G20 Energy Access Action Plan:

Voluntary Collaboration on Energy Access

Executive Summary

1. Within the framework of the G20 Principles on Energy Collaboration agreed at the Brisbane Summit, G20 Leaders committed to work together to "ensure access to affordable and reliable energy for all", recognising that the lack of access to energy that is affordable, reliable, viable sustainable and modern currently acts as a severe obstacle to poverty eradication, economic growth and social development and inclusion, particularly in developing countries. Under the newly agreed UN Sustainable Development Goals, energy access is a core priority, enshrined in Goal 7.
2. In the spirit of the Principles of Energy Collaboration and the SDGs, many G20 members are already actively working to improve energy access worldwide. The G20 Energy Access Action Plan: Voluntary Collaboration on Energy Access (the "Action Plan") is intended to strengthen collaboration of G20 members on energy access issues in a flexible way, taking account of existing initiatives, and will focus on adding value through the sharing of knowledge, experiences, and good practices, in accordance with national circumstances and developmental priorities. The first phase of the Action Plan highlights a number of possible options that G20 members could embrace to support electricity access in sub-Saharan Africa with the recognition that determination of the energy mix of a country is a sovereign decision of the respective governments, including the usage of all available indigenous renewable and fossil energy resources. These options for sharing of knowledge, experiences and good practices are grouped under the following headings: policy and regulatory environment; technology development, dissemination, and deployment; investment and finance; capacity building; regional integration; and coordination and collaboration
3. The Action Plan is envisaged to be a multi-phase plan focusing on different regions and thematic issues as chosen by future G20 presidencies. This document presents the first phase which will focus on improving electricity access in sub-Saharan Africa. Future phases of the Action Plan may focus on different regions of the world and may emphasize additional areas as would be endorsed by the ESWG through consultations.
4. The Global Facilitation Team of the Sustainable Energy for All (SE4All) initiative will support collaboration under the Action Plan, cooperating with other relevant organizations to prepare regular input into the G20 Energy Sustainability Working Group (ESWG) and to help avoid inefficient duplication.
5. G20 members and other participating countries acknowledge the importance of providing sufficient resources to SE4All and other International Organizations through voluntary contributions and in-kind contributions to assist work under the Action Plan to progress.

Introduction

The G20 is committed to working together to ensure access to affordable, reliable, viable sustainable, and modern energy for all, in line with the Sustainable Development Goal 7 agreed by the United Nations General Assembly. Access to modern energy is a key enabler for poverty eradication, social inclusion, health, education, productive economic activity, gender empowerment and all-round improvements in quality of life. Yet, more than 1.1 billion people in the world live without access to electricity and many more are faced with supply that is insufficient, unreliable and too costly to meet their needs. Around 2.9 billion people rely on the traditional use of biomass for cooking, causing indoor air pollution that the World Health Organization estimates leads to 4.3 million premature deaths each year, more than from malaria, tuberculosis and HIV/AIDS combined. Of this, close to 800,000 premature deaths occur in Africa. Beyond the household, access to modern energy services is critical to overcoming poverty, to enabling productive economic activity and the provision of public services. Overall, the lack of access to modern energy services acts as a severe obstacle to economic growth and social development, particularly in developing countries. This challenge is concentrated overwhelmingly in sub-Saharan Africa and parts of Asia, with smaller (but still significant) populations in other parts of the world, including Latin America and the Caribbean, Oceania and the Middle East.

The G20 Energy Access Action Plan (the "Action Plan") is intended to complement existing global and regional initiatives. The Action Plan is envisaged to be a multi-phase plan focusing on different regions and thematic issues as may be decided by future G20 presidencies. This Action Plan presents the first phase that focuses on improving electricity access in sub-Saharan Africa where two-thirds of the population (around 620 million people) live without electricity, according to the International Energy Agency's (IEA) *Africa Energy Outlook* (see Annex). Many African governments place a high priority on improving electricity access and significant positive action is already underway, but they still face a number of regulatory, technical, institutional, financial and other challenges that are holding back the much needed investments in the energy infrastructure and capacity development. The Action Plan highlights a number of possible options that G20 members could embrace to support electricity access in sub-Saharan Africa. These options are grouped under the following headings: policy and regulatory environment; technology development, dissemination, and deployment; investment and financing; capacity building; regional integration; and coordination and collaboration. Future phases of the Action Plan may focus on different regions of the world and may emphasize additional areas such as clean cooking and women and children's health, the water-energy-food nexus, the social and economic impact of energy access and measures to promote the productive use of energy, as well as other energy access issues, as may be endorsed by the ESWG through consultations. This first phase of the Action Plan, however, focuses on access to electricity. It has to be emphasized that the determination of the energy mix of a country is a sovereign decision of the respective governments, including the usage of all available indigenous renewable and fossil energy resources. Depending on the specific circumstances and resource endowment renewable sources of energy may prove to be particularly attractive. It is also noted that sub-Saharan Africa is rich in many forms of energy resources. It is clear, moreover, that sustained socio-economic development depends on access to services that enable productive uses of energy sources.

[1] The number of people without access to electricity globally has slightly decreased in recent years: the SE4All Global Tracking Framework 2015 up-dated the number to 1,1 Billion.

The Global Facilitation Team of the Sustainable Energy for All (SE4All) initiative will support collaboration under the Action Plan, cooperating with other relevant organizations, such as the International Energy Agency (IEA), World Bank (WB), Turkish Energy Market Regulatory Authority (EMRA), United Nations Development Programme (UNDP), African Development Bank (AfDB), African Union Commission (AUC), United Nations Economic Commission for Africa (UNECA), Organization of the Petroleum Exporting Countries (OPEC), OPEC Fund for International Development (OFID), International Energy Forum (IEF), International Renewable Energy Agency (IRENA), International Gas Union (IGU), Food and Agriculture Organization of the United Nations (FAO), Global Lighting and Energy Access Partnership (Global LEAP), European Union Energy Initiative Partnership Dialogue Facility (EUEI PDF), the Africa-EU Energy Partnership (AEEP), the ASEAN Centre for Energy (ACE), the Energy Charter, as well as other relevant regional organizations, including from Asia and Latin America to prepare regular input to the G20 Energy Sustainability Working Group (ESWG) as directed by the ESWG and to help avoid duplication. For the first phase of the Action Plan, the African-institutions led SE4All Africa Hub will be of particular importance for these tasks. In preparing input to the ESWG, SE4All will continue to draw on relevant existing tracking tools such as, but not limited to, the SE4All Global Tracking Framework (GTF) which is coordinated by the World Bank and the IEA, the Readiness for Investment in Sustainable Energy (RISE) led by the World Bank, and the forthcoming Status of Energy Access Report (SEAR). G20 members and other participating countries acknowledge the importance of providing sufficient resourcing to SE4All and other IOs through voluntary contributions and/or in-kind contributions to assist work under the Action Plan to progress.

1. Policy and Regulatory Environment

KEY OPTIONS
Participating members undertake to support efforts to help governments at country-level to strengthen their domestic policy setting, energy sector planning, regulatory framework, regulatory institutions and the technical capacities of their power utilities and to improve sector governance in order to increase public and private investments in energy access according to their national circumstances and priorities.

The challenge: The African energy sector has evolved in recent years in terms of increased focus on investment, regulation and coordination with increased investments and the emergence of Independent Power Producers and Small and Medium Enterprises as providers of services through off-grid and mini-grid technologies, providing a complement to on-grid capacity which provides increased energy supply and services, particularly to rural areas. However, a major increase in energy access activity and investments is required in order to achieve electricity access for all, which could materialize and provide the relevant benefits with supportive policy and regulatory environments.

Options that G20 members could embrace to support electricity access in sub-Saharan Africa:

1.1. Within bilateral and multilateral efforts to support electricity access in sub-Saharan Africa, prioritise the following policy options:

a. Assist in enhancing national energy policies and related electrification plans and targets, ensuring that good governance and effective means of implementation underpin them. Complementary to north-south cooperation, south-south cooperation could have a particularly beneficial impact in this regard.

b. Assist in elaborating sound regulatory rules at country-level related to tariff structures, licensing and concession granting, and other legal instruments, as credible and competent regulatory authorities constitute a prerequisite to attract the needed investments.

c. Support, while taking into account the needs of vulnerable populations, the implementation of policies to price energy that consider the overall commercial and structural viability of utilities and other parts of the power sector, while balancing this with the objective of affordable, reliable, viable, sustainable, and modern electricity for all.

d. Support the development of regulatory frameworks that are attractive to potential new electricity suppliers (the private sector as well as public entities), and are proportional, so as to encourage small and micro suppliers and auto-producers.

e. Support the ongoing and future African voluntary country-led processes to develop SE4All Action Agendas with appropriate goals as an umbrella framework for energy sector development at the national level. These frameworks will have a long-term vision, ensuring overall inclusive sector-wide coherence and synergy of the accumulated efforts towards these goals, developed in a cross-sectoral approach recognizing the links of energy to multiple other forms of critical infrastructure development and domestic policy goals, expanding local skilled workforce and expertise, and developed in a multi-stakeholder approach bringing in private sector, civil society and development partners, while benefitting from relevant best practice toolkits.

1.2. Linked to the G20 Energy Efficiency Action Plan, intensify efforts to support energy efficiency in the broader context of sustainable development, including for affordable, reliable, viable, highly efficient, high-quality appliances and equipment to support household, community, and income-generating end-uses in grid and off-grid contexts.

2. Technology Development, Dissemination, and Deployment

KEY OPTIONS
Participating members undertake to work together with relevant parties to support the development, dissemination, deployment and scale-up of innovative technologies and business models to increase affordable, reliable, viable sustainable, and modern energy access according to national circumstances and priorities.

The challenge: Many of those without modern energy represent the poorest and hardest to reach communities. There is already significant innovation underway to identify, pilot and promote key technologies and business models that are needed to ensure affordable,

reliable, viable sustainable, and modern energy access to all. For example, the market-based expansion of household solar systems in East Africa, often with "Pay-as-you-Go" microfinance, has meant that while in 2008, only 1% of Africans used solar power, in 2014, 5% of Africans did so. Such rapid progress indicates the potential of new technologies and business approaches to accelerate energy access projects.

Options that G20 members could embrace to support electricity access in sub-Saharan Africa:

2.1. Support the integration of mini- and off-grid electricity access solutions into national electrification policies and plans as a complement to cost-effective on-grid solutions, including those for the transmission and distribution network.

2.2. Support innovative on-grid solutions that can be harnessed to meet the considerable energy access needs of the region and help to extend power generation and distribution, particularly in rural areas.

2.3. Support collaborative efforts such as those of the Sustainable Energy for All High-Impact Opportunity on Clean Energy Mini-grids including the Africa-focused Green Mini-Grid Market Development Program.

2.4. Leverage G20 experience with smart metering and power electronics (e.g. inverters, for anti- islanding, off-grid with or without hybrid operation) to enable affordable access to products, nationally-determined standardization, product aggregation and efficient supply chains.

2.5. Support the development, deployment and dissemination of a broad range of innovative energy access solutions through suitable R&D programmes, and scaling up local expertise. Identify opportunities for technology transfer and adaptation to help ensure energy access to all.

2.6. Enter into partnerships and agreements with national governments to provide a co-ordinated toolkit of support to develop the market for decentralized energy systems, linked to a series of policy reforms to enable market acceleration.

2.7. Share knowledge on establishing and enforcing nationally-determined standards to provide quality assurance for new energy access solutions, including suitable grid codes.

2.8. Facilitate transfer of innovative technologies to sub-Saharan governments in energy efficiency, renewable energy and clean energy which contributes to low GHG economic growth which may otherwise be difficult for these countries to obtain if left entirely to market mechanisms.

3. Investment and Finance

KEY OPTIONS
Participating members undertake to work with countries, financiers and other relevant stakeholders to develop and implement financial approaches to enhance capital flows to energy access investments across the value chain according to national circumstances and priorities.

The challenge: Investment in energy access services in Sub-Saharan Africa is far short of what is required to ensure modern electricity access services to all. The GTF estimates that an additional $36 billion annual investments would be needed to achieve universal electrification by 2030. Hence, many sources and forms of finance will be required, including a dramatic upswing in public and private sector flows.

Options that G20 members embrace to support electricity access in sub-Saharan Africa:

3.1. Support governments focused on attracting energy access-related investments through existing frameworks such as SE4All Action Agendas and Investment Prospectuses, and with the appropriate financing instruments. The World Bank's Readiness for Investment in Sustainable Energy initiative (RISE), Climate Scope, and others will help countries to identify the enabling environments and gaps for such investment.

3.2. Support co-finance by African governments and the wider international community in the form of concessional development finance, supplemented by aid, aiming at unbundling risk and aligning Africa's risk premium with realities on the ground.

3.3. Deepen dialogue with private financial intermediaries and Development Finance Institutions (DFIs) on transforming investment prospectuses to bankable projects, making use of project preparation facilities and dedicated instruments. Support coordination between international financial institutions, development finance agencies and development partners.

3.4. In line with their own financing policies and geographical sphere of activity, G20 members may want to explore opportunities to prioritize and increase financing for funds, programmes and projects to expand electricity access.

3.5. Explore the establishment of sharing good practices and knowledge experience from across countries and regions on de-risking facilities, aimed at accelerating and scaling up high-impact innovations in energy access including effective on- and off-grid distributed energy products and services, establishing investor marketplaces and energy access market accelerators. This may take into consideration also the relevant facilities suggested under the G20 Toolkit of Voluntary Options for Renewable Energy Deployment under ESWG.

