



All ON

Achieving Economies of Scale in the Nigerian Solar Value Chain

Opportunities and Benefits of Upstream Localization

February 2021

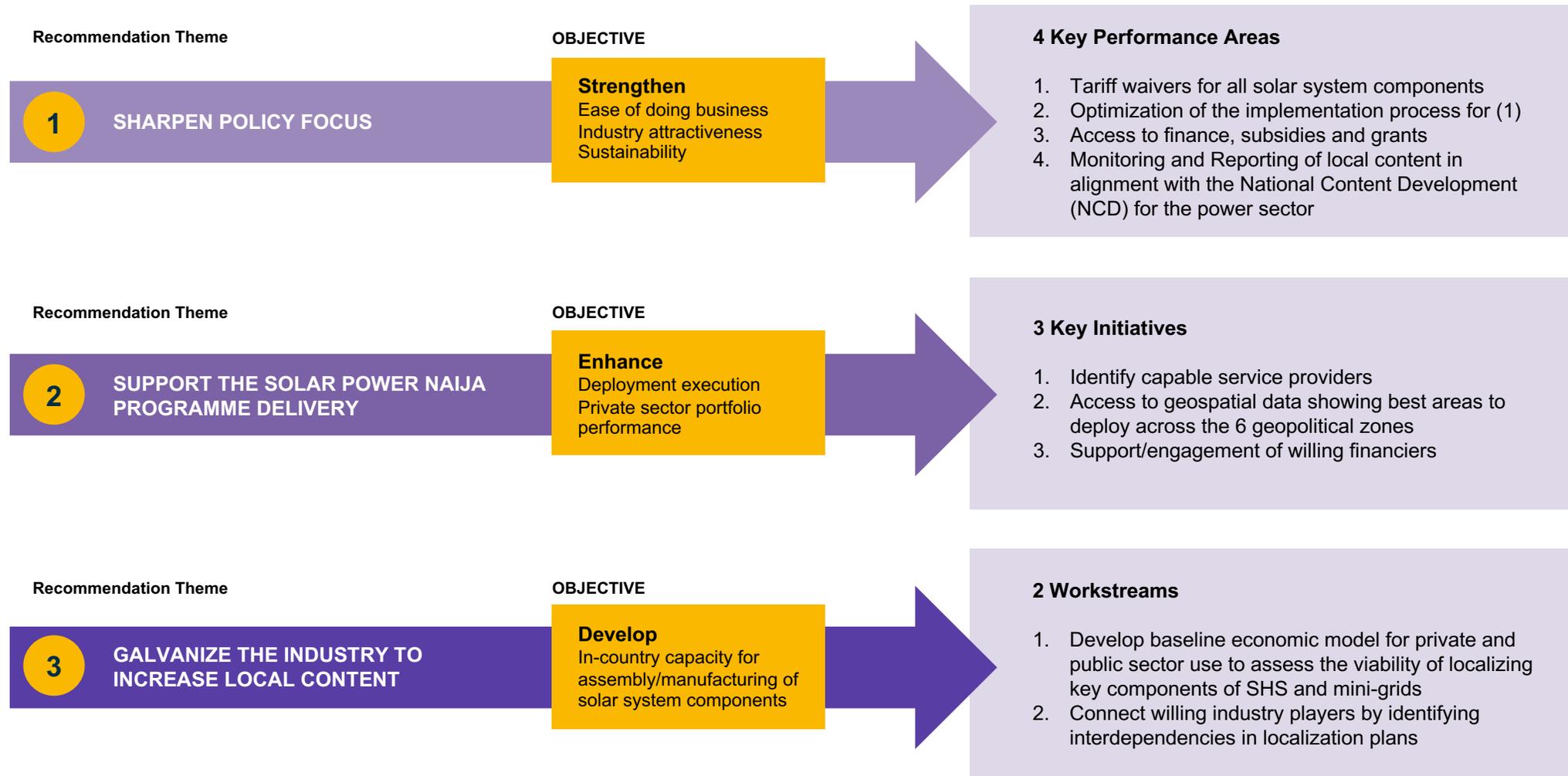
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Executive Summary

Analysis shows focused implementation of key enablers in existing policies, access to data, low-cost finance and capital investments provide the best pathway to increased electrification and localization of the upstream value chain



1. Sharpen Policy Focus: The Federal Government of Nigeria (FGN) has done a remarkable job thus far establishing the policies for the enhancement of the renewable energy sector; a laser focus on key enablers is the next step in energizing the solar sector



1

National Renewable and Energy Efficiency Policy (NREEEP)

Policy that serves as the blueprint for sustained development, supply and utilization of renewable energy resources within the economy for on-grid and off-grid

Key Recommendation

- Complete tariff waivers for all solar use components (panels, TV, batteries, bulbs) to attract investments, create downstream jobs and build scale
- Institute priority clearance at the ports for the above as observed with Kenya and Ghana to promote ease of doing business

2

NERC Mini-grid Regulations 2016

Regulation guiding the operations of mini-grids in Nigeria with the objective to increase unserved electricity access and encourage the use of renewables on a small scale

Key Recommendation

- Prioritize solar mini-grid applications at the regulator NERC
- Tracking and reporting of all applications to the 30-day upper limit as stipulated in the regulations

3

National Content Development for Power Sector

Regulation that aims to promote the deliberate utilization of local human workforce and material resources across the value chain of the Nigerian Electricity Supply Industry (NESI)

Key Recommendation

- Empower the NESI Nigerian Content Consultative Forum (NNCCF) to carry out periodic surveys to determine the national content participation in the sector
- Specific inclusion of women's participation in the local content regulation quota for jobs across NESI

The Nigerian Electrification Project

Nigeria Electrification Project (NEP) is a Federal Government credit facility and initiative that is private sector driven and seeks to provide electricity access to households, micro, small and medium enterprises in off grid communities across the country through renewable power sources. NEP is being implemented by the Rural Electrification Agency (REA) in collaboration with the World Bank, AfDB and other partners

Objectives

- Increase electricity access to households and micro small and medium enterprises (MSMEs).
- Provide clean, safe, reliable and affordable electricity through renewable power sources to unserved and underserved rural communities.
- Develop a data driven off-grid model for Nigeria that will become an exemplar for Sub-Saharan Africa.
- Provide reliable power supply for 250,000 (MSMEs) and 1 million households.

Solar Power Naija

To support the economic recovery in response to the COVID-19 pandemic, the FGN has launched an initiative as part of the Economic Sustainability Plan (ESP) to achieve the roll out of 5 million new solar-based connections in off-grid communities. The Solar Connection Intervention Facility will complement FGN's efforts in providing affordable electricity through the provision of long term low interest credit facilities to the Nigeria Electrification Project (NEP) pre-qualified home solar value chain players

Objectives

- Expand energy access to 25 million individuals (5 million new connections) through the provision of solar home systems (SHS) or connection to a mini grid.
- Increase local content in the off-grid solar value chain and facilitating the growth of the local manufacturing industry.
- Incentivize the creation of 250,000 new jobs in the energy sector.

Key Objectives

- Increase Energy Access
- Provide Reliable Electricity through Renewable Power Sources
- Promote the use of Solar – Solar Home Systems (SHS) and Solar Minigrids
- Increase Local Content in the Off-Grid Solar Value Chain
- Create 250,000 new jobs in the Energy Sector

2. Access to Data: With support of the REA, a holistic supply and demand-side approach using geospatial data was used to determine the best operators and sites for solar systems deployment in support of the Solar Power Naija Programme

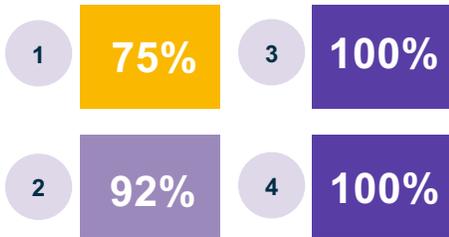


Supply Side: ESTABLISH OPERATOR CAPABILITIES TO DEPLOY

Surveys and Interviews were carried out to determine:

- 1. NEP Fund Eligibility¹** : A measure of an operator's competency and capability
- 2. Portfolio Coverage:** A measure of an operator's ability to supply Tier 2 electricity²
- 3. Scalability:** A measure of an operator's ability to scale operations quickly
- 4. Local Content Plans:** Measure an organization's intentions to localize its value chain

RESULTS (% of companies that fulfil criteria 1 – 4)



Demand Side: DETERMINE THE BEST AREAS FOR DEPLOYMENT USING GEOSPATIAL DATA I.E. TARGET HOUSEHOLDS APPROACH



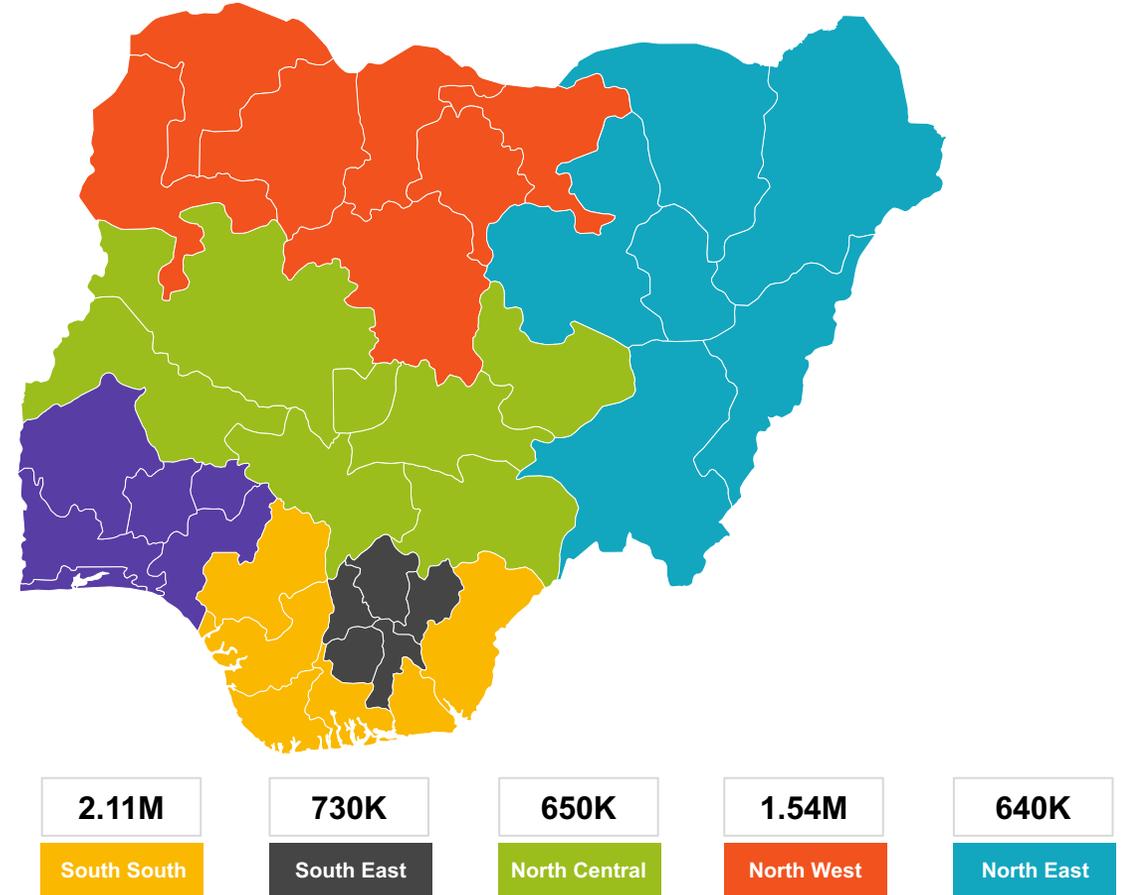
Note 1. NEP involves a best-in-class eligibility assessment process designed in collaboration with the World Bank to measure Regulatory Compliance, E & S Compliance, Technical Capacity, Financial Capacity, Local Content Inclusion etc.
 Note 2: Tier 2 access provides a minimum of 50Wp for at least 4 hours of electricity per day, including at least 2 hours per evening with capacity sufficient to power low-load appliances – such as multiple lights, a television, or a fan as needed during that time.
 Note 3: Homes that can pay at least NGN 5,250 per month, assuming households can transfer 50% of discretionary spending to cover monthly payments.
 Note 4: Access to electricity includes electricity from any source such as PHCN/NEPA, local mini-grids, generators, SHS, batteries, and other sources.
 Note 5: See Nithio methodology note on credit scoring.
 Source: Company Interviews, Fraym, Nithio.

2.1. Access to Data: Preliminary results show ~7 million Nigerian households ready for immediate deployment of SHS in the 6 geo-political zones



<p>Ability to Pay</p>	<p>Tier 2 Electricity ($\geq 50Wp$) ~26 million</p>
<p>Electrification</p>	<p>>5km from mini-grid and > 30% unelectrified ~17 million</p>
<p>Credit Risk</p>	<p>Community with $\geq 50\%$ fast or moderate re-payers ~7 million</p>

Geographic Distribution of Target Households (millions)



Note 1: Homes that can pay at least NGN 5,250 per month, assuming households can transfer 50% of discretionary spending to cover monthly payments.
Note 2: Access to electricity includes electricity from any source such as PHCN/NEPA, local mini-grids, generators, SHS, batteries, and other sources.
Source: Fraym, Nithio.



