# Ten Years of the Africa-EU Energy Partnership

## Status Report 2017-18 and future perspectives

Africa-EU Energy Partnership

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The Africa-EU Energy Partnership (AEEP) constitutes one of the initial eight partnerships under the Joint Africa-EU Strategy (JAES), a long-term framework for cooperation between the two continents. The African Union Commission, the Common Market for Eastern and Southern Africa (COMESA) Secretariat, Egypt, the European Commission, Germany, and Italy are the Steering Group members providing political guidance to the Secretariat. The AEEP Secretariat is based at Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

## Steering Group

European Commission

Ministry of Electricity and Renewable Energy

Federal Ministry for Economic Cooperation and Development

Ministero degli Affari Esteri della Cooperazione Internazionale

# Ten Years of the Africa-EU Energy Partnership

## Status Report 2017-18 and future perspectives

**Ten years after the AEEP's creation, this Status Report provides an update on the progress made towards achieving the Partnership's 2020 Political Targets.**

**As the AEEP assesses possible new directions for the next decade, we also look ahead towards other measurements of energy-related development in Africa.**

10 Years
Africa-EU
Energy Partnership

# Contents

# AEEP 2020 Political Targets

## Declaration of the First High Level Meeting of the Africa-EU Energy Partnership

**Vienna, Austria, 14 September 2010**

"**We**, African Ministers responsible for Energy, and European Union (EU) Ministers responsible for Africa-EU energy relations **resolve** to work within the AEEP to attain the **following targets**, in the timeframe up to 2020:

### Energy Access

As a contribution to the African objective of achieving a continent-wide rate of access to modern and sustainable energy of around 50%, Africa and the EU will take joint action to:

- **bring access to modern and sustainable energy services to at least an additional 100 million Africans**, focusing on sustainable models: to provide energy for basic services (health, education, water, communication); to power productive activities; and to provide safe and sustainable energy services to households.

### Energy Security

Africa and the EU will take joint action to improve energy security by:

- **doubling the capacity of cross-border electricity interconnections**, both within Africa and between Africa and Europe, thus increasing trade in electricity while ensuring adequate levels of generation capacity;
- **doubling the use of natural gas in Africa, as well as doubling African gas exports to Europe**, by building natural gas infrastructure, notably to bring currently flared gas to market.

### Renewable Energy and Energy Efficiency

Africa and the EU will take joint action to increase both energy efficiency and the use of renewable energy in Africa by:

- building **10,000MW of new hydropower facilities**, taking into consideration social and environmental standards;
- building **at least 5,000MW of wind power capacity**;
- building **500MW of all forms of solar energy capacity**;
- **tripling the capacity of other renewables**, such as geothermal, and modern biomass; and
- **improving energy efficiency in Africa in all sectors**, starting with the electricity sector, in support of Africa's continental, regional and sectoral targets."

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# A Decade of Progress

## The AEEP and Euro-African energy sector cooperation

In the decade since it was established, the Africa-EU Energy Partnership has served as a long-term framework for strategic dialogue between Africa and the European Union, with a focus on sharing knowledge, setting political priorities and developing joint programmes on the key energy issues and challenges in the 21st century.

Set up as one of the partnerships created under the ground-breaking Joint Africa-EU Strategy (JAES), unveiled at the 2007 Lisbon Summit, the AEEP's overall objective is to improve access to secure, affordable and sustainable energy for both continents. It has a special focus on increasing investment in energy infrastructure in Africa. To achieve this it has sought to work with a wide range of partners, including regional economic communities (RECs), but also private sector operators, civil society organisations and academia.

When important new initiatives have emerged – such as the United Nations-led Sustainable Energy for All (SEforALL), Sustainable Development Goals (SDGs) and the African Renewable Energy Initiative (AREI) – it has sought to align with them to progress its agenda. The AEEP is well aware of the need for the international community to avoid adding over-lapping initiatives so that genuine progress can be made, as underlined by its *Mapping of Energy Initiatives and Programs in Africa* project.

The AEEP has matured into a Partnership that provides a forum for official bodies – and also a much wider range of stakeholders – to conduct strategic political dialogue that develops a shared vision, common policy approaches and actions. Its Steering Group is currently comprised of the African Union Commission (AUC), European Commission (EC), Common Market for Eastern and Southern Africa (Comesa) and the governments of Egypt, Germany and Italy. The AEEP Secretariat is provided by the EU Energy Initiative Partnership Dialogue Facility (EUEI PDF), founded in 2004 by the EC and several EU Member States.

The AEEP places considerable emphasis on its promotion of networks in which Africans and Europeans can advance the energy agenda. Thematic Work Streams bring together stakeholders to cooperate in critical areas such as energy access and energy efficiency.

The AEEP has developed a dynamic youth programme to ensure the voices of tomorrow are incorporated at the highest level of political dialogue. It has supported groups of young journalists to attend such major events as the

**Amb. Sergio Mercuri, Minister Plenipotentiary, Foreign Affairs and International Cooperation, Italy**

"Italy is not just a member of the European Union, it's a country that looks to Africa as a necessary partner for development in many sectors. Having the AEEP as a tool [to promote] the contact with Africa is a plus and is advantageous to all of us."

**Felice Zaccheo, Head of Unit, Sustainable Energy, Climate Change, European Commission**

"The AEEP has worked so well because of its big advantage that adds value to the Partnership, which has been the bringing together of different stakeholders. The networking and connecting of the dots gives a quality to the Partnership that drives its energy agenda forward tremendously."

second High Level Meeting (HLM) of the Partnership, held in Addis Ababa, Ethiopia in 2014 and the Second Stakeholder Forum held in Milan in May 2016. Giving hope for a dynamic future, an AEEP Young Leader in Energy Access, Astria Fataki, is profiled on page 55.

To help successfully attain the Partnership's political targets, the AEEP supports the capacities of key African institutions. The Secretariat seconds staff to the AUC Department of Infrastructure and Energy. It provides targeted support to key continental institutions and programmes such as the Nepad Planning and Coordinating Agency, African Energy Commission (Afrec) and SEforALL Africa hub at the African Development Bank.

By engaging closely with Africa's RECs, the AEEP works to foster the exchange of energy information and dialogue, and to strengthen regional policies and capacity development, knowledge management and awareness initiatives – in addition to investment and business promotion in their regions of operation. The AEEP was pivotal in the shaping and eventual establishment of Centres of Excellence for Renewable Energy and Energy Efficiency in Africa.

Through a lengthening list of National Energy Business Dialogue Forums held across Africa and Europe, the AEEP has consolidated its reputation as an 'official' Partnership that is focused on making business work. The Africa-EU Renewable Energy Cooperation Programme (RECP) is the only fully European multi-donor initiative supporting comprehensive market development and project preparation for decentralised renewable energy. RECP is building up an impressive portfolio of business implementation (*see page 7*).

This latest *Status Report*, the fourth of its type to be published by the AEEP Secretariat since 2012, seeks to show what has been achieved so far, but also to point the way ahead for a genuine Partnership that has exhibited considerable resilience in meeting the challenges posed by improving levels of energy access, efficiency and security.

## AEEP Milestones towards a more inclusive energy agenda

**2007: AU-EU LISBON SUMMIT**
European and African leaders meet in the Portuguese capital to establish the framework of the Joint Africa-EU Strategy (JAES) and constitute the AEEP.

**2010: 1ST AEEP HIGH LEVEL MEETING**
The first HLM convenes in Vienna, Austria and endorses the AEEP Political 2020 Targets and launches the Renewable Energy Cooperation Programme (RECP).

**2012: 1ST AEEP STAKEHOLDER FORUM**
More than 300 stakeholders gathered in Cape Town, South Africa commend the way forward for the AEEP and initiate the monitoring of the AEEP 2020 Targets based on the Secretariat's *Monitoring Progress in the Africa-Europe Energy Partnership* report.

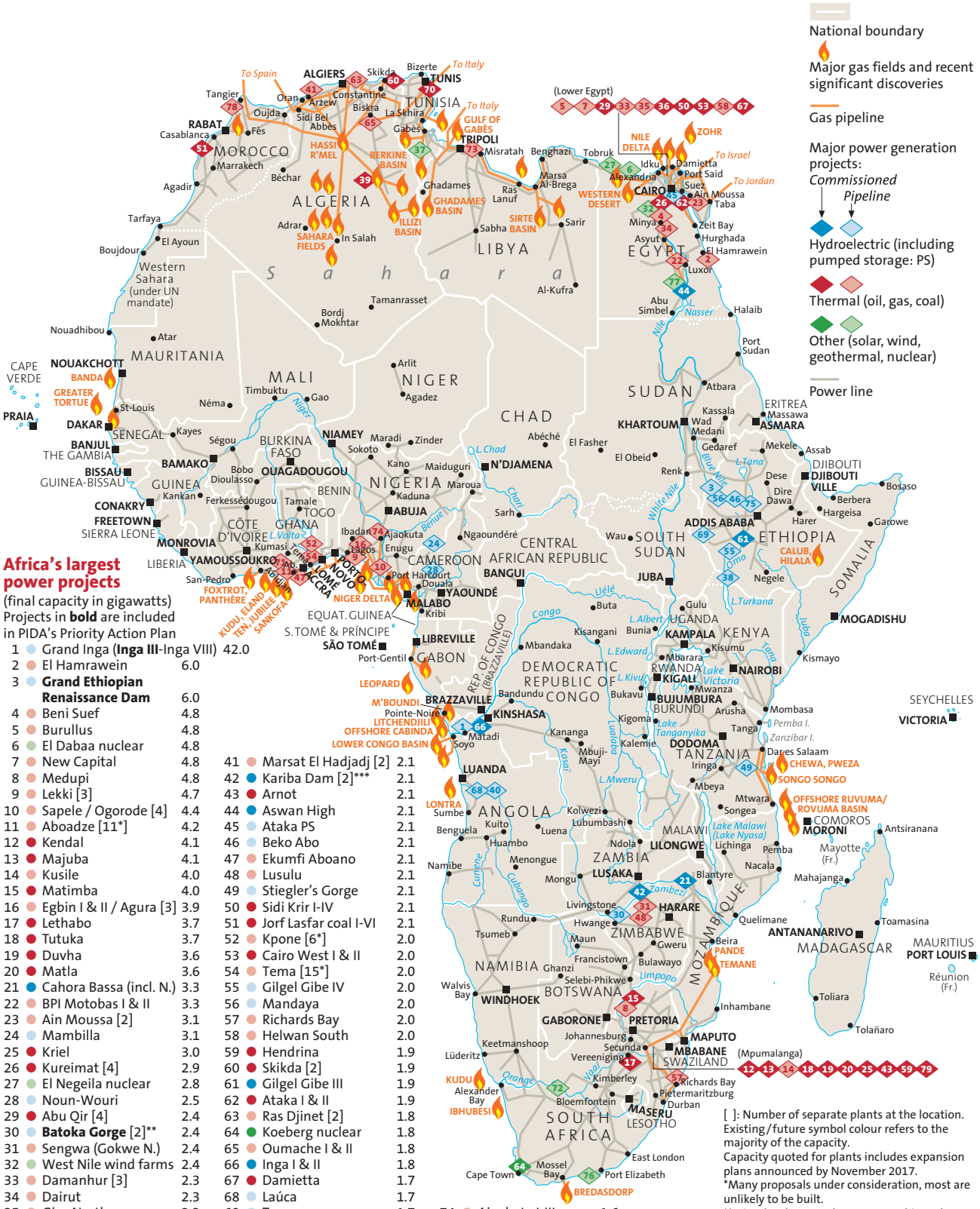
**2013: AEEP NATIONAL ENERGY BUSINESS DIALOGUE FORUMS**
National forums are held in Uganda, Djibouti, Zambia, Ghana, Cameroon and Vienna to help promote the energy agenda.

**2014: 2ND AEEP HIGH LEVEL MEETING, LAUNCH OF THE AEEP *STATUS REPORT***
More than 400 leaders from governments, the private sector, international organisations, CSOs and other stakeholders meet in Addis Ababa, Ethiopia to shape the future of Africa-EU energy cooperation based on results from the newly released AEEP *Status Report*.

**2015: NEW STEERING GROUP, MINISTERIAL MEETING**
Egypt and COMESA join the AEEP's Steering Group and the first North African AEEP Energy Security Dialogue takes place in Egypt. At a Ministerial Meeting in Rome, the AEEP organises the Italian-African private sector session, Off-grid Renewable Energy Dialogue Forum, jointly with the Italian government.

**2016: 2ND AEEP STAKEHOLDER FORUM**
More than 300 participants in Milan, Italy further the dialogue between key stakeholders and sees the launch of RES4Africa. Other Forum highlights include publication of the *Second AEEP Status Report* and *Mapping of Energy Initiatives and Programmes in Africa;* Energy Access working group releases *AEEP Energy Access: Best Practices 2016*.

**2017: TEN YEARS OF THE AEEP**
The Partnership celebrates ten years of successful Africa-EU energy cooperation at the AU-EU Summit in Abidjan. Endorsed at the G7 Energy Ministerial Meeting in Rome, the AEEP contributes with a side-event. Other events include a national energy dialogue in Zambia, which feeds into the SEforALL country processes. The AEEP Youth Programme builds momentum.




## Africa's largest power projects

(final capacity in gigawatts)
Projects in **bold** are included in PIDA's Priority Action Plan

| | | |
|---|---|---|
| 1 | Grand Inga (**Inga III**-Inga VIII) | 42.0 |
| 2 | El Hamrawein | 6.0 |
| 3 | **Grand Ethiopian Renaissance Dam** | 6.0 |
| 4 | Beni Suef | 4.8 |
| 5 | Burullus | 4.8 |
| 6 | El Dabaa nuclear | 4.8 |
| 7 | New Capital | 4.8 |
| 8 | Medupi | 4.8 |
| 9 | Lekki [3] | 4.7 |
| 10 | Sapele / Ogorode [4] | 4.4 |
| 11 | Aboadze [11*] | 4.2 |
| 12 | Kendal | 4.1 |
| 13 | Majuba | 4.1 |
| 14 | Kusile | 4.0 |
| 15 | Matimba | 4.0 |
| 16 | Egbin I & II / Agura [3] | 3.9 |
| 17 | Lethabo | 3.7 |
| 18 | Tutuka | 3.7 |
| 19 | Duvha | 3.6 |
| 20 | Matla | 3.6 |
| 21 | Cahora Bassa (incl. N.) | 3.3 |
| 22 | BPI Motobas I & II | 3.3 |
| 23 | Ain Moussa [2] | 3.1 |
| 24 | Mambilla | 3.1 |
| 25 | Kriel | 3.0 |
| 26 | Kureimat [4] | 2.9 |
| 27 | El Negeila nuclear | 2.8 |
| 28 | Noun-Wouri | 2.5 |
| 29 | Abu Qir [4] | 2.4 |
| 30 | **Batoka Gorge** [2]** | 2.4 |
| 31 | Sengwa (Gokwe N.) | 2.4 |
| 32 | West Nile wind farms | 2.4 |
| 33 | Damanhur [3] | 2.3 |
| 34 | Dairut | 2.3 |
| 35 | Giza North | 2.3 |
| 36 | Nubaria I-III | 2.3 |
| 37 | TuNur solar | 2.3 |
| 38 | Koysha | 2.2 |
| 39 | Hassi Messaoud [4] | 2.2 |
| 40 | Caculo Cabaça | 2.2 |
| 41 | Marsat El Hadjadj [2] | 2.1 |
| 42 | Kariba Dam [2]*** | 2.1 |
| 43 | Arnot | 2.1 |
| 44 | Aswan High | 2.1 |
| 45 | Ataka PS | 2.1 |
| 46 | Beko Abo | 2.1 |
| 47 | Ekumfi Aboano | 2.1 |
| 48 | Lusulu | 2.1 |
| 49 | Stiegler's Gorge | 2.1 |
| 50 | Sidi Krir I-IV | 2.1 |
| 51 | Jorf Lasfar coal I-VI | 2.1 |
| 52 | Kpone [6*] | 2.0 |
| 53 | Cairo West I & II | 2.0 |
| 54 | Tema [15*] | 2.0 |
| 55 | Gilgel Gibe IV | 2.0 |
| 56 | Mandaya | 2.0 |
| 57 | Richards Bay | 2.0 |
| 58 | Helwan South | 2.0 |
| 59 | Hendrina | 1.9 |
| 60 | Skikda [2] | 1.9 |
| 61 | Gilgel Gibe III | 1.9 |
| 62 | Ataka I & II | 1.9 |
| 63 | Ras Djinet [2] | 1.8 |
| 64 | Koeberg nuclear | 1.8 |
| 65 | Oumache I & II | 1.8 |
| 66 | Inga I & II | 1.8 |
| 67 | Damietta | 1.7 |
| 68 | Laúca | 1.7 |
| 69 | Tams | 1.7 |
| 70 | Radès [3] | 1.7 |
| 71 | Ghana 1000 | 1.7 |
| 72 | Karashoek solar parks [13] | 1.7 |
| 73 | Al-Khums [3] | 1.6 |
| 74 | Ajaokuta I-III | 1.6 |
| 75 | Karadobi | 1.6 |
| 76 | Thyspunt nuclear | 1.6 |
| 77 | Benban solar parks | 1.6 |
| 78 | Tahaddart | 1.6 |
| 79 | Camden | 1.6 |

[ ]: Number of separate plants at the location. Existing / future symbol colour refers to the majority of the capacity.
Capacity quoted for plants includes expansion plans announced by November 2017.
*Many proposals under consideration, most are unlikely to be built.
**Joint development between Zambia and Zimbabwe; 1,200MW each.
***North (Zambia) 1,080MW, South (Zimbabwe) 750MW+300 future.

Sources: Africa-EU Energy Partnership; Programme for Infrastructure Development in Africa (PIDA)

# Keeping track of the Political Targets

Achieving targets that are a true measure of progress in increasing levels of energy access, energy efficiency and energy security has been a central feature of the Africa-EU Energy Partnership since its inception. Following the AEEP's creation at the Africa-EU Summit held in Lisbon on 8-9 December 2007, a series of Political Targets were agreed that have served as a benchmark in the decade since. These were announced in the Declaration of the First High Level Meeting of the Africa-EU Energy Partnership, in Vienna on 14 September 2010 (*see page 3*).

The Vienna Declaration not only set out targets, but emphasised dialogue, saying: "Africa and the EU shall strengthen dialogue at multiple levels on energy issues of mutual interest, including research institutions, the private sector and civil society. The above-mentioned targets will be reviewed and updated periodically in the light of new political developments and joint agreements."

The means by which those targets could be reviewed and updated periodically was the subject of work by the AEEP Secretariat, which from the start sought to give the political declarations a robust empirical underpinning.

At the time of the Lisbon summit and the Vienna First HLM, the extent of energy data across Africa and among the continent's OECD partners was considerably more limited than now. For much of the decade since Lisbon, the Partnership has played a significant role in improving that situation, while always accepting that much remains to be done and that the AEEP cannot operate in isolation from others active in the sector.

**Cheikh Bedda, Director of Infrastructure and Energy, African Union Commission**

"One of the most important tasks of this Partnership is to promote energy access and to coordinate the different initiatives working on this challenge."

The AEEP has been a pioneer in proposing policy directions and targets to overcome energy poverty, improve access and efficiency, and underpin domestic and cross-border energy security in Africa and Europe. It is widely acknowledged that the AEEP has carved a distinctive niche in shaping the approach of global initiatives like SEforALL, which have understood the need to collect and collate more accurate data to inform the campaign to end energy poverty.

## RECP scales up support for decentralised renewables in Africa

The Africa-EU Renewable Energy Cooperation Programme (RECP) is a European multi-donor initiative supporting comprehensive market development and project preparation for decentralised renewable energy (RE).

The RECP fills a gap in the landscape of support for private sector mobilisation and pipeline development, acting as an 'honest broker' and 'integrator' of financing and other support instruments. It seeks to link market actors with each other as well as with financiers and investors. To this end, RECP has supported market information products, as well as numerous B2B and match-making events. In addition, it has built a pipeline of decentralised RE investment projects for European financing instruments.

As of October 2017, the RECP pipeline included more than 35 projects (out of more than 240 applicants for support), representing a broad range of business models including on-grid IPP, commercial and industrial energy, mini-grids as well as standalone systems. If only 50% of the projects supported by the RECP were to materialise, the RECP would have leveraged €540m investment and 165MW of installed capacity, providing some 2.5 million end-users with access to sustainable energy and reducing by GHG emissions by 640,000 tCO2e annually.

RECP is now entering a new phase, looking to further scaling up its operation to extend more support to private-sector-driven decentralised renewable energy investment projects.

During 2015-17, RECP was funded by Germany, the European Commission, the Netherlands, Austria and Finland.

For more visit: *www.africa-eu-renewables.org*

**Roberto Ridolfi, Director of Planet and Prosperity, European Commission**

"In this Partnership, the private sector plays a very important role. Energy is delivered by companies with big investments in hydro, solar and other renewable energies undertaken by private operators."

**Mohamedain Elnasr, CEO, Regional Association of Energy Regulators for Eastern and Southern Africa, COMESA**

"Regional Economic Communities are very important in efforts to meet the AEEP targets, which they do by aligning different programmes and projects. They can also develop policies to make a harmonised system which encourages investment."

In the period since then, the AEEP has taken a lead in underlining the need for empirical rigour and benchmarking of indicators, as has been recognised by African and European leaders, as well as other stakeholders. Among these steps has been the publication of three significant reports: *Monitoring Progress in the Africa-Europe Energy Partnership* (2012), the first *AEEP Status Report* (2014) and the *AEEP Status Report Update: 2016*. These combine original research conducted by the AEEP Secretariat and its consultants with analysis and collation of the best available data from third party providers. These reports put the First HLM recommendations into practice, setting out both a baseline of data from which progress or lack of it could be measured, and a trajectory for monitoring planned investments (pipelines).

With their compilation of baseline data and pipelines of planned investments – notably in the field of electricity generation, where projects have been recorded in the specially developed AEEP Monitoring Tool – these reports have set the stage for ground-breaking monitoring of generation capacity and cross-border electricity and gas interconnections on the continent. This has given a distinctive voice to the AEEP's benchmarking of several of the 2020 Political Targets in the Energy Security and Renewable Energy sectors. The reports have created a unique dataset, running from a baseline of 2010, which have been regularly updated and therefore constitute a point of reference. The dataset runs to 2020.

# Making PIDA work

The AEEP is closely aligned with the Programme for Infrastructure Development in Africa (PIDA) and its Priority Action Programme (PAP), which are focused on developing major projects at a regional level. PIDA has an impressive roster of schemes, shown in the map on page 6. It is supported by the African Union Commission, African Development Bank and the New Partnership for Africa's Development, whose NEPAD Planning and Coordinating Agency is PIDA's implementing agency.

The EU has promoted support for PIDA as an important element in its cooperation policy, as reflected in financial and technical support for projects, and coordinated through bodies like the Africa-EU Reference Group on Infrastructure. European institutions are participating in initiatives such as the PIDA Project Technical Assistance Facility, which supports early stage project preparation.

PIDA has identified energy sector projects which could have the greatest transformative potential in the period to 2040: the PAP. A subset of priority programmes will expand existing capacity to meet forecasts of growing trade through to 2020. The programme's primary objective is to reduce energy costs and increase access.

PIDA gives project development a strongly regional focus. The scale and complexity of PIDA's 'transformational' projects – led by the biggest project of all, to develop the potential 50GW Inga Falls hydropower resource in Democratic Republic of Congo for the benefit of all Africa – means progress has been slow in many cases. But recently progress on projects like the Ruzizi III hydropower and the CLSG transmission line (*see Energy Security*) suggests several more PIDA schemes will be implemented in the period to 2020.

# Interview: African Union Commissioner Amani Abou-Zeid

**You have said: "Africa and its partners are working towards universal access by 2030 so no one gets left behind". Is this an attainable target?**

Yes, I believe it's feasible. I do believe that now more than ever. There is a good focus on Africa for a change, and it's up to us Africans to seize the moment and opportunity. The African nations are very conscious of energy issues because they are focusing on sectors that are in dire need of energy. The whole of Africa has talked about industrialisation and is looking for value-addition to our products. We are growing demographically, probably at the fastest rate of growth around the world, so we need jobs for our youth. It's a young continent – and energy underlines each one of these things.

The focus of the world is on Africa – this time, not out of compassion, but out of opportunity. It's not just about a philanthropic, humanitarian kind of attention, it's about business, and it's about creating jobs for us and our partners as well. All the elements are there to boost the implementation of this ambitious target for universal access, and now we have more solutions than before on a continent that is very well endowed with sources of renewable energy – and other types of energy, including gas, which is one of the cleanest sources of fossil fuel. It's no longer the case that the cost of renewables is too high, or the technology is lacking – in some cases the cost of solar and wind is even more competitive than other technologies.

**Can we realistically expect to mobilise the much-increased private sector investment needed to meet the AU's Agenda 2063 targets for socio-economic transformation or global calls for universal access by 2030?**

Had you asked me that question before, I would have had my doubts, but not anymore. Look at the development of other sectors in our countries, as reported in the competitiveness reports... the innovations, the number of start-ups and the technology that all help to demonstrate the dynamism taking place in the continent. What we have been trying to do in Africa is to create an environment conducive to the private sector to work. We want Africans to invest in Africa, which we have seen increasingly happening. The private sector at all levels, not

just at the giant level of mega-enterprises but start-ups, which is a very promising field. We are also trying to make our business environment conducive to start-up development in Africa and especially in the energy sector. Innovative technology is helping to transform the business climate and financial sectors.

**What can Europe and Africa, working together, do to facilitate that transformation?**

Our main mandate, as an African Union, is to integrate the continent. One issue we have been talking about with the EU particularly is the private sector's involvement in regional projects, which are implemented where the beneficiaries are more than one country. Not only do you have technical complexities in these projects, but there are also serious issues concerning the harmonisation of rules, regulations and policies – which make it very difficult for the private sector, especially non-African participants, to get into regional projects.

**How does the AEEP fit into this model of cooperation?**

The AEEP was pioneering, the AEEP not only ensured a commitment at the highest political level, but it also set clear targets and monitored the implementation and delivery of those targets. The AEEP Status Reports came before Sustainable Energie For All and the SDGs – it gave birth to these initiatives and targets for energy later. I see this continuing but we are in a new phase and maybe we must review and revise the targets, to align them with the African strategy for development that we call Agenda 2063 and to the EU-AU strategy.

The AEEP targets have so far been met with often excellent results. We need to capitalise on that, build on it, and now realign ourselves with what has happened in Africa over the last ten years and indeed the world, as it is not just about Africa. It is about Africa and the world.

# Status Report Update

## Progress towards achieving the 2020 Political Targets

The First *AEEP Status Report* – published to coincide with the AEEP'S Second High Level Meeting in February 2014 – was the result of more than two years of work conducted by the AEEP Secretariat, its consultants and stakeholders, to help the Partnership to track progress against the AEEP 2020 Political Targets and inform decision-making in Africa-EU energy cooperation. It was notable for operationalising the AEEP Monitoring Tool – a Power Project Database now containing over 4,000 individual generation projects, along with details of transmission lines, cross-border connections and export markets and other data.

**Status Report 2017-18 continues that work, during a period when the need to collect and collate more accurate data has risen yet further up the global agenda**, supported by initiatives such as Sustainable Energy for All (SEforALL), the United States' Power Africa and the African Renewable Energy Initiative (AREI).

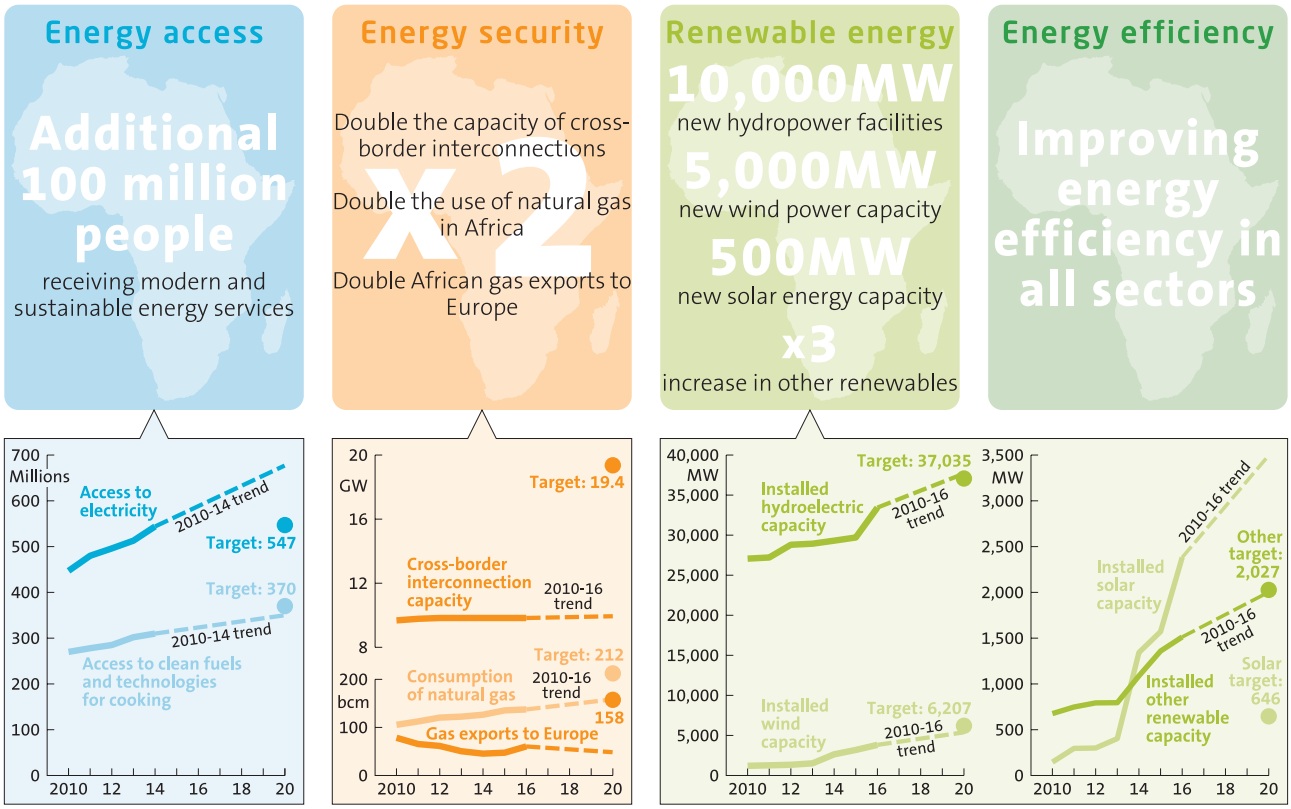
While the Monitoring Tool's principal aim was to track progress towards achieving the AEEP 2020 Political Targets in terms of electricity generation capacity and cross-border electricity and gas interconnections, constraints on resources mean that external sources were used to benchmark other key targets – for energy access and energy efficiency – following rigorous analysis of the data by the AEEP Secretariat. This remains the case in the *Status Report 2017-18*.

Since the 2014 *Status Report* and the subsequent *Status Report Update: 2016* the quality of existing data has improved – even if it remains far from perfect. The Global Tracking Framework (GTF) – established within the SEforALL framework and driven by a Steering Group led jointly by the World Bank Group's Energy Sector Management Assistance Program (Esmap) and the International Energy Agency (IEA) – has started to produce more authoritative data sets, which are expected to improve further in the next few years. This data is used for access and efficiency indicators in this report.

*Status Report 2017-18* will be launched at the 6th EU Africa Business Forum, on the sidelines of the AU-EU Summit in Abidjan, Côte d'Ivoire in November 2017. It is hoped that its data and analysis will help the AEEP's diverse community of stakeholders to take stock of progress to date and develop policy for Africa and Europe to move ahead.

**This report goes into greater detail than before on the question of whether the AEEP's Political Targets are still relevant** after nearly a decade of growth and transformative technological change in the African energy industries and marked shifts in perceptions of how levels of energy access, efficiency and security should be improved and measured.

**Status Report 2017-18 therefore looks at other potential 'alternative benchmarks'** that might be used, such as technical indicators for commercial power generation (cost-reflective tariffs or time of use tariffs), progress on policy (the extent that utilities are 'unbundled'), the boom in distributed energy (measuring mini- and micro-grids) and moves to bring the global revolution in energy efficiency to Africa.




**It also examines the 'Social Agenda'** based on the need to create a better future for Africa's youthful populations, with an overview of efforts to measure critical indicators such as job creation, gender (in)equality and climate change mitigation – to which the AEEP might align and bring its considerable networks to bear in improving the situation.

When it comes to the more traditional 'megawatt' measures and other benchmarks and activities, there is discussion of how the AEEP can better align – and help to rationalise – the growing number of major initiatives.

Many of these – including SEforALL, AREI and Power Africa – are looking towards 2030, as are the United Nations' Sustainable Development Goals (SDGs), which are intended as a baseline for harmonising global action to tackle poverty.

SDG Goal 7 provides a commitment to "ensure access to affordable, reliable, sustainable and modern energy" by 2030. Goal 7 closely aligns with other AEEP targets, with commitments to substantially increase renewables' share of the global energy mix and doubling the global rate of improvement in energy efficiency. Clearly, we can all work together to make this happen as efficiently as possible – and without wasting all too scarce resources.