3.6. Support the tracking of the scale and scope of global public and private investments for

energy access, and ensure that these are reported within SE4All's existing Global Tracking Framework.

3.7. Employ development finance as one method to de-risk private investments in innovative energy access solutions, including micro-finance for energy products and productive use devices and financing of energy enterprises.

3.8. Engage with investors to facilitate investments in the spirit of various fora which have called for stepping up clean energy investments by the developed world in developing countries.

4. Capacity Building

KEY OPTIONS
Participating members recognize the vital importance of capacity building and undertake to actively support efforts to build the energy sector capacity necessary to underpin energy access efforts according to national circumstances and priorities.

The challenge: Most countries in sub-Saharan Africa face serious capacity constraints within energy sector institutions. Existing and future energy access efforts will be hindered severely if existing capacity constraints are not prioritized for action and overcome.

Options that G20 members could embrace to support electricity access in sub-Saharan Africa:

4.1. Strengthen national and supra-national agencies/institutions/utilities/regulators through the promotion and support of twinning projects between regions, countries, and cities, expert exchanges, university research programmes, study visits and peer reviews between sub- Saharan countries and G20 countries, as well as between African countries themselves.

4.2. Support the dissemination of successful cases of reform of policy, legal, and regulatory frameworks, with a special focus on potential south-south cooperation.

4.3. Direct enhanced aid funding to projects and programmes that enhance energy sector capacity and accelerate the development and transfer of the technology needed to expand energy access.

4.4. Through the SE4All Knowledge and Capacity Building Hubs, and other bilateral/multilateral training and capacity building activities, contribute to the development of a knowledge base built on good practices and lessons learnt from successful programs/projects and aim to share the knowledge through good practice toolkits, information packages, webinars and direct stakeholder engagement, while taking into account the national context and circumstances.

5. Regional Integration

KEY OPTIONS
Participating members undertake to work together with energy policy makers, energy regulators, power pools, African and international institutions and other interested parties and organizations to encourage and support regional integration in the energy sector and the development of regional projects.

The challenge: An affordable and reliable energy supply is key for increasing energy access. Depending on their national circumstances, countries need to find the appropriate mix to ensure energy security and achieve sustainable development. Natural resources (renewable and fossil) are endowments that are distributed unevenly across the continent and regions. Regional projects and regional integration in the energy sector allow a least-cost approach that takes advantage of cheaper and more sustainable energy resources, facilitates the integration of different types of energy resources, leads to higher utilization of resources, improves energy security, and reduces environmental impacts. However, regional projects are also highly challenging in terms of planning, financing and operation.

Options that G20 members could embrace to support electricity access in sub-Saharan Africa:

5.1. Work with African institutions, energy policy makers, energy regulators, power pools, the African Energy Leaders Group (AELG) and other interested parties and organizations to encourage and support regional cooperation and integration in the energy sector that will facilitate the creation of regional power-sharing markets and the development of regional projects including those contained in the Program for Infrastructure Development in Africa (PIDA) and IRENA's clean energy corridor through support for planning and projects preparation, capacity building, good practice dissemination, and assistance for regulatory framework development.

5.2. Assist in aligning national and regional plans through the mapping of a summary of all available energy resources at the country level and drawing possible links between them so as to maximize the benefits of all available energy resources and integrative potential in regions.

5.3. Promote collaboration on key energy policies and technical standards within regions to facilitate cross-border energy trade and support the development of local capacity in the energy sector.

5.4. Strengthen project preparation capacities for regional energy projects on the continent for example, through enhancing the capacity of the New Partnership for Africa's Development Infrastructure Project Preparation Facility (NEPAD IPPF).

6. Coordination and Collaboration

KEY OPTIONS
Participating members undertake to work together with Sustainable Energy for All and other international organizations to enable the coordination and promotion of programmes and projects which aim to increase access to affordable, reliable, viable, sustainable, and modern energy services in sub- Saharan Africa. Participating countries undertake to ensure that their respective efforts are supportive of local ownership according to national circumstances and priorities.

The challenge: A number of energy access initiatives focused on sub-Saharan Africa already exist and additional ones are in planning, and there is a need to ensure that they are well coordinated, to avoid unnecessary duplication and ensure a maximum degree of synergy.

Options that G20 members could embrace to support electricity access in sub-Saharan Africa:

6.1. Work with Sustainable Energy for All and the African institutions-led SE4All Africa Hub to support African countries in developing and implementing national access plans, such as the SE4All Country Action Agenda as an integrated coordination and implementation tool at the country level.

6.2. Support and promote policies that integrate the governance, investment and implementation of strategies relating to energy, water, food, health, industrial development and others, in accordance with national circumstances and priorities.

6.3. Support resource allocations to strengthen African countries' capacity, e.g. through the *SE4All Country Focal Points* to enable coordination, to avoid overlap, to strengthen implementation and to ensure long-term engagement and continuity.

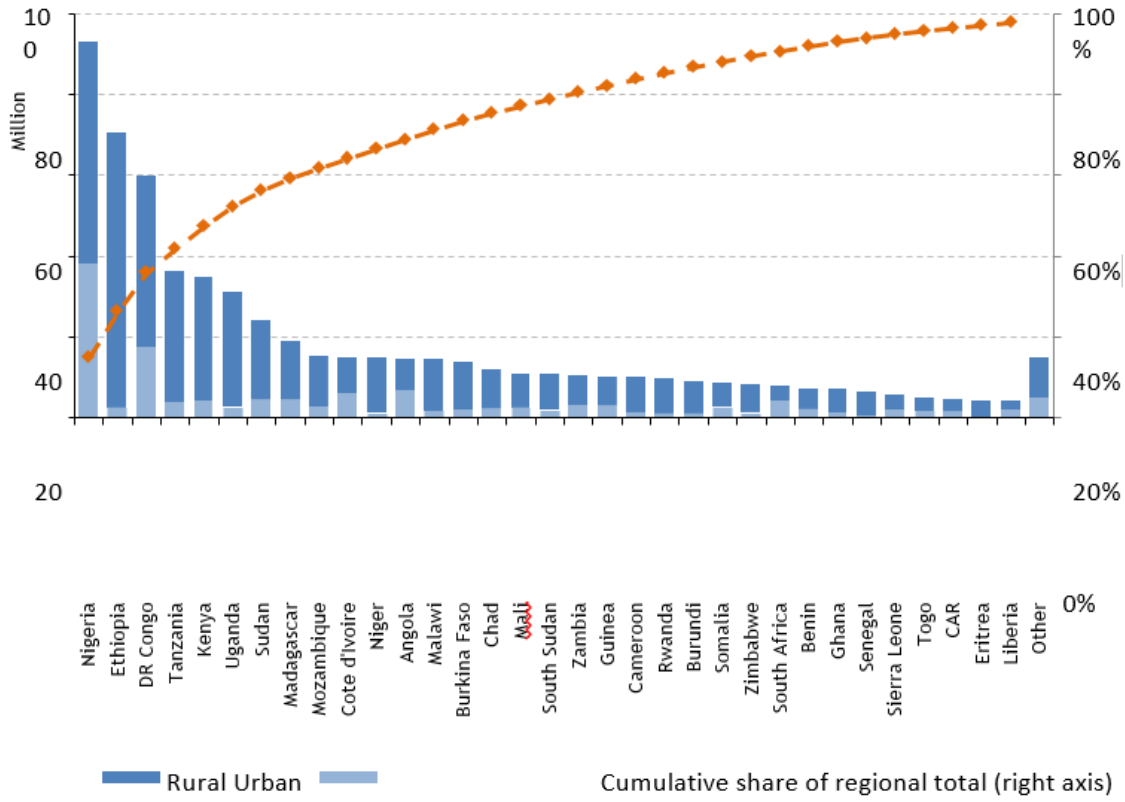
6.4. Evaluate opportunities to promote greater linkages among Global LEAP market development work to date, which includes and builds upon the World Bank and IFC-led Lighting Africa program, SE4All country-level engagements, and G20 member efforts.

6.5. The SE4All Global Facilitation Team and other relevant bodies to help ensure that G20 efforts to support energy access are well-coordinated. To this end, SE4All will submit an annual report to the ESWG.

Annex 1 – Electricity Access in Sub-Saharan Africa

Sub-Saharan Africa is the most electricity poor region in the world in relative terms and comparable only with developing Asia in absolute terms: according to the International Energy Agency's (IEA) *Africa Energy Outlook 2014*, two-thirds of the sub-Saharan population (around 620 million people) live without electricity. More than half of this total is accounted for by just six countries – Nigeria, Ethiopia, Democratic Republic of Congo, Tanzania, Kenya and Uganda (See Figure 1). Sub-Saharan Africa is also the only major world region where the number of people without electricity access is increasing – a product of rapid population growth outpacing the many positive efforts underway to expand electricity access. Across sub-Saharan Africa, there are only a handful of countries where more than half of the population has access to electricity, while many others fall far short of even this level (e.g. South Sudan, Chad, Malawi and DR Congo all have electrification rates of below 10%).

Figure 1: Sub-Saharan population without access to electricity by country and by urban/rural, 2012



Notes: CAR is Central African Republic. "Other" is Botswana, Cabo Verde, Comoros, Congo, Djibouti, Equatorial Guinea, Gabon, Gambia, Guinea-Bissau, Lesotho, Mauritania, Mauritius, Namibia, Sao Tome and Principe, Seychelles, Swaziland.

Source: IEA Africa Energy Outlook,
OECD/IEA (2014).

On-grid power generation capacity for the region was 90 gigawatts in 2012 – around the level of the United Kingdom – with more than half of this being in South Africa. Of this capacity, 45% is coal (mainly South Africa), 22% hydro, 17% oil (both more evenly spread) and 14% gas (mainly Nigeria). In many cases, electricity tariffs are among the highest in the world and, outside South Africa, losses in poorly maintained transmission and distribution networks are double the world average. The poor reliability of grid supply has resulted in the extensive use of costly back-up generators using oil products.

Sub-Saharan Africa's inadequate electricity supply is not due to a shortage of suitable energy resources. The region is rich in resources that could potentially be utilised to generate electricity, but many of these are spread unevenly across a huge geographical area and are at differing stages of development. These include huge renewable resources that remain largely untapped; excellent solar across all of Africa, hydro in many countries, wind mainly in coastal areas and geothermal in the East African Rift Valley. The region has both major existing fossil fuel producers, including Nigeria, Angola and South Africa, and emerging producers, such as Mozambique and Tanzania.

Significant positive action is already underway to improve electricity access in sub-Saharan Africa. Many African governments place a high priority on improving electricity access, but face a number of regulatory, technical, financial and other challenges that are holding back investment in the energy infrastructure that is needed to meet the expectations of a population with rising needs and expectations. A number of bilateral, multilateral and non-governmental initiatives exist to support countries in their efforts, such as the Sustainable Energy for All initiative, the US Power Africa initiative, Japan's power infrastructure support program, the European Union's Energising Development initiative, EnDev programme (Germany, the Netherlands, UK, and others) and significant funding and/or technical support from multilateral development banks, and from governments, such as China. These initiatives are often working directly with African governments, companies or regional bodies, such as the African Union, the New Partnership for Africa's Development and the African Development Bank. Regarding SE4All, 44 African countries have joined the initiative and more than 25 African countries are currently developing their SE4All Action Agenda and some 17 countries are developing or starting to work on SE4All Investment Prospectuses. There is also a broad range of civil society-led efforts that are in line with national objectives while not necessarily linked to them explicitly. Despite the activity underway, the region has yet to turn the corner and see the number of people without electricity access start to decline.

In the central projections of the IEA's *Africa Energy Outlook*, the sub-Saharan electricity system expands rapidly to 2040 but so do the demands placed upon it. The sub-Saharan power generation capacity quadruples in size and the mix becomes increasingly diverse, with the large shares of coal (South Africa) and hydropower (all regions) supplemented by natural gas and an increasing share of other renewables (including solar, wind, geothermal and biomass). Based on IEA projections, the share of renewables in sub-Saharan power generation capacity more than doubles, reaching 44% in 2040. This expansion is underpinned by a significant increase in power sector investment, averaging around $46 billion per year. Around 950 million people gain access to electricity from now to 2040, but more than half a billion remain without access at that time – thus, falling short of the progress desired. By 2040, around 90% of the population projected to be without electricity access in the region are in rural areas. However, it is recognised that as technologies and the economics of different energy sources change over the coming decades

there will be many opportunities for leapfrogging and new forms of provision which could compress timelines or reduce delivery costs.

Annex 2: Good Practices of variousG20 Member States

The good practices submitted by 15 Member States and the African Union Commission for the purpose of information and experience sharing demonstrate that access to energy is an enabler of economic and social development, leading to poverty reduction and an improvement of the quality of life. Moreover, the success factors identified by some Member States in these examples justify the focus on the six areas of the Energy Access Action Plan: (1) Policy and Regulatory Environment, (2) Technology Development, Dissemination, and Deployment, (3) Investment and Finance, (4) Capacity Building, (5) Regional Integration, and (6) Coordination and Implementation.

(1) Policy and Regulatory Environment

It is clear from many of the submissions that an appropriate regulatory framework can be an important factor for investments into energy access. Efficient utilities and regulatory agencies are needed to manage the creation and maintenance of access, including adequate expertise of the distribution companies. As the integration of energy-markets can contribute to a more steady and balanced supply, regulation that allows for such integration can, in many cases, promote reliable access to electricity. A successful policy and regulation on energy access needs to take into account the requirement of strengthening the entire value chain of the electricity industry in accordance with national circumstances and sustainable development priorities.