Reserved access to FX at CBN to companies deploying solar solutions

To address some of the cost challenges due to increasing material costs as a result of the naira devaluation



Access to low-cost naira financing

High cost of capital and availability of capital is an encumbrance to the growth of the industry



Access to grants and subsidies

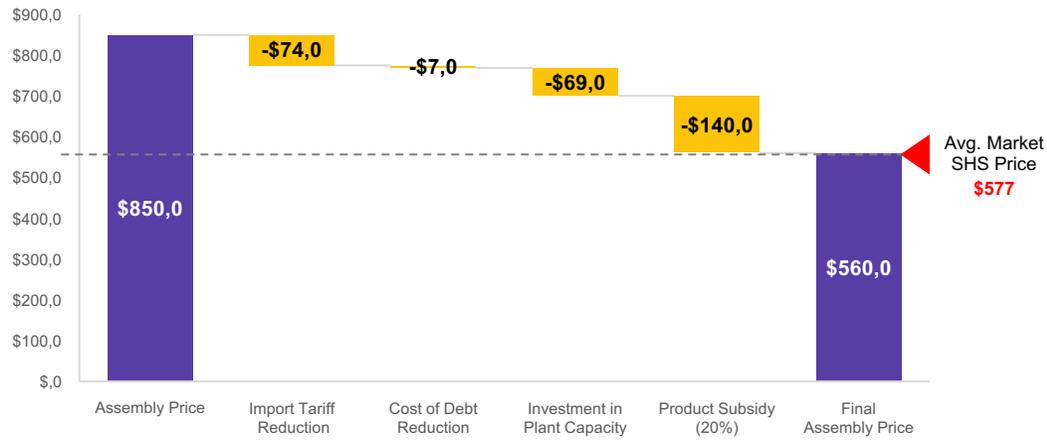
Customers' ability to pay in rural households is observed to diminish for PAYGO systems after the first 6 months; access to grants and subsidies will alleviate some of the revenue challenges

- SEforALL is supporting the Solar Power Naija Programme by engaging with international funders and vendor financiers

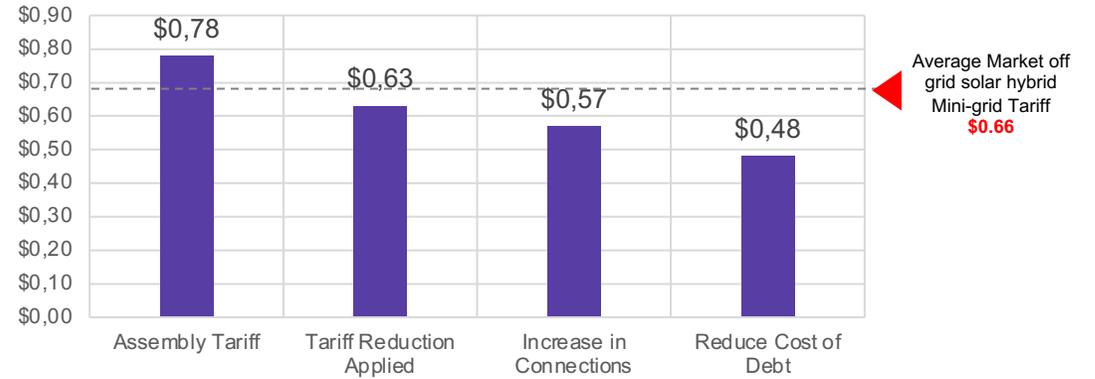
3. The cumulative effect of the identified enablers on the local assembly of key solar system components will make Nigerian pricing competitive, increase its export potential and have positive effects for the ECOWAS region



SHS PRODUCT PRICE



MINI-GRID TARIFF



333,105

Number of locally assembled SHS required to be price competitive against imports with 4 enablers applied.
Shows a 34% reduction from 505,374 without the enablers

356,486

Greenhouse Gas Emissions Savings in Metric Tons

193,053

Number of Jobs Created

Modeled Assembly Price: price of a 50Wp SHS (battery and PV assembled in Nigeria) with table fan, TV and bulbs from a 20MW capacity plant; locally assembled components – battery & PV import tariff reduction: 0% on all SHS system components ; cost of finance reduction: from 12% to 5%; CapEx Investments: assumes investment in plant capacity from 20M to 100MW ; product subsidy: 20% of cost of SHS; 20% sales margin. Jobs created over 5 years for SHS and 10 years for mini-grid



1

Background

Objective:

- Increase electrification rate by accelerating the distribution and improving the affordability of high-quality solar components for off-grid electrification
- Identify an incentive framework that attracts high-quality component suppliers/manufacturers for export and local production
- Support the Federal Government of Nigeria's Solar Power Naija target
- Develop best in class data to identify off-grid households and ability to pay
- Create an economic model for localization that can be used by the public and private sector

Sponsors:

- SEforALL
- All On



Methodology:

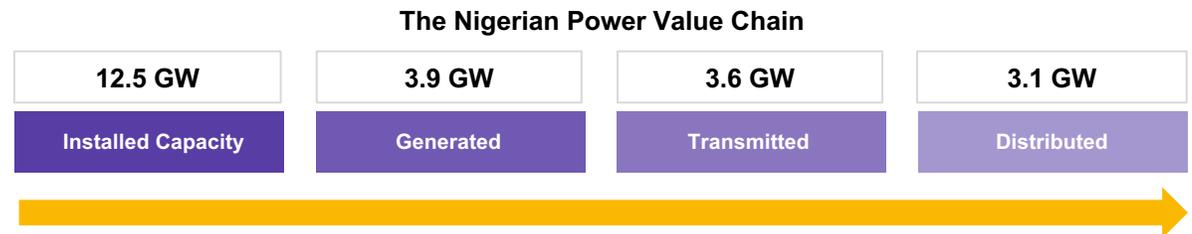
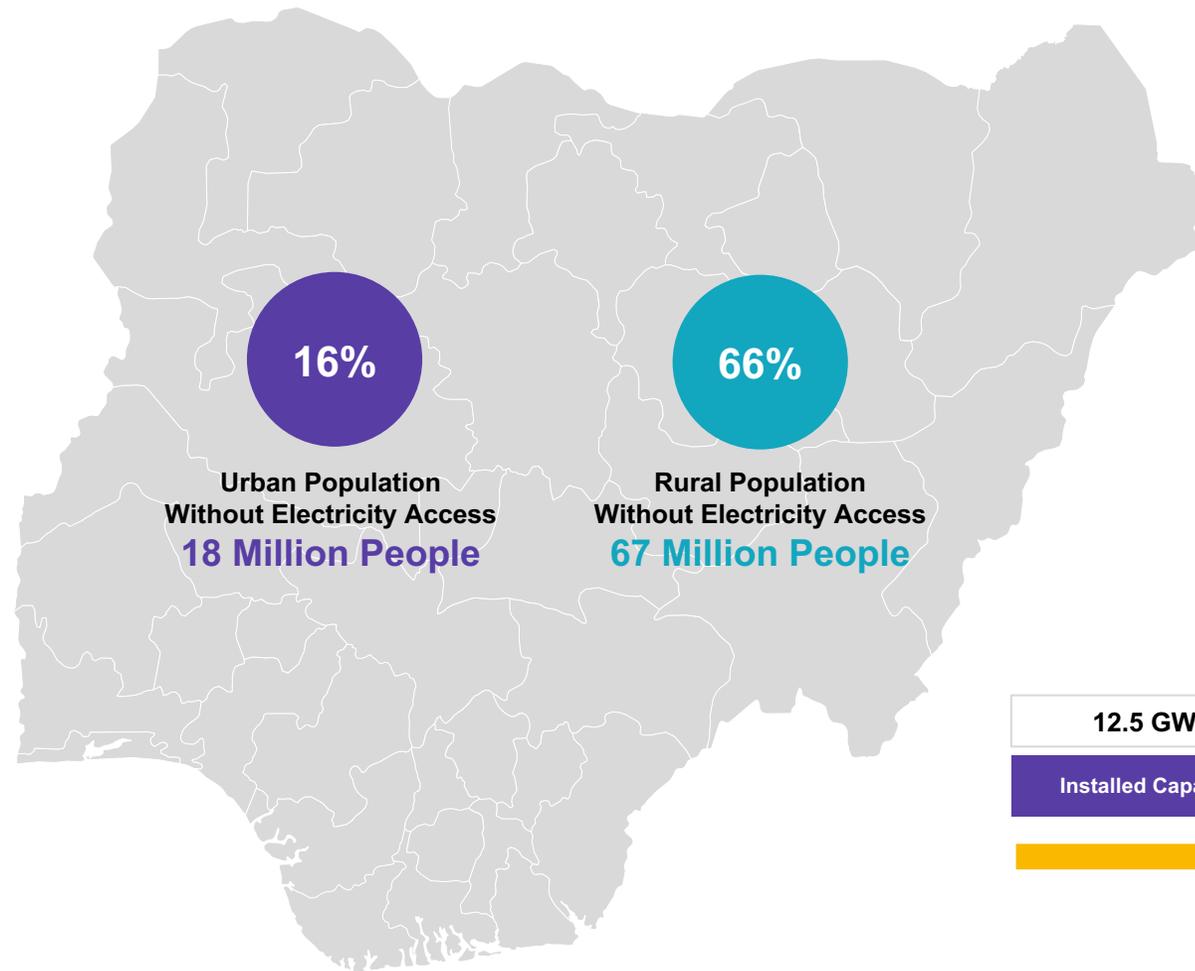
- Desktop research
- Stakeholder engagements
- Economic modelling
- Geospatial analysis
- Recommendations

Expected Outcome:

Solar off-grid enterprises in Nigeria:

- Scale-up delivery and installation operations
- Build local capacity upstream in the value chain
- Leverage efficiencies to address affordability of high-quality solar systems to the end consumer
- Provide customer data for both public and private sector

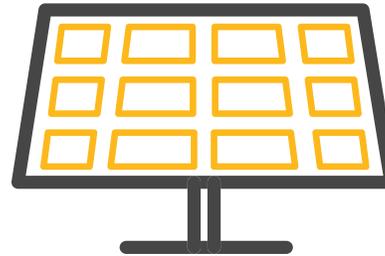
Nigeria's electrification rate is ~57%, leaving 85 million Nigerians without access to electricity, mostly in rural areas



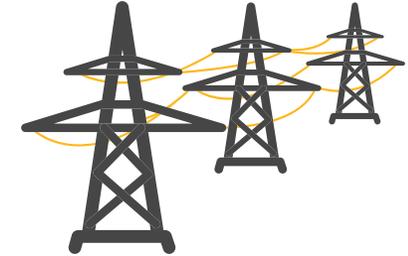
Evidence shows that the least-cost approach for achieving universal access in Nigeria involves an integrated mix of grid, mini-grid and solar home systems (SHS)



Solar Home Systems (SHS)



Solar Mini-grid



Grid



7.5 – 7.8 Million

Connections best served using solar home systems

1.3 – 4.7 Million

Mini-grid connections in densely populated areas far from the grid

0 – 3.6 Million

Grid connections in densely populated areas within 10 km of existing grid infrastructure

The FGN has recognized these opportunities and developed an energy for all solar power strategy, a key component of its economic sustainability plan to be implemented by the Rural Electrification Agency

Focus Themes



Increase energy access through 5 million solar connections



Increase local content in the off-grid solar value chain



Create new jobs in the energy sector



5 Million Households



25 Million Individuals



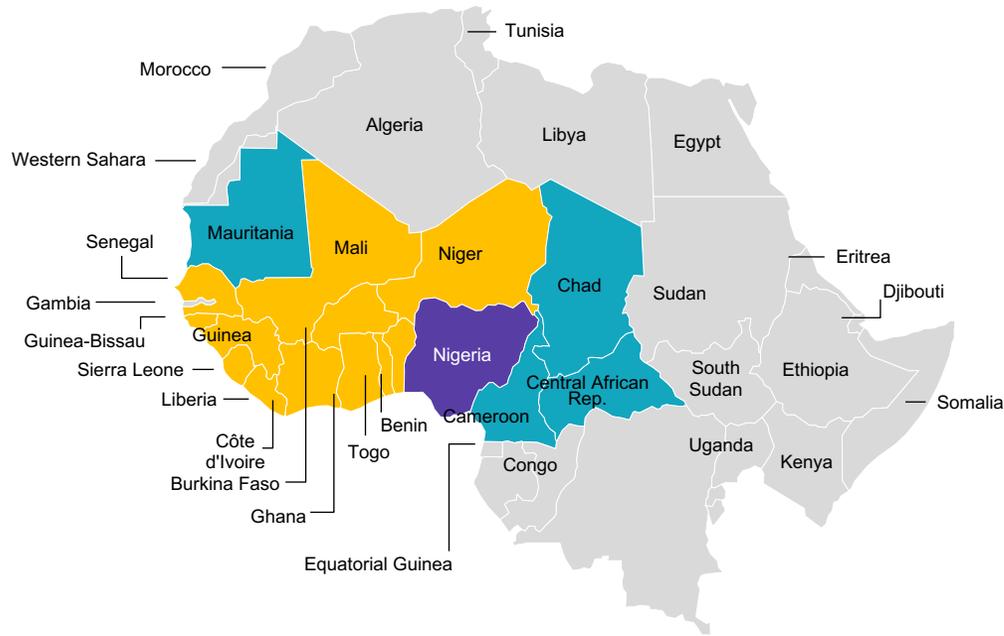
Upstream
Local Assembly/
Local Manufacturing



Create 250,000 in the Energy Sector

Background

Strategically placed in ECOWAS, a solar-enabled Nigeria presents enormous benefits and opportunities for export and for the region's electrification objectives

