ANNUAL SOLAR OUTLOOK 2023

A country-by-country review of the status of solar energy in Africa.

OFFICIAL EVENT PARTNER:

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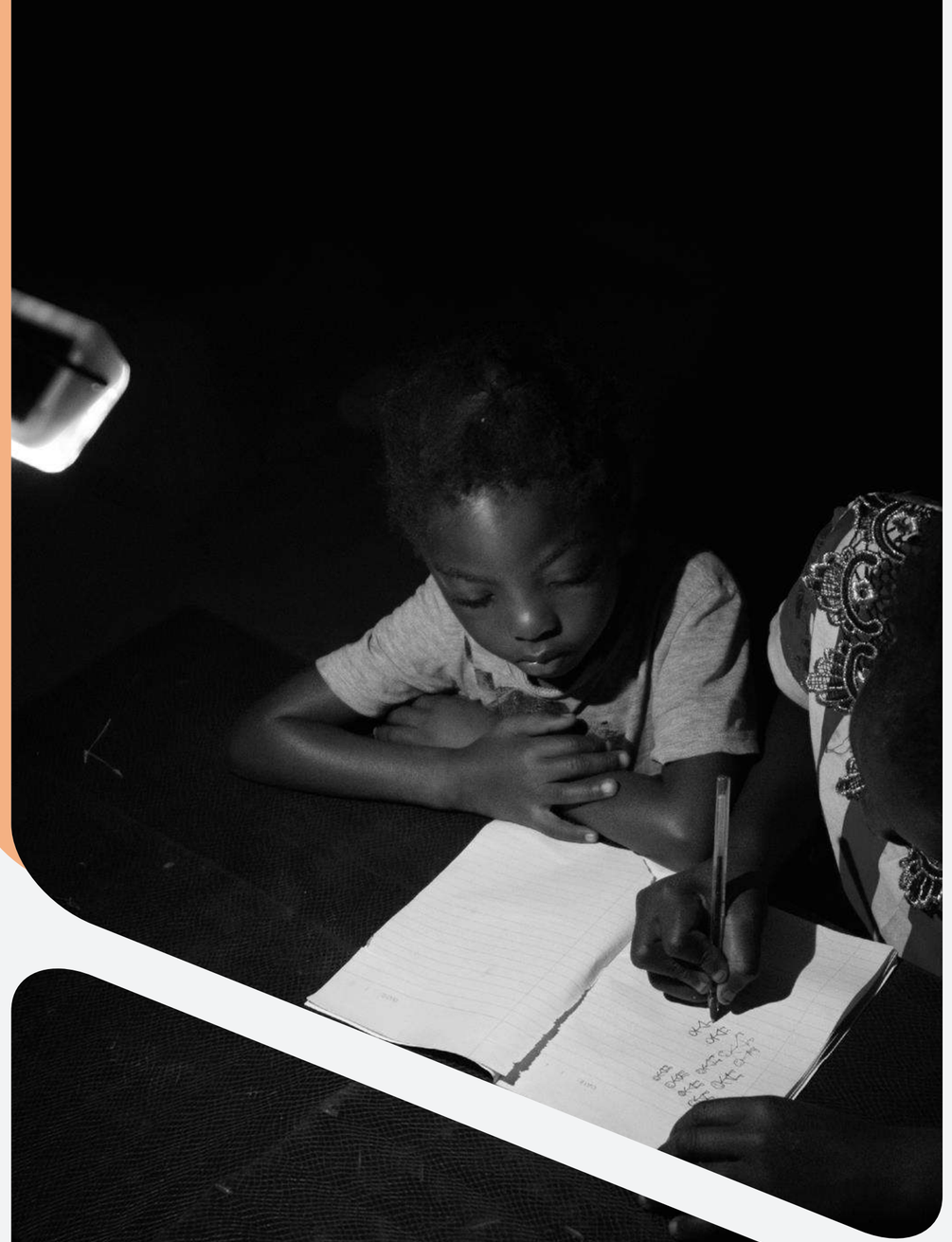
WORDS OF GRATITUDE

For the 3rd year in a row, I am delighted to present to you AFSIA's Annual Solar Outlook report. Since the 1st edition, many of you have let me know how instrumental this report has been in their daily work, being the ideal "desk companion" for any small detail or major piece of information about anything solar across the continent. These gestures of appreciation of AFSIA's work mean a lot to me, and I would like in return to share my sincere thanks to the individuals and companies who have contributed to what I believe is one of the best reports of the African solar industry.

First and foremost, I would like to congratulate Ines Rachel Dushime and Aline Uwimana for the amazing work they have delivered to make this report a reality. They have relentlessly collected and analyzed all solar updates possible throughout the year, to bring it to you in this summarized version which I hope will help you save a lot of time in your daily work. Congratulations ladies for your comprehensive work and permanent attention to detail.



Anyone who has endeavored to produce a similar report knows who much effort, time and resources this requires. And the AFSIA team would not have been able to bring you this report without the support of our growing group of partners.

I would like to extend a warm thank you to WFES – the World Future Energy Forum - for giving us a global platform for the release of this important report. Your continued support means a lot to us.

I also thank the partners of this year's edition. It is a great honor to benefit from your support to and trust in this report which we designed to be the reference in our industry. It is a pleasure working with you, not only for this report but also throughout the year, to further promote the use of solar energy across the continent. Special thanks to LONGi, JinkoSolar, meteocontrol, Trina Solar, ecoligo, JA Solar, Gridtech Infrastructure and GET.invest.

Credit: Distributed Power Africa

This year's report is an even more collective effort than ever before as we have invited the best experts globally to share their insights and knowledge.

First, I would like to thank those who accepted the invitation to contribute an article and provide exclusive market intelligence about key aspects of our industry. I am thinking here specifically of Dr. Svet Bajlekov, Sergio Montoro, Claire Le Ster, Aashna Aggarwal, Gillian-Alexandre Huart, Terje Osmundsen, Andrea Renzulli, Iarina Ciceu, Léandre Berwa, Jean-Philippe Seya and Kathleen Jean-Pierre.

And I would also like to thank our amazing group of peer reviewers who accepted the challenging mission of reviewing and correcting the information provided in this report. You may find the entire list here. I am extremely grateful for your assistance with this important piece of work of AFSIA. Being able to count on a network of experts like you is the essence of what we are creating at AFSIA and I look forward to many more years of mutual support.

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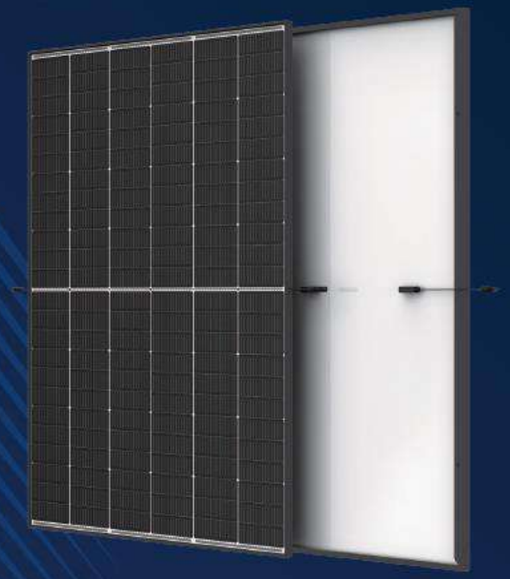

C&I
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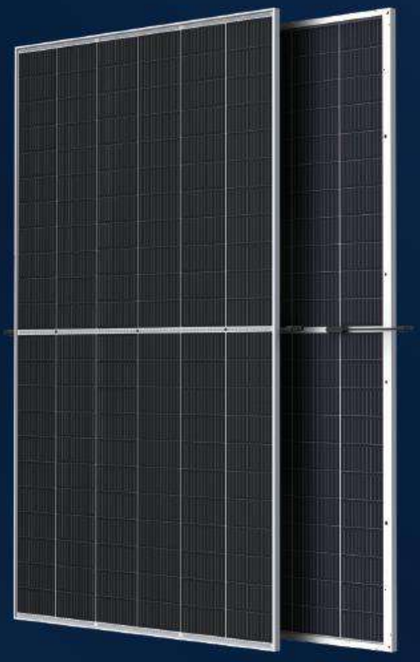

UTILITY
685W VERTEX N
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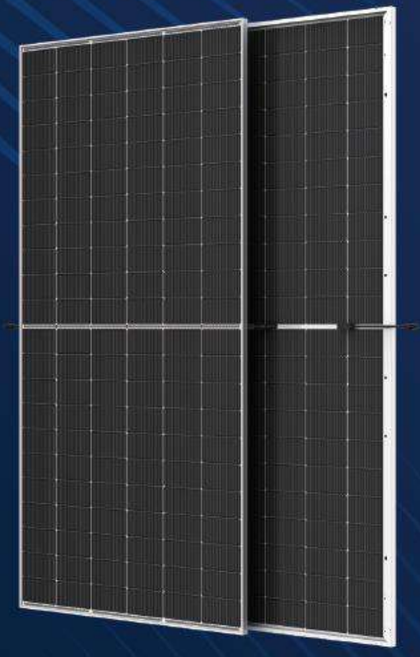

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ANOTHER RECORD YEAR FOR SOLAR GLOBALLY, COMBINED WITH PROMISING DEVELOPMENTS ACROSS AFRICA

The world has added between 220-260 GW in 2022

In 2022, the world has added an estimated 220-260 GW of new solar PV installations. No official figures are available yet and this range is based on the estimations of various sources. This brings the total global solar installed capacity at a whopping 1.15 TWp, a symbolic threshold which we indicated would be crossed in AFSIA's 2022 Annual Outlook report.

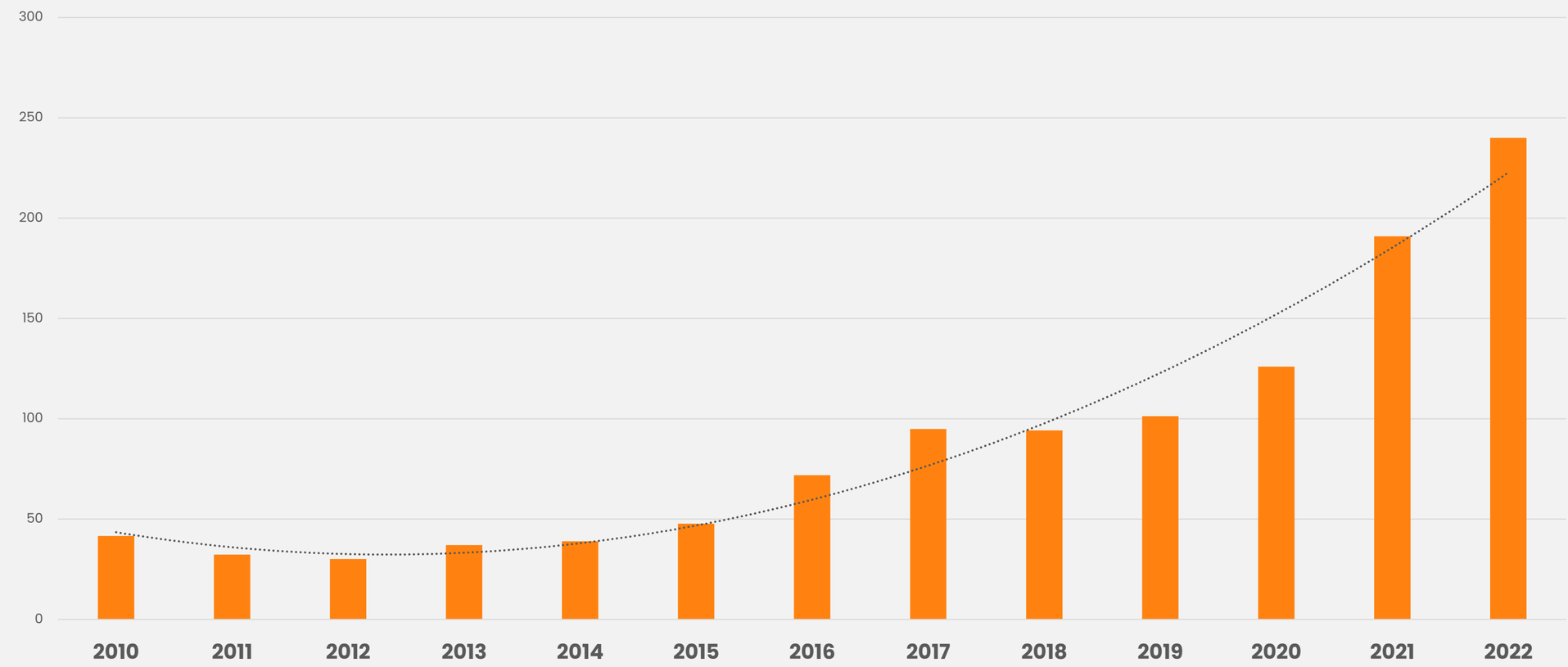
This 2022 capacity addition is equivalent to 24%-29% of all the solar PV that had been installed historically. In comparison, in 2021, 191 GW were added globally, which at that time represented 27% of all historically installed capacity.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Annual Installed	41.6	32.3	30.1	37	39	47.7	71.9	94.9	94.2	101.3	126	191	240
Y-O-Y Growth		-22%	-7%	23%	5%	22%	51%	32%	-1%	8%	24%	52%	26%
Cumulative	41.6	73.9	104	141	180	227.7	299.6	394.5	488.7	590	716	907	1147
Growth Vs History		78%	41%	36%	28%	27%	32%	32%	24%	21%	21%	27%	26%

While being an excellent year, 2022 however shows a little slow-down in year-on-year growth compared to 2021. At end of 2021, IRENA identified the total global installed capacity at 907 GW, with an addition of 191 GW during that year. That was a 52% y-o-y growth of installed capacity compared to 2020 and the best year of global solar ever.

And based on the estimated range mentioned above as reference, 2022 thus saw a y-o-y growth of “only” 15%-36%. This puts 2022 at the 4th rank of biggest annual increase since 2010 but nevertheless confirmed 2022 was a solid year for solar across the globe.

GLOBAL ANNUAL INSTALLED CAPACITY



AFRICA HAS ADDED 0.9 GW, AND AFSIA HAS MANAGED TO UNIQUELY TRACE 10 GW OF PROJECTS

If we zoom in on Africa, we notice that 2022 has been slightly less exceptional than at global level, but it has been a good year for solar nevertheless.

In 2022, the continent saw the installation of almost 1 GW of new PV capacity (949 MW), a 14% y-o-y growth compared to 2021 (833 MW, based on revised AFSIA figures).

As highlighted in last year's report, AFSIA's figures differ slightly from IRENA's figures when it comes to Africa. This is mostly based on a different methodology to track installed capacity (importation figures for IRENA vs. documented actual projects for AFSIA). While AFSIA's figures are of course underestimating the real total installed capacity across Africa (not all projects are documented and we do not track residential installations), our data offers an alternative look at the solar reality in Africa with more granularity and more info on specific projects when available.

As a result, the global trend is fairly similar but variations may be identified for specific years between IRENA's and AFSIA's records. In total, a gap of 2 GW still needs to be filled between our respective databases (12.4 GW total for IRENA vs. 10.5 GW total for AFSIA), while 1.8 GW worth of confirmed operational projects still need to be assigned to a specific year of commissioning in the AFSIA database.

The positive news despite these discrepancies is that no matter which data source is being considered, Africa is now home to more than 10 GW of identified solar projects and this is another symbolic milestone for the continent!

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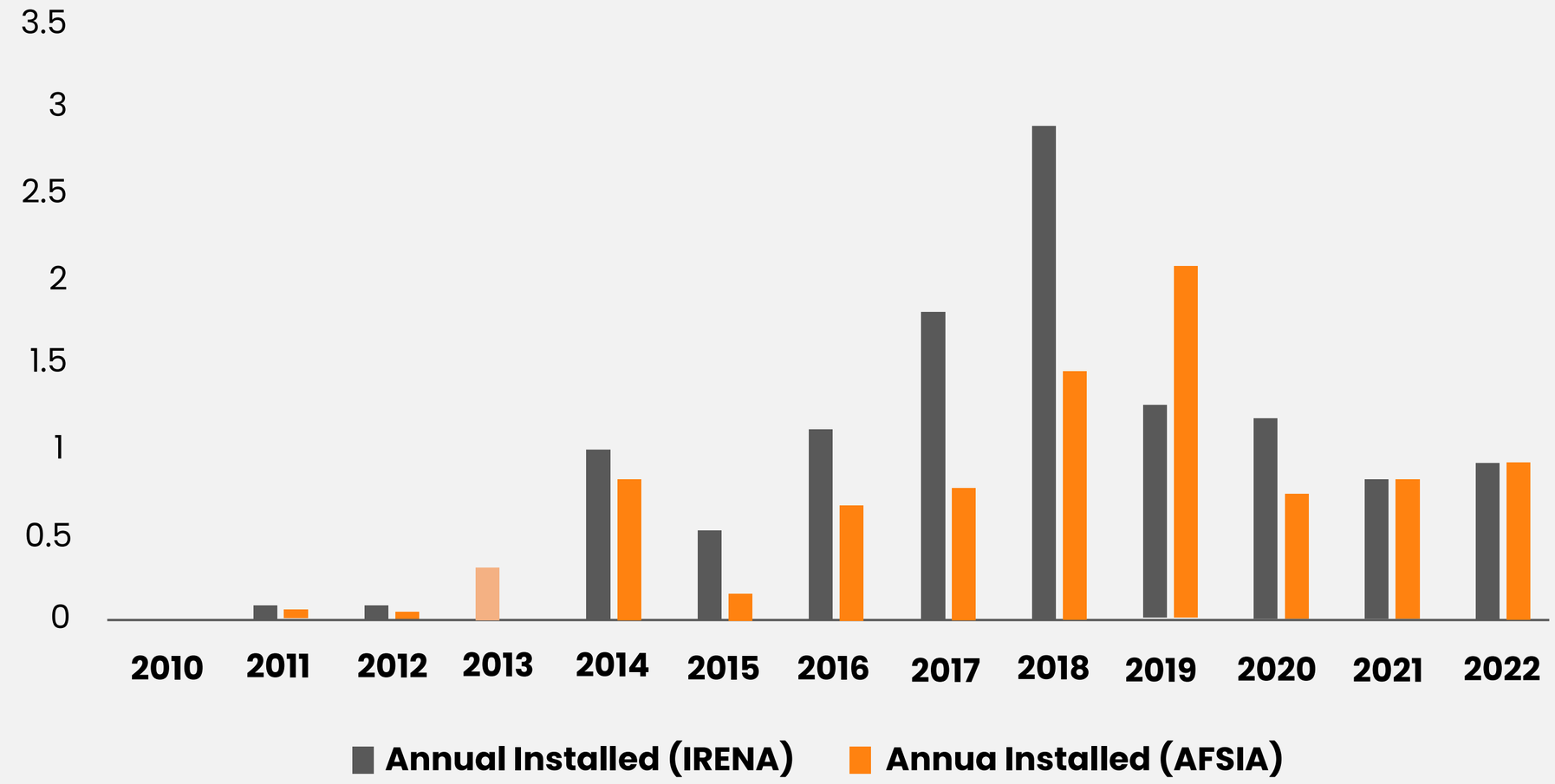
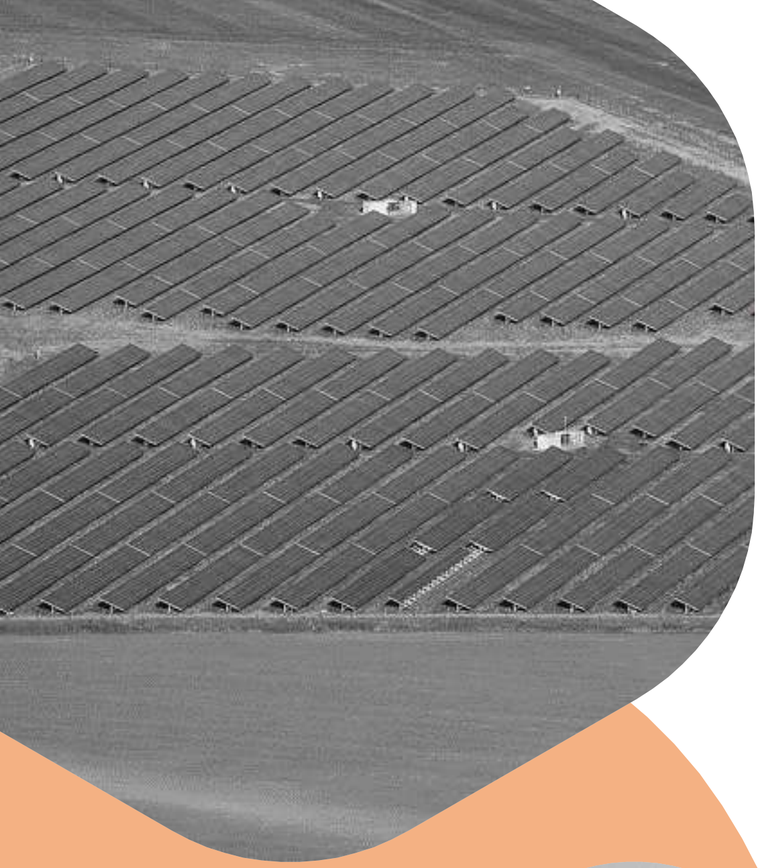
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Annual Installed (IRENA)		0.09	0.08	0.31	1.01	0.53	1.14	1.8	2.9	1.3	1.2	0.8	0.9
Y-O-Y Growth			-11%	288%	226%	-48%	115%	58%	61%	-55%	-8%	-31%	-14%
Cumulative	0.2	0.3	0.4	0.7	1.7	2.3	3.4	5.2	8.1	9.4	10.6	11.4	12.4
Growth Vs History		38%	24%	76%	140%	31%	50%	53%	56%	16%	13%	8%	8%

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Annual Installed (AFSIA)		0.0	0.0	0.0	0.8	0.2	0.7	0.8	1.5	2.1	0.8	0.8	0.95
Y-O-Y Growth			-62%	4%	4803%	-79%	283%	19%	85%	40%	-64%	10%	14%
Cumulative	0.0	0.1	0.1	0.1	1.0	1.1	1.8	2.6	4.1	6.2	7.0	7.8	8.7
Unassigned to year													1.8
Total Cumulative													10.5

AFRICA ANNUAL INSTALLED CAPACITY





SOLAR SPREADS ACROSS THE CONTINENT

Solar in Africa has historically been driven by a limited number of “hot spots” such as South Africa, Morocco and more recently Egypt. While these countries continue leading the charge with important solar initiatives being launched and developed, it is interesting to note that more and more other countries are now also adopting solar.

This means not only that more people across the continent have now access to clean and reliable power, but also that the industry as a whole gets a wider territory to expand its presence in, develop projects and partnerships, and grow its business footprint. This is a very positive trend for the industry, which will inevitably lead to economies of scale through network effects, as well as allow local companies and technicians to further specialize in solar, grow their business and hire more.

In 2022, if we take into account installations for large-scale, C&I, mini-grids and SHS (hence not accounting for residential installations)

30 countries in Africa have installed more than 1 MW

16 countries in Africa have installed more than 10 MW

2 countries in Africa have installed more than 100 MW

And the winner for 2022 in terms of installed capacity is… Angola! Angola has indeed commissioned 2 major large-scale projects this year, namely the 188 MW Biópio solar plant and the 96 MW Baía Farta solar plant, both developed by the consortium MCA Group, Sun Africa LLC, Hitachi ABB. This is quite an impressive achievement for companies with relatively limited track record in the African solar space.

The top 5 is further composed of South Africa (111.8 MW), Egypt (80 MW), Ghana (71.3 MW) and Mozambique (41.9 MW).

Row Labels	C&I	large scale	mini-grid	SHS	wheeling	Grand Total
Angola		284.0	0.0	0.0		284.0
South Africa	110.9				0.9	111.8
Egypt	49.0	31.0				80.0
Ghana	2.8	68.5				71.3
Mozambique	0.0	41.0	0.5	0.4		41.9
Guinea	33.0			0.3		33.3
Burkina Faso		30.0		0.5		30.5
Madagascar	0.2	29.1		0.5		29.8
Malawi		28.5		0.6		29.1
Namibia	4.7	24.0	0.2			28.8
Benin		25.0	0.1	1.0		26.1
Senegal	2.3	23.0	0.1	0.4		25.7
Kenya	14.0		0.5	7.7		22.2
Central African Republic		15.0		0.0		15.0
Tunisia		12.2				12.2
Zimbabwe	12.0			0.1		12.1

Row Labels	C&I	large scale	mini-grid	SHS	wheeling	Grand Total
Nigeria	6.6		1.5			8.1
Uganda	2.3	4.0	0.6			6.9
Sierra Leone		5.0	0.4			5.4
Mali	4.0		1.0	0.2		5.1
Seychelles	0.1	5.0				5.1
Comoros		4.0				4.0
Ethiopia				2.1		2.1
Tanzania	1.0			0.9		1.9
Zambia				1.7		1.7
Cote d'Ivoire	1.2			0.4		1.6
Mauritania	1.5					1.5
Rwanda	0.2		0.1	1.2		1.5
Somalia	0.0			1.3		1.3
Uganda				1.0		1.0
Cameroon				0.8		0.8
Togo				0.7		0.7

Row Labels	C&I	large scale	mini-grid	SHS	wheeling	Grand Total
São Tomé and Príncipe		0.6				0.6
Saierra Leone				0.4		0.4
Republic of the Congo				0.2		0.2
DRC	0.2			0.0		0.2
Gambia				0.1		0.1
Cape Verde	0.1					0.1
Liberia				0.1		0.1
Ghana				0.1		0.1
Botswana	0.0					0.0
Lesotho	0.0					0.0
Somaliland	0.0					0.0
Burundi				0.0		0.0
The Gambia				0.0		0.0
Namibia				0.0		0.0
Chad				0.0		0.0
Niger				0.0		0.0
Grand Total	246.0	629.8	5.0	67.0	0.9	948.7

The growing footprint of solar becomes even more impressive if we look at projects under development. If we take into consideration projects which have been announced in 2022, then 49 African countries are considered to be working on at least 1 MW of solar and 29 on more than 100 MW.

And if we also include announcements made in 2021, then every single African country is expected to see new solar installations in the relative short term.

Finally, it is also important to bring installed capacities in contrast with other key national metrics. It is indeed unfair to compare a country with 100 million inhabitants with another which would be home to only 10 million. Likewise, the level of development of the country (for example measured by total installed capacity across all technologies) can also be used an indicator to evaluate how strongly or poorly a country performs with regards to solar.

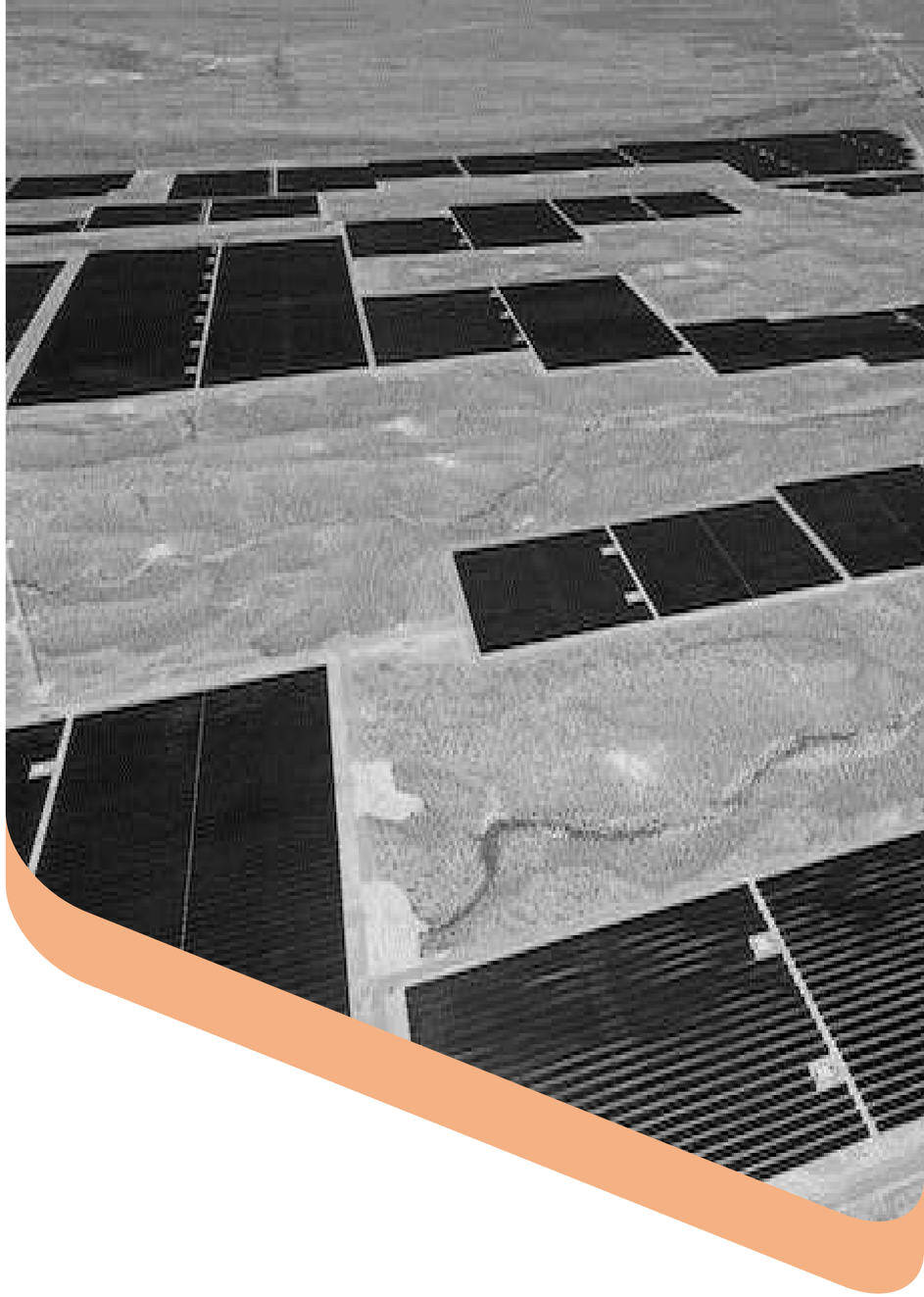
The table below aims at bringing a somewhat fresh perspective on national solar performance. It shows the top 16 countries based on “Wp/capita”. When comparing “apples to apples”, we notice that this “top solar countries” ranking looks quite different from the traditional “total solar capacity installed” which is dominated by South Africa, Egypt and Morocco.

Country	MWp	Population	Wp/capita
Seychelles	17.9	99,858	179.4
Namibia	291.4	2,655,167	109.7
Cape Verde	34.2	570,977	60.0
South Africa	3,850.8	69,662,216	55.3
Morocco	948.5	37,996,605	25.0
Egypt	2,255.6	107,127,291	21.1
Mauritania	86.1	4,953,241	17.4
Senegal	230.1	99,858	12.9
Eswatini	14.2	99,858	11.9
Zambia	226.0	19,662,940	11.5
Algeria	380.5	45,817,271	8.3
Angola	284.2	35,406,345	8.0
Togo	58.2	8,760,629	6.6
Kenya	323.4	56,712,859	5.7
Malawi	111.0	20,357,811	5.5
Ghana	173.9	32,681,937	5.3

C&I DOMINATES 2022, MINI-GRIDS REGRESS

Out of the total 948 MW which AFSIA managed to identify as being commissioned in 2022, the breakdown is as follows:

SEGMENT	CAPACITY	% OF 2022	Y-O-Y GROWTH
C&I	246 MW	26%	61.5%
LARGE-SCALE	630 MW	66.5%	1.7%
MINI-GRID	5 MW	0.5%	-18%
SHS	67 MW (est)	7%	20.7%
TOTAL	**948 MW**	**100%**	**13.8%**

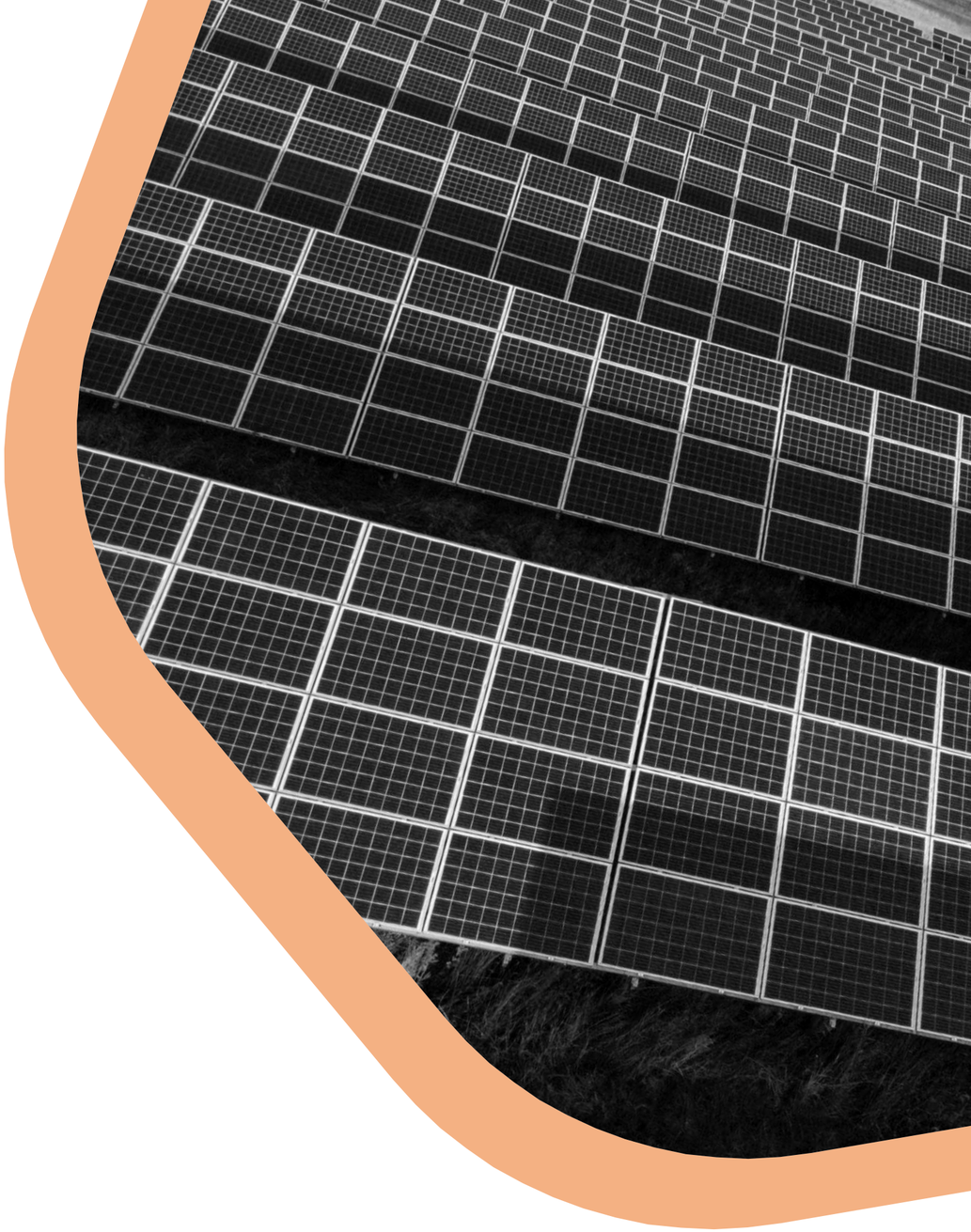


While large-scale still contributes for the largest share of installed capacity, it is interesting to note that C&I now already represents almost 30% of all installations across the continent (a trend which we announced in the first edition of AFSIA's Annual Outlook report).

