Manufacturing Africa

Nigeria Solar Manufacture

March 2021

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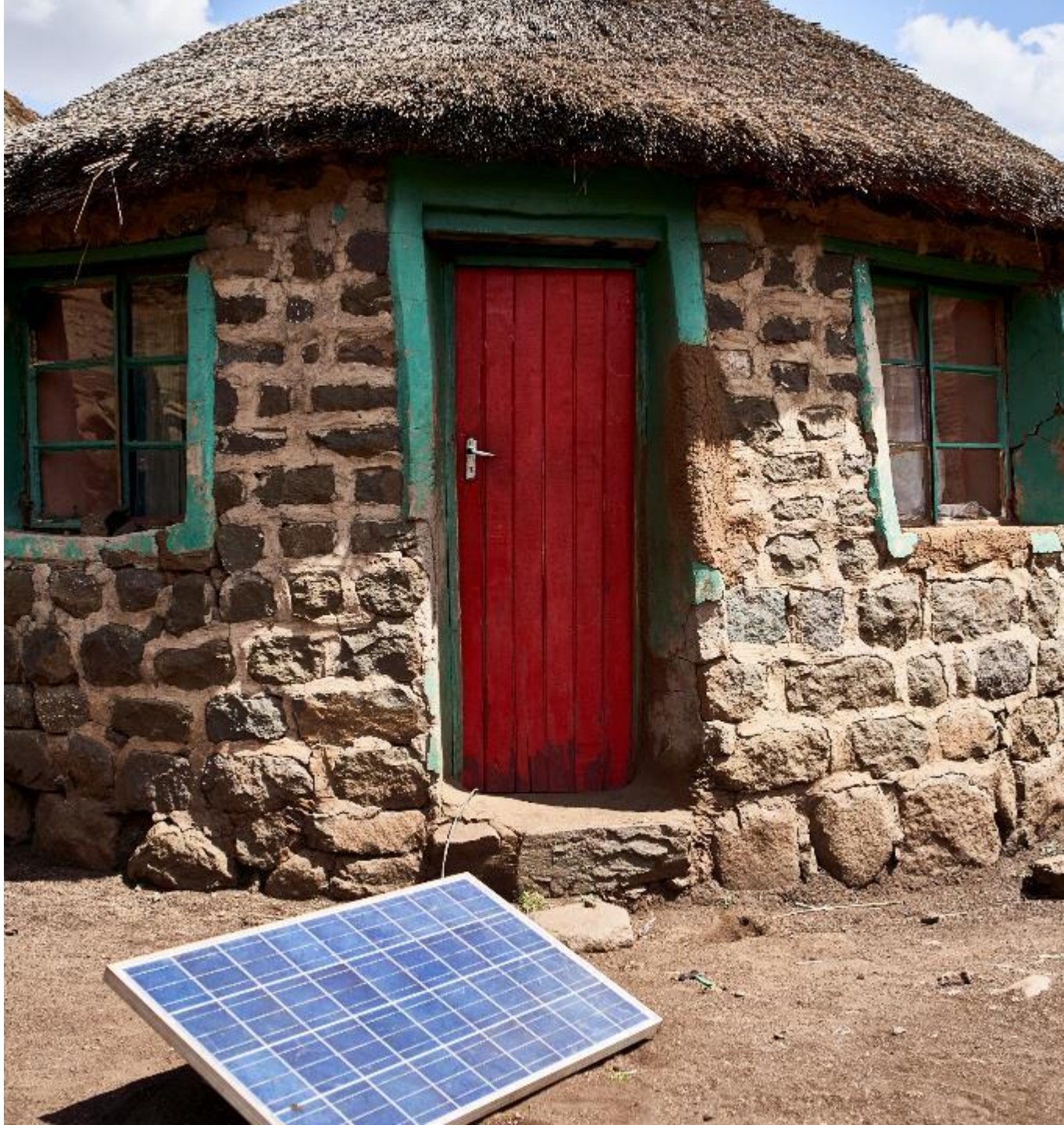


Agenda

Nigerian solar landscape overview

Roadmap

We have spoken to a wide range of local and international experts and stakeholders to generate insights on the potential for localization

Global players

Upstream

- Azuri
- Bboxx
- Fenix
- Lumos
- M-Kopa solar
- Oolu
- Power Gen
- Winch

Downstream

- Renewsys
- SteamaCo

Local upstream players

Mini-grid

- Arnergy
- GVE
- Rubitec
- Rensource

SHS

- Emel Solar

Local downstream players

- Auxano
- Beacon
- Bluecamel
- Greenage
- Naseni
- Nayo Tropical Technologies

Donors, partners and public organisations

- ACE:TAF
- AFDB
- ALL-ON
- CrossBoundary
- FCDO
- GIZ
- NPSP – Power Africa
- REA
- Rockefeller foundation
- Rocky Mountain Institute
- SEforALL
- Tetratech
- UKNIAF