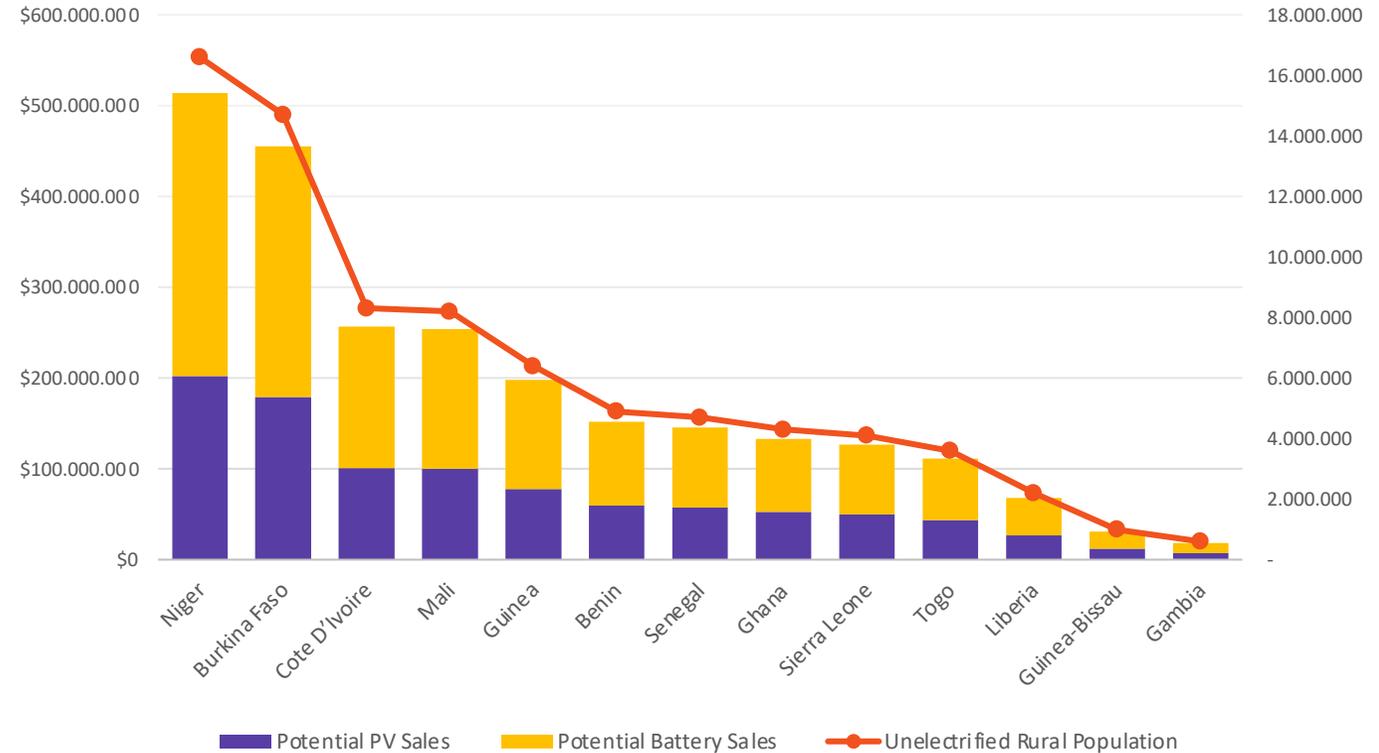


■ ECOWAS
■ Non-ECOWAS

POTENTIAL SALES CALCULATION:

Assumption 1: A Nigerian assembled 50Wp PV and SHS battery can be sold in the region
 Assumption 2: PV and battery price take into account import tariff waivers, product subsidies, low cost financing and a 100MW plant capacity
 Assumption 3: Target 10% of the rural unelectrified population in the listed ECOWAS countries
 Assembly price of PV: \$122
 Assembly price of battery: \$188
 Potential sales = (10% of unelectrified rural) x (price of solar component)

NIGERIA'S POTENTIAL SALES EXPORT TO THE ECOWAS REGION



\$2.5 Billion	79.6 Million	10%
Total Sales Potential	Total Unelectrified Rural Pop.	Sales Target

Source: ESMAP Tracking SDG7 Database, 2018, World Bank for Unelectrified Population Data



2

Nigerian (Local) Solar Systems Industry Analysis

Product Segments	Characteristics	Installed Capacity	Customer Segments
Small pico systems: lamps & chargers	Lighting and charging of batteries and mobile phones	1 – 10 W _p	Private, over the counter consumer devices
Solar home systems (SHS)	Off-grid electricity demand in private homes in settlements far from existing distribution lines	10 – 500 W _p	Private households and small productive use businesses
Stand-alone PV systems	Single institutional deployments located in settlements without grid or mini-grid	500 W – 10 kW _p	Government procurement for public institutions like schools, clinics etc., high-income households and SMEs
Mini-grids (e.g., hybrid PV-diesel)	Communities and settlements far from the existing grid	5 kW – 1 MW _p	Utilities and community electrification projects
Large scale, grid-connected PV systems	Extension/expansion of production capacity in existing grid	1 – 50 MW _p	Utilities and IPP's

- SHS and mini-grids are the target product segments
- Tier 2: > 50Wp <= 200Wp. Minimum 4hrs per day and 2hrs per evening. Electrical lighting, air-circulation, television and phone charging are possible



Key FGN Interventions

- **Nigeria Electrification Project (NEP)**
- **National Content Development for the power sector**
- **NERC Mini-grid Regulations 2016**
- **Nigerian Renewal Energy and Efficiency Policy (NREEEP)**
- **Nigerian Investment Promotion Commission's Pioneer Status Incentive**
- **Import Waiver on Solar PVs**
- **Bank of Industry (BOI) N6B Solar Energy Fund**

Import Dependent

The solar off-grid market is highly dependent on imports from China



Tariff Discrepancies

Component distributors and assemblers pay varied tariffs for the same products with confusion around charges for both port authority and distributors



High Costs & Low Adoption

While the cost of solar photovoltaic (PV) modules have fallen dramatically, costs of solar systems remain high due to the reliance on foreign suppliers



Lack of Economies of Scale

Solar system enterprises are often of small/medium scale with individual suppliers making it difficult for the market to achieve economies of scale

Component Quality

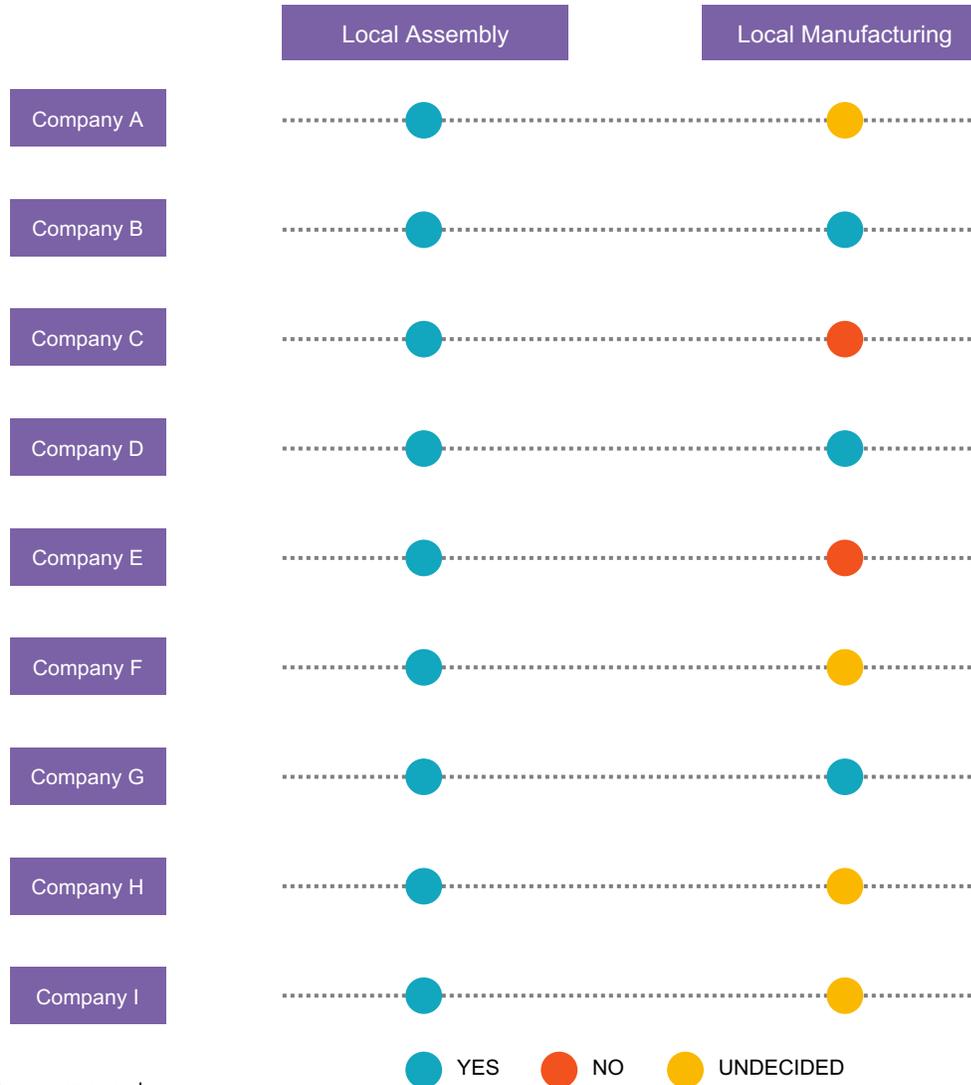
There is a proliferation of low-quality imports from China due to lack of strict regulations on quality products coming into Nigeria



Responses from a subset of:

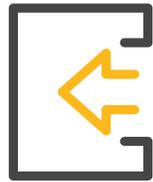
- SHS Distributors
- Mini-grid Developers
- Component Manufacturers
- Component Assemblers

When asked how they plan to locally assemble if mandated as part of the 5M Connection Project?



See Appendix 1 for list of upstream and downstream players engaged
 See Appendix 2 for list of companies that are already (in the process of) assembling

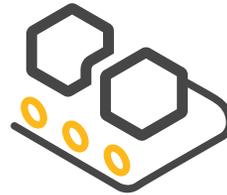
Short Term (~9 months)



1. Accelerated Importation

- This phase of the approach is characterized by imports of SKDs (semi-knocked-down kit) while status quo is maintained
- Benefits can be derived from quick deployment of systems to target market and discounts attributed to large purchases from foreign manufacturer/assembler
- Precursor to local assembly and manufacturing

Short to Medium Term (~10–22 months)



2. Local Assembly

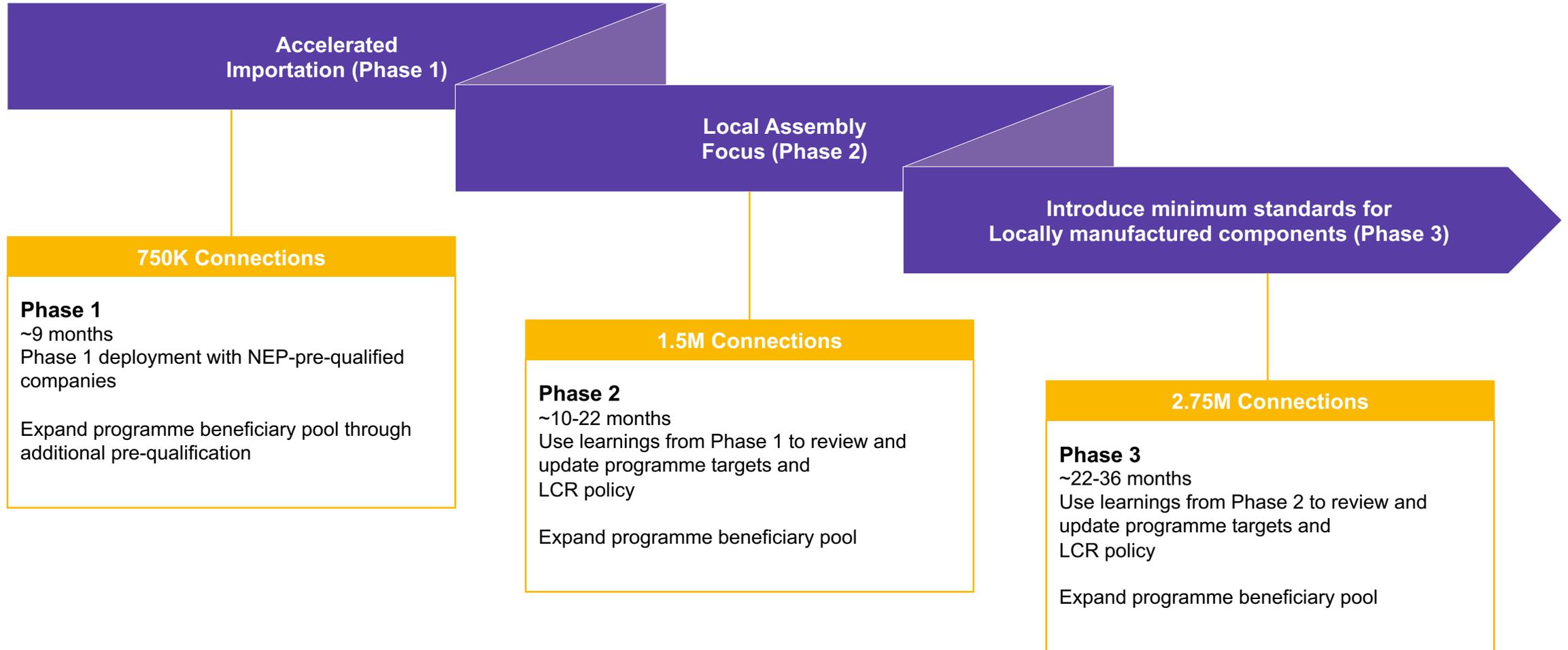
- This phase is characterized by local assembly of key solar systems components i.e., PV and batteries
- Extended opportunities to create an enabling environment for sustained employment and empowerment of women
- Increased upstream activity
- Lay the foundations for an export enabled Nigeria

Long Term (~22-36 months)



3. Local Manufacturing

- This phase will be characterized by manufacturing of key components of a solar system i.e., silicon cells
- Investment in raw materials required for large scale production of components
- Investment in R&D through tertiary institutions
- Invest in re-use of petroleum by-products for PV production
- Export enabled Nigeria





Accelerated Importation

Key Success Factors



- Create enabling environment for a sustainable solar systems industry:
 - Custom tariffs and exemptions
 - Port operations
 - Enforce quality standards