The y-o-y growth of C&I is particularly noteworthy (+61.5%). And with the recent multiple announcements of large-ticket financing deals for C&I projects and M&A activity in the segment, it is easy to imagine that this trend is set to continue.

C&I will play an extremely important role in South Africa particularly. Looking at data for projects under development, we notice that announcements for C&I projects only represent 4.8% of potential future capacity across Africa (but we know that many large-scale projects unfortunately never see the daylight, and this figure is potentially also biased by a group of super large green hydrogen projects announced, more about this later).

Yet, if we zoom in on South Africa, we notice that 22.2% of all projects currently announced are already related to C&I (including wheeling projects). This should not come as a surprise though when taking into account the need for companies for take their power supply into their own hands given the failure of ESKOM and the simplified procedure to supply up to 100 MW of capacity for own consumption.



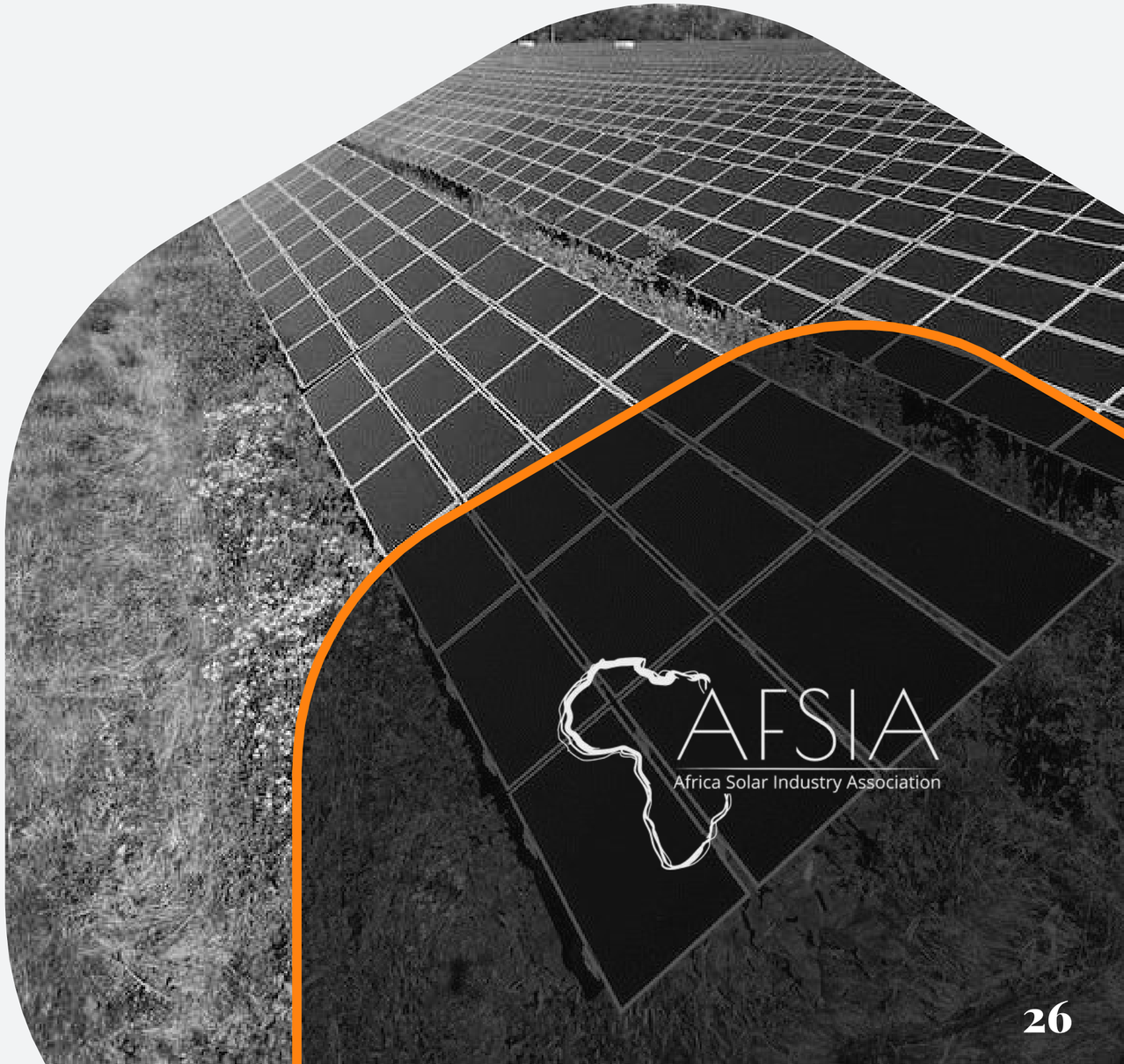
PROJECTS UNDER DEVELOPMENT
(2021 & 2022 ANNOUNCEMENTS)

	AFRICA-WIDE		SOUTH AFRICA	
SEGMENT	CAPACITY	% SHARE	CAPACITY	% SHARE
C&I - CAPTIVE	3,567 MW	3,2%	1,611 MW	10.6%
C&I - WHEELING	1,768 MW	1.6%	1,750 MW	11.5%
LARGE-SCALE	105,255 MW	94.3%	11,798 MW	77.8%
MINI-GRID	1,030 MW	0.9%	0 MW	0%
TOTAL	111,622 MW	100%	15,159 MW	100%

Continent-wide data also indicate that mini-grids have had a difficult year in 2022, with a regression of 18% y-o-y in terms of installed capacity (only 5 MW installed in 2022). This segment is still very dependent on grants and subsidies while it tries to identify solutions that will lead to pure commercial bankability. As a result, its progress is also limited by the availability of support programs and initiatives (or the lack thereof).

The number of countries where the mini-grid segment has been active is relatively limited. Nigeria leads the charge with close to 1.5 MW of new capacity, followed by Mali, Uganda, Kenya, and Mozambique.

Finally, SHS has experienced a solid year with an estimated 20.7% increase y-o-y. The data for the full 2022 year can only be estimated at this point as only sales for H1 2022 have been shared thus far. The estimated total of 67 MW of SHS for 2022 is a great increase from last year, driven primarily by the continental SHS majors. But much work is still required to equal the historical performance of 2019 and 2020, which saw 80 and 91 MW of SHS brought to market respectively.



NOT GREAT WHEN COMPARED TO THE REST OF THE WORLD, BUT GREAT PROSPECTS AHEAD

When comparing newly-added or total installed solar capacity between the world and Africa, one must recognize that Africa is still very much underperforming when considering its size, population and/or solar potential. Africa now hosts less than 1% of the global solar capacity installed, and installed less than 0.5% of the 2022 global new capacity installed. As such, one may say that solar in Africa is regressing compared to the rest of the world.

Yet, Africa offers lots of opportunities when it comes to solar and these opportunities can be very different than in other parts of the world.

The first such opportunity lies in the C&I segment. As previously mentioned, this segment already represents 28% of the 2022 new capacity installed, with a y-o-y growth of 60%+. And this exponential growth is set to continue as more than 5 GW of C&I projects under development have already been advertised in one way or another. This represents almost 50% of the total installed capacity across the continent to date. Out of this 5.3 GW under development, 3.4 GW is based in South Africa alone.

C&I is not unique to Africa. But C&I in Africa comes with additional layers of interest. From a technical point of view, C&I in Africa often requires a higher level of technicity because it needs to integrate unstable grids, storage and alternative power supply such as diesel generators. But also in terms of impact, C&I encompasses much more than “just” procuring cheaper electricity. Thanks to solar, companies and industries in Africa can enjoy a more stable electricity supply, which in turn allows them to operate in a smoother and more predictable way. This naturally leads to improved business operations and more job creation. In a continent where unemployment rate is already too high and 60% of the population is below 20 years old (hence soon coming to the job market), ensuring job creation and economic inclusion is the #1 priority to ensure long-term stability. C&I solar, indirectly, contributes to this.

The other major opportunity comes from green hydrogen. Developed economies are hungry for hydrogen, and more specifically cheap and green hydrogen. Thanks to Africa’s stellar solar irradiation, the continent offers some of the best features to produce green hydrogen. And the large industrial conglomerates have understood this some time ago already and have contributed to the recent (sometimes extravagant) announcements of green hydrogen projects in Africa. At the time of writing this report, 115 GW of large-scale projects are said to be under development in Africa, out of which 52 GW exclusively for green hydrogen! This represents 5 times the total installed solar capacity in Africa.

While not all projects announced might come to fruition, these announcements may not be as unrealistic as many may think. A first 100 MW project was already commissioned in Q3 2022 in Egypt. And for the remaining projects, the combination of attractive economics of green hydrogen in Africa and developed economies pushing for these projects to be developed so they can import cheap green hydrogen for their own consumption back home, push us to believe that green hydrogen in Africa is based on solid fundamentals.

The third exciting trend we are seeing for solar in Africa is rather indirect and is linked to the exponential growth of electric mobility across the continent. Mobility in Africa is mainly driven by motorbikes and recent technology now allows to drive an electric motorbike (new or retrofitted) at a significantly lower costs than the traditional ICE (internal combustion engine). These unbeatable economics are already causing a boom in taxi moto drivers switching to electric in markets where these motos are available. And it is anticipated that the rest of Africa will soon follow.

But to power these electric bikes, renewable energy is required. Indeed, powering electric bikes with electricity produced through fossil fuel power plants would only displace the problem and would offer no real solution. Moreover, all these electric motor bikes will represent an additional electricity demand and many African countries already do not have sufficient power to address the

existing demand. You may find a dedicated article on this topic further in this report. This article highlights why solar is the ideal (and maybe only!) companion to support and enable the growth of electric mobility in Africa. And the magnitude of the new solar capacity required may surprise you. AFSIA's info indicate that to support commercial moto taxis to switch to electric, most African countries might need to double or triple their existing installed capacity. This will of course come with many challenges. But out of all possible solutions, solar is the most adapted for this need and this represents an amazing opportunity for all solar professionals across the continent.

Finally, we would like to highlight PUE (Productive Use of Energy) as our last exciting trend for solar in Africa. For the past decade, much efforts and money have been invested in electricity access, allowing the most vulnerable people in Africa to get access to basic comfort such as lighting and communication means (charging cell phones, listening to radio, watching TV). These solutions, mostly supported by SHS and mini-grids, have indeed improved the lives of millions across the continent. But a growing number of voices have highlighted that more should be done to empower people with revenue-generating solutions before thinking of being able to watch cable TV or acquire the latest smart phone.

PUE is a new segment in the solar eco-system which encompasses all these solutions, mostly based on solar energy, which allow for some kind of economic activity which was either already possible but at a very high cost (relying on a diesel generator for example) or simply not possible at all. PUE is at the intersection of SHS (complete stand-alone kits with solar and device/machine) and C&I (because the purpose of the kit is to run an economic activity, albeit small).

We are only at the very early days of PUE and yet there are already millions of users of these solutions, and dozens of solutions are already available on the market. Very little information currently exists on this new solar segment and this is why PUE is not yet included in our Annual Outlook report. But the AFSIA is currently compiling what intends to be the most comprehensive catalog of PUE solutions to share with the community in an effort to increase awareness and understanding about these very exciting solutions. Stay tuned for this new AFSIA report in March 2023!

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25 YEARS

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FOREWORD

I am delighted to share with you the 3rd edition of AFSIA's Annual Solar Outlook for solar energy in Africa.

2022 has again been a year of solid growth for solar in Africa, albeit at a lower level than elsewhere across the globe. In light of the massive challenges that have plagued the globe since 2020, this growth of solar in Africa in 2022 remains commendable and highlights very strong fundamentals.

Large-scale solar has maintained a comparable level to 2021. This means that despite the many challenges faced by the continent (particularly hit this year by food insecurity, inflation and currency devaluation), a sizeable number of large-scale projects has nevertheless been commissioned. But more systemic obstacles remain in the way of more large-scale projects: off-taker's poor creditworthiness and lack of bankability of contractual agreements.

Despite these challenges, one segment has particularly outperformed all others: C&I solar. This segment has shown impressive resilience and growth in 2022, delivering on the promise we identified in previous editions of this report.

PUE or productive use of energy solutions are also gaining in popularity and should be watched closely in the near future. While very little is shared about PUE in this annual report, the AFSIA team is preparing a dedicated report on PUE to bring this nascent solar segment the attention it deserves.

The fact that these 2 segments have overperformed other segments comes from their intrinsic value to the end-users: they address people and companies who are already spending money on alternative, but less convenient and/or more expensive solutions. In contrast, other solar segments, as long as they continue relying on subsidies and development aid, are at risk of continuing their dependency on external factors, as might have been the case in 2022.

Looking forward, we anticipate a bright future for solar in Africa. This should be driven by a continued exponential growth of C&I, the finalization of gigantic green hydrogen projects, the rise of e-mobility which will undeniably be supported by solar and the growing adaptation of PUE across vast segments of the economy. Large-scale projects (probably combined with large-scale storage) will of course continue to contribute to the growing solar installed capacity across the continent, but as always in a very punctual and somewhat difficult to predict manner.

MEET THE TEAM

AFSIA
Africa Solar Industry Association

INÈS	ALINE	JOHN	VESTINE	JOSÉE	VINCENT	KERSY	ÉUGENIE
TEAM MANAGER	MARKET INTELLIGENCE MANAGER	CEO	DIGITAL COMMUNICATION MANAGER	COMMUNITY MANAGER	PARTNERSHIPS MANAGER	RESEARCH ASSOCIATE	EVENTS COORDINATOR

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Mobilising Renewable Energy Investments

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Funding Database

100+ financing instruments for renewable energy projects

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Prospect

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prospect.energy

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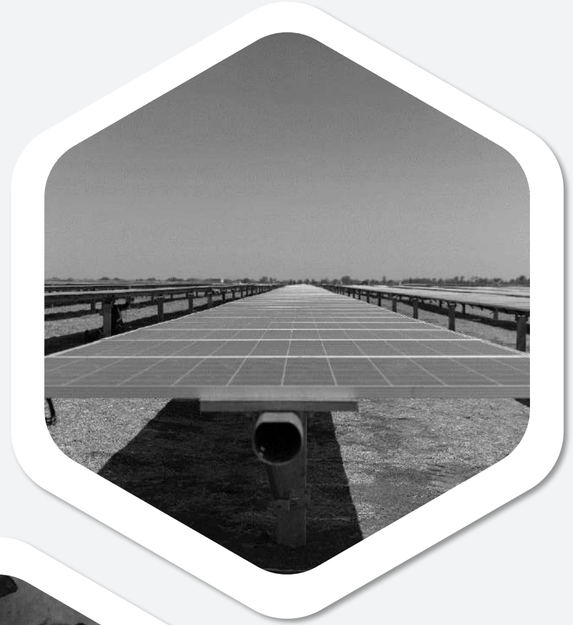

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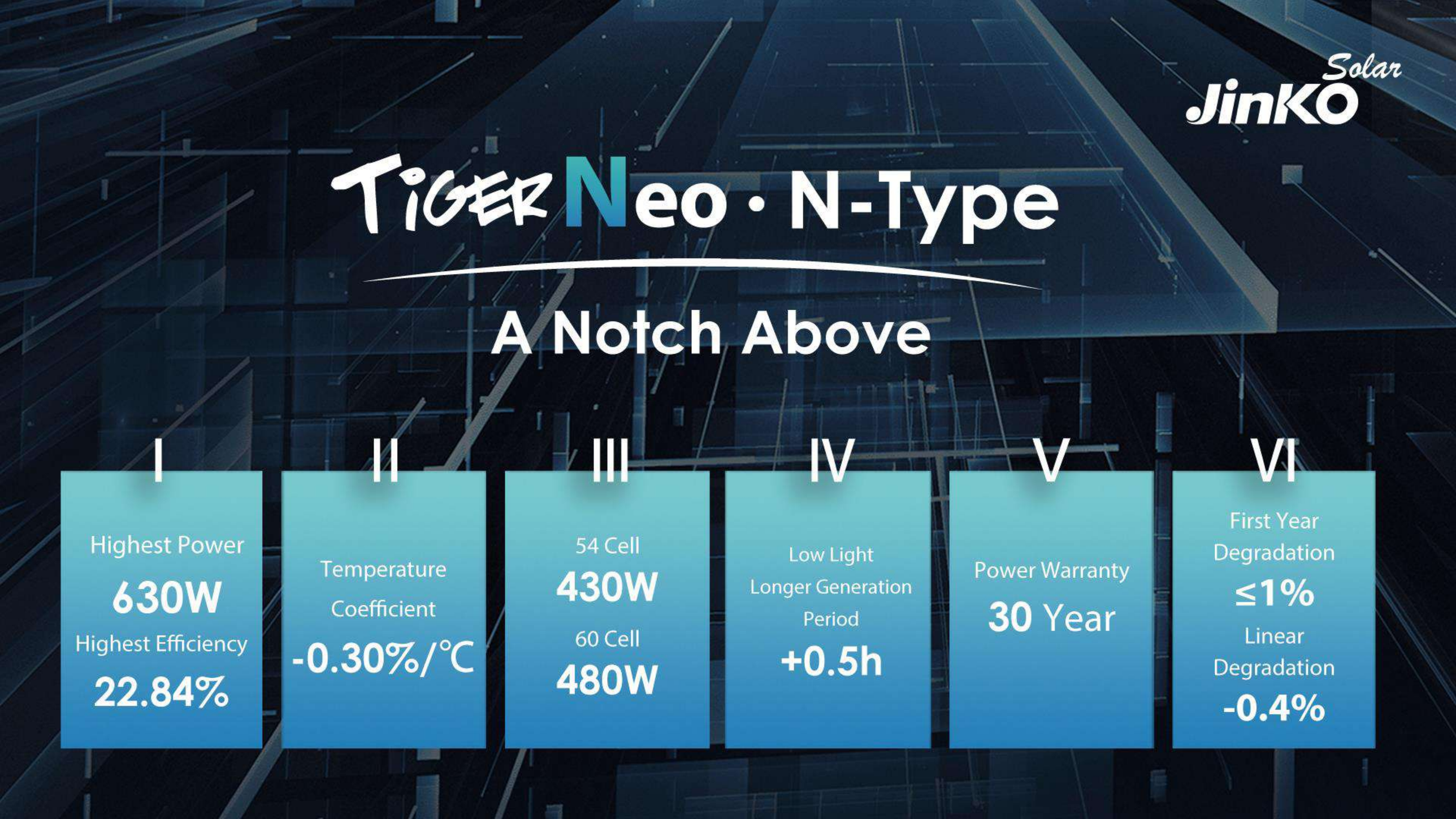
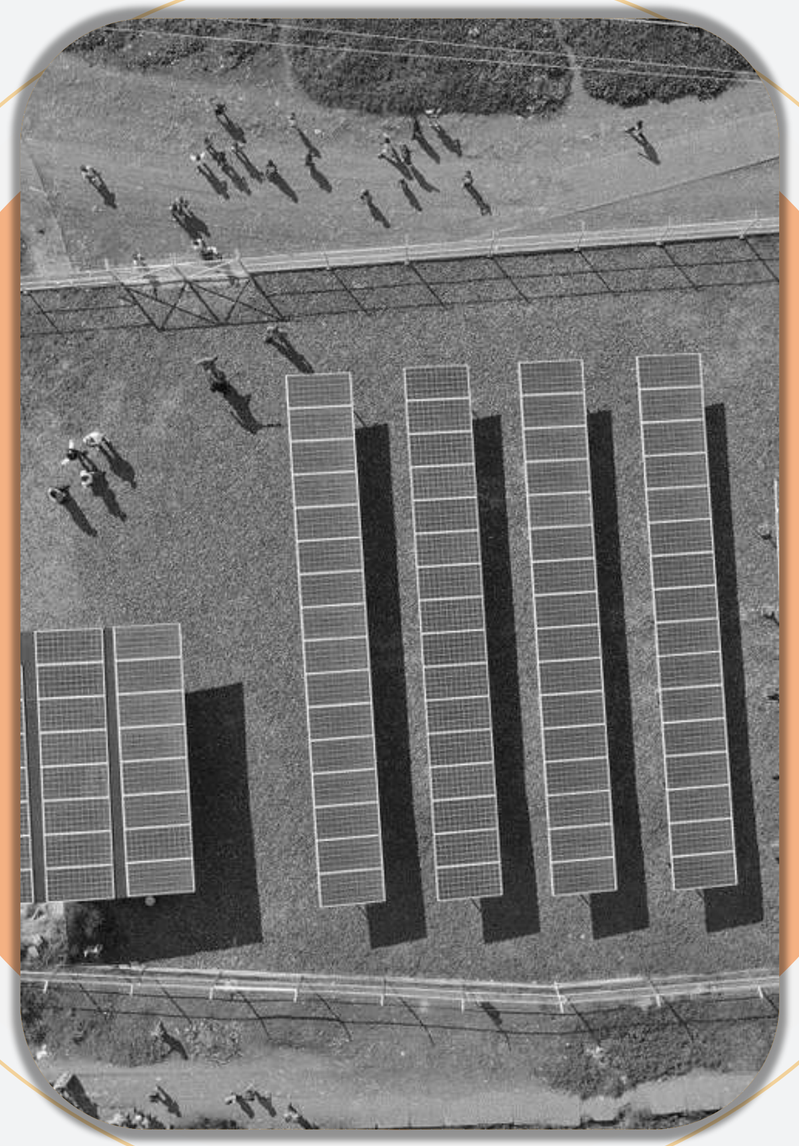

Solar
JinKO
TiGER Neo · N-Type
A Notch Above
I
Highest Power
630W
Highest Efficiency
22.84%
II
Temperature
Coefficient
-0.30%/℃
III
54 Cell
430W
60 Cell
480W
IV
Low Light
Longer Generation
Period
+0.5h
V
Power Warranty
30 Year
VI
First Year
Degradation
≤1%
Linear
Degradation
-0.4%



HOW TO GET THE MOST OUT OF THIS REPORT

AFSIA's Annual Solar Outlook report distinguishes itself from other industry reports mainly through its format. Our approach is to present a collection of concise yet information-rich "**country vignettes**" summaries, containing all key information about solar. A such, it aims at being the year-long reference document for all solar decision-makers active in Africa. This report intends to help solar professionals get **fast access to verified and sourced information** and quickly identify business opportunities.

Each country vignette contains synthesized data about solar in the country. This information has been **gathered through a continuous market watch** conducted by the AFSIA team. This year, we have brought a second layer of quality by asking our **expert peer reviewers** to provide additional input on their respective country of expertise.

All info is presented in summarized format to provide a **"straight-to-the-point" read**. But every piece of information is also sourced so the reader can easily track the origin of the

information and decide to collect complementary information directly from the source. (We invite you to download the digital version of this report for optimal use of the sources).

In between country vignettes, the reader will **find topical articles on some key trends of our industry**. These articles are not meant to give a comprehensive review of the topic, but rather provide a peculiar point of view of a specific aspect of solar in Africa. Hopefully, some of these articles will also open the reader's eyes on some of the most exciting elements that make solar in Africa so different than in other geographies.

At the end of this report, the reader will also get a chance to view the key data presented on each country vignette in **summarized and comparative tables**. This will allow the reader to quickly identify which countries apply a "0 import duty" policy or which country has the highest electricity tariffs for commercial and industrial customers, to cite just 2 examples. This should help the reader quickly identify the next targets for international expansion and/or business development efforts.

We hope you will enjoy AFSIA's 3rd Annual Solar Outlook report and look forward to your comments to make future reports better and more useful. Please do not hesitate to share your suggestions and remarks so that we can continue building a strong and growing industry together.

WEBSITE
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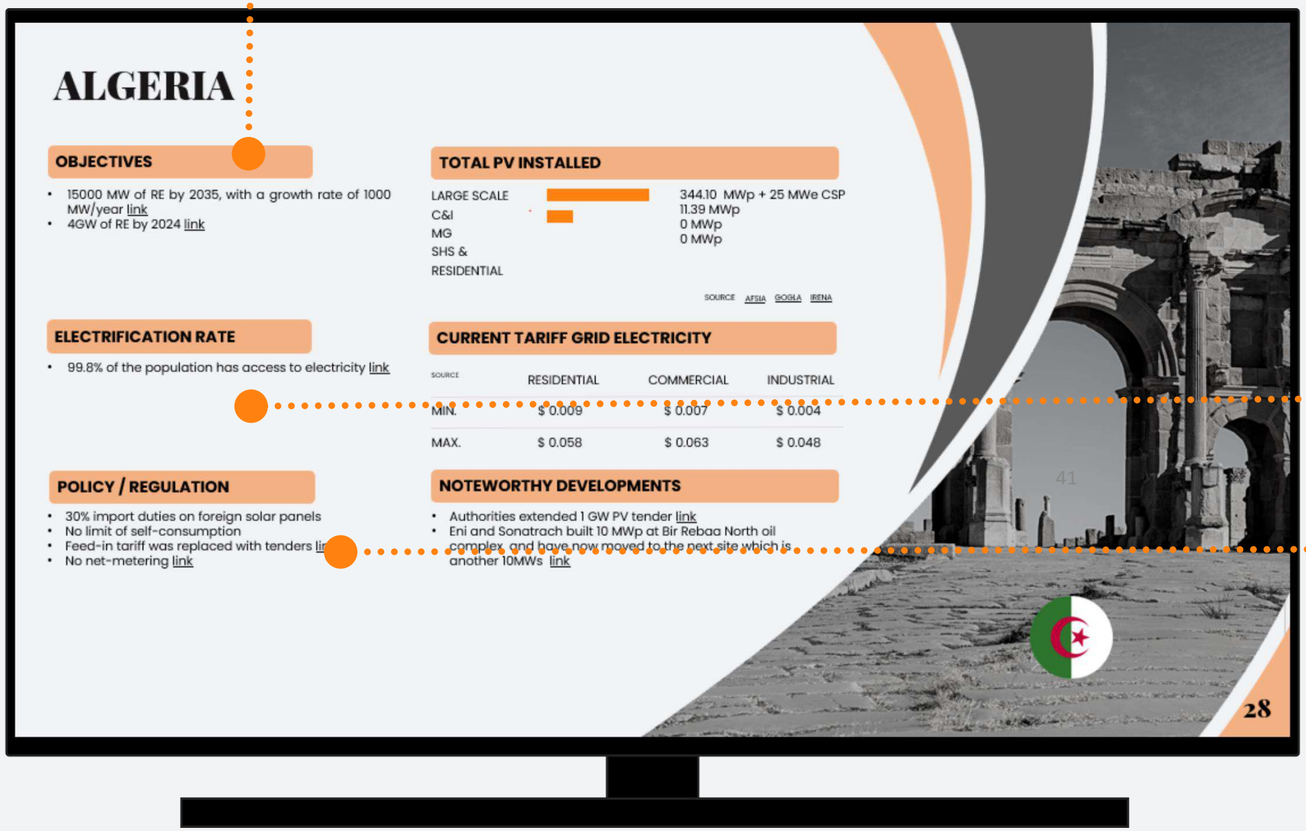
INFO@AFSIASOLAR.COM

COUNTRY VIGNETTE EXPLAINED



OBJECTIVES

This section contains information on the objectives of a country to include renewable energy in its energy mix. Targets are set for the next 5 years, 10 years or maybe more. (in a future edition, we will compare objectives and achievements)

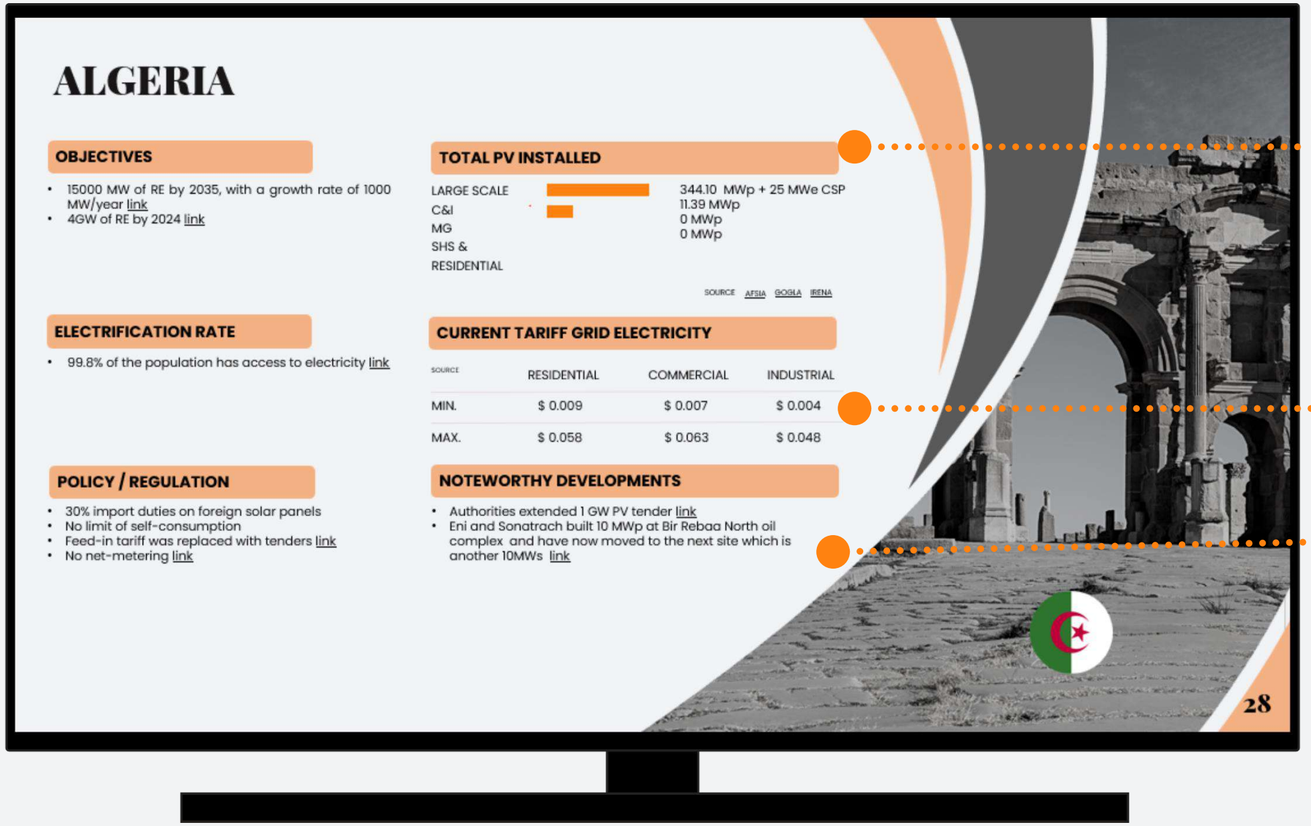
ELECTRIFICATION RATE

This shows the percentage of people in each country that has access to the grid and/or electricity. It also highlights electrification rate objectives in the near future. Please keep in mind that different countries count “electrification” differently. In some countries it means “connected to the grid”, in some other it means “has access to lighting, even through SHS”.

POLICY / REGULATION

Lists all applicable rules in terms of duties, taxes, exemptions, net-metering, wheeling, feed-in tariffs or any special government program that supports or restricts the deployment of solar or renewables in general in a country.

COUNTRY VIGNETTE EXPLAINED



TOTAL PV INSTALLED

Displays figures of the currently installed capacity as identified by AFSIA for each solar segment.
We only display figures of projects that have been verified by AFSIA and are recorded as such in AFSIA projects database.

CURRENT TARIFF GRID ELECTRICITY

Represents the tariff charged to different types of consumers classified by residential, commercial, and industrial depending on their electricity consumption. This tariff provides the range between the minimum and the maximum $/kWh charged per category in this country. The prices shown are exclusive of VAT.

NOTEWORTHY DEVELOPMENTS

Identifies bigger projects/programs that are either under development, construction, tendering or any other phase of development and which are expected to significantly contribute to the solar opportunity in a given country.

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COUNTRY SLIDE

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JA SOLAR

DEEP BLUE 4.0

Infinite Future

High Efficiency & Power

Efficiency up to 22.4%, power 625W

Low Degradation

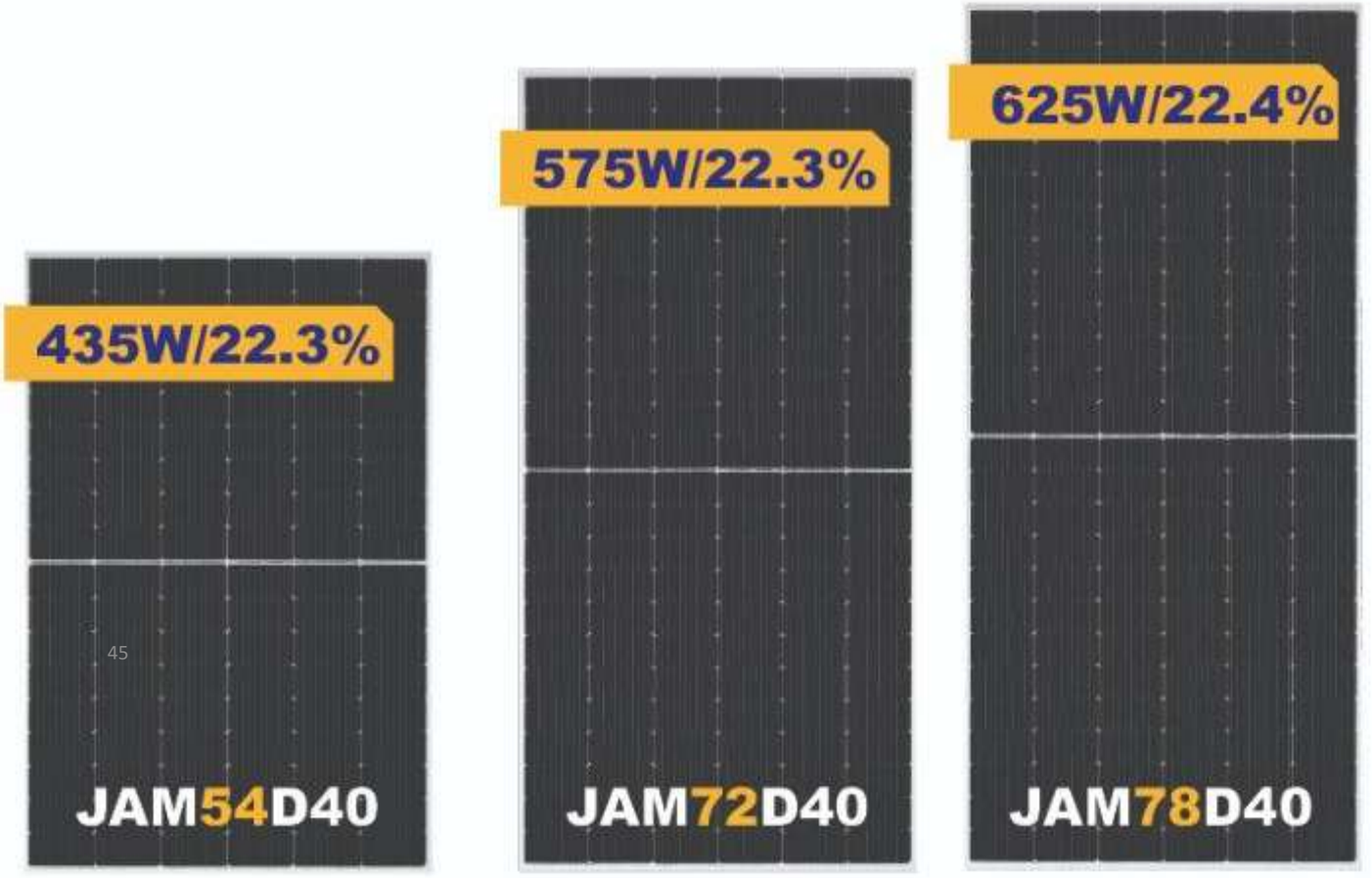
1st year degradation < 1%,
annual degradation over 30 years < 0.4%

Lower Temperature Coefficient

-0.30%/℃ temperature dependence of Pmax (ΔPmax/ ΔT)

Higher Bifacial Benefits

Bifaciality 80%. Bring more electricity generation.