Key messages

1: Swim lanes delineation	Donor mapping revealed that significant work is ongoing across the sector, however, **the transaction facilitation work being done fills an important gap in supporting the private sector**
2: Sector landscape	**Upstream assembly and manufacturing is still nascent in Nigeria while** – current activity is limited to only 6 local players, with several potential new entrants **indicating an interest in establishing local operations**
3: Key insights	7 key themes emerged from the extensive industry interviews, **infrastructure constraints, access to working capital & financing, scale of operations, access to skilled workforce, challenging imports and logistics, low quality control and local supply chain constraints**
4: Cost effectiveness	Building on the work from SEforALL, the most cost-competitive segments in value chain for localisation is **assembly of solar components** (e.g., batteries, appliances, inverters, packaging)

1: Significant work has been done on localisation assessment and incentives identification; FCDO to focus on transaction facilitation

NOT EXHAUSTIVE

Value chain analysis

Building economic model to **estimate cost** of SHS and mini-grids under **different scenarios** – import, local assembly, local manufacturing

Identifying attractive entry points for Nigeria along the value chain

ACES — **Assessing potential for localisation** and **requirements** for local manufacturing of SHS and assembly of solar equipment

Policy levers

Identification of policy levers to ensure successful implementation of the programme

Evaluation of working models and legal and regulatory frameworks in practice in SHS countries and that are **absent in Nigeria**

Definition of policies, **regulations** and actions **to be taken by FGN** to support localisation

Development of **recommendations** through which stakeholders can **promote development of minigrids**

Identification of **incentives to alleviate barriers to scale**

Creation of a platform to **promote incentives implemented** to attract investment

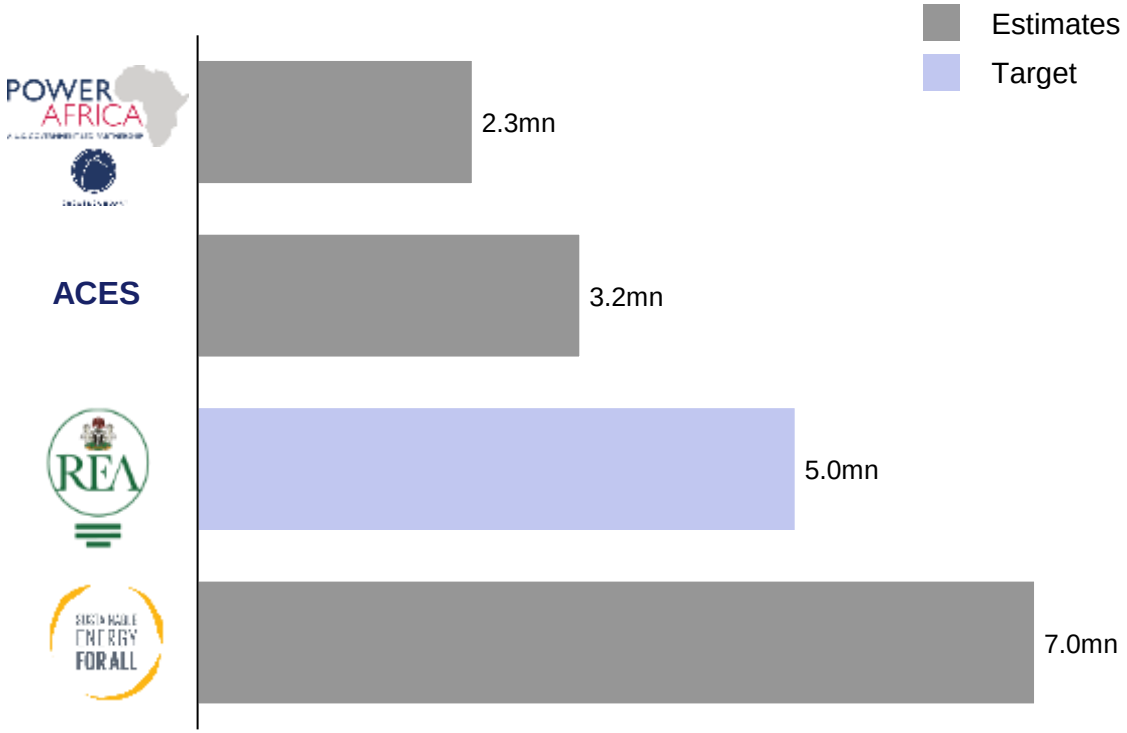
Source: Stakeholder interviews

FCDO team is able to **build off** the heavy lifting **other donors and partners** have done on cost-competitiveness, potential for localisation and incentives and the **insights** they have drawn