(2) Technology Development, Dissemination, and Deployment

The prerequisite and benefits of applying efficient technology in the generation, distribution and management of electricity is mentioned in most of the good practice cases. This is not only a question of establishing, maintaining and up-grading the necessary infrastructure, but concerns also the question of how to create accountability and how to enable return on investments through monitoring the distribution and consumption of electricity, and revenue protection. Innovative technology can, moreover, help in tracking, monitoring, and controlling losses and making collection of payments more efficient. Finally, the good practices make clear that the choice of technology and business solutions, be it on-, mini-, or off-grid, depends on the particular circumstances. It is crucial, however, that the application of these technologies is well-balanced, supported and coordinated by international dialogue and long-term planning.

(3) Investment and Finance

Some countries' examples demonstrate that a range of actors and financial instruments is needed to create investments into energy access. Beyond creating an enabling environment for investments, the public sector will need to actively promote access by allocating resources and other support. This is specifically important as in many cases the commercial viability of energy access projects is highly dependent on public incentives and resources. In many countries, the poorest sections of the population would not be able to afford access to electricity without support. If the right level and mix of subsidies, grants, de-risking instruments and long-term concessional financing

is in place, the private sector can invest into projects that promote access to energy. In the end, universal access to energy cannot be achieved without both public and private sector investments.

(4) Capacity Building

Capacity is a crucial enabler in all aspects of access to energy, be it planning, creation or management on the local, national or regional level. Hence, many of the submissions highlight the need for training programmes and other forms of capacity building, including the consistent and strategic employment and engagement of locals in energy projects. In general, it is beneficial to the viability of such projects if all the relevant stakeholders are aware of the advantages and disadvantages of particular technological solutions. This may also help to build the necessary political support for the respective technology.

(5) Regional Integration

A number of the examples submitted by the Member States also demonstrate that coordination between jurisdictions and programmes on the regional, national and sub-national level is necessary to prevent contradictory processes and to instead create mutually supporting synergy. In some cases, this may also entail regional market integration.

(6) Coordination and Implementation

Finally, effective coordination in the planning and implementation of energy access policies, programmes, initiatives and projects is essential. The good practices demonstrate that this needs to include the regional, national, and sub-national levels, but also coordination between the various government ministries and agencies in order to allow for access to energy to enable sustainable economic and social development. Moreover, the energy sector depends on long-term planning which makes it necessary to take into account projections of future energy supply and demand trends and infrastructure development. In addition, public-private cooperation and coordination is crucial to enable access to energy.

Universal Access to Energy: Examples of Argentina's national experiences

Universal access to affordable, reliable and modern energy services is one of the most important energy priorities for the Argentine government. Energy access is an essential right to guarantee social, economic and human development, as well as critical to eradicate poverty, following international agreements on the matter.

In this regard, it is worth to recall that the outcome document of the United Nations Conference on Sustainable Development (2012) -, established the following: "...*access to sustainable modern energy services contributes to poverty eradication, saves lives, improves health and helps provide for basic human needs. … these services are essential to social inclusion and gender equality, and …energy is also a key input to production. We commit to facilitate support for access to these services by 1.4 billion people worldwide who are currently without them. We recognize that access to these services is critical for achieving sustainable development*".

Likewise, in the final report of the UN Open Working Group Report on Sustainable Development Goals -welcomed by UN General Assembly Resolution A/RES/68/309 of September 2014- the following goal was decided: "*by 2030 ensure universal access to affordable, reliable, and modern energy services*". In the same spirit, G20 Leaders endorsed in November 2014 the G20 Principles on Energy Collaboration, including its first principle to "*ensure access to affordable and reliable energy for all*". In this context, Argentina welcomes the invitation by the Turkish G20 Presidency to share some examples of its national experiences on energy electrical access.

Argentina faces several key challenges in the energy sector, notably the country's vast territorial extension, its topography and low population density in rural areas, which continue to be the main obstacle to a universal supply of conventional networks able to connect electricity services at reasonable costs. Even with a current electrification rate of 98%, many households are still without access to modern energy services, and many others have inadequate, partial and/or inefficient access (they have it for a few hours a day and it is frequently subject to costly transport of fossil fuels).

Moreover, approximately a third of the national population does not have access to natural gas networks and depend on bottled gas or biomass for heating and cooking. This shows the need for huge infrastructure energy investments in order to reach isolated and rural populations that remain today unconnected, and thus, the importance of increasing financing for these investments, due their long-term characteristics and their sunk costs.

In order to achieve the goals to ensure a reliable and affordable energy access, Argentina has embarked upon a concerted effort to implement specific public national policies. Two of those policies will be described in this document: the Renewable Energies Project in Rural Markets of Argentina -PERMER- and the Program of National Electrical Inclusion -PROINEN-. The launching of these programs reaffirms the Argentine government's strong commitment to social inclusion through universal access to energy.

PERMER

Under the guidance of the Secretariat of Energy (SE), Argentina implemented several projects seeking to improve access to energy services in rural areas. The most successful till the moment has

been the Renewable Energies Project in Rural Markets of Argentina (PERMER), supported through an International Bank for Reconstruction and Development (IBRD) loan.

The main objective of the project has been to supply reliable and sustainable electricity to rural zones mainly by using renewable energies and supporting the use of thermal appliances and water pumps in public buildings, among others.

PERMER was approved in March 1999, but the emergency framework put in place in the immediate aftermath of the 2002 economic crisis delayed its implementation. Argentina finally managed to overcome initial difficulties and successfully implemented the original project and obtained additional financing in 2008 for what it was known as PERMER I. Hence, the Project remained active until December 2012. As a whole, the project covered the needs of more than 30,000 households, institutions and establishments -that accounted to more than 150,000 people- in 15 provinces.

Given the use of renewable technologies with no network connectivity (off-grid systems) and the implementation of a sound and effective scheme of operations, maintenance and replenishment, PERMER I proved to be a valuable tool for increase the access to electricity in rural areas in a sustained manner. It has also helped to create a network of rural electrification that includes federal and provincial institutions, which allows a closer coordination between national and sub-national entities.

From 2015 onwards, and for a five-year period, the program PERMER II will be implemented, also supported through a 200 million USD IBRD loan expected to provide complementary financing to the 50 million USD that the national government will contribute. This second phase will become the national central instrument in terms of the facilitation of support to universal access to electricity. Through the implementation of this second phase, rural households will be provided with energy infrastructure, or will count with improved access to it.

Thus, the project will assist rural populations in isolated areas to leave extreme poverty. Also, the program will support the national government's goals of improving energy security, diversifying the energy matrix and protecting the environment, in the broader context of the achievement of sustainable development in its economic, social and environmental dimensions.

For this second phase, it is estimated that 46,000 households and 15,000 public service institutions will be provided with basic electricity services through renewable off-grid systems (solar and wind), while 9,500 consumers will be also connected. This is planned to be achieved through: the construction or improvement of renewable mini-grids in small isolated communities; the provision of energy for thermal use in public service institutions; the provision of solar-powered water pumps for households and public institutions; and the supply of renewable off-grid systems.

PROINEN

The Program of National Electrical Inclusion was constituted by Decree N°516/2015 of the National Executive Branch as a long-term permanent initiative, with the objective of the realization of infrastructure projects that ensure a quality and secure provision of electrical supply to settlements with precarious facilities. Through this program, electrical power lines will be reconditioned under secure conditions in order to diminish the number of accidents and disasters derived from insecure installations (positioning of posts, wiring, security control-panels and switches in households) and will normalize installations within households.

PROINEN is endowed with an initial investment of 45 million USD per year and is aimed at benefitting more than 2 million inhabitants all over the country that live in informal settlements. Its implementation is coordinated with provincial and municipal governments.

Australia's National Electricity Market

The National Electricity Market (NEM) is one of the world's largest interconnected power system. It stretches for more than 5,000 kilometres from Port Douglas in Queensland to Port Lincoln in South Australia and supplies electricity to meet the demand of approximately nine million end users, including residential dwellings, businesses and industrial facilities.

The NEM connects six jurisdictions: Queensland, New South Wales, the Australian Capital Territory, Victoria, South Australia and Tasmania, whose cooperation under the NEM is secured through federal and state and territory legislation and memorandums of understanding.

NEM infrastructure comprises both government and privately owned assets, and is managed by a variety of entities under the overall direction of Australian Energy Market Operator (AEMO).

The NEM facilitates exchange between electricity producers and consumers through a pooled system where output from generators is scheduled to meet consumer demand. This allows for sophisticated pricing structures and load shedding arrangements that ensure security of supply to meet large fluctuations in demand.

Australian Energy Market Operator

AEMO was established to manage the NEM and national gas markets. AEMO's primary responsibility is to balance the supply and demand for electricity by dispatching the generation necessary to meet demand. AEMO's core functions include:

- Electricity Market - Power System and Market Operator
- Gas Markets Operator
- National Transmission Planner
- Transmission Services
- Energy Market Development

Spot market

The NEM is both a physical market for the despatch of electricity and a financial market to pay for the electricity. Electricity generators offer to supply the market with specified amounts of electricity at specified prices for set periods of time. From all the bids offered, AEMO decides which generators will be despatched with the cheapest generator put on line first. In this way, the NEM is designed to meet electricity demand at the lowest cost.

Security of supply

The power system must at all times operate with a certain level of reserve in order to meet the required standard of supply reliability across the NEM. AEMO has the authority to direct registered generators into production when a supply shortfall is expected. In addition, AEMO can instruct network service providers to shed some customer load in situations where there is an urgent need to protect the power system.

Renewable energy

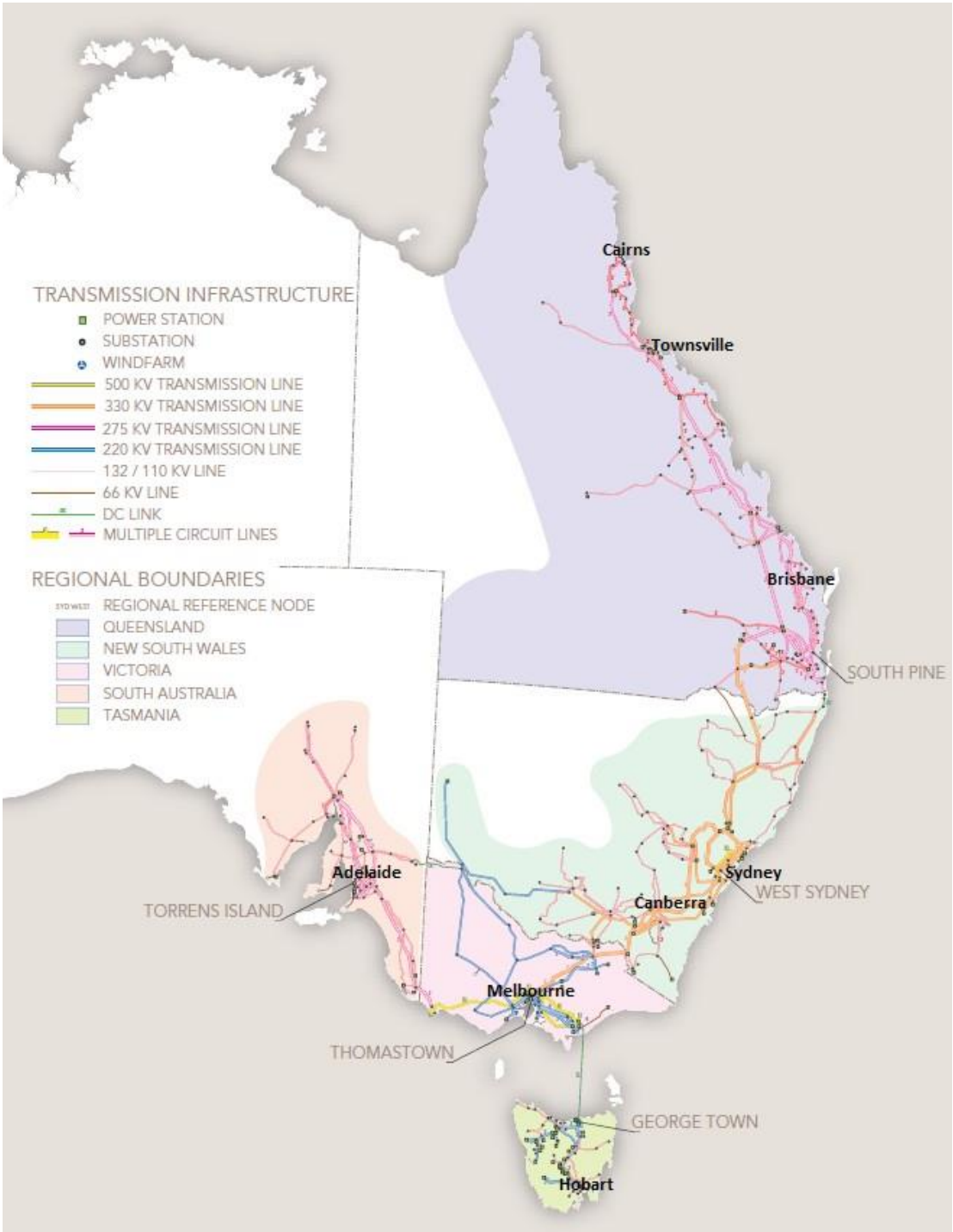
Approximately 14 per cent of electricity in the NEM is generated from renewable sources, principally hydroelectricity and wind power. Rooftop solar systems are widespread in Australia, but they are treated as negative demand in the NEM, due to their small size and connection to the distribution

network. AEMO accommodates intermittent generation from wind farms, which can reach more than half of electricity generation in some parts of the network at certain times of the day.