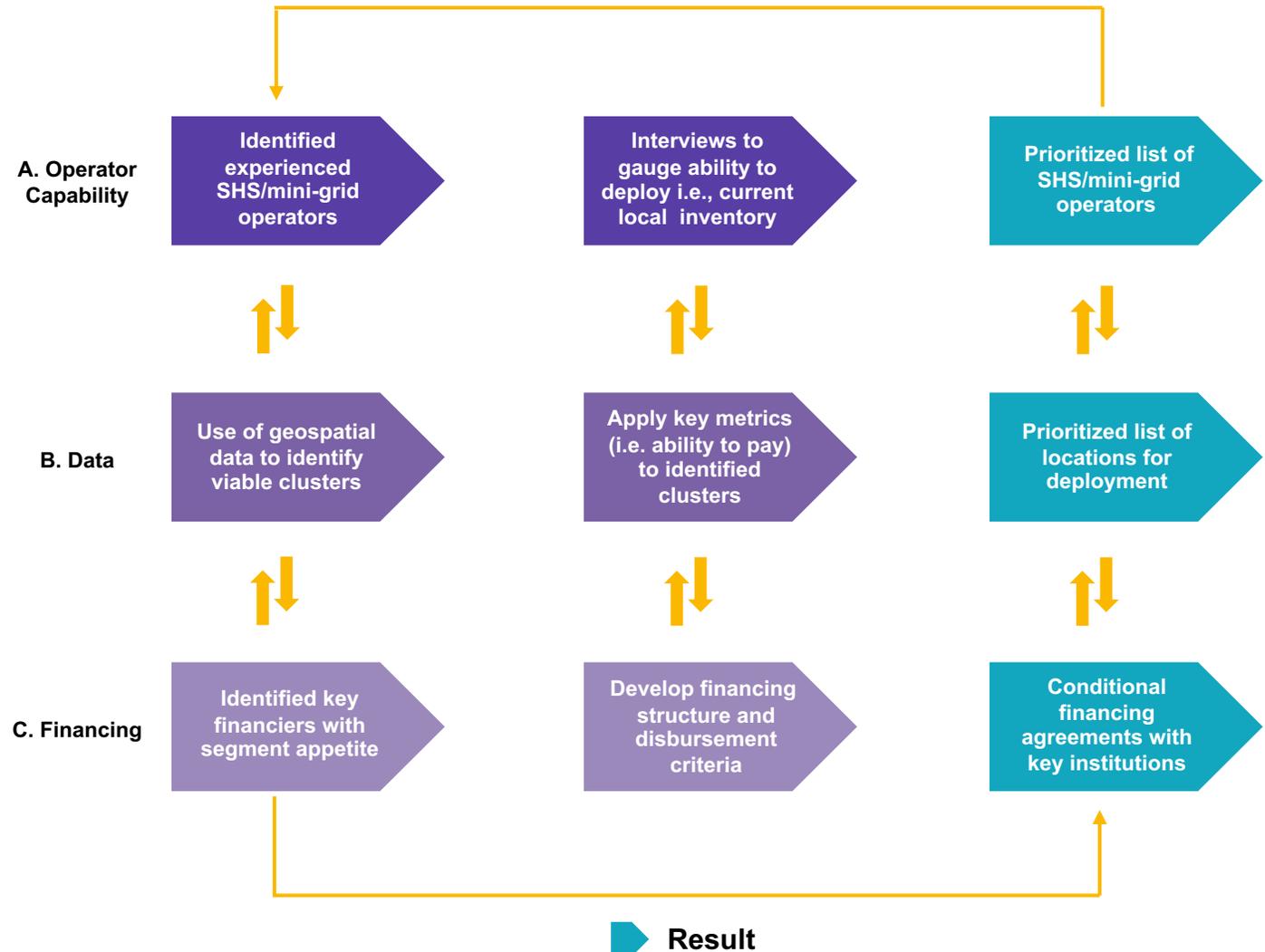


- Access to data
- Access to **lower cost / concessionary** financing
- Access to FX at CBN Rate



- Favourable down payment and payment plan
- Access to customer service and repairs
- Access to mobile money platforms at lower rates

- SEforALL's immediate focus



An **Aggregated Purchase** is a type of procurement mechanism which combines efforts across **sourcing of suppliers, aggregating demand for goods and services, negotiating tender, and streamlining the payment in order to benefit from economies of scale**

Given the scale of the access challenge in Nigeria, several stakeholders are in the ideation phase to develop an aggregate purchase for off-grid solar products in Nigeria.

Both empirical evidence and analysis are limited. Examples in other countries or sister-sectors demonstrate variable results when it comes to price decreases due to bulk procurement, often coupled with gains in energy efficiency and sourcing higher-quality products than are typically sold on the market.

Qualitative Findings

Global Distributors Collective (GDC) pilot 2020/21

In partnership with Sollatek is working to establish a bulk-purchase pilot for “last-mile” (typically >Tier2) solar products and appliances combined with favorable credit payment terms and 2-year warranty in East Africa

Rocky Mountain Institute (RMI) SHINE analysis 2018

Based on US Market experience comparing cost benchmarks, the 1MW purchasing has been identified as the price break for solar panels

SEforALL interviews 2020

One supplier in an interview responded bulk purchasing of units over 100k will typically receive a 10% discount, and it's capped thereafter

Demonstrated

International Solar Alliance Solar Water Pumps (Multi-country)

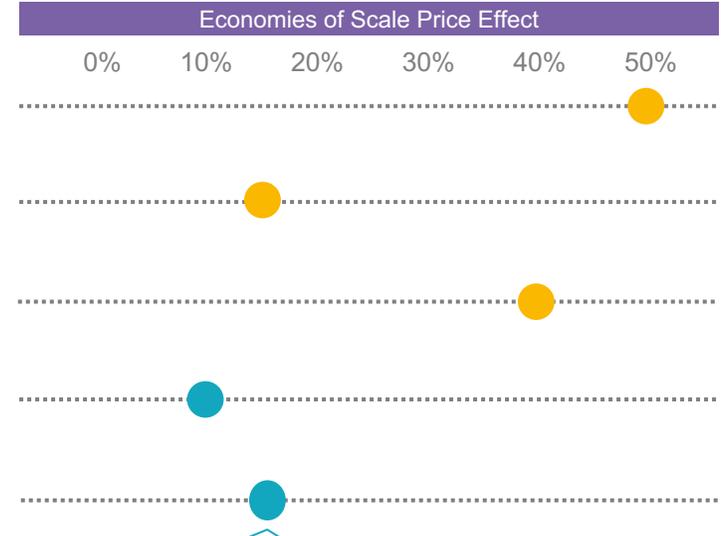
World Resources Institute Solar Rooftop PV (India)

TREESPA Energy Efficient Bulbs for Street Lighting (Tanzania)

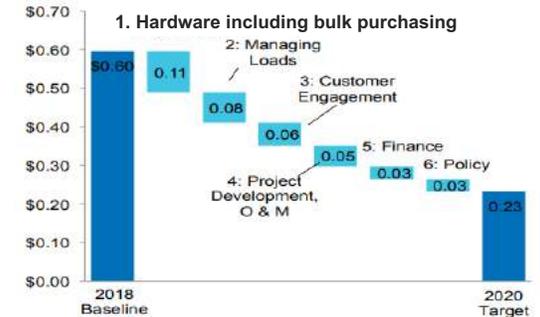
Projections

SEforALL Stakeholder Interviews, SHS (Nigeria)

Rockefeller Foundation Mini-grids (Nigeria)



Estimated reduction opportunities



Source: Rockefeller Foundation analysis, 2019

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2

3

Evaluated Policies

National Renewable and Energy Efficiency Policy (NREEEP)
Policy that serves as the blueprint for sustained development, supply and utilization of renewable energy resources within the economy for on-grid and off-grid

NERC Mini-grid Regulations 2016
Regulations guiding the operations of mini-grids in Nigeria with the objective to increase unserved electricity access and encourage the use of renewables on a small scale

National Content Development for Power Sector
Regulation that aims to promote the deliberate utilization of local human workforce and material resources across the value chain of the Nigerian Electricity Supply Industry (NESI)

Relevant Strategy

Key Strategies (Section 2, Subsection 2.7.2)
Provide fiscal incentives, subsidies to alleviate up-front costs, tax and duty exemptions for prospective investors in the renewable energy sub-sector

Review the existing laws with respect to the operations of EPSR 2005 and simplification ('fast track procedure'), to increase private sector participation in the renewable energy sub-sector

Key Strategies (Section 10, Subsection 10.2 and 10.3)
The Commission shall issue a permit to an applicant within a maximum period of **30 days** from the date of receipt of complete documentation

Pending when a response is received from the Commission, the mini-grid developer of a mini-grid of up to 100kW of distributed power who has applied for a permit can commence operations as a Registered Mini-Grid Operator

Key Strategies
All operators and companies in the NESI shall employ only Nigerians in their junior and intermediate cadre or any other corresponding grades designated by the operator or company

All licensees shall give first consideration for goods made in Nigeria. Where there is inadequate local capacity NERC may grant an approval for waiver provided such an approval shall not continue for longer than 3 years

Observed Implementation

0% import duty on solar panels under HS Code 8541, but when these panels are imported with other systems as is the case with SHS, they will be classified under 8502 and attract a 5% duty. All other solar components (bulbs, fans, TVs) can attract up to 20% import duty.

Applications for permits have been observed to be pending for months with no accommodation for mini-grids >100kW

The NESI Nigerian Content Consultative Forum (NNCCF) was established to develop the regulation schedules and implementation guidelines
No observed impact or results post-schedule development in 2018

Recommendations

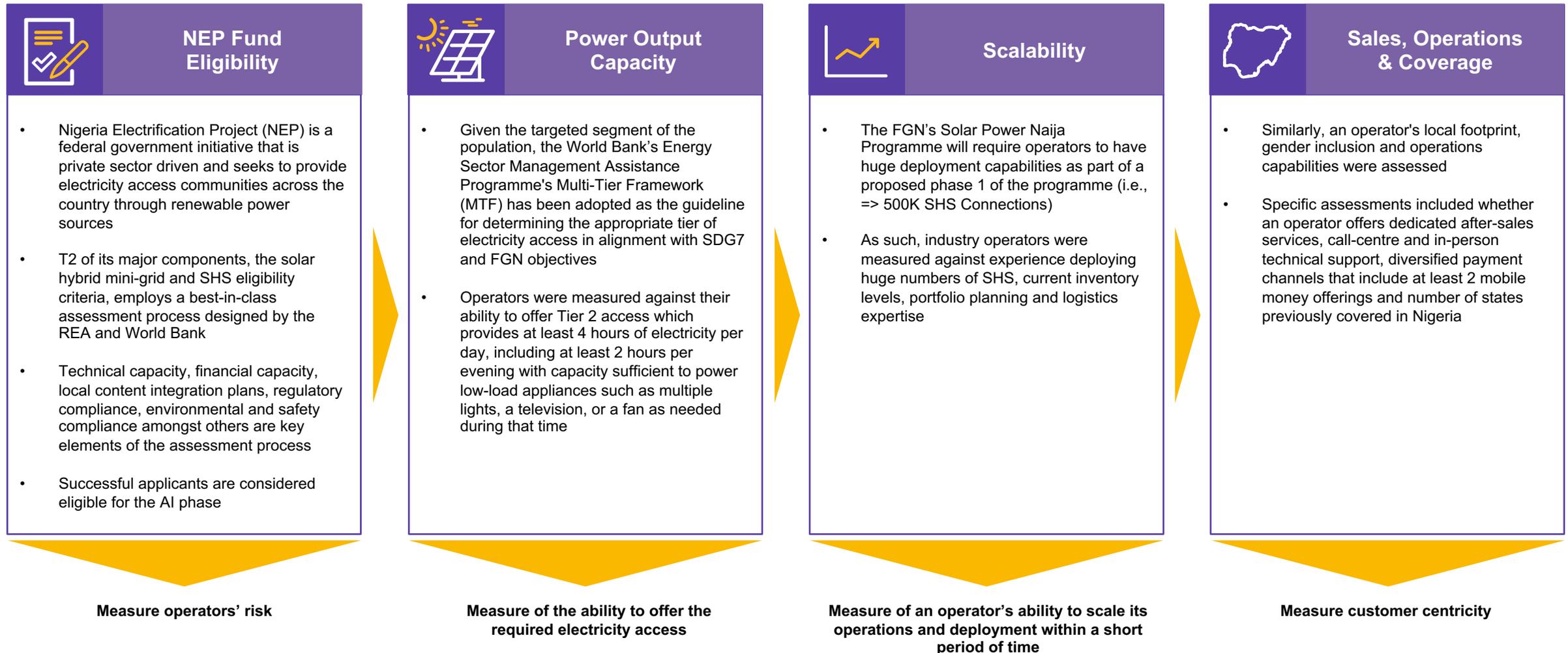
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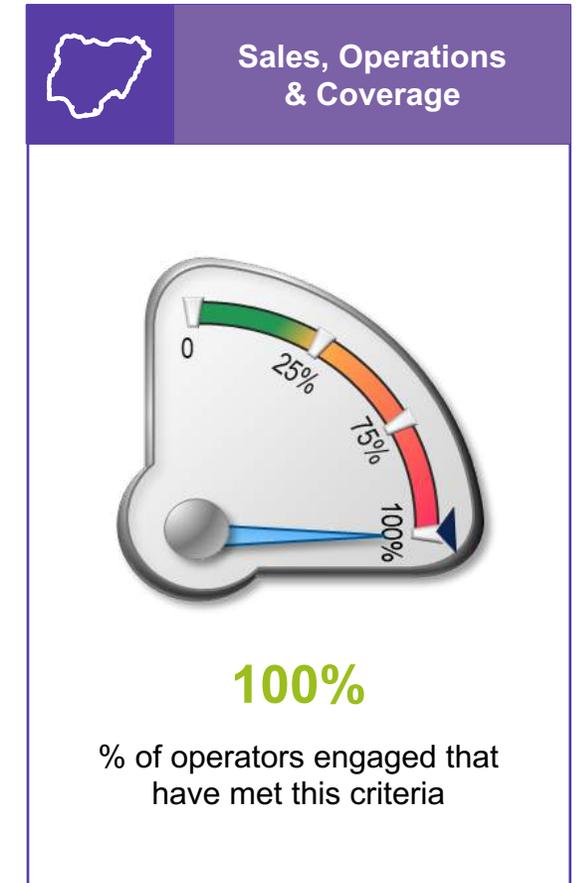
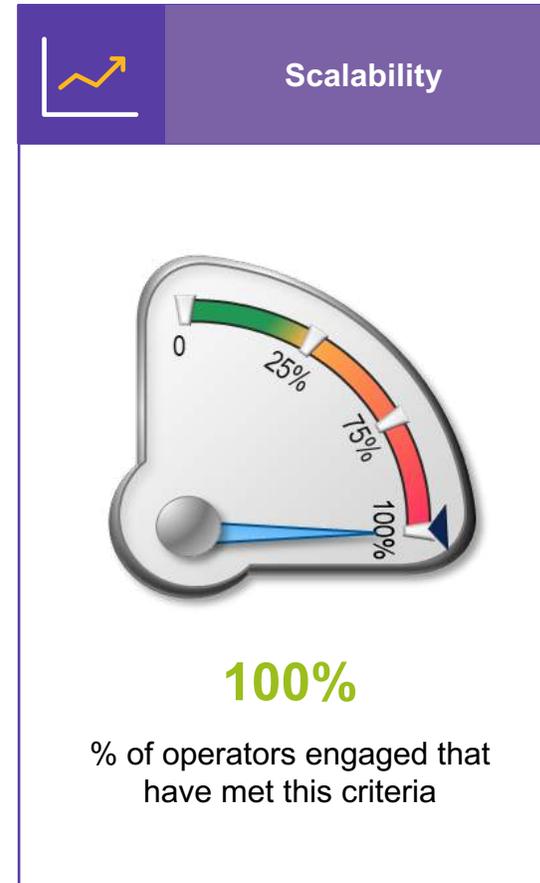
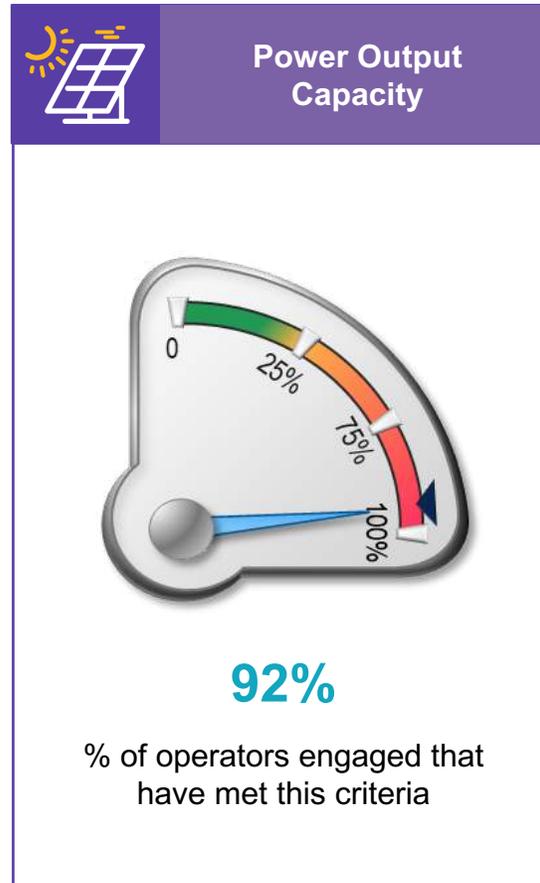
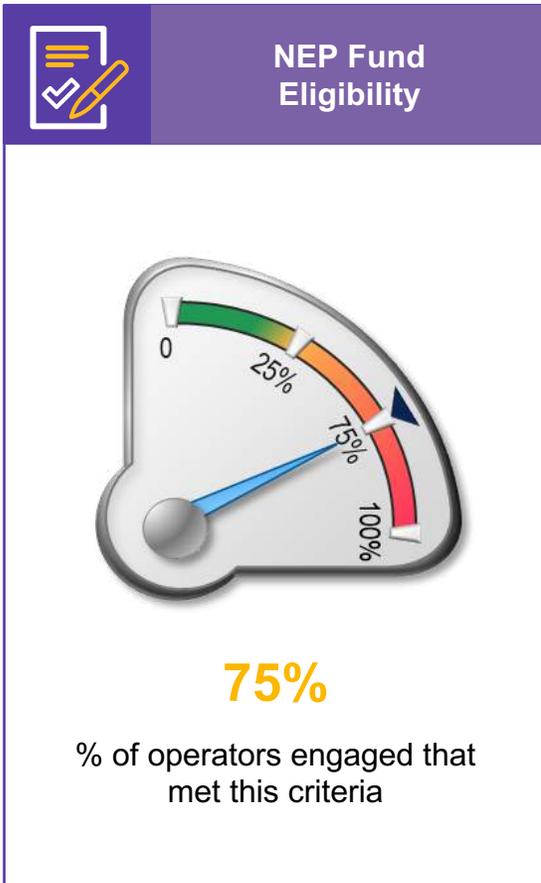
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- Specific inclusion of women's participation in the local content regulation quota for jobs across the NESI