Transaction facilitation is not a space that REA is currently getting help on, there is therefore **a lot of value for FCDO to focus on** that objective

2: There is latent demand for solar home systems which needs to be addressed by scaling up sales

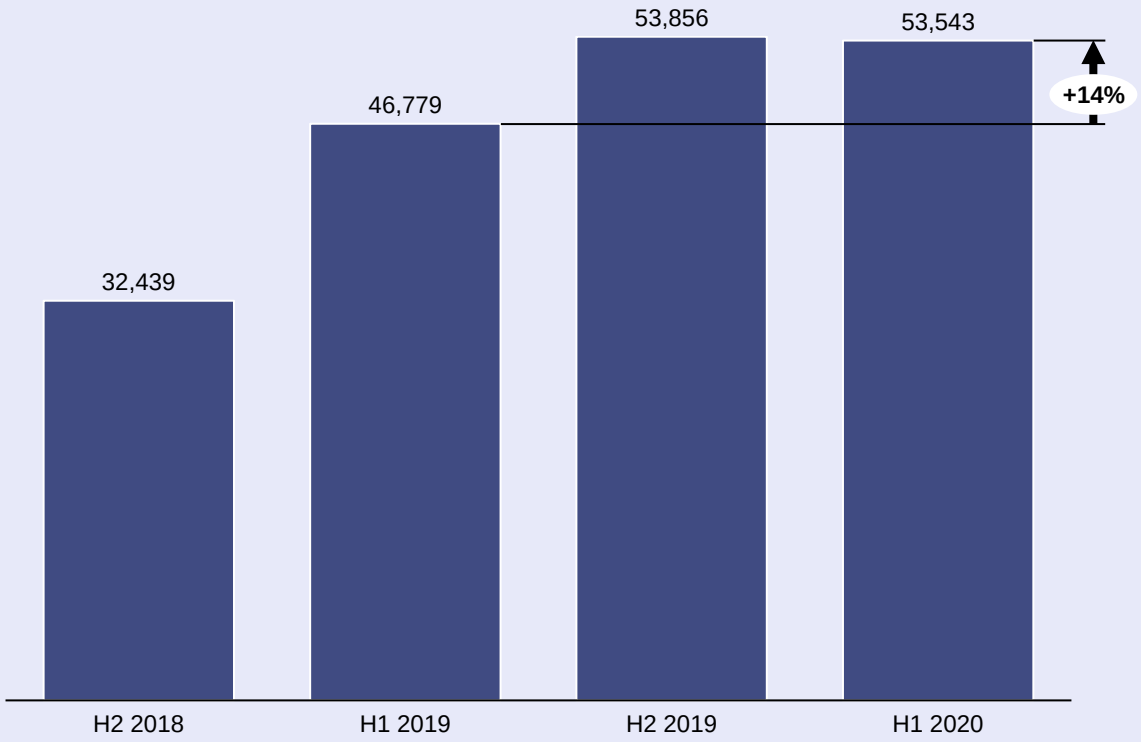
Demand estimates for SHS



Source: GOGLA reports, SEforALL, Crossboundary, ACES, REA

While there is a wide range of estimates on potential demand for new Tier 2 connections, on average, 5M demand seems within realm of what different donors/partners have modelled

Sales of solar home systems[1] in Nigeria, *units*



Unit sales are below required levels to reach the 5Mn target

2019 was a year of momentum but Covid has slowed down the growth pace

[1]Sales of SHS estimated from PAYGO sales, GOGLA reports show that 100% systems of 20W capacity and above are sold through PAYGO

2: Most players are specialised along the value chain, with very few players present in the upstream steps

Detailed next

Expected launch of activities

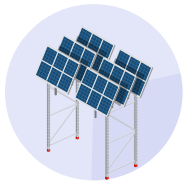
NOT EXHAUSTIVE

Upstream

Downstream

Manufacturers and assemblers	Retailers	Installation	After sales companies

Solar Home System



Mini-grid/ commercial

**Includes companies who do both full systems and individual components

rensource

IBETO GROUP

AUXANO SOLAR

BEACON

BLUE CAMEL ENERGY

GREENAGE TECHNOLOGIES

AYO

arnergy

steamaco

NASENI

EMELSOLAR

Solarpawa

d.light

M-KOPA SOLAR

bboxx

Azuri

ZOLA ELECTRIC

AYO

OOLU

LUMOS

fenix intl

ASOLAR

sunking. from Greenlight Planet

chibek

EAUXWELL

GREEDS ENERGY

AYO

VENTURA LOGISTICS SERVICE LIMITED

GV

PowerGen

RUBITEC POWER RUBITEC SOLAR

A4&T Power Solutions

arnergy

RENEWVIA ENERGY

HAVENHILL

Community Energy Social Enterprise

BGC

Insights

Very few players are currently involved in the upstream space as it requires **high technological** capability and specialised **skills**