Governance

The Australian Energy Market Commission (AEMC) and the Australian Energy Regulator (AER) have had responsibility for oversight and regulation of the NEM. The AEMC is responsible for rule making and market development and the AER has responsibility for enforcement and monitoring compliance with the Rules, as well as economic regulation of electricity transmission.

Australia's National Electricity Market



Statistics

- The NEM incorporates approximately 40,000 kilometres of transmission lines and cables.
- The NEM supplies about 200 terawatt hours of electricity a year.
- The NEM has approximately 50 gigawatts of installed electricity generation capacity, excluding small scale solar systems.
- Over AUD 11 billion is traded through the NEM every year.
- To gauge the scale of the map above, it is 2,884 kilometres by air from Hobart to Cairns, which is greater than the distance between London and Moscow.

Brazil´s universal electrification experience – "Light for All" Program

Access to energy is essential for social development, as it improves the quality of life and allows for an increase in income generation. Until the end of the XX Century, energy access remained a challenge to be overcome in Brazil, especially in poor and isolated communities.

Over the years, many governmental programs were conceived in Brazil to promote electrification, especially in rural areas. Those programs were based on the recuperation of infrastructure, with taxes and fees being applied to end users. Such charges eventually constituted barriers to universal access to electricity and kept a considerable share of the population excluded from the programs.

To overcome this obstacle, in 2003 the Brazilian government launched the "Light for All Program", conceived as a mechanism for socioeconomic development and poverty reduction, with the initial objective of providing free access to electricity infrastructure to two million households (10 million people) previously identified by a national wide census carried out in 2002. 90% of those households were considered low-income households.

After being implemented for 12 years in Brazilian rural areas, the Light for All program provided energy access to 3,2 million households (as of May 2015), reaching 15,5 million people – including 180,000 indigenous people and 150,000 descendants of the of "quilombos" (old communities of former slaves). Total investments amounted to R$ 22,7 billion (US$ 7,3 billion) – R$ 16.8 billion (US$ 5.4 billion) of which provided by the Federal Government.

Many factors contributed to the success of the program: the sustainability of electricity access to more than 95% of the national territory; a strong regulatory framework in the energy sector; the expertise of electricity distribution companies; the role of Eletrobras (Brazil´s national electricity company) in overseeing the contracts; the availability of resources from electricity sectorial funds to finance the program and reduce tariff impacts on consumers; the industrial base in the electricity distribution system and the use of local workforce; and, above all, the provision of electricity without costs to the benefited population.

In order to overcome the difficulties of providing energy access to isolated, hard to reach communities, including communities located in river and maritime islands, the program had to make use of new technologies - such as underwater cables extended over river and sea waters. Approximately 90,000 meters of underwater cables were already deployed – of which 58,000 in the State of Amazon.

The deployment of such technology enabled the replacement of diesel engines, which were in the past the only source of energy to communities that nowadays rely on stable electricity from the power grid.

Other technical challenges stimulated research and development of new technologies, such as electricity posts made of polyester resin reinforced with fiberglass, much lighter than concrete ones.

Solar power generation is also enabling the program to reach remote locations in the Amazon, based on mini photovoltaic systems connected to mini-grids. Such technology made it possible to reach isolated communities in the Amazon whereto the conventional power grid cannot be extended.

The Light for All program also aims at monitoring the impact of energy access in the benefited

communities. A national-wide survey carried out by the Ministry of Energy and Mines in 2013 indicated that the program had a positive impact in the social and economic development of assisted communities:

• The quality of life improved to 92.9% of interviewees, and living conditions improved to 81.8% of respondents. To 41.2%, household income increased, and 40.5% found better job opportunities. 50.8% of interviewees also referred to a notable increase in the quality of school activities.

• 4.9% of the surveyed families (around 776,500 people) returned to rural areas after the arrival of electricity.

• The program also benefited women in assisted communities: 81.8% of women pointed out to an improvement in public security after the implementation of the program. More than 300,000 women resumed or initiated studies, including at night, and more than 240,000 women entered the labor market and started a productive activity.

• 81.1% of the households acquired TVs, 78%, refrigerator and 62.3%, mobile phones. Taking into consideration that the program brought electricity access to more than 3 million households, this corresponds to the commercialization of 2.6 million televisions, 2.5 million refrigerators and 2 million mobile phones, resulting in an influx of in R$ 6.8 billion (US$ 2,2 billion) into the economy.

Energy Access Actions of China

For more than 3 decades, the Chinese government has been continuously striving to provide basic energy service to all Chinese people, with special emphasis on electricity access.

Since 1998, the Chinese government implemented 2 phases of actions on upgrading power grids in rural areas and power facilities construction in no-power areas. By 2012, 36.5 million people were provided with access to electricity.

Since 2013, the Chinese National Energy Administration launched the 3-year Action Plan in eliminating population with no access to electricity, with the target of providing electricity access to the remaining 2.73 million people, and the total investment is about 24.7 billion RMB. By July of 2015, only 40,000 people are left in the dark. And all Chinese people will have access to electricity by the end of 2015.

Best practices: Access to Energy
Examples of the French Development Agency (AFD) projects in Africa

To extend access to effective power services to as many people as possible, AFD supports the development of public policy on the issue and the investment required as a result. The planning and organisation of rural electrification programmes based on accurate diagnostic assessments of demand and on analysis of the most appropriate technical and financial solutions are key to providing wider access to electricity. Investment in this field requires long-term, concessional financing and subsidies which international providers like AFD and the European Union can provide. Blends of loans and grants should be sought to cater for the needs of this kind of deferred-profitability, high-social-impact investment. In some cases, involving the local private sector through Public-Private Partnership can be a way of increasing the impact of a project. Several kinds of investment deserve support including increasing the number and expanding the reach of connections in suburban areas (particularly on the edges of large cities), electrification of secondary centers (using hybrid diesel/renewable energy systems which are now economically justified) and rural electrification plans involving both expansion of the conventional grid and distributed solutions (using photovoltaic solar equipment for example) in proportions suitable for the country in question. To illustrate these various models, four examples of projects undertaken by AFD in Africa are presented briefly below.

1) Morocco: Global Rural Electrification Program (PERG): 1996-2009

Morocco's development has resulted in a growing gap between the country's major cities and rural areas. While the country has made significant progress in access to electricity in urban areas, rural electrification has suffered significant delays, with a rate of access in rural areas of less than 20% in 1995. To remedy this situation, Morocco has initiated in 1995 an ambitious "Global Rural Electrification Program (PERG), whose implementation has been entrusted to the National Electricity Office (ONE). The AFD has been accompanying the PERG since the beginning, with six concessional loans between 1996 and 2009: PERG 1 (€ 30 million), PERG 2 (€ 45 million), PERG 3 (€ 40 million), PERG 4.1 (€ 50 million), PERG
4.2 (€ 45 million) and PERG 5 (€ 30 million) for a total of € 240 million.

The PERG helped Morocco to catch the late rural electrification, using two modes of electrification, depending on the situation and the level of demand of the villages: connection to the main network, or decentralized solar electrification. The PERG is undoubtedly a success: by the end of 2009, more than 35,000 villages were electrified, representing 1.9 million households (60 000 in "decentralized solar"). The rural villages electrified rate was thus 97% with an average rate of households connected to about 75%.

2) Senegal: Rural electrification Concession Kaffrine - Tambacounda - Kedougou: 2007-2017

The Senegalese rural areas remain handicapped by a low rate of rural electrification. To remedy this, the Access Program Electricity Service in Rural Area (PASER) was developed with the support of the World Bank in 2004. It is an innovative scheme designed to involve the private sector in rural electrification concessions awarded by international tender.
AFD funding of € 8 million, awarded in 2007 (public grant), is the public contribution for the Kaffrine - Tambacounda – Kedougou concession. This geographic area has a population of about 900,000 inhabitants and the rural electrification rate is 2.5%. The project objective is to increase this rate to 30%, which requires to connect 18,000 additional customers. The

AFD funding is granted via the Senegalese Rural Electrification Agency, which has selected by tender a private company that became the concession manager. This is the decentralized service company called ERA, jointly owned by EDF, French utility, and Mattforce, a senegalese compan., ERA aims to connect 12,000 customers to the network and to serve 6,000 clients by individual solar kits. More than 2 000 subscribers have been connected since 2014 and the connection work continues to enable the achievement of the targets within 2018.

3) Kenya: Revolving fund for connections: 2011-2015

In Kenya, only 35% of households are connected to electricity on average, and only 12% in rural areas. Facing this situation, the Kenyan Government has committed since 2005 in a deliberate policy of electrification with the aim of connecting 200,000 households per year. To achieve these objectives, the public electricity company Kenya Power (KPLC) must connect a growing share of customers with lower incomes particularly in rural areas. However, high connection costs appear clearly as one of the main obstacles to access to electricity.

For this reason, AFD financed in 2011 in the form of a loan of EUR 31 million on-lent to KPLC, a Revolving Fund for advancing a portion of connection fees, users paying the balance in the following months (initial payment of 30% of customers, reimbursement of 70% over 2 years with interest). An EU grant of € 5 million has resulted in lower interest rates than usually charged for such loans. The project objective is to enable the 300,000 new customers' connection and since 2013, more than 70,000 have benefited from this innovative connection modality.

4) Kiffa in Mauritania: Access to energy from a solar-diesel hybrid power plant: 2012- 2017

Kiffa, the third largest city in terms of population of the country (42 000) and Guerou (located 60 km from Kiffa, 25 000 inhabitants), are being electrified by isolated mini-grids powered by diesel generators. The increase in population and economic activity in Kiffa and Guerou in recent decades is reflected in a growing demand for electricity that existing plants can no longer satisfy.

The project financed by AFD through a € 24M loan granted to the government in late 2012, follows these specific objectives:

- Contributing to the increase of production capacity of the Mauritanian Electricity Company (SOMELEC) in Kiffa area, through the installation of a PV solar power plant with a capacity of 1.3 MWp and diesel generators with a capacity of 4.8 MW.

- Improve the household connection rate, currently low at Kiffa and Guerou through electrification of new neighborhoods, and provide access to electricity to the inhabitants of villages on the new medium voltage line built between Kiffa and Guerou. In the end, more than 50 000 people should benefit from access to quality electricity.

The implementation of this project started in 2014 and the first connections are planned for 2016. This innovative option of hybridizing secondary centers could be also replicated by SOMELEC in other areas in the coming years.

Best Practice Cases of German Development Cooperation in the Field of Energy Access

Country	Project	Duration	Volume [Mio. €]	Targets	Approach	Partner(s)
				Africa		
Global	Energising Development (EnDev)	2005 - 2019	263.26	- 18 Mio. people have access to sustainable energy services by 2019 - Development through access to energy	- Promoting of PV energy, grid densification, micro-hydropower, energy-efficient cooking stoves and biogas - Piloting a results-based financing (RBF) approach on behalf of DFID - Monitoring system conducted every six month - Impact studies	- Federal Ministry of Economic Cooperation and Development (BMZ) - Directorate-General for International Cooperation of the Dutch Ministry of Foreign Affairs (DGIS) - Norwegian Ministry of Foreign Affairs (MFA) - Department for International Development (DFID) - Agency for Development and Cooperation (SDC)

Rwanda	Energising Development (EnDev)	2006 - 2018	15.49	- 1,008,090 people with energy for lighting/ electrical appliances - 20,544 people with cooking/thermal energy	- Providing technical, business management and financial support to consolidate the participation of private Micro-hydro Power Plants developers in the hydro sector. - Supporting efforts by the MININFRA, REG, Rwanda Utilities Regulatory Authority (RURA) and other stakeholders to develop a sustainable energy strategy and establish a suitable legal framework for promoting RE. - - Providing financial incentives (as grants) to the private sector to overcome initial market barriers	- Rwanda Energy Group (REG) - Ministry of Infrastructure (MININFRA) - Federal Ministry of Economic Cooperation and Development (BMZ) - Directorate-General for International Cooperation of the Dutch Ministry of Foreign Affairs (DGIS) - Norwegian Ministry of Foreign Affairs (MFA) - Department for International Development (DFID) - Agency for Development and Cooperation (SDC)
Bangladesh	Renewable Energy I – Solar System		16.5	- Promoting Solar Home Systems	- facilities comprising a PV module with an output of 10-130 Wp, a battery, a charge controller, installation equipment and lights sold to rural households	- Federal Ministry of Economic Cooperation and Development (BMZ) - Infrastructure Development Company Limited (IDCOL)	

					- Training of and support for the users of the facilities - Introduction of prepayment meters		
Uganda	Electrification West Nile		31.2	-	60,000 people in six cities and 40 commercial centres have access to sustainable and dependable electricity	- Expansion of two small hydro-electric power stations and enlargement of the grid - Construction of ca. 400 km of medium voltage lines	- Federal Ministry for Economic Cooperation and Development (BMZ) - European Union (EU)
Kenya	The German Climate Technology Initiative |GIZ Promotion of Solar-Hybrid Mini-Grids in Kenya (ProSolar)	2013 - 2018	7.5	-	Harnessing the efficiency and effectiveness of the private sector	- Improving the electrification in rural areas through mini- and micro-grids. - Advisory services to government partners in policy and regulation - Supporting the development of strategies and implementation mechanisms - Supporting pilot projects - Capacity development	- Federal Ministry for Economic Cooperation and Development (BMZ)

