to operate, maintain and replace selected electricity supply systems as well as replicate models to scale in the long-term.

These sustainability/impact profiles do not prescribe a "best" delivery model for different facility type but highlights key preconditions that need to be considered by Federal and State governments as they design and implement their archetypes of fit for purpose delivery models.

About SEforALL

Sustainable Energy for All (SEforALL) is an international 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.

About Power Africa

Power Africa is a U.S. government-led initiative that addresses one of the most pressing challenges to sustainable economic growth and development in Sub-Saharan Africa: access to electrical power. Power Africa provides coordinated support from the U.S. public and private sectors to add cleaner, more efficient electricity generation capacity, which benefits residents and businesses across the continent.

In support of Power Africa, USTDA provides critical early-stage planning to spur new power generation, and transmission and distribution infrastructure. These activities support a range of energy development and deployment from power generation to grid modernization, which increase efficiency and improve access.

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Contact us to learn more

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