Nigeria is a nascent market where **large capital investments are yet to be justified**

There is an **opportunity to capture some of the savings from shipping and logistics** through larger bulk consignments

Local assembly has started to gained traction for a select number of components (e.g., inverters, charge controllers)

The downstream segment of the market is at an early consolidation phase

Majority of distributors rely on **importation of products even if some have their own manufacturing and assembly facilities in other countries**

> The upstream segment of the market can only ever develop if the downstream operational challenges have been solved, and the market has been proven

> We are always open to either moving upstream or sourcing locally, as long as it has a cost advantage without compromising quality

Source: Lighting global, interviews, press research

2: Companies already operating upstream in the sector have ambitions to expand local production capacity

	Company	Current activities	Ambition	Production capacity	Quotes
Mini-grids	AYO	Mini-grids manufacturer and SHS wholesaler	Becoming the local assembler for any of the players participating in the SHS program	**Expanding to 1.2m units p.a.** in 2021 and 3-5m units p.a. in 2022-23	"There is too much of a hurdle in importing products"
Solar panels	AUXANO SOLAR	Solar panel assembly	Becoming a local leader in solar panel assembly	10MW current capacity and expanding to **100MW in 2021**	"In this business, it is little things (e.g., working capital financing) that make all the difference"
	NASENI	Solar panel assembly	Becoming a local leader	*N.A.*	*N.A.*
Batteries	IBETO GROUP	Lead-acid battery manufacturing	Manufacturing batteries for the local SHS and mini-grid sector	*N.A.*	*N.A.*
Inverters	GREENAGE TECHNOLOGIES	Inverter manufacturing	Scaling up production capacities	**30 units p.a.** current capacity and plan to expand to**~7,000 units p.a.**	"Greenage Technologies ambition is to become the power bank of Africa"
LED light bulbs and solar street lights	BLUE CAMEL ENERGY	LED lights bulbs and solar street lights manufacturing	Scaling up activities	**15,000** solar street and **40,000** LED lights assembled p.a. current capacity	"Government cannot actually move the industry forward, it can only set the pace – the results must be delivered by the private sector"

Source: Companies interviews & website

2: Companies without current upstream operations in Nigeria have ambitions to set up additional local production capacity (2/2)

	Company	Current activity	Ambition	Planned production capacity	Quotes
SHS modules	rensource	Mini-grid development and small scale SHS distribution	Moving upstream in the SHS sector in setting up two new assembly lines to become a regional leader	**600,000 SHS** produced p.a.	"There is a huge markup made on imported products"
	EMELSOLAR	SHS distribution	Moving upstream towards manufacturing SHS	*N.A.*	"There is a need to design an appropriate robust and cheap product for the local market"
	arnergy	SHS and mini-grid modules distribution	Moving upstream towards manufacturing SHS and mini-grids	**1,400 units** p.a.	"Chinese products represent a harsh competition for locally manufactured products"
Industrial	BEACON	Setting up production facilities	Becoming a regional leader in manufacturing for the energy sector and notably SHS and mini-grid components (e.g., inverters, batteries, charge controllers	**100,000 inverters and batteries** in the short term (6-9 months)	The 5m connection goal has been announced by the FGN but it is now the private sector responsibility to drive it
	steamaco	Meters manufacturing	Set a foot in the Nigerian market through finding a local partner for manufacturing	**>100,000 units** p.a.	*N.A.*

Source: Companies interviews & website

3: 7 themes of challenges and opportunities related to manufacturing have arisen from our conversations with private companies

Theme	Description	Companies	Number of companies impacted
A Constraints to infrastructure	Unreliable and costly energy access is a barrier to establishment of energy-intensive processes in country	OOLU, BEACON, GREENAGE TECHNOLOGIES	High
B Access to working capital & financing	Insufficient and restrictive financial support result in constrained working capital hindering scale up	bboxx, WINCH ENERGY, GREENAGE TECHNOLOGIES, LUMOS	
C Low access to highly skilled workforce	Low number of skilled workforce means companies need to do skill building in-house	BLUE CAMEL ENERGY, GREENAGE TECHNOLOGIES, M-KOPA SOLAR	
D Import & logistics constraints	Challenging importation process worsened by high customs duties is an opportunity for greater localisation	OOLU, fenix intl, LUMOS, PowerGen, arnergy	
E Scale of operations is key to sustainability	Increasing scale is necessary to be cost competitive but is not sufficient to make Nigeria a solar manufacturing hub	GREENAGE TECHNOLOGIES, EMEL SOLAR, azuri, RenewSys, AUXANO SOLAR	
F No quality control and local standards	Lack of trust in local manufacturing, dumping of inferior products and poor customer perception of local products	BLUE CAMEL ENERGY, GREENAGE TECHNOLOGIES, OOLU	
G Local supply chain constraints	Low availability of local content and insufficient demand are constraints to early establishment	PowerGen, rensource, AUXANO SOLAR, RenewSys	