India	German-Indo Energy Program | Access to Energy in Rural Areas	2015 - 2018	3	-	Improving the conditions for energy supply based on renewable energy in rural areas	- Implementing pilot projects ("Private Sector and Innovation") - Facilitating the development of access to finance by developing and testing finance instruments and mechanisms at private, state and national level - Capacity development and support for key stakeholder in the rural renewable energy sector - Facilitating knowledge dissemination through conferences, workshops and strengthening of practitioner networks - Designing Interventions to attract investments	- Ministry of New and Renewable Energy (MNRE) - Ministry of Power (MoP) - Federal Ministry for Economic Cooperation and Development (BMZ)

India's submission to the Energy Access Action Plan

National experiences and best practices in Universal Electrification

Country: India	
Name of the programme	Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY)
Government Department in charge	Ministry of Power, Government of India
Components of the programme	**Separation of agricultural and non-agricultural feeders** in rural areas and facilitating Distribution Companies (DISCOMS) in the judicious rostering of supply for agricultural and non-agricultural purposes in rural areas. **Strengthening and augmenting of sub-transmission and distribution infrastructure** in rural areas, including metering of distribution transformers/feeders/ consumers. **Rural Electrification*:** Provision of access to electricity to all rural households through the creation of rural electricity infrastructure and provision of electricity connections, free of cost, to households below the poverty line. (Lighting apparatus changed from CFL to LED Lamps)
Nodal Agency	Rural Electrification Corporation, a central public sector enterprise under the Ministry of Power, Government of India with the main objective of financing and promoting rural electrification projects all over the country.
Players in the ecosystem	Renewable Energy Corporation on behalf of the Central Government, State Governments and the Implementation agencies (All state owned distribution companies and State Power Departments)
The issue	In the rural areas of India, the agricultural and non-agricultural load is typically catered through a common distribution network. Many State Governments subsidise supply for pumping purposes, which is one of the reasons for their poor financial health. Historically, distribution utilities have practiced load shedding to mitigate the gap between the increased demand in the agricultural sector and limited supply. As non-agricultural consumers are also catered through the same feeder, they get deprived of essential electricity supply for their homes.
Envisaged Outcomes	Improvement in the hours of power supply. Reduction in the peak load. Improvement in billed energy units based on metered consumption. Electrification of all rural villages.
Activities under the scheme	Separation of feeders. Strengthening and augmentation of sub-transmission and distribution infrastructure to ensure reliable and quality power supply. Metering at the consumer end as well as at the distribution transformers and feeders to build a framework for energy accounting and enable the identification of high loss pockets and initiating remedial measures towards reduction of losses. ***Under the Rural Electrification Component:*** *Rural Electricity Distribution Backbone (REDB)* Creation of REDB with at least one 33/11 kV (or 66/11 kV) sub-station in each block. New 33/11 KV sub-station, augmentation of existing 33/11 KV sub-station, construction and augmentation of 33/11 KV lines. *Village Electrification Infrastructure (VEI)*

	Creation of VEI with at least one distribution transformer in each village / habitation. *Household connections* Free of cost service connection to all families Below Poverty Line. *Decentralized distribution-cum-generation (DDG)* Creation of DDG systems in villages where grid supply is not feasible or not cost effective from conventional or renewable resource. This also includes extending Decentralized Demand Generation to grid connected areas to supplement the availability of power in areas where power supply is less than six hours a day.
Pre-existing Best Practices in the Country	The scheme draws upon the benefits demonstrated successfully by Indian states like Andhra Pradesh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Punjab and Rajasthan, which have already undertaken capital investment for feeder separation. These states obtained commercial gains with their utilities reflecting an improved financial position, besides improved power supply in rural areas.
Convergence Mechanism	The Government recognizes that a variety of programmes currently running also have components that are contributing towards the facilitation of universal electrification. E.g.: The Restructured Accelerated Power Development and Reforms Programme (R-APDRP) aiming to reduce the Aggregate Technical and Commercial losses in the power sector, the NEF (Interest Subsidy) Scheme to promote the capital investment in the distribution sector by providing interest subsidy, on the loans taken by power utilities for distribution projects etc. While developing this programme, convergence with these existing programmes was encouraged but it was made sure that there is no overlapping of activities between different programmes. However, leveraging the ongoing activities under the other programmes to enable the attainment of objectives in this particular scheme is strongly encouraged so that schemes mutually reinforce each other.
Financial mechanism	The programme's funding pattern works on the principle of cost sharing (Grants and Capital Subsidies) by the Central Government and the State Government/Distribution companies. This is done to catalyse states by instilling a sense of ownership in the process. Additional grants are given by the Central Government on the achievement of milestones based on outcome parameters (A percentage of the loan component/ State's own contribution)
Implementation and Monitoring Mechanism	• A strong implementation and monitoring mechanism has been formed which has its basis in bankable Detailed Project Reports, which are then appraised by the Nodal agency before they are approved by a Monitoring Committee, chaired by the highest level officers in the Central Government. • Projects are to be completed in 24 months from the date of award of the contract by the utility. • For the rural electrification component, a three tier quality monitoring mechanism with different designated agencies monitoring a certain set sample size of villages at different levels. A detailed field survey for identifying the list of eligible villages and habitations to arrive at the actual scope/quantity of target villages.

Role of e-Governance	The electrification status of each and every village covered by this programme is available on a dynamic basis, on the programme's website.

** Definition of an electrified village:*

A village in India would be declared ' electrified' if:

- Basis infrastructure such as a distribution transformer and distribution lines are provided in the inhabited locality as well as the hamlet in which the village exists.

- Electricity is provide to public places like schools, panchayat office, health centres, community centres etc.

- The number of households electrified should be atleast 10% of the total number of households in the village.

Universal Access to Energy: some examples of Italian projects on Sub-Saharan Africa

Italy considers energy access as an essential element for economic and human development. Regarding energy access Italy develops several projects in Africa, Middle East and Latin America where energy access is the key factor for economic and human development, devolving more than 45 million €.

Focusing on Sub-Saharan Africa Italy's has developed several projects in order to improve energy access in the Region. In particular, please consider some examples listed below:

1. **Kenya:**
   a. **"Kenya-Italy Debt for Development Programme (KIDDP) "**

The "Kenya-Italy Debt for Development Programme (KIDDP)" aims at converting eligible Official Development Assistance (ODA) bilateral debt owed by the Kenyan Government to the Italian Government into financial resources to implement development projects (debt for development swap operations).
The Agreement, signed in October 2006 between the Italian and Kenyan Governments, provides for a total amount of 44 million Euros for swap operations over a period of ten years. Each annual instalment, equal to one tenth of the overall amount, is deposited into an ad hoc Counterpart Fund at the Central Bank of Kenya.
The objectives of the KIDD Programme are:

- ✓ fighting poverty
- ✓ environment protection (including energy): 47 out of 96 projects are related to environmental protection
- ✓ promote human development

   b. **Enhancement basic drinking water supply and basic sanitation for the population of Karungu district**

The initiative is implemented by the Italian NGO Salute e Sviluppo (SeS). The action consists in the creation of a water distribution system that meets the demand of clean water for the beneficiaries of the action. In addition to this, the initiative aims to create a number of public latrines in order to respond to the actual sanitation emergency of the area, affected by an epidemic of cholera in Kenya in February 2015. Specifically, the project will create a pumping station from Lake Victoria, a treatment plant, a 6 kilometers pipeline, 7 kiosks for water distribution, 5 standpipes inside 5 schools and 28 latrines. The broad range of institutional and popular participation that the initiative has had so far, will ensure a local ownership. Moreover, the joint use of Ozone for depuration, a Slow Sand Filter and Solar Energy, will provide the initiative with an innovative value and a high replicability.

2. **Senegal**
   a. **FREDDAS renewable sources of energy for sustainable development of Senegal river valley**

The project aims to promote sustainable and durable development under economic and strategic profile in Dagan department (Saint Louis region) and Kanel (Matam Region), both located in the Senegal river valley.

The direct beneficiaries are 900 units, of which 400 men farmer and 500 women farmer (about 500 families). In particular 600 in the Rural Community of Kanel (department of Kanel - Matam Region), and 300 in the Rural Community of Bokhol (Department of Dagana - Region of St. Louis) currently unemployed or underemployed. In addition, 30 farmers and technicians of SAED are direct beneficiaries of the training activities on maintenance of the new systems in place. Also 300 scholars from two schools benefit directly from the activities of electrification from the linked project Sustain promoted by ENEA and 30 students of the University of Saint Louis, who will follow training on agricultural sustainability.

b. <u>Implementation of the eco-system services and green economy for economic and social development in the Region of Matam, Senegal - insurance and social charges</u>

The project aims at promoting the economic development of the region of Matam, Senegal, through the introduction of some applications of renewable energy, particularly solar, thermal and photovoltaic. The project activities are implemented along three main axes: i) stimulation of the productive sector by encouraging the creation of micro-enterprises in the field of agriculture, production and services that would use renewable energy applications to increase or improve their production; ii) promotion of rural electrification through renewable energies, by developing eco- systemic services to the benefit of villages, public and community structure; iii) sustainability of the intervention by improving the offer of the technical and specialized training in the area. The project intervenes in favor of: the female population, the young population (under 20 years), the rural active one, the economic interest groups (GIE) active in the areas of project and based in the departments of Matam and Kanel and the 3 professional technical training centers (Matam, Waoundé, Ourssogui). The project started in March 2012 will end in May 2015 and counts among local counterparts the NGO Sahel 3000 and the Senegalese Institute of Agricultural Research (ISRA) and among the associates to the project the Union Rural des Mutuelles d'Epargne et de Crédit du Sénégal (URMECS). In addition, the project is part of a larger program that consists of two integrated projects (this project led by ACRA and a project led by Green Cross) and connected to Sustain campaign promoted by ENEA (Institutional Partner of the project) and the Italian Ministry of Education.

3. Uganda

a. <u>Solar energy for Karamoja</u>

The main objective of the project is to fight child malnutrition in the Region of Karamoja through:

- ✓ The implementation of educational activities to raise awareness among young people about the potential arising from the activities of agroforestry in the region and provide them with the necessary technical skills through theoretical and practical training;
- ✓ "infrastructural" intervention with the establishment of solar wells to improve water supply.

Specifically, the project aims to develop and complete an integrated intervention aimed at 14 primary schools in the district of Moroto for a total of about 6,100 students.

The decision to use the school to "convey" the action due to the fact that if malnutrition is still the leading cause of death of children in the region, on the other hand the possibility to receive

food is the only reason that drives families to send their children to school, even though the region has very low rates of education (in Karamoka 12% of children finish the primary school in the district of Kotido only 2.7%).

The idea to develop in each school an "agroforestry" project, i.e. a piece of land cultivated and planted, is in line with the need to lower the costs that each school has to support daily to buy firewood and thus ensure a meal to students. In a region where deforestation is a serious problem it is in fact essential to train young people on the importance of different cultures and the precariousness of the land. The goal is to encourage a gradual switch production from agricultural waste starting with children where adults mainly grow sorghum and are reluctant to use new seeds to promote the diversification of land.

4. Lighting Africa: Joint initiative of IFC and the World Bank to accelerate the development of markets for clean off-grid lighting products in Sub-Saharan Africa

Lighting Africa, a joint IFC/World Bank program, catalyzes commercial markets for the delivery of clean, affordable, reliable energy services to some 600 million people not connected to grid electricity in Sub-Saharan Africa. The program has already enabled more than 35 million people in Africa to access clean, affordable and safer lighting. Our vision is to create a commercially sustainable industry and market that will reach 250 million more by 2030.

Lighting Africa is part of the World Bank Group's contribution to the goal of Sustainable Energy for All (SE4All) and is implemented in partnership with the Africa Renewable Energy and Access (AFREA) Grants Program, Denmark, the Energy Sector Management Assistance Program (ESMAP), the Global Environment Facility (GEF), Italy, The Netherlands and The United States of America.

The program accomplishes this by undertaking a number of market development activities:

- **Market Intelligence**: In order to help product marketers understand the brand new off-grid lighting market segment, and accordingly plan their sales and marketing activities, Lighting Africa undertakes and publishes a wide range of insightful market research studies including the baseline Solar Lighting for the Base of the Pyramid: Overview of an Emerging Market (2010) and the subsequent Lighting Africa Market Trends Report (2012).
- Quality Assurance: A key market threat identified at the outset of the program was the influx of poor quality lighting products into Africa. This risked eroding confidence in the market among consumers, financiers and other stakeholders. To counter this risk of market spoilage, Lighting Africa developed test methods, now known as Lighting Global Quality Standards, for modern LED-based off-grid solar-powered lights that served as the foundation for the now global International Electro-technical Commission (IEC) Technical Specification 62257-9-5.
- Access to finance: Adequate financing along the entire supply chain has been identified as being critical for the growth of the off-grid lighting market. At distributor level, lack of working capital undermines the ability to secure adequate product stocks and build adequate distributorships in remote rural markets. At consumer level, lack of access to credit limits uptake of modern solar lights. Lighting Africa facilitates and leverages financial products for manufacturers, importers and distributors to help them surmount this barrier.
- Consumer Education: For a market to grow and thrive, consumers must know what products are available and understand the value and benefits of these products over what the consumers are currently using (kerosene and candles). Consumers must also be able to distinguish between good and poor quality products in order to get good value for their

scarce resources. Lighting Africa designs and implements Consumer Education Campaigns in partnership with product manufacturers and distributors to create awareness for modern off-grid solar lighting products.