# Key Findings

## The irresistible rise of renewable generation

Renewable energy (RE) generation capacity has been increasing, as shown in the graphics above, which are based on analysis and estimates drawn from the AEEP Power Project Database. The data for generation plants in operation and planned for completion in the period to 2020 suggest that in some sectors – such as the installation of utility-scale solar capacity – developments have largely surpassed the AEEP's 2020 Political Targets, which were agreed in 2007 when the global renewables industry was at a very different stage of development.

## Solar capacity breaks records

Solar capacity started at a very low level, but has enjoyed exponential success. The AEEP's Political Target of adding 500MW more generation capacity by 2020 was met only four years after the 2010 baseline was set. The AEEP's analysis of the continent's generation project pipeline shows that, in the last two years (since *Status Report*

*Update: 2016*), projects to develop utility-scale photovoltaic (PV) and concentrated solar power (CSP) capacity have spread across the continent. From installed capacity of only 146MW in 2010, solar facilities reached 2,382MW at end-2016. The AEEP's scenarios suggest over 7.7GW will be installed by 2020.

## Solar business is booming off-grid

The explosion of growth in solar home systems, commercial rooftop installations and other solar products is difficult to quantify as this potentially transformational industry is only in its infancy in Africa. But the success and proliferation of installers, and the increasingly serious money being raised to support new businesses, are a testament to the sector's potential – both to bring energy to isolated and marginalised communities, but also to create jobs in a new domestic solar services industry. *AEEP Status Report 2017-18* discusses potential new ways of measuring this, from mini-grid development to the extent distributed solutions create jobs.

## Wind power projects and industries

A 2010 baseline of 1,207MW of installed wind power capacity has risen to 3,822MW as of end-2016. Analysis of the project pipeline suggests the AEEP Political Target of adding 5GW by 2020 will be comfortably met, with over 9GW of installed wind capacity expected. While major wind power projects to date have been largely restricted to the industrialised countries of North Africa and South Africa, more countries are installing capacity, with Senegal, Ethiopia and Tanzania among those attracting private sector investments. More than 380MW is under construction and 1,220MW is expected online in Egypt by 2020, by which time the total North African project pipeline could deliver nearly 4.5GW of wind, with Morocco also putting in impressive capacity.

## Hydroelectric power exceeds target

Hydroelectric power (HEP) remains the dominant RE technology supplying African grids. Substantial progress was made in 2016 towards the AEEP's goal of increasing HEP capacity by 10GW in the decade to 2020, with 3,731MW added to the grid. This means that since 2010, 6,984MW has been added to the grid. A substantial pipeline of HEP projects is expected to come into operation in 2018-20, which means the target of 37.07MW will be comfortably exceeded, with well over 40GW serving the grid by 2020.

## Geothermal and other RE technologies

The ambition to triple the amount of generation from the AEEP's 'other renewables' category, which includes biomass and geothermal resources, should be comfortably achieved. From the 676MW baseline figure of 2010, other renewables stood at 1,513MW as of end-2016, but a substantial pipeline of projects, led by the development of East African Rift Valley's huge geothermal resources – which can provide reliable baseload power at low prices to supply the grid 24 hours a day – should be generating at least 3GW of other renewables power by 2020. Kenya remains a focus, but a serious push is under way to develop geothermal power in Ethiopia – where work is expected to start on the Corbetti scheme at Aluto Langano in 2018 – and Djibouti. The Geothermal Risk Mitigation Facility (GRMF) continues to play an important role in this respect.

## Indicators for electricity access

Indicators for access to electricity and clean, sustainable cooking fuels remain inexact, and GTF statistics published to date are a work in progress, but they show an overall improvement in electricity access: from a baseline of 307 million in 2010, 544 million Africans had access to electricity in 2016. However, this is forecast to rise to over 650 million by 2020. Given the increase to population in Sub-Saharan Africa, this will leave much to do if Africa is likely to achieve the AEEP's target of 50% access by 2020.

## ...and clean cooking

Figures for Africans with access to non-solid cooking fuel remain low. From a 2010 baseline of 200 million people, some 302 million had access by 2014. With an accelerated effort the number of Africans using clean cooking could double by 2020 to over 600 million – but recent trends suggest this is unlikely.

## Energy efficiency policies and trends

Globally, in recent years mandatory EE policies have increased considerably, but Africa still has major potential for the introduction and proper implementation of standards and other mandatory policies. Over the past four years the Global Tracking Framework has shown that a reduction of energy intensity by a compound annual growth rate of 5%-10% per year is feasible for short periods, especially for countries starting off with a high level of energy intensity.

Aligning more closely with the Regulatory Indicators for Sustainable Energy (RISE), developed by SEforALL and Esmap, is among the potential 'alternative benchmarks' discussed in this report.

## Measuring energy intensity and network losses

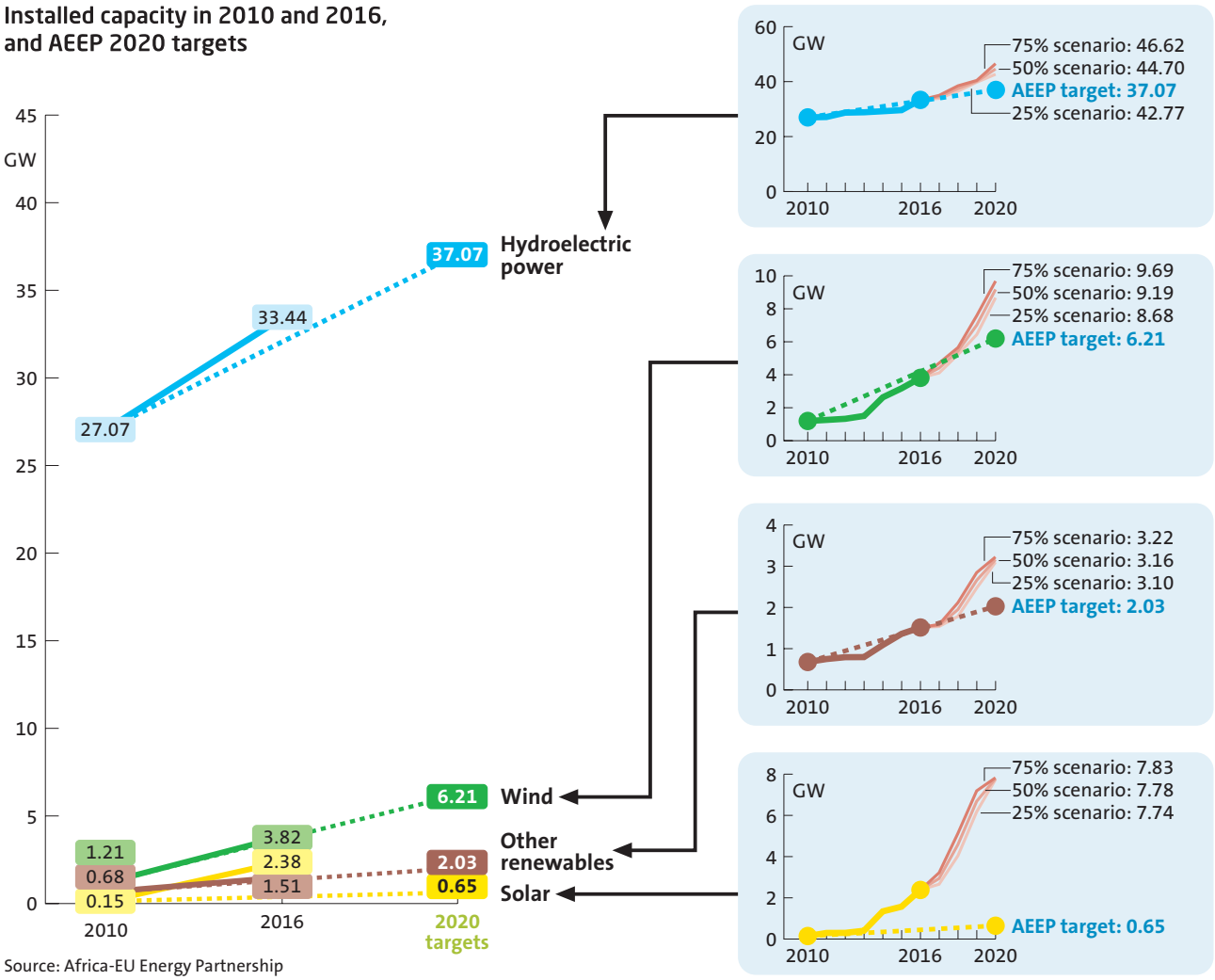
Data taken from the GTF focuses on primary energy intensity and is available up to 2014. For reasons of data availability and in order to align with the Global Tracking Framework, the AEEP *Status Report 2017-18* relies on this indicator instead of the previously used final energy intensity. The data indicates a decrease in average primary energy intensity for the African continent of 16% (or an average 1.3% per year) from 9.2 MJ/$ measured at 2011 purchasing power parity to 8.5 MJ/$ PPP between 2000 and 2014. However, this overall improvement seems to have slowed in 2013 and 2014, with a CAGR of -1.1% compared to -2.6% for the period 2010-12.

Transmission and distribution (T&D) losses– stated as a percentage of gross electricity production – vary quite widely across Africa with an (unweighted) average of 21.2%. In 2014, the smallest losses occurred in Mauritius (6.2%), South Africa (8.4%) and Cameroon (9.8%). Average African losses were 21.2% in 2014, which represents virtually no change since 2010 and an average annual increase of 1.3% since 1990. Action is needed to improve on the bleak forecast to 2020 and beyond.

Improved or repaired grid infrastructure, enhanced grid operation and measures to avoid commercial losses can contribute to fewer T&D losses. Another important emerging option to improve the situation is to increase the share of distributed generation, thereby bringing power generation closer to loads.

## AEEP renewable generation targets

**Installed capacity in 2010 and 2016, and AEEP 2020 targets**




Source: Africa-EU Energy Partnership

## Energy security enhanced by increased generation capacity

The AEEP Data Tool shows total installed generation capacity in Africa grew by almost 40GW, or 26%, in 2010-16, from 153,017MW to 192,325MW. With several major projects scheduled to come online in the 2018-20 period the medium-term prospects for supply are positive. Several mega-schemes will provide more hydroelectric power. Meanwhile, despite big investment in South Africa, coal's percentage of total capacity has fallen from 29.2% in 2010 to 23.1% in 2016, while gas use has increased by around 4.4% – and is set to rise by much more as major CCGT schemes are completed.

## Work on interconnections accelerates

The Programme for Infrastructure Development in Africa offers huge potential, but the slow pace of implementation of PIDA projects and other cross-border schemes has slowed increases to electricity transfer capacity; the database shows no new operating lines completed since 2011, but recent progress on regional transmission projects suggests that, with improved project delivery, the AEEP target of doubling capacity by 2020 could be met. Project preparation and implementation is under way on a number of major cross-border interconnections, within several regions of Africa and to strengthen electricity trade links with Europe.

## Gas use and trade evolves

African economies are making a slow, but in many cases successful, transition to increasing the domestic consumption of natural gas. Data compiled from the *BP Statistical Review of World Energy* shows that natural gas consumption in Africa increased to an estimated 138.2bcm in 2016. The largest user of natural gas remains Egypt – where the discovery of the offshore Zohr gas field will likely see gas consumption increase substantially.

Africa consistently delivered some 70bcm-80bcm of natural gas exports to Europe in 2005-10, but this healthy level of trade has fallen in the subsequent decade. However, there are solid signs that African LNG and pipeline exports are recovering to their previous levels.

| AEEP 2020 Political Target | Baseline 2010 | Numeric 2020 Target | AEEP 2020 Will the target be met or missed by 2020? |
|---|---|---|---|
| **Energy Security** | | | |
| Double capacity of cross-border interconnections | 9,680MW | 19,360MW | Missed on current trend |
| Double the use of natural gas in Africa | 106bcm | 212bcm | Missed on current trend |
| Double African gas exports to Europe | 79bcm | 158bcm | Current trend is negative |
| **Renewable Energy** | | | |
| 10,000MW Hydro | 27,069 | 37,069 | Achieved in all projections other than long-term |
| 5,000MW Wind | 1,207MW | 6,207MW | Missed on historical trends, achieved in all pipeline scenarios |
| 500MW Solar | 146MW | 646MW | Already achieved |
| Tripling of other renewables (geothermal, biomass) | 676MW | 2,027MW | Achieved in all projections |
| **Energy Efficiency** | | | |
| Network losses (% of gross electricity production)* | 21.2 | na | Target not defined |
| (Primary) energy intensity (MJ/US$2011 PPP) | 8.3 | na | Target not defined |
| **Energy Access** | | | |
| Electricity Access (for an additional 100 million) | 447m | 547m | Comfortably achieved if trend since 2010 is maintained |
| Cooking (for an additional 100 million) | 270m | 370m | Missed by 19m on trend since 2011 |

## Financial support continues to grow

Increasing levels of financial support are shown in data for African and European contributions – which, although still incomplete, point to positive trends. These include an increase in allocations to energy in African governments' annual capital spending budgets.

EU commitments and disbursements to infrastructure in Africa have risen substantially over the past nine years. Infrastructure Consortium for Africa data show the compound annual growth rate in commitments over the nine years to 2016 is 18%. The CAGR in disbursements over the eight years to 2016 is 12%. In 2014-16, EU commitments reached $10.5bn.

## The AEEP should be a catalyst for harmonisation of initiatives

Efforts to harmonise the growing number of African energy-focused initiatives, together with increased focus on private sector investments and the contribution of global initiatives like GTF towards better understanding energy access and efficiency, will inform the AEEP's thinking on its targets and priorities after 2020. 2030 is the chosen date for SEforALL and AREI, the Sustainable Development Goals and other benchmarks, which align with the AEEP's goals.

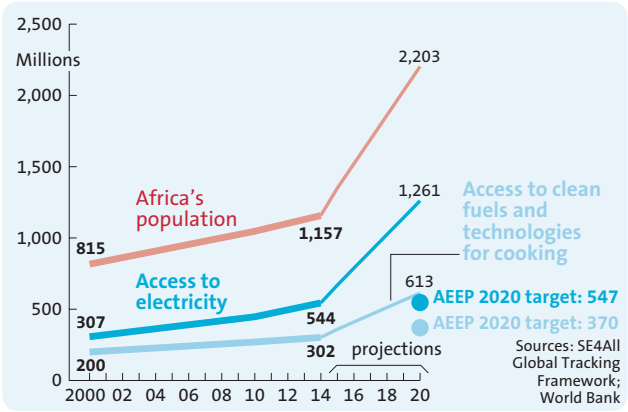
*Status Report 2017-18* offers some suggestions of potential 'alternative benchmarks' that might be used, such as technical indicators for commercial power generation (cost-reflective tariffs or time of use tariffs), progress on policy (the extent that utilities are 'unbundled'), the boom in distributed energy (measuring mini- and micro-grids) and moves to bring the global revolution in energy efficiency to Africa.

It also examines the 'Social Agenda' which seeks to create a better future for Africa's youthful populations, based on critical indicators such as job creation, gender and climate change mitigation – to which the AEEP might further align its work as Europe and Africa fashion a new agenda to tackle these major challenges for both continents.

| | Historical trends for 2020 target (based on annual average increases) | | | Scenarios (based % on current project pipeline) | | |
|---|---|---|---|---|---|---|
| | Long-term (2000-16) | Medium-term (2008-16) | Short-term (2011-16) | Pessimistic (25% online) | Halfway (50% online) | Optimistic (75% online) |
| **Energy Security** | | | | | | |
| Double capacity of cross-border interconnections | 11,635MW | 11,373MW | 9,931MW | na | na | na |
| Double the use of natural gas in Africa (bcm) | 158bcm | 160bcm | 159bcm | na | na | na |
| Double African gas exports to Europe (bcm) | 57bcm | 33bcm | 42bcm | na | na | na |
| **Renewable Energy** | | | | | | |
| 10,000MW Hydro | 36,119MW | 37,511MW | 37,685MW | 42,774MW | 44,696MW | 46,619MW |
| 5,000MW Wind | 4,643MW | 5,194MW | 5,565MW | 8,681MW | 9,187MW | 9,692MW |
| 500MW Solar | na | na | 6,580MW | 7,741MW | 7,784MW | 7,826MW |
| Tripling of other renewables (geothermal, biomass) | na | na | 2,071MW | 3,097MW | 3,160MW | 3,223MW |
| **Energy Efficiency** | | | | | | |
| Change in network losses (% CAGR)* | 1.3 | 1.3 | 1.1 | na | na | na |
| Change in (Primary) Energy Intensity* & ** | -1.5 | -0.8 | -0.4 | na | na | na |
| **Energy Access** | | | | | | |
| Electricity Access (for an additional 100 million)* | 623m | 660m | 664m | na | na | na |
| Cooking (for an additional 100 million)* | 344m | 348m | 351m | na | na | na |

* Trend figures are to 2014 **(MJ/US$2011 PPP)

# Energy Access




The provision of access to secure, affordable, clean and sustainable energy services has been a pillar of the Partnership's action since its inception. The AEEP's 2020 Political Target of increasing electricity access to 100 million more Africans sets a notable benchmark – which in volume terms has already have been met. It has informed more recent initiatives, such as the United Nations (UN)'s Sustainable Energy for All (SEforALL), which is supported by the African Union and European Union. SEforALL aims to pull 1 billion people out of energy poverty by 2030, some 500 million of them in Sub-Saharan Africa (SSA).

African governments, the EU and other international actors are firmly focused on achieving a radical overhaul of energy poverty in SSA and other under-resourced regions. Goal 7 of the UN's Sustainable Development Goals (SDGs), unveiled in September 2015 as a baseline for harmonising global action to overcome poverty, provides a commitment to "ensure access to affordable, reliable, sustainable and modern energy". This underpins SEforALL's commitment to universal access by 2030.

Efforts have accelerated over the past decade to provide sustainable energy to marginalised communities. Without access to reliable electricity supplies – the basis of every modern economy – it is impossible to raise living standards, create jobs, increase productivity and encourage young male and female entrepreneurs, or drive inclusive economic growth. In Africa, as in so many emerging economies, access to clean fuels and technologies for cooking is also integral to improving living standards. Reliance on solid fuel for cooking, such as charcoal, has well-documented adverse effects on health, together with often unsustainable and damaging production methods.

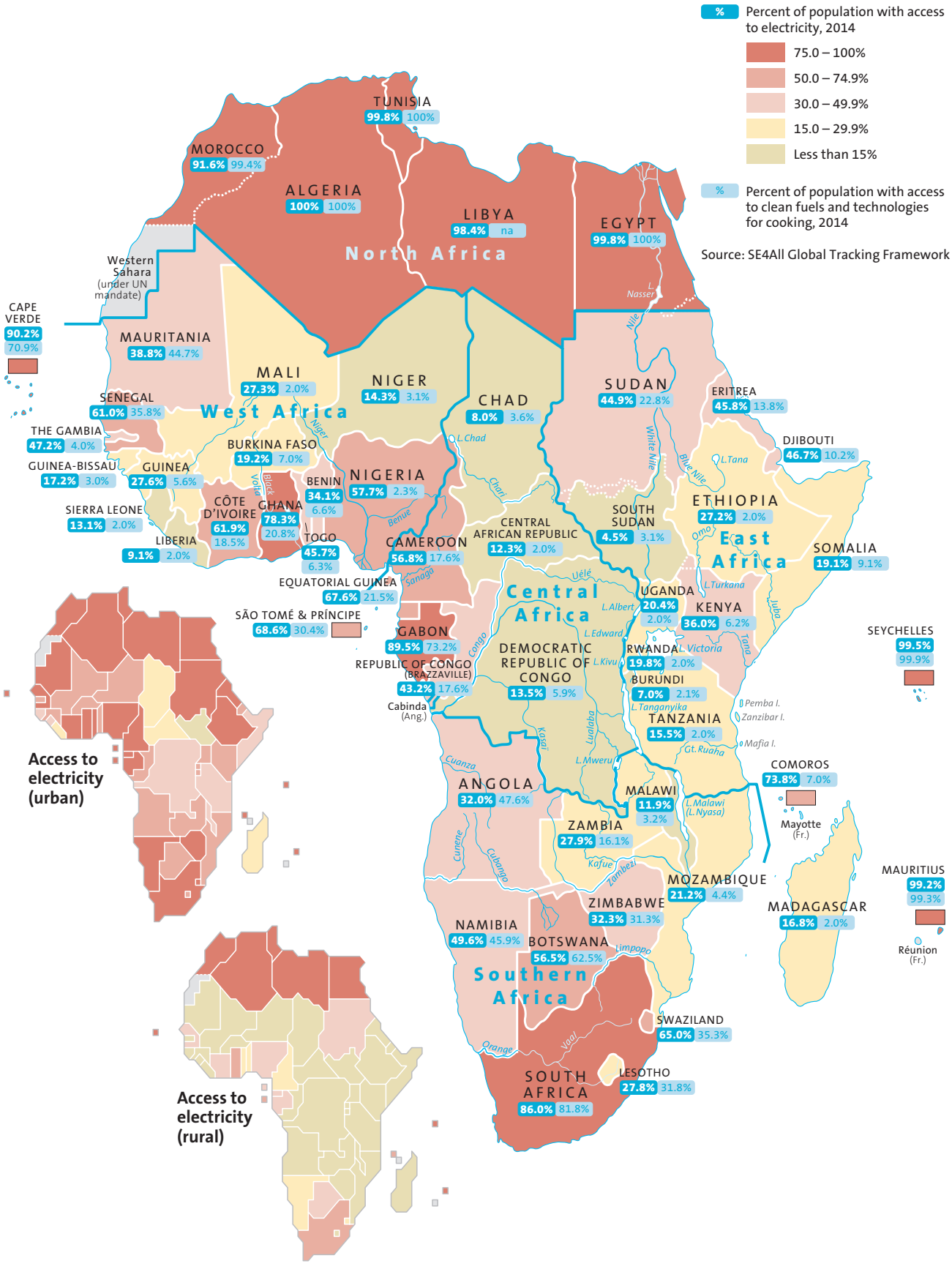
Data compiled for SEforALL, coupled with research by the AEEP and other agencies, suggest that universal energy remains an elusive goal. SEforALL statistics suggest that the AEEP's goal of providing electricity to 100 million more people in 2010-20 may already have been met; an estimated nearly 97 million more Africans gained access in 2010-14 alone. But while this is good news, the continent's population increased by more than 110 million during the same period.

This indicator does not take into account improvements in service, which are occurring as recent investments in the grid start to bear fruit, and should significantly improve access. According to a recent study by the International Energy Agency (IEA)[1], "from 2000 to 2016 nearly all of those who gained access to electricity worldwide did so through new grid connections, mostly with power generation from fossil fuels". However, it added that over the last five years, "decentralised renewables have started to gain ground, as have off-grid and mini-grid systems, and this shift is expected to accelerate. By 2030, renewable energy sources [are expected to] power over 60% of new access, and off-grid and mini-grid systems provide the means for almost half of new access, underpinned by new business models using digital and mobile technologies."

The technologies used to provide access have started to shift, with renewables providing 34% of new connections since 2012, and off-grid and mini-grid systems accounting for 6%, the IEA observed. Trends that include the declining costs of renewables, the spread of more efficient end-user appliances and of innovative business models for access – are having an impact. The IEA concluded that "this combination of factors is set to transform the energy access landscape in the years to come, especially in rural areas, where decentralised systems are likely to provide the most cost-effective solutions for a majority of those who gain access. The application of integrated rural electrification planning will have a significant role.

The increase in access to clean fuels and technologies for cooking is more disappointing, with only around 31

[1] International Energy Agency, *Energy Access Outlook 2017*. Available at *https://www.iea.org/publications/freepublications/publication/weo-2017-special-report-energy-access-outlook.html*


% Percent of population with access to electricity, 2014
75.0 – 100%
50.0 – 74.9%
30.0 – 49.9%
15.0 – 29.9%
Less than 15%
% Percent of population with access to clean fuels and technologies for cooking, 2014
Source: SE4All Global Tracking Framework
TUNISIA 99.8% 100%
MOROCCO 91.6% 99.4%
ALGERIA 100% 100%
LIBYA 98.4% na
EGYPT 99.8% 100%
North Africa
Western Sahara (under UN mandate)
CAPE VERDE 90.2% 70.9%
MAURITANIA 38.8% 44.7%
MALI 27.3% 2.0%
NIGER 14.3% 3.1%
CHAD 8.0% 3.6%
SUDAN 44.9% 22.8%
ERITREA 45.8% 13.8%
SENEGAL 61.0% 35.8%
West Africa
THE GAMBIA 47.2% 4.0%
BURKINA FASO 19.2% 7.0%
GUINEA-BISSAU 17.2% 3.0%
GUINEA 27.6% 5.6%
NIGERIA 57.7% 2.3%
BENIN 34.1% 6.6%
SIERRA LEONE 13.1% 2.0%
CÔTE D'IVOIRE 61.9% 18.5%
GHANA 78.3% 20.8%
TOGO 45.7% 6.3%
LIBERIA 9.1% 2.0%
CAMEROON 56.8% 17.6%
CENTRAL AFRICAN REPUBLIC 12.3% 2.0%
SOUTH SUDAN 4.5% 3.1%
DJIBOUTI 46.7% 10.2%
ETHIOPIA 27.2% 2.0%
East Africa
SOMALIA 19.1% 9.1%
EQUATORIAL GUINEA 67.6% 21.5%
SÃO TOMÉ & PRÍNCIPE 68.6% 30.4%
Central Africa
UGANDA 20.4% 2.0%
KENYA 36.0% 6.2%
GABON 89.5% 73.2%
DEMOCRATIC REPUBLIC OF CONGO 13.5% 5.9%
RWANDA 19.8% 2.0%
BURUNDI 7.0% 2.1%
REPUBLIC OF CONGO (BRAZZAVILLE) 43.2% 17.6%
Cabinda (Ang.)
TANZANIA 15.5% 2.0%
SEYCHELLES 99.5% 99.9%
Access to electricity (urban)
ANGOLA 32.0% 47.6%
MALAWI 11.9% 3.2%
COMOROS 73.8% 7.0%
Mayotte (Fr.)
ZAMBIA 27.9% 16.1%
MOZAMBIQUE 21.2% 4.4%
ZIMBABWE 32.3% 31.3%
MADAGASCAR 16.8% 2.0%
MAURITIUS 99.2% 99.3%
Réunion (Fr.)
NAMIBIA 49.6% 45.9%
BOTSWANA 56.5% 62.5%
Southern Africa
SWAZILAND 65.0% 35.3%
LESOTHO 27.8% 31.8%
SOUTH AFRICA 86.0% 81.8%
Access to electricity (rural)

million additional people gaining access from 2010 to 2014, according to SEforALL data. Some 850 million people remain without access to clean cooking in SSA, out of 3 billion worldwide.

Statistics – and basic observation – show that much of SSA is confronted with major shortfalls of access to electricity and clean cooking fuels. There is much to do before sufficiently accurate data is available. The SEforALL Global Tracking Framework (GTF) has been established to counter this shortfall, with a Steering Group led jointly by the World Bank Group-administered Energy Sector Management Assistance Programme (Esmap) and the IEA. Its datasets are by necessity highly modelled and based on limited underlying data, but the situation is improving.

Efforts to improve the capacity of national statistical authorities are supported by the AEEP and other stakeholders. Without these authorities' input, reliable on-the-ground tracking will not be possible. Technology is starting to help planners, including geospatial research and analysis, which can serve several important functions, from highlighting areas where national grids are unlikely to reach any time soon (pushing the case for distributed solutions to be applied) to developing cost-effective, holistic electrification strategies that incorporate agriculture and other productive economic activities.

Several trends are clear in the current datasets. The first is that gains are being made in terms of access to electricity, although they have so far struggled to keep up with dramatic population increases. Electricity surpluses – in many cases driven by slower than anticipated economic growth, as well as by the accelerated pace of increases to generation capacity – and a change of emphasis towards grid and 'last-mile connection' projects mean this is likely to improve as the decade moves on.

A worrying gap remains between urban and rural electricity access. The average difference between urban and rural electricity rates in African countries is more than 40%. Excluding North Africa (where access to electricity is close to universal), the difference is nearly 44%. Solar home systems are becoming more prevalent in rural areas, but stand alone options are rarely large enough to support productive uses of energy which would result in accelerated economic development in rural communities. Mini- and micro-grids may prove more effective but are at an earlier stage of market development.

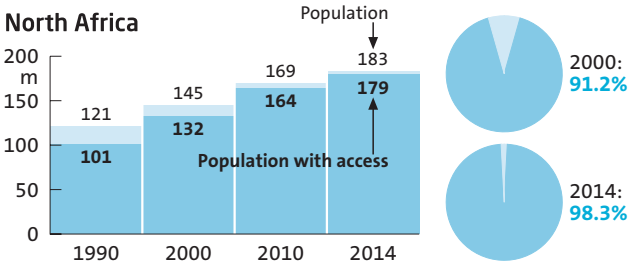
The average rate of access to clean fuels and technologies for cooking across the continent in 2014 was a meagre 26%, according to SEforALL. This even lags behind access to electricity, which in the average African country is around 46%. Clean cooking has failed to displace highly polluting fuels, led by solid biomass but also including kerosene in big markets such as Nigeria and Kenya. The IEA says over 90% of the SSA population, or 780 million people, rely on solid biomass for cooking.

Progress in clean cooking suffers from shortfalls in fuel supply chains and resistance from consumers – who are predominantly female – to what should be economically and socially beneficial cookstoves that should improve their lives. In countries where progress has been made, the provision of cost-effective clean cooking equipment has been accompanied with government action and campaigning groups, such as the Ghana Alliance for Clean Cookstoves, the Clean Cookstoves Association of Kenya and Uganda National Alliance for Clean Cookstoves.

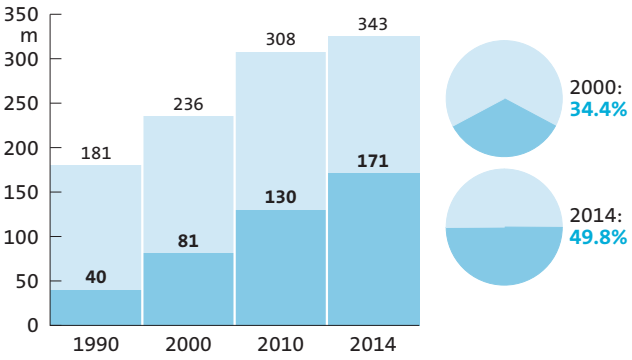
More investigation is needed into the market for clean fuel and technologies for cooking to identify failings and facilitate improvements similar to those that have taken place for solar home systems. Without a major acceleration of efforts, the outlook is grim: the IEA forecasts the number of people without access to clean cooking growing to 910 million by 2030, reflecting the impact of population growth, which is outpacing the provision of clean cookstoves. The figure of 780 million people who rely on solid biomass for cooking is nearly 50% higher than in 2000.