(1722×1134mm)

(2278×1134mm)

(2465×1134mm)

Residential

Commercial & Industrial Utility-Scale

ALGERIA

OBJECTIVES

- 15000 MW of RE by 2035, with a growth rate of 1000 MW/year link
- 4GW of RE by 2024 link

TOTAL PV INSTALLED

LARGE SCALE	344.10 MWp + 25 MWe CSP
C&I	11.39 MWp
MG	0 MWp
SHS & RESIDENTIAL	0 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 99.8% of the population has access to electricity link

CURRENT TARIFF GRID ELECTRICITY

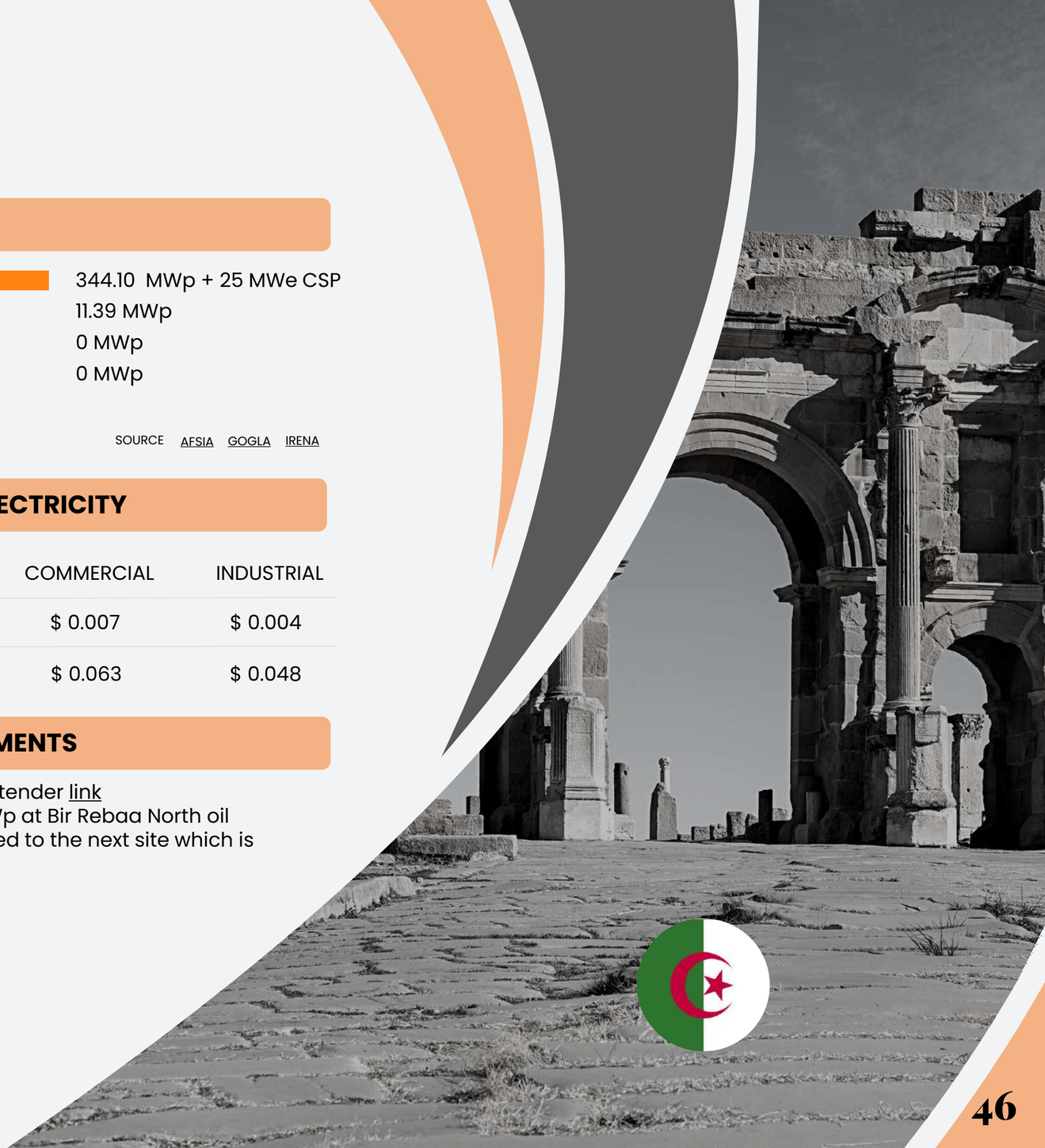
SOURCE SOURCE SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.009	$ 0.007	$ 0.004
MAX.	$ 0.058	$ 0.063	$ 0.048

POLICY / REGULATION

- 30% import duties on foreign solar panels
- No limit of self-consumption
- Feed-in tariff was replaced with tenders link
- No net-metering link

NOTEWORTHY DEVELOPMENTS

- Authorities extended 1 GW PV tender link
- Eni and Sonatrach built 10 MWp at Bir Rebaa North oil complex and have now moved to the next site which is another 10MW link



ANGOLA

OBJECTIVES

- 9.9 GW of installed generation capacity by 2025 link
- 500 solar villages by 2025 link
- RE to comprise of 70% of the energy mix by 2025 link
- 800MW of RE with 100MW of solar, 100MW by 2025 link

TOTAL PV INSTALLED

LARGE SCALE	284 MWp
C&I	0.15 MWp
MG	0.03 MWp
SHS & RESIDENTIAL	0.035 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 46.89 % of the population has access to electricity link
- 42.8% in urban areas and 10% in rural areas link
- Objective to reach 60% electrification rate by 2025 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.005	$ 0.012	$ 0.009
MAX.	$ 0.014	$ 0.014	$ 0.014

POLICY / REGULATION

- In June 2019 grid electricity subsidies were cut by 85% link
- Objective is to apply cost-reflective tariffs by 2025 link
- PV is subject to import duties and VAT link
- FiT exists and tariffs vary for projects of 10MW or greater link
- Net-metering available for projects of 10MW and more link

NOTEWORTHY DEVELOPMENTS

- 25 MWp Caraculo park under construction and to be extended to 50 MWp link
- Construction approved on 104 MWp Catete and 400 MWp Laúca solar parks link
- 125 MGs with 516MWp/1,006 MWh under development Link
- MCA Group constructing 83.64 MWp in five localities link
- 6 MWp Lucano solar park under development link

BENIN

OBJECTIVES

- Achieve 35% of RE in the energy mix by 2030 link
- More than 127 localities to be electrified via mini-grids by June 2023 link
- 25% of RE in the national energy mix by 2025 link
- 25MW of solar in 2025 and another 25MW in 2030 link

TOTAL PV INSTALLED

LARGE SCALE	27.25 MWp
C&I	6.83 MWp
MG	0.14 MWp
SHS & RESIDENTIAL	5.43 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 53% of the population have access to electricity link
- 53,9% in urban areas and 6,6% in rural areas link
- 95% urban and 65% rural electrification by 2025 link
- Targets 100% electrification rate by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.138	$ 0.146	$ 0.141
MAX.	$ 0.237	$ 0.262	$ 0.156

POLICY / REGULATION

- No import duties on solar panels and storage link
- 5% import duty on pre-assembled solar generating sets and VAT of 18% link
- No net-metering and no FiT link

NOTEWORTHY DEVELOPMENTS

- 25 MWp Illoulofin solar phase two launched link
- 2x15 + 2x10MW solar plants under construction link
- Aress to equip 15 private hospitals with solar link

BOTSWANA

OBJECTIVES

- Increase share of RE in the energy mix, 15% by 2030 and to 50% by 2036 link
- 200 MW CSP by 2027, up to 795 MWp new generation with 61% from RE by 2040 link

TOTAL PV INSTALLED

LARGE SCALE	1.3 MWp
C&I	6.47 MWp
MG	0.01 MWp
SHS & RESIDENTIAL	0.05 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 72% electricity access on average throughout the country link
- Target to reach 100% electrification by 2030 link

CURRENT TARIFF GRID ELECTRICITY

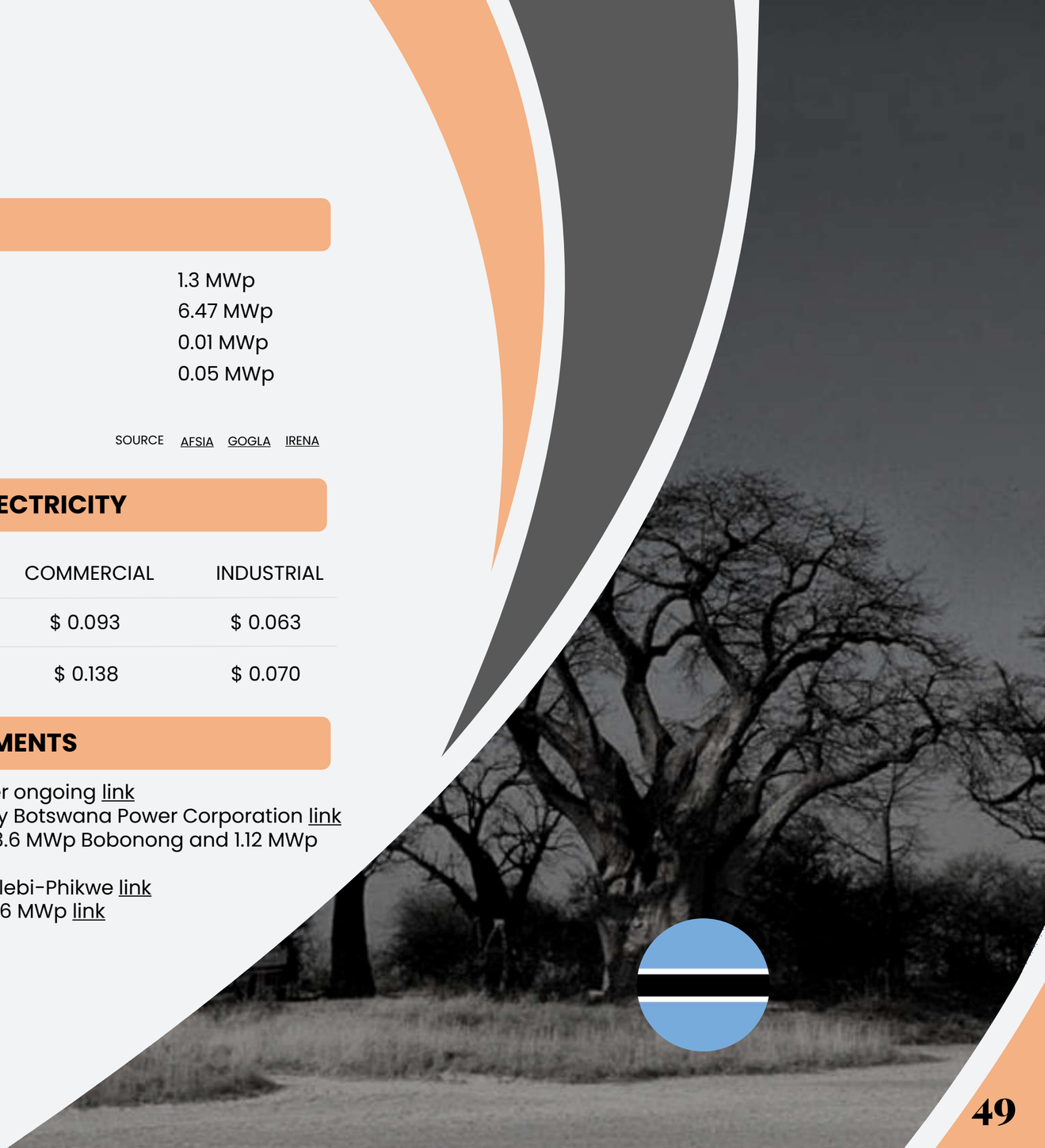
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.077	$ 0.093	$ 0.063
MAX.	$ 0.107	$ 0.138	$ 0.070

POLICY / REGULATION

- 20% import duties on solar lights/lanterns and a 5% on batteries link
- Some solar equipment are exempt from VAT with others subject to a 5%-20% VAT link
- Net-metering available link
- FiT guidelines issued in 2020 link

NOTEWORTHY DEVELOPMENTS

- 2*100MWp CSP projects tender ongoing link
- Six solar PV plants in tender by Botswana Power Corporation link
- Sturdee Energy constructing 3.6 MWp Bobonong and 1.12 MWp Shakawe projects link
- Scatec building 50 MWp in Selebi-Phikwe link
- University of Botswana to get 6 MWp link



BURKINA FASO

OBJECTIVES

- 20 MW of PV connected to the network every 10 years targeting 2025 link
- Target of 50% RE in the electric mix by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	64.10 MWp
C&I	17.84 MWp
MG	0.13 MWp
SHS & RESIDENTIAL	7.41 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 22.5% of the population has access to electricity link
- 67.4% in urban areas and 5.3% in rural areas link
- Targets 95% electrification rate by 2030 link
- Targets 75% electrification rate by 2025 link

CURRENT TARIFF GRID ELECTRICITY

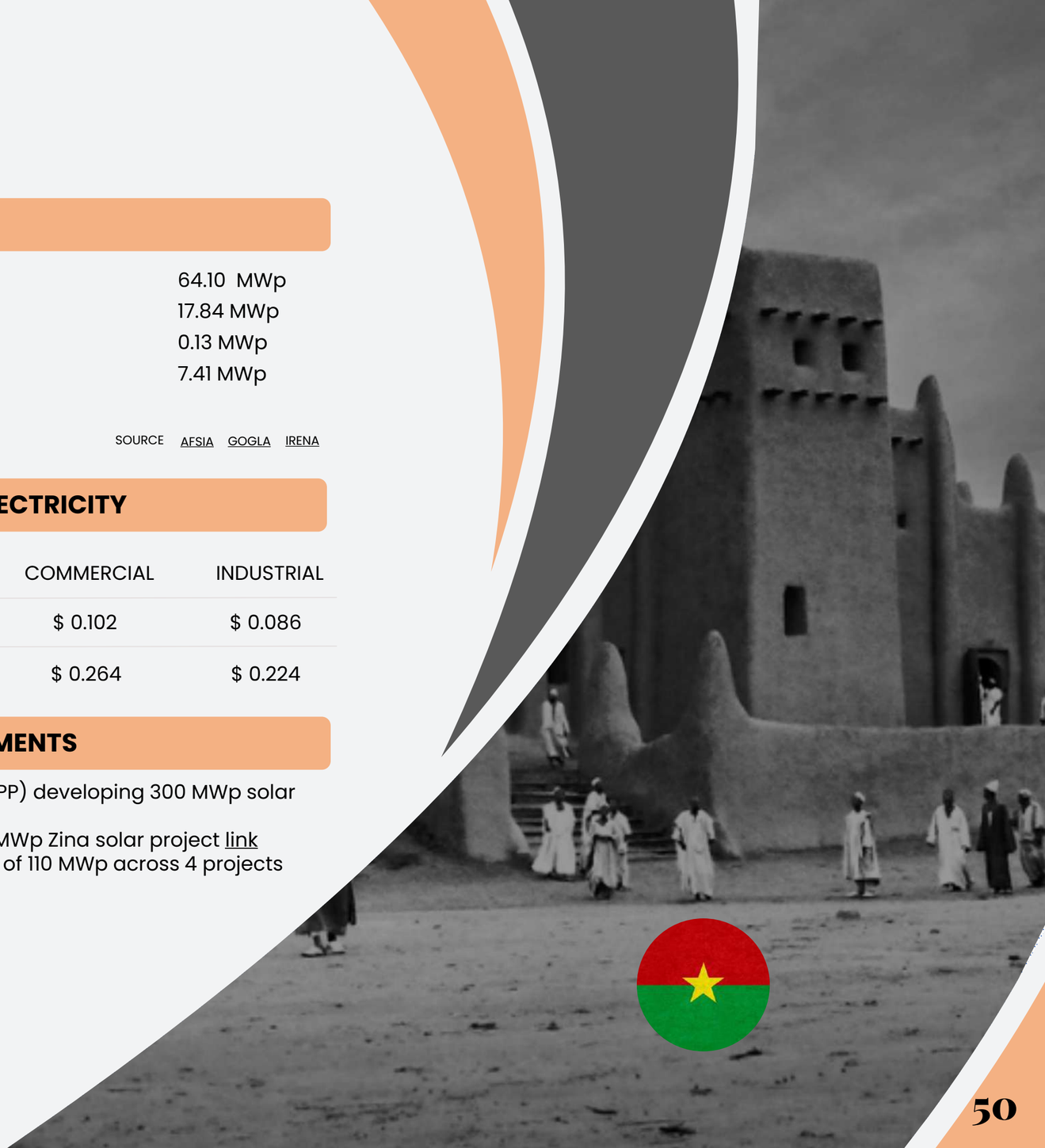
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.120	$ 0.102	$ 0.086
MAX.	$ 0.221	$ 0.264	$ 0.224

POLICY / REGULATION

- No import duties and VAT applicable on solar equipment link
- No feed-in tariff, no net-metering link

NOTEWORTHY DEVELOPMENTS

- West African Power Pool (WAPP) developing 300 MWp solar parks link
- Sinohydro constructing 26.6 MWp Zina solar project link
- FMO supporting construction of 110 MWp across 4 projects link



BURUNDI

OBJECTIVES

- Target of 50% of Renewable Energy in the electricity mix by 2025 link

TOTAL PV INSTALLED

LARGE SCALE	7.5 MWp
C&I	0.14 MWp
MG	0.25 MWp
SHS & RESIDENTIAL	0.1 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 13% of the population has access to electricity link
- Target 30% electrification rate by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.040	$ 0.096	$ 0.096
MAX.	$ 0.268	$ 0.196	$ 0.156

POLICY / REGULATION

- No VAT on Solar PV panels, batteries, inverters and some other equipment link
- No import duties on solar panels and 25% on the rest link
- 3% withholding tax on solar equipment and 4% on solar panels link
- No FiT, and no net-metering link

NOTEWORTHY DEVELOPMENTS

- World bank supporting 17 MW “Soleil-Nyakiriza” project through MGs link

FOCUS ON C&I

ARTICLE

BY ANDREA RENZULLI
Programme Manager Policy and Regulations

IARINA CICEU
Policy Officer

RES4AFRICA FOUNDATION

UNLEASHING THE POTENTIAL OF THE C&I MARKET IN AFRICA

Corporate power purchase agreements (CPPAs) for renewable energy, particularly solar PV, represent a small but growing market in Africa. CPPAs allow commercial and industrial customers to purchase renewable electricity directly from independent power producers (IPPs) at a pre-agreed price for a pre-agreed period (long-term).

These contractual arrangements provide benefits to both parties: generators have the possibility to circumvent the off-taker risk

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inherent in PPAs with financially strained public utilities and to find new opportunities to access the market beyond public tender programs; while end-customers benefit from a cheaper, more reliable electricity supply. This business model proves very advantageous in markets where the end-user tariffs on the main grid are higher than possible CPPA tariffs or where outages and grid unreliability oblige clients to rely on costly back-up solutions or suffer a loss of output.

Agreements are broadly divided into three categories:

1. Private wire CPPAs, whereby the end-customer purchases power from an on-site or near-site project behind-the-meter;
2. 'Physical' or 'sleeved' CPPAs, whereby generators wheel electricity to end-customers through a grid operated by a third party; and
3. 'Virtual' or 'synthetic' CPPAs, which do not involve the physical delivery of electricity, but are a financial derivative under which payments from end-customers to generators are determined by comparing an agreed-upon strike price against a market reference price.

In 2021, the nascent C&I market for solar comprised approximately 717 MWp of installed capacity, with the majority of projects located in South Africa, Egypt, and Nigeria. In general, African markets have thus far favored private wire PPAs thanks in

part to their simplicity from a regulatory and commercial point view, as they do not rely on any intermediary between generators and end-customers. Sleeved CPPAs are more complex, requiring multiple contracts between the involved parties (IPP, end-customer and grid operator) and are subject to wheeling costs . As a consequence these contracts are primarily confined to more developed markets like South Africa. In the absence of more sophisticated electricity market designs, virtual PPAs are notably absent.

Despite the potential for renewables deployment through C&I solar, barriers to the establishment of CPPAs persist. Dedicated financing for the C&I market and appropriate de-risking tools to enhance the creditworthiness of private off-takers are lacking. The absence of net-metering regulations limits the possibility of selling surplus electricity to the grid, preventing the generation of revenues at times of peak production and low consumption. Similarly, inadequate grid access and wheeling regulation, as well as the lack of transparency of use of system tariffs, prevent the development of CPPAs.

Addressing these barriers through regulatory reforms that increase market openness, attractiveness and readiness towards CPPAs would unleash the vast potential of the C&I market and contribute to achieving SDG7 across Africa.

CAMEROON

OBJECTIVES

- Increasing the contribution of RE from 1% to 25% with 6% from PV by 2035 link
- Electrify 10,000 additional localities using RE by 2035 link

TOTAL PV INSTALLED

LARGE SCALE	0.31 MWp
C&I	2.3 MWp
MG	11.25 MWp
SHS & RESIDENTIAL	13.0 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 65% of the population has access to electricity link
- Target 100% access to be achieved by 2030 for urban areas and 70% for rural areas by 2045 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.080	$ 0.134	$ 0.096
MAX.	$ 0.158	$ 0.158	$ 0.136

POLICY / REGULATION

- No VAT on solar equipment link
- Reduced customs duties on imported RE products link
- Import tax is 30% on pico solar products link
- No FiT link
- FER (Rural Energy Fund) provides subsidies up to 80% of the feasibility and up to 70% of the infrastructure costs link

NOTEWORTHY DEVELOPMENTS

- Maroua 14.52 MWp and Guider 15.78 MWp under construction link
- Government to develop 120 MWp in the northern region link
- Four thermal plants being hybridized with solar link

CAPE VERDE

OBJECTIVES

- Having at least one of the islands using 100% of RE by 2030 link
- Target reviewed to 30% by 2025 and 50% by 2030 link
- Invest 250 MW in renewable production by 2030 link
- 40 MW of solar and wind will be completed in 2023 link

ELECTRIFICATION RATE

- 94% of the population has access to electricity link
- 100% access to electricity by 2030 link

POLICY / REGULATION

- 23% import duties on batteries link
- No VAT on imports of solar panels and storage link
- Solar panels are VAT exempted, 2% on inverters and 10%-30% on other equipment link
- No net metering applications but regulatory framework exists link
- FiT is in the law but legislation to operationalize it remain enacted link

TOTAL PV INSTALLED

LARGE SCALE	33.82 MWp
C&I	0.29 MWp
MG	0.13 MWp
SHS & RESIDENTIAL	0 MWp

SOURCE AFSIA GOGLA IRENA

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.259	$ 0.246	$ 0.246
MAX.	$ 0.363	$ 0.277	$ 0.277

NOTEWORTHY DEVELOPMENTS

- Tender going on with two 5 MW projects in total link

CENTRAL AFRICAN REPUBLIC

OBJECTIVES

- Revealed plans to expand its use of RE including solar link

TOTAL PV INSTALLED

LARGE SCALE	15 MWp
C&I	0 MWp
MG	0.11 MWp
SHS & RESIDENTIAL	0 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 14.3% of the population has access to electricity link
- 35% electrified in Bangui to about 0.4% in rural areas link
- Target to connect 50% of the population by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.109	$ 0.043	$ 0.043
MAX.	$ 0.229	$ 0.060	$ 0.060

POLICY / REGULATION

- Import duties and VAT on solar equipment range between 5%-30% link
- No FiT, no net-metering link

NOTEWORTHY DEVELOPMENTS

- Danzi solar park to be extended to 40 MWp with the World bank support link
- World bank supporting development of 5 mini-grids with 10 MW combined capacity link

CHAD

OBJECTIVES

- Aims to increase the share of RE to 38% in the energy mix by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0.63 MWp
MG	0.57 MWp
SHS & RESIDENTIAL	0.019 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 10% of the population has access to electricity link
- Targets 53% electrification rate by 2030, with 20% electrification rate in rural areas link

CURRENT TARIFF GRID ELECTRICITY

SOURCE

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.136	$ 0.200	$ 0.200
MAX.	$ 0.200	$ 0.200	$ 0.200

POLICY / REGULATION

- Import tax exemptions for RE equipment link
- No VAT on solar equipment link

NOTEWORTHY DEVELOPMENTS

- Savannah Energy to build 400 MW projects link
- Innovent installing 5 MWp in Abéché link
- Merl Solar Technologies constructing 2*50 MWp hybrid projects link
- Aldwych progressing with Djermaya 60 MWp project link

COMOROS

OBJECTIVES

- Increase the share of RE to 55% by 2033 link
- 40% increase in RE by 2030

TOTAL PV INSTALLED

LARGE SCALE	4.18 MWp
C&I	0 MWp
MG	0 MWp
SHS & RESIDENTIAL	0.05 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 86.74 % of the population has access to electricity link
- Target of 100% electrification by 2033 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.324	$ 0.236	$ 0.236
MAX.	$ 0.332	$ 0.289	$ 0.289

POLICY / REGULATION

- No custom duties on PV materials link
- No VAT on RE equipment link
- No net-metering link
- No FiT link

NOTEWORTHY DEVELOPMENTS

- Comoros Solar Energy Access Project (CSEAP) to add 4 components with 9MW + 19MWh link

COTE D'IVOIRE

OBJECTIVES

- Target 16% renewable energy by 2025 link
- Target 42% RE in the electricity mix by 2030 link
- Target 400 MW of solar by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	1.71 MWp
MG	0 MWp
SHS & RESIDENTIAL	4.2 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 80% of the population has access to electricity link
- 95% electrification rate in urban areas and 32% in rural areas link
- Target of 100% electrification by 2025 link

CURRENT TARIFF GRID ELECTRICITY

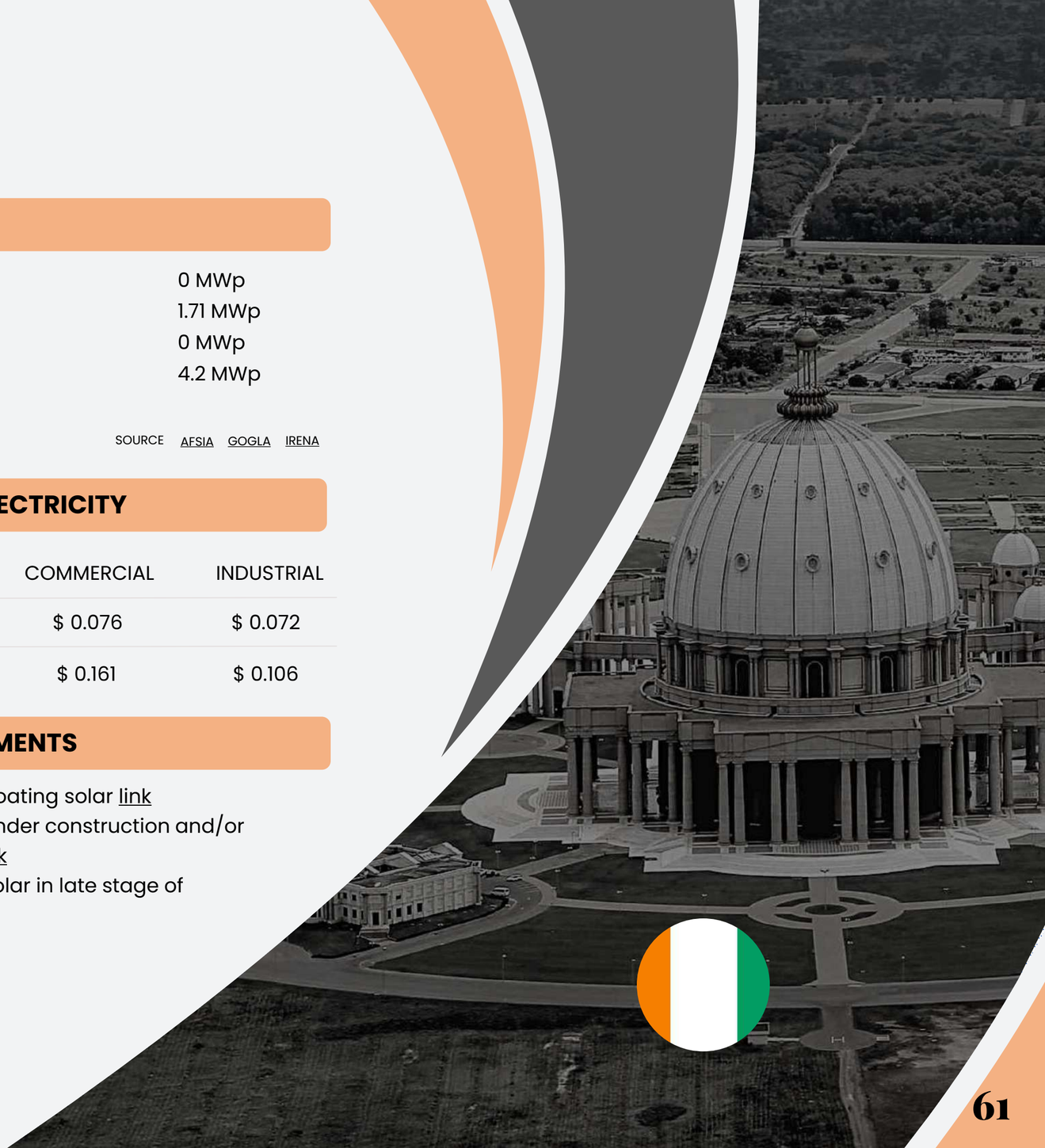
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.029	$ 0.076	$ 0.072
MAX.	$ 0.107	$ 0.161	$ 0.106

POLICY / REGULATION

- No import duties on solar panels, 5% if already assembled and 20% on batteries link
- 9% VAT on solar equipment link
- No FiT, no net-metering link

NOTEWORTHY DEVELOPMENTS

- Tender launched for 20 MW floating solar link
- Five projects with 253.5 MW under construction and/or late stage of development link
- 37.5 MW +10 MWh Boundiali solar in late stage of construction link



FOCUS ON DIGITAL SOLUTIONS

ARTICLE

BY SVET BAJLEKOV
Co-founder / CEO
AMMP

LATEST TRENDS IN DIGITAL SOLUTIONS FOR SOLAR IN AFRICA

Solar activities around the world have experienced an ever increasing rate of digitalization over the past years. And we expect this this trend to continue in 2023, in lockstep with the solar sector's needs. Below is a summarized list of some of the key developments AMMP is witnessing in the space.

Some of the thornier issues are at the start of a project's lifecycle: in site identification, project development, and financing. We are seeing the emergence of solutions that streamline this, for

AFSIA
Africa Solar Industry Association

ARTICLE

instance by UniFii for residential and C&I solar installations. This service simplifies the analysis of the energy consumption profile and automates calculations of energy and financial savings coming from the solar system. This will be an important driver of scale in the sector. At the same time, financing is often tied to credit risk assessments, which can introduce considerable friction. Tools like Nithio now exist to streamline this for the SHS space with among others tools to standardize credit risk assessment as well as portfolio performance analytics to enable more financing at scale. We anticipate similar tools serving the C&I segment specifically will also enter the scene soon.

Supply chain issues have emerged as another major bottleneck that is likely to persist. While digital tools don't offer a direct solution to this, they do offer some respite: by making it easier for owners and operators to multi-source from different vendors. Through vendor-agnostic software, asset portfolios comprising equipment from a multitude of vendors can be run in a unified and standardised way. Along with companies like meteocontrol and QOS, we at AMMP provide the core capabilities to enable this.

A related trend in O&M software is towards increasingly specialised, modular services. While traditionally most providers have focused on end-to-end offerings, we are seeing a growing take-up of dedicated solutions, such as SmartHelio for PV analytics, enee.io for batteries, and 60Hertz for maintenance, alongside common tools like Excel or PowerBI for in-house data analytics. We see this as a sign of the sector's increased maturity.

Interoperability across these services is critical, and we anticipate a growing focus on the APIs that make this possible.

Another hallmark of the maturing of African solar companies is the increasing number of players who are capturing economies of scale – whether through mergers and acquisitions, or organic growth. This scale brings about opportunities to leverage data for increased competitiveness. As a baseline, this is likely to involve streamlining complex processes throughout diverse asset portfolios. Yet there are additional opportunities well beyond this: for instance, by analysing KPIs across their asset portfolios, owners and operators can identify best practices, uncover pockets of under-performance, and act on these learnings to elevate all-round results.

Finally, we see ever-faster evolution of regulation across the continent, as governments recognise the potential of renewables to positively reshape the energy landscape. The new business models enabled by this are often coupled with novel digital solutions, which we see proliferating. Just one example is the relatively new ability to connect and match supply and demand through energy wheeling transactions in South Africa, with companies like Open Access Energy providing the software to facilitate this. Wheeling is expected to boom not only in South Africa as a result of the challenging energy access in the country, but also across Southern and Western Africa with the implementation of full-fledged power pools called SAPP and WAPP respectively.
Across the board, it is heartening to see the important role of digital in driving innovation and supporting the scale-up of renewables throughout Africa!