Source: Company interviews

Agenda

Nigerian solar landscape overview

Roadmap

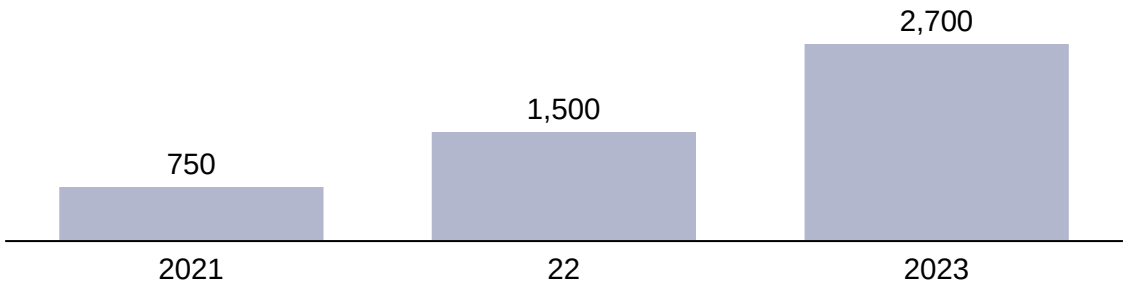
Localisation plays an important role in the 5mn solar connections target, with the goal of reaching 2.7mn locally assembled units yearly by 2023

FGN's and REA's targets for the localisation programme

Number of connections

	2021	22	2023
% local manufacturing	-	10%	15%
% local assembly	-	100%	100%

Text



Objectives of the 5mn connections programme, which localisation of the value chain can help achieve:

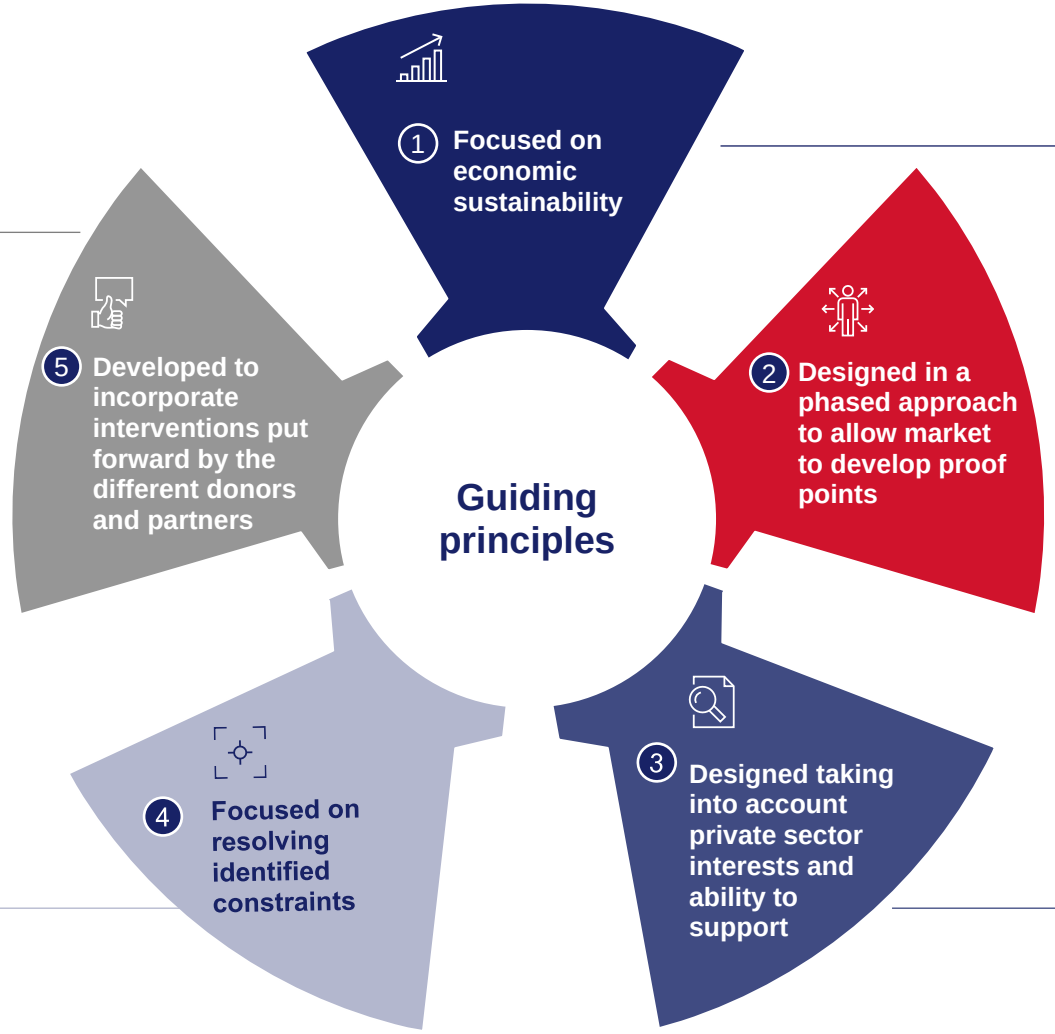
- **Providing energy access to 5 million** Nigerian households
- **Creating 250,000 new jobs** in the energy sector
- **Reducing GHG emissions**