## Access to electricity by region

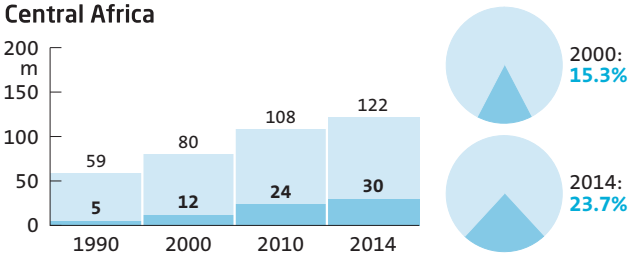
### North Africa



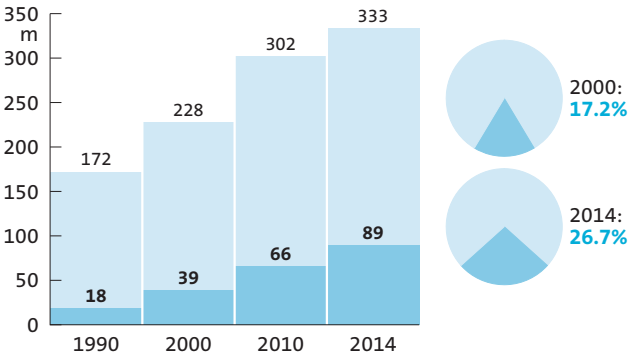

### West Africa



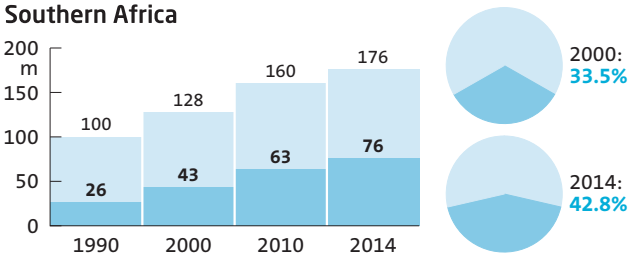

### Central Africa




### East Africa



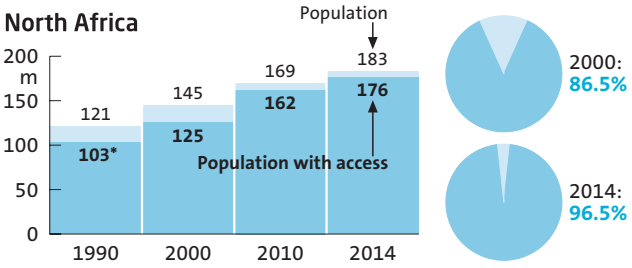

### Southern Africa



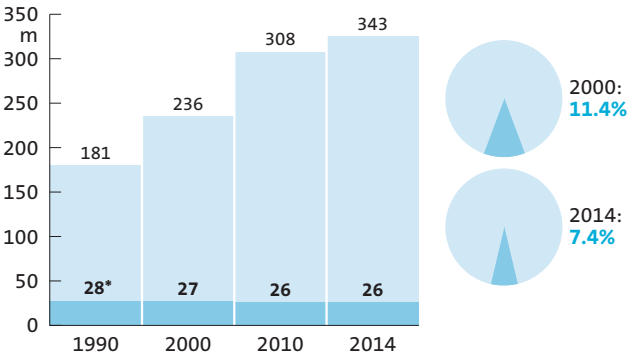

Source: SE4All Global Tracking Framework

## Access to clean fuels and technologies for cooking by region

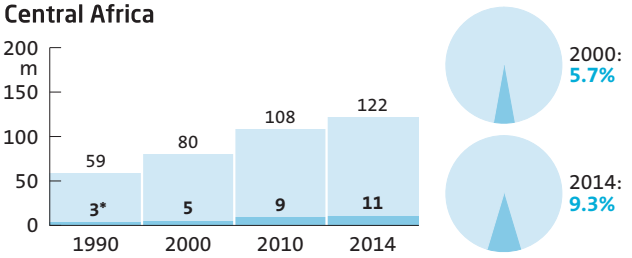
### North Africa



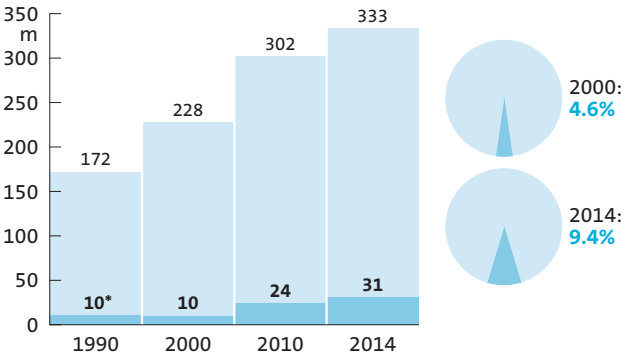

### West Africa



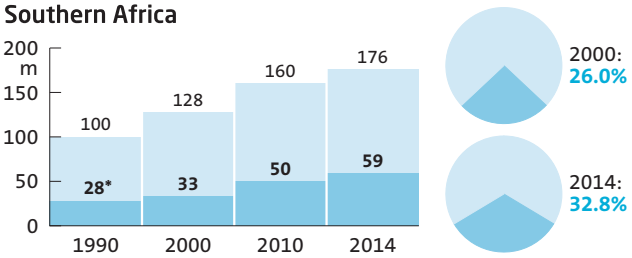

### Central Africa




### East Africa




### Southern Africa




Source: SE4All Global Tracking Framework * figures from SE4All 2015 Report

# AEEP's multi-faceted support for access

AEEP Energy Access Work Stream (EA WS) has emerged as a dynamic platform for dialogue and information-sharing. It brings together a wide variety of stakeholders, led by four key members: business group the Alliance for Rural Electrification (ARE), the African Association for Rural Electrification (CLUB-ER), civil society organisation Practical Action and Kenya-based Strathmore University's Strathmore Energy Research Centre (SERC).

Key events included the Multi-Stakeholder Forum on Sustainable Energy, held in Lusaka, Zambia in February 2017. This targeted those working on energy access in Zambia and the wider Eastern and/or Southern Africa regions. Attended by more than 210 stakeholders – including civil society, investors and financiers, project developers and the wider private and public sectors, including government agencies – the event discussed the barriers and opportunities for EA in Zambia and the wider region and contributed to the SEforALL Zambia process and other initiatives. Participants explored perspectives on energy access from other sectors including health, agriculture, water and gender, and presented best practice examples of multi-stakeholder engagement in energy planning and policy-making.

EA WS has produced a ground-breaking publication, *AEEP Energy Access Best Practices 2016*[1], a compilation of 24 project case studies and programmes on access to clean energy in Africa. The 32-page book demonstrates how bioenergy, small hydro, solar PV and wind energy provide sustainable solutions to electrify rural communities and lay the foundation for local economic development.

The AEEP's commitment to bringing through a new generation of decision-makers and doers is underlined by the Young Leaders In Energy Access Forum (one of whom is profiled on page 55). A call for proposals from young advocates, public sector workers and social entrepreneurs produced Six Young Leaders, who told the ARE Energy Access Investment Forum in Lisbon, Portugal how they would improve energy access in Africa.

The AEEP is also strongly supportive of CLUB-ER, which is undertaking a range of activities including training and publications, pointing the way to best practise in rural electrification.

[1] *AEEP Energy Access Best Practices 2016 may be accessed: at www.euei-pdf.org/en/aeep/thematic-work-streams/aeep-energy-access-best-practices-2016Best Practices publication*

# Filling the rural electrification planning gap

Electrification and energy access have risen up the political agenda but there has been no comprehensive overview available of National Approaches to Electrification (NEA), which could offer information and advice on technologies, policy options, instruments and implementation experiences to enable policy-makers and programme designers to understand the options and decide on an optimal design for their country's national electrification strategy. EUEI PDF, the Energising Development Programme (EnDev) and Practical Action have sought to fill that gap with an interactive tool, *National Approaches to Electrification: Review of Options*.[1]

The review provides high-level information on national electrification approaches, building a framework of National Electrification categories and the inter-relationships between the many factors that feed into policy. National-level examples used include Ethiopia's solar market development, Kenya's Off-Grid for Vision 2030, Mali's Rural Electrification Programme, Rwanda's sector-wide approach to planning, South Africa's, Integrated National Electrification programme, the mini-grids regulatory framework in Tanzania and low cost distribution technology in Tunisia.

The interactive tool analyses the relevant technologies and looks forward to providing more detailed and in-depth guidance to policy-makers and programme designers on the design and implementation of national approaches to electrification in Phase 2 of the Study.

This is urgently required because to date, "categorisation systems based on policies/interventions are inconsistent and generally cover only one form of electrification (eg grid extension, minigrids or stand-alone systems)." It concludes: "A new categorisation system which encompasses all forms and aspects of NEA is needed."

[1] *www.euei-pdf.org/en/national-approaches-to-electrification-a-review-of-options*

# Energy Security

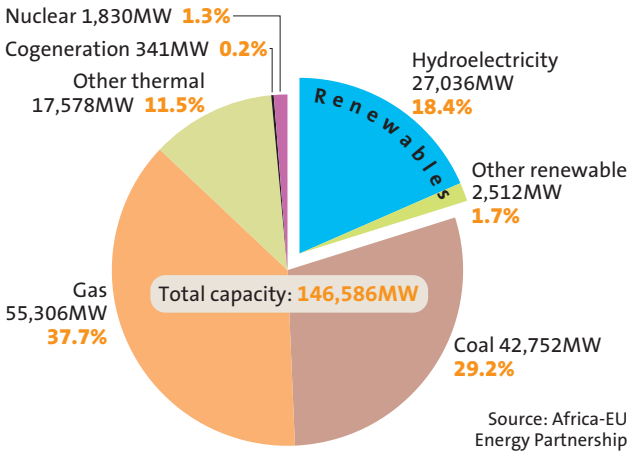
The promotion of energy security on both continents through the promotion of interconnections and trade was a founding principle of the AEEP and remains an essential element of the Partnership. Macroeconomic and market volatility and the difficulties of financing complex cross-border projects are among factors that have slowed progress in some areas – for example, lower demand for natural gas imports in Europe has slowed the flow of sales from Africa into EU markets. The years 2010-17 have produced marked results in improving connections that have helped consolidate the energy security of both Africa and Europe. As shown in the charts below, based on data collected by the AEEP Monitoring Tool, interconnections and the consumption of cleaner forms of energy have increased during the decade to 2020.

Levels of gas consumption appear to be recovering from the disappointing figures recorded in the middle of the decade, which plateaued in 2012-14. Major discoveries such as the Zhor field in deep waters off Egypt and huge fields off Mozambique and Tanzania are among new resources now being brought into production. In addition to existing reserves that are now being exploited more efficiently, new fields and increasing recourse to combined cycle gas turbine (CCGT) power stations – which are much cleaner that earlier thermal electricity sources – are expected to transform the African gas sector. The increased use of gas to drive industrial development from Morocco to Cameroon and Tanzania to South Africa points to a trend by which African economies will experience substantial increases to gas consumption and exports in the period to 2020 and beyond. Both LNG and pipeline exports increased substantially in 2016, recording their highest figure since 2012.

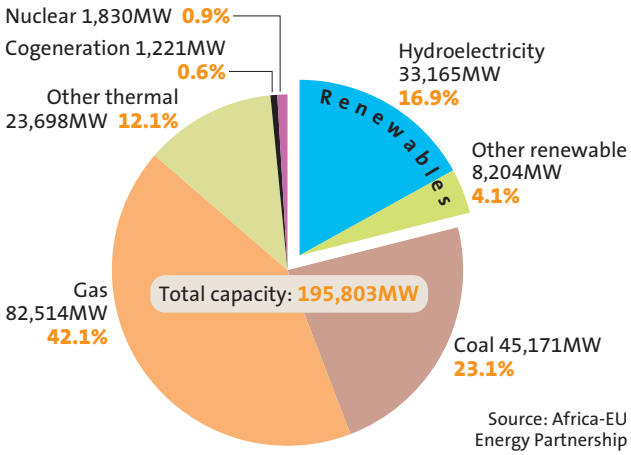
Regional integration is a critical element in the work of the African Union and European Union. The AEEP's data show that cross-border transmission projects have been making slow progress, but with progress being accelerated the outlook remains largely positive. Regional economic communities (RECs) and their energy-focused affiliates continue to take steps to improve levels of integration, underlined by the growing number of interconnections planned or under construction. The Southern Africa Power Pool (SAPP) is providing a model for wider regional cooperation, with an increasingly widely used trading platform that offers Forward Physical Markets and an Intra Day Market for its member utilities to buy and sell electricity. The West African Power Pool (WAPP) and East African Power Pool (EAPP) are also making progress, with some major new interconnections expected to come online before 2020.

The AEEP Data Tool shows total installed generation capacity in Africa grew by almost 40GW, or 26%, between 2010-16, from 153,017MW to 192,325MW. With several major projects scheduled to come online in the 2018-20

**Installed capacity by technology, 2010**

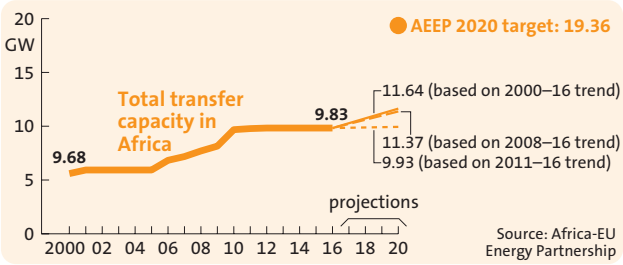



**Installed capacity by technology, 2016**



period – several of which are expected to individually increase Africa's total capacity by a measurement of gigawatts – the medium-term prospects for supply is positive. Several of these mega-schemes will provide more hydroelectric power. Meanwhile, despite major investment in South Africa, coal's percentage of total capacity has fallen from 29.2% in 2010 to 23.1% in 2016, while gas use has increased by around 4.4% – and is set to rise by much more as major CCGT schemes are completed around the continent. 'Other renewables', which include solar, biomass, wind and geothermal, have experienced a dramatic increase from 1.71% to 4.12% of total installed generation capacity.

# Cross-border interconnections




As the data above suggests, following substantial investment in 2016-17, several countries as diverse as Egypt and Kenya have moved from under-supply of electricity to meeting even their reserve margins. As more economies resolve their previously chronic shortfalls in electricity generation, the issue of channelling more investment into transmission and distribution (T&D) rises higher up the agenda. With the potential offered to supply an ever wider area from new large-scale generation projects, connecting national grids is a clear priority to achieve electrification across the continent.

The AEEP's 2020 Political Target of doubling cross-border interconnections seeks to address the substantial challenges to electricity transmission in Africa, including high associated costs of building and operating electricity grids, disjointed legal and regulatory environments, and the existing limits on infrastructure, much of which is weak and ageing. The interconnection of national grids has been a key focus for the Programme for Infrastructure Development in Africa (PIDA) and other international initiatives. By putting in place the structures necessary for cross-border electricity trading, regional power pools and other stakeholders are helping to meet rising demand from domestic and industrial consumers by making an important contribution towards encouraging investment into existing and new infrastructure.

There has been considerable progress, although analysis of cross-border interconnections completed shows this is uneven. In the period 2000-10, the capacity of cross-border transmission lines across Africa increased by 4,750MW, as total transfer capacity rose from 5,596MW to 9,679MW.

This growth has not been continued in project completions in the subsequent seven years, but that does not mean work has stopped. Indeed, project preparation and implementation is under way on a number of major cross-border interconnections, within several regions of Africa and to strengthen electricity trade links with Europe. A number of the major projects are shown in the tables below.

## East African Power Pool (EAPP)

East Africa has huge potential for cross-border power-sharing, with major projects including the 2,000km Kenya-Tanzania-Zambia interconnector link to the South Africa Power Pool (SAPP), which will provide opportunities for trade between the eastern and southern parts of the continent. Ethiopia is making Ethiopian Electric Power Company's completion of more than 1,400km of high-voltage transmission lines to serve the Grand Renaissance Dam (GERD) is in line with a policy to develop Ethiopia as what State Minister of Finance and Economic Co-Operation Dr Admasu Nebebe told a 3 October 2017 Res4Africa meeting in Addis Ababa – supported by the AEEP – was a strategy to move from transmission capacity of 2.6GW to 17GW by 2025, enabling Ethiopia "to become

| EAPP Selected interconnections in development | |
|---|---|
| **Project** | **Expected completion** |
| 500kV Ethiopia-Kenya | 2018 |
| 220kV Kenya-Rwanda | 2017 |
| 220kV Rwanda-Uganda | 2017 |
| 400kV Kenya-Tanzania | 2019 |
| 220kV Uganda-Kenya | 2017 |

the regional renewable energy hub in East Africa", for both generation and power trading. Construction of the 500kV Ethiopia-Kenya interconnector is under way; it will initially have 400MW transmission capacity (from 2018), later increasing to as much as 2GW.

Projects to link with the Central Africa Power Pool (CAPP) region include a 350km high-voltage line to sell power to eastern Democratic Republic of Congo (DRC) from a substation in Fort Portal, Uganda.

## Ambitious plans in West Africa

The completion of an ambitious roster of planned transmission infrastructure projects will eventually see the West African Power Pool (WAPP) region fully interconnected. The Organisation pour la Mise en Valeur du Fleuve Gambie (Gambia River Basin Development Organisation or OMVG) line, which connects Senegal, Gambia, Guinea and Guinea-Bissau, started in 2015 with an expected completion date of December 2022. The World Bank calls it "the missing link to create the transmission backbone infrastructure of the WAPP". The project will finance the construction of 1,677km of a 225kV transmission network capable of handling 800MW. The OMVG Interconnection Project brings together several major European funding institutions – including Agence Française de Développement, the European Investment Bank and the German government via KfW – with other international partners including the World Bank Group, African Development Bank, Islamic Development Bank, West African Development Bank and Kuwait Fund.

The similarly ambitious Cote d'Ivoire-Liberia-Sierra Leone-Gambia (CLSG) line is a €700m project to connect the four countries' grids by 2019. CLSG began construction in June, and is expected to have a substantial impact on the regional cross-border electricity trade. In September 2017, the CLSG meeting in Abidjan reported that eight of the project's total 13 engineering, procurement and construction contracts had now been signed, of which five were effective and had begun construction.

## Energy trading hubs in North Africa

North Africa offers huge potential both for linking up with Sub-Saharan partners and by building on its energy trade with Europe. Morocco is expanding its interconnections with Spain and its heavy investment in solar and wind offers the prospect of selling power generated by renewables to Europe.

The TuNur project aims to link a 2.25GW concentrated solar plant at Rjim Maatoug in southern Tunisia to Europe. As now configured, the project will comprise the initial development of a 400km HVDC transmission line to northern Tunisia and a 250MW subsea cable to Malta, eventually connecting to the existing Malta-Sicily cable and the Italian grid – eventually with 2GW of capacity. This link will form part of the EU's Project of Common Interest plan, which helps aid infrastructure projects in the collective interest of European states.

**SAPP Selected interconnections in development**

| Project | Expected completion |
|---|---|
| 400kV Solwezi (Zambia)-Kolwezi (DRC) | 2018 |
| 400kV Mozambique-Zambia | |
| 330kV Central Transmission Corridor Zimbabwe | 2019 |
| 330kV Zizabona[1] | |
| 400kV Botswana NW[2] | 2020 |
| 400/500kV Botswana-South Africa (BOSA) | 2022 |
| 220kV Mozambique-Malawi | 2021-2022 |
| 330kV Zambia-Malawi | 2019 |
| 400kV Zambia-Tanzania-Kenya | 2018 |

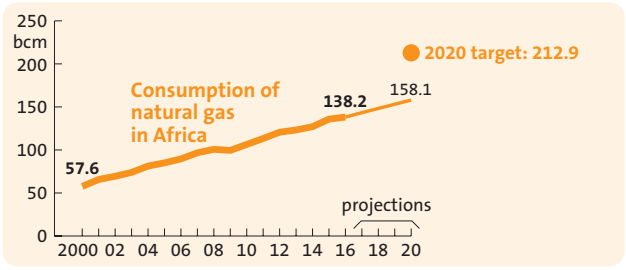
[1] Zimbabwe-Zambia-Botswana-Namibia. [2] North West Transmission Grid Connection Project Phases 1 and 2.

**WAPP Selected interconnections in development**

| Project | Expected completion |
|---|---|
| 225kV Ghana-Burkina Faso | 2019 |
| 225kV Guinea-Mali | 2021 |
| 225kV Ghana-Burkina Faso-Mali | 2020 |
| 330kV Côte d'Ivoire-Ghana IR | 2020 |
| 330kV Nigeria-Benin IR (PI) | 2021 |
| Côte d'Ivoire-Liberia IR | 2021 |
| Nigeria-Niger-Togo/Benin-Burkina Faso (PI) | 2020 |
| CLSG | 2019 |
| OMVG (Senegal-Gambia-Guinea-Guinea Bissau) | 2022 |

IR – interconnection reinforcement. PI – pre-investment phase.

# Natural gas



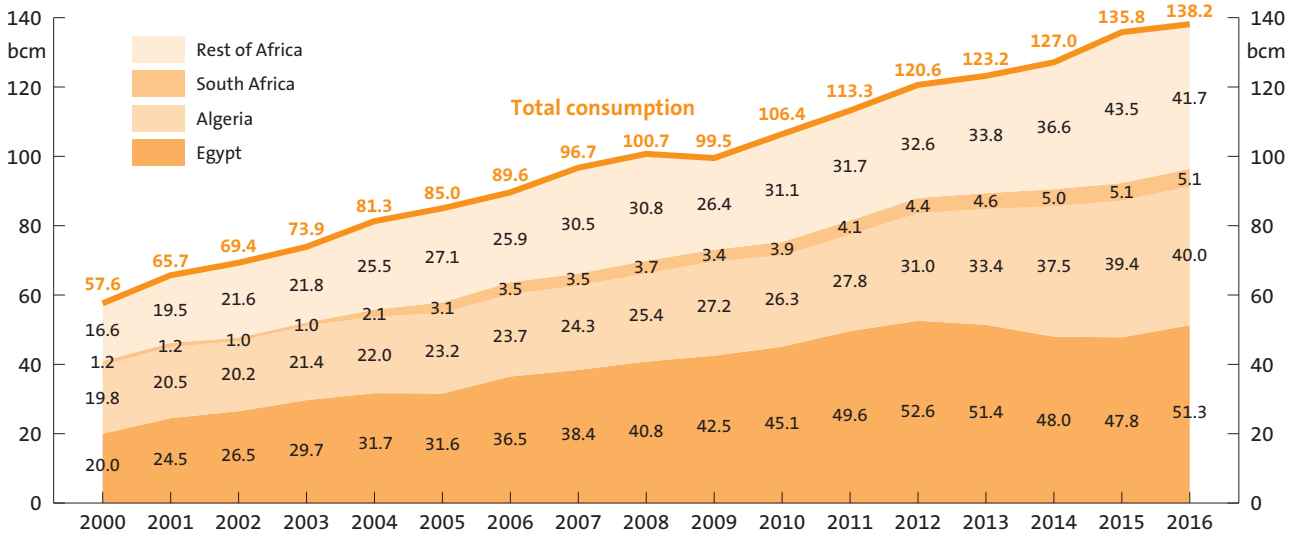

African economies are making a slow, but in many cases successful, transition to increasing the domestic consumption of natural gas, which is seen by many as the 'transitional' fuel, between more polluting, less efficient traditional thermal means of generation and cleaner, more sustainable renewables. Natural gas can play an important role in helping economies to industrialise; it can supply better quality housing in fast-growing urban and peri-urban neighbourhoods; and it is also seen by planners as especially appropriate in providing baseload power, to complement fast-growing but intermittent renewables supply to the grid. Increased gas use is thus viewed as a vehicle for improving energy security, raising living standards, and helping to mitigate the effects of climate change.

Data compiled from the *BP Statistical Review of World Energy* shows that natural gas consumption in Africa increased from 135.8bn cubic metres (bcm) in 2015 to an estimated 138.2bcm in 2016. This represents a growth of around 1.4% – a less dramatic increase than the 2014-15 rise of 8.8bcm (6.9%), from 127bcm to 135.8bcm. The 8.8% two-year increase between 2014 and 2016 marked an upturn; total consumption in 2012-14 had risen only by 5.3%, from 120.6bcm to 127bcm.

The largest user of natural gas remains Egypt, whose consumption dipped to 48bcm in 2014 and 47.8bcm in 2015, before rising to 51.3bcm (around the 2013 level) in 2016. The discovery of the offshore Zohr gas field by Italian major Eni – which is expected to start production in late 2017 – will provide feedstock that will likely see gas consumption increase substantially. North Africa's largest gas exporter, Algeria, remain its second largest consumer, at 39.4bcm in 2015 and 40bcm in 2016. This is also expected to rise following state utility Sonelgaz's large investment in CCGT power plants.

South African consumption remained constant at 5.1bcm in 2016, while the consumption of other African states combined fell from 43.5bcm in 2015 – by some distance the highest figure in the BP Statistical Review's run of data – to 41.7bcm in 2016. However, consumption in 'other African' economies is likely to rise considerably given the very notable trend towards local gas producers being able to monetise their reserves in the domestic market. This is in large part due to a recognition by local authorities that they can only expect investment in their resources if investors are paid a cost-reflective tariff for their supply. Success stories where private investors have succeeded in building a sustainable gas supply business in fast-growing African cities include Victoria Oil & Gas's operation in

**Consumption of natural gas in Africa, 2000-16**




Source: BP Statistical Review of World Energy

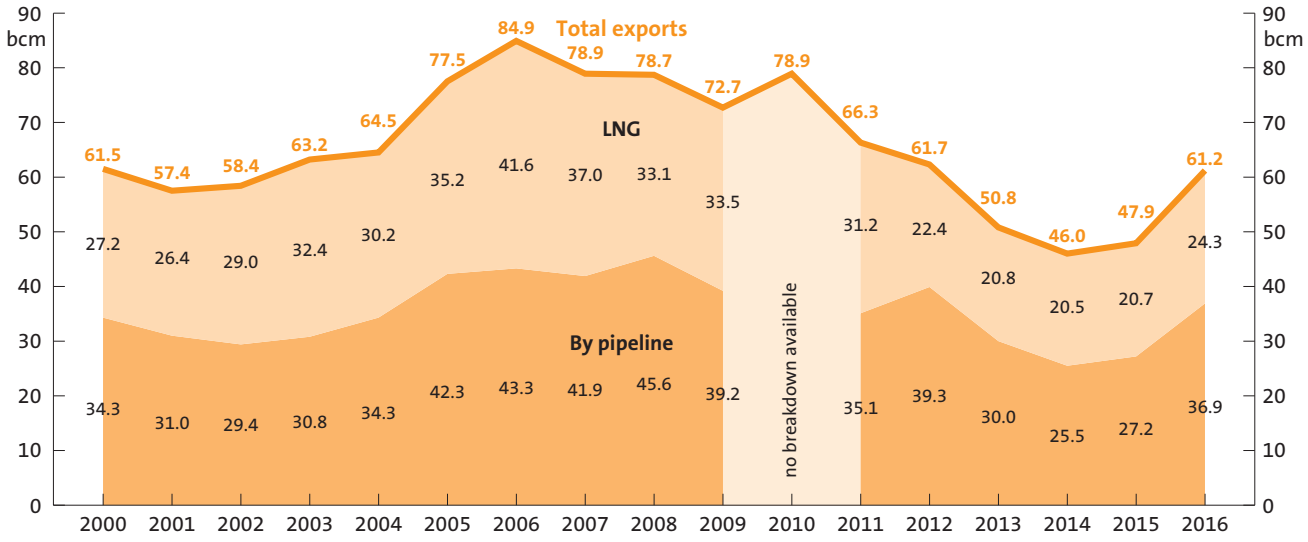
Douala, Cameroon and Songas in Dar es Salam, Tanzania.

Despite these promising signs, the ambitious target of doubling the 2010 natural gas consumption figure of 106.4bcm to 212.8bcm by 2020 looks unlikely to be reached, based on the trend of current data, which includes a plateauing consumption between 2012 and 2014. In economies challenged by the fallout of the 2008-09 global financial crisis and 2011 'Arab Spring', the average annual increase in gas consumption in 2010-16 has been approximately half the required amount, standing at approximately 5.3bcm a year. On this trend, consumption might be only around 158bcm as of 2020. However, it is likely that consumption will increase by considerably more as a number of economies are investing in floating liquefied natural gas (FLNG) terminals and other solutions to import gas for power and deals are being concluded in Nigeria and some other producers to sell gas into the domestic market. The monetisation of large reserves in East Africa, particularly in Mozambique and Tanzania, and other developments reflect Africa's considerable gas production potential – an increasing amount of which will go towards local consumption in the next decade.

# Exporting gas from Africa to Europe

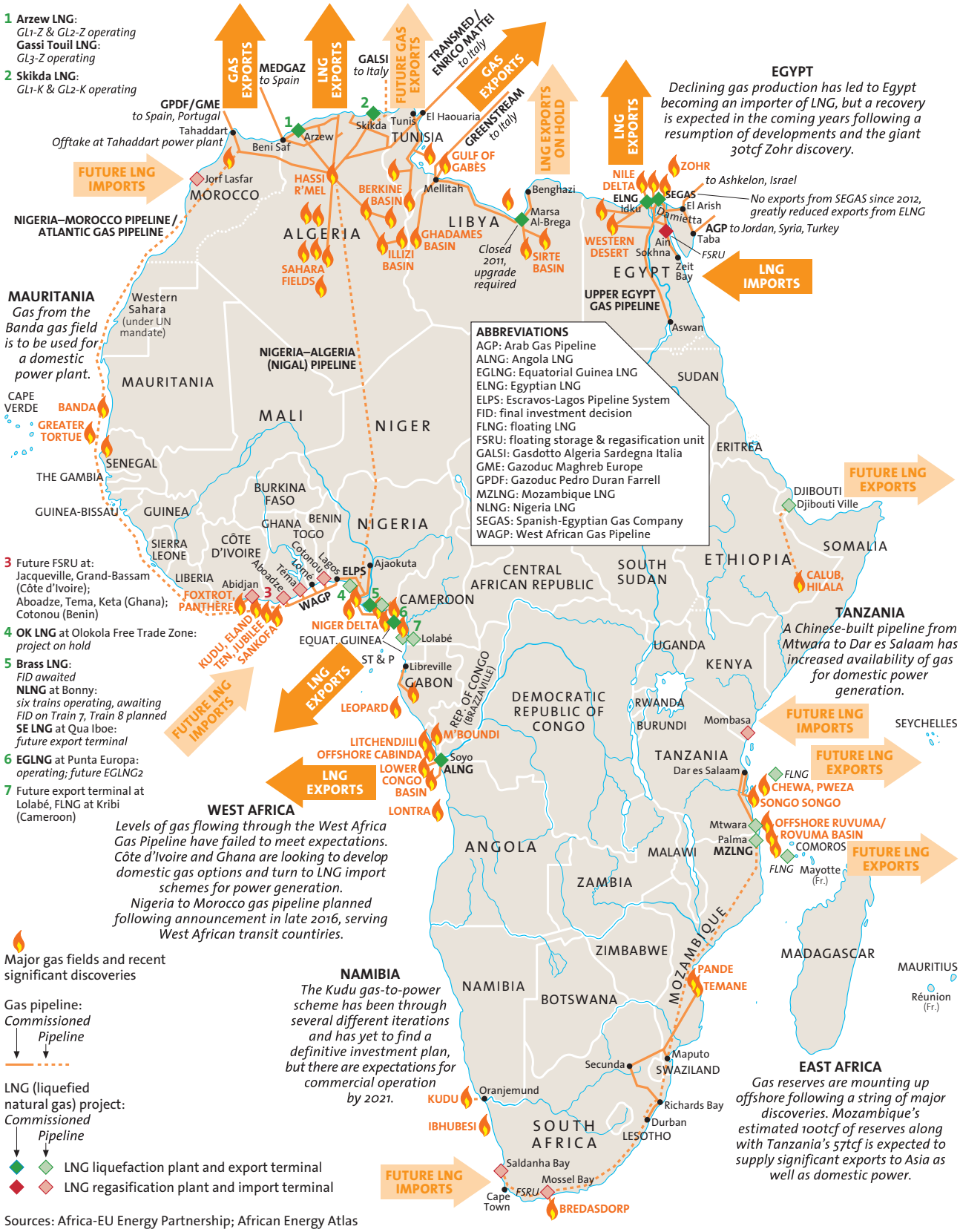
Africa consistently delivered some 70bcm-80bcm of natural gas exports to Europe between 2005 and 2010. This healthy level of trade has fallen in the subsequent decade, but there are solid signs that African liquefied natural gas (LNG) and pipeline exports are recovering to their previous levels. Thanks to a timely upturn in exports from Algeria, Africa sent 61.2bcm of natural gas to Europe in 2016. This represented a four-year high, after African

**African gas exports to Europe, 2000-16**

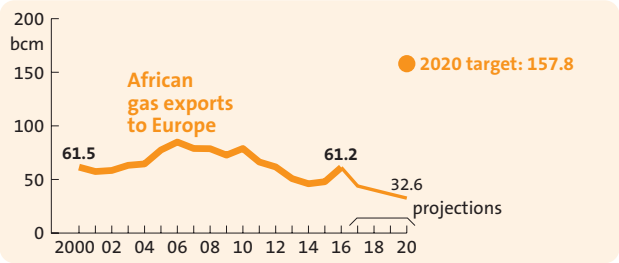



Source: BP Statistical Review of World Energy

# Natural Gas Infrastructure and Trade Routes




Sources: Africa-EU Energy Partnership; African Energy Atlas




exports in 2014 had totalled just 46bcm – the lowest figure between the years 2000 and 2016 – and were only 47.9bcm in 2015, compared to 50.8bcm in 2013. Algeria is now bringing several important gas fields in its south-west into production – including Touat, operated by France's Engie, with estimated proven and probable reserves of 68.5bcm of natural gas and 8.5m bbls of condensates; Timimoun, operated by Total; and Reggane North, operated by Spain's Repsol, expected to come on stream with initial production of 2.9bcm/yr. Big finds in Egypt and Mozambique and export potential from Nigeria, Equatorial Guinea, Angola and other producers also give scope for optimism.

According to the *BP Statistical Review of World Energy*, African pipeline exports to Europe amounted to 27.2bcm in 2015, of which 20.7bcm came from Algeria. In 2016, pipeline exports to Europe rose to 36.9bcm, of which 32.5bcm was exported by Algeria. Italy was the most popular destination, receiving 21.6bcm in 2016, followed by Spain, which imported 11.8bcm. These figures are more consistent with the levels of pre-2014 pipeline trade with Europe, a year in which exports fell to 25.5bcm, the lowest point between 2000 and 2014.

The 2016 figure, which matches the pipeline exports recorded in 2008, is the joint-biggest volume of piped gas exported between the years 2000-2016, and is significantly larger than the low point recorded in 2014 of 25.5bcm. The vast majority of this (32.5bcm) was destined for southern Europe, including Italy (17.2bcm) and Spain (11.8bcm).

LNG exports increased substantially in 2016, to 24.3bcm, of which 14.9bcm originated from Algeria and 19.2bcm from Nigeria, leaving only 0.2bcm coming from other African nations. Exports in 2015 were 20.7bcm, a slight increase on 20.5bcm in 2014. The largest European importer of African LNG in 2016 was France, at 8.1bcm, followed by Spain with 7.5bcm.

The prospect of gas discoveries coming into production offers considerable potential for exports and domestic supply in the coming years. The Zohr gas field discovery – which has stimulated an upturn in offshore exploration in other regional countries, including Cyprus – is likely to transform the Mediterranean Basin market, as well as eliminating Egypt's need to import gas.

In Morocco, oil company Sound Energy is set to produce gas for sale into the domestic grid for electricity generation. However, its investor group has also been exploring construction of a pipeline to link the Tendrara field to the Gazoduc Maghreb Europe (GME) pipeline, which runs from Hassi R'Mel in Algeria across Morocco to Spain; this spur would effectively open up an export route to southern Europe.