DEMOCRATIC REPUBLIC OF CONGO

OBJECTIVES

- ACERD surveyed 22 companies ambitioning to connect 7,616,000 households by 2023 link
- Increase access to 32% through the development of hydroelectric and solar by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0.96 MWp
MG	3.33 MWp
SHS & RESIDENTIAL	7.16 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 15% of the population has access to electricity link
- Targets to electrify 65% of the population by 2030 link
- Targets universal electricity access by 2050 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.027	$ 0.110	$ 0.057
MAX.	$ 0.087	$ 0.150	$ 0.057

POLICY / REGULATION

- No import duties on equipment intended for electricity production link
- VAT exemption on RE equipment link
- No FiT, no net-metering link

NOTEWORTHY DEVELOPMENTS

- Amea Power plans 100 MW project in the country link
- Nuru building 3.7 MWp mini-grid in Goma link
- 180 MW to be deployed under Scaling Mini-Grid (SMG) program link
- Kinshasa Solar City to bring 1 GW of PV in 2 phases link
- InfraCo supporting development of 4 mini-grids link
- Orange and Bboxx partner to construct 24 mini-grids by 2024 link

DJIBOUTI

OBJECTIVES

- Targets 100% RE by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0 MWp
MG	0 MWp
SHS & RESIDENTIAL	0 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 61.77% of the population has access to electricity link
- Universal access to electricity by 2035 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.151	$ 0.224	$ 0.162
MAX.	$ 0.308	$ 0.308	$ 0.230

POLICY / REGULATION

- Import duties and VAT on solar equipment range between 10%-26% link

NOTEWORTHY DEVELOPMENTS

- AMEA Power to develop 30 MW solar park link

EGYPT

OBJECTIVES

- Targets 42% from RE in the energy mix by 2035 link
- Plans to generate 10 GW from RE by 2023 link
- 31000 MW of solar and 12000 MW of CSP by 2035 link
- Plans to boost green investments to 50% of total public investments by 2024/2025 link

TOTAL PV INSTALLED

LARGE SCALE	2,037.91 MWp PV + 20 MWe CSP
C&I	173.1 MWp
MG	0.14 MWp
SHS & RESIDENTIAL	19.56 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 100% of the population has access to electricity link

CURRENT TARIFF GRID ELECTRICITY

SOURCE

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.024	$ 0.025	$ 0.016
MAX.	$ 0.059	$ 0.065	$ 0.062

POLICY / REGULATION

- 5% import duties on solar link
- State can authorize reduced rates or total VAT exemption depending on the nature of activities of investors link
- Net-metering exists link
- A $0.084/kWh FiT is awarded to the Benban solar projects link

NOTEWORTHY DEVELOPMENTS

- AMEA Power to build 560 MW Abydos PV facility link
- Lumika Renewables to build 50 MW for Ain Al-Sokhna cement plant link
- OneraSystems to implement 25 projects with 10 MW total capacity link
- Intro Power and Utilities to set up 20 MWp to Suez Cement of companies link

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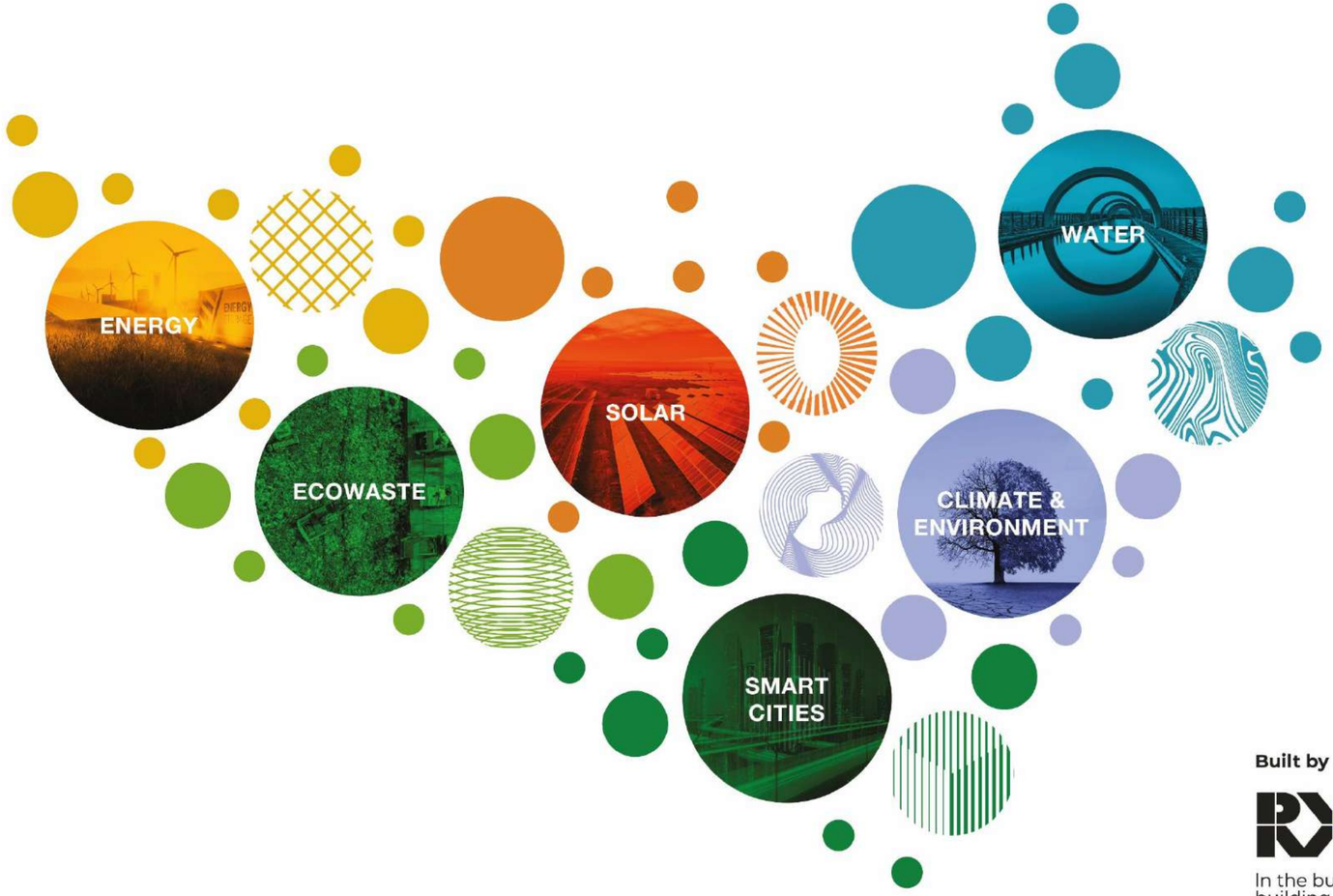

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TALK TO OUR TEAM ABOUT EXHIBITING AT THE WORLD FUTURE ENERGY SUMMIT 2024

EQUATORIAL GUINEA

OBJECTIVES

- No available target for renewable energy link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0 MWp
MG	0 MWp
SHS & RESIDENTIAL	0.14 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 66.75% of the population has access to electricity link
- Target universal electricity access by 2030 with 70% in urban areas link

CURRENT TARIFF GRID ELECTRICITY

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	NO RELIABLE DATA		
MAX.			

POLICY / REGULATION

- No tax incentives but state can authorize reduced rate or total exemption depending on activities of investors link
- 15% VAT is applicable link
- No FiT

NOTEWORTHY DEVELOPMENTS

- n/a

ERITREA

OBJECTIVES

- RE to account for 70% of total electricity generation by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	7.52 MWp
MG	2.25 MWp
SHS & RESIDENTIAL	0.05 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 50% of the population has access to electricity link
- 37% electrification rate in rural area link
- 100% rural electricity access by 2030 link
- Universal access by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.24	$ 0.24	$ 0.24
MAX.	$ 0.24	$ 0.24	$ 0.24

POLICY / REGULATION

- No specific incentives for the energy sector link
- No FiT, no net-metering link

NOTEWORTHY DEVELOPMENTS

- Government of the state to set up 25 MW project with the grant support from AfDB link

ESWATINI

OBJECTIVES

- Produce 100% of its own electricity consumption by 2034 link
- Increase the share of RE to 50% in the electricity mix by 2030 link
- 80MW RE with 40MW through solar PV by 2025 link

TOTAL PV INSTALLED

LARGE SCALE	10 MWp
C&I	4.1 MWp
MG	0.04 MWp
SHS & RESIDENTIAL	0.05 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 85% of the population has access to electricity link
- 100% electricity access by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.064	$ 0.136	$ 0.055
MAX.	$ 0.106	$ 0.288	$ 0.283

POLICY / REGULATION

- 0% import duties on solar panels and batteries link
- Standard VAT of 15 % is applicable link

NOTEWORTHY DEVELOPMENTS

- Globeleq and Sturdee Energy developing two 15 MW projects link
- Frazium Energy to build 100 MW Edwaleni power plant link
- ESERA launched tender on 40 MWp project link
- Authorities launched the Africa Minigrids Program (AMP) to benefit 500 emaSwati link

FOCUS ON MARKET DRIVERS

ARTICLE

BY TERJE OSMUNDSEN
Founder and CEO

Empower
Impact Investment

THE GLOBAL SCRAMBLE FOR RENEWABLES: WILL AFRICA FALL BEHIND, AGAIN?

Africa's share of solar PV dropped to 0,4 percent in 2021, and is set to drop even further to about 0,35 percent in 2022.

According to IEAs latest publication "Renewables 2022", Africa is like the rest of the world on the verge of a solar energy revolution, almost quadrupling the total installed PV capacity from 7 to 25 GW by 2027. In addition to this main forecast, IEA presents an "Accelerated case", bringing the total installed solar PV capacity

to 43,2 GW by 2027. Is this turn-around realistic, or is the continent at risk of becoming the world's fossil "outlier"?

Let's take a look at the actual numbers: The addition of new solar PV in Africa fell from 1,8 GW in 2019 to only 0,7 GW in 2021. The numbers from 2022 are not yet confirmed, but AFSIA (Africa Solar Industry Association) estimates that only about 0,9 MW of solar PV was installed in Africa in 2022, compared to 260 GW globally according to IEAs latest estimate. In other words: Africa's share of new solar PV capacity in the world dropped further, to about 0,35 percent in 2022.

These numbers fell into a wider and alarming pattern: In 2021, a year when renewable investments globally rose 9% to reach an all-time high, Africa's investments in renewables slipped 35 % to the lowest level since 2011. Of the $434 billion invested globally to build wind, solar, and other clean power projects in 2021, only 0.6% or $2.6 billion went to Africa, despite Africa representing 17 % of world population On this backdrop, it's refreshing and encouraging to read the optimistic forecast in IEAs recent publication "Renewables 2022", projecting that Africa the next five years will build to three and half time what's been invested the last 20 years. According to the flagship IEA report, we have entered a period of "turbocharged" growth in renewables worldwide fueled by energy security concerns and boosted decarbonization incentives in major economies like the US, EU, China and India.

So where in Africa will this “turbo-growth” take place, according to IEA? Looking at the numbers extracted from the publication’s website, here is what can be extracted:

IEAs “Renewables 2022”:
Actual and forecasted Solar PV capacity in Africa

	Installed 2021	Net additions 2021	Installed 2027: Main case	Installed 2027: Accelerated Case
EGYPT	1.7	0	3.6	6.4
MOROCCO	0.3	0	2.3	4.3
SOUTH AFRICA	2.8	0.3	12.4	14.9
NIGERIA	0.1	0	0.8	
ETHIOPIA	0	0	0.5	0.6
KENYA	0.2	0.1	1.2	1.5
CUMULATIVE	**5.1**	**0.4**	**20.8**	**27.7**
GROWTH vs. CUMULATIVE	**7.6**	**0.7**	**32.7**	**43.2**

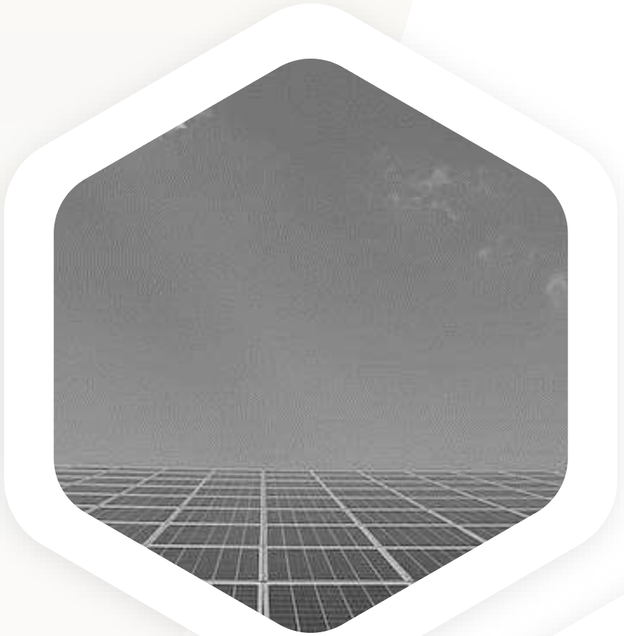
The table shows that Egypt and South Africa has attracted approximately 60% of all solar PV installed in Africa so far. This is mainly the result of the large renewable energy program (REIPP) in South Africa and the big Ben-Ban solar PV park in Aswan in Egypt, both sponsored by the host country governments and benefitting from a large amount of international competitive financing.

The next five years, IEA estimates that Egypt, Morocco, Nigeria, Kenya, Ethiopia and South Africa will grow its solar PV capacity from 5 to 20 MW. The remaining 12 GW of solar PV will come in the other 49 countries who currently has very little PV installed.

Undoubtedly the countries in Africa has the potential and urgent need to triple or quadruple solar investments. But in order to attract and deploy the 4- 5 billion dollar needed annually, to deliver this growth, governments and stakeholders must to address the barriers that currently discourages solar investments in Africa. If not, Africa will continue to fall behind against the mounting competition for solar investments from the US, Europe, China and India, just as it did in 2021 and 2022.

So why it is so difficult to increase solar investments in Africa? The answer, put short, can be summarized in the three, debt overhang, currency crisis, regulation and subsidies

- Debt overhang: Already before the pandemic, many of the large solar and wind projects that has been announced in Africa the last years remained stalled waiting for the government to issue payment guarantees. Investors and lenders request such guarantees because the utilities company that will buy the power are heavily indebted or in financial distress. But the governments are highly indebted too and



has therefore no or very limited capability to issue such payment guarantees.

This situation has now become worse, as Egypt and sub-Saharan Africa are among the hardest hit by the global debt crisis following the pandemic-induced recession, the Ukraine-war, the rise in interest rates and the dramatic fall in local currency values against the dollar. The World Bank estimates that the majority of countries in Africa will suffer from a 30-40 percent increase in yearly debt servicing payments, “The increased liquidity pressures go hand in hand with solvency challenges” warns David Malpass, World Bank president.

- The currency crisis: In 2022, the financial position of private and public off takers as well as governments has been further exacerbated by the sharp appreciation of the dollar against most currencies. Among the worst hit are the Egyptian Pound that has depreciated almost 60 % against the USD this year, and the Ghanaian Cedi that fell 110 percent! In Nigeria, the cost of dollar in the parallel market has risen from about 550 to 800 Naira since the beginning of the year.

Whereas richer countries can tap into local funding for renewable investments, Africa is still mostly dependent on foreign investments. International investors generally require revenues in USD or EUR to de-risk their investments, otherwise the cost of capital will be prohibitive. On the other side, energy users hesitate to make long-term commitments pegged hard currencies in fear of a prolonged currency crisis. The result is an effective halt to many renewable investments in Africa.

- Regulation and subsidies: According to IEA, the fastest-growing solar PV segments globally are the C & I (Commercial and Industrial) and residential sectors. In view of the challenges facing the government-owned utility sector, the private PV market should be seen as the largest untapped potential for scaling solar in Africa. And if governments are willing to implement the necessary reforms, this market could grow larger than the 4 GW projected by IEA in 2027.

  For example, commercial and industrial energy-users across Africa – except in Kenya, Nigeria, South Africa and a few other countries - are generally prohibited buying solar energy from private providers in the form of Power Purchase Agreements. (PPAs). Other contractual arrangements, for example equipment-lease, are of course permitted, but these do generally not provide the same form of flexibility as PPAs do.

  A second disincentive is the absence of net-metering. In most parts of the world, energy-users producing their own electricity have net-metering contracts with the local distribution company. This means that in periods when their solar power plant is generating more electricity than needed by the user, the user can “sell” surplus electricity back to the local utility company. Except for South Africa, net-metering has not yet been implemented in Africa, although many countries have made laws and regulations that prescribes net-metering.

  Finally, several governments in Africa continue to subsidize

electricity tariffs and fossil fuels, disincentivizing investments in solar and batteries. The cost of diesel in Egypt, for example, is only 7,2 EGP, equal 0,3 USD which is about 20 % of the price in Europe. A light “subsidy” on solar and batteries, in the form of a carbon tax or carbon credit, could be an efficient incentive especially for industrial off-grid energy users and microgrids to further reduce their reliance on diesel gensets, replacing them with solar-powered batteries. I would also make it make it attractive for micro-grids and off-grid industrial energy users to look at locally produced green hydrogen and fuel cells to meet the fast-growing electricity needs of manufacturers, mines and commercial farms in Africa.

Africa clearly has the potential for a turbo-charged growth as projected by IEA.
But if governments and international partners do not address the barriers holding back investments, Africa will continue to fall behind just as it did in 2021 and 2022. This is a risk we cannot take.

ETHIOPIA

OBJECTIVES

- Construction of 13.7 GW of RE from sources other than hydroelectric in the coming years link
- 45% of solar PV and geothermal in the electricity mix by 2040 link
- 3,500 MW of installed capacity by 2037 link
- Ethiopia to invest $40B in the construction of RE over the next 10 years link

ELECTRIFICATION RATE

- 45% of the population has access to electricity link
- 33% on-grid and 11% off-grid link
- Goal is 100% access by 2025, with 35% off-grid and 65% grid link
- Reach 96% grid connections by 2030 link

POLICY / REGULATION

- Most SAS products are exempted from import duty link
- 15% VAT and 3% withholding tax are applicable on solar products link
- Mini-grid license requirements for (<50 KW, >50 KW to 200 KW< and >200 KW up to 10 MW) link
- No net-metering link
- Existing FiT link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0.03 MWp
MG	4.04 MWp
SHS & RESIDENTIAL	28.7 MWp

SOURCE AFSIA GOGLA IRENA

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.03	$ 0.042	$ 0.019
MAX.	$ 0.06	$ 0.042	$ 0.031

NOTEWORTHY DEVELOPMENTS

- World bank supporting development of 200 mini-grids link
- Aqua Power to build 2 of the 14 solar power plants planned for next ten years link
- 29 solar projects under construction and/or development in the country by EEU link
- 10 mini-grids supplying rural smallholder farmers' irrigation, with expansion plan up to 100 mini-grids supported by GEAPP

GABON

OBJECTIVES

- 80% RE in the energy mix by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0.2 MWp
MG	0.4 MWp
SHS & RESIDENTIAL	0.06 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 91.6% of the population has access to electricity link
- 89% electrified in urban areas and 34% in rural areas link
- 85% electrification rate of rural areas by 2025 link
- Targets universal access by 2035 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.084	$ 0.027	$ 0.027
MAX.	$ 0.207	$ 0.720	$ 0.720

POLICY / REGULATION

- Import duties applicable between 5%-30% link
- 18% VAT applies link
- No net-metering link
- No FiT link

NOTEWORTHY DEVELOPMENTS

- SOLEN constructing 30 MWp hybrid project in Ayémé and planning more 90 MWp link
- AMEA Power to build 50 MWp in Oyem link
- Desiba Energy developing 20 MW Mouila project link

GHANA

OBJECTIVES

- Increase renewable energy share in the energy mix by 10% 2030 link

TOTAL PV INSTALLED

LARGE SCALE	113 MWp
C&I	57.95 MWp
MG	0.33 MWp
SHS & RESIDENTIAL	3.99 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 86.5% of the population has access to electricity link
- 91% in urban areas and 50% in rural areas link
- 99.8% electricity access by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.039	$ 0.080	$ 0.071
MAX.	$ 0.122	$ 0.127	$ 0.251

POLICY / REGULATION

- No import duties on solar panels but 5% import duties applies on SHS & 20 % on batteries link
- An import tax exemption for solar PV system is being implemented link
- Solar panels and all off-grid solar components are VAT exempted link
- Net-metering exists link
- FiT for solar PV is $0.041/kWh link

NOTEWORTHY DEVELOPMENTS

- Bui Power Authority to build 50 MWp Yendi project link
- 35 MGs being developed through African Development fund and government of Switzerland support link
- KfW supporting construction of 15 MWp Kaleo Solar phase two link
- G8 to install 65 MW floating solar system at BUI Hydro Dam facility link
- LMI – IFC building 16.8-MWp rooftop solar plant link

GUINEA

OBJECTIVES

- Target 90% of RE from all new capacities by 2030 link
- Installation of up to 2,600MW by 2025 from the current 658MW link

TOTAL PV INSTALLED

LARGE SCALE	0 MWP
C&I	33.8 MWp
MG	0 MWp
SHS & RESIDENTIAL	0.76 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 44.7% of the population has access to electricity link
- 51% in urban area and 1% in rural area link
- Target is to achieve 100% electrification by 2030 link

CURRENT TARIFF GRID ELECTRICITY

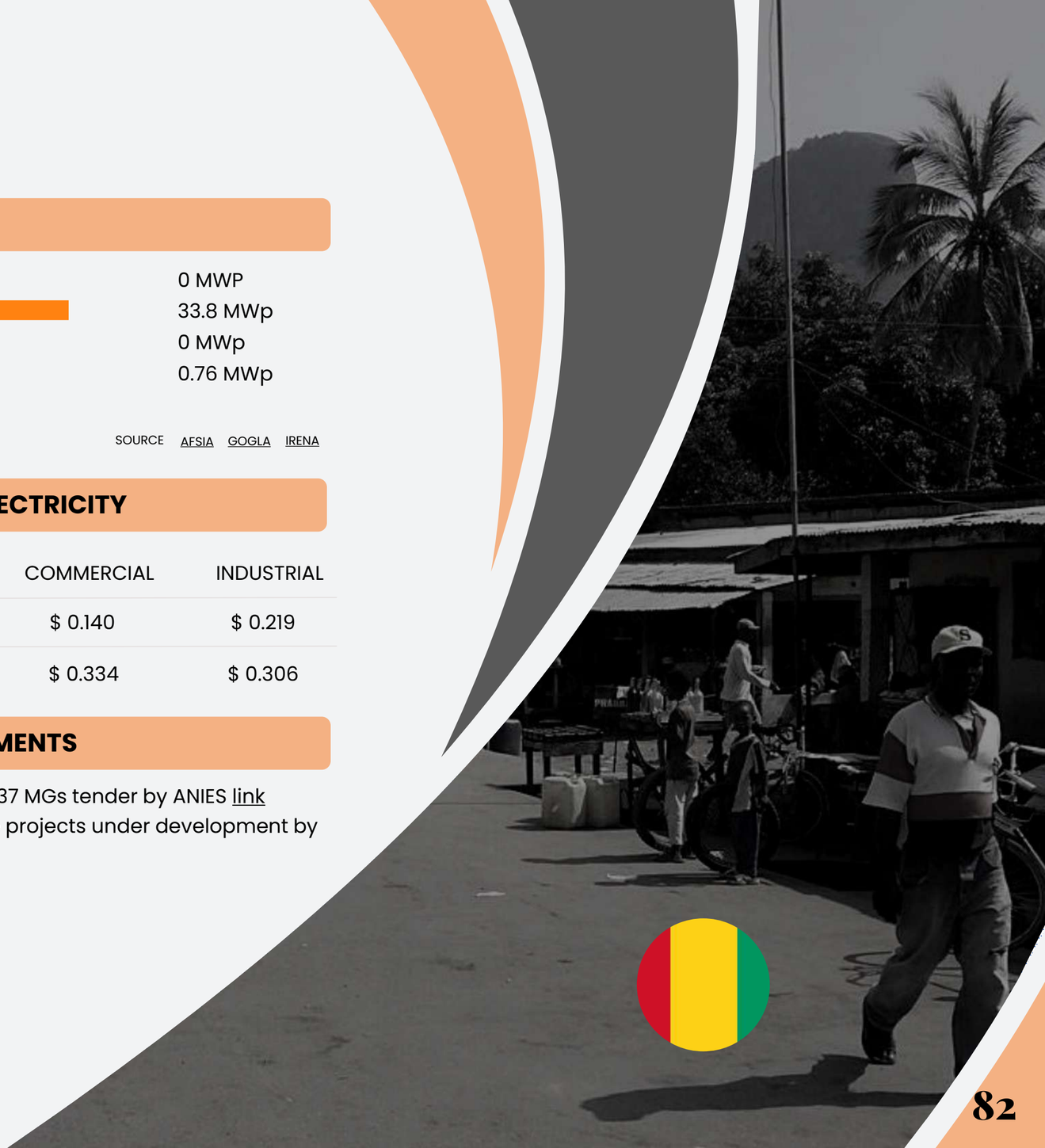
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.013	$ 0.140	$ 0.219
MAX.	$ 0.054	$ 0.334	$ 0.306

POLICY / REGULATION

- VAT and duty exemptions can be granted to projects on a case by-case basis link
- No FiT and no net-metering link

NOTEWORTHY DEVELOPMENTS

- Results to be announced for 137 MGs tender by ANIES link
- More than 150 MW large scale projects under development by various companies



GUINEA BISSAU

OBJECTIVES

- Increase the contribution of RE in the supply mix from 0 to 36% link
- 80% RE in the national energy mix by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWP
C&I	0 MWp
MG	0.42 MWp
SHS & RESIDENTIAL	1.3 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 33.34% of the population has access to electricity link
- Targets 80% electricity access by 2030 link
- 72% to access electricity grid and 9% through mini-off grid systems by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.205	$ 0.163	$ 0.206
MAX.	$ 0.392	$ 0.205	$ 0.258

POLICY / REGULATION

- Solar panels are exempted of VAT but other components of a solar kit are not link
- No FiT, no net-metering link

NOTEWORTHY DEVELOPMENTS

- The country to benefit from PPIPS program being supported by BOAD and GCF link
- Telectrinf to install 1505 kW on the Bolama island link

FOCUS ON PRODUCTIVE USE

ARTICLE

BY GILLIAN-ALEXANDRE HUART
CEO

THE EVOLUTION OF OFF-GRID SOLAR SOLUTIONS : FROM ELECTRICITY PROVISION TO PRODUCTIVE USAGE

In the last decade, 60 million Africans have been connected to electricity in their homes and business locations – that is the level of unparalleled opportunity that the global energy transition has given to rural communities in Africa. However, 72% of Sub-Saharan Africa's rural population and 22% in urban areas still lack power, which is why we must keep working. But for communities to reach their full development potential, what is next after providing electricity to households?

Productive uses of energy are the catalyst of the socio-economic development of underserved communities. They allow existent businesses and new entrepreneurs to increase employment rate, reduce poverty and create new income streams.

Because productive use appliances and machinery generally require more electricity, an integrated approach that leverages on the complementarity of Mini Grids and Solar Home System (SHS) solutions appears as are the way towards inclusive energy access. This means that customers with limited consumption needs or that cannot be reached by the mini-grid are provided with SHS and that customers with higher energy needs are connected to a mini-grid.

Customers must be assisted in selecting the right appliances and trained to use such appliances properly to optimize energy consumption. When doing this, a virtuous cycle is triggered - the customer will have a higher ability to pay, and there will be an increased consumption for the mini-grid (so-called anchor loads), reinforcing the sustainability and resilience of the business model.

Socio-economic benefits justify the installation of mini-grids in rural areas as they can power small industries, stimulate increased productivity and reduce costs through the use of more efficient and clean appliances.

We are therefore convinced that a sustainable strategy should be

developed around Income generating activities and productive usages with an increasing number of customers being Income Generating Activities customers.

Rapid advancements in the maturity of productive use of technologies with recent innovations driving down costs and improving efficiency have helped to speed up this evolution. In our work, we divide customers into different categories depending on their consumption needs and identify the potential entrepreneurs and businesses that require financial management skills. We profoundly analyze our target villages to identify and develop value chains to help customers create more income-generating activities. Further diversifying the product offerings will allow to reach more profitable customer segments and stabilize cash flows.

The approach is gender transformative - challenging the social norms that undermine women's participation in household decisions and the economic life within rural communities. Priority should be given to women-tied empowerment productive projects that are skill-enhancing and strengthen women's role within the economic tissue of rural society.

For the African continent to come to an economy-wide energy transition that is fair and affordable, we strongly believe that decentralized energy solutions should be combined with high-efficiency and environmentally sustainable appliances. Productive appliances should be adapted to local conditions, thus increasing the potential for rural communities to be empowered.

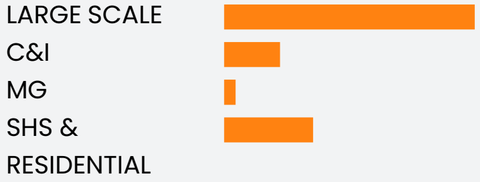
We believe that this is the way for Africa to keep pushing forward.

KENYA

OBJECTIVES

- Ambitions to achieve 100% utilization of renewable energy by 2030 link
- Over 60% of the country's installed capacity will be provided from RE sources by 2037 link
- 852 MW of solar by 2037 link

TOTAL PV INSTALLED



LARGE SCALE	161.6 MWp
C&I	77.69 MWp
MG	3.15 MWp
SHS & RESIDENTIAL	80.1 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- Over 75% of the population has access to electricity link

CURRENT TARIFF GRID ELECTRICITY

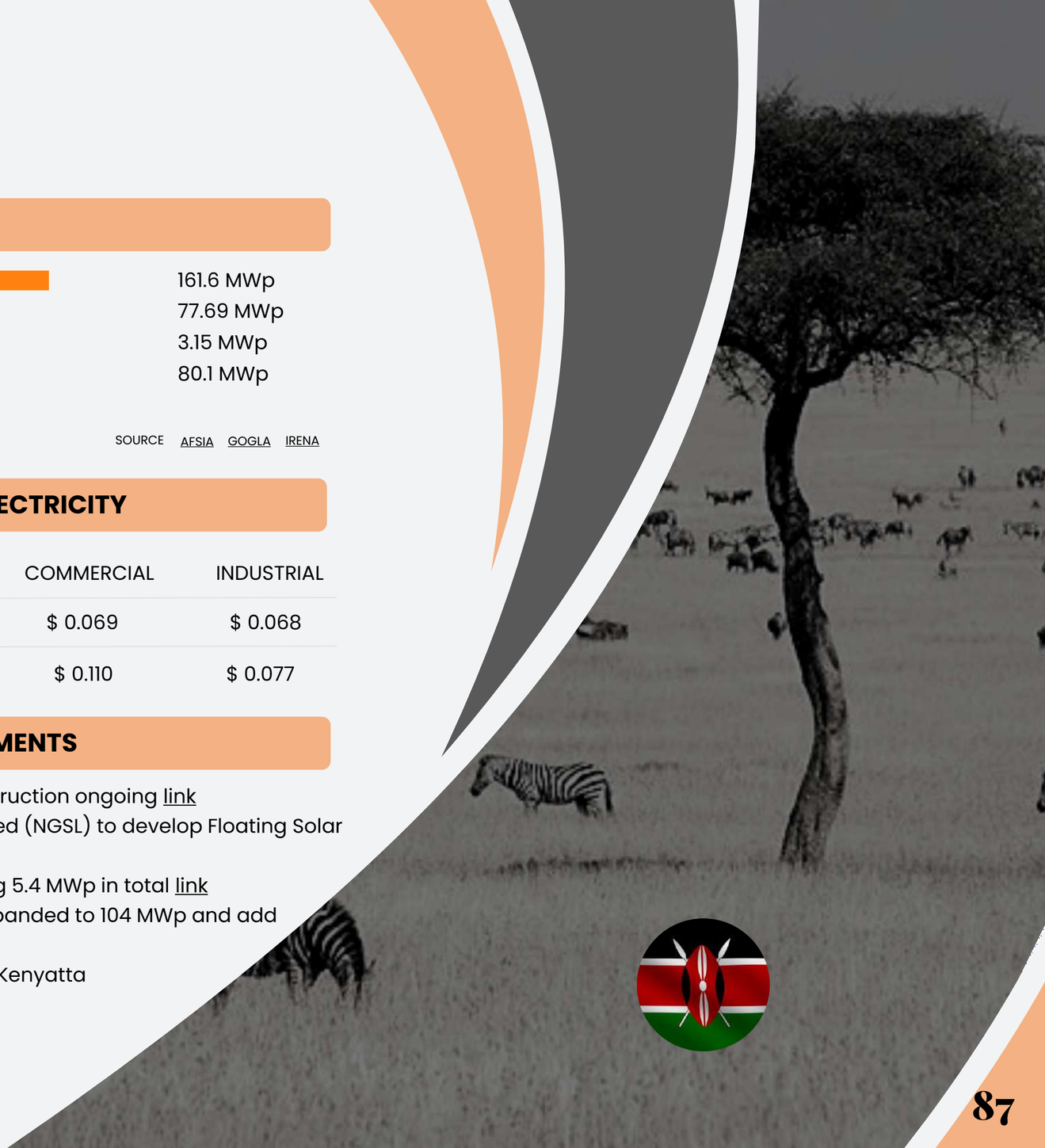
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.069	$ 0.069	$ 0.068
MAX.	$ 0.112	$ 0.110	$ 0.077

POLICY / REGULATION

- Solar panels & inverters are import duties free and between 0%-25% to the rest of solar products link
- VAT exempted on all RE products link
- Solar products are Withholding taxes free link
- FiT is $0.12/kWh since 2008 link
- EPRA releases a draft regulation for the introduction of a net-metering applied to PV systems up to 1 MW link
- 50% tax relief on initial investment for off grid power firms link

NOTEWORTHY DEVELOPMENTS

- 10 MW Samburu project construction ongoing link
- NTPC GE Power Services Limited (NGSL) to develop Floating Solar Projects in Lake Region link
- Devki Steel Mills and BAT eying 5.4 MWp in total link
- Malindi solar project to be expanded to 104 MWp and add storage link
- Tender launched for 2 MW at Kenyatta university link




+500MW
of Experience
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Partner
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Gridtech
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| Greener Continent | Sustainable Future |
http://www.gridtech-infra.com/
HQ Standard Chartered Tower, Cyber City, Ebene, Mauritius
info@gridtech-infra.com

LESOTHO

OBJECTIVES

- Additional renewable energy generation capacity of 200 MW by 2030 link
- 90 MW of renewables are under development link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0.14 MWp
MG	0.14 MWp
SHS & RESIDENTIAL	0.15 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 47.35% of the population has access to electricity link
- Targets 80% electricity access by 2030 link
- 78% in urban areas, 47% in rural areas by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.061	$0.018	$0.018
MAX.	$ 0.104	$0.019	$0.019

POLICY / REGULATION

- All PV components are subject to a reduced VAT rate of 5% link
- FiT and net-metering planned to be developed link

NOTEWORTHY DEVELOPMENTS

- EDFI ElectriFI and REPP supporting development of 11 MGs link
- 70 MW Mafeteng solar power plant under construction link
- The Lesotho Renewable Energy and Energy Access Project(LRREEAP) to provide electricity to 30 villages link

LIBERIA

OBJECTIVES

- Targets 80% renewal energy base by 2026 link
- Installation of at least 150 MW of RE generation - excluding large hydro by 2030 link
- 60 MW of solar on the National Grid by 60 MW by 2030 link
- Targets 250.000 solar lamps sales by 2030 link

ELECTRIFICATION RATE

- 27.53% of population has access to electricity link
- 34% access in urban areas and 1% in rural areas link
- Target 20% rural electrification by 2025 and 35% by 2030 link
- Target to reach 70% urban electrification by 2030 link

POLICY / REGULATION

- No import tariffs on off-grid system components related to RE development link
- No FiT, no net-metering link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0.29 MWp
MG	0 MWp
SHS & RESIDENTIAL	0.91 MWp

SOURCE AFSIA GOGLA IRENA

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.002	$ 0.002	$ 0.001
MAX.	$ 0.002	$ 0.002	$ 0.001

NOTEWORTHY DEVELOPMENTS

- 9000 households to get electricity trough Beyond the Grid Fund for Africa (BGFA) link
- 20 of 44 MWp Mount Coffee solar park to be implemented soon link
- Escotel to solarize Orange telecom towers link
- UNDP solarizing 12 health centers through MG link