Given the current l**ow proportion of local content in the solar assembly and manufacturing sector**, a high level roadmap is required to **support and guide the relevant parties** (FGN, REA and other donors & partners) in promoting a greater presence of localisation in the sector

The roadmap will need to build on the existing work done by other programmes and organisations

Source: REA

To get there, a roadmap will be important to coordinate the efforts of different stakeholders – it will be designed based on 5 guiding principles



5 Developed to incorporate interventions put forward by the different donors and partners

- Roadmap will be designed using key inputs from other partner stakeholders (i.e. incentives, customs) as a base, with the objective of avoiding duplication of work

4 Focused on resolving identified constraints

- Roadmap has been developed to resolve key constraints to scale-up identified in private sector interviews

1 Focused on economic sustainability

- Roadmap is focused on supporting scale-up of assembly and manufacturing where that actually makes economic sense for Nigeria

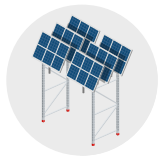
2 Designed in a phased approach to allow market to develop proof points

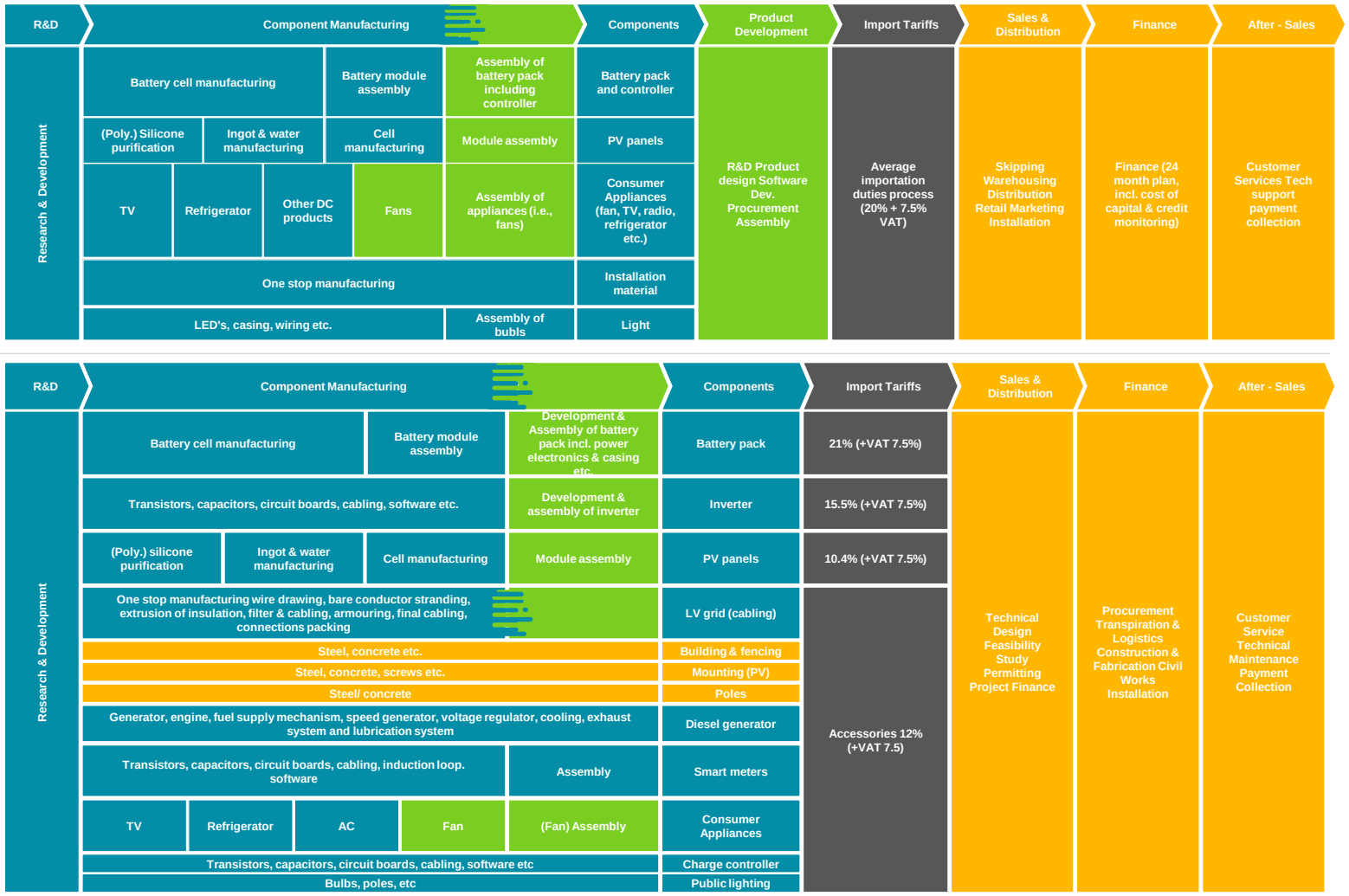
- Roadmap is meant to be an implementation guide taking into account the recognition that needs and interventions will be different at the different stages of the process