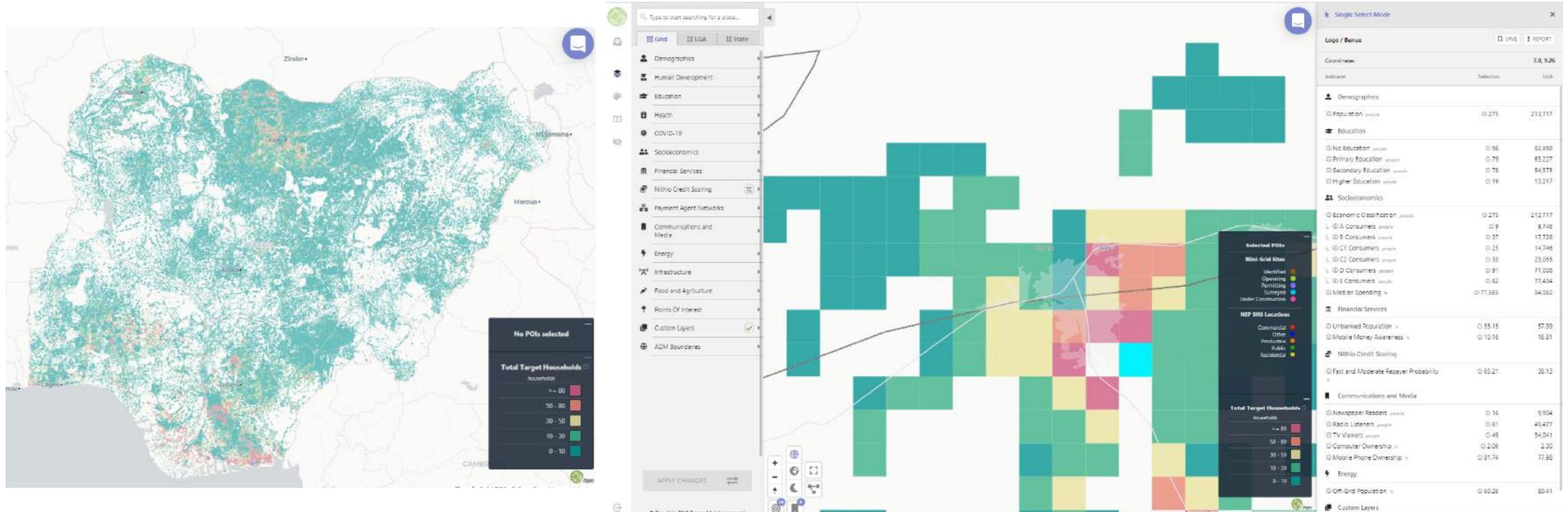


A. SHS/mini-grid operators were measured against 4 main criteria to assess their capabilities for the Accelerated Importation (AI) Phase

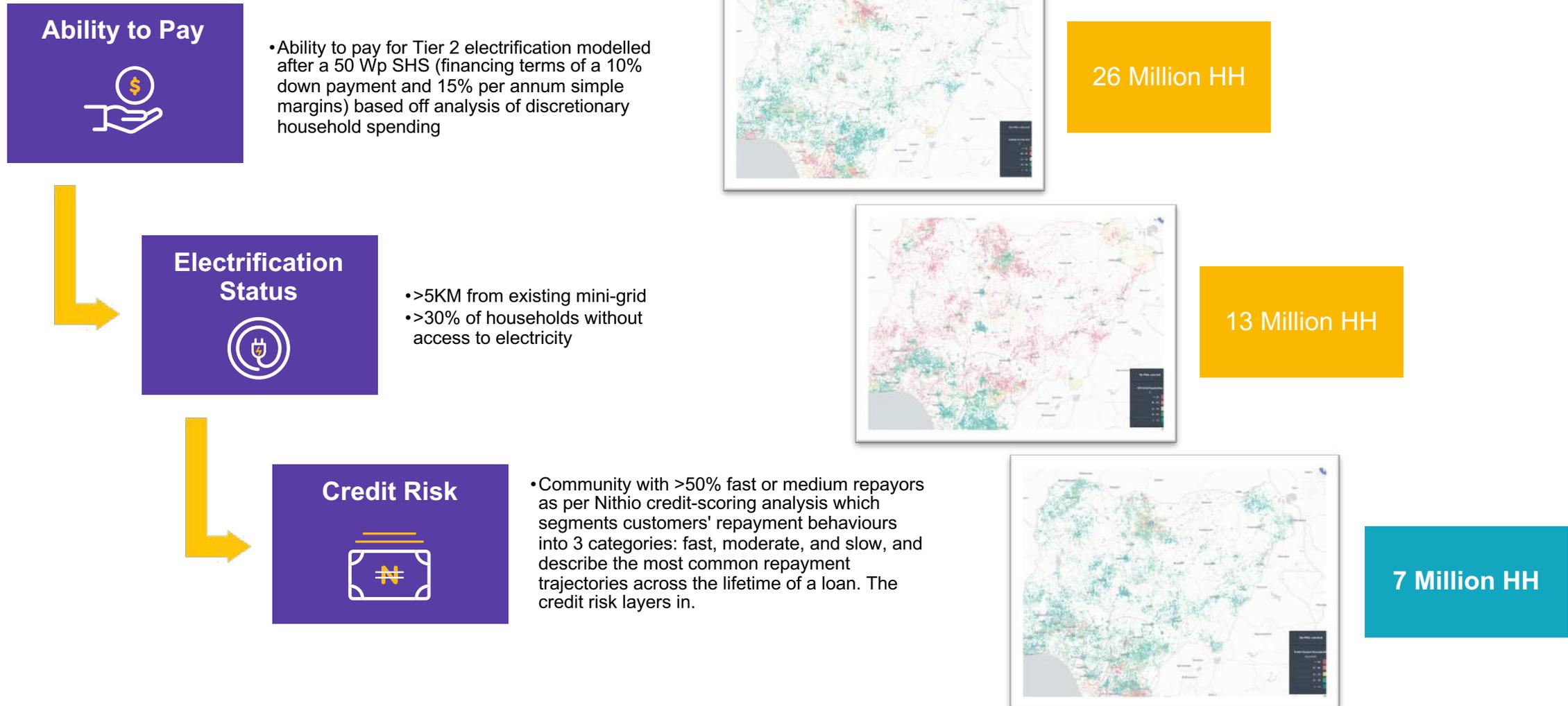


A. Results show a shortlist of 12 operators with proven capacity across the 4 assessed criteria that have the highest potential for success in the Accelerated Importation (AI) Phase





- Using public data, satellite imagery, and artificial intelligence, the platform produces population and consumer data with a 1km² resolution at national, state, and local government authority (LGA) level
- Objective to identify target households with the ability to pay for min. Tier 2 electrification under the Solar Power Naija Programme
- Distribute 1km² granular community-level data to off-grid developers, financiers and end-user payment providers to optimize operations and reduce project development and cost of finance

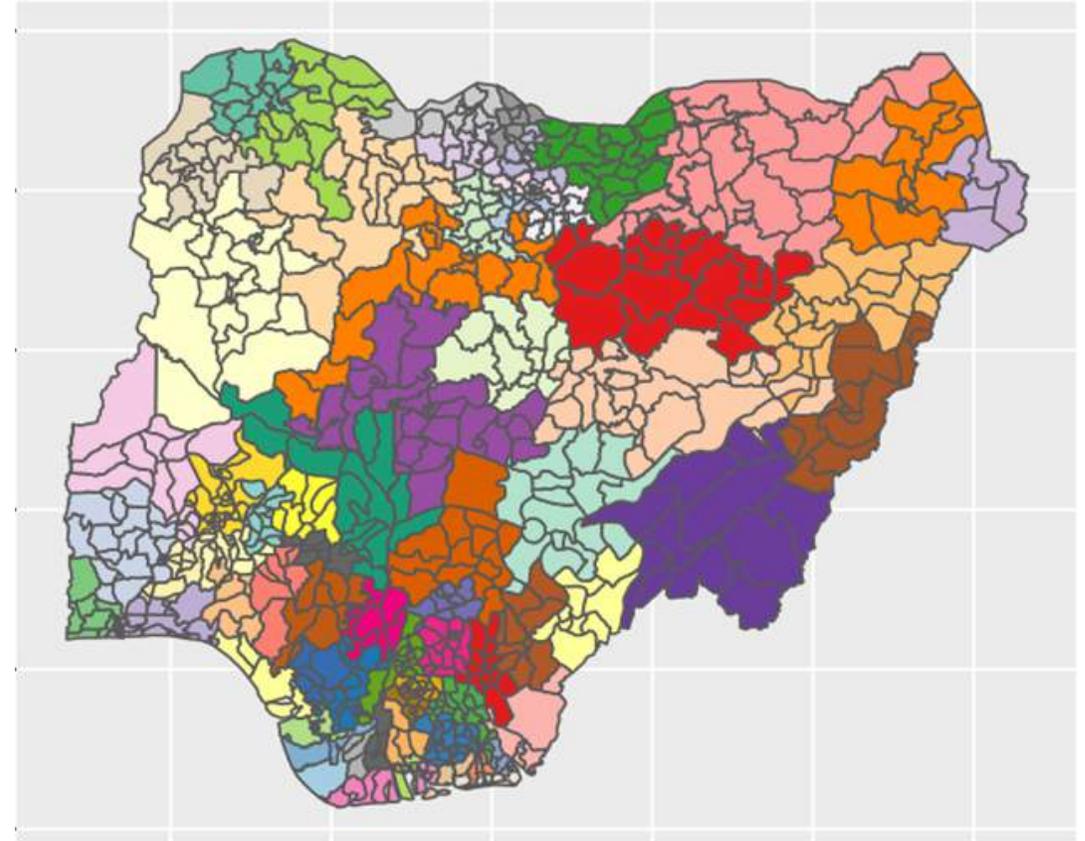


B. In readiness for field deployment, the 7 million target households were then clustered into 69 “allotments” of ca. 100,000 target households in each to be provided to private operators