LIBYA

OBJECTIVES

- Plans for 10% RE capacity by 2025 link
- 450 MW of solar by 2025 link
- 22% renewable electricity generation by 2030 and 2.2GW of solar projects under development link
- Doubling electricity from 8000 to 16000 by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0.06 MWp
MG	0 MWp
SHS & RESIDENTIAL	0 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 69.17% of the population has access to electricity link

CURRENT TARIFF GRID ELECTRICITY

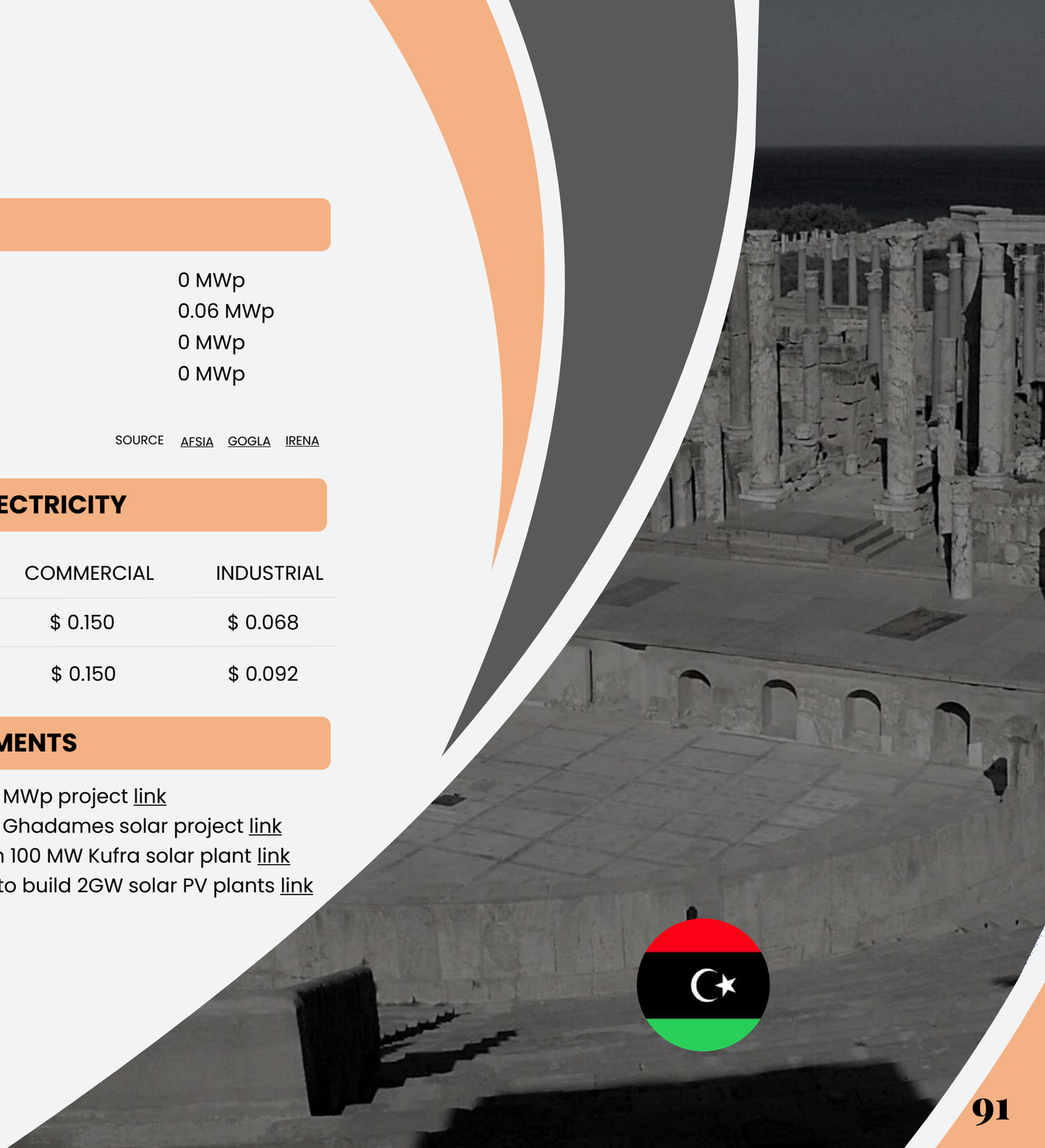
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.044	$ 0.150	$ 0.068
MAX.	$ 0.110	$ 0.150	$ 0.092

POLICY / REGULATION

- There is no VAT in Libya link
- No net-metering and no FiT policy link

NOTEWORTHY DEVELOPMENTS

- Total Energies to develop 500 MWp project link
- EG Energies to build 200 MWp Ghadames solar project link
- Construction progressing with 100 MW Kufra solar plant link
- W Solar Investment planning to build 2GW solar PV plants link

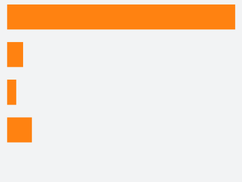


MADAGASCAR

OBJECTIVES

- Double total installed capacity to reach 800 MW by 2023 link
- 85% of RE in the power generation by 2030 link
- Solar to represent 5% of energy mix by 2030 link

TOTAL PV INSTALLED



LARGE SCALE	61.02 MWp
C&I	1.21 MWp
MG	0.25 MWp
SHS & RESIDENTIAL	3.5 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 33.74 % of the population has access to electricity link
- 70% of the population to access to electricity by 2030 link

CURRENT TARIFF GRID ELECTRICITY

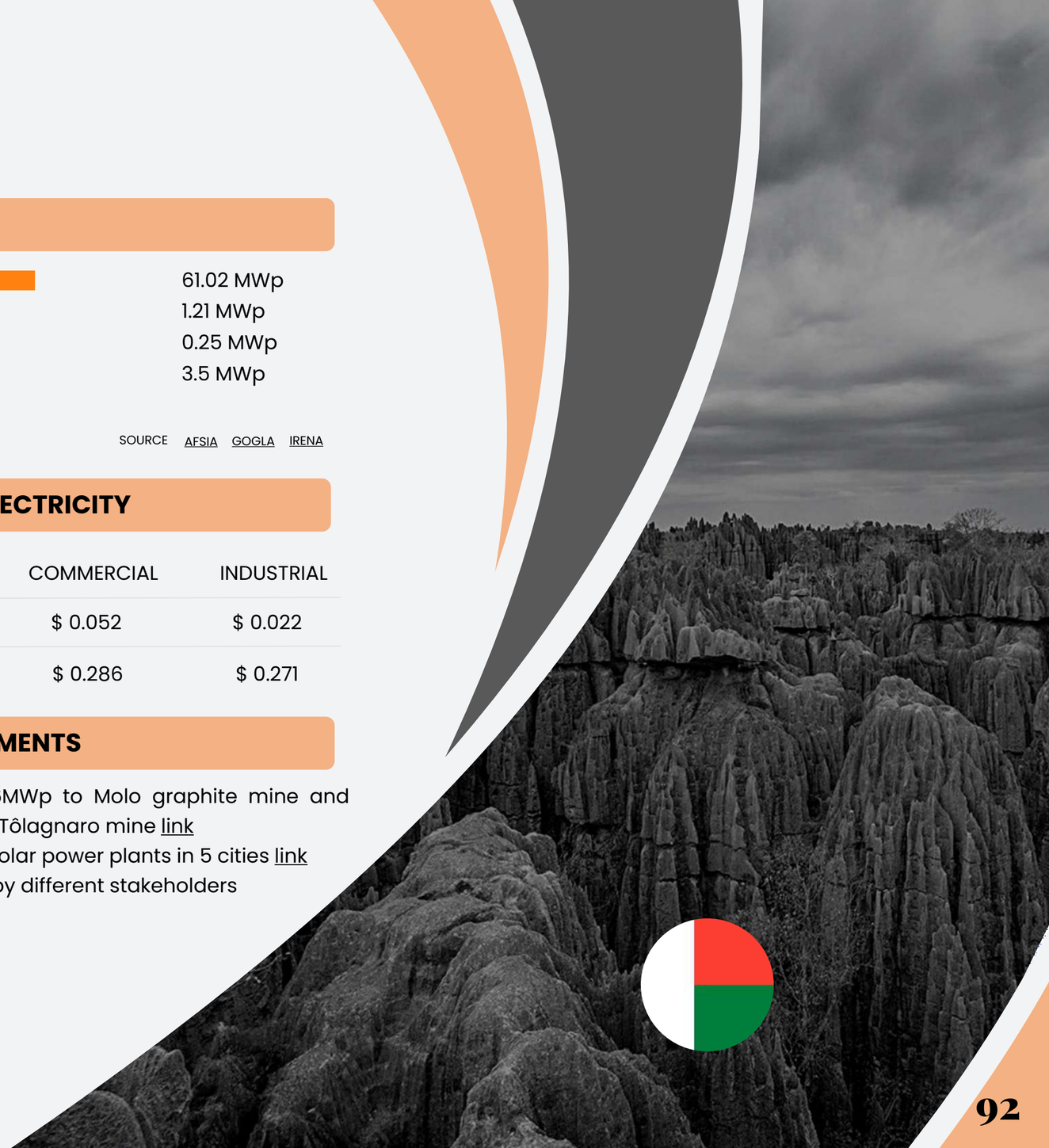
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.033	$ 0.052	$ 0.022
MAX.	$ 0.227	$ 0.286	$ 0.271

POLICY / REGULATION

- No import duties or VAT on solar panels or lithium batteries link
- FiT and net-metering are included in the country's legal frameworks link

NOTEWORTHY DEVELOPMENTS

- CrossBoundary installing 2.6MWp to Molo graphite mine and looking to connect 8 MWp to Tôlagnaro mine link
- Enerdeal to develop 7.5 MW solar power plants in 5 cities link
- 68 MGs under development by different stakeholders

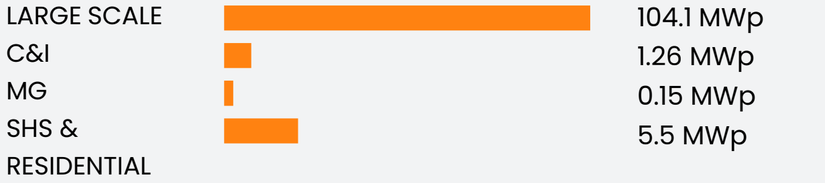


MALAWI

OBJECTIVES

- Government ambitions to generate 1,000 MW by 2025 link
- Increase RE share to 16% by 2025, 23% by 2030, and 28.9% by 2035 link

TOTAL PV INSTALLED



SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 15% of the population has access to electricity link
- 6% electricity in rural areas link
- Target to increase electricity access rate to 80% by 2035 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE

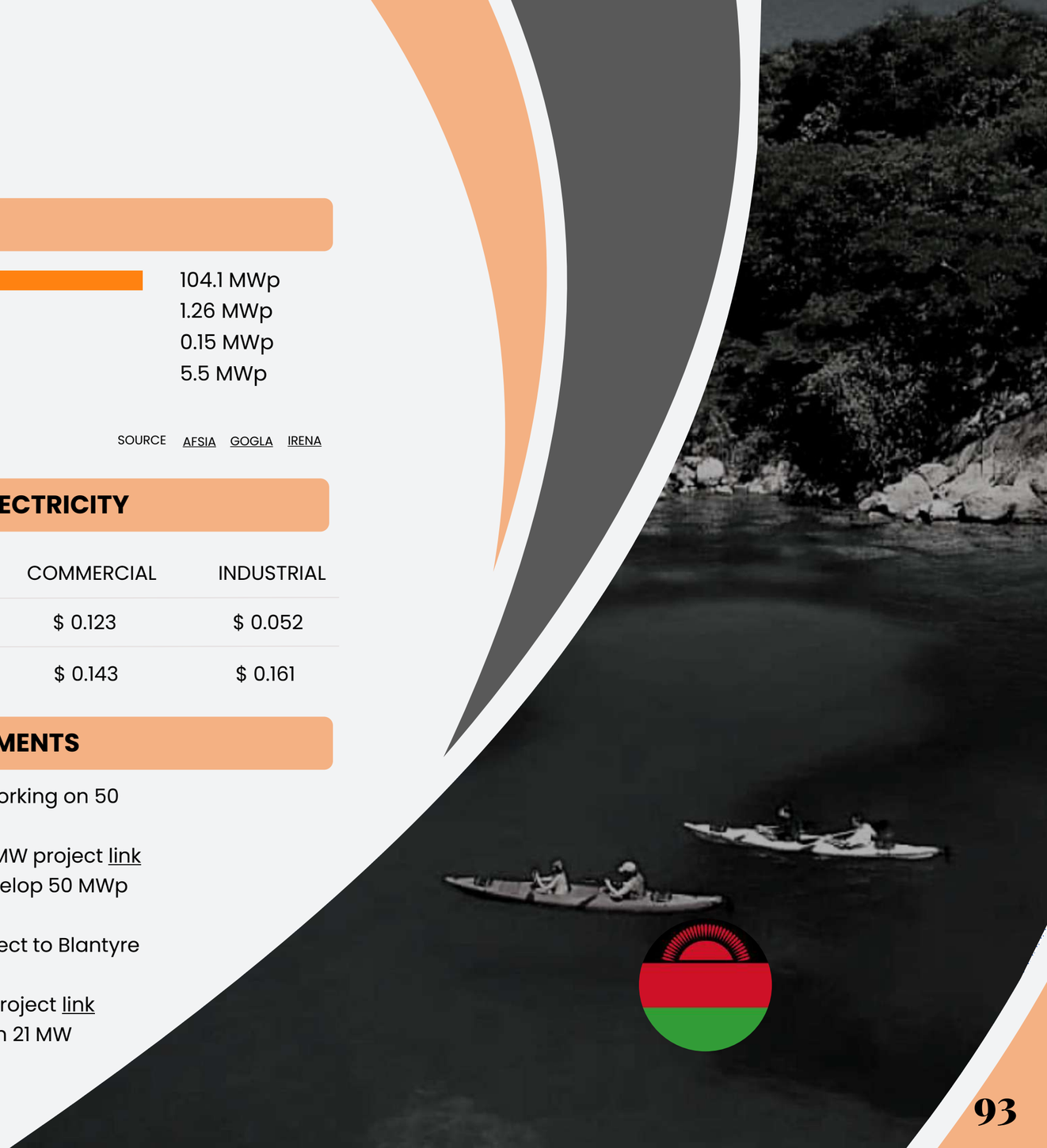
	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.054	$ 0.123	$ 0.052
MAX.	$ 0.125	$ 0.143	$ 0.161

POLICY / REGULATION

- Solar products are import duty free while VAT remains at 16.5% link
- FiT exists since 2012 for solar projects without storage sized 500kW-10MW at $0.10/kWh and $0.20/kWh for projects with storage link
- No net-metering link

NOTEWORTHY DEVELOPMENTS

- Quantel Renewable Energy working on 50 MWp Bwengu solar park link
- Elsewedy Electric to build 50 MW project link
- Solarcentury and RESA to develop 50 MWp khoma Deka plant link
- TATA to develop 30 MWp project to Blantyre Water Board link
- AMEA Power to start 50 MW project link
- Construction progressing with 21 MW Nkhotakota Solar phase 1 link



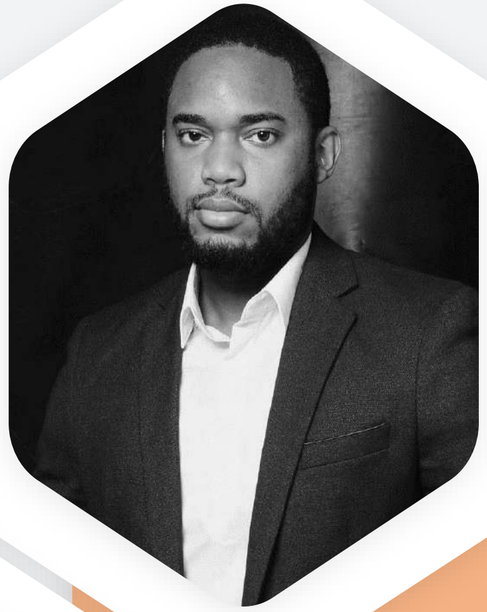
FOCUS ON STORAGE

ARTICLE

BY JEAN-PHILIPPE SEYA
Senior Project Development Manager

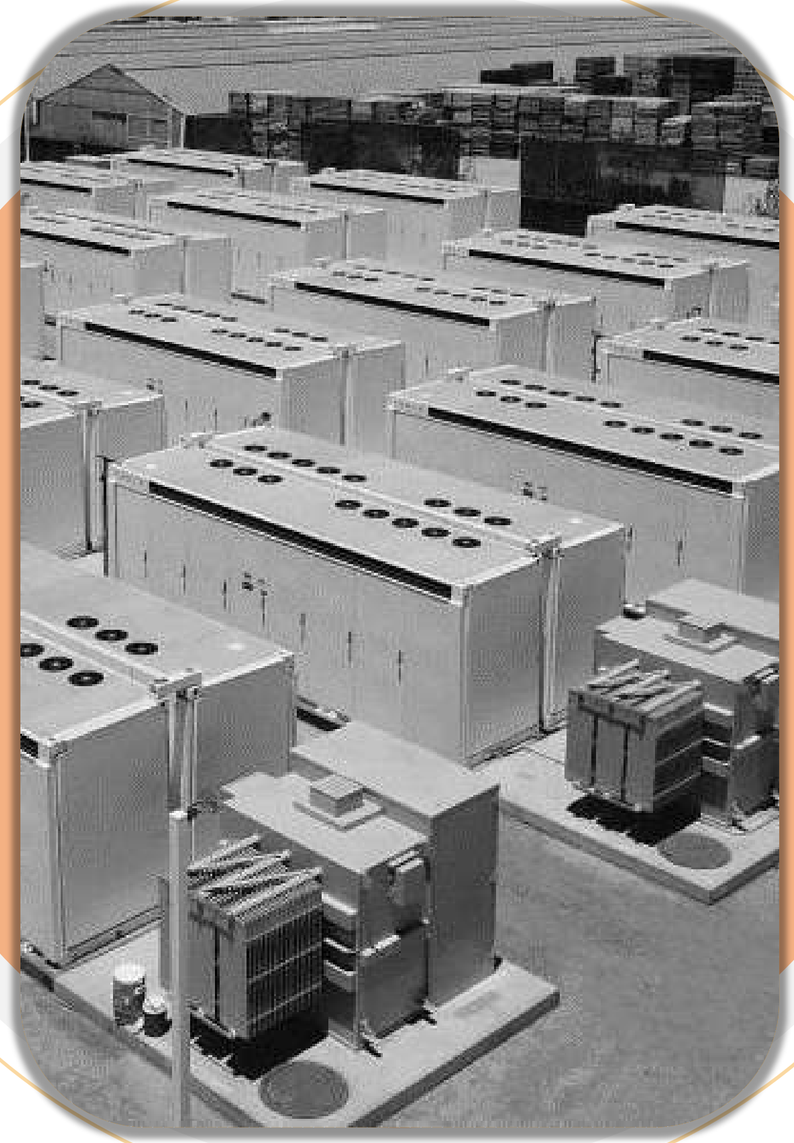
KATHLEEN JEAN-PIERRE
Chief Operating Officer

CROSSBOUNDARY ENERGY



WHICH BATTERY TECHNOLOGY SUITS YOU BEST?

Power availability, quality, and reliability are critical inputs into a successful African manufacturing enterprise. Having heard a lot about the falling cost of energy storage solutions, many factory managers are wondering how to take advantage of these new technologies to strengthen their power supply. But the variety of battery energy storage solution (BESS) options can be overwhelming to those new to the market. Luckily, the first step to procuring the best BESS is determining which energy storage applications make the best business case within your facility's operations. With target commercial outcomes in mind, it's easier for an energy services provider to identify the most appropriate and affordable storage technology for your situation.



Commercial applications for BESS

Traditional energy storage systems, such as pumped hydro, have been deployed to shift large amounts of energy over long periods of time, offering the benefits of energy arbitrage. But BESS offers customers a wider range of use cases. A BESS employs smaller energy capacities at sub-second response time, rapidly charging or discharging to help existing networks cope with power stability fluctuations. One reason BESS and solar energy systems are often installed together is because a BESS can smooth the integration of intermittent renewable energy sources.

BESS can be designed to provide a variety of services. Some examples include:

1. Replacing diesel spinning reserve with battery spinning reserve

Using a BESS in place of diesel spinning reserve reduces generator cycling and specific fuel consumption. Less fuel use reduces fuel costs. In Mali, a gold mine shifted spinning reserve for their 20MW diesel plant to battery energy storage, allowing the diesel generators to run at maximum efficiency without sacrificing the mine's power reliability. Reduced specific fuel consumption reduced the mine's overall fuel consumption (and fuel bill) by 10%

2. Reducing overall genset runtime, yielding more efficient loading of thermal unit(s) by offsetting with stored energy from another source

In Sierra Leone, a brewery is exploring the integration of a 2MWh battery energy storage system as part of a hybrid solar PV & thermal power system. Reducing generator usage in favour of real-time and stored solar power will help the facility to achieve up to 20% cost savings against its current power spending.

3. Smoothing load or supply volatility for more stable power

One of the biggest challenges for sensitive energy uses such as data centers or mining processes is power quality management. The integration of BESS into either existing thermal-powered networks or when adding renewable energy improves the transient response and reduces voltage and frequency disturbances.

Matching desired BESS services to the right technology

The ability of any BESS technology to deliver the desired energy storage service depends on numerous factors: battery cell chemistry and aging characteristics, duty cycle, environmental conditions such as temperature, and proposed project lifetime. A deep understanding of battery technologies, application stack (global duty cycle), operation control (local duty cycle), and

Credit: Africa REN

systems engineering is needed to design the most efficient BESS configuration!

However, what these technical specifications ultimately determine is how well a BESS technology can deliver either energy services or power services. Energy is how many kWh a BESS can store; the more energy capacity, the more work can be done. Power, on the other hand, is how quickly a BESS can discharge stored energy to be used. Different BESS technologies offer different balances of energy and power capabilities at a given cost. There is no single perfect battery chemistry, so the desired commercial application of the BESS is what drives the choice of appropriate BESS technology.

See following table for a listing of common BESS technologies and brief comparisons of their energy and power capabilities.

Chemistry	Abbreviation	Rating (1-5, 5 Best)					Summary
		Safety	Energy	Power	Life	Cost	
Lithium Manganese Oxide	LMO	3	4	4	4	4	Versatile technology with good overall performance
Lithium Iron Phosphate	LFP	3	4	4	2	3	Similar to LMO, but lower power capabilities so less flexible
Lithium Nickel Cobalt Aluminium	NCA	1	3	4	4	2	Good for power applications; historical safety concerns & high cost
Lithium Titanate	LTO	5	2	5	5	1	Excellent power and cycle life; highest cost technology
Sodium	Na	3	5	1	4	2	Great for energy applications but low power capabilities
Advanced Lead Acid	PbA	5	1	4	1	5	Very safe and inexpensive, but low cycle life and poor energy density

For example, utilities seeking grid scale BESS prioritize having have the most energy readily available to balance frequency and ensure available energy distribution. For this use case, sodium-ion BESS technology can be a good match, as this battery capacity optimizes for energy capacity and has a relatively good lifetime.

On the other hand, power systems for commercial-industrial operations such as mining, manufacturing, or data centers may be optimized for running specific equipment with sensitive thresholds. A BESS in this context needs to be fast enough to ensure rapid transient response to power fluctuations to maintain power reliability and quality. In this case, lithium-ion BESS technologies are often well-suited; 90% of lithium-ion BESS are currently deployed in commercial-industrial applications.

Facilities that can successfully identify how BESS will save their business money – whether through reducing the cost of specific fuel consumption or improving power quality management – are best-positioned to receive the most competitive, practical BESS quotes. The suite of commercially available BESS technologies is always changing, but this variety means energy service providers can offer clients many ways to balance technological and commercial trade-offs.

Residential ESS

- Back-up Mode Available Integrated with Diesel Generator
- Single/Three-phase Schemes Available
- Intelligent Battery Management System
- Monitoring Inverters Freely via Computers or Mobile Phones

Battery Type: Lithium Iron Phosphate (LFP) Battery Life Cycle : 6000 Cycles
Rated Energy: 9.6kWh Warranty:10 years
IP Grade: IP65 (Inverter), IP55(Battery)

C&I ESS

- Standardization / Customization Modes Available
- Highly Integrated, easy to install
- Multi-modes Available Based on AC/DC Coupling
- Grid-friendly and Quick Charge-Discharge Response

Battery Type: Lithium Iron Phosphate (LFP)
Battery Life Cycle: 8000 Cycles, 0.5C @25°C
Nominal Capacity: 50-1000kWh (Customized)
Voltage Range: 500-1500V IP Rating: IP54
Cooling:Air cooled / Liquid cooled
Certification:IEC 62619, UN 38.3, CE, UL 1973

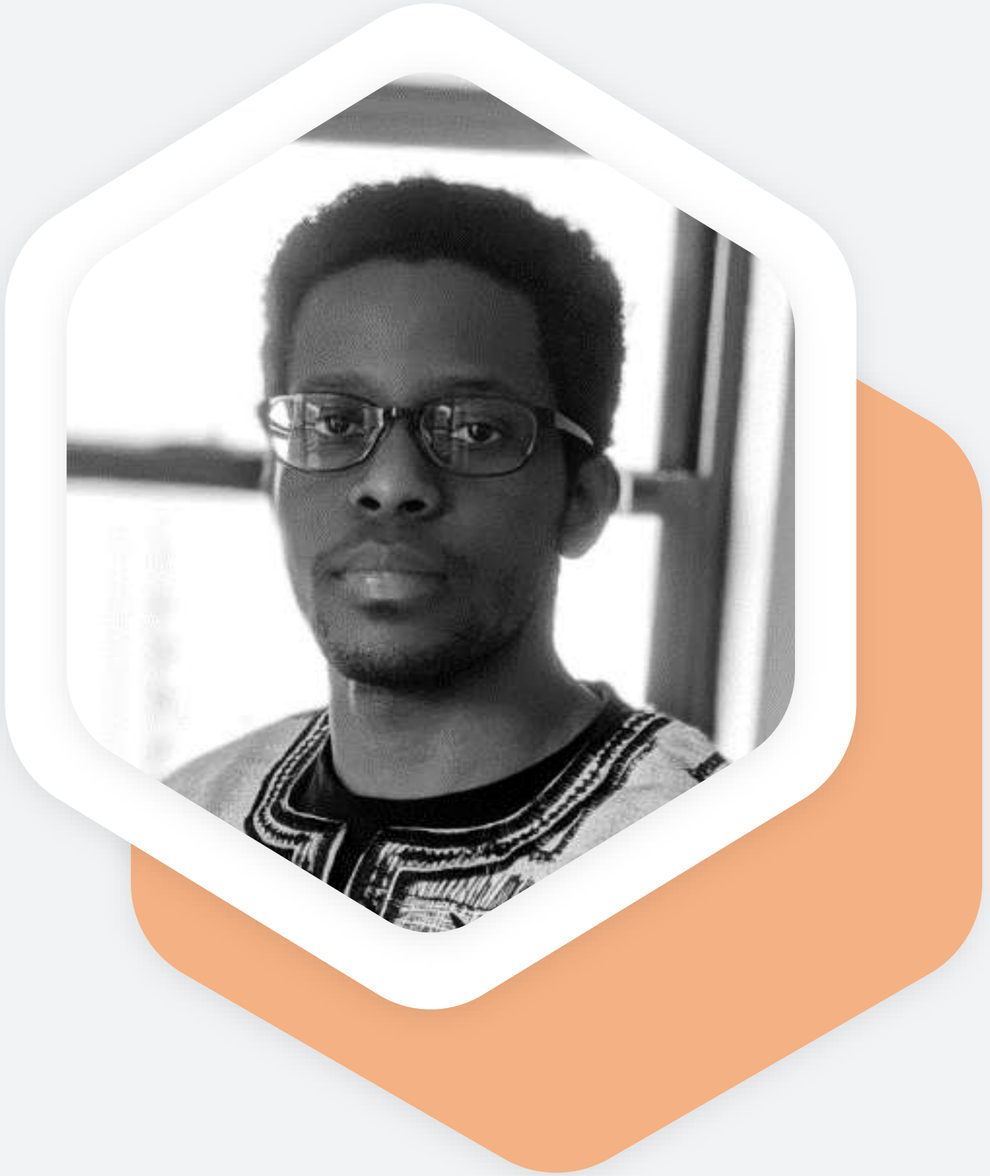
FOCUS ON STORAGE

ARTICLE

BY LÉANDRE BERWA
co-founder

OPPORTUNITIES OF SECOND-LIFE BATTERIES IN THE RENEWABLE AND ENERGY STORAGE INDUSTRIES

With the advent of renewable energy and electric mobility, the concern for battery waste is becoming an increasingly concerning issue. Many countries still lack afterlife management plans or processing capacity for retired batteries, yet these batteries retain storage capacity at their retirement. This creates a huge environmental and health hazard, but also a market and impact opportunity that companies like SLS Energy, which operates in Rwanda, are leveraging by providing energy storage services using batteries retired from electric vehicles or salvaged from the electronic waste stream. These repurposed batteries are also known as "second-life" batteries.



AFSIA
Africa Solar Industry Association

ARTICLE

Second-life batteries are suited for multiple applications

Second-life batteries are evolving from a hope or hype phase into a reality. Many market applications are being designed, and some are already adopted. These applications include the more common power backup services, but they could also be more complex applications such as peak shaving or load shifting, as well as larger-scale grid services. In addition to their environmental and social impact, second-life batteries also present many opportunities and implications in the renewable energy and energy storage industries.

The most obvious advantage of second-life batteries is lower energy storage costs for off-grid and other grid applications. Batteries becoming more affordable would not only accelerate the adoption of renewable energy sources such as solar energy but also increase the usability and reliability of these systems. More productive use of solar energy can be affordably achieved without being constrained by the high cost of energy storage. Off-grid consumers could also enjoy top-tier energy services at an affordable price.

From battery ownership to storage-as-a-service

Second-life batteries are also spurring the market to rethink battery ownership. Users need services from strong batteries that they can rely on and would be less bothered with owning the batteries if the

economics played in their favor. This is comparable to how grid-connected users are concerned about the reliability of their supply and not about the ownership of the generation and transmission systems. If these batteries are owned and managed by a central operator, their economics, lifetime, and performance can be easily optimized, and they can be used in their most suitable applications at different stages of their usable capacity. SLS Energy is currently pursuing energy storage as a service model for telecommunication towers.

Lastly, second-life batteries will present salvage value for retired batteries. This value could be factored into the project financial models to improve their economic viability, or it could be passed on to the end user to incentivize the adoption of renewable energy products. The retired battery salvage value is expected to have a bigger impact in the electric mobility space, where electric vehicle owners could reclaim that value at a strategic point of the vehicle's lifetime and be detached from battery degradation concerns.

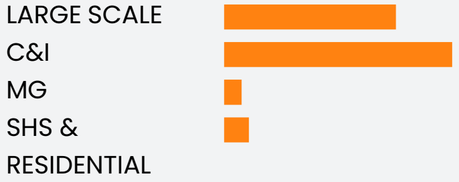
By modeling and optimizing battery economics, performance, and lifetime during both the first and second life applications, companies such as SLS Energy can bring all the environmental, social, and market opportunities of battery repurposing to life. In doing so, we will address battery waste and the reliance on fossil fuels for energy storage needs through building a sustainable chain and a circular economy for batteries.