Tapping into East African gas reserves is an exciting prospect for the international gas market, with export sales likely to mainly go to Asia. But exports from Sub-Saharan Africa have yet to reach their potential.

Angola LNG (ALNG) has stabilised its output, with production set to reach 3.5m tonnes in 2017, up from only 0.77m tonnes in 2016. Pointing to wider shifts in the gas export market, towards short-term trades and away from long-term 'take-or-pay' contracts, Angolan sales have been sold via competitive tenders into the spot market since the Soyo plant's original plan of shipping its output to the US fell through after the North American shale gas industry boomed. ALNG has entered into multi-year sales agreements with traders Vitol and RWE Supply &Trading to deliver LNG cargoes to destinations around the world.

## African domestic markets emerge

African markets from Morocco to South Africa are planning to import LNG for electricity supply. While Mozambique's world-scale offshore reserves are expected to be exported to Asia in the 2020s, the country's resource mix and geography also raises the prospect that gas produced in the Rovuma Basin gas will be transported south by pipeline or FSRU for domestic consumption. Kenya is considering following the LNG import route, via Mombasa port, as is Mauritius, where Mauritius Ports Authority has retained Royal Haskoning DHV to study a project to supply Port Louis.

# Renewable Energy

The substantial efforts made by African governments and institutions, assisted by international organisations, to add renewable power to their grids – and, increasingly, to encourage off-grid solutions – has resulted in significant progress being made since 2010. Renewable energy is critical to providing clean and sustainable electricity as well as improving energy security on a continent where countries are too often over-reliant on one dominant source of energy. The technical development and geographical spread of renewable technology is central to efforts to reduce global greenhouse gas emissions, taking advantage of the falling price of equipment and increasing number of appropriate technologies.

This is strongly backed by donor governments and international institutions, as underlined by the EU's commitment to allocate at least 20% of its development assistance portfolio for climate change-related projects.

Renewable technologies have continued their decreasing price trajectory, in many cases becoming a least-cost option, particularly as the true cost of fossil fuels becomes more widely appreciated. The debate has moved beyond whether renewables have 'a role to play' to ask how best to incorporate them effectively into the grid. This has brought a welcome focus back onto the transmission grid, which in many African countries is in serious need of investment.

Large procurement programmes in South Africa and Morocco have shown that renewable energy can be delivered on time and on budget. Many other countries are now following suit, with international tenders for renewables at various stages of implementation in more than 13 other nations.

The monitoring of utility-scale power projects that are increasingly applying renewable technologies to help improve access to electricity across Africa has benefitted from research methods and reporting that has considerably improved since the AEEP published its original *Baseline Report* in 2012. The *Status Report 2017-18* provides the best assessment yet of progress towards achieving the AEEP's 2020 Political Targets. Among the highlights, this shows the target for solar was surpassed in 2014 and continues to grow impressively.

The target for utility-scale wind capacity is likely to be surpassed, provided South Africa can resume its impressive pace of development. This follows a period when national utility Eskom has been unable to make progress with the latest round of its Renewable Energy Independent Power Producer Procurement (REIPPP) programme, which has done so much to encourage private sector investment in solar and wind.

Hydroelectric power (HEP) is expected to meet the goal of adding 10GW since the 2010 baseline, either in 2018 or in 2019. With investment in geothermal projects, in particular, gaining some momentum, the AEEP's targets of trebling the capacity of other renewables over the decade is also now possible, based on achieving the current project pipeline, by 2020.

While there has been an improvement in the geographical spread of new schemes, in particular those applying solar technologies, many projects remain still 'in the pipeline', Continued efforts are required to ensure that these projects reach financial close and begin operating in time. The experience of many countries across Africa is that the successful implementation of renewables projects remains problematic for developers, while transmission and distribution systems have yet to catch up with the development of generation infrastructure.

## An increasing diversity of technologies

The AEEP's data suggest that the main trend in African utility-scale power generation since 2010 has been the increasing diversity of energy sources, with wind and solar in particular starting to make significant inroads on traditional resources such as HEP and coal. While HEP will continue to be the dominant utility-scale renewable energy on the continent (in volume terms), the renewables mix charts below show the transition to more diverse technologies – and away from over-reliance on HEP, which can be costly in times of drought – is already well under way. The pipeline of projects scheduled to 2020 recorded by the AEEP reveals that HEP could account for as little as 68% of renewable generation on the continent by end-decade – a situation unthinkable in 2010.

Among other trends, hybrid systems are becoming increasingly common. Solar-battery and solar-diesel systems are beginning to be seen as options for diesel-hungry mines and large industrial consumers.

An increasing number of African electricity supply industries are now addressing bottlenecks in their grids to facilitate generation from the full range of flexible, baseload and intermittent technologies. Battery technology may be an important part of the answer, but the technology is still several years from becoming cost-effective for African grids.

## Positive trends will attract global capital

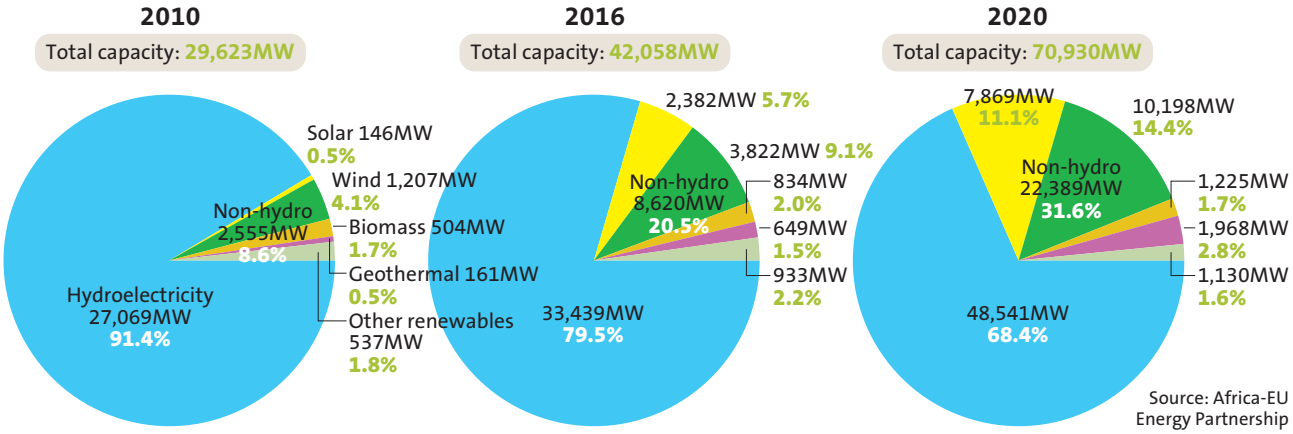
Positive trends such as the increased investment in upgrading and extending existing networks, improving metering and utility revenue collection, and the introduction of smart grid technology will allow the positive trends seen in renewable technology to blossom into an industry that can attract much greater financial support from global capital markets, as well as from the official funding sources that now dominate.

## ...build industrial capacity and create jobs

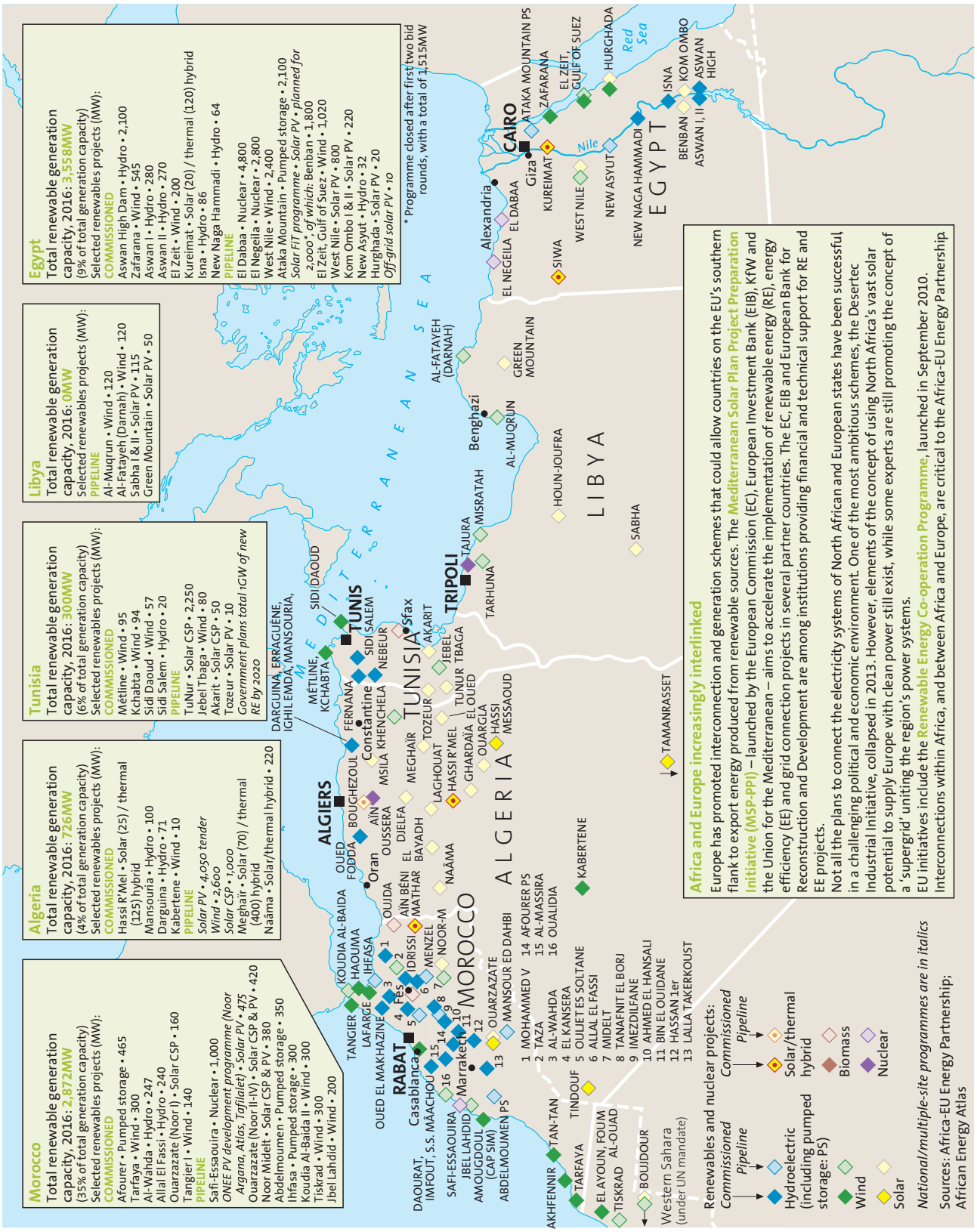
The continent's renewable energy boom offers considerable potential to develop new sources of employment and develop local industries. The widespread installation of roof-top solar kits in South Africa has employed substantial numbers of local servicemen. Across the continent, the rapid growth of mobile telecoms has shown how the application of 'new technologies' can empower entrepreneurs in even the most marginalised environments. Renewables are widely expected to play a similar role.

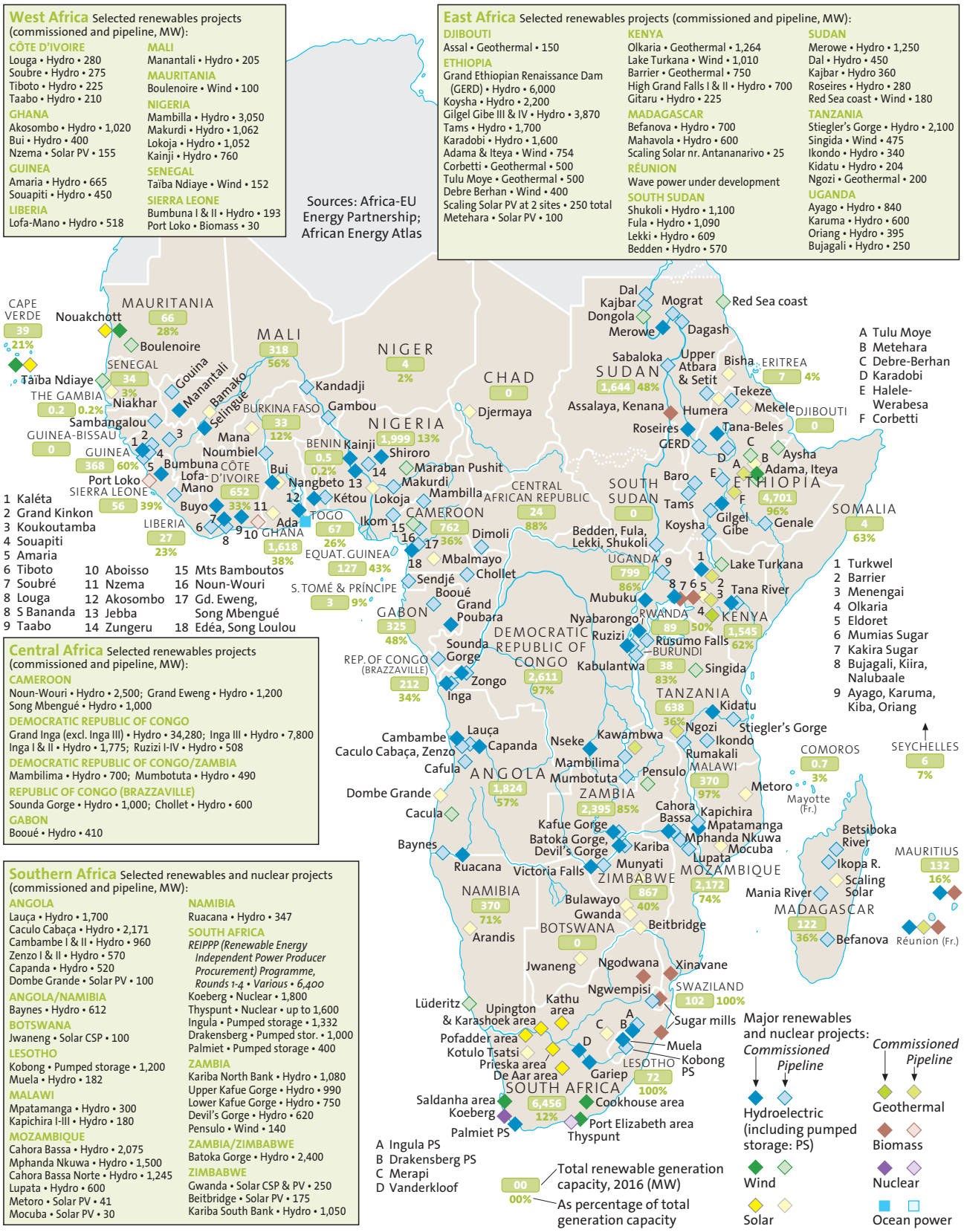
Larger-scale manufacturing also has the potential to drive industrial development. This was underlined when Siemens Gamesa Renewable Energy opened a new turbine manufacturing plant in Morocco in October 2017.

**Installed renewable capacity by technology in 2010 and 2016, and 2020 projections**

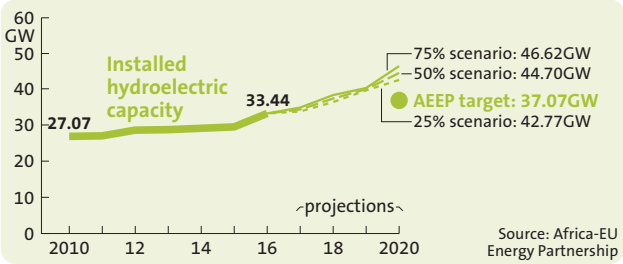



Source: Africa-EU Energy Partnership


Morocco
Total renewable generation capacity, 2016: 2,872MW
(35% of total generation capacity)
Selected renewables projects (MW):
COMMISSIONED
Afourer • Pumped storage • 465
Tarfaya • Wind • 300
Al-Wahda • Hydro • 247
Allal El Fassi • Hydro • 240
Ouarzazate (Noor I) • Solar CSP • 160
Tangier I • Wind • 140
PIPELINE
Safi-Essaouira • Nuclear • 1,000
ONEE PV development programme (Noor Argana, Atlas, Tafilalet) • Solar PV • 475
Ouarzazate (Noor II-IV) • Solar CSP & PV • 420
Noor Midelt • Solar CSP & PV • 380
Abdelmoumen • Pumped storage • 350
Ihfasa • Pumped storage • 300
Koudia Al-Baida II • Wind • 300
Tiskrad • Wind • 300
Jbel Lahdid • Wind • 200
Algeria
Total renewable generation capacity, 2016: 726MW
(4% of total generation capacity)
Selected renewables projects (MW):
COMMISSIONED
Hassi R'Mel • Solar (25) / thermal (125) hybrid
Mansouria • Hydro • 100
Darguina • Hydro • 71
Kabertene • Wind • 10
PIPELINE
Solar PV • 4,050 tender
Wind • 2,600
Solar CSP • 1,000
Meghaïr • Solar (70) / thermal (400) hybrid
Naâma • Solar/thermal hybrid • 220
Tunisia
Total renewable generation capacity, 2016: 300MW
(6% of total generation capacity)
Selected renewables projects (MW):
COMMISSIONED
Métline • Wind • 95
Kchabta • Wind • 94
Sidi Daoud • Wind • 57
Sidi Salem • Hydro • 20
PIPELINE
TuNur • Solar CSP • 2,250
Jebel Tbaga • Wind • 80
Akarit • Solar CSP • 50
Tozeur • Solar PV • 10
Government plans total 1GW of new RE by 2020
Libya
Total renewable generation capacity, 2016: 0MW
Selected renewables projects (MW):
PIPELINE
Al-Muqrun • Wind • 120
Al-Fatayeh (Darnah) • Wind • 120
Sabha I & II • Solar PV • 115
Green Mountain • Solar PV • 50
Egypt
Total renewable generation capacity, 2016: 3,558MW
(9% of total generation capacity)
Selected renewables projects (MW):
COMMISSIONED
Aswan High Dam • Hydro • 2,100
Zafarana • Wind • 545
Aswan I • Hydro • 280
Aswan II • Hydro • 270
El Zeit • Wind • 200
Kureimat • Solar (20) / thermal (120) hybrid
Isna • Hydro • 86
New Naga Hammadi • Hydro • 64
PIPELINE
El Dabaa • Nuclear • 4,800
El Negeila • Nuclear • 2,800
West Nile • Wind • 2,400
Ataka Mountain • Pumped storage • 2,100
Solar FiT programme • Solar PV • planned for 2,000*, of which: Benban • 1,800
El Zeit, Gulf of Suez • Wind • 1,020
West Nile • Solar PV • 800
Kom Ombo I & II • Solar PV • 220
New Asyut • Hydro • 32
Hurghada • Solar PV • 20
Off-grid solar PV • 10
* Programme closed after first two bid rounds, with a total of 1,515MW
Africa and Europe increasingly interlinked
Europe has promoted interconnection and generation schemes that could allow countries on the EU's southern flank to export energy produced from renewable sources. The Mediterranean Solar Plan Project Preparation Initiative (MSP-PPI) – launched by the European Commission (EC), European Investment Bank (EIB), KfW and the Union for the Mediterranean – aims to accelerate the implementation of renewable energy (RE), energy efficiency (EE) and grid connection projects in several partner countries. The EC, EIB and European Bank for Reconstruction and Development are among institutions providing financial and technical support for RE and EE projects.
Not all the plans to connect the electricity systems of North African and European states have been successful, in a challenging political and economic environment. One of the most ambitious schemes, the Desertec Industrial Initiative, collapsed in 2013. However, elements of the concept of using North Africa's vast solar potential to supply Europe with clean power still exist, while some experts are still promoting the concept of a 'supergrid' uniting the region's power systems.
EU initiatives include the Renewable Energy Co-operation Programme, launched in September 2010. Interconnections within Africa, and between Africa and Europe, are critical to the Africa-EU Energy Partnership.
Renewables and nuclear projects:
Commissioned
Pipeline
Hydroelectric (including pumped storage: PS)
Wind
Solar
Solar/thermal hybrid
Biomass
Nuclear
Western Sahara (under UN mandate)
National/multiple-site programmes are in italics
Sources: Africa-EU Energy Partnership; African Energy Atlas
ALGIERS
TUNIS
TRIPOLI
CAIRO
Alexandria
Giza
Benghazi
Nile
Red Sea
MEDITERRANEAN SEA
ALGERIA
TUNISIA
LIBYA
EGYPT
MOROCCO
RABAT
Casablanca
Marrakech
Fes
Oran
Constantine
Sfax
TANGIER
TETOUAN
OUJDA
LAAYOUNE
DAKHLA
AKHFENNIR
TAN-TAN
TARFAYA
EL AYOUN, FOUM
TISKRAD
AL-OUAD
BOUDOUR
TINDOUF
KOUDIA AL-BAIDA
HAOUMA
IHFASA
OUED EL MAKHAZINE
DAOURAT, IMFOUT, S.S. MÂACHOU
SAFI-ESSAOUIRA
JBEL LAHDID
AMOUGDOUL (CAP SIM)
ABDELMOUMEN PS
OUARZAZATE
MANSOUR ED DAHBI
1 MOHAMMED V
2 TAZA
3 AL-WAHDA
4 EL KANSERA
5 OUJET ES SOLTANE
6 ALLAL EL FASSI
7 MIDELT
8 TANAFNIT EL BORJ
9 IMEZDILFANE
10 AHMED EL HANSALI
11 BIN EL OUIDANE
12 HASSAN 1er
13 LALLA TAKERKOUST
14 AFOURER PS
15 AL-MASSIRA
16 OUALIDIA
KABERTENE
TAMANRASSET
SABHA
HOUN-JOUFRA
MISRATAH
TARHUNA
AL-MUQRUN
AL-FATAYEH (DARNAH)
GREEN MOUNTAIN
EL NEGEILA
EL DABAA
SIWA
KUREIMAT
ZAFARANA
ATAKA MOUNTAIN PS
EL ZEIT
GULF OF SUEZ
HURGHADA
WEST NILE
NEW ASYUT
NEW NAGA HAMMADI
ISNA
KOM OMBO
ASWAN HIGH
BENBAN
ASWAN I, II
SIDI DAOUD
MÉTLINE, KCHABTA
FERNANA
SIDI SALEM
NEBEUR
AKARIT
TOZEUR
TAJURA
TBAGA
TUNUR
EBEL
DJELFA
AÏN BÉNI MATHAR
EL BAYADH
MEGHAÏR
LAGHOUAT
NOOR-M
NAÂMA
HASSI R'MEL
GHARDAÏA
EL OUED
OUARGLA
HASSI MESSAOUD
DARGUINA, ERRAGUÈNE, IGHIL EMDA, MANSOURIA, M'LILI
AÏN OUSSERA
MSILA
KHENCHELA
SIDI DAOUD


West Africa Selected renewables projects (commissioned and pipeline, MW):
CÔTE D'IVOIRE
Louga • Hydro • 280
Soubre • Hydro • 275
Tiboto • Hydro • 225
Taabo • Hydro • 210
GHANA
Akosombo • Hydro • 1,020
Bui • Hydro • 400
Nzema • Solar PV • 155
GUINEA
Amaria • Hydro • 665
Souapiti • Hydro • 450
LIBERIA
Lofa-Mano • Hydro • 518
MALI
Manantali • Hydro • 205
MAURITANIA
Boulenoire • Wind • 100
NIGERIA
Mambilla • Hydro • 3,050
Makurdi • Hydro • 1,062
Lokoja • Hydro • 1,052
Kainji • Hydro • 760
SENEGAL
Taïba Ndiaye • Wind • 152
SIERRA LEONE
Bumbuna I & II • Hydro • 193
Port Loko • Biomass • 30
Sources: Africa-EU Energy Partnership; African Energy Atlas
East Africa Selected renewables projects (commissioned and pipeline, MW):
DJIBOUTI
Assal • Geothermal • 150
ETHIOPIA
Grand Ethiopian Renaissance Dam (GERD) • Hydro • 6,000
Koysha • Hydro • 2,200
Gilgel Gibe III & IV • Hydro • 3,870
Tams • Hydro • 1,700
Karadobi • Hydro • 1,600
Adama & Iteya • Wind • 754
Corbetti • Geothermal • 500
Tulu Moye • Geothermal • 500
Debre Berhan • Wind • 400
Scaling Solar PV at 2 sites • 250 total
Metehara • Solar PV • 100
KENYA
Olkaria • Geothermal • 1,264
Lake Turkana • Wind • 1,010
Barrier • Geothermal • 750
High Grand Falls I & II • Hydro • 700
Gitaru • Hydro • 225
MADAGASCAR
Befanova • Hydro • 700
Mahavola • Hydro • 600
Scaling Solar nr. Antananarivo • 25
RÉUNION
Wave power under development
SOUTH SUDAN
Shukoli • Hydro • 1,100
Fula • Hydro • 1,090
Lekki • Hydro • 609
Bedden • Hydro • 570
SUDAN
Merowe • Hydro • 1,250
Dal • Hydro • 450
Kajbar • Hydro 360
Roseires • Hydro • 280
Red Sea coast • Wind • 180
TANZANIA
Stiegler's Gorge • Hydro • 2,100
Singida • Wind • 475
Ikondo • Hydro • 340
Kidatu • Hydro • 204
Ngozi • Geothermal • 200
UGANDA
Ayago • Hydro • 840
Karuma • Hydro • 600
Oriang • Hydro • 395
Bujagali • Hydro • 250
CAPE VERDE 39 21%
Nouakchott
MAURITANIA 66 28%
Boulenoire
SENEGAL 34 3%
Taïba Ndiaye
THE GAMBIA 0.2 0.2%
Niakhar
Sambangalou
GUINEA-BISSAU 0
GUINEA 368 60%
Bumbuna
Port Loko
SIERRA LEONE 56 39%
LIBERIA 27 23%
Mano
Buyo
MALI 318 56%
Gouina
Manantali
Bamako
Selingue
Kandadji
Mana
Noumbiel
BURKINA FOSO 33 12%
Gambou
BENIN 0.5 0.2%
Kainji
Bui
Lofa-
CÔTE D'IVOIRE 652 33%
TOGO 67 26%
Kétou
Nangbeto
Lokoja
Ada
GHANA 1,618 38%
Ikom
NIGER 4 2%
Shiroro
Maraban Pushit
Makurdi
Mambilla
NIGERIA 1,999 13%
CAMEROON 762 36%
Dimoli
Mbalmayo
Chollet
Sendjé
EQUAT. GUINEA 127 43%
S.TOMÉ & PRÍNCIPE 3 9%
Booué
GABON 325 48%
Grand Poubara
REP. OF CONGO (BRAZZAVILLE) 212 34%
Sounda Gorge
Zongo
Inga
CHAD 0
Djermaya
CENTRAL AFRICAN REPUBLIC 24 88%
Bedden, Fula, Lekki, Shukoli
SOUTH SUDAN 0
Baro
Tams
Koysha
Gilgel Gibe
SUDAN 1,644 48%
Dal
Kajbar
Dongola
Merowe
Mograt
Red Sea coast
Dagash
Sabaloka
Upper Atbara & Setit
Bisha
ERITREA 7 4%
Tekeze
Assalaya, Kenana
Humera
Mekele
DJIBOUTI 0
Roseires
GERD
Tana-Beles
Aysha
Adama, Iteya
ETHIOPIA 4,701 96%
SOMALIA 4 63%
Genale
UGANDA 799 86%
Mubuku
Nyabarongo
RWANDA 89 50%
Ruzizi
Rusumo Falls
BURUNDI 38 83%
Kabulantwa
Singida
Lake Turkana
Tana River
KENYA 1,545 62%
DEMOCRATIC REPUBLIC OF CONGO 2,611 97%
TANZANIA 638 36%
Kidatu
Ngozi
Stiegler's Gorge
Ikondo
Rumakali
Kawambwa
Nseke
Mambilima
Mumbotuta
Pensulo
ZAMBIA 2,395 85%
Cahora Bassa
Kapichira
Mpatamanga
Mphanda Nkuwa
Mocuba
Lupata
MOZAMBIQUE 2,172 74%
Kafue Gorge
Batoka Gorge, Devil's Gorge
Kariba
Munyati
Victoria Falls
ZIMBABWE 867 40%
Bulawayo
Gwanda
Beitbridge
MALAWI 370 97%
Metoro
Mayotte (Fr.)
COMOROS 0.7 3%
SEYCHELLES 6 7%
Betsiboka River
Ikopa R.
Scaling Solar
Mania River
MADAGASCAR 122 36%
Befanova
MAURITIUS 132 16%
Réunion (Fr.)
ANGOLA 1,824 57%
Cambambe
Caculo Cabaça, Zenzo
Cafula
Lauça
Capanda
Dombe Grande
Cacula
Baynes
Ruacana
NAMIBIA 370 71%
Arandis
BOTSWANA 0
Jwaneng
Ngodwana
Xinavane
SWAZILAND 102 100%
Sugar mills
Lüderitz
Upington & Karashoek area
Kathu area
Pofadder area
Kotulo Tsatsi
Prieska area
De Aar area
Muela
Kobong PS
LESOTHO 72 100%
Gariep
SOUTH AFRICA 6,456 12%
Saldanha area
Koeberg
Palmiet PS
Cookhouse area
Port Elizabeth area
Thyspunt
A Tulu Moye
B Metehara
C Debre-Berhan
D Karadobi
E Halele-Werabesa
F Corbetti
1 Kaléta
2 Grand Kinkon
3 Koukoutamba
4 Souapiti
5 Amaria
6 Tiboto
7 Soubré
8 Louga
8 S Bananda
9 Taabo
10 Aboisso
11 Nzema
12 Akosombo
13 Jebba
14 Zungeru
15 Mts Bamboutos
16 Noun-Wouri
17 Gd. Eweng, Song Mbengué
18 Edéa, Song Loulou
1 Turkwel
2 Barrier
3 Menengai
4 Olkaria
5 Eldoret
6 Mumias Sugar
7 Kakira Sugar
8 Bujagali, Kiira, Nalubaale
9 Ayago, Karuma, Kiba, Oriang
Central Africa Selected renewables projects (commissioned and pipeline, MW):
CAMEROON
Noun-Wouri • Hydro • 2,500; Grand Eweng • Hydro • 1,200
Song Mbengué • Hydro • 1,000
DEMOCRATIC REPUBLIC OF CONGO
Grand Inga (excl. Inga III) • Hydro • 34,280; Inga III • Hydro • 7,800
Inga I & II • Hydro • 1,775; Ruzizi I-IV • Hydro • 508
DEMOCRATIC REPUBLIC OF CONGO/ZAMBIA
Mambilima • Hydro • 700; Mumbotuta • Hydro • 490
REPUBLIC OF CONGO (BRAZZAVILLE)
Sounda Gorge • Hydro • 1,000; Chollet • Hydro • 600
GABON
Booué • Hydro • 410
Southern Africa Selected renewables and nuclear projects (commissioned and pipeline, MW):
ANGOLA
Lauça • Hydro • 1,700
Caculo Cabaça • Hydro • 2,171
Cambambe I & II • Hydro • 960
Zenzo I & II • Hydro • 570
Capanda • Hydro • 520
Dombe Grande • Solar PV • 100
ANGOLA/NAMIBIA
Baynes • Hydro • 612
BOTSWANA
Jwaneng • Solar CSP • 100
LESOTHO
Kobong • Pumped storage • 1,200
Muela • Hydro • 182
MALAWI
Mpatamanga • Hydro • 300
Kapichira I-III • Hydro • 180
MOZAMBIQUE
Cahora Bassa • Hydro • 2,075
Mphanda Nkuwa • Hydro • 1,500
Cahora Bassa Norte • Hydro • 1,245
Lupata • Hydro • 600
Metoro • Solar PV • 41
Mocuba • Solar PV • 30
NAMIBIA
Ruacana • Hydro • 347
SOUTH AFRICA
REIPPP (Renewable Energy Independent Power Producer Procurement) Programme, Rounds 1-4 • Various • 6,400
Koeberg • Nuclear • 1,800
Thyspunt • Nuclear • up to 1,600
Ingula • Pumped storage • 1,332
Drakensberg • Pumped stor. • 1,000
Palmiet • Pumped storage • 400
ZAMBIA
Kariba North Bank • Hydro • 1,080
Upper Kafue Gorge • Hydro • 990
Lower Kafue Gorge • Hydro • 750
Devil's Gorge • Hydro • 620
Pensulo • Wind • 140
ZAMBIA/ZIMBABWE
Batoka Gorge • Hydro • 2,400
ZIMBABWE
Gwanda • Solar CSP & PV • 250
Beitbridge • Solar PV • 175
Kariba South Bank • Hydro • 1,050
A Ingula PS
B Drakensberg PS
C Merapi
D Vanderkloof
00 Total renewable generation capacity, 2016 (MW)
00% As percentage of total generation capacity
Major renewables and nuclear projects:
Commissioned
Pipeline
Hydroelectric (including pumped storage: PS)
Wind
Solar
Geothermal
Biomass
Nuclear
Ocean power

# Hydroelectric power




**Almost 7GW of HEP capacity has been added to the grid Since 2010 and The 2018-20 project pipeline points to over 40GW serving the grid by 2020.**

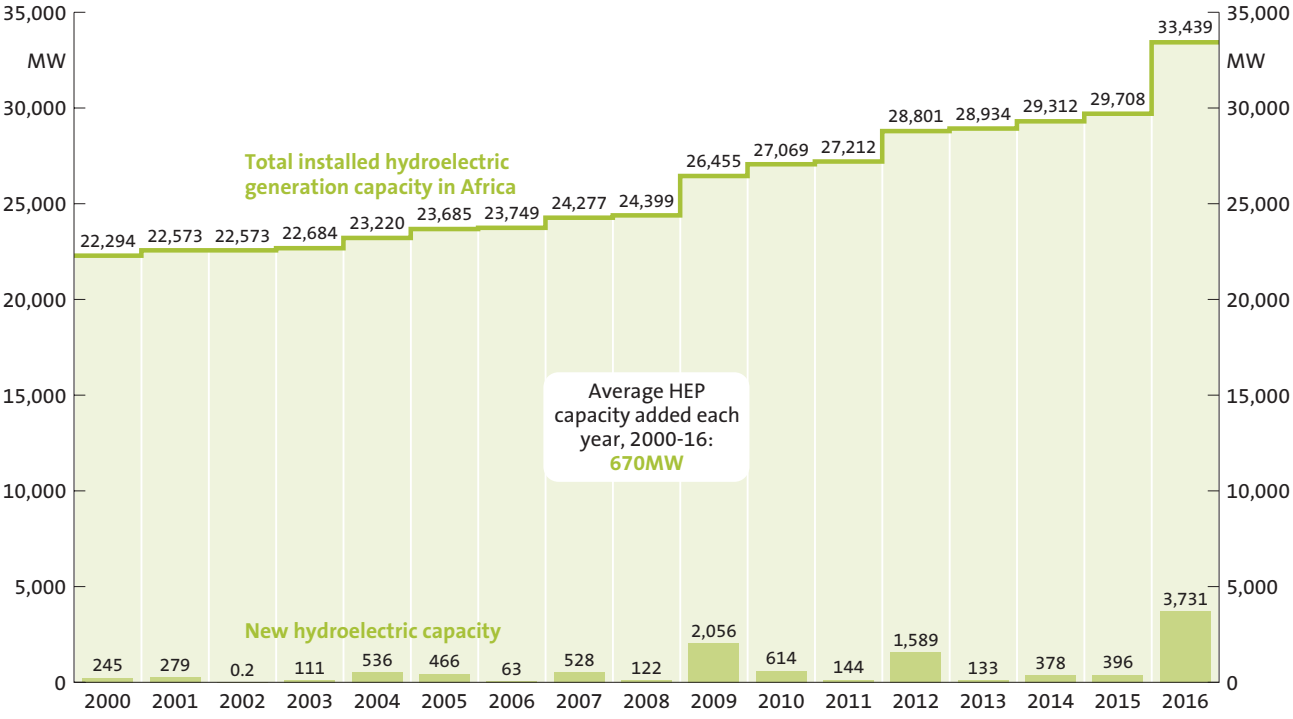
Hydroelectric power (HEP) holds a key to providing clean, sustainable, baseload energy when it is produced from the continent's abundant hydrological basins, in Democratic Republic of Congo (DRC), Ethiopia and several other 'water towers'. However, HEP resources are not immune from the impact of climate change and complex weather patterns such as El Niño, which can lead to disastrous water shortages in some regions that leave traditionally reliable dams barely able to generate electricity.