Clustering based on geographic continuity for ease of distribution channels – “**contiguous local government authorities (LGAs)**”

Data along critical indicators to be provided to private sector companies

- **Target households** and **Ability to Pay** (Granular, 1 km² – delivered via dataFraym® to participating SHS companies)
- **Credit risk data**
- **Electrification**, generator ownership
- **Financial inclusion** (incl. access to bank agent networks)
- Latent **demand gap** / SHS penetration
- Access to **infrastructure** (roads, mobile coverage, electrical grid)
- **Productive uses** of energy – e.g.. farming
- **Non-commercial demand** i.e., health centres, businesses and schools



*Allotments are collections of contiguous LGAs that comprise approximately 100,000 target households. The average is 98,000 and the range of the allotments is between 76,000 and 118,000. The allotments cover all 774 LGAs in the country.
Different colours indicate different LGAs



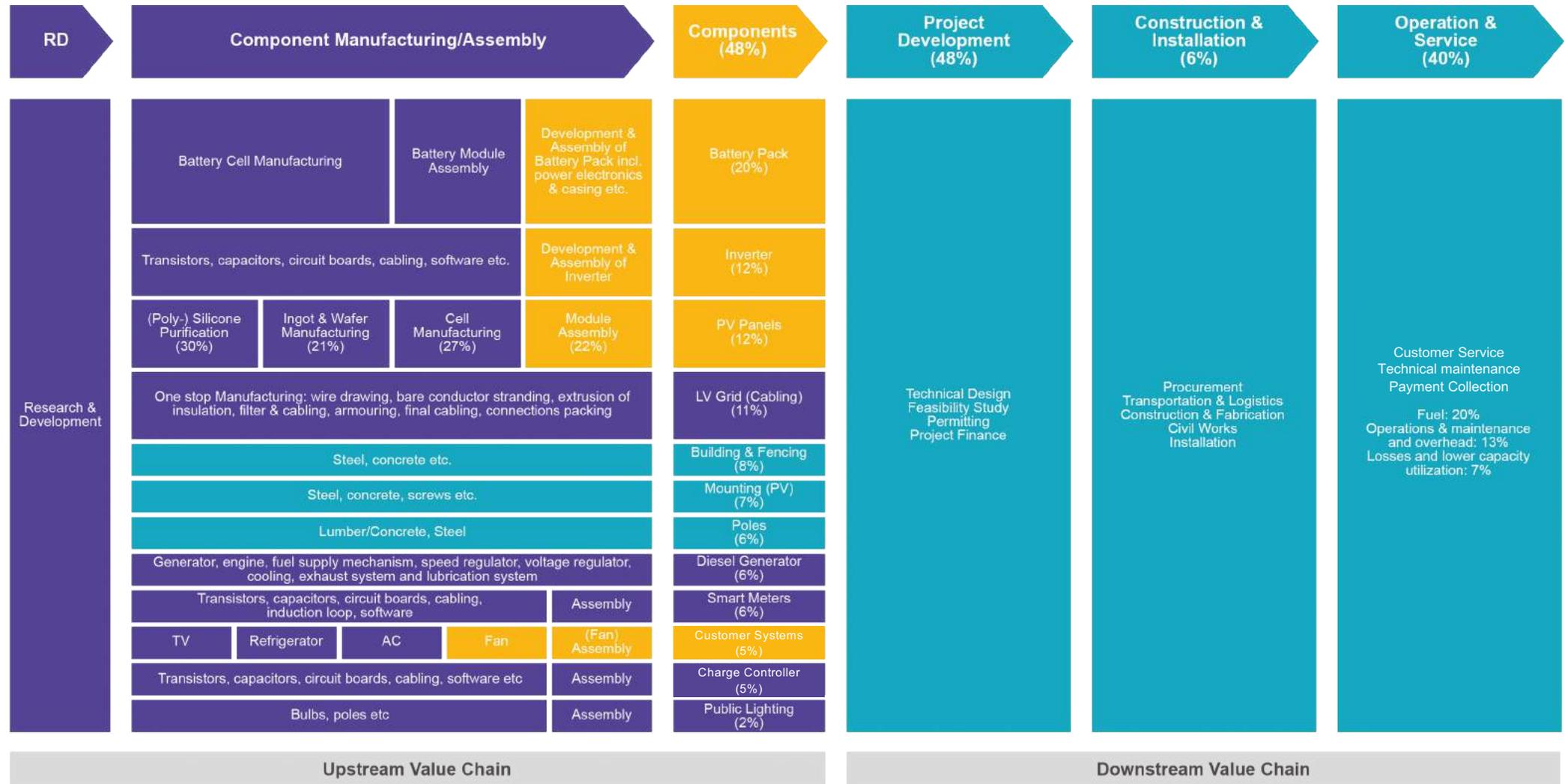


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Localization of
the Value Chain

Localization of the Value Chain

Market assessments show little upstream value chain activity as compared to downstream, leaving short and long-term opportunities to localize (Nigerian Assembly) in the upstream value chain



*% represent value dispersion at each step of value chain

■ Conducted Abroad
 ■ Opportunity for Local Assembly
 ■ Conducted Locally

02. Female Empowerment

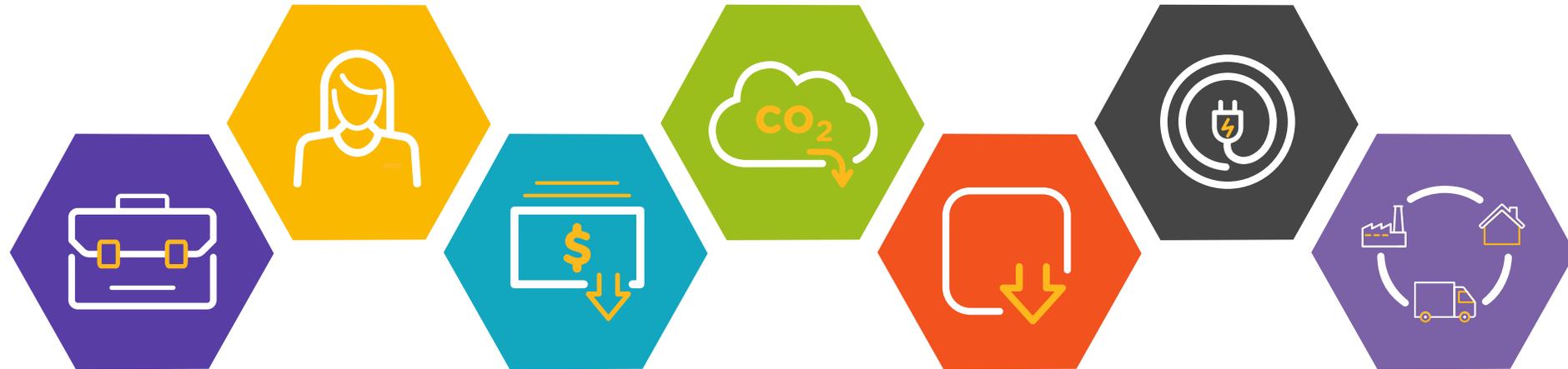
Off-grid solutions offer diverse opportunities for women to work in the solar value chain, since most of the skills needed can be developed locally. Availability of high-quality lighting provides women with income-generating activities and education for children

04. GHG Reduction

Localizing the value chain is a key enabler to increase energy efficiency, reduce the use of generators and attract international support

06. Increased Rural Electrification

Due to its off-grid potential and ability to create rural jobs, localization of the value chain will increase adoption rates



01. Job Creation

Investment in upstream localization can result in skilled and semi-skilled job creation throughout the value chain from manufacturing, assembly and distribution

03. Reduced Pricing

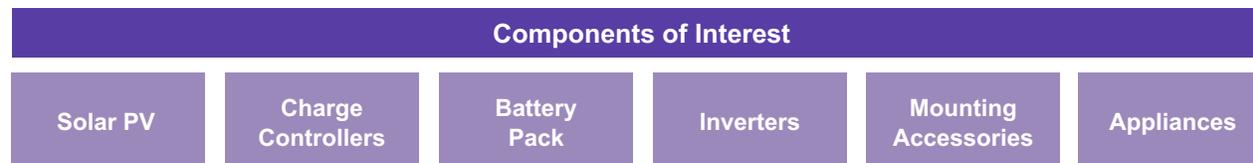
Localization of key components of the value chain have the potential to reduce product prices and increase adoption rates in a very price sensitive market

05. Export Potential

Nigeria is strategically positioned to cater to the wider ECOWAS market, with also significant off-grid market potentials (see slide 15)

07. Reduced Supply Chain Risk

Having locally available high-quality solar components will alleviate potential time lost in the development cycle for the solar electrification sector



Localization of the Value Chain

To assess the localization potential of key upstream solar components, an economic model was developed to measure the viability of various localization scenarios



Scenarios Modelled	Import	Assemble	Manufacture
Components			
Solar PV	✓	✓	✓
Battery Pack	✓	✓	✓
Inverters	✓	✓	✓
Charge Controllers	✓	✓	✓
DC Cables	✓	✓	✓
Mounting Accessories	✓	✓	✓
Appliances (TVs, fans, bulbs, radios)	✓	✓	✓

Enablers Modelled
Importation Tariffs
Capital Structure (includes Cost of Financing)
Product Subsidy
Installed Plant Capacity
Pioneer Status

The impact of a combination of component scenarios & enablers was used to assess the socio-economic indicators below

PRICE OF SHS

MINI-GRID TARIFF

JOBS CREATED

GHG SAVINGS

NIGERIA'S EXPORT POTENTIAL

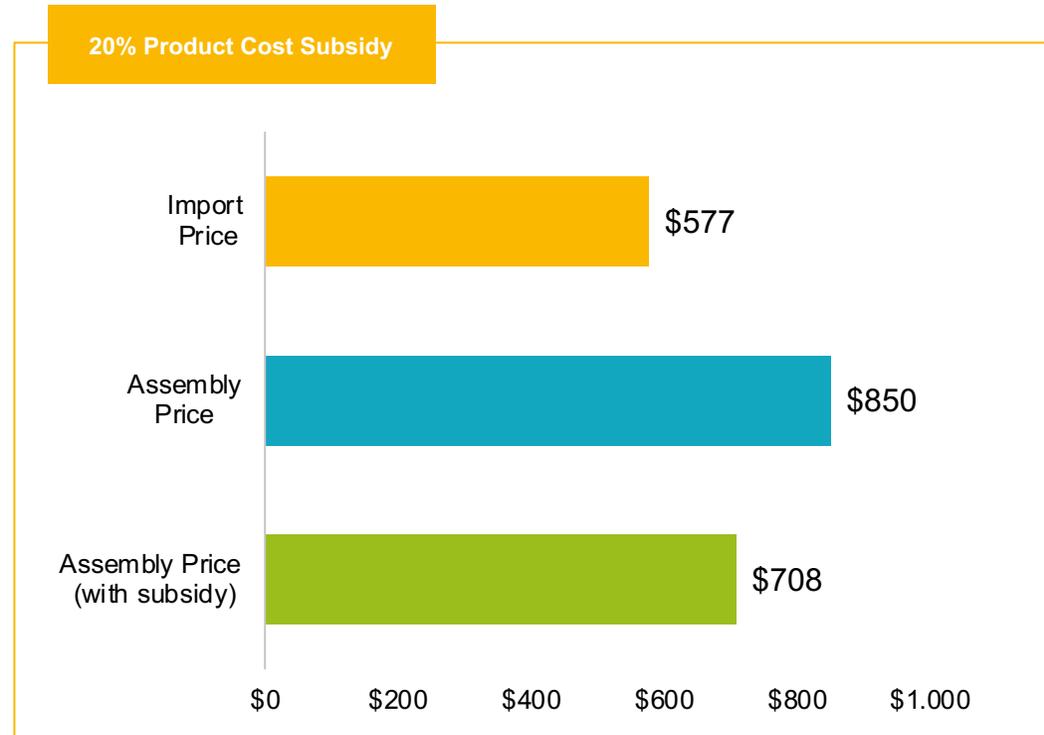
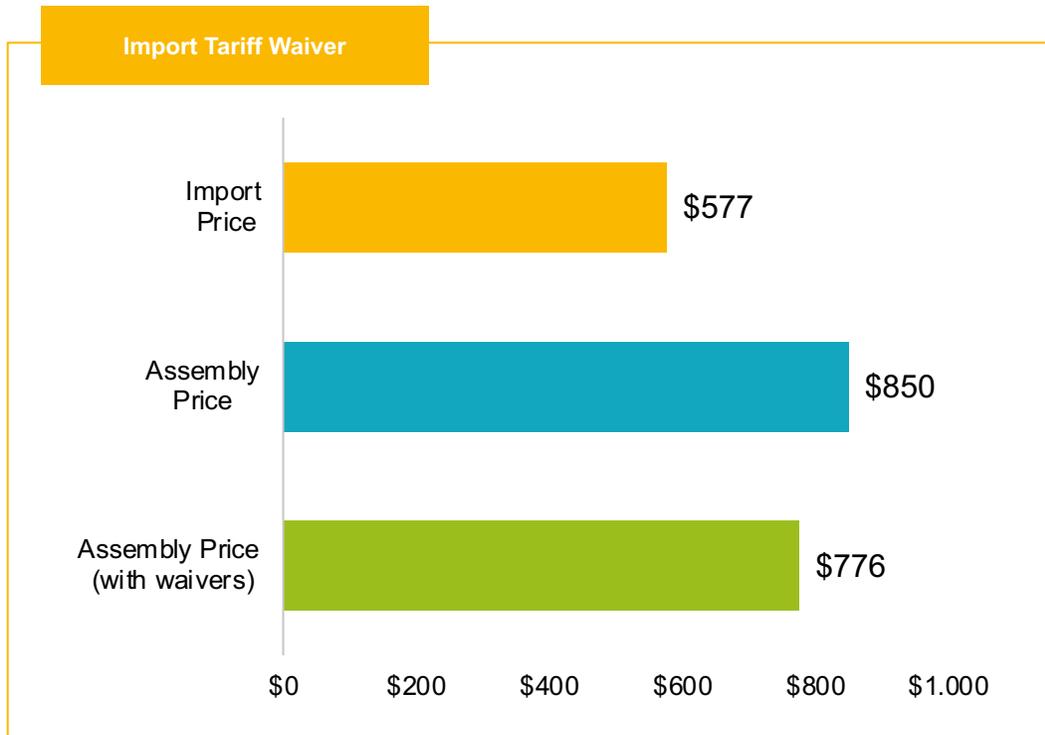
No. OF SHS UNITS REQUIRED TO MAKE LOCALIZATION VIABLE