3 Designed taking into account private sector interests and ability to support

- Roadmap is taking into account the diversity of private sector players involved and their different needs
- Localisation plan is designed around roles of different archetypes of companies in the localisation programme

1: A list of attractive entry points along the value chain have been identified





Source: SEforALL

Most components of SHS and mini-grids can be assembled locally, including batteries and solar modules which represent the bulk of costs

Opportunities in manufacturing are limited to appliances, with a specific focus on fans

Nigeria also has an opportunity to **design and develop products in country**

2: The roadmap to localisation will unfold across three phases, with the most intense support happening in Phase 1

	Year 1	Year 2	Year 3+
	Phase 1: Proof-of-concept	**Phase 2: Scale-up**	**Phase 3: Maturity**
FGN targets			
Assembly	-	**100%**	**100%**
Manufacturing	-	**10%**	**15%**
Kenya example	N/A	**20%**[1]	**20%**
Key objectives	**Demonstrate potential of Nigerian market** through pilots conducted with specific private sector partners – i.e. **ability to manufacture and/or assemble** at a **competitive price and equal quality** Prove there is **sufficient off-take for** substantial quantities of **locally assembled components**	**Develop local assembly capabilities** at a **scale** that is able to **keep up with the 5mn connections programme ambitions** and targets **Foster selective manufacturing** for components for which Nigeria has a competitive advantage	**Supply demand** with locally assembled products – assembly is at scale or nearing scale **Expand on manufacturing**
Areas of support			
Company-specific interventions	**Strong company-specific support** in the pilot phase to help private sector	**Light support** focusing mainly on **investor attraction** and promotion of Nigeria	No more company specific support
Macro-level interventions	**Strong support** to coordinate interventions with the aim of **creating the right business environment conditions** to: - ensure success of pilots - attract investors in phase 2		**Ad hoc support** on initiatives that need coordination of multiple stakeholders

1. Estimated from % of local content in SHS sold by M-Kopa in Kenya, 100k SHS units were made of locally assembled solar panels out of 500k SHS units sold in 2018

Objective

This roadmap is meant to support REA, as the implementing and coordinating body, in driving and coordinating efforts to on-shore part of the solar value chain

3: Localisation will be driven by 4 archetypes of companies, each of which will be involved at different steps of the roadmap

Archetype	Manufacturing in Nigeria	Presence in solar	Description	Examples	Role
1 **Early movers**	✓	✓	Nigerian solar companies and start-ups with small to medium manufacturing/assembly capacity	GREENAGE TECHNOLOGIES, AYO, BLUE CAMEL ENERGY, arnergy, AUXANO SOLAR	**Creating proof-points** for the solar industry in Nigeria and **demonstrating viability** of localisation programme Encouraging and **creating appetite** for investors to come in Nigeria
2 **Local non-solar manufacturers and assemblers**	✓	✗	Nigerian manufacturers and assemblers of products close to solar components which could potentially start supplying solar players	EMERALD INDUSTRIAL CO. CFZE Manufacturers of products close to solar	
3 **Global downstream players**	✗	✓	Global solar players, with existing manufacturing and assembly capabilities in other countries	azuri, bboxx, M-KOPA SOLAR	**Creating scale** and increasing local manufacturing and assembly capacity
4 **Global manufacturers and assemblers**	✗	✓	Global manufacturers and assemblers of solar components (e.g., solar cells, battery cells) with large economies of scale in country of establishment	JinKO Solar, steamaco, LONGi Solar, Hanwha Q.CELLS, JA SOLAR	