Integration with increasingly cheap alternative renewable electricity generation resources holds the potential to revolutionise the use of HEP dams, where utilities can apply intermittent solar and wind to better manage dam levels, maximising output and reducing losses during dry seasons. Interconnections, such as the planned link between Ethiopia and Kenya, should allow the cross-border exchange of renewable power to better manage resources.

AEEP data show HEP remains the dominant RE technology operating on the continent, with capacity to generate large volumes of energy. It will remain so for the foreseeable future, given the pipeline of projects being developed in the period to 2020 and beyond. Having turned away from large HEP projects in the previous decade, due to concerns about environmental and social impacts, many official financing sources are looking to become involved in the sector again, albeit with a more robust system of safeguards in place.

Substantial progress was made in 2016 towards the AEEP's goal of increasing hydroelectric capacity by 10GW in the decade to 2020, with 3,731MW added to the grid. This means that since 2010, 6,984MW have been added to the grid and there is a substantial pipeline of projects expected to come into operation in 2018-20.

**Hydroelectric power generation capacity, 2000-16**




Source: Africa-EU Energy Partnership

The largest HEP capacity increases since 2010 have come in Southern Africa (with 2,884MW more in service as this report went to press) and East Africa (2,400MW). Ethiopia has been – and is likely to continue to be – the biggest contributor of new HEP capacity. In Ethiopia, the 1,870MW Gilgel Gibe III dam began operating in 2016 and several more HEP units are under construction and expected online before 2020. Work is also well under way at the Grand Ethiopian Renaissance Dam, which will be by some way the largest hydroelectric facility in Africa and where one or more units could begin operating by 2020, depending on negotiations with downstream nations Egypt and Sudan, who have expressed serious concerns about water flows.

Progress in two more regions with highly promising hydrology, Central and West Africa, remains disappointing. Central Africa has added only 323MW of HEP since 2010, while West Africa has managed only 723MW. However, there is an accelerating pipeline of HEP dams in Nigeria, Sierra Leone and some other West African countries.

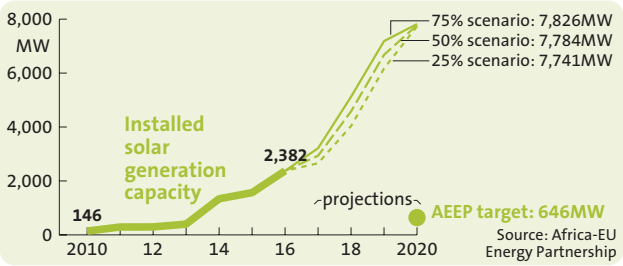
**Incremental progress is being made towards better utilisation of smaller hydro opportunities.** Technological efforts are under way to standardise hydroelectric equipment to facilitate mass production and to help the sector to benefit from falling costs.

Considerable progress has been made in several countries, including Rwanda and Uganda, supported by European instruments such as German development bank KfW's Global Energy Transfer Feed-in Tariffs (GET-FiT) scheme, which will soon begin in Zambia.

However, it will be some time until all these investments are realised and smaller opportunities are often going under the radar.

Some progress is being made in the DRC, despite the slow pace of progress on the mega-scheme to develop up to 50GW of HEP potential at Inga Falls on the Congo River. Looking to smaller schemes, at least eight plants with combined capacity of 420MW are now being rehabilitated in DRC, and there is substantial potential to be tapped, with more than 50 projects of between 1MW and 50MW identified for development.

# Solar




**From only 146MW installed in 2010, solar capacity reached 2.4GMW at end-2016 and a total of more than 7.7GW will be installed by 2020.**

Solar power has long been expected to make a major contribution to improving levels of energy access and energy security in Africa. It also offers the prospect of supplying electricity generated in regions with some of the world's strongest irradiation levels to Europe. Ground-breaking projects in Morocco and South Africa have encouraged utility scale solar projects elsewhere.

The AEEP's analysis of the continent's generation project pipeline shows that, in the last two years (since the 2016 *Status Report Update*), projects to develop utility-scale photovoltaic (PV) and concentrated solar power (CSP) capacity have become more prevalent in less developed markets on the continent.

The decrease in cost to the point where solar plants can compete with diesel and other thermal technologies – and in some cases even with coal, whose advocates often argue is a much cheaper (if more polluting) fuel – has brought solar technologies to the forefront of the African industry.

Utility-scale solar parks, such as the Moroccan Agency for Sustainable Energy (Masen)'s 525MW facility blending CSP and PV units at Ouarzazate, have proven to be an effective way of expanding generation in a short timeframe. Large solar projects to date have not suffered the delays and cost overruns characteristic of some other technologies. CSP can now, in some circumstances, deliver power around the clock, enabling generators to help meet peak demand.

Developments in battery and hybrid technology means that solar-based plants are being used increasingly for off-grid baseload power by large consumers such as mines.

Solar development was for the first half of the decade largely restricted to major markets such as Morocco and South Africa. Egypt is now expected to deliver a large amount of capacity over the next few years and other new markets are emerging.

The AEEP's soundings of commercial stakeholders suggest West Africa is attracting considerable attention from developers and financiers. The region is lining up a pipeline of projects able to deliver more than 1,139MW of solar capacity by 2020. However, there is potential for a lot more: Nigeria, Ghana and Senegal are all increasing solar generation by independent power producers (IPPs). Smaller markets such as Burkina Faso now have significant procurement programmes.

East Africa has moved more slowly, but developments in Ethiopia, Madagascar, Rwanda and Uganda mean the region can hope to have more than 500MW solar capacity by 2020. The World Bank-supported Scaling Solar programme in Ethiopia and recent tenders from national utility Ethiopian Electric Power for solar PV plants have generated considerable developer interest.

Southern Africa has the largest pipeline and by 2020 could generate as much as 3.6GW from solar. This depends on the REIPPP programme's fourth round going ahead in South Africa, after projects to add nearly 900MW stalled in 2016-17. Some 65MW of PV projects are coming online in Namibia's Interim REFiT programme. Big procurements are under way in Zambia (Scaling Solar) and Botswana, while Mozambique is attracting international developers with two utility-scale projects.

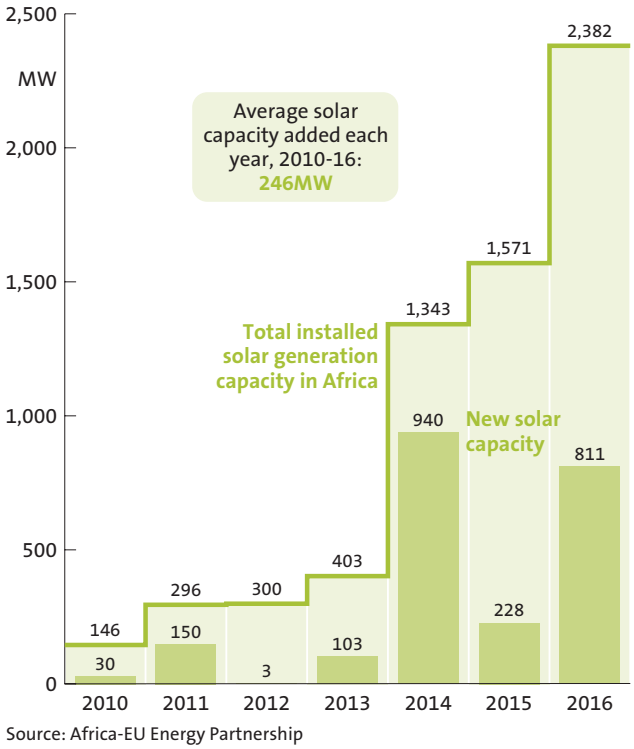
## Solar solutions are booming off grid

Alongside the increase in utility-scale projects has been an explosion of growth in the solar home systems, commercial rooftop installations and solar products. While difficult to quantify as the industry is far from mature, the success and proliferation of installers and the increasingly serious money being raised to support new businesses are a testament to the sector's potential – both to bring energy to isolated and marginalised communities, but also to create jobs in a new domestic solar services industry.

Solar lamps, USB chargers and other products are having a transformative impact on households previously reliant on kerosene lamps and long walks to mobile phone charging stations.

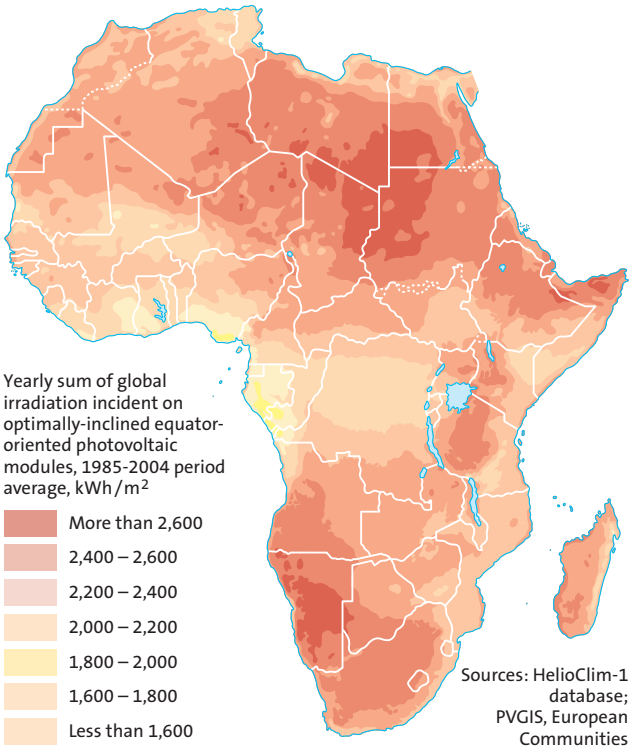
While far less developed, the market for micro-grids is also opening up, with NGO and donor-led pilot projects building experience and developing best practices. Many countries are working to put in place regulatory and financial structures to develop a commercial model for solar powered mini- and micro-grids.

### Solar generation capacity, 2010-16



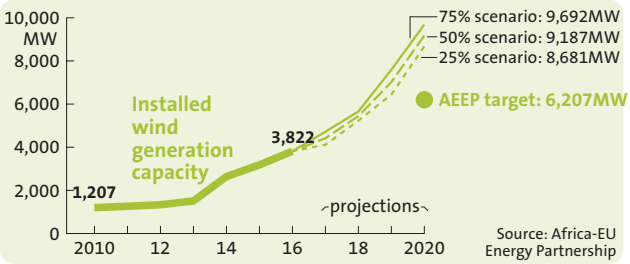

Source: Africa-EU Energy Partnership

### Photovoltaic solar electricity potential




Sources: HelioClim-1 database; PVGIS, European Communities

# Wind




**A 2010 baseline of 1.2GW of installed wind power capacity had risen to 3,822MW as of end-2016 and over 9GW is expected by 2020 (Target 5GW).**

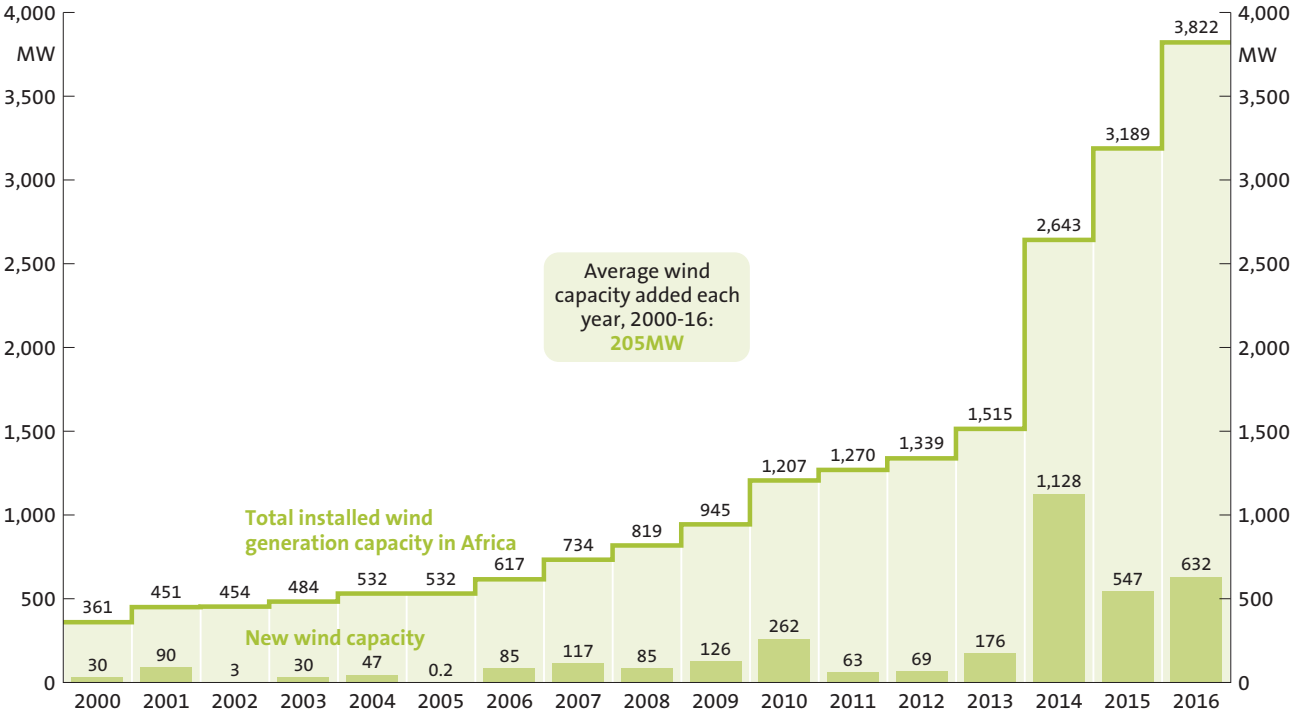
To date, major wind power projects have been largely restricted to the industrialised countries of North Africa and South Africa. The industry suffers logistical constraints – for example, a lack of large cranes and poor access roads – while also being heavily impacted by disputes over land rights and compensation. But it can drive industrial development, as shown by turbine manufacturing in Morocco and plants in South Africa.

Wind power remains largely restricted to major markets, with a limited pipeline of projects in West Africa. The East African market has seen considerable impetus. There are projects in Ethiopia and Tanzania, where the Singida wind scheme has attracted attention but has been slow to move forwards.

Kenya offered early promise, but has struggled to live up to expectations. The 102MW Kipeto project has been delayed, along with other renewable IPPs after the Kinangop wind project stalled. Most headlines have been generated by the 310MW Lake Turkana Wind Project, which has now been built but cannot provide power to the grid until a transmission line is connected.

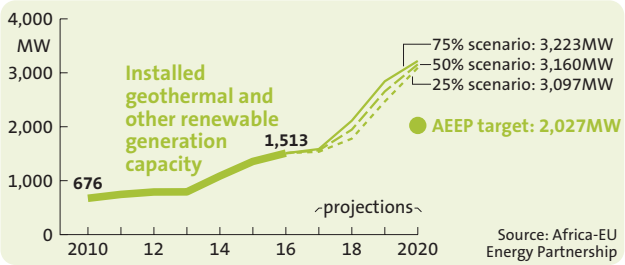
Egypt has some of the world's best wind resources. While some programmes have slowed as the Egyptian government has readjusted its price expectations, 750MW of wind power is already operating and more than 380MW is under construction; 1,220MW is expected online in Egypt by 2020, by which time the total North African project pipeline could deliver nearly 4.5GW of wind.

**Wind generation capacity, 2000-16**




Source: Africa-EU Energy Partnership

# Other renewables




The AEEP's 'other renewables' category includes biomass and geothermal resources, both of which can provide reliable baseload power at low prices to supply the grid 24 hours a day. This is especially relevant in the East African Rift Valley, whose huge geothermal resources make it the continent's most promising region for harnessing energy from the earth's core. The focus to date has been the Olkaria complex in Kenya, which has been exploited on a large scale. Exploration has been conducted elsewhere in Kenya, where commercial-scale resources are still sought.

Despite delays to some high-profile schemes, a serious push is under way to develop geothermal power in Ethiopia – where work is expected to start on the Corbetti scheme at Aluto Langano in 2018 – and Djibouti. Eritrea has very substantial geothermal resources, but has yet to put in place the structures needed to attract substantial private investment. Geothermal power could also encourage cross-border energy trading: once completed, the Ethiopia-Kenya interconnection could trade Kenyan geothermal baseload peak hydropower from Ethiopia.

The Geothermal Risk Mitigation Facility (GRMF), established by the African Union Commission, the German government and EU-Africa Infrastructure Trust Fund, with technical support from German development bank KfW, has played an important role in encouraging public and private investors. Having made available an initial €50m to provide grants for surface studies and the drilling of reservoir confirmation wells, other partners have come in to support the GRMF – which has so far awarded around $90m in grants for 26 projects in Comoros, Djibouti, Ethiopia, Kenya, Rwanda and Tanzania. More will follow, as a fifth GRMF application round was launched in October 2017.

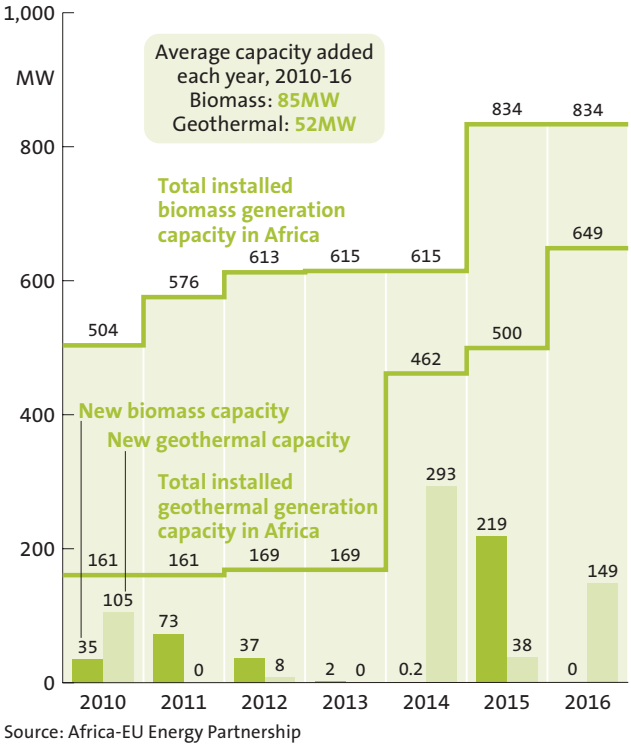
Elsewhere,a privately-led and -financed initiative has made notable progress in Zambia; there is some renewed interest in Uganda; and early work at Mount Khartala in Comoros has been promising.

Biomass fuelled by agricultural waste, especially bagasse from sugar plantations, can be used to power remote areas and stabilise the grid, as in Mauritius.

The growth of 'other renewable' technologies has picked up substantially since a slow start from the AEEP's 2010 baseline. This growth primarily comes from geothermal and biomass developments, but hybrid projects which blend renewable technologies to overcome problems of intermittency and even more innovative schemes – for example harnessing ocean technology – can also play a role. Mixed renewable and non-renewable hybrid plants are not included in the AEEP's figures but are increasing prevalent, especially those mixing solar PV and diesel, and biomass and coal.

AEEP data show that 2,027MW are needed to meet the target of trebling the capacity from 'other renewables' in the decade to 2020. Growth in the pipeline of biomass project and continued development at the Olkaria geothermal resource mean this target can be met with existing projects. Olkaria remains the largest geothermal development in the period to 2020, but another 70MW may come at Aluto Langano in Ethiopia and developers in Zambia are optimistic they might add 10MW in 2020.

**Biomass and geothermal generation capacity, 2010-16**




Source: Africa-EU Energy Partnership

# Energy Efficiency

Energy efficiency (EE) is one key pillar for a clean and sustainable energy future. It combines economic, environmental and social benefits as it enables enhanced value creation per unit of energy used, reduced carbon emissions, improved competitiveness of different sectors and affordability to end consumers. Saving energy is usually cheaper than producing additional energy.

Globally, in recent years mandatory EE policies have increased considerably, but for Africa there is still large potential for the introduction and proper implementation of standards and other mandatory policies. Over the past four years the Global Tracking Framework (GTF) – whose Steering Group is led jointly by the World Bank Esmap (*see note on page 45*) and the International Energy Agency – has shown that a reduction of energy intensity by a compound annual growth rate (CAGR) of 5%-10% per year is feasible for short periods, especially for countries starting off with a high level of energy intensity .

Efficiency is difficult to quantify. It manifests itself in different ways – in better appliances, new industrial processes, changes in economic structure and an effective electricity supply industry. Initiatives to improve EE can take many forms, from improved insulation to regulations. As a result, there are a number of different ways to measure EE, each of which has deficiencies.

On the demand side, energy intensity data (measured as total primary or final energy supply per GDP at purchase power parity) as an aggregated proxy for energy efficiency is relatively easy to retrieve, but difficult to interpret.

Sectoral energy intensity, as shown in the table on page 38, carries somewhat more informational value and allows an initial assessment of trends in energy consumption and comparisons across countries.  However, it is mostly not as widely available as energy intensity, especially for time series.

More disaggregated indicators, such as sub-sectoral or end-use indicators in the residential, services, industry or transport sectors, would allow a more insightful and detailed analysis but are rarely available. The same is true for process or appliance indicators which capture information at the unit energy consumption level.

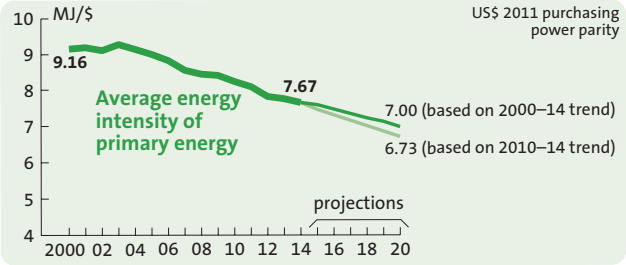
Previous AEEP *Status Reports* have observed that energy intensity is only an imperfect proxy for EE as it potentially reflects a wide range of determining factors, such as climate (heating and cooling needs), economic structure, the size of a country (transport needs), the exchange rate, electrification rate or the extent of biomass usage. It reflects national economic performance fluctuations at least as much as any changes in EE. Therefore, a low level of energy intensity does not necessarily mean high efficiency – but it remains the most widespread indicator.

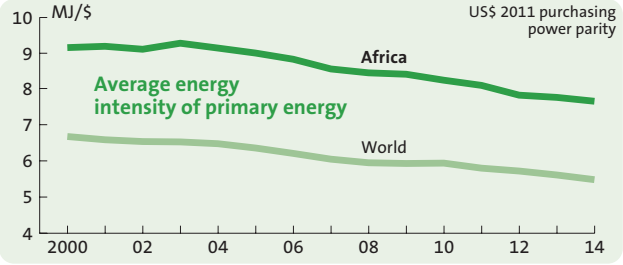
On the supply side, network losses are a measure of an efficient electricity sector in good condition. Low transmission and distribution (T&D) losses translate directly into reduced generation needs, while at the same time improving the quality of supply by increasing the availability of power and stability of the grid.

For Africa, EE developments in the industrial and agricultural sectors will likely stay a focus alongside large national energy consumers, for whom energy intensity has recently increased again, such as South Africa. For transport no data was available, but better data would make an important contribution when looking at global trends. According to the GTF's 2017 report, light-duty vehicles are the most energy intense transport mode, (accounting for 64% of passenger energy consumption), followed by aviation. On the supply side, efficiency improvements in thermal power generation and electricity networks remain a challenge.

This report – for reasons of data availability and comparability with SEforALL targets – uses primary energy supply per GDP at PPP as the main indicator. Data is drawn from the SEforALL *Global Tracking Framework 2017*.

# Energy intensity




Data taken from the SEforALL Global Tracking Framework 2017 focuses on primary energy intensity and is available up to 2014. For reasons of data availability and in order to align with the Global Tracking Framework, the AEEP *Status Report 2017-18* relies on this indicator instead of the previously used final energy intensity. The data indicates a decrease in average primary energy intensity for the African continent of 16% (or an average 1.3% per year) from 9.2 MJ/$ measured at 2011 purchasing power parity to 7.7 MJ/$ PPP between 2000 and 2014 (*see map on page 40 for those countries for which data was available*.)

This overall improvement seems to have slowed down to some extent in 2013 and 2014, with a CAGR of -1.1% compared to -2.6% for the period from 2010-2012. Until recently, a CAGR of -2.6% was the reference point for global primary energy intensity improvements within the framework of SEforALL and its objectives to 2030. It has now been corrected to -2.8% for the period 2014-30 to reflect the recent global underperformance in energy intensity improvements (global CAGR of only -2.1% in 2012-14). Taking -2.8% as guidance for Africa translates into a target value of 5.2 MJ/$ PPP by 2020 and shows a significant need for improvement, especially when compared to projections based on recent trends which forecast a much higher value for 2020, of 6.7-7 MJ/$ PPP.

From a regional perspective, primary energy intensity has been steadily decreasing in the period 2000-14 in West, East and Southern Africa. North and Central Africa have seen increases since 2012 that have become more pronounced towards the year 2014.

Average energy intensity per sector has decreased for all sectors, except for agriculture, in the 2000-2014 period. While the industrial sector seems to have been a main contributor to efficiency gains by 2012, the sector trend has been reversed for 2012-14. Energy consumption in industry largely hinges on changes in industrial processes and the degree of capacity utilisation. But, from a purely statistical viewpoint, a lower industrial value-added could result in an increase in the overall energy intensity figure. Unfortunately, transport efficiency data are not available.

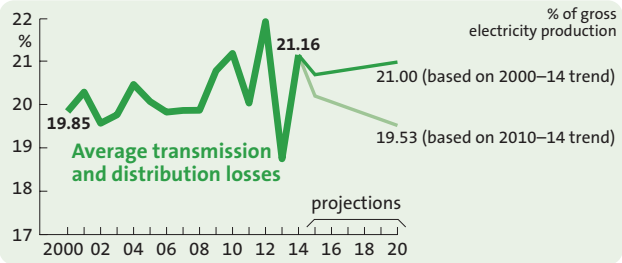
Overall, energy demand will continue to rise due to increased electrification and new end-users. Globally, electricity consumption per household remained nearly unchanged over the past 15 years despite the advances in EE, as energy savings – for example from using more efficient white goods and lamps – have been nearly set off by the rise of communication and computer devices.

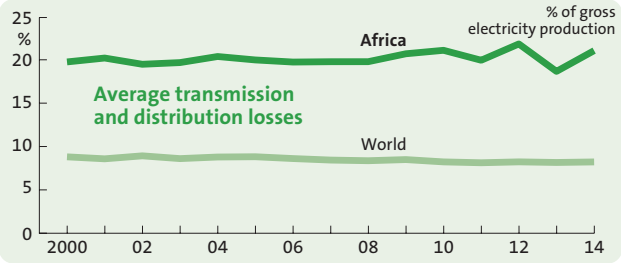
**Energy intensity projections**

| Energy intensity by sector | Energy intensity | | | | CAGR 2000-12 | CAGR 2000-14 | CAGR 2010-12 | CAGR 2010-14 | CAGR 2012-14 | Country coverage |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2010 | 2012 | 2014 | | | | | | |
| **Industry*** | 3.4 | 3.5 | 3.2 | 3.3 | -0.4% | -0.2% | -3.7% | -1.6% | 0.7% | 43 |
| **Residential (GJ/Population)** | 8.2 | 7.8 | 7.8 | 7.7 | -0.5% | -0.5% | 0% | -0.2% | -0.3% | 53 |
| **Services *** | 0.44 | 0.42 | 0.39 | 0.39 | -0.9% | -0.8% | -2.8% | -1.7% | -0.6% | 37 |
| **Agriculture*** | 1.0 | 2.9 | 3.0 | 3.2 | 9.4% | 8.6% | 1.0% | 2.3% | 3.7% | 25 |

* MJ/$ at 2011 purchasing power parity. **Source: World Bank - ESMAP Global Tracking Framework 2017, own calculations**

# Network losses




Supply-side energy efficiency improvements can be driven by various factors such as a shift in the energy mix, improved efficiency of generation technologies, combined heat and power, and reduced transmission and distribution (T&D) losses.

Global thermal efficiency of fossil-fuel based power generation has decreased by only 3.6% since 1990, which is mainly due to very limited efficiency improvements of coal-fired power plants. Natural gas performed better, delivering an efficiency improvement of about 8% globally over the same period, which is largely a result of the increased installation of combined-cycle technologies. A shift from thermal power to non-thermal renewables would be one way of raising primary EE considerably.

T&D losses are stated as a percentage of gross electricity production in *Status Report 2017-18* – which also leads to some differences in analysis from previous reports. For the AEEP *Status Report Update 2016*, T&D losses were stated as per total electricity output. Generally, T&D losses vary quite widely across Africa with an (unweighted) average of 21.2% (*see map on page 40 for those countries for which data was available*).