The economic model captures other metrics including Sales, Revenue, Profit etc. It provides a universe of opportunity for analytical assessments to be used by the private and public sector as they deem fit.
Full version of the model can be downloaded on www.seforall.org

Key Items	Commentary
Model Scenarios	<ul style="list-style-type: none"> ▪ Importation: status quo where solar system products are predominantly imported into the country SKD or fully assembled ▪ Assembly: local assembly of key components of a solar system (e.g. PVs, batteries, etc.) ▪ Manufacturing: local manufacturing of key components of a solar system (i.e. local manufacturing of the solar cells)
Model Assumptions	<ul style="list-style-type: none"> ▪ Components of interest : solar PVs, batteries, inverters, DC cables, mounting accessories, appliances ▪ Tier 2 solar systems: 50Wp, 80Wp, 150Wp ▪ Payment structure: 90% PAYGO, 10% outright purchase ▪ 0.04% drop in cost per MW produced (IRENA) – assembly/manufacturing ▪ 10% cost savings for purchases over 1M – importation ▪ SHS subsidy : 20% of product cost ▪ Mini-grid subsidy: \$350 per connection
Operating Assumptions	<ul style="list-style-type: none"> ▪ SG&A : 2% of revenue ▪ Warranty: 0.01% of product cost ▪ System maintenance : 0.25% of revenue ▪ Maintenance reserve: 0.20% of revenue ▪ Cost of SHS distribution : N600 per unit
Financing Assumptions	<ul style="list-style-type: none"> ▪ Debt finance is 12%, tenor: 5 years, moratorium: 1 year ▪ Debt – 70%, Equity 30% ▪ Tax rate – 32% ▪ WACC – 16% ▪ Pioneer status (tax break) - 5 years
Port Assumptions (Duties and VAT)	<ul style="list-style-type: none"> ▪ Solar panels: 5% ▪ Batteries: 20.5% ▪ Inverters: 20.5% ▪ Charge controllers: 16.5% ▪ DC cables: 12.5% ▪ Mounting accessories: 12.5% ▪ Appliances: 15.5% – 20.5%

Localization of the Value Chain

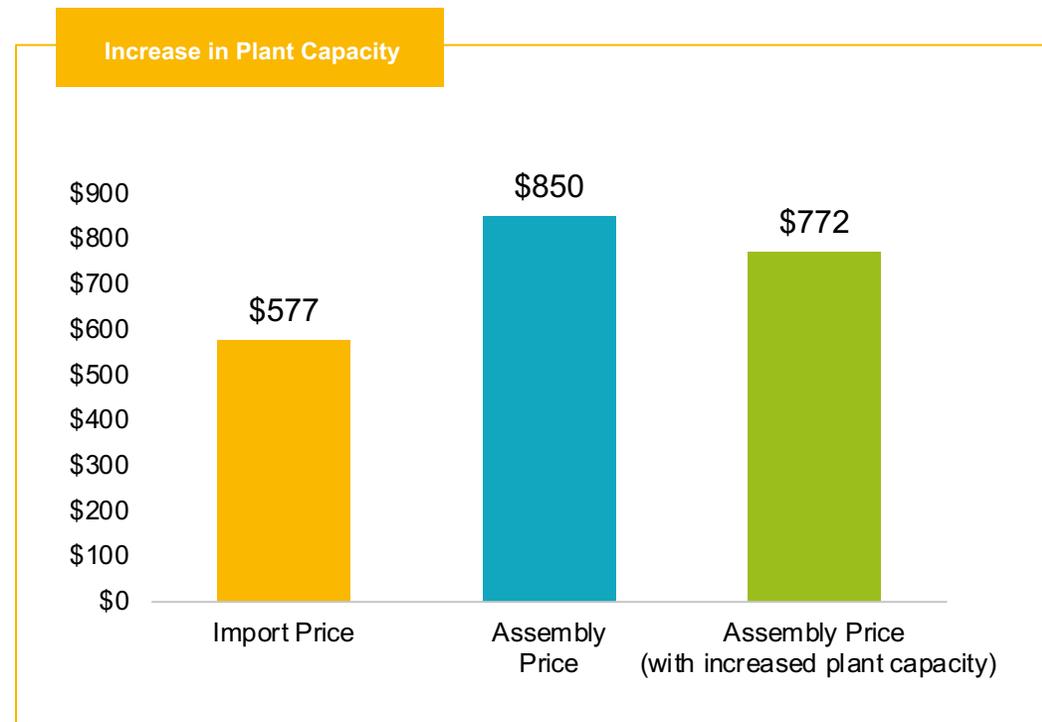
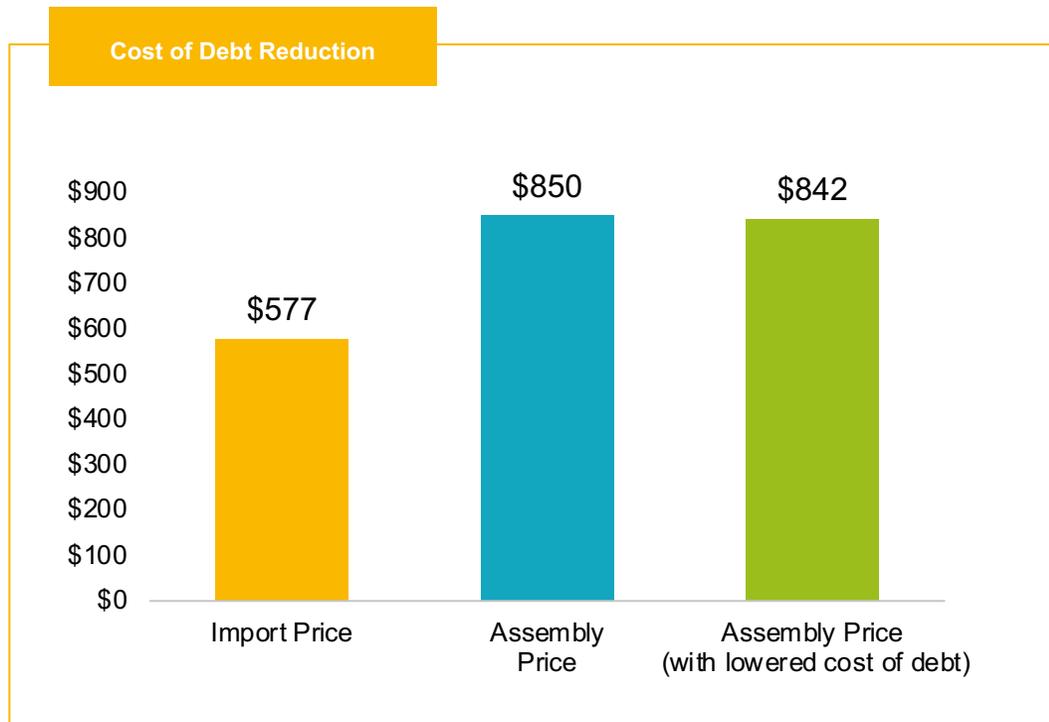
Results show lowering tariffs and providing product subsidies have the largest impact on Nigeria's ability to localize (assemble) key components of the upstream value chain



Action	Full import waiver on all solar components
Results & Impact	Product price of SHS decreases by 9% ▼
	Number of households able to afford system increases by 73% ▲
	Number of units required for localization decreases from 505K to 461K units ▼

Action	20% subsidy on product costs
Results & Impact	Product price of SHS decreases by 17% ▼
	Number of households able to afford system increases by 140% ▲
	Number of units required for localization decreases from 505K to 421K units ▼

Modelled assembly price: price of a 50Wp SHS (battery and PV assembled in Nigeria) with table fan, TV and bulbs from a 20MW capacity plant; locally assembled components – battery & PV
 import tariff reduction: 0% on all SHS system components ; cost of finance reduction: from 12% to 5%; CapEx investments: assumes investment in plant capacity from 20M to 100MW; product subsidy: 20% of cost of SHS; 20% sales margin
 Jobs created over 5 years for SHS and 10 years for mini-grids
 Number of households able to afford is based on Nithio/Fraym geospatial data for homes that can pay at least NGN 5,000 per month, assuming households can transfer 50% of discretionary spending to cover monthly payments
 Impact of localized manufacturing and other scenarios can be assessed from the economic model.



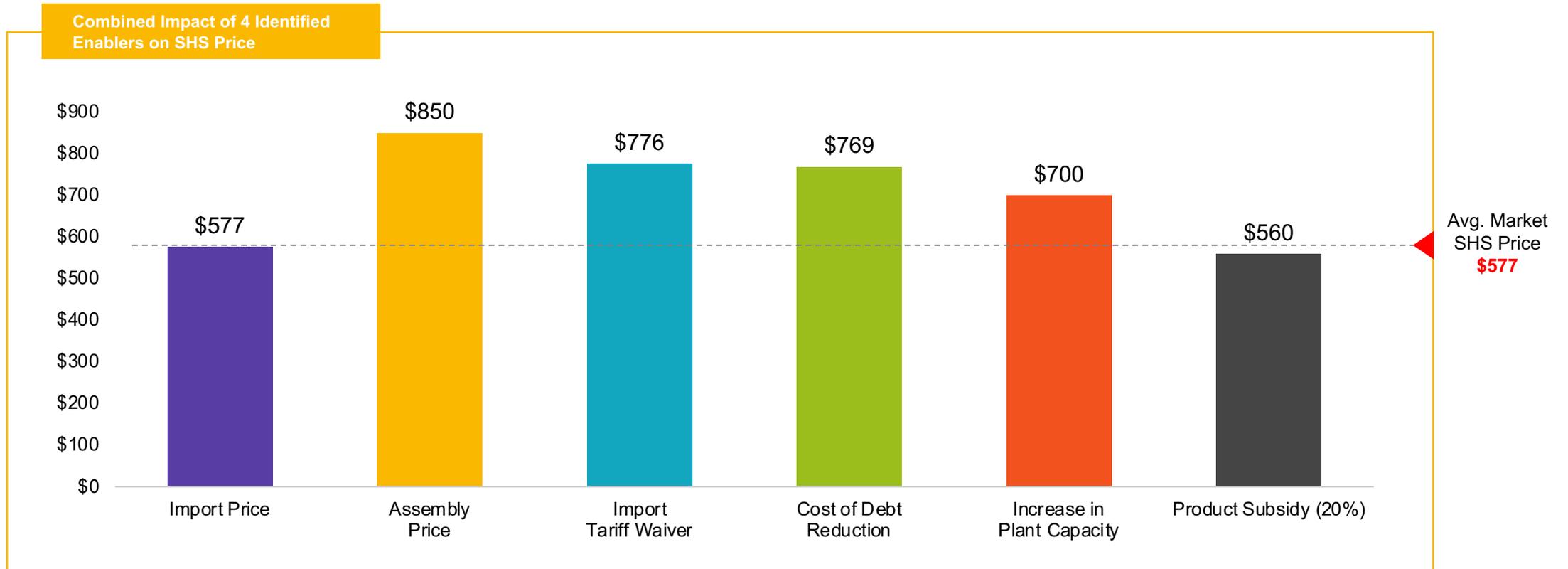
Action	Reduce the cost of debt from double digit 12% to 5%
Results & Impact	Product price of SHS decreases by 1% ▼
	Number of households able to afford system increases by 8% ▲
	Number of units required for localization decreases from 505K to 502K units ▼

Action	Increase in plant capacity from 20MW to 100MW
Results & Impact	Product price of SHS decreases by 9% ▼
	Number of households able to afford system increases by 77% ▲
	Number of units required for localization decreases from 505K to 459K units ▼

Modelled assembly price: price of a 50Wp SHS (battery and PV assembled in Nigeria) with table fan, TV and bulbs from a 20MW capacity plant; locally assembled components – battery & PV import tariff reduction: 0% on all SHS system components ; cost of finance reduction: from 12% to 5%; CapEx Investments: assumes investment in plant capacity from 20M to 100MW; product subsidy: 20% of cost of SHS; 20% sales margin
 Jobs created over 5 years for SHS and 10 years for mini-grids
 Number of households able to afford is based on Nithio/Fraym geospatial data for homes that can pay at least NGN 5,000 per month, assuming households can transfer 50% of discretionary spending to cover monthly payments.
 Please note the impact of cost of debt on SHS product price will be more pronounced on any one single distributor. The reason for the minimal impact here is because we have assumed one distributor for the whole country for the purpose of modelling; as such they are able to spread their interests costs over much larger units of SHS assembled.