Source: Web search, Company interviews

4: To successfully achieve programme targets, a range of challenges need to be overcome

Theme	Description	Quotes
Lack of accessible and affordable financing	**Providing the right financial support programmes** to manufacturers and assemblers to encourage establishment in Nigeria	*"The market can work, but there needs to be adequate financing programmes and subsidies"*
Uncertainty in off-take demand	**Implement programmes to create traction from the demand side** and encourage manufacturers and assemblers to invest in Nigeria	*"If there was more traction from the demand side, companies would follow"*
Lack of consistent and enforced quality standards	**Creating unified quality standards and local testing capacity** to make sure the market is not flooded with substandard products	*"Shipping my products elsewhere to get a certification is too expensive, but it would really help me find buyers"*
Limited pool of local manufacturing and assembly skills	**Co-design training programmes with private sector** to equip labour force with the skills adapted and required in the energy sector, with a focus on solar	*"Nigeria has the workforce, but they just need to be trained and that requires a significant investment from our side"*
Burdensome and inconsistent customs processes	**Solving the operational and financial barriers** encountered by manufacturers and assemblers in the importation process	*"The process is burdensome and painful, and duties are high compared to other SHS countries"*

Source: Company interviews

5: Interventions at both the macro and micro levels will help create a favourable business environment while empowering private companies

Suggested implementer: X CBN X GIZ X MA X OVP X NIPC X ACE-TAF X REA X NERC X MoF[1] X TBD

PRELIMINARY

	Macro level interventions	Company specific interventions
Lack of accessible and affordable financing	1 Establish a working capital facility for upstream players to import components or raw materials from the CBN through to the Commercial banks and/or from the GCF through AFC 2 Create a forex window through the CBN for upstream players to ensure timely importation of components or raw materials 3 Collaborate with commercial banks on loans requirements to ensure companies can access financial support from traditional channels 4 Establish a low interest CAPEX facility for upstream players to build and invest in long term CAPEX investments through the CBN to the Commercial banks and/or from the GCF through AFC 5 Promote investment in the upstream segment of the Nigerian solar sector through the NIPC as the single source of truth	6 Establish a support desk within the REA to get upstream players registered as pioneer status companies 7 FCDO's MA programme to provide direct transaction support to select companies to reduce the costs associated with doing a transaction 8 Create a portal with information on financial support programmes in place, and establish a support desk within the REA to support companies on applications
Uncertainty in off-take demand	9 Ensure government tenders and DISCOs have a minimum local content requirement to support local manufacturing and assembly players	10 Help during the match making between manufacturers and distributors to help them secure demand
Burdensome and inconsistent customs processes	11 Benchmark tariffs with other SHS countries and adjust tariff levels to align with best practice countries 12 Map reception process at the port with MITI, remove waste and digitalize key steps to reduce lead time and make the journey less burdensome for importers 13 Create an “express clearance” status for selected companies based on certain criteria 14 Ensure the correct application of import duties on solar components, and raw materials used in solar assembly/manufacturing by increasing transparency through greater collaboration between the ports authority, Customs, Ministry of Finance, MITI and REA	15 Establish a support desk specific to solar companies to help them on an ad-hoc basis when issues related to imports arise, with a REA secondee at the port
Lack of consistent and enforced quality standards	16 Ensure the adoption and application of IEC standards through the Standards Organization of Nigeria (SON) on all solar related products 17 Establish an accreditation center in Nigeria in partnership with the SON to support local testing and accreditaion of locally produced solar goods and decrease costs of certification 18 Streamline the application and approval process for new components to be manufactured locally with the NERC	19 Provide remedial support to those companies who fail to meet the minimum standards and criteria through the REA in partnership with the SON
Limited pool of local manufacturing and assembly skills	20 Identify and partner with 3 universities to create learning programmes tailored to the renewable energy sector, and solar in particular 21 Identify and partner with 5 existing technical and vocational training centres to introduce programmes which will support the growth of the upstream segment in the solar sector	22 Support existing upstream solar companies to establish in-house training programmes, through the REAN in partnership with existing donors 23 Encourage upstream solar companies to actively promote women and minorities in their workforce by linking any funding and support to a set of basic criteria

Source: SEforALL, Crossboundary, ACES, ACE-TAF

[1] Ministry of Finance