MALI

OBJECTIVES

- Increase share of RE capacity to 58% by 2030 link
- 1416 MW of renewables of which 528 MW of solar by 2030 link

TOTAL PV INSTALLED



SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 50.6% of the population has access to electricity link
- 70% by 2025, 80% by 2030 and 90% by 2036 link
- 100% urban access by 2025, 31% rural access by 2025, and 50% by 2030 and 55% by 2036 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.170	$ 0.144	$ 0.144
MAX.	$ 0.170	$ 0.144	$ 0.144

POLICY / REGULATION

- No import duty and VAT on solar products link
- No net-metering, no FiT

NOTEWORTHY DEVELOPMENTS

- Abu Dhabi Fund for Development supporting construction of 31 MGs link
- Scatec constructing 33 MWp Segou project link
- 70+ MW for mining activity under construction or development
- NTPC awarded PMC contract to set up 500 MW solar project link
- Orange Mali to install 25MW/30MWh solar power station link

MAURITANIA

OBJECTIVES

- Targets to increase the share of renewables in the electricity mix to 50% by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	69.3 MWp
C&I	1.61 MWp
MG	15.05 MWp
SHS & RESIDENTIAL	0.14 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 47.35 % of the population has access to electricity link
- Targets 12% rural electrification rate by 2024 and 40% by 2030 link
- Universal access in urban areas by 2030 link

CURRENT TARIFF GRID ELECTRICITY

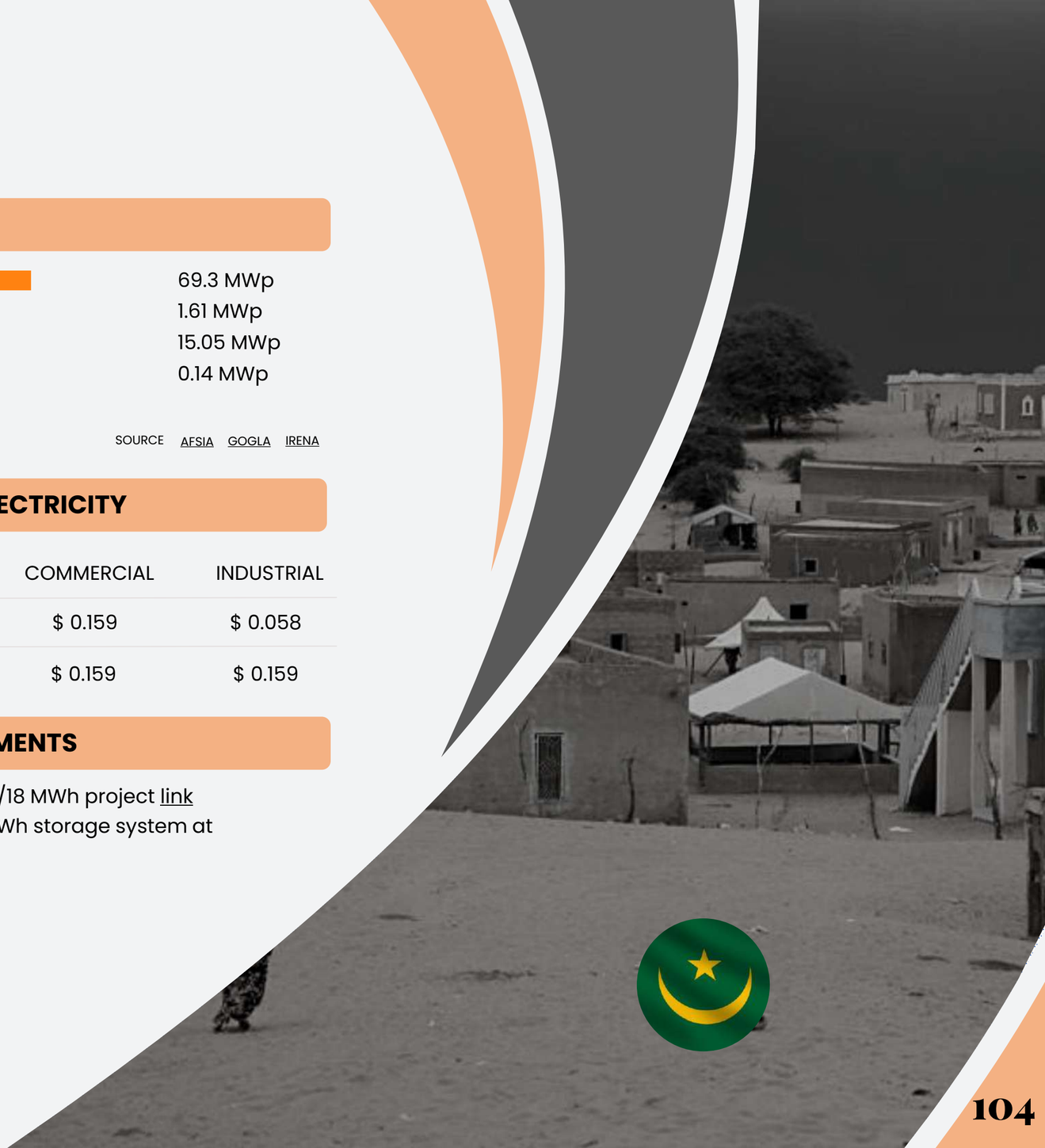
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.066	$ 0.159	$ 0.058
MAX.	$ 0.159	$ 0.159	$ 0.159

POLICY / REGULATION

- Duties range between 9% - 18% link
- ADER provides subsidies of 60-80% for some of the isolated grids link
- No net-metering, no FiT link

NOTEWORTHY DEVELOPMENTS

- Voltalia constructing 42 MWp/18 MWh project link
- Kinross to build 34 MWp+18 MWh storage system at Tasiast mine link



MAURITIUS

OBJECTIVES

- 35% of RE in the electricity mix by 2025 link
- 60% of RE in its electricity mix by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	98.8 MWp
C&I	2.59 MWp
MG	0 MWp
SHS & RESIDENTIAL	0.05 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 99.6% of the population has access to electricity link
- 98% access in urban areas and 98% in rural areas link

CURRENT TARIFF GRID ELECTRICITY

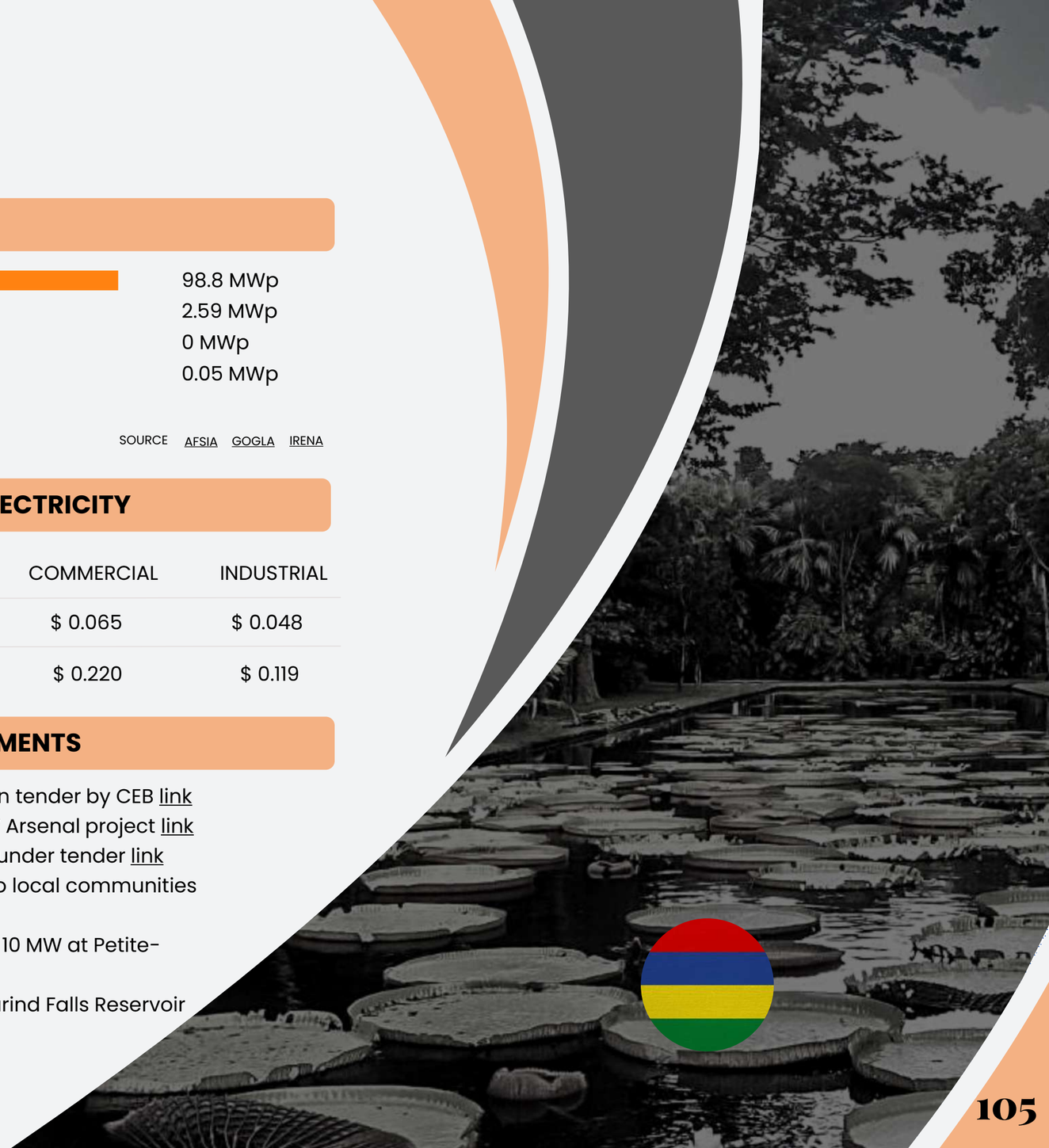
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.048	$ 0.065	$ 0.048
MAX.	$ 0.193	$ 0.220	$ 0.119

POLICY / REGULATION

- Solar PV projects are VAT exempt link
- Net-metering available to individual generation capacity of up to 5 kW link
- Prosumers registered under the CEB net-metering scheme get FiT (scheme closed in 2015 after target was reached) link
- Green energy scheme for SMEs: 2,000 2 kWp systems installed free of charge link

NOTEWORTHY DEVELOPMENTS

- 140 MW project with storage in tender by CEB link
- Green Yellow to build 13.6 MW Arsenal project link
- 8 MW Tamarind Falls project under tender link
- UNDP to build 25 MW power to local communities on Agalega Island link
- Green Rock Ltd to implement 10 MW at Petite-Retraite link
- 2 MWp floating solar at Tamarind Falls Reservoir under tender by TCIL link



MOROCCO

OBJECTIVES

- 52% RE in the energy mix by 2030, 70% by 2040 and 80% by 2050 link
- Target to add 10 GW of RE between 2018 and 2030, with 4560 MW of solar link

TOTAL PV INSTALLED

LARGE SCALE	323 MWp PV + 534 MWe CSP
C&I	10.55 MWp
MG	0 MWp
SHS & RESIDENTIAL	79.28 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 100% of the population has access to electricity link
- 95% access in urban areas and 95% in rural areas link

CURRENT TARIFF GRID ELECTRICITY

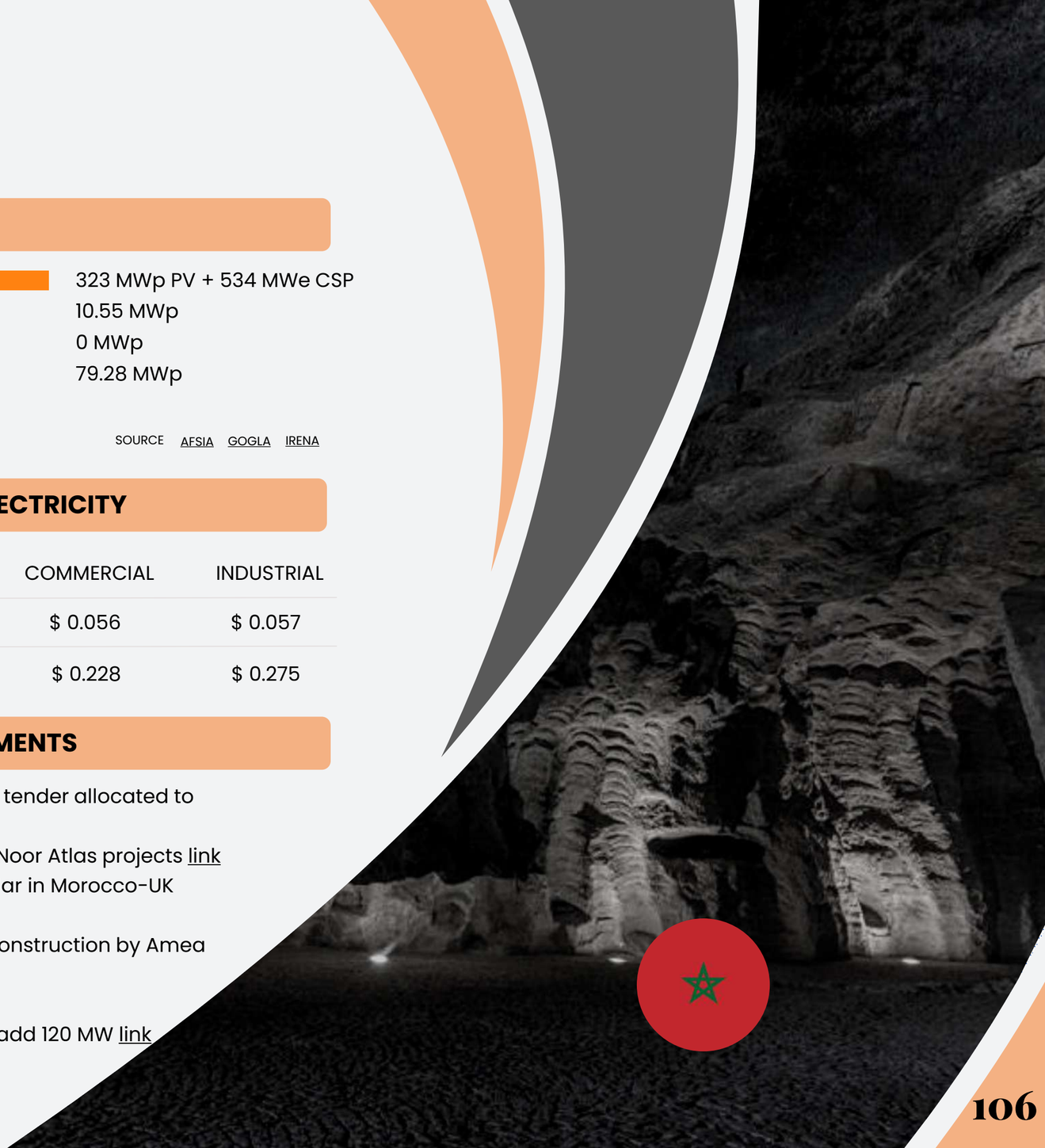
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$0.085	$ 0.056	$ 0.057
MAX.	$0.150	$ 0.228	$ 0.275

POLICY / REGULATION

- 10% import duties on solar panels but exempted for water heaters link
- Exemption for solar water pumps for agricultural use link
- 20% import VAT and 20% VAT apply on water heaters and solar panels link
- Net metering available link
- No FiT link

NOTEWORTHY DEVELOPMENTS

- 333 MW PV in 400 MW NOOR II tender allocated to private companies link
- Tender launched for 260 MW Noor Atlas projects link
- Xlinks to construct 7 GW of solar in Morocco-UK Power Project link
- 34 MWp GPM1 project under construction by Amea Power link
- Noor Midelt I on hold link
- The "Noor Tafilalet" project to add 120 MW link



MOZAMBIQUE

OBJECTIVES

- Target 20% integration of RE in the grid by 2030 link
- Installed capacity of 600 MW, including 200 MW of RE by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	107 MWp
C&I	0.25 MWp
MG	0.65 MWp
SHS & RESIDENTIAL	1.9 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 30% of the population has access to electricity link
- 68% in urban areas and 17% in rural areas link
- Target access of 50% of the population by 2023 link
- Target universal electrification by 2030 link

CURRENT TARIFF GRID ELECTRICITY

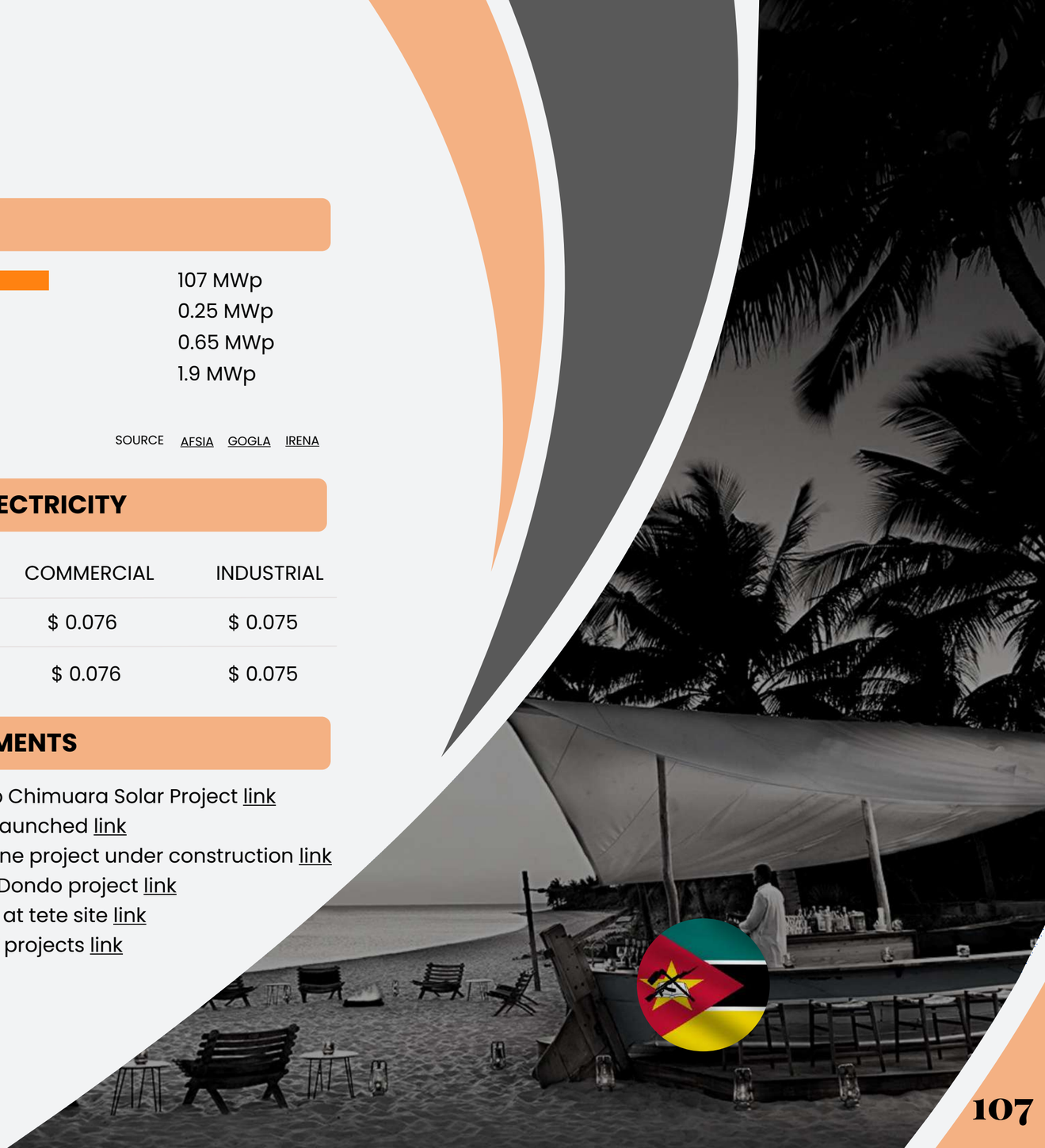
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.096	$ 0.076	$ 0.075
MAX.	$ 0.143	$ 0.076	$ 0.075

POLICY / REGULATION

- Solar products are charged an import duty of 7.5% and 17% VAT on all RE products link
- FiT was approved in 2014 but no implementation guidelines in place yet link

NOTEWORTHY DEVELOPMENTS

- Solarcentury to build 120 MWp Chimuara Solar Project link
- 20 MW Mecufi project tender launched link
- 11.25MWp+8.5MWh Balama Mine project under construction link
- Total Eren developing 40 MW Dondo project link
- Ncondezi developing 300 MW at tete site link
- Tender launched for 2*30 MW projects link



NAMIBIA

OBJECTIVES

- RE to represent 70% of country's energy mix by 2030 link
- Expecting to increase the installed capacity to 1,138 MW by 2030 link
- Target to have 229 MW of solar PV and 250 MW of CSP by 2035 link

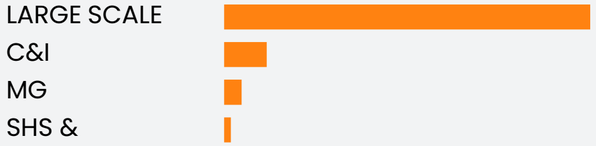
ELECTRIFICATION RATE

- 56.26% of the population has access to electricity link
- 73% in urban areas and 24% in rural areas link
- Targets universal electricity access by 2040 link

POLICY / REGULATION

- Import duties are not levied on RE, except solar thermal energy for households link
- 15% VAT on importation of goods is levied link
- Net-metering exists for less than <500kVA link
- FiT available for systems <5MW link
- Wheeling system in place link

TOTAL PV INSTALLED



LARGE SCALE	254.57 MWp
C&I	36.4 MWp
MG	0.36 MWp
SHS & RESIDENTIAL	0.04 MWp

SOURCE AFSIA GOGLA IRENA

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.066	$ 0.092	$ 0.090
MAX.	$ 0.172	$ 0.255	$ 0.149

NOTEWORTHY DEVELOPMENTS

- Emesco developing 125 MW Karasburg solar park for export to Southern African Power Pool link
- ANIREP constructing 18.5 MWp Kokerboom solar plant link
- NamPower constructing 20 MWp Khan solar plant link
- Development Bank of Namibia supporting construction of 5.4 MW p at Rosh Pinah mine link
- 90 MWp to power the first green hydrogen plant in the country link
- NamPower eyeing at 135 MW Arandis CSP project link

FOCUS ON YOUTH EMPLOYMENT

ARTICLE

BY AASHNA AGGARWAL

Partnerships and Development Manager

POWER FOR ALL

WHAT DO WE NEED TO BUILD A CLEAN ENERGY WORKFORCE?

The current geopolitics and socio-economic challenges plaguing the world have thrust the alternative approaches to energy on top of the global agenda. Beyond the climate-induced energy crisis, war-induced electricity shortages, and grid failure-induced blackouts, we must not forget that the number of those living without any access to electricity stands at 733 million. Decentralized renewable energy (DRE) systems play a vital role in drastically scaling up

AFSIA
Africa Solar Industry Association

ARTICLE

efforts toward achieving universal and sustainable energy access by quickly providing renewable electricity to the 733 million people trapped in energy poverty. This however requires a skilled, engaged workforce.

I believe that the clean energy sector is one field where active solidarity between established energy leaders and the emerging young workforce has the potential to make a massive impact in accelerating the transition to a sustainable energy future.

Estimates from the International Renewable Energy Agency (IRENA) suggest that as many as 4.5 million off-grid, renewable energy jobs could be created globally by 2030. Despite its immense potential for growth and innovation, the clean energy sector will face a dire shortage of talent in the coming years because the rapid increase in demand for workers with experience in renewables does not match the supply of the workforce and it will take time to train people up.

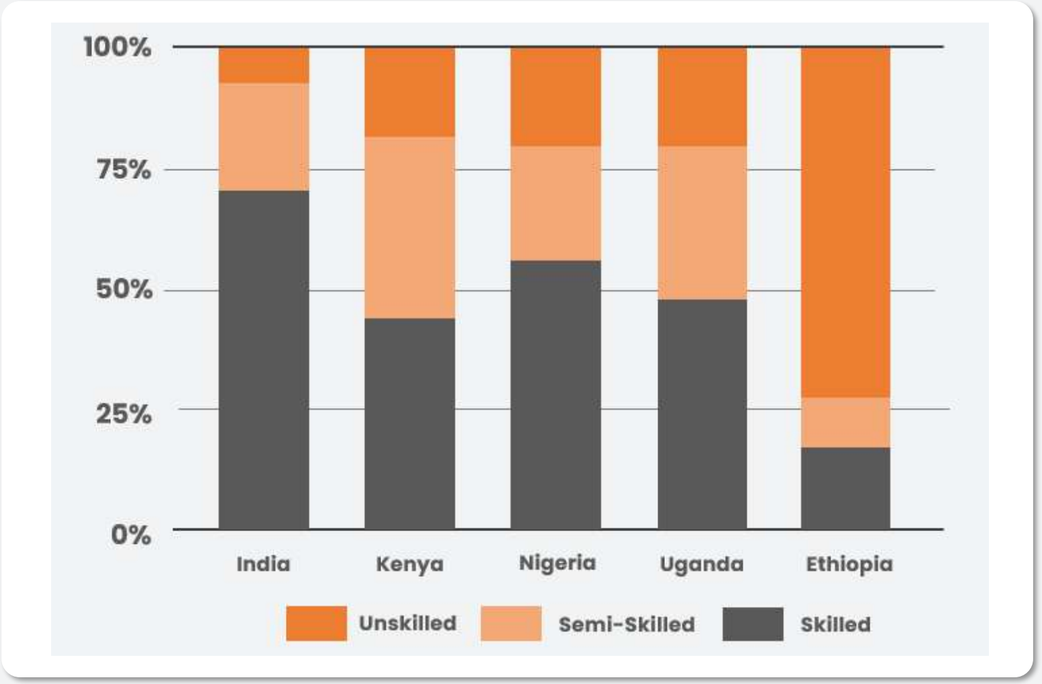
At the same time, youth unemployment numbers are high in many developing countries. This year it is estimated that the global population has surpassed 8 billion, with the majority of the growth being concentrated in the poorest countries. Africa has the youngest population in the world, with 70 percent of sub-Saharan Africa under the age of 30. The DRE sector represents a path forward to provide rural and peri-urban youth with meaningful, stable employment and a career path.

By providing youth with opportunity, education, and training to allow them to fully participate in politics and society, which is critical for economic growth and stability, we can solve two problems at once.

“The barriers to entry include the lack of access to skills training programs, mentorship networks, and entry-level project experience needed to enter these careers,” said Helen Watts, Senior Director of Global Partnerships at Student Energy, a global youth-led organization empowering young people to accelerate the sustainable energy transition.

As the DRE sector continues to mature, demand for a skilled workforce will rise exponentially as higher skills are required for more complex installations. According to Power for All’s recent DRE employment study — Powering Jobs Census 2022: The Energy Access Workforce — as the sector matures more skilled workers are needed. In the report, skilled workers were defined as leadership, management and professional positions including CEO, any C-level executives and technical jobs such as installation technicians or engineers. In India and Ethiopia, 71 and 25 percent of the DRE jobs respectively are considered skilled, while both countries are in a relatively nascent DRE sector.

"There are thousands of young people around the world who are deeply passionate about a just energy transition and have the



potential to become leaders in the clean energy sector," The Youth Expert at Sustainable Energy for All, Akil Callender said. "However, accessible programs are not responding fast enough or the training opportunities do not always translate to jobs."

Powering Jobs Census 2022: The Energy Access Workforce

Given the importance of human capital to the spread of DRE technology and realizing the potential of both countries and

communities, Power for All, a campaign to end energy poverty through accelerated deployment of decentralized renewable energy (DRE), has launched a coordinated global effort to develop a DRE-specific human capital pipeline to meet the needs of this rapidly growing sector.

Central to this effort is reliable, accessible, and statistically significant data that can help funders, employers, and policymakers alike ensure the growth of talent needed to scale the DRE sector. To fill this knowledge gap Power For All is expanding on our Powering Jobs Census with a campaign to inform and mobilize support for decentralized renewables, we hope this will act as an engine for job creation. The 2022 Powering Jobs study focused on five countries including Ethiopia, India, Kenya, Nigeria and Uganda.

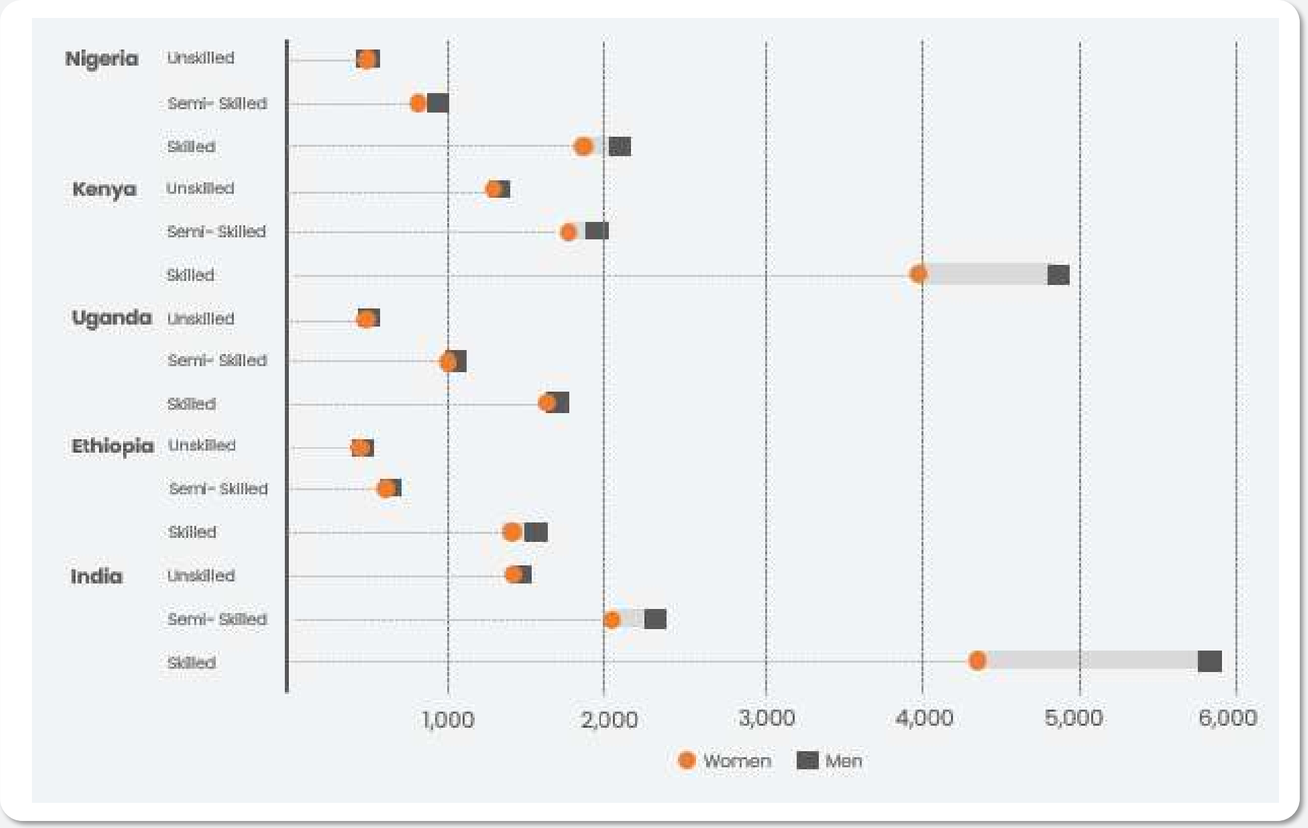
The data in the census shows the resilience of the sector despite the global pandemic. Structural barriers (foreign exchange shortages, conflict, etc.) have hindered employment growth in countries like Uganda and Ethiopia, but DRE is recovering faster than the broader economy.

Many DRE companies surveyed for the Powering Jobs Census cited critical skills gaps as a major impediment to growth, recommending addressing address them through upskilling including education in sales, installation and after-sales services.

Credit: ENGIE Energy Access

The companies and experts that were interviewed identified a lack of financial resources and standardized curricula as additional challenges in a widening skills gap.

The report finds that women's participation in the DRE sector has improved in all focus countries but India. More specifically, women's participation nearly doubled in Kenya and increased by 10 percent in Nigeria. But India saw a largely pandemic-driven reduction of 9 percent. In other promising findings, the gender wage gap is smaller than the national wage gap for all focus countries, with the exception of Ethiopia.



The benefits of DRE are significant. The Powering Jobs Census shows it is making a significant impact on developing economies. It is estimated the DRE will create up to half a million jobs by 2030 in Africa alone. This is on top of the broader economic and societal benefits of off-grid electrification.

A just transition will look different for all economies but job creation might be the one common denominator. The re-skilling and up-skilling of the clean energy workforce is critical for the DRE market to be able to reach its full potential of alleviating energy poverty and providing secure meaningful work. To continue to reap the benefits, education institutions, technical and vocational education, and training (TVET) companies, DRE companies, and non-profit organizations must collaborate in developing skills training modules, standardized curricula, and a workforce pipeline to allow more young people to enter the clean energy space.

NIGER

OBJECTIVES

- The government aim to source 30% of its power from renewables by 2035 link
- RE to reach 57% of the electricity mix by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	7 MWp
C&I	0.15 MWp
MG	0.14 MWp
SHS & RESIDENTIAL	0.44 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 19.3% of the population has access to electricity link
- 69% in urban areas and 11% in rural areas link
- Target 30% electrification rate by 2026 and 80% by 2035 link
- Achieve universal electrification by 2035 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.109	$ 0.090	$ 0.090
MAX.	$ 0.219	$ 0.143	$ 0.143

POLICY / REGULATION

- No import duties on RE equipment link
- Import tax and VAT exempted on all RE equipment link
- No net-metering, no FiT link

NOTEWORTHY DEVELOPMENTS

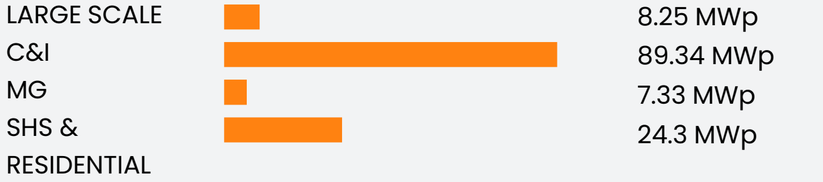
- 16 MW+15 MWh Dasa Uranium project under development link
- 50 MWp Gorou Banda project tender going on link
- Africa GreenTec developing 50 MGs link
- 150 MW being developed by West African Power Pool link
- Sterling & Wilson building 18.9 MW + 11.5 MWh Agadez hybrid link
- NTPC secured contract to set up 50 MW solar capacity link
- World bank to develop 50 MW as part of scaling solar program link

NIGERIA

OBJECTIVES

- Targets 30GW by 2030 with 30% renewable energy link
- Solar energy to contribute 19% to electricity mix by 2030 link
- 500 MW of PV by 2025 link

TOTAL PV INSTALLED



SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 60% of the urban population has access to electricity link
- 20% in urban areas and 9% in rural areas link
- Targets to increase electricity access to 90% by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.059	$ 0.066	$ 0.067
MAX.	$ 0.166	$ 0.155	$ 0.153

POLICY / REGULATION

- 0% import duty on solar panels, 5% on SHS and 20% for other components link
- 5% VAT applies on solar components link
- Solar Nigeria Programme (NSP) supporting the market for off-grid solar link
- Updating the Mini-Grid Regulation to raise cap for licensing from 1MW to 5MW link
- FiT for projects up to 5 MW link
- Net-metering for projects below 1MW link

NOTEWORTHY DEVELOPMENTS

- 961 MWp+455 MWh under development by Sterling and Wilson link
- 100 MGs under development in by Engie link
- Gombo State looking to generate 250 MW link
- University of Abuja to get 3.1 MWp+2.03 MWh link
- Husk Power planning 500 MGs in the country link
- CrossBoundary developing 6.337 MWp for Nigerian Breweries link

REPUBLIC OF THE CONGO

OBJECTIVES

- Congo Energy Strategy 2015-2025 aiming at developing a PV electrification plan for remote villages link
- Plans 70% renewable energy for mining by 2025 link
- 85% renewable electricity by 2025 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	0.02 MWp
MG	0 MWp
SHS & RESIDENTIAL	0.9 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 48.3% of the population countrywide has access to electricity link
- Targets 95% electricity access in urban areas and 60% in rural areas by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.050	$ 0.046	$ 0.041
MAX.	$ 0.079	$ 0.046	$ 0.041

POLICY / REGULATION

- All RE components are subject to import duties and VAT link
- Country has no implemented legislation intended to incentivize the development of renewable energy projects link

NOTEWORTHY DEVELOPMENTS

- Cash Congo to build 66 MWp hybrid solar power plant link
- Copasol and Green Corp to establish more than 150 MW solar power plants in various parts of the country link

RWANDA

OBJECTIVES

- Rwanda eyes to reach 512MW of total installed capacity by 2024 link
- 30% households to be electrified through off-grid solutions by 2024 link
- The government target 60% of renewable resources by 2030 link

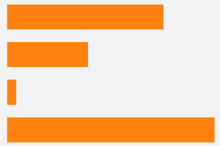
ELECTRIFICATION RATE

- 74.5% of the population has access to electricity link
- 50.9% connected to the grid and 23.6% have access through off-grid systems (mainly solar) link
- 100% electrification rate by 2024, 70% on-grid and 30% off-grid link

POLICY / REGULATION

- No import duties on solar panels and a range of 0%-25% to other solar products link
- VAT exemption on solar equipment and 5% withholding taxe link
- $15M subsidy + $20M guarantee program for SHS launched in 2020 link
- No permit required for systems <50kWp
- No net-metering and no FiT

TOTAL PV INSTALLED



LARGE SCALE	8.8 MWp
C&I	5.73 MWp
MG	0.55 MWp
SHS & RESIDENTIAL	9.6 MWp

SOURCE AFSIA GOGLA IRENA

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.086	$ 0.122	$ 0.091
MAX.	$ 0.242	$ 0.247	$ 0.130

NOTEWORTHY DEVELOPMENTS

- Equatorial Power to develop 4 MGs in the south-east region with InfraCo Africa support link
- KfW and Green Climate Fund supporting green city Kigali project link

SAO TOME & PRINCIPE

OBJECTIVES

- 50% RE in the energy mix by 2030 link
- Increasing RE production from 26 MW to 49 MW by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0.55 MWp
C&I	0.01 MWp
MG	0 MWp
SHS & RESIDENTIAL	0 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 76.56% of the population has access to electricity link
- Targets universal electrification by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.067	$ 0.155	$ 0.138
MAX.	$ 0.155	$ 0.398	$ 0.138

POLICY / REGULATION

- No existing VAT framework, activities in the energy sector are subject to a 5% tax rate link
- No net-metering, no FIT

NOTEWORTHY DEVELOPMENTS

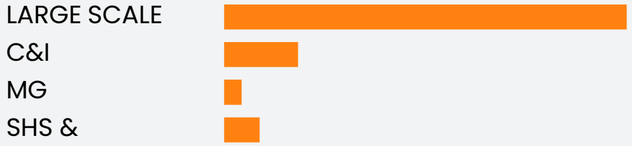
- Tender launched for the construction of 1.5 MWp project link
- 1.4 MWp under construction at two airports link
- Solo Solar Energy and CISAN planning four projects of 15 to 10 MW link
- EDP Renewables planning 4.75 MWp/3.5 MWh project on Principe island link
- 22 MW additional total capacity being developed b various companies

SENEGAL

OBJECTIVES

- 32% RE contribution in energy mix by 2030 link
- 15% RE in the energy mix by 2025 link
- 22% renewable energy by 2025 link

TOTAL PV INSTALLED



SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 70% of the population has access to electricity link
- 77% in urban areas and 35% in rural areas link
- Universal access by 2025 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.146	$ 0.119	$ 0.094
MAX.	$ 0.214	$ 0.311	$ 0.181

POLICY / REGULATION

- No import duties on solar panels but 5% applies for SHS link
- No VAT for PV equipment link
- Hybrid form of net-metering and FiT introduced in 2018 link

NOTEWORTHY DEVELOPMENTS

- 2 MWp under development at Abdoulaye Wade stadium link
- 30 MW Niakhar hybrid plant under construction link
- CrossBoundary to build 13 MW hybrid plant for Grande Côte Operations link
- 300 mini-grids to be built across the country link

FOCUS ON E-MOBILITY

ARTICLE

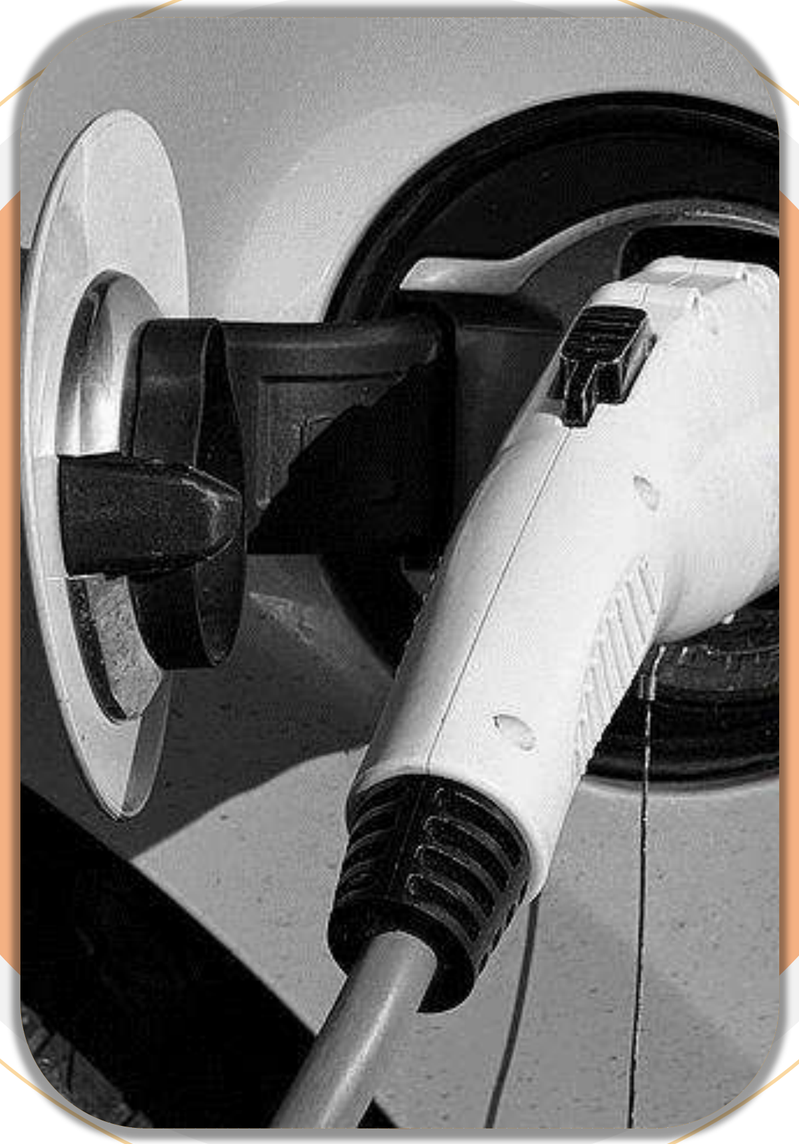
BY JOHN VAN ZUYLEN
CEO – Africa Solar Industry Association

WARREN ONDAJE
Managing Director – Association for Electric Mobility & Development in Africa

AFRICA IS GETTING MORE AND NEW MOBILITY SOLUTIONS

In 2022, the world's population reached 8 billion, the shortest period in which a billion people got added to the planet. Given the recent COP27 discussions on sustainability, promoting sustainable energy and transportation is crucial. One solution is electric mobility (e-mobility), which can increase energy independence, reduce greenhouse gas emissions, and foster innovation in new markets.