Localization of the Value Chain

The combined effect of the identified enablers on the local assembly of key solar systems components will make Nigerian pricing competitive, increase its export potential and reduce the time it takes to localize

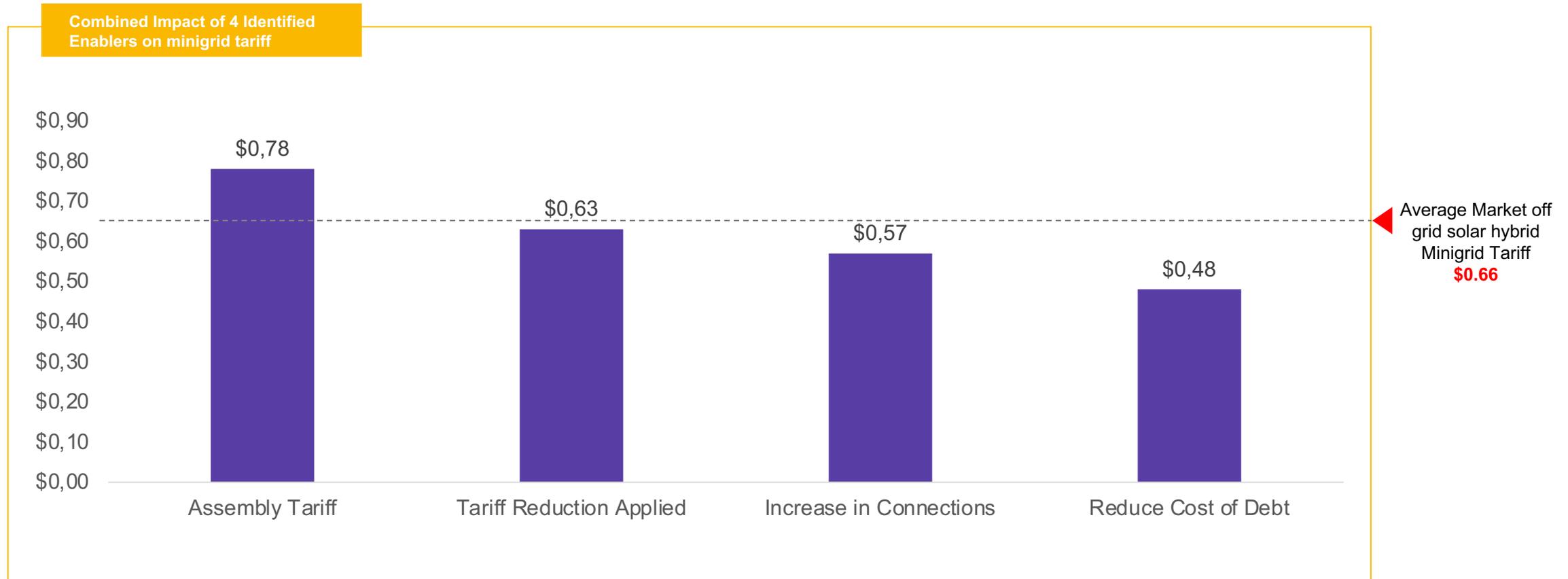


Results & Impact	Product price of SHS decreases by 34% ▼
	Number of households able to afford system increases by 288% ▲
	Number of units required for localization decreases from 505K to 333K units ▼

Modelled assembly price: price of a 50Wp SHS (battery and PV assembled in Nigeria) with table fan, TV and bulbs from a 20MW capacity plant; locally assembled components – battery & PV
 import tariff reduction: 0% on all SHS system components ; cost of finance reduction: from 12% to 5%; CapEx Investments: assumes investment in plant capacity from 20M to 100MW; product subsidy : 20% of cost of SHS; 20% sales margin
 Jobs created over 5 years for SHS and 10 years for mini-grids
 Impact of localized manufacturing and other scenarios can be assessed from the economic model.

Localization of the Value Chain

The combined effect of the identified enablers on mini-grid tariffs will reduce the levelized costs of energy and promote investments in the sector



Locally assembled components – battery & PV

Import tariff reduction: 0% on all system components; cost of finance reduction: from 12% to 5%; CapEx investments: Increase in demand from 500K to 600K connections

Impact of localized manufacturing and other scenarios can be assessed from the economic model.

Localization of the Value Chain

A small subset of local businesses have shown that localization is viable and are actively pursuing different pathways by investing in PV plant capacity, battery assembly and PCBs to increase scale, local content and business efficiency



Charge Controller and Solar PV



Solar PV



Printed Circuit Board (PCB)



Cables



Local battery recycling with short-term assembly plans



Local assembly of a SHS



4

Recommendations

1

Focus on sharpening key enablers in existing policies to strengthen ease of doing business and industry attractiveness

Key Areas

- Waivers for all solar system components
- Optimization of the implementation process for (1)**
- Access to finance, subsidies and grants
- Monitoring and reporting of local content in alignment with the National Content Development (NCD) for the power sector

2

Provide access to data (energy audits & geospatial data) to enhance deployment execution, improve operator portfolio performance and reduce development costs

Key Areas

- Access to geospatial data that capture consumers' ability to pay in rural areas to improve operators' portfolio performances and increase willingness to continue to invest
- Access to energy demand studies to allow for accurate business planning for mini-grid developers

3

Provide access to financing, subsidies & grants to scale the industry

Key Areas

- Reserved access to FX at CBN to companies deploying solar solutions
- Access to low-cost naira financing
- Access to grants and subsidies to reduce product costs to the end consumer, improve portfolio performance and encourage investments

4

Galvanize the private sector to make its counterpart investment especially in PV and battery assembly to reduce product costs and create jobs

Key Areas

- Invest in quality PV assembly plants with tailored sizes to meet industry demand and specifications for both mini-grids and SHS i.e., lower wattage peak panels for SHS
- Promote the work of Auxano and Naseni to encourage new entrants and investors
- Encourage battery recyclers and assemblers to meet the demand of the rural segment

**Optimisation of the implementation process for waivers starts at the ports. Customs are generally observed to be one of the major bottlenecks in industry; a re-training, re-focused and accountable customs officials and processes must be put in place and monitored to make any progress in the industry.

1

Quality Assurance Verification of Localized Products:

Changing location or process of any component of the value chain requires recertification by major accreditation providers

Mitigation Measures for Consideration

- Prioritize local verification lab in collaboration with internationally recognized certification accreditors i.e., Lighting Global
- Collaborate with accreditation providers to develop a fast-track recertification procedure

2

Inconsistent application of import duties at port:

Given the limited availability and competitiveness of raw materials for solar components, the port authority must be able to differentiate between input components and fully assembled systems

Mitigation Measures for Consideration

- Standardized manuals and trainings for the port officers
- Institute priority clearance at the ports to promote ease of doing business
- Tax exemptions specifically for local assembly or manufacturing capacity
- Solar Power Naija' Programme secondment at the port to provide clear guidelines and instructions

3

Local content "washing" and misrepresentation:

The FGN must be very clear at each "stage" of localization on the definition of local content in order to ensure systems are indeed creating value and jobs in Nigeria

Mitigation Measures for Consideration

- Develop tailored monitoring and tracking framework tools for each stage
- Develop a specific goal and target for each stage
- Create an official communication channel for the government and private sector

4

Local content requirements outpace sector's ability to scale:

Overly stringent local content criteria could threaten the acceleration of off-grid solar electrification in the country

Mitigation Measures for Consideration

- Establish a phased approach based on reassessment of the current market situation analysis
- Distributor-focused subsidy
- Purchase guarantees or quotas to reserve a share for local (manufactured/assembled) products in public procurements
- Carry out periodic surveys to determine the national content participation in the sector

Data Support

- Allotment of identified 7M homes ready for the Solar Power Naija Programme
- Provide data of homes' ability to afford Tier 2
- Strategic support for REA and other private partners with data and intelligence from localization exercise

Financing Support

- Continue to engage financiers and donors in support of the Solar Power Naija Programme
- Engage payment providers to ease after-sales operations

“Broker Role”

- Delineate a dissemination strategy to ensure relevant stakeholders capture the learnings and recommendations from localization exercise
- Connect industry players with similar objectives who can benefit from already established industry enablers

Integrated Energy Planning

- Develop integrated energy & COVID-19 vaccine distribution plan for Nigeria accessible online and usable by both public and private sectors
- Assist the government in evaluating the trade-offs of different approaches for rolling out a national COVID-19 vaccine, considering the constraints and opportunities around cold chain storage and transportation and their associated costs

Continued and immediate support for the Solar Power Naija Programme

General Support



5

Annexes

Category	Company	HQ	Market countries
SHS	Emel Solar Solutions	Nigeria	Nigeria
SHS	Smarter Grid International	Nigeria	Nigeria
SHS	Lumos	Netherlands	Nigeria, Cote D'Ivoire
SHS	D.Light Limited	USA	Nigeria, China, India, Kenya, Uganda
SHS	LightBox Solar	Nigeria	Nigeria
MG	NASENI	Nigeria	Nigeria
SHS	A4&T Solutions	Nigeria	Nigeria
SHS	Oolu Solar	Senegal	Nigeria, Senegal, Mali, Burkina Faso, Niger
SHS	Asolar	Nigeria	Nigeria
SHS	M-KOPA Solar	Kenya	Nigeria, Kenya, Uganda
SHS	Azuri Technologies Ltd	Nigeria	12 countries in Sub-Saharan Africa
SHS	Fenix International	Uganda	Nigeria, Uganda, Zambia, Mozambique, Cote D'Ivoire
SHS	Greenlight Planet	India	60+ countries
SHS	PAS Bboxx Ltd.	UK	9 countries in Africa
Assembly / Manufacture	Rural Spark	Netherlands	Sub-Saharan Africa
	Auxano Solar	Nigeria	Nigeria
	Hirotec	Nigeria	Nigeria
	Spark Works	Nigeria	Nigeria

Category	Company	HQ	Market countries
SHS	Arnergy Solar Ltd.	Nigeria	West Africa
SHS	SOSAI Renewable Energies Company	Nigeria	Nigeria
MG	ACOB Lighting Technology Ltd.	Nigeria	Nigeria
MG	Community Energy Social Enterprise Ltd.	Nigeria	Nigeria
MG	Rubitec Nigeria Ltd.	Nigeria	Nigeria
MG	PowerGen Renewable	Kenya	Nigeria, Tanzania, Sierra Leone
MG	Darway Coast	Nigeria	Nigeria
MG	GVE Projects	Nigeria	Nigeria
			Description
Manufacturer	LONGi Group	China	Chinese manufacturing companies that demonstrated interest in the Solar Power Naija project in Nigeria
Manufacturer	Poly Solar	China	
Other	LADOL		Free Trade zone
Other	Emerald Industrial CFZE	Nigeria	Multimodal manufacturing, assembly and service facility – Battery and Inverters
Government	REA	Nigeria	Solar Power Naija implementing organization
Government	FCDO (former DFID)	UK	Potential international financing provider
Financier	Interswitch	Nigeria	Payment company
Financier	Sterling Bank	Nigeria	End-user payment provider

About Auxano



Auxano Solar is a privately owned indigenous renewable energy solution provider with emphasis on solar energy. Dealing in the manufacture of solar panels, procurement, sales, design, installation and maintenance of solar inverter systems.

Auxano began operations in 2016 with a 6.5MW annual capacity that was upgraded to 10MW with support from All On, USADF & BOI. With recent investment from All On, it plans to expand to 80MW installed capacity and is poised to supply at least 20% of the solar modules being used in Nigeria within the next 2-3years.

Testimonials

“ Before now I spent as much as N50,000 on a monthly basis for power but since I started using Auxano Solar, I’ve hardly spent N5,000, I make much saving using it. ”

Assembly Pictures



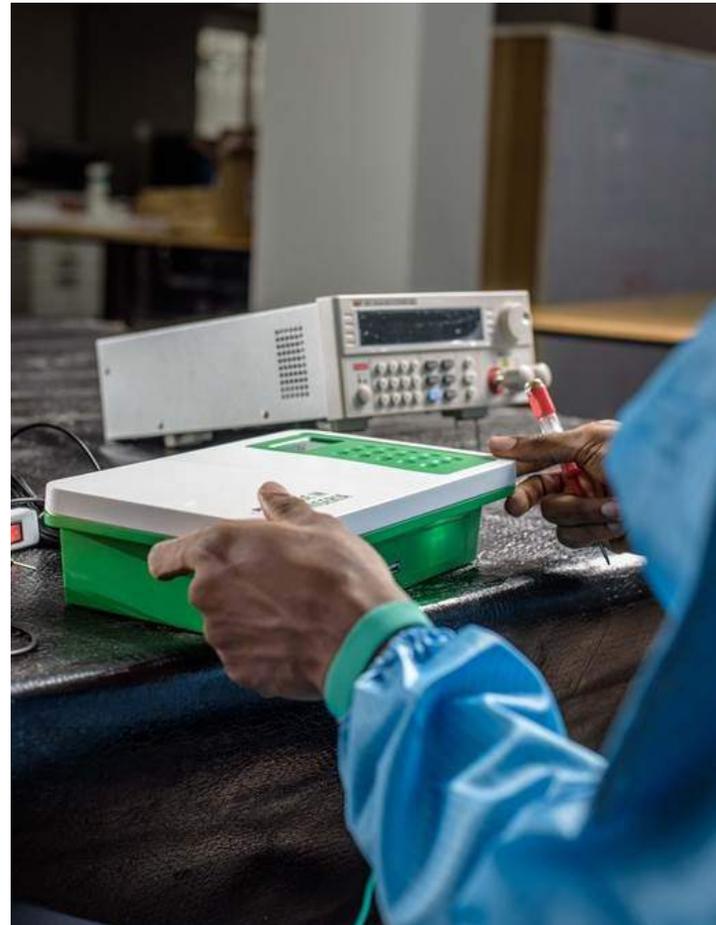
About Hirotec

The Hirotec Solar Home System range seeks to enable a middle-income lifestyle at an affordable price point. Hirotec's design philosophy of Affordable Prosperity ensures that all of its products could, for instance, power 12V cooling, or charge a laptop. Essential to Hirotec is that a product Made in Nigeria would also be Designed in Nigeria.

Hirotec has its own PAYG platform with both front-end and back-end software development run from Lagos and integrating with Nigeria's fintech startups for payment processing. Thus, job creation and technical capacity building happen not just on the assembly floor but in engineering.

Hirotec's cardboard packaging (retail and cartons) is also produced in Lagos and Hirotec is working with local injection moulding firms for its later phase.

Assembly Pictures



SUSTAINABLE
ENERGY
FOR ALL

All ON