- Business Development Support: The off-grid lighting market has been typified by remarkable innovation and novelty, and largely driven by social entrepreneurs. Lighting Africa provides advice to players in this sector on best business practices, corporate governance and risk management. The program also provides other types of business development services including quarterly briefings on industry and market trends and business-to-business (B2B) events.

The program also works with governments towards removing policy and regulatory market entry barriers in order to increase access to clean energy, and to foster a vibrant competitive market for off-grid lighting products. In addition, Lighting Africa works with governments to integrate modern off-grid lighting products into rural electrification programs.

Current situation and challenges of energy access in the Sub-Sahara Africa and lessons learnt from Japan's international cooperation

July 7, 2015
Japan

1. Electrification through extension of national power grid

(1) Step-by-step electrification based on the government's commitment and medium- and long-term national electrification program:

Since electrification through the development of national power grid requires huge amount of funding in the constructions of facilities, the electrification will be made in a phased manner based on the medium-and long-term targeting by the government, prioritizing areas which have high electricity demands (national capital area, local city, urban periphery and rural community). Therefore, mid-and long-term commitment by the government is essential and it is necessary to implement in a steady manner based on the mid-and long-term national electrification program and capital investment plan. (Malawi, Zambia)

(2) Strengthening of capacity for operation and maintenance of power system including trouble shooting:

Frequent power outages occur due to excessive load by electricity demand surges and troubles by decrepit electricity facilities. In order to secure stable power supply, it is important to strengthen the capacity for appropriate maintenance of power facilities including preventive maintenance such as patrolling and regular inspections. (Tanzania)

(3) Consideration on social aspect for the poor:

In rural areas, electrification quite highly encounters impediments even if transmission and distribution networks are extended to these areas when the local people cannot afford the connection fees and electricity charges due to their low income. Therefore, electrification program in these areas require keen insights of such prospected risks when formulating program, and careful consideration and implementation of responding measures. (Uganda)

2. Electrification through distributed off-grid power system

(1) Checking the coherence of distributed off-grid power system programs with the national medium-and long-term electrification policy and national program to extend national power grid:

Distributed off-grid electrification program should be formulated in consistence with the overall mid-and long-term policy for electrification, and the extension of power distribution network, and utility rate system. Otherwise, the program would end up with poor development effect as to actual case where the distribution network was extended right after the introduction of distributed off-grid power system. (Ghana, Kenya)

(2) *Appropriate design, installation and maintenance of distributed off-grid power system:*

Distributed off-grid power system should be designed, installed and maintained in an appropriate manner despite the common misunderstanding that distributed off-grid power generation such as photovoltaic （PV）generation is a simple system. A number of cases have been reported in which

storage batteries were abandoned only a few years after the introduction because of the failure. (All over the world)

2. ***Clarifying the property right and responsibility for maintenance:***

Institutional and organizational factors can easily be a bottleneck when property rights of the distributed off-grid power system and the responsibility of their maintenance are not properly understood. Therefore, sustaining introduction and promotion of distributed off-grid power system needs to incorporate effective capacity-building assistance components such as training of engineers and technicians on the ground and awareness activities for end-users. End-user education program needs to reflect actual situation on the ground (including literacy rate of such users). (Ghana)

3. ***Possibility of the mobile expression, introduction of the variableness-type small renewable energy power supply:***

When introducing large-scale distributed off-grid electrification, careful selection of the location is essential. Taking into account the demographical shift that is expected to progress following economic development, promotion of portable or transportable small-scale renewable power sources could be an effective option.

(END)

Mexico's national best practices and experiences in pursuit of universal access to electricity

The International Energy Agency (IEA) estimates nearly 1.3 billion people worldwide lack access to electricity. Mexico, being aware of this situation that affects globally and national wide, has considered it as one of the important action points to follow in its National Plan of Development.

Due to international and national experience Mexico believe that the use and consumption of energy is essential for the productive activities of the society. Its scarcity can become an obstacle for the development of any economy. For this reason, it's imperative to satisfy the energetic necessities of the country, identifying them early and in accordance of the requirements of the economic growth, to extend them to all the Mexicans.

In Mexico, the primary energy production had an average annual decrease of 0.3%, between 2000 and 2011, meanwhile the energy consumption increased by a 2.1% in the same period of time

Regarding the electricity's coverage service, it has expanded and currently covers around 98% of the population. According to the National Institute of Statistics and Geography (INEGI), 1,952,008 Mexicans don't have access to electricity; this represents the 1.8% of the country's population.

Even though today there is enough electric capacity, according to the current national consumption, in the future, a largest incorporation of users and better access to the power supply will mean a challenge, as to meet the needs of electric power of the population and the productive part of the country.

In accordance with the above mentioned, the Mexican Federal Government, in conjunction with several State secretaries, have developed and carried out programs to procure the goals and changes that are necessary for the development of the country, in energy matters, all of them following the strategies and pursuing the goals stablished in the Development National Plan 2013-2018 that are then translated into the National Energy Strategy;

National Energy Strategy 2013-2027
Secretary of Energy (SENER)
Further information:
http://www.sener.gob.mx/portal/Default.aspx?id=2682

In this document, among other strategic topics, "Expanding energy access to disadvantaged communities" is directly related to the energy access for everyone. This strategy has 2 lines of action; "Support to improve the quality of life of the life disadvantaged" and "Improve the energy access". That would have a direct impact in actions such as: water pumping, sewage and treatment systems, public and domestic lightning, digital information and increase the development of women.
The strategy's goal is to bring access to energy services that will provide significant benefits in terms of quality of life and social inclusion to population. By providing drinking water, efficient lighting, heating, cooking, cooling, transport and telecommunications, energy has the effects that result in a better education, health, security, gender equality and sustainable environment.

Below we list and describe relevant programs that attend and promote the universal energy access for all:

Program for the Development of the National Electric System (PRODESEN) 2015-2019
Secretary of Energy (SENER)
Further information:
http://sener.gob.mx/portal/Default_intermedia.aspx?id=3222

The exercise of planning considers general aspects as a result of analysis and consultation with official reports of the "Energy Control National Center" (CENACE), the "Regulatory Electricity Commission" (CRE) and "Federal Electricity Commission" (CFE), as well with help and cooperation of the members of the electrical private industry. This shows the needs of electric power demand and supply. Future energy infrastructure: total transmission infrastructure will cover a length of 24,194 km circuit (km-c) lines, 64,352 MVA of transformation and 12,090 MVAr.

This program has as main objectives to establish in an indicative way, the requirements of the generation capacity sufficient to meet the needs of the country's electric demand and meet the goals of clean energy and determining the development of projects for the power supply associated with the increases of capacity for the period 2015-2029

Program for productive activities with renewable energies
Secretary of Energy (SENER)
Further information:
http://www.sener.gob.mx/portal/Default.aspx?id=2938

The program stablishes work networks in communities that have electric service, this detonates the agro alimentary system and the resultant products are inserted in the local businesses and markets.
This program allows identifying and supporting rural localities that have productive activities, and that technically and economically are susceptible of electrification using renewable energy. It proposes to detonate the extension of the service of rural electrification which has the characteristics of using non-conventional means of electrification and that use renewable alternatives. In this way, not only social inclusion policy is improved, but also increases the component of clean energy sources and the sustainable development of localities with the promotion of productive activities that engage the inhabitants of the communities.

Program: "Change your old refrigerator for a new one"
Electric Energy Saving Trust (FIDE), Federal Commission of Electricity (CFE) and Secretary of Energy (SENER)
Further information:
http://www.fide.org.mx/index.php

It's an incentive and a support so people can get rid of their old refrigerators that have more than 10 years. With this change, people give their old refrigerator and through filling a request and a commercial agreement with a company registered to the program, they can get a new one. According to consumption is the size of the incentive people can get. There are many models of refrigerators to choose from, of course that such equipment must comply with standards endorsed by FIDE which indicates that they have low energy consumption, which incidentally is the goal of the program; to get more people have access to energy, lower cost of energy consumption and increase energy efficiency, which is translated to better energy access for people.

National Crusade Against Hunger
Secretary of Social Development (SEDESOL)
Further information: http://www.sedesol.gob.mx/es/SEDESOL/TodoSobrelaCruzada
The actions that this program takes, in relation with energy access, are the following: Build infrastructure to provide energy power to homes that do not have the service, install solar cells to provide electric energy to houses, build eco- stoves for cooking.

The crusade against hunger is a strategy of inclusion and social welfare, to be implemented from

a participatory process of wide-ranging whose purpose is to combine efforts and resources of the Federation, the Federal States and municipalities, as well as of the public, social and private sectors and agencies and international institutions for the fulfillment of its objectives. The crusade against hunger is oriented to benefit the population who live in conditions of extreme multidimensional poverty and lack of access to food. To accomplish those goals and the population welfare, this wide range program combines other Secretaries and other sub programs, such as; Program for biosecurity and sustainability carried by SAGARPA and Program for Electrification carried by SENER.

Program for promotion of the agriculture 2014, Component of biosecurity and Sustainability
Secretary of Agriculture, Livestock, Rural Development, Fishing and Food. (SAGARPA) carried thru Venture thrust (FIRCO)
Further information:
http://www.firco.gob.mx/componentes_2014/Paginas/Bioenergia_Sustentabilidad.aspx
It's open to any individual or company that engage in productive primary processes in agricultural, livestock activities, aquaculture and fisheries, giving incentives to promote practical sustainable, harnessing, generation and use of renewable energy, energy efficiency, sustainable production of bioenergy, organic crops, production and use of bio inputs, and new products of the bio economy. This program is aiming to help increase production and productivity of the agricultural rural economic units through incentives for: integration of productive chains (systems product), development of agro cluster; investment in physical, human and technological capital, agricultural inputs, post-harvest management, energy-efficient and sustainable use of natural resources.

Decent housing/Rural housing
Secretary of Agriculture, Territorial and Urban Development (SEDATU)
Further information: http://www.sedatu.gob.mx/sraweb/programas/vivienda-rural/

Through decent housing and rural housing programs subsidies are granted to Mexican households in poverty with an income below the line of wellness, with lack of quality and living spaces so they can acquire, build, expand or improve their homes.

In order to contribute to equal opportunities for all Mexicans to improve their quality of life through access to decent housing, the Federal Government, implemented this programs, designed to help lower income households and with this help to decrease the index of social backwardness with the improvement of basic services in the home, through financial support awarded as Federal subsidy for housing improvements.

Korean Experiences in Enhancing Energy Access

To enhance energy access in Sub-Saharan Africa, off-grid or micro-grid solutions will be more appropriate than large-scale grid systems because of the limited demand and resources in the region. In this regard, Korea believes that its experiences with off-grid systems will be useful as best practices.

1. Domestic Experiences of Korea

1-1. Gapado Micro -Grid Project: The Carbon –Free Island

Gapado is a small island located near Jeju Island in Korea. There are around 280 residents in 135 households. The Korean government played a major role in the Gapado project, in which a total of 6 million USD was invested. The project started in November 2011 and was completed in July 2014. To achieve the goal of a carbon-free island, the government focused on the two areas of electricity generation and transportation. With regard to transportation, only electric cars are permitted to operate on the island. Fishing boats and agricultural machinery using fossil fuels are being replaced in stages. In terms of electricity generation, Gapado had previously relied on diesel generators. As a result of the project, the island is now taking advantage of wind power, solar photovoltaic power, and energy storage systems. The island operates two 250 KW wind power generators and two 30 KW solar photovoltaic power generators. Also, 37 houses have 3 KW solar photovoltaic power generators with energy storage systems. In addition, smart-grid technologies were applied to the project and smart-meter systems are being used to check the electricity usage of every household, making it possible to supply electricity in a way that better reflects demand. The system still has some weaknesses arising from inconsistent wind power generation. Nevertheless, considering that this project was carried out on the basis of an off-grid system in a small area, the experience and the data accumulated from it will be valuable for future projects aimed at promoting energy access.

1-2. Gasado Micro - Grid Project : The Energy Self -Sufficient Island

Gasado is a small island located near Jeju Island in Korea with 286 residents in 168 households. The Gasado project started in October 2012 and will be completed in September 2015. The Korean government is playing a major role in the project, in which a total of 8 million USD is being invested. The main goal of this project is to demonstrate technologies for designing and operating “an independent micro-grid system (an off-grid system),” which was developed by the Korea Electric Power Corporation. Thus, instead of generating power only from renewables, the project has adopted a mix of various forms of power generation using diesel, solar photovoltaic, and wind. In normal circumstances, power is generated from 314 KW solar photovoltaic power generators and 400 KW wind power generators. However, in emergency situations where sufficient power generation is not available, 300 KW diesel power generators are also operated. Once power is generated, it is distributed to each household and other power consumers, such as a lighthouse and a radar base, through invertors and convertors. If more power is generated than needed, it is saved in storage systems. The important point of this smart off-grid system is that it adjusts the power supply according to power demand using information technology. As in the Gapado project, the operational data accumulated through the Gasado project will be helpful in establishing future off-grid systems in small areas.