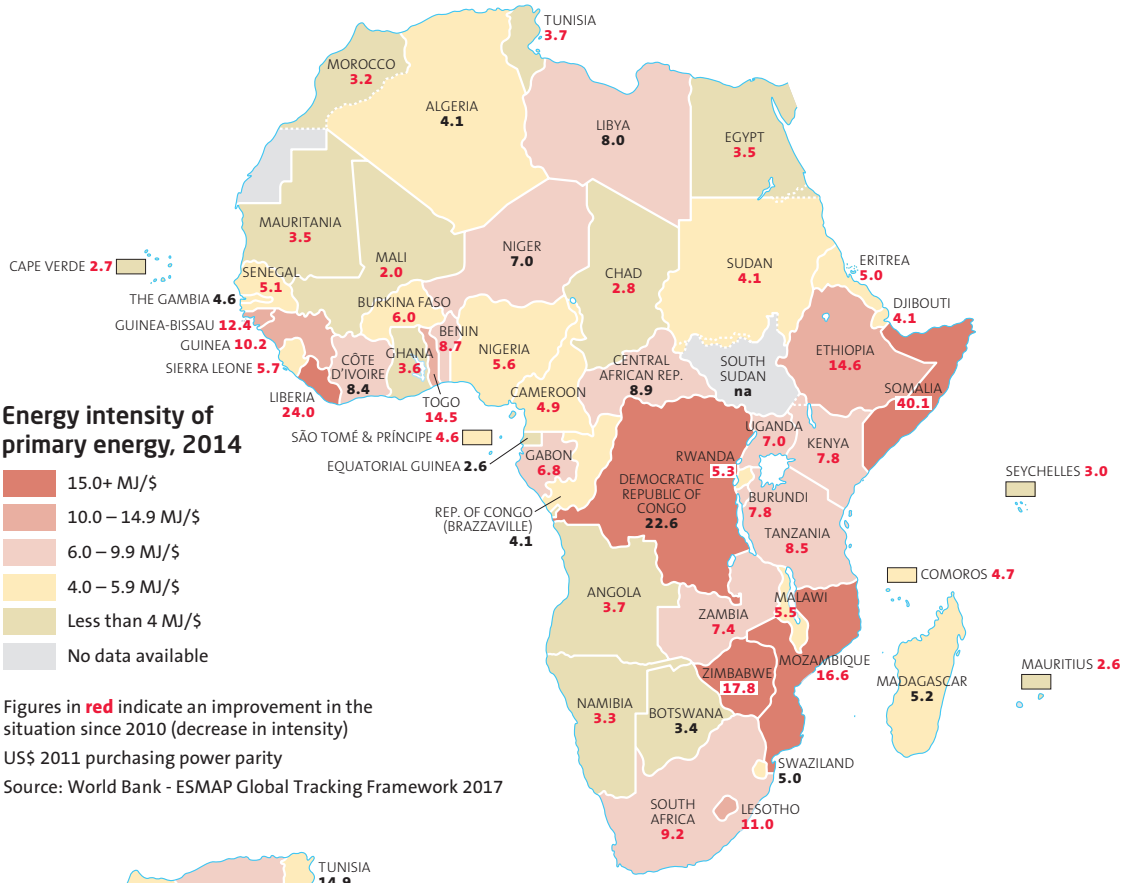
In 2014, the smallest losses occurred in Mauritius (6.2%), South Africa (8.4%) and Cameroon (9.8%); these numbers compare quite well to the global average of 8.3% or the high-income country benchmark of 7%. The average for low income countries stood at 15.8% in 2014. The average African losses were 21.2% in 2014, the GTF reports.

Despite considerable inter-year, in-country fluctuations, this represent virtually no change since 2010 and an increase of 1.3 percentage points since 2000. Despite some doubts about overall data validity, this result means that action needs to be taken – either on technical or non-technical aspects of these losses – to remedy the situation and improve upon the currently very bleak forecast to 2020 (and beyond).

**Improved or repaired grid infrastructure, enhanced grid operation and measures to avoid commercial losses can contribute to fewer T&D losses by bringing power generation closer to loads, where possible. An increased share of distributed generation is an important emerging option to improve the situation.**

As in 2012, East Africa performed best in terms of average T&D losses of 14.6% – its all-time low since the year 2000 – followed by Southern Africa which managed to reduce losses by 4.4 percentage points from 20.5% in 2012 to 16.1% in 2014. West Africa managed to slightly improve its performance, albeit from the highest level in the regions in 2012. North Africa and Central Africa's situation deteriorated between 2012 and 2014 by 2.2 percentage points and 4.9 percentage points, respectively. Democratic Republic of Congo losses spiked at 21.5% compared to a low of 5.7% in the years before. Botswana, Togo, and Côte d'Ivoire saw the highest improvements in 2012-14 of 45.1 percentage points, 10.3 percentage points and 5.1 percentage points, respectively. Libya's and Namibia's grid performance deteriorated by about 10 percentage points each.

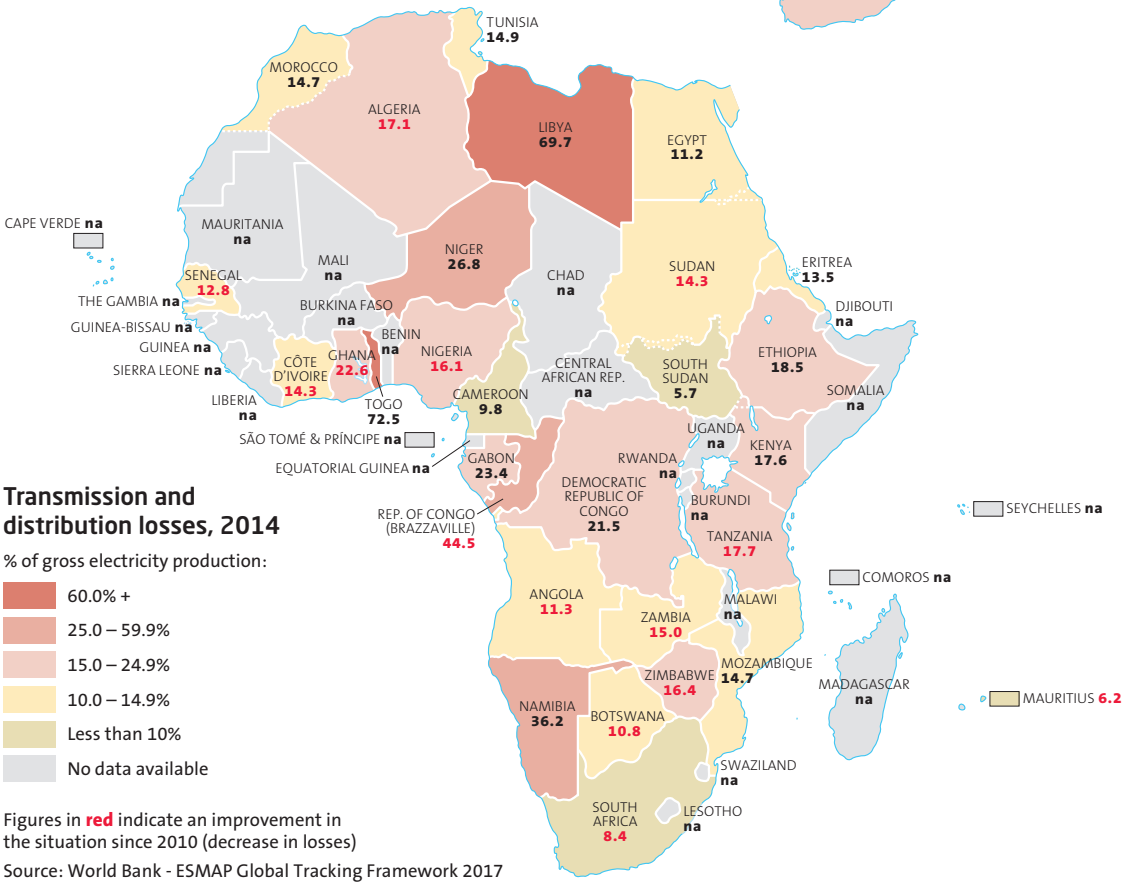
| Average network losses (%) | | | | | | |
|---|---|---|---|---|---|---|
| | North Africa | West Africa | East Africa | Central Africa | Southern Africa | Southern Africa (minus RSA) |
| 2000 | 14.4 | 28.1 | 16.1 | 32.5 | 12.7 | 13.5 |
| 2010 | 17.7 | 24.9 | 15.0 | 23.4 | 24.6 | 27.1 |
| 2012 | 23.3 | 28.8 | 17.0 | 19.9 | 20.5 | 22.5 |
| 2014 | 25.5 | 27.5 | 14.6 | 24.8 | 16.1 | 17.4 |




Figures in **red** indicate an improvement in the situation since 2010 (decrease in intensity)

US$ 2011 purchasing power parity

Source: World Bank - ESMAP Global Tracking Framework 2017




Figures in **red** indicate an improvement in the situation since 2010 (decrease in losses)

Source: World Bank - ESMAP Global Tracking Framework 2017

# Harmonising African Energy Initiatives

## Rationalising an overload of initiatives

The monitoring of targets that measure progress in increasing levels of energy access, energy efficiency and energy security have been a central feature of the AEEP since its inception.

Following the AEEP's creation in 2007, the 2020 Political Targets were agreed that have served as a benchmark in the decade since. The Partnership's 2010 Vienna Declaration set out targets and emphasised the need for "Africa and the EU [to] strengthen dialogue at multiple levels on energy issues of mutual interest, including research institutions, the private sector and civil society. The above-mentioned targets will be reviewed and updated periodically in the light of new political developments and joint agreements."

The means by which those targets could be reviewed and updated periodically was the subject of work by the AEEP Secretariat, which from the start sought to give the political declarations a robust empirical underpinning.

A decade ago, the extent and accuracy of energy data across Africa and its partners was considerably more limited than now. For much of the decade since Lisbon, the Partnership has played a significant role in improving that situation, while always accepting that much remains to be done and that the AEEP cannot operate in isolation from others active in the sector. This has helped to shape the approach of global initiatives like the United Nations-led Sustainable Energy for All (SEforALL), which have understood the need to collect and collate more accurate data to inform the campaign to end energy poverty.

The number of initiatives seeking to support improved levels of energy access, efficiency and security in Africa have mushroomed in the past decade. This was clearly identified in the AEEP and SEforALL Africa Hub's *Mapping of Energy Initiatives and Programs in Africa* project, whose first report was published in May 2016 and whose work continues.

One of its main conclusions was that "the energy sector in Africa is the target of a large variety of multi-country, multi-stakeholder initiatives and programmes, corresponding to the substantial increase in ODA that the sector has seen over the past years. Stakeholders agree that the increasing number of initiatives and programmes brings with it the need for more systematic exchange of information and knowledge-sharing and increased coordination to enable synergies and to avoid unnecessary duplication of efforts."

While datasets consulted for *Status Report 2017-18* remain far from perfect, programmes such as SEforALL and its Global Tracking Framework (GTF) – whose Steering Group is led jointly by the World Bank Group-administered Energy Sector Management Assistance Programme (Esmap) and International Energy Agency – offer the prospect of very substantial improvements in data collection across the continent in the next decade.

There is thus considerable potential for the AEEP to align with SEforALL and other initiatives – among which the most important include the 2015 Sustainable Development

| Frequency of the AEEP 2020 Political Targets and other goals in 83 mapped initiatives | |
|---|---|
| **Sector** | **Number** |
| Energy Access | 50 |
| Renewable capacity | 40 |
| Energy Efficiency | 26 |
| Reduce Emissions | 12 |
| Cross-border Interconnection | 11 |
| Natural Gas use and export | 6 |

Source: *The Harmonisation of African Energy Targets*, AEEP Research Paper, October 2017

Goals (SDGs) and initiatives that emerged from the 2015 Paris COP21 climate agreement, most notably the Africa Renewable Energy Initiative (AREI – *see page 63*).

## Making the best use of resources

The AEEP is committed to encouraging the best use of resources by not duplicating work being done by other participants in the sector. As the Partnership looks ahead, there is a strong commitment from stakeholders to contribute to a programme of work that adds to the global conversation and that incorporates input from the widest possible constituency of policy-making, civil society, academic and other stakeholders. Where possible, this should be done in coordination with other key participants. This applies to the choice of goals and targets as much as to other elements of the AEEP's work.

A desktop mapping exercise of targets, carried out during the compilation of *Status Report 2017-18*, identified 83 initiatives, some of which had similar targets to the AEEP's. A smaller number of the initiatives analysed might provide alternative targets that could inform the process of benchmarking progress in key sectors.

To determine which initiatives aligned with the AEEP, each of the 2020 Political Targets were placed into categories for the systemisation framework (*see table above*). Thus the combined capacity targets for hydroelectric power, wind and solar power were grouped simply into Renewable Capacity. Other targets were added to encompass the variety of targets found in the mapped initiatives. Selected initiatives were then researched to define their objectives, which were then systemised according to the AEEP target categories.

The majority of those mapped do not quantify or provide specific targets outside of broad objectives such as the need to 'increase energy access' or 'improve energy efficiency'.

Initiatives that broadly share three or more of the AEEP's 2020 Political Targets are deemed to align well with the Partnership's existing targets. Some 50 initiatives included Energy Access among their main targets. Targets and ambitions linked to Renewable Capacity and Energy Efficiency were included in 40 and 26 of the initiatives respectively. Cross-border interconnections and targets for natural gas use and export were almost exclusively found in regional power pool masterplans and other infrastructure-based initiatives. A total of 17 initiatives align closely with the AEEP in terms of their main targets, scope of work and type of intervention.

## When initiatives align

Out of the 17 initiatives whose stated goals align most closely with the AEEP, eight take their targets beyond 2020. (These include the African Energy Leaders Group, which is one of SEforALL's implementing agencies and so contributes towards the global initiative's targets.)

**AMONG THE MOST RELEVANT TO AEEP STAKEHOLDERS ARE THE FOLLOWING:**

- **The African Union Agenda 2063** has yet to provide details of its energy targets beyond providing 'universal energy access'. It plans to harness all of Africa's resources to ensure modern, reliable and cost-effective energy services to all households, notably by strengthening regional power pools and Programme for Infrastructure Development in Africa (PIDA) projects.

- **The African Renewable Energy Initiative (AREI)** plans to achieve 10GW of new and additional renewable capacity by 2020 and at least 300GW by 2030. One particular focus is the need to provide energy that can drive productive sectors, as well as household economies. AREI's energy access goals include "a quantitative and relative increase in the number of MSMEs and other users connected to national grids or new mini-grids". It argues that energy access targets should help to achieve equitable and sustainable access and not simply equate successful access in 'megawatt' terms (*see page 63*).

- **The Programme for Infrastructure Development in Africa**'s Energy Vision says energy projects prioritised through to 2020 will cost $40.3bn. PIDA has emphasised a desire to align with other infrastructure-based initiatives, so as to produce a single integrated African infrastructure report.

Out of the 15 PIDA energy projects, four are for regional transmission interconnections – the North-South Power Transmission Corridor, Central African Power Interconnection, West Africa Power Transmission Corridor and North Africa Power Transmission Corridor – and one is a gas project: the Nigeria-Algeria Trans-Saharan Gas Pipeline. Given the AEEP Political Targets' include increasing cross-border interconnections and natural gas trade, and ensuring wider energy security, the AEEP and PIDA are already closely aligned.

- **Power Africa** (PA), the United States' initiative, sets 2030 as its target to add 30GW of additional capacity and provide access for 60 million households and businesses. Led by the US government and some 140 public and private sector partners, PA's model is based around using public-private partnerships to maximise development impacts, support power project development and support governments to create an enabling regulatory environment.

PA is mandated by the Electrify Africa Act of 2015, which commits the United States, its partner African governments and the private sector to deliver first time electricity access for at least 50 million people by 2020 and install 20GW of new generation from a mix of sources.

**THE AEEP IS CLOSELY ALIGNED WITH THE MAJOR GLOBAL INITIATIVES, A PROCESS THAT IS EXPECTED TO CONTINUE:**

- **The United Nations' Sustainable Development Goal 7** is intended to ensure access to affordable, reliable, sustainable and modern energy for all, looking to achieve its targets by 2030. The targets and indicators are shown in the box. More detail on monitoring has still to emerge.

In its most recent update on the SDGs, *Progress towards the Sustainable Development Goals (*DOC E/2017/66), the United Nations Economic and Social Council says that for Goal 7, "Progress in every area of sustainable energy falls short of what is needed to achieve energy access for all and to meet targets for renewable energy and energy efficiency. Meaningful improvements will require higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale."

- **Sustainable Energy for All (SEforALL)** is a major global initiative that the AEEP has moved towards aligning with. SEforALL's Africa Hub is hosted by the African Development Bank. The initiative has three main objectives to be achieved by 2030: to ensure universal energy access to modern energy services, double the global rate of energy efficiency improvements and double the share of renewable energy in the global energy mix.

Reflecting a shared history of mutual understanding, these targets are very close to those of the AEEP's 2020 Political Targets – a model which SEfromAll, like other major initiatives of the past few years, took inspiration from. Benchmarking and measurement of results are conducted through the Global Tracking Framework (GTF) and the Regulatory Indicators for Sustainable Energy (RISE). These datasets provide energy information on a global scale, primarily using household surveys and regulation and policy assessments to determine energy access. The GTF already informs the energy access data in the AEEP's series of *Status Reports*.

# SDG 7's global targets

**THE UN'S GLOBAL INITIATIVE IS COMMITTED TO:**

- ensure universal energy access by 2030;
- continually increase the proportion of the population with electricity access;
- continually increase the proportion of the population with primary reliance on clean fuels and technology;
- substantially increase the renewable energy (RE) mix globally;
- increase RE's share in total final energy consumption;
- double the global rate of energy efficiency (EE) improvement;
- improve energy intensity in terms of primary energy and GDP;
- make a $100bn commitment towards international cooperation on energy access research, EE and infrastructure;
- increase the amount in US dollars mobilised every year from 2020;
- expand and upgrade infrastructure for developing countries; and
- increase investments in EE as a percentage of GDP and amount of foreign direct investment for infrastructure.

# Alternative Measurements

Through its work in benchmarking the progress of energy developments in Africa and promoting cooperation with Europe, the AEEP has promoted a rigorous approach to understanding and applying energy data in Africa and among its European partners. Since its creation, the AEEP has played a pioneering role in proposing policy directions and targets to overcome energy poverty, improve access and efficiency, and underpin domestic and cross-border energy security in Africa and Europe. The Partnership has been especially significant in moulding the approach to understanding the data involved in improving these critical issues, influencing initiatives such as Sustainable Energy for All (SEforALL) and the Africa Renewable Energy Initiative (AREI), which have understood the need to collect and collate more accurate data to inform the campaign to end energy poverty.

Such an approach requires continual reappraisal in a fast-changing global environment, where the amount of data being provided by an apparently ever greater number of participants in the sector means the AEEP is no longer alone. Nor is it the best resourced body now operating in data collection and management; neither does it have a mandate to undertake that work.

The AEEP has taken a leading role in identifying and analysing the problems engendered by the growing number of complementary (and all too often isolated) programmes operating in the sector. The Partnership has shown itself resolute in its determination to work with other leading initiatives and organisations, as discussed elsewhere in this report. Some of these provide targets, to which the AEEP itself might obviously align.

One of the most important is the 27 indicators used in the Regulatory Indicators for Sustainable Energy (RISE), developed by SEforALL and Esmap[1]. These are shown in the table on page 47. The RISE indicators aim to support the comparison of national policy and regulatory frameworks in the promotion of sustainable energy. The already considerable work done by RISE in energy access, energy efficiency and renewable energy make the initiative an ideal partner as the AEEP looks beyond the 2020 Targets.

SEforALL and RISE are monitoring a number of new indicators, which may offer substantial scope for the AEEP to align with. RISE, in turn, is aligned with the targets of Sustainable Development Goal 7 and SEforALL. It is intended to provide a set of indicators to help compare national policy and regulatory frameworks for sustainable energy, which are particularly relevant for Africa.

As Sub-Saharan Africa (SSA) moves into a new era of technological development, it is important that specific targets are set to ensure that economies modernise in parallel with cost savings and technology advancements with the rest of the world. This suggests that new technical and policy targets might be adopted to complement the incumbent generation capacity, social and economic targets aligned across a number of development agencies and international initiatives' energy programmes.

The traditional focus of development agencies' programmes for improving energy access has been on direct implementation, such as the financing and encouragement of offgrid solar systems, cook stoves and solar lanterns. Looking well beyond the AEEP 2020 Political Targets' focus on ongrid activity (measuring progress in megawatts), the Partnership could examine ways to recalibrate its targets – to find other routes to supporting long-term, sustainable economic growth, helping to pave the way for a globally competitive continent.

Alternative targets might foster more efficient and affordable energy access for all, in the process creating jobs and promoting gender equality – underpinning energy's role in achieving other, related SDGs.

New 'targets' might focus on the infrastructure required to provide cheaper, reliable and sustainable electricity.

The AEEP Secretariat has sounded out opinion and carried out initial research on the applicability of a number of indicators in areas such as grid stability, smart grid technologies and energy storage solutions that are needed to accommodate larger amounts of intermittent renewable energy technologies on the grid. Meanwhile

| The 27 RISE indicators | | |
|---|---|---|
| **Energy Access** | **Renewable Energy** | **Energy Efficiency** |
| 1. Existence and monitoring of officially approved electrification plan | 1. Legal framework for renewable energy | 1. National energy efficiency planning |
| 2. Scope of officially approved electrification plan | 2. Planning for renewable energy expansion | 2. Energy efficiency entities |
| 3. Framework for grid electrification | 3. Incentives and regulatory support | 3. Information provided to consumers about electricity usage |
| 4. Framework for mini-grids | 4. Attributes of financial and regulatory incentives | 4. Energy efficiency incentives from electricity rate structures |
| 5. Framework for stand-alone systems | 5. Network connection and access | 5. Mandates and incentives: large consumers |
| 6. Consumer affordability of electricity | 6. Counterparty risk | 6. Mandates and incentives: public sector |
| 7. Utility transparency and monitoring | 7. Carbon pricing and monitoring | 7. Mandates and incentives: utilities |
| 8. Utility creditworthiness | | 8. Financing mechanisms for energy efficiency |
| | | 9. Minimum energy performance standards |
| | | 10. Energy labelling systems |
| | | 11. Building energy codes |
| | | 12. Carbon pricing and monitoring |

Source: Regulatory Indicators for Sustainable Energy (RISE), Sustainable Energy for All and Energy Sector Management Assistance Program (Esmap).

across SSA, planners are considering how offgrid supply options can complement grid connections that may not reach some rural communities for many years. There is a need for reflection on how these communities can create jobs and stimulate economic growth as mini- and micro-grids are introduced and policies are enacted that attract private sector actors.

Discussion of targets and benchmarks that can inform policy and promote sustainable energy developments cannot ignore the need for much greater private sector involvement in raising levels of energy access and security. Consideration has thus been given to policy issues such as cost-reflective tariffs (CRTs) and unbundling of the energy sector, which are widely seen as essential to enable utilities to maintain robust financials for the long term. Such indicators speak directly to private developers and other investors, as well as to the managements of often financially challenged utilities – all essential stakeholders in the electricity supply industry's development.

## A range of alternatives

Other alternative benchmarks that might also be considered include energy efficiency (EE) indicators that could either be aligned to current initiatives, led by RISE and the Global Tracking Framework (GTF), or alternatives.

The range of EE indicators is improving. They include the recent dataset on energy intensity/GDP, proposed by the GTF (a new GTF energy intensity dataset to 2014 is one of the EE indicators used to benchmark the 2020 Political Targets, above).

Already mentioned has been the prospect of harmonising and cooperating with the RISE programme.

Also potentially applicable are measures of industry and consumer improvements in energy intensity – among benchmarks which are becoming available for the fastest moving African countries – and measures for the rate of investment in EE.

Other indicators considered include measures of the contribution of RE and other energy indicators to the creation of jobs; gender equality in the region's energy sectors; and measures that mitigate the impacts of climate change. These are also discussed as part of *The Social Agenda*, which begins on page 53.

[1] Administered by the World Bank Group (WBG), the Energy Sector Management Assistance Program (Esmap)'s remit is to provide analytical and advisory services to low- and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. Esmap is funded by Australia, Austria, Denmark, the European Commission, Finland, France, Germany, Iceland, Japan, Lithuania, Netherlands, Norway, Sweden, Switzerland, the UK and WBG.

[2] RISE was initially piloted in 2014 and a first edition was published in 2016. It is understood that the WBG is planning to update RISE studies on a regular basis (every one to three years). RISE scores reflect a snapshot of a country's energy sector policies and regulations, organised by the three pillars of the SEforALL initiative: Energy Access, Energy Efficiency and Renewable Energy. RISE is made possible by the contributions of more than 1,000 experts, business people and public officials in 111 economies.

# Cost-reflective tariffs

The challenges facing many African electricity supply industries (ESIs) can partly be attributed to their tariffs not reflecting costs; many national ESIs still depend on subsidies and government bailouts. This has led to inadequate investments in infrastructure, especially in the generation and transmission sectors, leading to outages, poor power quality and often insolvent utilities. One solution to overcome such problems is the application of cost-reflective tariffs (CRTs) Under tariff structures that reflect all the cost of electricity generation, transmission, distribution and supply to the customer, the customer bears all of the cost of their electricity consumption without government subsidy.

Implementing CRTs would enable African utilities to raise adequate capital to expand generation and transmission networks and provide the right signals for investment. It would promote economic efficiency as consumers make better consumption decisions when the true cost of power supply is reflected. CRTs would bolster off-takers' credit-worthiness, since lenders would be required to take a long-term view on the offtakers' ability to make payments under its power purchase agreement (PPA). CRTs would further incentivise development of new projects and better efficiency of grid operators.

There is a consensus among the many private sector stakeholders and regulators canvassed in its research by the AEEP Secretariat that CRTs would also promote transparency, by pushing the regulator to ensure that the equivalent of a Least Cost Power Development Plan (as seen in Kenya for example) is not interfered with by unscrupulous politicians, who might otherwise be tempted to take on surplus power or power from more expensive sources such as coal or other fossil fuels.

Progress is afoot. The SEforALL and World Bank Group's Regulatory Indicators for Sustainable Energy (RISE) is already monitoring a number of indicators related to the setting of tariffs and CRTs. This offers some scope for the AEEP to align with RISE.

Issues surrounding the application of CRTs need to be resolved. On counterparty risk, for example, investors want to know whether the government offers or allows backing of utility payments. Are off-taker balance sheet risks, such as foreign exchange exposure and fuel pricing exposure, passed to the customer?

Based on input from independent power producers (IPPs) and other private sector project developers and initial research for the AEEP Secretariat, CRTs have the potential to be a key indicator for measuring the progress of the African ESI business environment. The need for CRTs to build sustainable industries is evident – as expressed by a number of interventions on ongrid and offgrid electricity supply during the 3-4 October 2017 RES4Africa conference in Addis Ababa, supported by the AEEP.

But some stakeholders have concerns about CRTs' relevance to all African contexts. World Bank Group Energy & Extractives Global Practice Manager Sudeshana Ghosh Banerjeepoints out that setting CRT and cost recovery is "very complex". Operational cost-recovery is relatively easy to define. In contrast, defining full cost-recovery including new investments and the cost of capital is highly complex. "The World Bank Group has put significant resources into obtaining financial data for utilities and modelling capital costs. Without this, setting full cost-recovery CRTs is not viable," Ms Banerjee said during research for this report.

The fact that only two countries out of a sample of 39 – the Seychelles and Uganda – are currently fully recovering their operational and capital costs is indicative of the challenge. But the benefits are clear: over the long-term, CRTs could promote expansion of generation and transmission networks by enabling African utilities to raise sufficient capital and provide the right signals for investment in the power sector.  But the weaknesses are equally stark. Defining full cost recovery, including new investments and the cost of capital is highly intricate.

On balance, CRTs are best seen as indicator to ensure that more long-term planning is considered. Not all markets are ready to make the switch. It might not always be beneficial to set CRTs in all markets in the short- to medium-term. Rather, it might be better suited as an indicator for earlier stage markets.

# Time of use tariffs

Until now, time of use tariffs (ToUTs) have not been considered a realistic tool in Africa, due to security issues, the lack of 24-hour economies and inadequate metering systems. But this innovative energy tariff pricing structure could serve as a viable demand management tool as the continental ESI develops.

Under ToUTs, the cost of electricity per kWh is dependent on the time it is consumed. The main objective is to shift consumption to the offpeak period, by stimulating a reduction of peak demand by introducing higher tariffs at the busiest times; such economic incentives promote the efficient use of the network. This has been tested and implemented in some in some constituencies in Europe and North America. Hydro One customers in Ontario, Canada reduced load demand by an average of 3.7% during the summer months when placed on a ToUT rate in 2008.

There could thus be sizeable potential benefits for African consumers as industries mature – for example, by supporting grid integration of renewable energy via support of flexibility of demand and supply. Cost reductions in electricity load during peak periods allow for more efficient utilisation of grid systems, allowing utility companies to save on high generation costs, as well as avoiding building new generation units to cater for peak load. The Commercial and Industrial (C7I) sector would benefit from lower tariffs during night time operating hours, especially if power costs rise in the future.

Private sector operators argue that ToUTs would help generators that can dispatch power at night. Companies and business groups in Kenya cite the Lake Turkana Wind Power project as an example, whose siting is well suited to evening and night time generation.

Initial research compiled for the AEEP Secretariat suggests the RISE indicator could be further refined to effectively monitor the ToUT in Africa. An initial suggestion: a series of yes/no answer indicators could be used to benchmark more accurately countries that have ToUTs in development but not yet implemented. From initial soundings, stakeholders generally viewed TuUTs favourably – in conceptual terms at least.

# Unbundling of T&D and Generation Assets

Africa is under pressure to move away from the sort of monopolistic utility model that dominates many markets. To achieve this, the 'unbundling' of utilities' generation, transmission and distribution (T&D) assets is seen by many as essential for efficient and transparent grid operation. When utilities are vertically integrated, it is difficult to separate the costs for generation, transmission and distribution, which can cover up mismanagement and inefficiencies.

One of the key purposes of liberalisation is to introduce competition to increase efficiency through cost reduction, providing more reliable power and other benefits. Reform measures can slash the burden on government finances by opening the market to greater private sector investment.

Unbundling can be done in a number of stages with measurable consequences. Kenya provides one example, where the government split up the former monopoly Kenya Power Company in 1997 to create KenGen (generation) and Kenya Power and Lighting Company (KPLC – now Kenya Power), which owns and manages the distribution network and part of the transmission network. The Kenyan government in 2010 recognised that construction of the much-needed high-voltage transmission system required significant investment which KPLC could not access. It thus created Kenya Electricity Transmission Company Ltd (Ketraco), which is 100% government-owned and able to access concessional financing. In this unbundled environment, Kenya hosts a significant number of IPPs, which have been operating for over 15 years with no payment default by KPLC. It is now able to bring on more power supply as and when required without depending on government finances.

The successful unbundling of assets in Uganda saw utility Umeme purchased by private equity fund Actis. Umeme's stock is now traded on the Ugandan Stock Exchange helping to build a domestic investor (as well as consumer) base. In contrast, many other countries that retain vertically-integrated utilities still suffer a significant power deficit for want of investment and improved efficiencies.

RISE is already monitoring a number of indicators related

# Grid modernisation

Grid modernisation is critical to African economies' hopes of delivering electricity services in a more efficient, reliable and sustainable manner. Technology is poised to make a substantial impact, transforming operations from mostly manually-driven processes to electronic, computer-assisted decision-making. This transition supports the use of advanced technologies to monitor and manage the transmission of electricity from all generation sources to meet the varying demands of end-users, thereby improving the reliability and utilisation of grid facilities. Control and communication technology advances now permit the automatic or semi-automatic and remote operation of grid equipment and facilities.

There are other benefits for African utilities. A modernised grid will enable more renewable energy integration and should reduce the frequency of outages via automated remote-controlled grid devices and real-time communication to distribution companies of outages and failures. Improved grid efficiency, reduced grid operation and maintenance costs, integration with RE and lower GHG emissions should all follow.

The process should start with digitisation of the grid and the installation of smart meters. Digitisation allows Automatic Generation Control systems to continually monitor the system frequency and provides automated generator speed control, giving more visibility of what is happening in the distribution network. Ancillary services – including energy storage, demand response, system control, grid stabilisation and frequency response – can also provide reliable and efficient operation of the grid.

By adopting global developments in on-grid storage African markets should reap the benefits of improved grid stabilisation, frequency response and other ancillary services. These services can be tendered out to private sector companies – provided the right incentive structures are in place. Meanwhile battery and other energy storage solutions will improve power quality and reliability and store unused energy for dispatch in peak times, or respond to rapid increases in load.

RISE is monitoring a number of related indicators. A next generation of AEEP targets could focus on important areas such as grid stability, smart grid technologies and energy storage solutions that are needed to accommodate intermittent renewable energy technologies on the grid.

Public and private sector actors alike advocate a nuanced approach. Grid upgrades are not universally required, but in some cases grid upgrades are required immediately.

## Unbundling, Continued from page 49

to the unbundling of grid assets, which offers substantial scope for alignment with the AEEP. RISE indicators include measures of wheeling, which gauge whether there are rules that allow electricity customers to purchase power directly from a third party and whether the rules define the size and allocation of costs for transmission and distribution wheeling charges.

However, unbundling may not be appropriate in all cases; RISE is among those who have expressed reservations, highlighting the considerable regulatory and legal costs required to make the shift. The World Bank's Sudeshana Banerjee points to the small size of many grids, where it does not make economic sense to unbundle T&D assets.

RISE is already monitoring a number of indicators on the unbundling of grid assets. Further refinements to indicators could help to monitor the evolution of policy environments and their impact towards making utilities more efficient and national ESIs more open to investment.

## A range of social indicators

The following section, *The Social Agenda*, goes into greater detail on the sort of 'alternative' indicators the AEEP might look to align with as it promotes its long-term concerns with improving levels of energy access and the penetration of renewable energy, increasing energy security and energy efficiency. This social agenda clearly links energy to major social and economic preoccupations, which find expression in all 17 of the global Sustainable Development Goals.

The key policy areas discussed are job creation and building a better life for Africa's young population, addressing severe gender imbalances and mitigating climate change. Work on some of these issues – such as linking the implementation of energy projects and businesses with employment – is at an early stage, pointing to a role for the AEEP in promoting a better understanding of these issues in Africa.

# Mini- and micro-grid indicators

Access to modern energy services in rural, peri-urban and other marignalised areas is a major development priority which will remain central to the AEEP's work. Measuring the progress of offgrid access is thus a pressing issue. Fortunately, there is already a body of work building up – notably through the Regulatory Indicators for Sustainable Energy (RISE) – that should inform the decision-making and work streams of the AEEP and other stakeholders.