Africa, which is responsible for only 4% of global greenhouse gas emissions, is particularly vulnerable to the impacts of climate change. Transportation accounts for 40% of emissions from fossil fuel burning, and 38 of the continent's 55 countries are net oil importers. This reliance points to the continent's potential economic and environmental impact as its energy needs grow.



By 2050, the target year for achieving net zero emissions globally, Africa is projected to have 2.5 billion people, 25% of the world's population, with a median age of 20 years. The widespread adoption of the internet and mobile money has provided access to improved energy and transportation solutions through pay-as-you-go models. Electric mobility can take advantage of these advances to accelerate the adoption of clean transportation paired with renewable energy.

Currently, 85% of the vehicles in Africa are secondhand. However, there is a growing market for new two and three-wheelers. These light-duty vehicles bought new or assembled in Africa are expected to make up 55% of the 58 million vehicles on the continent's roads by 2040. Africa's motorization rate, at just 42 vehicles per 1,000 people, is far below the global average of 182. This gap represents a 238% growth potential that could be filled by electric vehicles.

It is estimated that approximately $600 billion will be needed to electrify Africa's vehicle fleet by 2040. The market is ready for innovative business models such as battery-as-a-service or pay-as-you-drive, which reduce the upfront cost of vehicles for consumers. There are already over 100 solution providers addressing the entire value chain, from passenger transport on electric motorcycles to mass transportation in metropolitan areas to electric outboard engines for fishing boats and even electric three-wheelers for economic productivity in rural areas.

However, these efforts represent less than 1% of the required investment. Investors now have the opportunity to lead in this emerging subsector. African governments must develop policies that allow for importing and growing local assembly and manufacturing of electric vehicles.
Additionally, more robust policies are needed to address used vehicles, which risk being dumped in Africa as other regions phase them out. Demand-side initiatives, such as competitive electricity tariffs or rebate programs, can sensitize consumers to choose electric vehicles over internal combustion engines.

Africa has the unique opportunity to compete globally with solutions designed, manufactured, and assembled on the continent for Africa. A shift to electrified transportation promises rapid economic development while being socially and environmentally sustainable, creating a new class of high-quality jobs in engineering, data, payments, and operations for the continent's young, tech-savvy professionals.

Solar expected to be the only way to support e-mobility in Africa

But for Africa to fully embrace its e-mobility potential, solar will undeniably play a central role. We believe this is the case because a) e-mobility should only be powered by renewable energy, b) the transition to electric bikes in Africa will happen very fast and c) solar is the only renewable power technology that can be deployed quickly and flexibly to follow the expected e-mobility boom in Africa.

First, it is important to note that switching from ICE (internal combustion engines) vehicles to electric ones only make sense if the electricity consumed is from renewable source. Countries where we currently see a good uptake of electric vehicles but which are predominantly relying on fossil fuels for their electricity generation are only displacing the problem from the gas station to the power plant. But the net impact unfortunately is close to zero.

Only a few African countries are already predominantly counting on reliable renewable sources for their electricity generation. These countries could very easily welcome an entire fleet of electric vehicles. Kenya and Rwanda are two such countries. For the other countries however, the situation is very different. Some of them have historically bet on hydro but are now facing seasonal challenges due to climate change seriously affecting the water reserves and dams potential. These countries are already struggling to generate their basic electricity from renewable sources, so a growing fleet of electric vehicles would only add pressure on an already fragile power generation system. As for the final group of countries, which predominantly rely on fossil fuels, incorporating electric vehicles to the national fleet would only displace the fossil fuel problem. This is particularly the case in West Africa.

As a result, most African countries will need additional renewable electricity generation capacity if they want to move into the era of electric mobility and reap all of its environmental and financial benefits.

Further, we expect the electric mobility transition in Africa to happen quickly and be predominantly driven by commercial motorbikes. Commercial motorbikes represent by far the largest share of vehicles across Africa. There are 27 million motorcycles registered in sub-Sahara Africa, translating to roughly one for every 48 people. Approximately 80% of these motorcycles are used as passenger taxis and for deliveries. The drivers of these motorbikes are very cost-sensitive as they drive an average of 200km per day. For them, any saving in operational costs can make a big difference. Switching to electric can help these taxi drivers increase they net take-home pay by 40% to 100%. It is therefore to be expected that no special policy will be required for electric motorbikes to become mainstream very quickly: the market forces will simply do their job! Just like horses have been replaced in just a few years with the arrival of cars, we anticipate almost all commercial motorbikes in Africa to switch to electric in the next few years (this will be made very easy with “pay-as-you-drive” companies popping up all over the continent).

But while this is great news for the environment, this expected fast switch does not come without challenges. The major challenge will be to make enough green electricity available to charge all these batteries. And we believe this can only be done through solar.
Let’s take the simple example of Rwanda and Kenya to see the impact of a growth of electric motorbikes on the induced installed power capacity.

	Rwanda	Kenya
Total number of bikes (est.)	100,000	1,600,000
Total number of commercial bikes (est.)	70,000	1,120,000
Average daily power requirement per bike	12 kWh	12 kWh
Hypothetical power requirement for all commercial bikes switching to electric	840,000 kWh/day	13,440,000 kWh/day
Solar irradiation	3.8 kWh/kWp/day	3.9 kWh/kWp/day
Theoretical solar capacity required to power bikes	221,000 kWp 221 MWp	3,446,150 kWp 3,446 MWp
Current installed capacity in the country (across all technologies)	276 MW	2,651 MW

The same ratios can be found for pretty much all other countries across Africa. Doubling or tripling the historical installed capacity in no simple feat, and we anticipate this might need to happen in just a few years, on top of other additional power needs driven by population and economic growth across the continent.

To support the harmonious growth of e-mobility across Africa, only 2 solutions seem realistic: 1) new capacity which has been planned several years ago and is currently being built and/or commissioned or 2) planning and rolling out new solar capacity now. Witnessing the systemic capacity lag in many African countries, it seems that solar is the most likely solution to be implemented thanks to its flexibility and speed of being rolled out. Solar will generate electricity for e-bikes through a combination a C&I projects directly at the facilities of pay-as-you-drive companies, but also through large scale projects being added to the grid, wheeling and net-metering. Every single solar panel will be required to ensure enough green power is available to charge our vehicles of tomorrow.

SEYCHELLES

OBJECTIVES

- 15% RE in the energy mix by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	12.26 MWp
C&I	2.46 MWp
MG	2.88 MWp
SHS & RESIDENTIAL	0.32 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 100% of the population have access to electricity link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.172	$ 0.360	$ 0.360
MAX.	$ 0.401	$ 0.431	$ 0.431

POLICY / REGULATION

- No GST on RE energy equipment link
- SEEREP provides loan facility open to households to acquire solar systems link
- Rebate scheme residential and small commercial installations link
- Net-metering for residential and commercial users since 2013 link

NOTEWORTHY DEVELOPMENTS

- 1.5 MWp under development at Indian Ocean Tuna (IOT) processing facility link
- Construction of 5.8 MW Providence floating solar plant is moving forward link
- Results to be announced for Seychelles Trading company tender link

SIERRA LEONE

OBJECTIVES

- RE to represent 84% in the energy mix by 2030 link
- increase renewables capacity to 1,000MW link
- Increase off-grid mini-grid and solar stand-alone systems by 27% and 10%, respectively, in 2030 link

TOTAL PV INSTALLED

LARGE SCALE	5 MWp
C&I	0.51 MWp
MG	4.22 MWp
SHS & RESIDENTIAL	3.82 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 26.2% of the population has access to electricity link
- 48% in urban areas and 1% in rural area link
- Target to reach 92% total access to electricity by 2030 with 37% being off-grid link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.039	$ 0.131	$ 0.132
MAX.	$ 0.112	$ 0.131	$ 0.132

POLICY / REGULATION

- All SHS are exempted from import duties and GST link
- PV equipment and low energy or energy-efficient appliances that meet IEC global standards are exempt from GST link
- The Electricity and Water Regulatory Commission (EWRC) plans to develop FiT for solar schemes irrespective of their size link

NOTEWORTHY DEVELOPMENTS

- Sunon Asogli to build 50 MWp Freetown solar park link
- The country to benefit from the West Africa power project being financed by the World Bank link

SOMALIA

OBJECTIVES

- Commits to reduce and avoid emissions 30% by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	10.4 MWp
C&I	1.82 MWp
MG	1.64 MWp
SHS & RESIDENTIAL	5.6 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 49.73% of the population has access to electricity link
- Target to achieve universal access by 2030 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.5	$ 0.5	$ 0.5
MAX.	$ 1	$ 1	$ 1

POLICY / REGULATION

- Taxes are not standardized. Different states, ports compete in respect of duty rates in order to secure import traffic, rates varying from around 10%-15% link
- No national electrification policy in place waiving taxes on PV products
- No FiT and no net-metering

NOTEWORTHY DEVELOPMENTS

- BECO to build second phase of Mogadishu solar with 92 MW of capacity link
- Abu Dhabi fund for development financing construction of 7 MWp Bosaso solar plant link

SOMALILAND

OBJECTIVES

- n/a

TOTAL PV INSTALLED

LARGE SCALE		8 MWp
C&I		1.73 MWp
MG		0.2 MWp
SHS & RESIDENTIAL		0 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- n/a

CURRENT TARIFF GRID ELECTRICITY

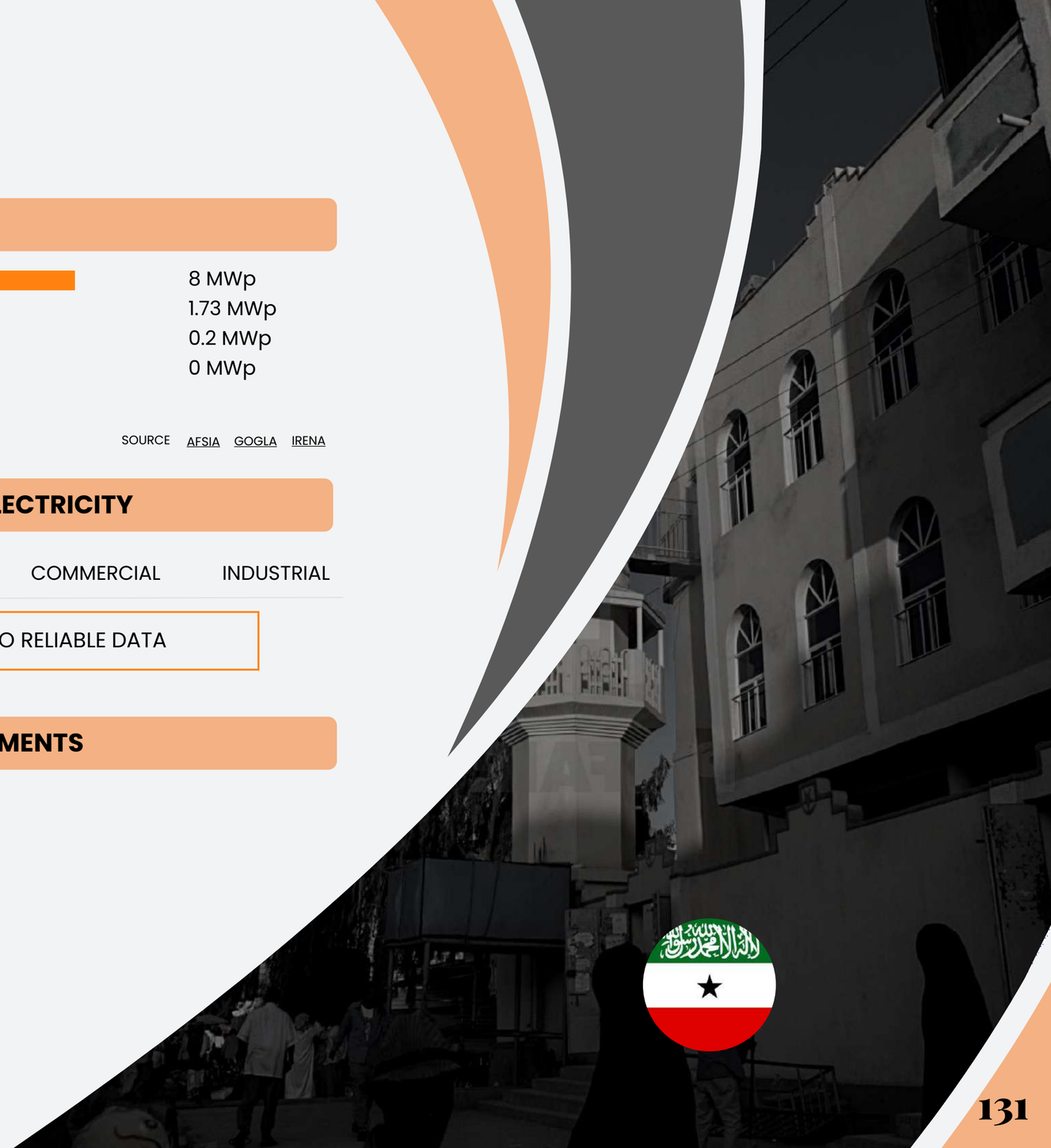
	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	NO RELIABLE DATA		
MAX.			

POLICY / REGULATION

- n/a

NOTEWORTHY DEVELOPMENTS

- n/a



SOUTH AFRICA

OBJECTIVES

- 25% of RE in national energy mix by 2030 link
- Targets the addition of 6.5GW of solar by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	2,864.78 MWp PV + 500 MWe CSP
C&I	483.34 MWp
MG	0.74 MWp
SHS & RESIDENTIAL	5.18 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 84.39% of the population has access to electricity link
- 88.8% electrification rate in urban areas and 75.3% in rural areas link
- Achieving universal access by 2025 link

CURRENT TARIFF GRID ELECTRICITY

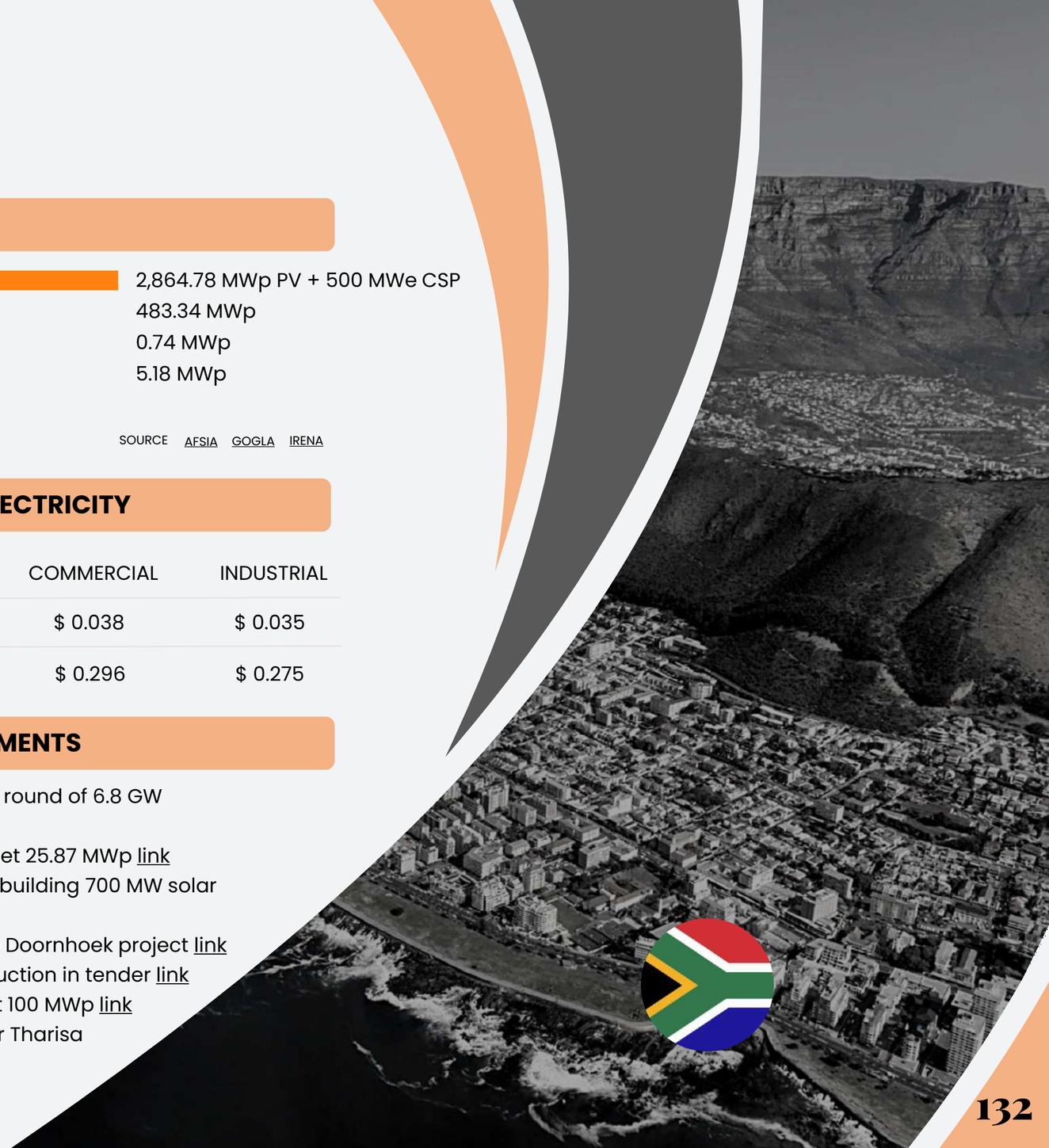
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.039	$ 0.038	$ 0.035
MAX.	$ 0.299	$ 0.296	$ 0.275

POLICY / REGULATION

- No import duties link
- License required for self consumption over 100 MW link
- Possible for companies to write off 100% solar investment in year 1 link
- Cape Town to introduce FiT soon for C&I and residential customers link
- Net-metering available in some municipalities link

NOTEWORTHY DEVELOPMENTS

- Tender issued on 2.6 GW, first round of 6.8 GW procurement link
- 41 Western Cape schools to get 25.87 MWp link
- The city of Ekurhuleni to start building 700 MW solar plant link
- AMEA Power to build 120 MWp Doornhoek project link
- 7 MW Atlantis solar PV construction in tender link
- Venetia diamond mine to get 100 MWp link
- Total Eren to build 40 MWp for Tharisa minerals link



SOUTH SUDAN

OBJECTIVES

- The Infrastructure Action Plan aims to expand generation capacity to about 580 MW by 2025 link
- Solar expected to be the best option to improve the nation's dependence on diesel link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	5.34MWp
MG	0.06MWp
SHS & RESIDENTIAL	0.5 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 7.2% of the population has access to electricity link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.002	$ 0.003	$ 0.003
MAX.	$ 0.003	$ 0.003	$ 0.003

POLICY / REGULATION

- Import duties range from 0%-25% on solar products link
- VAT exempted and 4% withholding tax applies on solar products link
- No FiT, no net-metering

NOTEWORTHY DEVELOPMENTS

- Aptech Africa to build a 12 MWp solar plant in Juba link

FOCUS ON FLOATING SOLAR

ARTICLE

BY SERGIO MONTORO

Globaltec

AFRICAN SOLAR COULD SOON HARNESS THE POWER OF WATER

Floating solar is one of the most promising new solar technologies for Africa. Floating solar, also called floating PV or floatovoltaics, consists of traditional solar photovoltaic panels installed on a water body. Short explanation about what is floating solar. This kind of installation of course comes with a set of specific technical challenges which are not found on the firm ground.

But it also presents some very strong advantages, especially in the African context where so many hydro resources are being exploited to produce electricity.

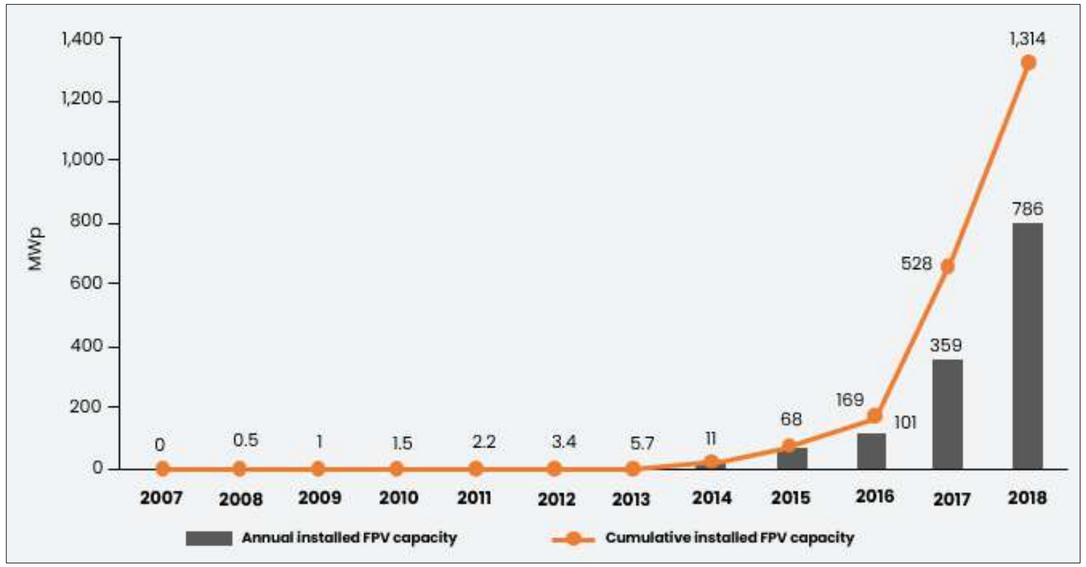
Africa suffers from serious water scarcity, which translates into dramatic consequences on hydroelectric generation, among others. Due to hydropower capacity and solar irradiation potential of such a continent, FPV responds very well to African continent idiosyncrasies:

- In locations where networks are weak, this technology has an unquestionable advantage by interconnecting with existing hydroelectric plants. This hybridization solution, in addition to compensate for unstable and intermittent PV output during the wet season, it provides access to the grid due to the presence of an existing hydropower plant connecting infrastructure.
- This system reduces water loss from evaporation in reservoirs up to 80%, by covering a large part of the water surface and improving its quality by proliferation of algae and mosses.
- It avoids all the obstacles of land acquisition and the concerns of land consumption, freeing up land in densely populated regions.

The conclusions of the study “Assessment of floating solar photovoltaic potential in existing hydro power reservoirs in Africa”[2], from the Joint Research Center of the European Commission, published in January 2021 in Renewable Energy, analyzing 146 of the largest operational hydro power reservoirs in Africa, indicate that the production of Floating Solar Panels could be 52.9 TWh/year, which means an increase of 50% of the annual production of existing hydroelectric plants (105 TWh/year).

In addition, water savings could reach 743 million m3/year, increasing annual hydro power production by 170 GWh.

Although still in its infancy, FPV is quickly gaining traction around the world. A report by the World Bank titled “Where Sun Meets Water”[1], already identified an exponential growth of this technology in 2018.



Source1 Source 2

Imagen 1. Global installed FPV capacity and annual additions. SOURCE World Bank Group, ESMAP, and SERIS 2019.

If the same growth curve as that of ground-mounted photovoltaics is followed, Floating Solar Photovoltaics infrastructure (FPV) could become a very significant part of the global solar industry in just a few years. Although this segment is still very marginal globally, with a total installed capacity of 2,500 MW in 2020, current projections estimate its potential at 62 GW capacity worldwide by 2030.

To sum it up, The Floating Solar Photovoltaics (FPV) is shown as an achievable solution to the energy needs and the growing/challenging scarcity of water in Africa, using existing resources such as an excellent solar potential and a great hydroelectric potential infrastructure.

SUDAN

OBJECTIVES

- 14% RE (excluding Hydro) to be integrated in the power system by 2033
- 250 MW of rooftop solar to be installed by 2033
- 2,400 MW of solar PV; 50 MW of solar CSP by 2033

TOTAL PV INSTALLED

LARGE SCALE	5 MWp
C&I	11.77 MWp
MG	0 MWp
SHS & RESIDENTIAL	0 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 55% of the population has access to electricity link
- 32% connected on-grid to the national distribution company, 14% connected to stand-alone diesel-based isolated grids and 8% to stand-alone solar PV systems (with batteries)
- Targets 82% electrification by 2035

CURRENT TARIFF GRID ELECTRICITY

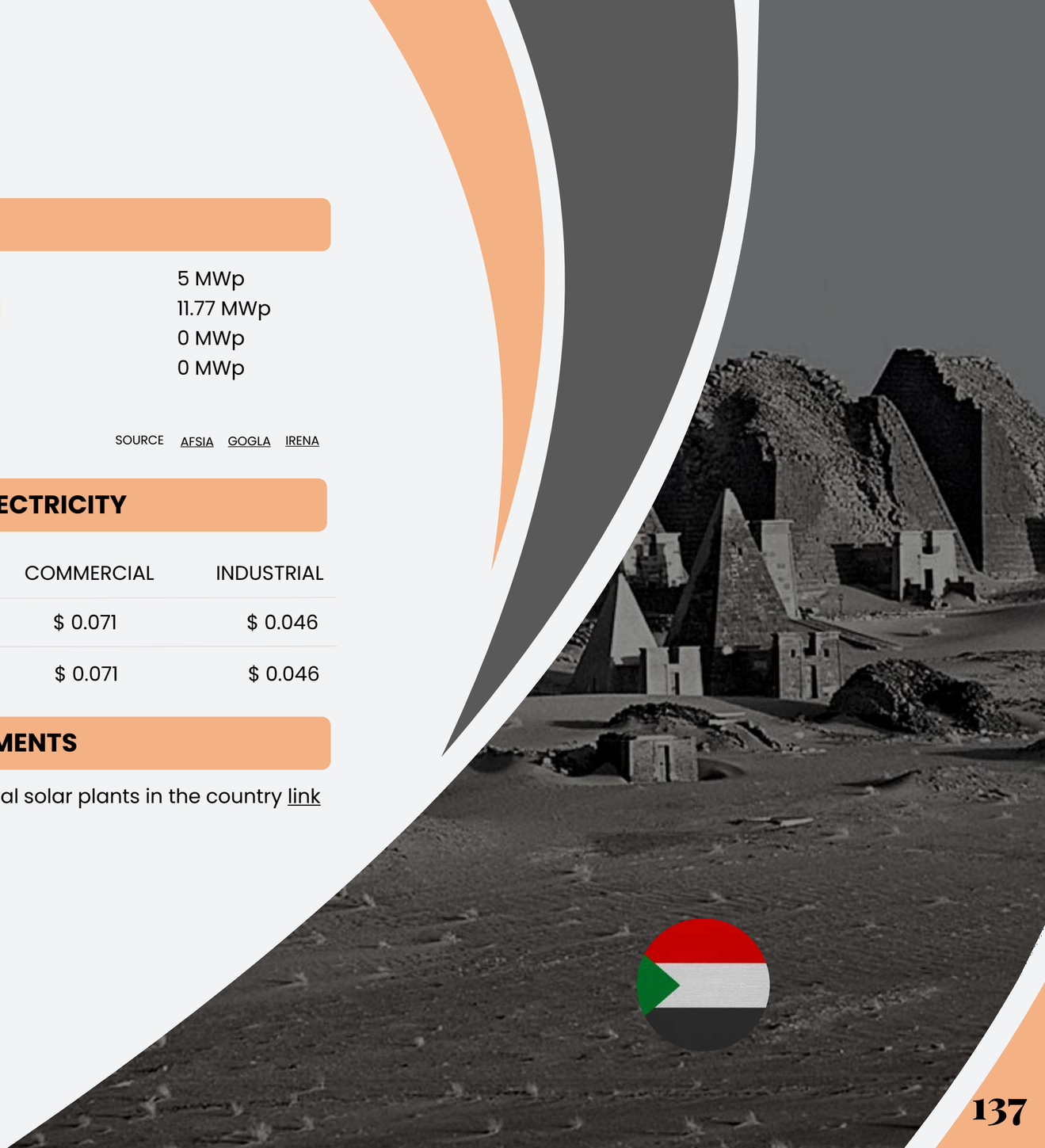
	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.008	$ 0.071	$ 0.046
MAX.	$ 0.055	$ 0.071	$ 0.046

POLICY / REGULATION

- No import duty and VAT on PV components link
- Amendments made on the Electricity Act to allow private companies to work in the power generation business as independent power producers (IPP)
- PPP Law approved and allows BOOT projects link
- Investment Law approved which provides incentives to foreign investors link
- Net-metering regulations for small-scale solar systems (less than 1 MW) link
- A feed-in tariff is under development with the support of the UNDP link

NOTEWORTHY DEVELOPMENTS

- TAQA Arabia to develop several solar plants in the country link



TANZANIA

OBJECTIVES

- Nation's energy transition targets to reach 5000MW capacity by 2025 link
- 50% of RE in the energy mix by 2030 link
- Renewable power generation is expected to increase from 268GWh in 2021 to 3,040GWh in 2035 link

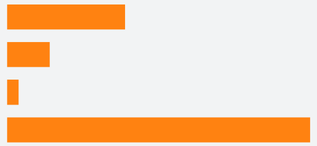
ELECTRIFICATION RATE

- 37% of the population has access to electricity link
- Electricity access rates in urban areas is 73.2% and 24.5% rural areas link
- Targets 75% electrification rate in 2025 link
- Universal access by 2030 link

POLICY / REGULATION

- No import duties on solar panels and a range of 0-25% for other solar equipment link
- No VAT on several solar equipment link
- No license required for projects below 1 MW link
- FiT of $0.21/kWh for MG, FiT to systems connected to the national grid at $0.079/kWh in the dry season, $0.059/kWh in the wet season link
- Net-metering in application since 2017 link

TOTAL PV INSTALLED



6 MWp
2.8 MWp
0.89 MWp
12.5 MWp

SOURCE

SOURCE AFSIA GOGLA IRENA

CURRENT TARIFF GRID ELECTRICITY

SOURCE 1
SOURCE 2

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.043	$ 0.007	$ 0.004
MAX.	$ 0.126	$ 0.126	$ 0.068

NOTEWORTHY DEVELOPMENTS

- AFD supporting the development of the 150 MWp Kishapu Solar Project link
- Masdar and TANESCO to deploy PV plants with 600 MWp total capacity link
- Other upcoming projects include Zuzu, Dodoma (60 MW), Same (50 MW) & Next Gen-Kigoma (5MW) link