2. Overseas Experiences of Korea

- Hy brid Power System Projects – Kampot & Siem Reap in Cambodia

The Kampot and Siem Reap projects were made possible by the Korea International Cooperation Agency (KOICA) from 2009 to 2011. KOICA provided 2.2 million USD and sent experts to establish the systems and train local people. At the request of Cambodian Ministry of Industry, Mining, and Energy, KOICA supported the building of hybrid power systems in the two Cambodian towns. As Kohsla of Kampot and Phnom Kulen of Siem Reap are not connected to the national grid system, people in the towns had previously relied on batteries manufactured for automobiles. They had to pay 0.25 USD to charge batteries that would last for three to seven days. As a result, 447 households in each town were able to use power for only four to five hours a day. Although the weather of the towns was normally sunny, consistent solar power generation is not guaranteed, so KOICA decided to establish hybrid systems composed of diesel power generation and solar photovoltaic power generation. An important point in this case is that the projects were successful because both financial support and expert training were provided. KOICA sent a project master to work in the towns for eight weeks and four technical engineers for two weeks. In addition, KOICA trained four local workers to operate for six months. Another factor in the projects' success was that they not only focused on local training and education but also adopted a hybrid system instead of generating power only from renewables.

Russian Federation

Urengoy Power Station

Building of the combined cycle power unit with capacity of 460 MW
(Yamalo-Nenets Autonomous Okrug)

Built in a harsh climate conditions and permafrost, Urengoy Power Station nowadays is the first stationary thermal electric power station in Yamalo-Nenets AO.

Putting in operation the combined cycle power unit has a great importance to the station and the energy development of the Yamalo-Nenets autonomous okrug in general, and helped to eliminate electricity deficit and also to ensure the reliability of the power system of Yamalo- Nenets AO – one of the main oil and gas extraction regions in Russia. The new equipment meets the most modern standards of the ecological security and energy efficiency. The efficiency of the new power unit reaches 52.2% that allows to saving to 20-25% of fuel in consideration with the steam power analogues. The station is operated in the mode of the maximum electric load with the capacity factor around 79%.

The power-generating unit has been put in operation in 2012. Basic equipment:

- Two gas turbines GTE-160, the producer OJSC “Power Machines”;
- Two waste-heat recovery unit 160 MW, the producer OJSC “EMAlliance”;
- Steam turbine K-160-7.5, 160 MW, the producer OJSC “Power Machines”.

Dzhubga Thermal Power Plant

Building of the power plant unit on the basis of two power units with the total power of 200.7 MW
(Krasnodar krai)

Dzhubga Thermal Power Plant is one of the most modern and efficient in its class. During the building of the station the requirements of the International Olympic Committee about ecological security were taken into account: the load on the environment is practically absent.

The building was in a mountain conditions with high seismicity. Putting in operation the power station guaranteed the electrical capacity for the winter Olympic facilities 2014 and allowed to cover the needs of electric power of dynamically developing South of Russia. Basic equipment: two gas turbines LMS 100, the producer GE Energy (USA).

The Power Station has been put in operation in 2013.

Lessons learnt from Singapore: Singapore's electrification story

Singapore currently enjoys universal energy access. To achieve this, Singapore adopted a long term strategy on electrification since independence in 1965 based on two key elements. The initial focus was on building the necessary infrastructure to provide basic utilities such as electricity to the population. This was followed by ensuring the reliability of the national grid.

Part I: Building the electricity infrastructure

During the early days of Singapore, there was little demand for electricity, resulting in the government investing in infrastructure in anticipation of future demand. Demand grew steadily through World War Two, driven by the industrial sector. After the war, the unreliability of the surviving generators and the worldwide shortage of materials led to a generation crisis in the 1950s. Additionally, factories and public services such as hospitals and banks were given priority ahead of domestic consumption. This meant that the supply of electricity for household usage was unstable and limited, resulting in many households relying mainly on candles.

One of the top priorities after Singapore's independence in 1965 was to ensure an adequate supply of essential utilities such as water and electricity. The government thus implemented the 10-year Rural Electrification Program to electrify all housing areas in Singapore. Villages that were located closer to the power grid were the first to be electrified, with 300 electrification schemes being implemented at a cost of S$9 million and benefitting over 180,000 people between 1963 and 1969. For villages furthest away from grid, the government decided to shell out $1 million monthly to subsidise the non-viable areas to ensure that every home had power and light. To facilitate bill payment for rural areas, a Mobile Collection Unit was set up in 1964. The government was thus able to provide electricity and ensure accountability by residents. Through this method, Singapore addressed the first step of providing residents with the basic framework of electricity.

However, challenges remained. The power grids in rural areas consisted of overhead bare, stranded copper conductors supported on poles. The electricity supply was liable to frequent disruptions when stormy weather caused tree branches to fall on the wires, causing blackouts. There was also easy theft of electricity by throwing another bare wire onto the overhead line or even theft of the wiring itself. This issue was only resolved by replacing them with insulated wires in 1980s. By then, more than 200,000 people enjoyed the benefits of electrification. Besides electrifying existing houses, Singapore also implemented a compulsory electrification scheme when new houses were built by the Housing Development Board (HDB). This meant that all new public housing came with electricity and were fixed with individual meters outside each flat that could monitor their usage. Electricity was also supplied to the offshore islands through submarine cables. With the implementation of these measures, Singapore ensured the universal coverage of electricity for all its residents.

Part II: Ensuring the reliability of the electrical system

After securing an island-wide coverage of electricity, Singapore concentrated on three key areas in the electricity supply: generation, transmission and distribution. The Public Utilities Board (PUB) was established in 1963 to provide electricity, water and piped gas to Singapore. Its focus was to ensure the sustainability of its investments and the security and high reliability of electricity supply in Singapore. PUB was also responsible for building up the technical competency of locals by instituting a vocation training program for school leavers and engineers. Such a program ensured that Singapore was able to be self-sufficient and have a steady pool of workers that were able to manage Singapore's electricity.

In building electrical facilities, Singapore aimed to 'stay ahead of the curve' by anticipating electrical

demand and building power stations ahead of time. This was done by forecasting demand growth accurately and acting fast, as each power station takes about 5 years to construct. By 1984, there were about 670,000 electricity consumers, with a demand of 13,000 million kilowatt-hours. Singapore was able to cope with this demand with the completion of 3 new power stations.

Alongside the completion of new plants, Singapore began to computerise its current electrical system. PUB introduced the Power System Control Centre system at the Ayer Rajah substation that effectively controlled and monitored the operation of Singapore's power stations and transmission substation. The Condition Monitoring System was installed to provide early warning of any impending failure of any transmission and distribution equipment. The computerisation of the electricity and gas cables map also helped to avoid accidental cutting of underground cables in 1980s and 1990s when the Mass Rapid Transit system and HDB flats were constructed.

Singapore today enjoys a 100% electrification rate and our grid remains one of the most reliable in the world with an average electricity interruption time of less than 1 minute per customer per year. This milestone was achieved by the government's willingness to view electricity as an investment for its people and consistently upgrading itself to be more efficient. By constantly seeking to revamp itself in the field of electricity, Singapore is better positioned to face the challenges ahead in the 21st century.

. . . . .

energy

Department:
Energy
REPUBLIC OF SOUTH AFRICA

INTEGRATED NATIONAL ELECTRIFICATION PROGRAMME (INEP)

INEP BACKGROUND

The Department of Energy (DOE) has been mandated to ensure and secure sustainable provision of energy for socio-economic development. The Integrated National Electrification Programme is the Department's programme responsible for achieving universal electrification in the country. The Integrated National Electrification Programme (INEP) is responsible for planning, project management and funding the bulk infrastructure (e.g. MV lines and substations), grid and non-grid new connections for households that cannot afford to pay for themselves to receive access to electricity.

The programme is implemented by transferring funds to distributors (Eskom and local municipalities) and non-grid service providers with the capacity to undertake the execution of the electrification programme with the aim of achieving universal access by 2025.

INEP and its implementing partners have made remarkable progress in increasing access to electricity in South Africa. Electrification has more than doubled from 34% of the population in 1994 to 86% of formal housing in 2015.

Over 6.5 million households were connected to the grid between 1994 and March 2015. Since the inception of Non-Grid Programme INEP achieved more than 93 000 installations mainly at Eastern Cape, KwaZulu Natal and Limpopo provinces.

Despite its successes to date, there are still about 1.9 million households (informal ~ 1 mil and formal ~ 0,9 mil) without supply of electricity according to Statistics SA information. However, if the illegal connections are added, the real backlog is about 3 million households that are without a metered supply of electricity.

Originally INEP was established in 2001/02 to address the backlog in un-electrified households, in line with the Energy White Paper of 1998. (Before INEP been established, the electrification programme was managed by firstly the IRP Office and then later by the Electricity Regulator on behalf of the Electricity Industry). The newly built households were envisaged to be dealt with by the restructured Electricity Distribution Industry (EDI) which is currently owned by municipalities and Eskom.

Due to serious inefficiencies in the EDI over the last 15 years, DOE had to address both the backlogs and growth in newly built houses. This resulted in a higher than expected demand on electrification funding, and as a result the backlogs could not be addressed effectively. In addition, due to the annual growth rate of houses (formal and informal) being faster than the annual rate of electrification

delivery, escalating electrification costs due to lack of infrastructure, universal access at the current delivery rate will only be possible in 25 years' time. Hence a new approach to electrification was required.

NEW HOUSEHOLD ELECTRIFICATION STRATEGY

The introduction of a New Household Electrification Strategy has the intention to accelerate the delivery of electricity to households in different municipalities, non-grid service providers and Eskom in order to realize the NDP target.

The rollout of electricity supply in remote areas is important to improve the lives of people.

The key areas of the new Electrification Roadmap are as follows:

1) Integrated Electrification Planning based on a least cost approach that combines grid and high-quality non-grid solutions;
2) support to high-backlog, low-delivery Municipalities to ensure that electrification targets are met,
3) Implementing entities Eskom and Municipalities to step up their electrification management and delivery responsibilities.

The Cabinet approved (26 June 2013) the implementing of the new Household Electrification Strategy based on the following focus areas:

a) The defining of universal access as 97% of households, as full electrification is unlikely to be possible due to growth and delays in the process of formalising informal settlements;
b) The electrification of about 90% of households through grid connection and the rest with high-quality non-grid solar home systems or other possible technologies based on cost effective options in order to address current and future backlogs;
c) The development of a master plan to increase efficiency in planning and the delivery process to ensure more connections, including a workshop on the Plan to which all members of Cabinet would be invited to; and

The consideration of the proposed delivery targets, taking into consideration views with regard to-

i. the proposed change to the delivery dates for universal access from 2014 to 2025
ii. the concern that the new proposed target of 280 000 households will contribute to the backlog with regard to the targets set by the Presidential Infrastructure Coordinating Commission (PICC); and
iii. funding provided by the National Treasury to speed up connections

CHALLENGES

Despite the good achievement of the INEP programme, there are still serious challenges with regard to the electrification programme. The following challenges are experienced during the implementation of INEP:

- Lack of resources in municipalities to effectively roll-out the INEP programme – takes sometimes up to 12 months before a design (not start of construction!!) is been made after the funds have been allocated to a municipality,

- Limited oversight from some municipalities and some Eskom regions with regard to the implementation of the projects,
- No of limited reporting of municipalities on progress of projects,
- Most of the backlogs are within Eskom area of supply,
- The price of infrastructure and labour cable increases annually, due to inflation , but also as a result of more connections need to be made in deeper rural area, Areas for electrification in un-proclaimed although permanent structures are being built,
- Funding of electricity bulk infrastructure (e.g. substations and transmission lines)
- Limited resources of INEP to manage and monitor the over 900 projects effectively throughout the country,
- Houses are not delivered as scheduled, making it difficult to plan for electricity,

- Projects scheduled over more than one financial year due to size and complexity provides challenges as DOE funding is fixed on a yearly basis per project,.
- Annual connection cost increasing at a 50% higher rate than the annual allocation increase per connection. This is due to lack of infrastructure of networks not functioning well, since limited maintenance was done over years,
- Municipalities are struggling with the administrative burden regarding procurement, implementation and monthly reporting due to capacity challenges.
- In terms of the non-grid programme it is a tedious process to convince all stakeholders such as Eskom, Municipalities as well as communities to accept the fact that some households will take years to be grid electrified, and that non-grid is an alternative in the meantime.

OBSERVATION REGARDING ELECTRIFICATIONS PROGRAMME

Following observations realised in regards electrification projects after 20 years in implementing the electrification programme:

- Electrification is not only an electricity industry challenge – it is a social challenge;
- No every new research/technology break-through will automatically result in resolving electrification mass roll-out implementation problems – challenge not technology but whole value chain of electricity industry need to functioning in harmony;
- Pilot projects will solve electrification problems - very few pilot projects are successful in mass roll-out circumstances;
- Electrification does not make commercial sense – at the most it can be a break even commercial venture:
- Recover connection costs via tariffs - consumption levels of rural costumers so low that it is impossible to recover capital and operations cost from the tariffs alone;
- In most instances not even possible to recover operation costs to supply a rural customer.
- Ageing infrastructure maybe addressed through maintenance and refurbishment framework in the form of ADAM allocations.
- Need holistic planning, funding and oversight of an national electrification programme.