This includes the growing importance of mini- and micro-grids, which involve small-scale generation (10kW to 10MW) that serves communities of consumers through a distribution grid that can either operate in isolation from, or be interconnected to, national electricity transmission networks. Mini-/micro-grids improve access to power that allows the development of enterprise and industry and hugely improves the lives of marginalised populations. They lower the financial burden on governments, bringing private sector investment into the provision of electricity services where there is little economic incentive or insufficient funding available for the larger utility to do so. Net costs are likely to become lower over the lifetime of projects as renewable energy and energy storage technology costs come down. Lower CO2 emissions are likely; hybrid mini-grid systems often incorporate a 75-99% renewable supply.

Despite their undoubted benefits, in many countries the lack of sound policy and regulatory frameworks remain a big barrier to mini-/micro-grid implementation (*see page 20*). This can be tracked via RISE, which is effectively monitoring the development of frameworks for mini-grids. This offers substantial scope for the AEEP to utilise a set of indicators that can help compare national policy and regulatory frameworks for mini- and micro-grid implementation.

Directly-related RISE indicators cover the legal framework for operation, gauging whether mini-grids can legally operate and can be owned by private operators. Indicators could be used to examine the ability to charge cost-reflective tariffs, and whether there are publicly-funded mechanisms to secure viability gap funding for operators. These would also monitor standards and quality, such as whether technical standards exist detailing the requirements for mini-grids to connect to the grid.

# Enhancing the energy efficiency drive

Energy efficiency (EE) entails optimising the use of power so that less resources are used to obtain the same result. EE can be difficult to quantify and expensive to monitor. Existing indicators have tracked energy intensity, which allows an initial assessment of trends in energy consumption and comparisons across countries, and network losses (*see pages 37-40*).

African economies are encouraged to embrace demand-side EE monitoring tools, which applied to grid systems can deliver significant economic, reliability and environmental benefits. Basic areas where consumption can be reduced significantly include use of more efficient lighting (for example, through the distribution of LED bulbs), reduction of electricity network losses (an existing AEEP benchmark), energy efficient building design and upgrading manufacturing equipment.

Demand side EE monitoring is fundamental in reducing costs for utilities and, in the long term, can limit the requirement for further generation capacity rises and strengthening of transmission and distribution systems.

Monitoring can reduce energy use, leading to reduced greenhouse emissions. Monitoring can also slow the growth in energy consumption, save consumers money from fuel imports, as well as reduce capital expenses for energy infrastructure including the construction of new power plants. Demand side EE can contribute to improved quality of energy services by reducing network losses. The reduction of the overall load on a distribution network results in various improvements including mitigating electrical system emergencies, reducing the number of blackouts and increasing system reliability.

RISE is monitoring the development of frameworks for EE, with substantial scope for the AEEP to align with its indicators. RISE indicators take in national EE planning (including the existence of legislation action plans to increase EE and monitoring whether EE targets have been set at the national level, and for residential, commercial, industrial and power sectors.

The indicators would enquire whether it was mandatory for utilities to provide reports of their energy usage, whether through billing or other means. The quality of information is also important. For example, at what intervals do customers receive these reports and does the regulator track utilities' compliance with laws for providing energy usage information to customers? Do customers receive a bill or report that shows their energy usage compared to previous bills or reports over time? And can they access real time feedback on energy usage (for either prepaid or post-paid systems), and manage energy usage levels remotely using technology?

Such indicators should also investigate whether it is mandatory for the consumption and/or savings of large-scale energy users to be tracked and documented on a regular basis. Are efficiency targets and energy audits mandated for large consumers? And what penalties are in place for non-compliance with regulatory obligations for large consumers?

Alongside the stick comes the carrot. The indicators should also gauge performance recognition. For example, is there a programme to publicly recognise large-scale users that have achieved significant energy savings measures? For utilities, the indicators should monitor whether there is a requirement to carry out EE activities. For example, are energy savings or other target indicators measured to track performance in meeting EE requirements?

They should also look at minimum EE performance standards, which would examine whether standards and verification programmes are in place for refrigerators, air conditioners, lighting equipment, industrial electric motors, light and heavy-duty vehicles – as well as what penalties are in place for non-compliance.

Building energy codes also a play a role here. Indicators should determine EE codes for residential and commercial buildings, asking whether mandatory standardised ratings or labelling systems exist for the energy performance of existing buildings and whether there are mandates or targets for new building stocks to achieve high quality energy efficiency certifications, such as LEED (Leadership in Energy & Environmental Design).

### EE investment is growing, but more is needed

On a positive note, global investment in energy efficiency increased further in 2016 to $231bn ($133bn of which was in the buildings sector). But the International Energy Agency projects average annual global investment needs of $919bn up to 2030 (70% of which in the transport sector) which sheds some light on the gap that needs to be closed.

# Approaches to measurement

In looking for potential indicators of continent-wide applicability, the ease of data collection is critical for effective monitoring. The AEEP's experience of monitoring the Political Targets has been that detailed data is very challenging to obtain from utilities and other sources in many African countries. Despite some progress, statistics still often exists only in manual form, if they exist at all.

Stakeholders in Africa contacted for this report said it was important to ask for information that would not require considerable effort to compile. It was also essential to compare utility and other data on a fair basis; therefore the questions had to be 'objective'.

The indicators RISE has developed meet these criteria; they only require 'yes/no' responses. RISE emphasised it was important that its indicators provided not only a comparison between countries but they would also be used to demonstrate the progress by country year-on-year.

The indicators outlined above follow a similar structure. Existing relevant RISE indicators have been listed. Also proposed are new indicators of a sort that could be measured to incentivise further sector development.

Benchmarks based on prescribed yes/no answer would facilitate ease of responses from ministries and utilities for the purpose of benchmarking each country using a suitable scoring mechanism. Although these indicators have been developed to minimise the number of people in each country to be contacted to obtain the responses, effective monitoring would still require a network of correspondents across different jurisdictions operating in different languages.

Establishing such a network and measuring these indicators would entail considerable cost. However, progress will be achieved as a collaborative process. SEforALL and RISE are in the process of monitoring a number of new indicators which may offer substantial scope for AEEP collaboration.

# Energy and Development

Energy's inclusion as a Sustainable Development Goal underlines the sector's central importance in building new economies even in the poorest of polities. Go-ahead governments and ambitious entrepreneurs see emerging renewable energy (RE) industries as providing a means of delivering jobs, building a manufacturing base and more efficient agricultural production, diversifying ownership and allowing disadvantaged groups – notably women and youths – to better fulfil their potential.

Among the AEEP's areas of greatest interest, efforts to improve levels of energy access – from the light bulbs that allow children to study at night to clean cooking utensils that stop the need for burning firewood – have clear socio-economic impacts. The Partnership's advocacy of RE promotes technologies that offer particular advantages. RE solutions are well suited for use in areas isolated from the grid, applying technologies such as solar PV, which is comparatively simple to operate and build. They have other benefits, ranging from reduced currency risks for economic planners to creating jobs in marginalised areas.

These pressures and opportunities are understood by recent initiatives such as the Africa Renewable Energy Initiative (AREI), which highlights the fact that "as well as ensuring appropriate electricity access for households and families, access needs to be sufficient to also drive the productive sectors in both local and national contexts for job creation, thriving economic development and increased resilience". AREI argues that addressing the quantity and quality of access for small-scale farming and micro-, small- and medium-scale enterprises, "entails a vision of electricity access beyond the bare minimum requirements for households".

The EU has a clear understanding of the challenges involved. According to EU Commissioner for European Neighbourhood Policy and Enlargement Negotiations Johannes Hahn, "Europe is confronted with many challenges at its borders and beyond, challenges that will surely grow in the future, as demographic pressures, mobility and effects of climate change increase and regional conflicts are ongoing. It is in Europe's own interest that we all work to ensure sustainable and balanced economic growth in our partner countries."

The positive impact of greater employment opportunities, gender equality and developments that help to offset the impacts of climate change are clear. However, measuring the inputs and outputs that can make a positive impact on the 'Social Agenda' are less easy to quantify. Some institutions such as the International Renewable Energy Agency (IRENA) and the New Partnership for Africa's Development (Nepad) have started work to quantify the impact energy developments have on jobs, gender and other social indicators. There is much more to do. The AEEP stands ready to make a contribution.

### Sustainable Development Goal 7

**The global target is general but unambiguous: it commits to "Ensure access to affordable, reliable, sustainable and modern energy for all"**

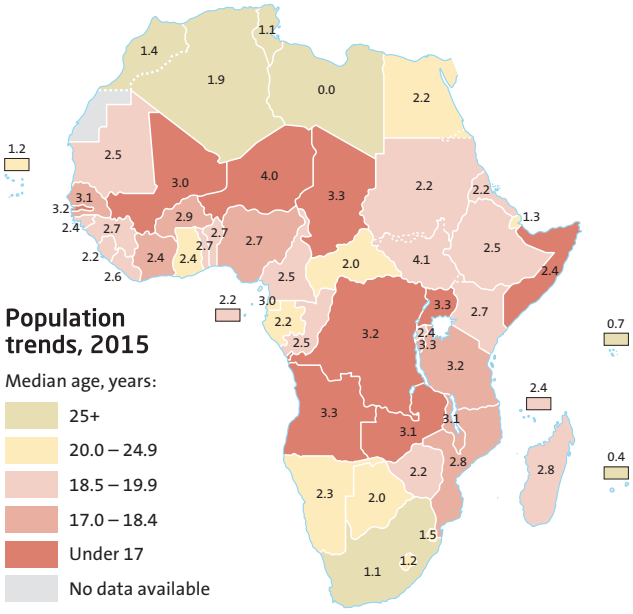
# Giving Youth a Future

Go-ahead governments and ambitious entrepreneurs see emerging renewable energy industries as a means of building a manufacturing base, delivering jobs and diversifying ownership. The technologies offer particular advantages: they are well suited for use in remote rural areas – with technology such as solar PV, which is comparatively simple to operate and build – and can help to create the jobs essential for keeping fast-growing populations gainfully occupied in their regions of origin.

The need to create jobs, especially for the continent's booming younger age group segments, has been underlined by the upsurge in illegal migration from Africa to Europe, which in many cases is driven by economic need, rather than the wars which have displaced so many people in Africa and the Middle East. Accommodating fast growing populations (shown in the map opposite) and high unemployment levels (*measured in the map on page 55*) are central elements in the recent policy directions of the African Union and European Union – who have made jobs and youth a central plank of the 29-30 November AU-EU Summit in Abidjan – and of Member States, as underlined by Germany's Marshall Plan with Africa (*see box on page 53*).

Among the many issues that must be tackled are the energy needs of crisis-affected and displaced communities. These already vulnerable people require timely action to provide adequate lighting, heating and cooking facilities to ensure their security and dignity during emergencies. The UNHCR's Safe Access to Fuel and Energy (SAFE) initiative aims to integrate energy needs into emergency planning and response, and improve the conditions within refugee camps and other displaced communities. Monitoring of outcomes are conducted through the UNCHR's FOCUS results-based management tool.

Africans account for 26% of the world's refugee population (visit: *www.unhcr.org/africa*), which amounts to over 18 million people without reliable energy services. Expanding energy access targets to include displaced communities would further the effort towards universal access.




**Figures** show average annual population growth, 2010/2015, %

**Young age dependency ratio:**
Ratio of the population ages 0-14 per 100 people of working age (15-64)

| *Best 5 countries:* | *Worst 5 countries:* |
|---|---|
| Mauritius 27.2 | Mali 95.1 |
| Seychelles 33.6 | Angola 95.2 |
| Tunisia 33.8 | Chad 95.8 |
| Morocco 40.9 | Uganda 97.3 |
| Algeria 43.6 | Niger 107.5 |

Source: United Nations Development Programme

## Astria Fataki, Energy Generation

An AEEP Young Leader in Energy Access, Astria Fataki is a "passionate entrepreneur who truly believes that energy is at the centre of socio-economic development". She founded a dynamic association, Energy Generation, to support young African entrepreneurs while also developing solar power plants. In 2013-15 she coordinated the contractual and legal construction of two public-private partnership (PPP) projects to build and operate solar photovoltaic power plants in Mali (40MW) and Chad (60MW). In 2015, she founded an Infrastructure and PPP consultancy firm, Isis Development (Implementing Sustainable Infrastructure Solutions for Development), and is now working to develop solar plants in Togo and Benin.

A French citizen of Congolese origin, Fataki was "educated between two cultures". She became an entrepreneur having "always been incensed by development inequalities". Energy Generation aims to promote social innovation and entrepreneurship, to identify, develop and spread 'made in Africa' electrification solutions. Fataki says its "main drive relies on the belief that Africa's challenges will be solved by its youth, which needs to be properly trained, not only on technological issues, but also on entrepreneurial values". Represented by 'ambassadors' in 32 African countries, its partners include the European Union, the French and Togolese governments, Akon Lighting Africa and Schneider Electric.

Candidates from all over Africa are selected annually through the Africa Energy Generation Prize to attend a one-year intensive training at the Energy Generation Academy in Lomé, Togo. Energy Generation proposes four types of support designed to help young entrepreneurs at different stages of development: the Lab helps young innovators transform their idea into a functioning prototype, while the Academy trains them to become start-up entrepreneurs. They may then graduate to the Incubator and draw on the Seed Fund, which supports small ventures as they scale up. For more visit: *www.energy-generation.org*

## The German Government's Marshall Plan with Africa asks:

**"The most important question that must be answered: How can 20 million new jobs be created that give young people prospects for their future without destroying the environment?"**

The plan, launched in 2016, is based on the conviction that peace and development can be promoted by cooperation between Europe and Africa focused on fair trade, increased private investment, more bottom-up economic development, greater entrepreneurial spirit and, above all, more jobs and employment. The launch document, *Africa and Europe – A new partnership for development, peace and a better future: Cornerstones of a Marshall Plan with Africa*, said: "It is vital that Africa's young people can see a future for themselves in Africa... Soon Africa's population will top 2 billion. That means that 20 million new jobs will be needed each year."

Three of the "10 starting points for a Marshall Plan with Africa" refer directly to employment:

**PRIORITISING JOBS AND OPPORTUNITIES FOR YOUNG PEOPLE** – Developing the necessary economic structures and creating new employment and training opportunities will be the central challenge. But also young people "need contact and interaction with Europe", which "must develop a strategy that allows for legal migration whilst combating irregular migration."

**INVESTMENT IN ENTREPRENEURSHIP** – Long-term employment opportunities will be created by the private sector – which means creating an attractive environment in Africa, developing new instruments to mobilise and safeguard investments, backed by tax incentives and new instruments such as Africa funds or infrastructure bonds.

**VALUE CREATION, NOT EXPLOITATION** – Africa must be more than the continent of raw materials. The Marshall Plan is focused on economic diversification, production chains, targeted support for agriculture and the creation of a new SME sector, backed by offering improved access to the EU single market and dismantling trade barriers.

Visit: *www.marshallplan-mit-afrika.de*.

# Creating Jobs

Job creation is a crucial target for all governments, not only as a measure of economic growth but also as an essential element in maintaining social cohesion. Renewable energy globally is showing a positive trend in creating jobs – notably in the European Union.

An EU-funded study, *Green Jobs and related policy frameworks* (2013) – issued as part of the Social Dialogue for Green and Decent Jobs—South Africa-European Dialogue on Just Transition project, co-funded by EuropeAid and Sustainlabour, with the Congress of South African Trade Unions as partner organisation – started with the observation that "the green economy offers enormous opportunities for job creation, many of which are already under way in the European economy. These opportunities range from sectors traditionally associated with an environmental content – such as renewable energies or recycling – to other activities that represent emerging sectors in green jobs – such as sustainable mobility – and to activities in 'established sectors' which have potential for conversion into sustainable activities." However, even in Europe there is a lack of reliable, comprehensive and comparable data on 'green jobs' – not least because of the lack of a standard, EU-wide definition of what constitutes green jobs.

Significant renewable energy investments have been undertaken from Morocco to South Africa. Up-to-date figures on their social impact remain elusive. However, the International Renewable Energy Agency (IRENA) has done some important work to measure how RE investment can create jobs. Abu Dhabi-based IRENA has produced an annual publication since 2012 that seeks to record the number of RE jobs in existence and those created in the past year; this employment is broken down by technology and country. IRENA also provides comparisons of deploying RE relative to conventional fossil fuel sources.

IRENA's *Annual Review 2016*, published in mid-2017, estimates that global RE employment increased by 5% in 2015 to reach 8.1 million; an additional 1.3 million people were employed in large hydropower. It observed: "While the growth in jobs slowed down compared to previous years, the total number of jobs in renewables worldwide continued to rise, in stark contrast with depressed labour markets in the broader energy sector." Countries with the highest number of RE jobs were China, Brazil, the United States, India, Japan and Germany. IRENA observed: "Jobs continued to shift towards Asia", whose share of global RRE employment increased to 60%. Solar PV was the largest RE employer, with 2.8 million jobs worldwide.

IRENA has also created an employment indicator 'dashboard' to give an overview of the global employment figures. This is to be welcomed as African and European countries seek to better understand the impact of their finance and projects. However, the data are very incomplete – which could offer an opportunity for the AEEP to support IRENA as it seeks to significantly improve its data collection and assessment coming out of Africa.

Also looking to measure jobs is the New Partnership for Africa's Development, which is looking at ways to estimate job creation in Programme for Infrastructure Development in Africa projects (*see box on page 55*);

## Stand-alone solar PV installations a driver of employment

The International Renewable Energy Agency has collected some data on jobs in off-grid solar PV. These can result from different applications, ranging from stand-alone installations, such as solar lanterns and solar home systems, to mini-grids. The growth in grassroots rooftop PV installation and maintenance entrepreneurs has been observed as a very positive development in South Africa, where new jobs have been created.

"In general, stand-alone applications create more local jobs in installation and equipment distribution, while mini-grids require more employees in operations and maintenance (e.g. to collect tariffs)," IRENA says in its *Annual Review 2016*.

There is limited information available on employment in solar PV based mini-grids, but more data on jobs in stand-alone applications, led by PV systems which provide electricity access and create employment in countries such as Bangladesh, India and Kenya. In 2015, Bangladesh added an estimated 700,000 solar home systems (SHS), raising the total cumulative installations in the country to 4.5 million. IRENA estimates that the workforce in Bangladesh's stand-alone solar PV sector has increased by 13% to reach 127,000 jobs, a quarter of which are in manufacturing; the remaining jobs are spread across distribution, installation and after-sales services.

Companies that build, install and maintain stand-alone systems are rapidly scaling up operations and creating jobs along the value chain. The D.Light company, which manufactures and retails solar lanterns and SHSs, has sold over 10 million solar products, employing over 400 staff, in Uganda and Kenya, as well as China and India

Kenya-based M-KOPA Solar has sold over 300,000 SHSs in Kenya, Uganda, and Tanzania and created more than 700 full-time jobs, along with 1,500 sales representatives, the IRENA report said. In its latest update, M-KOPA says that, as of May 2017, it has connected over 500,000 homes, with 500 new homes being added every day, employing 1,000 full time staff.

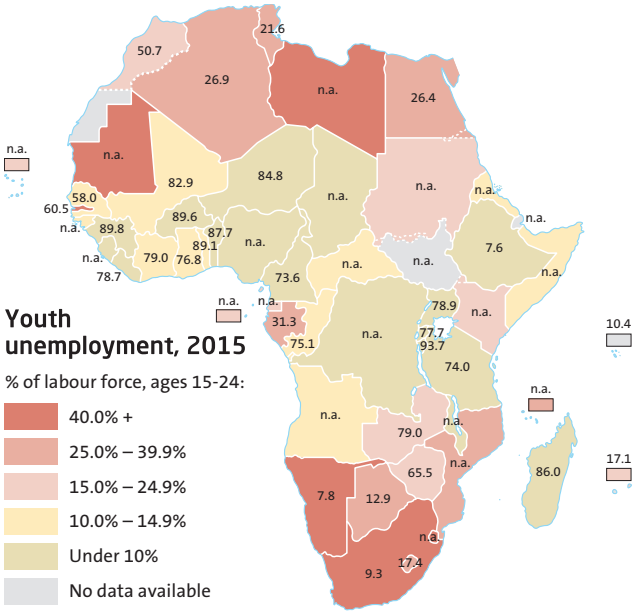
The growing number of companies operating in Sub-Saharan Africa include Azuri Technologies, BBOXX, Fenix International, Mobisol, Off Grid Electric, Renewable Energy Foundation, Solaraid, Solar Kiosk, Solar Now, Solar Sister and Tessa Power.

## A scalable instrument to estimate infrastructure job creation

Work by the New Partnership for Africa's Development (Nepad), supported by German technical assistance agency GiZ, has identified the imperative to estimate job creation in Programme for Infrastructure Development in Africa projects – recognising that data that show how PIDA and other regional projects stimulate employment will add to host governments' political commitment and encourage greater funding.

In the project's Phase I, a Toolkit methodology was developed, using the Ruzizi III hydropower plant and Central Corridor projects for pilot studies to estimate the number of jobs created. Phase II would estimate the impact of the majority of PIDA projects on the African labour market. This would track jobs in the project preparation, construction and post-construction phases.

The approach uses input-output tables to analyse economic impact and provide scalable methodologies. The International Finance Corporation has developed this approach to estimate job creation in 20 countries.




**Figures** show vulnerable employment, latest year from 2005 to 2014 (unpaid family workers and own-account workers as % of labour force)

**Working poor at $3.10 a day** (purchasing power parity)**:**
latest year from 2004 to 2013; % of total employed, ages 15 and over

| *Best 5 countries:* | *Worst 5 countries:* |
|---|---|
| Tunisia 4.6% | Malawi 87.7% |
| Mauritius 6.1% | Liberia 89.0% |
| Morocco 13.1% | Madagascar 90.0% |
| South Africa 16.6% | Mozambique 90.9% |
| Mauritania 17.6% | Burundi 93.5% |

Source: United Nations Development Programme

# Empowering Women

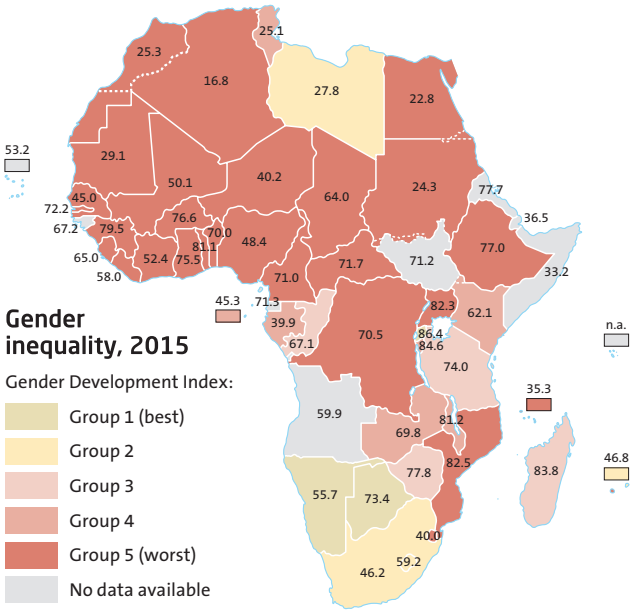
The AEEP has been acutely aware of the need to place gender issues at the forefront of all of its activities and advocacy. This has been especially prominent in its advocacy of clean cooking and in the activities of many of its closest collaborators, such as the NGO Practical Action.

In the decade since the AEEP's Political Targets were designed, the role of women has become increasingly important in the drive to provide sustainable energy services. Esmap's Africa Renewable Energy Access (AFREA) – Gender and Energy Program was set up as a way of mainstreaming gender issues into the work of AFREA and of rural energy agencies. To date, work has been conducted on gender assessments of projects, creating gender desks within energy agencies and working with project beneficiaries to identify the needs of men and women within communities.

The UN's Sustainable Development Goals (SDGs), established in September 2015, commit to "ensure access to affordable, reliable, sustainable and modern energy" by 2030 (SDG 7). This will require gender empowerment in the workplace and in marginalised communities – and in the process will promote other SDGs, including Goal 5, which seeks to "Achieve gender equality and empower all women and girls".

In its latest update of progress on the SDGs, the UN observes: "Gender inequality persists worldwide... Achieving gender equality and the empowerment of women and girls will require more vigorous efforts, including legal frameworks, to counter deeply rooted gender-based discrimination that often results from patriarchal attitudes and related social norms."

Among the several indicators used to judge the progress (or not) of SDG 5, the UN says "the average amount of time spent on unpaid domestic and care work is more than threefold higher for women than men, according to survey data from 83 countries and areas. Available data indicate that time spent on domestic chores accounts for a large proportion of the gender gap in unpaid work."




Ratio of female to male HDI (Human Development Index) values; countries are divided into five groups by absolute deviation from gender parity

**Figures** show female participation in the labour force, 2015 (%, ages 15 & over)

**% of seats held by women in parliament, 2015:**

| *Top 5 countries:* | *Bottom 5 countries:* |
|---|---|
| Rwanda 57.5% | Democratic Republic of Congo 8.2% |
| Seychelles 43.8% | Benin 7.2% |
| Senegal 42.7% | Nigeria 5.8% |
| South Africa 41.2% | Comoros 3.0% |
| Mozambique 39.6% | Egypt 2.2% |

Source: United Nations Development Programme

Collecting firewood and other traditional cooking tasks occupy a high proportion of Sub-Saharan women's time. Measures that reduce the need to forage or the time taken to cook food mean girls can go to school and women can use their time for productive uses.

Gender issues also affect utilities and other commercial institutions. The UN says that, globally, "women are still underrepresented in managerial positions". In the majority of the 67 countries with data from 2009 to 2015, fewer than a third of senior- and middle-management positions were held by women, it said.

As it moves forward, the AEEP is well-placed to further promote gender equality in the energy sector, from remote villages to the boardroom. Its Steering Group co-chairs, the AU and EU, both enshrine this goal in their policy.

The EU is committed to further mainstreaming gender policies across its activities. This includes in humanitarian aid allocation and programming – in the recognition that natural disasters and man-made crises are not gender-neutral, but have a differing impact on women, girls, boys, men and elderly people. The European Commission's European Civil Protection and Humanitarian Aid Operations has introduced a Gender-Age Marker, an accountability tool that measures how strongly humanitarian actions integrate gender and age. This found that 89% of all EU-funded humanitarian actions strongly or to a certain extent integrated gender and age in their planning in 2015.

# Scaling up clean cooking and fuels

Clean cook stoves and the replacement of traditional and insecure fuels are an effective way of improving the health of those using solid fuels, which cause nearly 500,000 premature deaths every year in sub-Saharan Africa. The unsustainable use of biomass fuels can cause deforestation and prevent women and girls from earning income and gaining education due to their traditional responsibility of cooking and firewood collection.

The Global Alliance for Clean Cookstoves, hosted by the UN Foundation, aims to provide clean and efficient cooking stoves and fuels to 100 million households by 2020. The programme comprises three phases: Phase I (2012-14) launched global and in-country efforts to grow the sector; Phase II (2015-17) is driving investments, innovation and operations to scale; and Phase III (2018-20) will seek to establish a sustainable global clean cooking stove market.

Until recently, the Alliance has prioritised reporting on stove and fuel production and distribution as part of Phase II. As they transition into Phase III in 2018, the focus will broaden to enabling policy, reducing trade barriers and integrating women and girls into the value chain. This shift may prove useful for harmonisation as it moves the Alliance's work into the same sphere of the AEEP's.

The Alliance recommends that such an approach will create a more comprehensive assessment of clean cooking stove market health, but this will require a greater effort and coordination in data collection over a long period of time. One area where the AEEP could help is in supporting data collection in Africa.

## A difficult situation

SEforALL data on the increase in access to clean fuels and technologies for cooking shows that only around 31 million more Africans gained access in 2010-14, while some 850 million people remain without access to clean cooking in Sub-Saharan Africa (SSA), out of 3 billion worldwide. The fastest rates of progress are being made in Asia; SSA remains reliant on charcoal and other biomass for cooking, along with other highly polluting fuels such as kerosene, which is widely used in Nigeria and Kenya. The average rate of access to clean cooking across the continent in 2014 was a meagre 26%, which compares unfavourably even with access to electricity.

According to the International Energy Agency (IEA)'s *Energy Access Outlook 2017**, over 90% of the SSA population – some 780 million people – rely on solid biomass for cooking. This figure is already nearly 50% higher than in 2000 – and the IEA forecasts the number of people without access to clean cooking growing to 910 million by 2030, reflecting the impact of population growth.

However, if sufficient resources can be mobilised to support clean cooking for all by 2030, the benefits would include avoiding an estimated 1.8 million premature deaths related to household air pollution and saving over 100 billion hours each year that are currently spent gathering fuel.

**www.iea.org/publications/freepublications/publication/weo-2017-special-report-energy-access-outlook.html*

# Mitigating Climate Change

## Sustainable Development Goal 13

**"Take urgent action to combat climate change and its impacts"**

Through its persistent advocacy of clean and sustainable energy solutions, the AEEP has been in the vanguard of promoting climate change mitigation since it was established. Climate change per se was not included in 2010 as one of the AEEP's 2020 Political Targets, but the understanding that urgent action is needed by all stakeholders has informed all AEEP actions throughout the Partnership's existence.

The AEEP had input into the historic 2015 Conference of the Parties (COP 21) climate conference and the Partnership was present at COP 22 in Marrakech, Morocco and COP 23 in Bonn, Germany.[1].

As part of its action, the AEEP has supported the African Renewable Energy Initiative's efforts to incorporate African energy ministers as key participants in the COP process.

The AEEP is in complete accord with the UN Secretary General's rationale for Sustainable Development Goal 13, that "Climate change is now affecting every country on every continent. It is disrupting national economies and affecting lives, costing people, communities and countries dearly today and even more tomorrow." Nowhere is this felt more acutely than in Africa.

**Felice Zaccheo, Head of Unit, Sustainable Energy and Climate Change, European Commission**

**"The Africa-EU Energy Partnership is very important and predominant in achieving the climate goals. The outcome of COP21 is clear: we need more clean energy investment – and this is what the Partnership does: boosting investment between the two continents, Europe and Africa. It will also help in tackling the climate change challenges."**

## Clean energy cuts emissions

Greenhouse gas emissions from human activities are driving climate change and continue to rise to their highest levels in history. This could see the world's average surface temperature likely to rise by 3º Celsius this century, with some areas of the world expected to warm even more.

The poorest and most vulnerable people are being affected the most, as desertification encroaches and

forests lose their tree cover – very often due to under-resourced communities' dependency on charcoal and other solid biomass. The extent of deforestation is shown in the map, based on UN data, opposite.

The AEEP is supporting one of the major solutions – providing affordable, scalable solutions that can "enable countries to leapfrog to cleaner, more resilient economies". The UN has observed that the "pace of change is quickening as more people are turning to renewable energy and a range of other measures that will reduce emissions and increase adaptation efforts". The AEEP's 2020 Political Targets have been a measure of the energy transition.

One indicator clearly linked to the global industry is global emissions of carbon dioxide ($CO^2$), which have increased by almost 50% since 1990. Emissions grew more quickly between 2000 and 2010 than in each of the three previous decades. While Africa is the smallest continental polluter, it still harbours some highly polluting energy industries.

However, as the UN has observed: "It is still possible, using a wide array of technological measures and changes in behaviour, to limit the increase in global mean temperature to 2º Celsius above pre-industrial levels". To achieve this, "Major institutional and technological change will give a better than even chance that global warming will not exceed this threshold."

The AEEP's future actions will clearly have these stark realities in mind.

## Europe is a crucial source of finance and investment

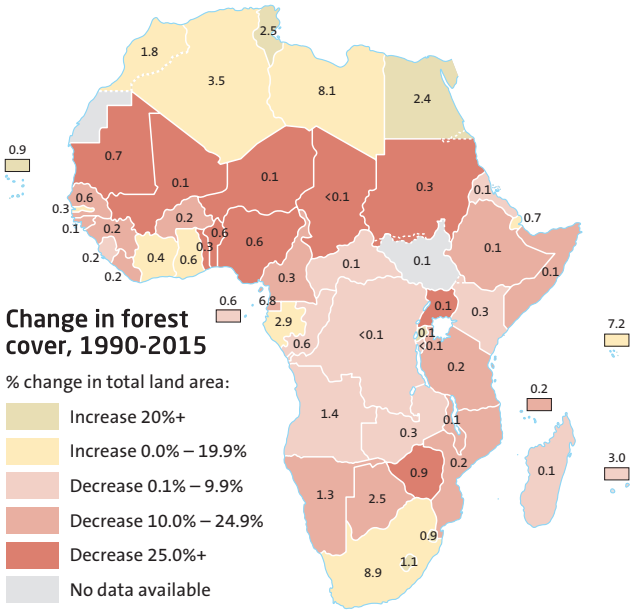
Europe is deeply involved in increasing financing flows to and investment in clean energy and other sectors that promote a low-carbon, climate-resilient future. The urgent need to raise the finances necessary to meet the funding goals of the COP 21 Paris Agreement, especially to support action by developing countries, was a major issue at COP 23 in November 2017.

The scale of the challenge is huge. UN Environment Programme Head of Finance Initiative Eric Usher said:

**"We need all financial players – public, private, domestic, international – and including markets and regulators, to work together effectively to mobilise at least $1.5trn in climate finance that is needed every year."**

Members of African civil society and parliaments used COP 23's 'Finance Day' to emphasise the urgency of climate finance to drive ambitious action on the continent. Pan-African Parliament (the legislative body of the African Union) President Roger Nkodo Dang emphasised that while "Africa is the continent that pollutes the least... it is Africa which suffers the effect of climate change." He added that developed countries have a duty to provide additional support for Africa's green development. "If you tell us 'do not cut the wood,' we say, 'you bring us electricity,'" he said. "It's not a favour; it's a compensation."