THE GAMBIA

OBJECTIVES

- Targets to increase the share of RE to 48% by 2030 link
- Target of 250MW RE by 2040 link
- RE sources to contribute to GHG reductions of 78.5 GgCO2e in 2025 and 104 GgCO2e in 2030 link

TOTAL PV INSTALLED

LARGE SCALE	0 MWp
C&I	2.15 MWp
MG	0.12 MWp
SHS & RESIDENTIAL	0.02 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 62% of the population has access to electricity link
- 32% access in rural areas and 81% in urban areas link
- Targets universal electricity access by 2025 link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.183	$ 0.18	$ 0.210
MAX.	$ 0.194	$ 0.18	$ 0.210

POLICY / REGULATION

- Exemptions on import duties link
- An investment enterprise within priority categories is granted import VAT waiver link
- No VAT for RE/solar projects link
- Net-metering available for capacities below 20kW link
- There is a provision for a FiT in the RE Law of 2013, but FiT not in-force
- The government commits to $449 800 for Accelerated Community Development (PACD) to extend electrification to 7 villages link

NOTEWORTHY DEVELOPMENTS

- FAO installing 34 solar-powered irrigation systems link
- Government developing the 150 MW Regional Solar PV Project in Soma link
- 1,100 rural schools and health centers to be powered with solar PV through EIB, EU and World Bank support link
- Implementation of 20MW on-grid solar PV project in progress with EIB and WB funding, to be commissioned in 2023

TOGO

OBJECTIVES

- 50% renewables in the national energy mix by 2030 link
- Adding 50MW of solar PV, 315 mini-grids and the distribution of 550,000 solar kits link
- Increase of the share of RE to 40% in 2024 link
- Target of 10% of PV in the energy by 2030 link

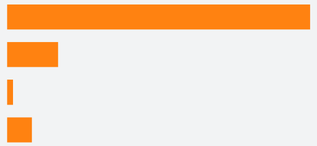
ELECTRIFICATION RATE

- 54% of the population has access to electricity link
- 86% in urban areas and 36% in rural areas link
- Target of 75% of electricity access by 2025 and 100% by 2030 link

POLICY / REGULATION

- All RE components are exempt from import duties and VAT link
- CIZO Programme offers subsidies to households to cover the cost of off-grid PV systems link
- A pilot project is being implemented at the Regional Center for Technical Education and Vocational Training (CRETFP) for the net-metering link

TOTAL PV INSTALLED



LARGE SCALE	50 MWp
C&I	4.3 MWp
MG	0.4 MWp
SHS & RESIDENTIAL	3.56 MWp

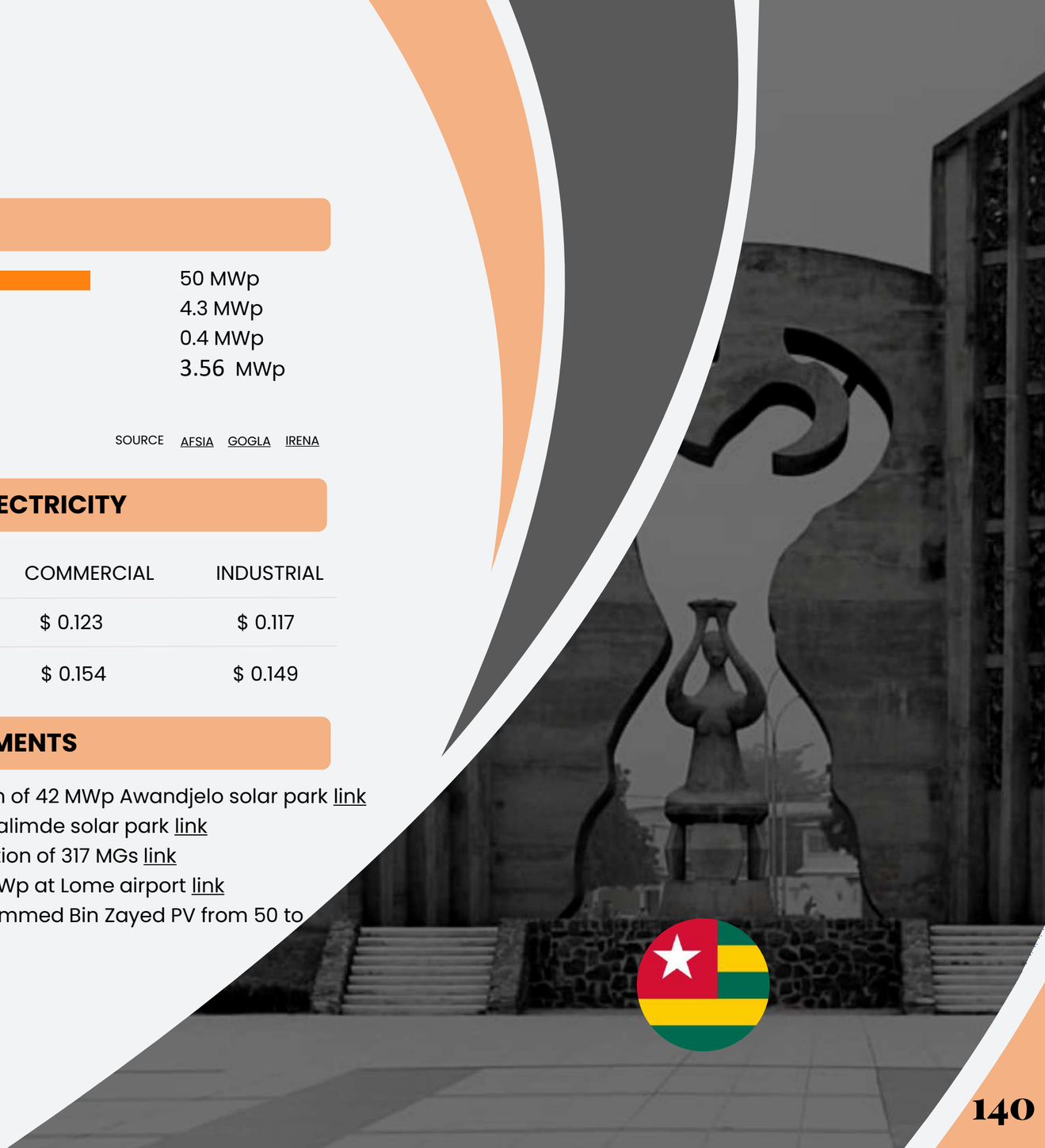
SOURCE AFSIA GOGLA IRENA

CURRENT TARIFF GRID ELECTRICITY

SOURCE 1 SOURCE 2	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.101	$ 0.123	$ 0.117
MAX.	$ 0.192	$ 0.154	$ 0.149

NOTEWORTHY DEVELOPMENTS

- BOAD supporting construction of 42 MWp Awandjelo solar park link
- Tender launched for 50 MW Salimde solar park link
- AfDB supporting implementation of 317 MGs link
- Tender progressing with 1.8 MWp at Lome airport link
- AMEA Power to expand Mohammed Bin Zayed PV from 50 to 70 MW link



TUNISIA

OBJECTIVES

- 35% of RE capacity by 2030 link
- Targets 3.8 GW of solar capacity by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	37.4 MWp
C&I	7.7 MWp
MG	0 MWp
SHS & RESIDENTIAL	9 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 100% of the population has access to electricity link

CURRENT TARIFF GRID ELECTRICITY

SOURCE 1 SOURCE 3 SOURCE 2

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.019	$ 0.066	$ 0.055
MAX.	$ 0.128	$ 0.141	$ 0.122

POLICY / REGULATION

- Imported energy equipment with no locally produced equivalent are subject to minimum customs duties and are exempt from VAT link
- Net-metering and FiT possible link

NOTEWORTHY DEVELOPMENTS

- Construction to start soon on 100 MW Kairouan plant link
- Scatec to build 240MW, 60MW, and 60MW in Tatouine, Tozeur and Sidi Bouzid link
- Akuo Energy, HBG Holding and Nour Energy to build 10 MW Gabès solar PV plant link
- Results to be announced on 70 MWp plants tender link
- ENGIE and NAREVA to build 120 MWp Gafsa solar park link

UGANDA

OBJECTIVES

- More than 90% of renewable electricity production by 2030 link
- Targeting 100% clean renewable by 2050 link
- Raise renewable electricity generation capacity to at least 3,200 MW by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	74 MWp
C&I	7.92 MWp
MG	2.53 MWp
SHS & RESIDENTIAL	43.53 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 24% electrification rate nationwide with 8% in rural area link
- Universal access targets range from 2030 to 2040.link

CURRENT TARIFF GRID ELECTRICITY

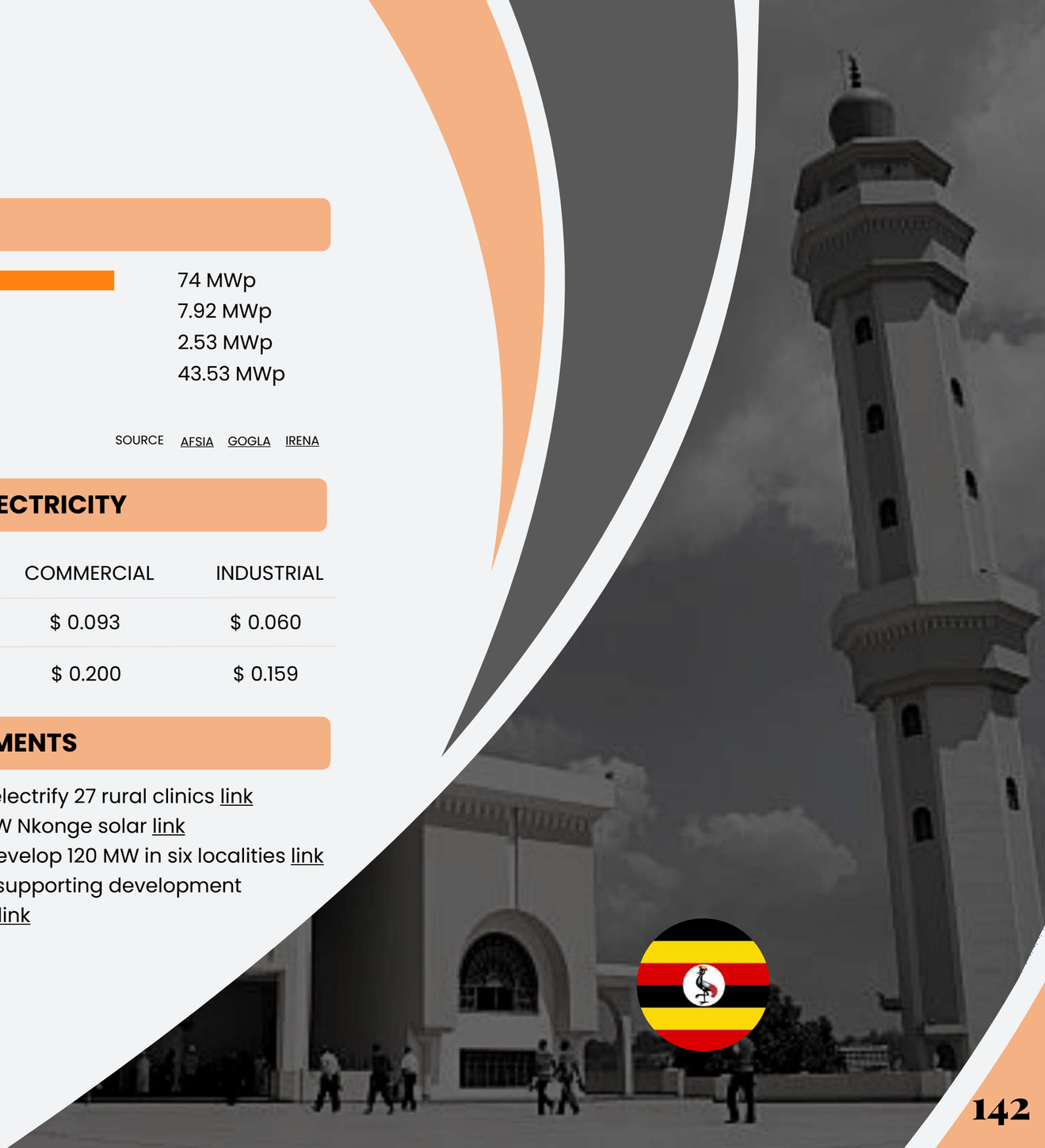
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.065	$ 0.093	$ 0.060
MAX.	$ 0.194	$ 0.200	$ 0.159

POLICY / REGULATION

- PV panels exempt from import duties and VAT link
- 0-25% import duties apply for other solar equipment link
- Net-metering and FiT under development link

NOTEWORTHY DEVELOPMENTS

- Equatorial Power and GIZ to electrify 27 rural clinics link
- RIC Energy constructing 23 MW Nkonge solar link
- TotalEnergies EP Uganda to develop 120 MW in six localities link
- German government and EU supporting development of 120 MGs across the country link



ZAMBIA

OBJECTIVES

- Increase the electricity generation to 6000 MW by 2030 link
- 30%of national energy needs to be covered with RE (excluding large hydro)by 2030 link
- target to generate 600 MW of PV by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	215 MWp
C&I	0.94 MWp
MG	2.25 MWp
SHS & RESIDENTIAL	7.8 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 43% of the population has access to electricity link
- 80% in urban areas and 13% in rural areas link
- Government plans 66% national access (90% urban and 51% rural) link

CURRENT TARIFF GRID ELECTRICITY

SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.009	$ 0.032	$ 0.009
MAX.	$ 0.053	$ 0.032	$ 0.026

POLICY / REGULATION

- Custom duty exemptions for most PV projects components link
- No VAT on solar panels and batteries but 15% VAT applies to some solar equipment link
- No permit required for systems <100kW link
- Energy Regulation Board publishes the draft net-metering regulations link
- Existent wheeling system link

NOTEWORTHY DEVELOPMENTS

- Tender launched for the construction of 200MW Siavonga solar park link
- Power Corner Zambia to build 11 MGs with 1.1 MWp capacity link
- Construction progressing on 200 MWp Serenje PV plant link
- Ilute Solar to build 25 MW in Sesheke link

ZIMBABWE

OBJECTIVES

- Targets 1,575MW for solar by 2030 link
- RE to contribute 1,100MW of total electricity supply by 2025, and 2,100MW by 2030 link

TOTAL PV INSTALLED

LARGE SCALE	13.5 MWp
C&I	28.34 MWp
MG	0.22 MWp
SHS & RESIDENTIAL	0.9 MWp

SOURCE AFSIA GOGLA IRENA

ELECTRIFICATION RATE

- 52.75% of the population has access to electricity link
- Universal access by 2030 link

CURRENT TARIFF GRID ELECTRICITY

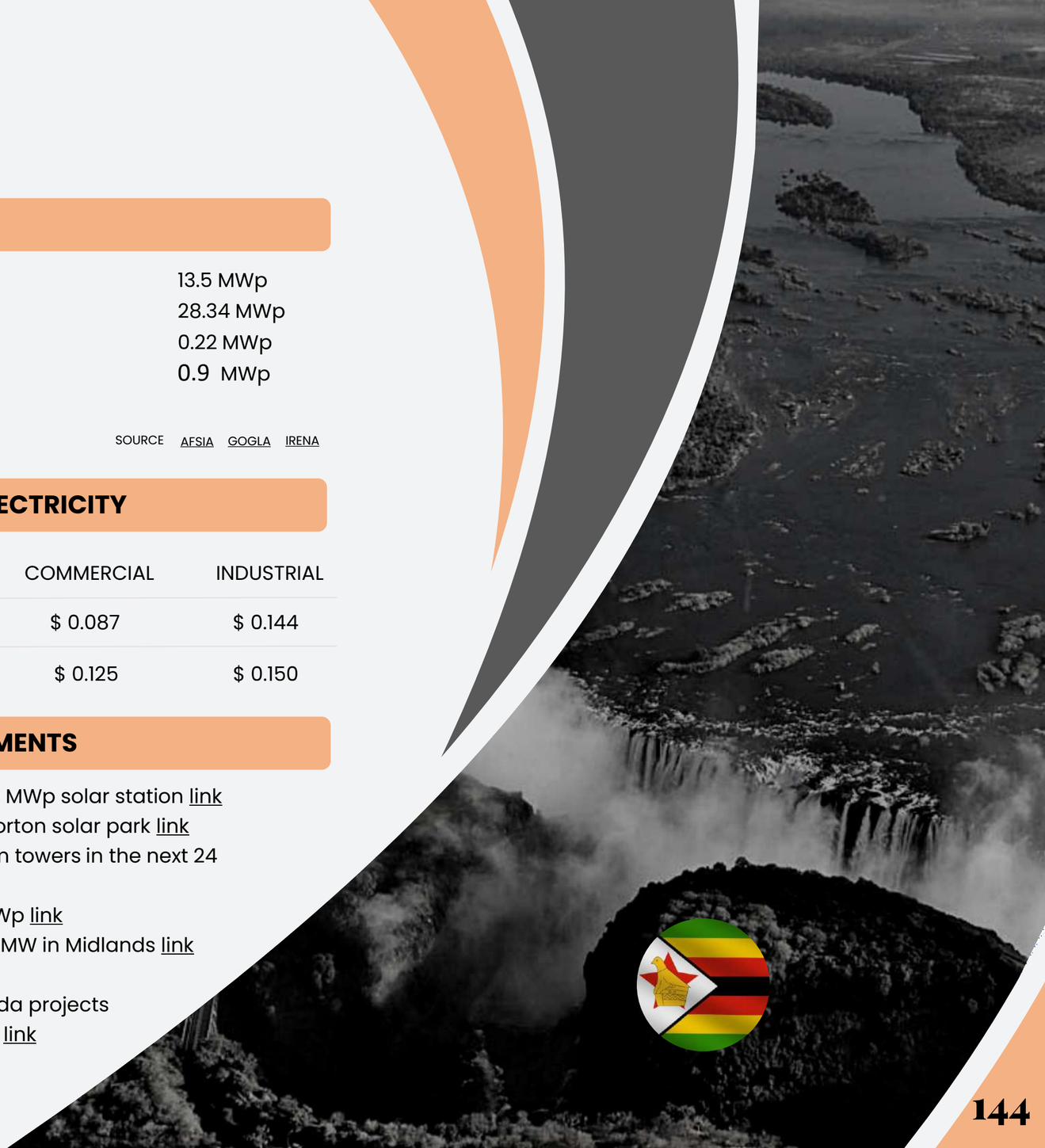
SOURCE	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
MIN.	$ 0.025	$ 0.087	$ 0.144
MAX.	$ 0.050	$ 0.125	$ 0.150

POLICY / REGULATION

- No import duties on solar equipment but 15% VAT applies link
- New Draft Renewable Energy Regulation looking at waiving licensing fees for installation and operation of micro-grids and mini-grids with an installed capacity of less than 1 MW link
- Net-metering threshold capacity extended from 100kW to 5MW
- FiT regulation exist but not yet implemented link

NOTEWORTHY DEVELOPMENTS

- Skypower Global building 500 MWp solar station link
- Belarus developing 100 MW Norton solar park link
- Econet to solarize 499 telecom towers in the next 24 months link
- Mimosa mining to get 238 MWp link
- Evergreen Private to build 100 MW in Midlands link
- 10 MGs in tender by UNDP link
- 36 MWp Bulawayo and Gwanda projects construction moving forward link



FOCUS ON MADE IN AFRICA

ARTICLE

BY CLAIRE LE STER
Operations Manager

MADE IN AFRICA FOR AFRICA

While the solar market has been growing quickly in Africa, local manufacturing of off-grid solar products is still limited. The vast majority of equipment is imported from Asia where production is centralized. Yet, it has been demonstrated that the development of local value chains contributes not only to industrial development, but also the wider economic and social development of a country.

Localizing manufacturing offers many tangible benefits.

In the first place, locating the industry close to the market allows to understand the customer's needs and to adapt the offer to the specific needs of the area. As a result, this model then also allows to provide a better and faster local after-sales service to the customer and thus ensure a greater durability of the products put on the market. Indeed, the repair of products is made possible by the availability of spare parts and a trained local workforce.

In addition, the local presence of a manufacturer also facilitates the sourcing of local small and medium-sized enterprises, building inventory then becomes less risky, ties up less cash because of higher turn-over and in the end becomes more flexible and more efficient.

Finally, one of the most important benefits of local manufacturing is jobs creation. A study conducted by the Burkinabe research association IFSRA highlighted the socio-economic impacts of the presence of solar manufacturing workshops in the areas where they are located. It created formal jobs, led to the inclusion of vulnerable people, created training opportunities at the local level, improved the employees' living conditions,

and last but not least it increased the users' pride in consuming local products.

But manufacturing in Africa still presents major challenges for entrepreneurs.
First, the underdeveloped manufacturing environment results in a lack of local suppliers and value chains. As a result, starting local manufacturing in Africa is comparatively more challenging than in other parts of the world.
Second, even when local manufacturing does exist, the lack of intra-African logistics solutions limits the size of the market accessible from the production plant.
In addition, with the exception of a handful of economic zones recently being developed in selected countries, there is still a lack of concrete action by governments and international institutions to create an environment conducive to the development of a local industry. Local entrepreneurs need tangible support beyond the speeches that increasingly advocate for "Made in Africa".

And on top of these structural difficulties, there are also cyclical difficulties. For the past two years, industries have been facing tensions over the supply of raw materials, longer supply times and higher transport costs. All of these negative impacts, are further multiplied in a poorly industrialized African environment.

Some recommendations can be made to support the development of local industrialization.
African manufacturers must obtain, for imported components and spare parts, customs conditions that are at least equivalent if not preferential to those for imported finished products . Exoneration of taxes and duties on solar products implemented by some African countries to promote the development of renewable energies should apply for finished solar products but also for components used for the local manufacturing of solar products. Currently, it is difficult to benefit from these exemptions when importing cables, electronic components, screws, etc., and not a finished solar product.

In addition, the implementation of the African continental free trade zone (AfCFTA) would create an enabling environment for local industry to flourish.

Finally, Government institutions, as well as the development programs of international or bilateral institutions, should also integrate local preference criteria into public procurement and support programs for off-grid solar market development.

SPECIAL THANKS TO OUR PEER REVIEWERS

One of the basic principles of AFSIA is to create networks and knowledge-sharing platforms for all solar stakeholders to get the quickest access possible to partners and information, and thereby achieve better and more efficient business.

AFSIA would like to extend a warm thank you to the amazing group of experts spread across the continent and who have accepted our request to review and correct the information presented to you in the report.

AFSIA is happy to put these individuals in the spotlight and warmly invites you to contact them directly should you require further ad-hoc expert insights on specific countries.

Adel Baba -Aissa
Investment Director
Meridiam



Omar Abdelhamid
Business Development Executive
Gridtech Infrastructure


Apollinaire Niyirora
Communication Officer
Burundi Renewable Energy Association

Serge Stephane AOUELY
Chief Commercial & Marketing
LUMOS GLOBAL (Côte d'Ivoire Sub)

Michael Lappin
Country Manager - Africa

SegenSolar



Abdourahamane Keita
Deputy General Director

Agence Guinéenne d'Electrification Rurale(AGER)

Judicaël Graas
Operation Manager

GoShop Energy

Dr. Mohamed Alhaj
Founder & Managing Director

Terra Energy


Mikael Alemu
General manager & Co-founder

10 Green Gigawatt for Ethiopia

Laura Corcoran
Chief Business Development Officer

Aptech Africa




Yao Azoumah
CEO & Founder

KYA-Energy Group

Herbert Friese
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Andrew Amadi
Chief Executive Officer

Kenya Renewable Energy Association

Sire Abdoul Diallo
Sustainable Energy Expert - Consultant


Ivie Ehanmo
Founder

Electricity Lawyer

Lamya Abdel Hady
RE consultant

Egypt Electricity Transmission company

Divin kouebatouka
Founder & Chairman

GreenBox

Greyson Onesmo Metili
Head of Africa Operations

ENGIE Energy Access

Babucarr Bittaye
Principal Energy Officer

Ministry of Petroleum and Energy of The Gambia

SUMMARY TABLES / Duties & Taxes

COUNTRY	IMPORT DUTIES	VAT ON IMPORT	VAT
Algeria	Exemption on raw materials for local module production		
Angola	No exemption for PV components		VAT applies on solar products
Benin	5% import duties on pre-assembled solar generating assets (SHS)		0% VAT on solar panel and batteries
Botswana			Some solar equipment are exempt from VAT with others subject to a 5%-20% VAT
Burkina Faso	Exemption on solar equipment		No VAT on solar equipment
Burundi	No import duties on solar panels and 25% on the rest		0% VAT on solar panels, batteries, inverters And some other solar equipment
Cameroon	Reduced duties on imported RE products 30% on pico-solar products		No VAT on solar equipment
Cape Verde	23% import duties on batteries	No VAT in imports of solar panels and storage	No VAT on solar panels
Central African Republic (CAR)	Import duties range between 5%-30%		

SUMMARY TABLES / Duties & Taxes

COUNTRY	IMPORT DUTIES	VAT ON IMPORT	VAT
Chad		Import tax exemptions for RE equipment	No VAT on solar equipment
Comoros	0% duties on PV materials		No VAT on RE equipment
Congo (DRC)	0% duties on equipment intended for electricity production		VAT exemption on RE equipment
Congo (Republic of The Congo)	All RE components are subject to import duties		All RE components are subject to VAT
Cote d'Ivoire	0% on solar panel 5% if already assembled and 20% on batteries		9% VAT on solar equipment
Djibouti	Import duties on solar equipment range between 10%-26%		Import duties and VAT on solar equipment range between 10%-26%
Egypt	5% import duties on solar		State can authorize reduced rates or total VAT exemption depending on the nature of activities of investors
Equatorial Guinea	Exemption depending on activities of investors		15% VAT applicable
Eritrea			

SUMMARY TABLES / Duties & Taxes

COUNTRY	IMPORT DUTIES	VAT ON IMPORT	VAT
eSwatini	0% import duties on solar panels and batteries		Standard VAT of 15 % is applicable
Ethiopia	Most SAS products are exempted from import duty		15% VAT is applicable on solar products
Gabon	Import duties applicable between 5%-30%		18% VAT on solar components
The Gambia	No import duties		No VAT for RE/solar projects
Ghana	0% import duties on solar panels 5% import duties on SHS and 20% import duties on batteries	An import tax exemption for solar PV system is being implemented	0% VAT on solar panels
Guinea	Duty exemptions can be granted to projects on a case by-case basis		VAT exemptions can be granted to projects on a case by-case basis
Guinea-Bissau			Solar panels are exempted of VAT but other components of a solar kit are not
Kenya	0% duties on solar panels and inverters Range of 0%-25% applies to others products		VAT exemption on all renewable products
Lesotho	All PV components are subject to a reduced VAT rate of 5%		

SUMMARY TABLES / Duties & Taxes

COUNTRY	IMPORT DUTIES	VAT ON IMPORT	VAT
Liberia		No import tariffs on off-grid system components related to RE development	
Libya			No VAT in Libya
Madagascar	No import duties on solar panels or lithium batteries		No VAT on solar panels or lithium batteries
Malawi	Solar products are import duty free		Solar products are subject to a 16.5% VAT
Mali	No import duties on solar products		0% VAT on solar products
Mauritania	Duties range between 9% - 18%		
Mauritius			Solar PV projects are VAT exempt
Morocco	10% import duties on solar panels but exempted for water heaters	20% import VAT applies	20% VAT applies on water heaters and solar panels
Mozambique	Solar products are subject to an import duty of 7.5%		17% VAT on all RE products
Namibia	No import duties on thermal energy for households	15% VAT on importation of goods is levied	

SUMMARY TABLES / Duties & Taxes

COUNTRY	IMPORT DUTIES	VAT ON IMPORT	VAT
Niger	0% import duties on RE products	No VAT on imports	0% VAT on RE products
Nigeria	0% import duty on solar panels, 5% on SHS and 20% for other components		5% VAT on solar components
Rwanda	No import duties on solar panels and a range of 0%-25% to other solar products		No VAT on solar components
Sao Tome and Principe			Activities in the energy sector are subject to a 5% tax rate
Senegal	No import duties on solar panels and 5% applies for SHS		No VAT on PV equipment
Seychelles	0% import duties on RE equipment		0% VAT on RE equipment
Sierra Leone	No import duties on SHS		0% VAT on SHS
Somalia			
South Africa	No import duties		
South Sudan	Import duties range between 0%-25% on solar products		No VAT on solar products
Sudan	0% import duty on PV components		0% VAT on PV components
Tanzania	No import duties on solar panels		No VAT on several solar equipment

SUMMARY TABLES / Duties & Taxes

COUNTRY	IMPORT DUTIES	VAT ON IMPORT	VAT
Togo	Renewable energy components are exempt from import duties		Renewable energy components are exempt from VAT
Tunisia	Imported energy equipment with no locally produced equivalent are subject to minimum customs duties		VAT exemption on Imported energy equipment with no locally produced equivalent
Uganda	PV panels are exempted from import duties		No VAT on PV panels
Zambia	No import duties on PV components		No VAT on solar panels and batteries but 15% VAT applies to some solar equipment
Zimbabwe	No import duties on solar equipment		15% VAT on solar equipment

SUMMARY TABLES / Electrification rate &electricity tariff

COUNTRY	ELECTRIFICATION RATE	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SOURCE
		MIN	MAX	MIN	MAX	MIN	MAX	
Algeria	99.8%	0.009	0.058	0.007	0.063	0.004	0.048	Link
Angola	46.89 %	0.005	0.014	0.012	0.014	0.009	0.014	Link
Benin	53%	0.138	0.237	0.146	0.262	0.141	0.156	Link
Botswana	72%	0.077	0.107	0.093	0.138	0.063	0.070	Link
Burkina Faso	22.5%	0.120	0.221	0.102	0.264	0.086	0.224	Link
Burundi	13%	0.040	0.268	0.096	0.196	0.096	0.156	Link
Cameroon	65%	0.080	0.158	0.134	0.158	0.096	0.136	Link
Cape Verde	94%	0.259	0.363	0.246	0.277	0.246	0.277	Link
Central African Republic	14.3%	0.109	0.229	0.043	0.060	0.043	0.060	Link
Chad	10%	0.136	0.200	0.200	0.200	0.200	0.200	Link
Comoros	86.74%	0.324	0.332	0.236	0.289	0.236	0.289	Link
Cote d'Ivoire	80%	0.029	0.107	0.076	0.161	0.072	0.106	Link

All tariffs in USD equivalent at 1/1/2023

SUMMARY TABLES / Electrification rate &electricity tariff

COUNTRY	ELECTRIFICATION RATE	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SOURCE
		MIN	MAX	MIN	MAX	MIN	MAX	
RDC	15%	0.027	0.087	0.110	0.150	0.057	0.057	Link
Republic of the Congo	48.3%	0.050	0.079	0.046	0.046	0.041	0.041	Link
Djibouti	61.77%	0.151	0.308	0.224	0.308	0.162	0.230	Link
Egypt	100%	0.024	0.059	0.025	0.065	0.016	0.062	Link
Equatorial Guinea	66.75%	n/a	n/a	n/a	n/a	n/a	n/a	
Eritrea	50%	0.24	0.24	0.24	0.24	0.24	0.24	Link
Eswatini	85%	0.064	0.106	0.136	0.288	0.055	0.283	Link
Ethiopia	45%	0.03	0.06	0.042	0.042	0.019	0.031	Link
Gabon	91.6%	0.084	0.207	0.027	0.720	0.027	0.720	Link
The Gambia	62%	0.183	0.194	0.18	0.18	0.210	0.210	Link
Ghana	85.9%	0.029	0.088	0.578	0.092	0.514	0.182	Link
Guinea	44.7%	0.013	0.054	0.140	0.334	0.219	0.306	Link

All tariffs in USD equivalent at 1/1/2023

SUMMARY TABLES / Electrification rate &electricity tariff

COUNTRY	ELECTRIFICATION RATE	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SOURCE
		MIN	MAX	MIN	MAX	MIN	MAX	
Guinea Bissau	33.34%	0.205	0.392	0.163	0.205	0.206	0.258	Link
Kenya	75%	0.069	0.112	0.069	0.110	0.068	0.077	Link
Lesotho	47.35%	0.061	0.104	0.018	0.019	0.018	0.019	Link
Liberia	27.53%	0.002	0.002	0.002	0.002	0.001	0.001	Link
Libya	69.17%	0.044	0.110	0.150	0.150	0.068	0.092	Link
Madagascar	33.74%	0.033	0.227	0.052	0.286	0.022	0.271	Link
Malawi	15%	0.054	0.125	0.123	0.143	0.052	0.161	Link
Mali	50.6%	0.170	0.170	0.144	0.144	0.144	0.144	Link
Mauritania	47.35%	0.066	0.159	0.159	0.159	0.058	0.159	Link
Mauritius	99.6%	0.048	0.193	0.065	0.220	0.048	0.119	Link
Morocco	100%	0.085	0.150	0.056	0.228	0.057	0.275	Link
Mozambique	30%	0.096	0.143	0.076	0.076	0.075	0.075	Link

All tariffs in USD equivalent at 1/1/2023

SUMMARY TABLES / Electrification rate &electricity tariff

COUNTRY	ELECTRIFICATION RATE	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SOURCE
		MIN	MAX	MIN	MAX	MIN	MAX	
Namibia	56.26%	0.066	0.172	0.092	0.255	0.090	0.149	Link
Niger	19.3%	0.109	0.219	0.090	0.143	0.090	0.143	Link
Nigeria	60%	0.059	0.166	0.066	0.155	0.067	0.153	Link
Liberia	12%	0.390	0.390	0.390	0.390	0.390	0.390	Link
Rwanda	74.5%	0.086	0.242	0.122	0.247	0.091	0.130	Link
Sao Tome and Principe	76.56%	0.067	0.155	0.155	0.398	0.138	0.138	Link
Senegal	70%	0.146	0.214	0.119	0.311	0.094	0.181	Link
Seychelles	100%	0.172	0.401	0.360	0.431	0.360	0..431	Link
Sierra Leone	26.2%	0.039	0.112	0.131	0.131	0.132	0.132	Link
Somalia	49.7.3%	n/a	n/a	n/a	n/a	n/a	n/a	
Somaliland	n/a	0.650	0.650	0.650	0.650	0.390	0.390	Local industry source
South Africa	84.39	0.039	0.299	0.038	0.296	0.035	0.0275	Link

All tariffs in USD equivalent at 1/1/2023

SUMMARY TABLES / Electrification rate &electricity tariff

COUNTRY	ELECTRIFICATION RATE	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		SOURCE
		MIN	MAX	MIN	MAX	MIN	MAX	
South Sudan	7.2%	0.002	0.003	0.003	0.003	0.003	0.003	Link
Sudan	55.39%	0.027	0.00047	0.001	0.001	0.00032	0.00032	Link
Tanzania	37%	0.043	0.126	0.007	0.126	0.004	0.068	Link Link
Togo	54%	0.101	0.192	0.123	0.154	0.004	0.048	Link Link
Tunisia	100%	0.019	0.128	0.066	0.141	0.055	0.122	Link Link Link
Uganda	24%	0.065	0.194	0.093	0.2	0.060	0.159	Link
Zambia	43%	0.009	0.053	0.032	0.032	0.009	0.026	Link
Zimbabwe	52.7%	0.025	0.050	0.087	0.125	0.144	0.150	Link

All tariffs in USD equivalent at 1/1/2023

OUR MEMBERS

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