It is to facilitate this transition that the AEEP has been so active over the previous decade. The Partnership is looking towards having an even more impactful role in the future.




**Figures** show 2013 carbon dioxide emissions, tonnes per capita

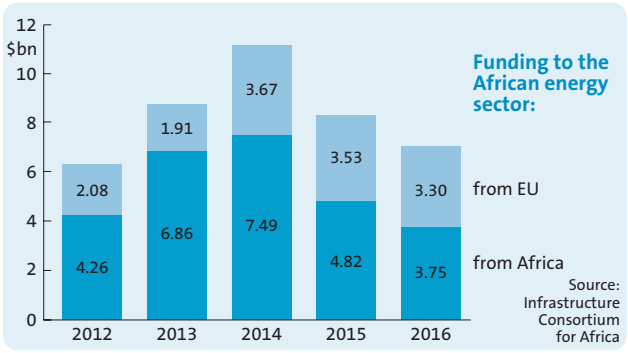
**Natural resource depletion, 2010-14:**
Monetary expression of energy, mineral and forest depletion as % of GNI (gross national income)

| *Best 5 countries:* | *Worst 5 countries:* |
|---|---|
| Mauritius <0.1% | Gabon 26.2% |
| Central African Republic 0.1% | Liberia 27.4% |
| Seychelles 0.1% | Democratic Republic of Congo 31.8 |
| Cape Verde 0.5% | Republic of Congo 39.2 |
| Morocco 1.0% | Equatorial Guinea 67.2% |

Source: United Nations Development Programme

[1] The 30 November-12 December 2015 United Nations Climate Change Conference, held in Paris, France, was designated COP 21, being the 21st session of the Conference of the Parties (COP) to the 1992 UN Framework Convention on Climate Change (UNFCCC). In was also the 11th session of the Conference of the Parties (CMP) to the 1997 Kyoto Protocol. The 2016 UN Climate Conference (COP 22) was held in Marrakech, Morocco, on 7-18 November 2016. The COP23 UN Climate Conference, presided over by Fiji, was held in Bonn, Germany on 6-17 November 2017.

# African and European Contributions




Analysis of the most recent data available indicates that European Union institutions, Member States and their corporate and individual citizens are playing an increasingly active role helping to develop Africa's energy infrastructures and capabilities. While measuring the financial contributions of all stakeholders remains challenging – as pointed out in previous AEEP *Status Reports* – a clearer picture is emerging of official financing flows; several positive trends are observable.

Contributions of European development finance institutions (DFIs) can be measured by their financial commitments. Tracking disbursements is more challenging, particularly when commitments are made to multi-donor or partially privately-owned entities or managed funds, which are subject to limited disclosure requirements. Data on outputs – such as additional gigawatts of power generation or kilometres of electricity lines installed – is not yet collated in a consistent manner.

The AEEP has proposed playing a role in this process, drawing on its decade of statistical analysis. Measuring outcomes such as employment, entrepreneurship and youth and gender integration opportunities that are created by investment in energy are more challenging but they could play an important part in the next phase of the AEEP's work.

More work is needed to identify a consistent dataset of outputs and outcomes that can be applied to the several thousand African energy projects recorded. However, while this could prove to be a daunting information-gathering challenge, requiring considerable resources and inter-institutional cooperation, research for the AEEP Secretariat suggests there is no technical reason why this should not be possible.

There are also issues in measuring indirect European contributions, most significantly made through the World Bank Group and African Development Bank (AfDB) Group, both of which have substantial European shareholdings and make big investments in African energy.

Progress is underway to record a complete ledger of European commitments into the African energy sector. The most complete time series is kept by the Infrastructure Consortium for Africa (ICA), which is managed by the AfDB in Abidjan. This useful tool has, over several years, tracked commitments made by the European Investment Bank, European Commission, France, Germany, the UK and, most recently, Italy. The ICA has been working to expand its coverage, with significant success, and this data is used to inform this report.

# African contribution

**African national governments allocated $3.8bn** in their annual budgets to energy projects in 2016. This was the lowest amount in the five years analysed by the Infrastructure Consortium for Africa (ICA) data. It compares with an average annual investment over the period of $5.4bn and represents a 22% decline in allocations in 2016 compared with the previous year. This is most likely due to interrelated global issues, including low growth rates and falling prices of oil and other commodities, rather than reflecting any wavering in governments' policy commitments. East Africa saw the largest decrease in energy spending, down 44% in 2016.

There was a clear dependence on external financing in many countries. But West Africa bucked the trend by doubling its spending in the energy sector. Gambia, Côte d'Ivoire, Liberia and Sierra Leone all prioritised the energy sector. (Among infrastructure sectors, national governments tend to allocate most to the transport). Côte d'Ivoire dedicated 78.2% of its infrastructure budget to the energy sector.

In terms of infrastructure spending per capita, southern African countries tended to spend more than many others. There are, however, exception: Cape Verde and the Seychelles spent $100 and $242 per capita respectively in 2016. In contrast, overall West Africa spending per capita was relatively low, averaging $23.8 per capita.

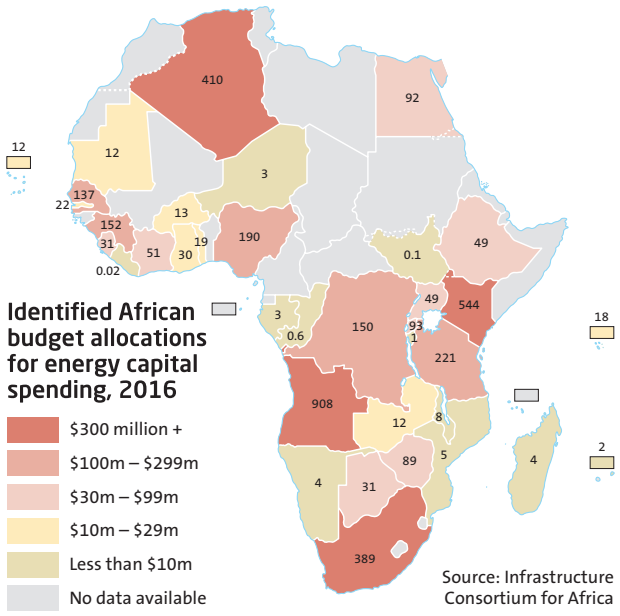
## Subnational sources offer a growing range of options

National government funding is supplemented in many countries by subnational funding sources such as local government and parastatal companies. In some of Africa's largest economies – including Egypt, Republic of South Africa (RSA), Nigeria and Morocco – there is a very substantial emphasis on subnational financing.

Indeed, African public sector contributions to the energy sector derive from an increasingly diverse range of sources. Traditionally these have included local or municipal governments or state utilities deploying their own internally generated funds or, as is increasingly the case, by leveraging finance from capital markets.

**Other instruments are emerging.** Sovereign bonds to finance Africa's infrastructure development have been issued by Angola, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Kenya, Namibia, Nigeria, Rwanda, Senegal, Seychelles, Tanzania, and Zambia. Nigerian states and South African parastatals, among other entities, have issued bonds to raise finance.

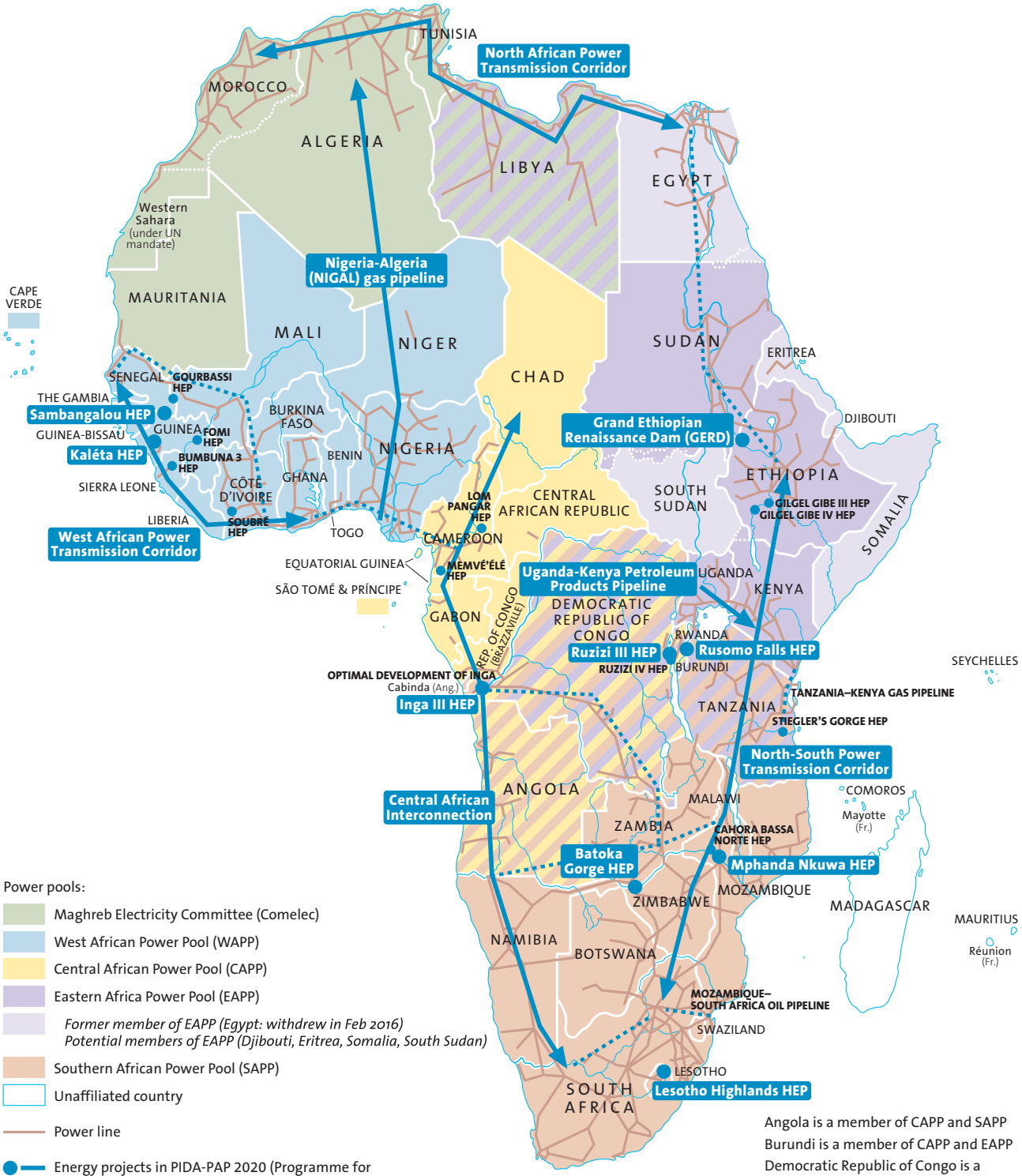
A Moroccan bank, Banque Centrale Populaire (BCP), launched a €100m green bond in November 2016 at the




Measuring African contributions to the continent's infrastructure presents challenges. Data used here is drawn from national budgets from which, wherever possible, only capital expenditure has been captured. Recurrent expenditure and external budgetary support from multilaterals and bilateral donors has been identified and excluded wherever possible to avoid double counting of commitments made by external sources of finance. Inclusion of revenue spending or double-counted data cannot be discounted.

Contributions by subnational bodies are not included in the overall data compiled by the ICA. In some countries where energy infrastructure spending is substantially made at a municipal or state level or by state utilities, these contributions may be substantial. Also not included in the data are contributions by sovereign wealth funds (SWFs), state-owned infrastructure bodies or finance raised by public entities on capital markets – sources of funding which are expected to increase in the next decade.

# Emerging Africa




Power pools:

- Maghreb Electricity Committee (Comelec)
- West African Power Pool (WAPP)
- Central African Power Pool (CAPP)
- Eastern Africa Power Pool (EAPP)

*Former member of EAPP (Egypt: withdrew in Feb 2016)*
*Potential members of EAPP (Djibouti, Eritrea, Somalia, South Sudan)*

- Southern African Power Pool (SAPP)
- Unaffiliated country
- Power line
- Energy projects in PIDA-PAP 2020 (Programme for Infrastructure Development in Africa Priority Action Plan)
- Energy projects in PIDA 2040

Sources: African Energy Atlas; Programme for Infrastructure Development in Africa (PIDA)

Angola is a member of CAPP and SAPP
Burundi is a member of CAPP and EAPP
Democratic Republic of Congo is a member of CAPP, EAPP and SAPP
Libya is a member of Comelec and EAPP
Rwanda is a member of EAPP and a applicant member of CAPP
Tanzania is a member of EAPP and SAPP

## African budgets, Continued from page 61

COP 22 climate change conference in Marrakesh. Its proceeds will be used to refinance investments in selected renewable energy projects in Morocco.

Rwanda launched its treasury bond issuance programme in 2014 to finance infrastructure projects, including power plants, and develop the local capital market. In February 2016, it issued a five-year $20m infrastructure bond and another $12m bond was issued in May 2017.

In October 2016, the Kenyan government's first ever 15-year infrastructure bond appeared, targeting energy as well as road, water and sanitation projects. The Central Bank of Kenya accepted bids worth around $300m from local and international investors.

South Africa's state-owned power utility Eskom issues government-guaranteed bonds and US dollar-denominated bonds in the international debt markets. Progress is being made in the development of bonds for infrastructure projects in South Africa's Renewable Energy Independent Power Producer Procurement (REIPPP) programme. The bonds have been under development since discussions began between the World Bank, the Johannesburg Stock Exchange (JSE) and the National Treasury in late 2015.

## Sovereign Wealth Funds

Although usually not yet as sophisticated as their counterparts in Europe, Asia, and the Middle East, the number of sovereign wealth funds (SWFs) in Africa is increasing. New resource discoveries and robust commodity prices in the 2000s substantially increased the continent's stock of SWFs. According to Quantum Global Group, there were 19 African SWFs in 2014, compared with only ten before 2010. So far they have not been prominent in the infrastructure space, but this could change. Several SWFs – including funds in Nigeria, Ghana and Kenya – have mandates to prioritise domestic investments, especially infrastructure and industrial development.

The Nigerian Sovereign Investment Authority (NSIA) is based on oil earnings, and has an asset base of $1.5bn, of which $600m is allocated to the Nigeria Infrastructure Fund. In 2016, NSIA joined with Ogun State Government and Lafarge Africa to develop the Ogun State Land Reforestation and Waste to Energy Project, which comprises three sub-projects: waste-to-energy, land degradation neutrality and biofertiliser. A fund for infrastructure is also contemplated for Kenya's SWF, if it materialises as a significant source of development finance once oil production starts.

# African Renewable Energy Initiative

The Africa Renewable Energy Initiative (AREI) was created as a **transformative Africa-led effort to accelerate, scale-up and harness the continent's huge potential of renewable energy (RE) sources**. Conceived and developed in the context of the United Nations Framework Convention on Climate Change (UNFCCC) and the African Union Committee of African Heads of State and Government on Climate Change, AREI was launched at the 21st Conference of the Parties (COP21) to the UNFCCC in Paris, France. Ten international partners committed to mobilise $10bn by 2020 to contribute to AREI's goal of achieving 10GW of new and additional RE capacity by 2020 and at least 300GW by 2030.

AREI sees the need to expand beyond household electricity access and provide energy that can drive productive sectors in local and national contexts. The *African Renewable Energy Initiative Action Plan*, published in 2016, outlined a number of energy access metrics. These include "a quantitative and relative increase in the number of [Micro, Small and Medium Enterprises] MSMEs and other users connected to national grids or new mini-grids". Such granularity is intended to ensure that AREI's target will achieve more equitable and sustainable energy access – and not simply equate success in megawatt terms. This aligns with the AEEP's 2020 Political Target for energy access: "To power productive activities; and to provide safe and sustainable energy services to households".

AREI has three distinct project phases, starting with an establishment phase (2016-17). Formal implementation will be followed by:

- **Phase I (2017-20)** – assessment, preparation and enabling of critical activities across several countries to ensure rapid deployment in Phase II. AREI aims to enable RE projects in the pipeline to add 10GW of generation.
- **Phase II (2020-30)** – the full-scale roll-out of nationally determined polices and programmes, and the achievement of 300GW of new and additional generation.

# A substantial rise in European commitments

**EU commitments and disbursements to infrastructure in Africa have risen substantially** over the past nine years. Data from the ICA show that the compound annual growth rate (CAGR) in commitments over the nine years to 2016 is 18%. The CAGR in disbursements over the eight years to 2016 is 12%.

In the three years to 2010, the EU committed $6bn to Africa's infrastructure development followed by a further $5.2bn in the following three years to 2013. **In 2014-16, EU commitments doubled over the previous three years to reach $10.5bn.**

Growth in commitments is substantially a product of bilateral support, notably from France and Germany, which between them committed $6.2bn in the three years to 2016 compared with $3.5bn in 2013-15.

At $3.3bn in the three years to 2016, commitments from the European Investment Bank (EIB) are less than the $4.3bn in the three years to 2010 (where there were exceptionally large commitments to North African projects). Over the nine years to 2016, the EIB has made the greatest volume of disbursements to African energy projects – of $4.6bn. In the same period, France disbursed $2.6bn, Germany $1.8bn, and the European Commission $1.2bn.

**European funding to multilaterals** is another important conduit for supporting for Africa's infrastructure development. EU Member States provide around half of the finance required for World Bank Group (WBG) and African Development Bank (AfDB) Group projects and programmes.

Member states are key partners of the WBG, holding around one-third of shares in the International Bank for Reconstruction and Development. They provided 50.6% of contributions to the 18th replenishment of the WBG's soft-lending International Development Association. This percentage is indicative of Europe's indirect contribution to the WBG's African energy commitments – equivalent, on average over the seven years to 2016 to an annual $757m.

EU member states also provided 51.3% of subscriptions to the 14th replenishment of the African Development Fund (ADF), which substantially provides the funds administered by the AfDB. If this percentage is applied to the AfDB's commitments to the African energy sector, then member states contributed an annual average of $426m in 2010-16.

Europe and Africa's financial commitments via DFIs to the continent's energy infrastructure development increasingly aim to catalyse substantially more investment than the headline amount of funds suggest.

**Blended finance techniques** that use concessional funds to leverage non-concessional funding that would not otherwise have been available will play a role in achieving this aim. Europe has actively promoted this funding type and will promote it further through the new European External Investment Plan (*see page 66*).

**The EU-Africa Infrastructure Trust Fund (EU-AITF)** was established the in 2007 by the EU, Member States and the EIB. It is the second largest EU facility that blends investment. The EU-AITF aims to increase European and African investment in infrastructure and related services, providing support for large regional programmes that facilitate interconnectivity and regional integration.

**EU-AITF grants have leveraged investments worth €18.5bn, contributing to 7.1GW of additional renewable electricity and 26,193km of T&D lines**

The EU-AITF's initial objective was to provide grants for regional and cross-border infrastructure projects in the energy, water, transport and communications, and telecoms sectors. A second objective was introduced in 2013 to support projects falling within the EU's guidelines for the Sustainable Energy for ALL (SEforALL) initiative.

By 2016 the EU-AITF had provided €438m to 67 energy projects, representing 62.7% of its total provision of €698m. Every euro of EU-AITF grant support is calculated to have leveraged €18.5bn of investments. Funds directed to power projects contributed to 7.1GW of additional electricity from renewables and 26,193km of transmission or distribution lines installed or upgraded.

**The African Investment Facility (AfIF) is replacing** the EU-AITF. Formally launched in July 2015, AfIF is tasked with managing all blending, as well as financial instruments and programmes.

In 2016, AfIF supported one regional and four country-specific projects in the energy sector:

- **Electrical network interconnection in guinea and mali –** Total budget: €329m, including €18.86m AfIF Investment Grant and €11.14m Technical Assistance. Lead finance institution is the AfDB (€70m), with co-financing from Banque Ouest Africaine de Développement (€23m), Islamic Development Band (€53m), Ecowas Bank for Investment and Development (€48.5m), Agence Française de Développement (AFD – €35m), others (€51.7m), and the governments of Guinea (€14.2m) and Mali (€3.6m).
- **Sovereign loan to Côte d'Ivoire for renewable electricity access, production and distribution –** Total budget: €129.2m, of which AfIF contribution is €24m Investment Grant. Lead finance institution is AFD (€105.2m).
- **Senegal Electricity Modernisation –** €158.98m budget including €13.08m AfIF Investment Grant. The EIB is lead finance institution (€75m), with the WBG (€65.92m), the Government of Senegal (€3.37m) and others (€1.61m).
- **Sunref Nigeria –** Total budget of €134m includes €10m AfIF Investment Grant. Lead finance institution AFD (€100m) is co-financing with project developers (€20m).
- **Enhancing Vocational training delivery for the power sector in Nigeria –** Total budget: €50.7m, of which €8m from AfIF Technical Assistance and €42.7m from AFD.

# Building up development capital resources

Institutional investors – pension funds in particular – and African domestic investors are needed to fund the continent's energy financing gap. There is now clear evidence to show that so-called patient development capital can leverage investment from these sources.

At the end of 2016, Uganda's National Social Security Fund (NSSF) became the largest shareholder in Umeme, the country's main electricity company, which was in poor condition in 2005 when it attracted development capital from the UK's CDC Group. After years of improvement, the British DFI exited its investment in 2016 by selling 12% to institutional investors, including NSSF and several international funds. Subsequently, a remaining 2.3% stake was offered to domestic retail investors and management.

This approach has so far been adopted by a handful of DFIs. Norway's Norfund and the WBG's International Finance Corporation (IFC) include patient equity investments in their modus operandi. Supporters of this funding type say private equity can strengthen corporate governance of local firms and help them grow – and by bringing in cash rather than debt, private equity is investing development capital where it is most needed.

Agence Française de Développement and CDC are investing together €600m of equity in infrastructure projects over the next five years.

The Sustainable Energy Fund for Africa (SEFA), administered by the AfDB, is structured as a multi-donor trust fund, anchored in a commitment of $60 million from Denmark and the United States. SEFA aims to support sustainable private sector-led economic growth through the efficient utilisation of presently untapped clean energy resources. One of SEFA's financing windows provides equity capital combined with a dedicated technical assistance envelope to be deployed by the SEFA co-sponsored African Renewable Energy Fund, a pan-African private equity fund solely focused on 5MW-50 MW renewable and stranded gas IPPs.

## Nigeria hydroelectric financing

The AfDB made its inaugural private sector power transaction in Nigeria in December 2016, when it approved a financing package of $100m for the rehabilitation of the Kainji and Jebba hydropower plants on the Niger River. This featured $20m in equity alongside an $80m loan, designed to increase capacity from the currently available 917MW to the dam's nameplate capacity of 1,338.4MW. The twin plants are operated by private investor Mainstream Energy Solutions under a 30-year concession it secured following a competitive tender held in 2012. The facilities generate on average around 20% of the country's total electricity supply.

The transaction was handled by AfDB's Private Sector Department. Under the New Deal on Energy for Africa, the AfDB is working with governments, private sector, bilateral and multilateral initiatives to develop a platform for innovative energy sector public-private partnerships.

As highlighted by the ambitions of the new European External Investment Plan, discussed below, DFIs need to offer financing solutions that go beyond loans and grants, scaling up structure that attract private capital. There is a considerable way to go: the ICA records that out of its members' total 2016 commitments of $18.62bn across all infrastructure sectors (energy, transport, water and ICT), only $320m was provided in equity investment, while blended finance was provided through $920m of loans and $810m of grants.

| European Energy Commitments to Africa 2008-16 ($m) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| EC | 0 | 345 | 93 | 166 | 595 | 336 | 267 | 318 | 629 |
| EIB | 1,242 | 319 | 2,292 | 146 | 821 | 588 | 498 | 868 | 509 |
| EU-AITF* | | | | | | | 45 | 82 | 58 |
| France | 331 | 204 | 743 | 791 | 637 | 854 | 1166 | 1394 | 994 |
| Germany | 299 | 126 | 386 | 288 | 599 | 352 | 1,190 | 682 | 779 |
| UK** | 27 | na | 21 | 26 | 27 | 29 | 223 | 49 | 34 |
| Other EU | | | | | | 90 | 549 | 458 | 295 |
| **Total** | **1,899** | **994** | **3,535** | **1,417** | **2,679** | **2,249** | **3,937** | **3,851** | **3,298** |

*included within EIB until 2014. **DfID & CDC. na = not available

# European External Investment Plan

The European Commission has started the implementation of the EU's ambitious new External Investment Plan (EIP), which is designed to boost more inclusive and sustainable public and private sector investments in Sub-Saharan Africa and the European Neighbourhood, which includes the North African countries. By boosting investment the EIP addresses some of the obstacles to growth,economic and social development in the EU's partner countries. It will contribute to achieving the Sustainable Development Goals while tackling some of the root causes of irregular migration and strengthening public and private partnerships for development

A major step forward came when the European Parliament and Council in September 2017 adopted the creation of a central element of EIP, the European Fund for Sustainable Development (EFSD). After this, EU High Representative and Vice-President Federica Mogherini observed that less than 10 per cent of foreign direct investment in Africa goes to fragile regions – those that need it the most. "We want our External Investment Plan to become a powerful engine of more inclusive and sustainable growth, to create green energy, to bring new opportunities to entrepreneurs, also in the European Union, to young people, to empower women. This is the plan Africa needs, this is what our African partners are asking for, this is European partnership at its best," she said.

Commissioner for International Cooperation and Development Neven Mimica added that "by leveraging in particular private finance, our contribution of €4.1bn will leverage up to €44bn of investments, which otherwise would not happen. Now it is up to all key players of the private sector in Europe and in our partner countries to join us in creating sustainable growth and decent jobs for the benefit of all."

The EFSD's Strategic Board includes the EU Member States and European Investment Bank, with the European Parliament as observer. The fund is developing a series of 'investment windows', which define priority sectors for the EFSD Guarantee, which have been identified as essential for the creation of decent and sustainable jobs.

An important contribution to the global effort to provide more holistic solutions to support the development of more sustainable projects, the EIP brings together lessons learned by the Commission over ten years of blending activities. It integrates a new generation of financial instruments into more traditional forms of assistance such as grants, guarantees and risk-sharing instruments. Substantial technical assistance will help beneficiaries produce more mature and financially viable projects and businesses.

In parallel to this, the EU is stepping up its dialogue with partner countries, along with a structured dialogue with the private sector actors critical to providing major new financing flows, to improve the investment climate and business environment in partner countries.

| European Energy Disbursements to Africa 2008-2016 ($m) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| EC | na | 23 | na | na | 297 | 230 | 257 | 112 | 296 |
| EIB | na | 431 | 1,017 | 445 | 658 | 406 | 614 | 453 | 531 |
| EU-AITF* | | | | | | | 47 | 28 | 26 |
| France | na | na | 98 | 251 | 320 | 439 | 572 | 405 | 485 |
| Germany | na | 5 | 9 | na | 56 | na | 243 | 535 | 951 |
| UK** | na | na | 10 | 0 | 2 | 107 | 71 | 68 | 41 |
| **Total** | | **459** | **1,134** | **696** | **1,333** | **1,182** | **1,805** | **1,600** | **2,330** |

*included within EIB until 2014. **DfID & CDC. na = not available

# ElectriFi helps to fill a gap in the market

The Electrification Financing Initiative (ElectriFI) was set up by the European Commission and European Development Finance Institutions (EDFIs) to "unlock, accelerate and leverage private sector investment to increase or improve access to affordable, reliable, and sustainable energy in developing countries". It aims to support investments that harness reliable renewable energy to install new and improved connections. ElectriFI has a special focus on the needs of underserved rural areas, and those affected by unreliable power supply.

ElectriFI was born as an initiative to tackle a shortfall in financing for this critical sector – namely the reluctance of commercial banks to provide suitable lending terms for investors and existing capacity limitations when it comes to structuring projects and bringing them to financial close. ElectriFI is thus designed to provide interim financing solutions to help projects reach a mature stage where commercial investors can take over.

ElectriFI's current financing envelope is over €116m, which includes $10m from the US Power Africa initiative. Implemented by Dutch development bank FMO, working with the EDFI Association of 15 European development banks through the Brussels-based EDFI Management Company, the programme has a timeframe of ten years, which could be extended if additional funding is secured.

ElectriFI launched a first call of proposals in April 2016, which received 292 applications; a second CfP in February 2017 received 156 applications. Although the initiative covers developing countries and emerging markets world-wide, a high proportion of ElectriFI's activities are in Sub-Saharan Africa (SSA) due to the region's low electrification rates and substantial needs.

Applicable to off- and on-grid solutions, all renewable technologies are eligible (with the exception of first generation biofuels). A combination of renewable and conventional generation can be considered if a mix is essential for the stability of a system.

All projects must show they are financially sustainable. Otherwise ElectriFI supports a variety of innovative business models – including independent power projects (IPPs), mini-grids and solar home systems – that are replicable and scalable. ElectriFI only considers projects that have entered the active development stage.

Funding ranges from €0.5m to €10m. ElectriFI provides financial support through risk capital, without competing with other investors, hence remaining additional to other funders. Its financing solutions are flexible, including debt, mezzanine and equity.

Showing what is possible, ElectriFI has financed Sigora's mini-grids in Haiti and Mera Gao Power's micro-grids in rural Uttar Pradesh in India; both investments apply solar PV and battery storage. ElectriFI has provided technical assistance to NextGen's 5MW solar IPP, which is connected to an isolated grid in Tanzania, and to the Benoo mini-grids project in Togo.

# Scaling Up, Changing Perspectives

The Africa-EU Energy Partnership's ten-year anniversary marks a decade of fruitful, effective and important cooperation on sustainable energy. It has been a decade in which the sector has proven to be critically important and dynamic. As *Status Report 2017-18* shows, many of the AEEP's 2020 Political Targets have been either achieved, exceeded or are on the right course. Based on current growth rates, it is expected that by 2020, an additional 223 million Africans will have received an electricity connection, far exceeding the original target of 100 million. All the renewable energy targets are on track, with conservative projections calling for an additional 28GW of RE to be operational by 2020. An acceleration in the number of cross-border connections in the project pipeline looks forward to a further improvement in energy security on the continent, while energy intensity has decreased steadily, leading to higher rates of energy efficiency.

The AEEP has provided a platform for high-level political dialogue, giving Europe and Africa a shared voice as energy has risen to the top of the global political agenda. This was most notably signalled by the inclusion of energy as an explicit Sustainable Development Goal, setting overall targets that the Partnership's experience in providing key input and supporting instruments to international initiatives can help to achieve in the period to 2030. The AEEP will remain closely aligned with major Africa-focused initiatives, such as Sustainable Energy for All and the African Renewable Energy Initiative.

The AEEP looks forward to future collaboration with an ever widening constituency of stakeholders. It expects to further align its priorities to fit the changing stakeholder landscape, and scale-up the development of sustainable energy systems in Europe and Africa. As the Partnership celebrates a decade of multi-stakeholder engagement and dialogue, it remains an agenda-setter for African-European cooperation on energy issues.

# Achieving targets, with greater ambitions

The AEEP will continue its work in the dynamic sector of energy and development, where new priorities, challenges and opportunities have called for a realignment of the Partnership to enable it to continue its pioneering role in the future.

With many of its 2020 Political Targets either on track, or already achieved, the AEEP is examining ways to define more ambitious targets and track the sector's contribution to social, economic and environmental progress in Africa. Along the way it will continue to ensure that sustainable energy systems develop in a way that provides equitable access to all. It will promote strategies that increase the capacities of countries to mitigate and adapt to climate change. It will promote investment that creates sustainable green jobs in Africa, which are of critical importance to assuring the future of the continent's young populations over the coming decades.

Putting in place the necessary structures to maintain the growth of renewable energy solutions on the continent will also, of course, remain a priority. As RE technologies become increasingly cost-competitive, engaging the private sector and reducing barriers to market entry for project developers will be a core focus of the AEEP's work.

It is to promote all these – and possibly more – aims that the Partnership will continue to be an effective framework for high-level political dialogue between the continents, engaging with international initiatives, promoting coordination and acting as an information hub for innovative ideas and best practices. The AEEP will continue to engage with the maximum number of stakeholders, aligning its goals and work flows, where possible, with like-minded partners, and carrying the challenge of managing the sustainable energy transition to both its partner continents.

## Abbreviations

| | |
|---|---|
| **bcm** | billion cubic metres |
| **bn** | billion |
| **C02e** | C02 equivalent |
| **CSP** | concentrated solar power |
| **GJ** | gigajoule |
| **GW** | gigawatt (MW1,000) |
| **h** | hour (as in GWh) |
| **HEP** | hydroelectric power |
| **km** | kilometre |
| **kV** | kilovolt |
| **kW** | kilowatt |
| **m** | million |
| **MJ/$** | million joules/dollar |
| **MW** | megawatt |
| **PV** | photovoltaic |
| **tcf** | trillion cubic feet |
| **t/yr** | tonnes a year |

## Definitions

**Hydropower** includes micro-hydro and pumped storage projects unless otherwise stated.

**Biomass** for electricity generation (rather than, cooking) covers the burning of organic matter . This category of 'Other Renewables' includes waste-to-power projects.

**Solar** is utilised as a semantic covering any form of electricity generation which uses the sun as its sole energy source unless further specified.

**Thermal** covers fossil fuels such as petroleum products and coal when used for electricity.