WAY FORWARD

If universal access to electricity is to be reach by 2025, the following is needed:

- Adequate funding for capital projects, management of INEP programme, skills transfer/Training
- Implementation in line with the Integrated Electrification Plan to be completed by September 2015,
- In the next five years INEP will connect approximately 1.4 million.
- Separate ring-fenced funding for the bulk infrastructure programme to be considered.
- Need to solve the serious challenges in the EDI - difficult to run an electrification programme where networks requires serious upgrading,
- To solve some serious network constrains – we cannot roll out connections in some parts of KZN and EC where there are large network congestions.
- More political support for non-grid technologies
- Good co-operation between National Government and other spheres of government and private sectors
- Resources with regard to municipalities to be improved, political intervention, long procurement processes, lack of responsibility and accountability, lack of reporting and oversight of projects.

ELECTRIFICATION IN TURKEY

In 1970, Turkish Electricity Authority (TEK) was founded by the Law No. 1312 and electrification works had been accelerated in Turkey. Except municipalities and İller Bank, the integrity was achieved, so the works for construction and operation of transmission facilities and distribution facilities as well as planning of electricity sector were assigned to TEA. Some facilities were constructed in the first years and they were amplified in the following years through the allocated investment amount.

By the Law No. 2705 came into force in 1982, urban networks in the first years and rural networks in the following years were transferred to TEK. Since then, electricity generation, distribution and sale activities were carried out by TEK.

By the end of the year 1913, electricity demand of only Istanbul city center was met. The number of electrified city center was reached 32 in 1930, 62 in 1940 and all of the city centers were electrified by the end of the year 1956.

The construction works for rural distribution and rural networks have been commenced in the mid 1960's. Through the investment amount allocated for rural electrification, while the number of electrified villages was 210 in 1963, it was reached 35.191 in 1990 and all of the villages have been electrified in Turkey by the early 1990's.

Year	Number of Electrified Villages	Rate of Electrified Villages (%)
1963	210	0.6
1968	1097	3.1
1973	4883	13.6
1978	12,994	36.0
1983	24,436	67.6
1988	34,834	99.1
1993	36,196	100.0

Rural networks were designed primarily considering the needs of residential lighting due to the conditions of those days. But, in the following years, strengthening or renewal of existing networks was required, due to the increased use of electronic devices and agricultural tools as well as social needs in the villages.

For these reasons, the subject of elimination of existing problems in rural distribution facilities was included into the government program. In 2008, within the scope of Village Infrastructure Support Project, a significant amount of investment allowance was allocated and renovation works for rural networks were started. Distribution facilities in villages have been renovated, using the investments in the Project and the quality of electricity supplied to rural areas had been increased. Investments in the amount of 1.260 Billion TL, corresponding 91.3% of the actual implemented amount have been realized by TEDAŞ.

Turkey, as a developing country, has a high growth rate of electrical energy demand. Compared to the recent years, this demand increase rate is about 6%. In order to meet the demand for electricity and to supply the quality and uninterrupted energy, in addition to generation investments, required investments for distribution network as well as technology investments have been made.

Year	Distribution Line Length (km)	Number of Distribution Transformers	Power of Distribution Transformers (MVA)
1983	228,039	45,212	13,411
1993	595,019	153,060	41,192
2003	818,502	254,289	81,001
2013	1,044,952	384,288	129,550

Recent forecasts indicate that the demand growth trend in all segments of the energy sector will go on in the forthcoming decades in parallel with the economic and social development.

In this regard, main target of the Turkish energy policy has been to provide the timely, reliable and sufficient energy at affordable prices and in an environmentally sound manner, in order to foster the economic growth as well as social development. Efforts of Turkey focus on addressing the energy security, economic efficiency and environmental protection in a sustainable manner.

In 2004, 23.428 MW peak demand and 150.018 GWh electricity consumption, respectively reached 38.274 MW and 248.324 GWh in 2014. The first effect of this increase in demand has been echoed in the electricity production and Turkey, with the purpose of diversifying its production resources, gave priority to local resources and has blocked a single source position production period. As a result, electricity generation capacity of 149.340 GWh in 2004 was increased 250.435 GWh in 2014.

Increase in electricity production has resulted with the increase of the transmission sector infrastructure investments and a number of substations which were 1008 with an installed capacity of 68.941 MW in 2004, has reached up to 1550 with an installed capacity of 127.705 MW in 2014. On the other hand, length of the transmission lines has been reached up to 53.238 km from 45.779 km in the mentioned period. Development and improvement in the sector has resulted with the increase of accessible electricity amount and decrease of the transmission losses. Transmission losses have been decreased to 2.5 % in 2014 from 2.7 % in 2006.

As the improvements in the electricity system infrastructure and realization of electricity exchange in a transparent-competitive-neutral environment make access to electricity easier, it has also contributed to the electricity access through the cross border electricity trade. Our country is continuously extending the possibilities for the access to the electricity by establishing interconnection lines with all neighbouring countries as well as by its synchronous parallel operation with ENTSO-E.

Turkish Electricity Grid

S o u rce:TEİAŞ

Selected UK support in sub-Saharan Africa relevant to the G20 Energy Access Action Plan

The following is not a complete list of the support the UK provides to accelerating energy access in Africa, however it seeks to highlight against the main headings of the Action Plan particular programmes and funds which we believe have the potential for co-operation and replication with G20 and African partners:

1. Policy and Regulatory Environment

The Energy Africa access campaign, being developed with a number of donor and African partners, seeks to build consensus and policy commitments in the form of country **Policy Compacts.** The campaign is currently compiling a model list of the key policy measures needed to create an enabling environment for household solar solutions – for example regarding to fiscal and import issues, consumer protections and product standards. This list will be based on evidence from countries that have demonstrated success in scaling household solar, such as Kenya and Bangladesh, and through industry consultation with the Global Off-Grid Lighting Association (GOGLA) and other key stakeholders. Each country joining the campaign will consider and implement the set of policy measures that can best unlock the household solar market in that country.

Public Private Infrastructure Advisory Facility (PPIAF) is a multi-donor initiative hosted by the World Bank with the UK as the largest contributor. It offers technical support and capacity building to governments wishing to strengthen their legislation and regulation to support private investment in infrastructure. For example PPIAF has been instrumental in supporting reforms of the Kenyan power sector that have unlocked a series of private generation IPP projects, boosting supply and stabilising the electricity supply in the country.

Infrastructure and Cities for Economic Development (ICED) is a new initiative that supports both DFID Country offices and our partners to improve the enabling environment for infrastructure delivery in DFID focus countries and harness the benefits of cities for economic growth and poverty reduction. It aims to replicate the success of the Nigeria Infrastructure Advisory Facility (NIAF - see below) by funding the design of new demand-led Infrastructure Advisory Facilities that respond to country needs and contexts.

2. Technology Development and Deployment

Energy Africa access campaign Co-ordinated Toolkit of Support - Where there is willingness from partner governments to commit to a Policy Compact on expanding household solar access, a coordinated toolkit of support from partner funders can then play an important role in supporting governments in the implementation of the policy commitments, as well as supporting firms as they expand and improve their offerings. Working closely with Power Africa and other donor and financing partners, the campaign will seek to draw together a co-ordinated multi-donor toolkit of programmes and facilities offering technical and financial support to this innovative and high growth potential sector.

Mobile for Development (M4D) Utilities. Working jointly with the Foundation arm of the industry group representing mobile phone operators worldwide, GSMA (Group Speciale Mobile Association), the programme aims to identify and support the development and use of new, innovative ways in which mobile phone technologies and mobile network infrastructure can be used to improve the 27

reach, delivery and affordability of basic energy, water and sanitation services to poor people in Africa and Asia. As a result of this work some 4 million poor people are expected to benefit from improved access to basic energy and water services by 2020.

Green Mini-Grids Africa (GMGs) delivered as bilateral programmes in Kenya and Tanzania, a regional facility with the African Development Bank, and an Action Learning component with the World Bank/ESMAP. GMGs Africa provides project preparation, market development support and viability gap capital to stimulate investment in renewable and hybrid mini-grids powering households, enterprises and community services. This programme is closely co-ordinated with the SE4ALL High Impact Opportunity on Clean Energy Mini-Grids and the SE4ALL Africa Hub hosted at the African Development Bank.

3. Investment and Finance

CDC Group. In partnership with Norfund, CDC has acquired direct ownership and control of Globeleq Africa, the leading independent power producer in Africa with assets in 5 countries. Under its new ownership, Globeleq aims to boost power generation to Africa by adding at least 5,000 megawatts (MW) of generating capacity over the next 10 years. This electricity will enable the creation of over 1.5 million new formal and informal jobs across Africa. Globeleq is currently expanding its gas power station at Azito in Cote D'Ivoire to 430 MW and converting it to a more efficient combined cycle power plant. Working closely with local stakeholders, Globeleq's experienced team of professionals will focus on a range of development opportunities in Africa, including the under-funded earlier stage projects that are too risky for traditional investors.

Private Infrastructure Development Group (PIDG) (£700 million from DFID). The UK contributes towards the PIDG which mobilises private sector investment in infrastructure. 31% of its portfolio is in power generation, including Renewable Energy. A group of subsidiary PIDG companies advise country governments on structuring investments, provide support for project development, and provide long-term finance on commercial terms for power plant construction. In total PIDG has supported projects in construction or operational generating 2.8 GW with a further 1.9 GW (of purely renewable projects) in the pipeline or under active development. Projects funded and developed include the 110 MW Olkaria III geothermal power station in Kenya, the 13 MW Bugoye run of river hydro in Uganda and the 340 MW Cenpower gas and oil fired power station in Ghana (the largest private infrastructure project in Africa in 2014). **Green Africa Power (GAP)** is a Facility under PIDG with a specific remit on Renewable Energy in Africa. It provides long term patient capital as well as a guarantee instrument for private sector investment in development of on-grid renewables.

Results Based Financing for Low Carbon Access tests new approaches to increasing people's energy access using off-grid renewable technologies (£40m). The RBF Facility is housed within the multi-donor Energising Development (EnDev) partnership managed by GIZ and NGO partners including SNV and Practical Action. It will improve energy access for 5.5m people; create or expand at least 5100 enterprises providing energy products and services; avoid emissions of 8.9m tonnes of CO2 equivalent; and funding will be matched 1:1 by private sector investment.

Uganda Get-FiT UK assistance will top-up the Ugandan government's renewable energy feed-in tariff to stimulate private sector investment in 1-20 MW scale, on-grid renewable energy. The project will also help improve the Ugandan Government's regulatory framework through standard form power purchase agreements and tariff reform. We co-fund this programme with Norway, Germany and the EU.

The Scaling-Up Renewable Energy Programme (SREP) is one of the Climate Investment Funds (CIFs) and the UK is the largest contributor with up to £268m in the fund. SREP supports renewable energy 28

generation and off-grid/access projects in Low Income Countries globally, with a focus on Africa. African countries with approved SREP investment plans include Ethiopia, Kenya, Tanzania, Liberia, Mali and Ghana. Further African countries currently preparing investment plans include Benin, Lesotho, Madagascar, Malawi, Rwanda, Sierra Leone, Uganda and Zambia.

4. Capacity Building

Nigeria Infrastructure Advisory Facility (NIAF) provides the government with access to rapid and flexible consulting expertise to help Nigeria improve its infrastructure through policy and strategy formulation, planning, project implementation and private sector investment. NIAF has responded to strong demand from senior decision makers in government to support power sector reforms in Nigeria. In power (which constitutes 40% of NIAF, alongside climate change, urban development, roads and capital projects), NIAF has supported government objectives including unbundling generation, transmission, and distribution - allowing technical expertise to be introduced that was not previously available; the creation of a commercial environment to encourage investment for infrastructure - nearly $3bn in foreign loan financing has been secured for the transmission network since privatisation; introducing independent regulatory oversight and improving transparency – including an effective mechanism allowing for consumer rights.

Climate Innovation Centres (CICs) create business incubation hubs to facilitate very early stage local private sector development of innovative renewable energy and other climate-related technologies. The CIC in Kenya is the furthest advanced in Sub-Saharan Africa with a strong portfolio of firms and technologies, while the Ethiopian CIC is also moving forward. The £19m Global Network of Climate Technology Innovation Centres programme with World Bank InfoDev, supports the design and establishment of another nine individual CICs and the co-ordination and cross-learning of the growing CICs network, such that individual CICs are more interconnected and efficient.

5. Regional Integration

EU Africa Infrastructure Trust Fund (ITF). The UK contributes funds bilaterally for regional projects and also supports some large renewable energy projects in Africa through this trust fund, including the Lake Turkana wind farm and Ethiopia Geothermal (using EDF funds under the SE4ALL window).

6. Coordination and Implementation

Sustainable Energy for Girls and Women (SE4G&W) is an £18m programme seeking to improve the health, safety and economic opportunities of low income girls and women via clean energy, principally in Africa. This includes support via the **SE4ALL Global Facilitation** team for actions co-ordinating, facilitating and tracking international progress on the goals of SE4ALL, and mainstreaming gender considerations into these.

The Energy Africa access campaign will also seek to develop a single window into a co-ordinated multi-donor Toolkit of programmes and facilities offering technical and financial support, aligned with the Policy Compact mentioned above of measures to unlock the market for energy access, particularly household solar.

African Union

Geothermal Risk Mitigation Facility (GRMF) to Unlock Investments and Increase Energy Access in Eastern Africa

1. Introduction

Access to modern and sustainable energy is crucial to achieving Africa's development and transformation agenda, which includes poverty alleviation, jobs creation as well as continued economic and social development. Despite persistent challenges that still hamper the development of the energy sector, Africa has significant amounts of energy resources, both renewable and non-renewable, to address its energy access challenges, including hydro, solar, wind, biomass, natural gas and geothermal energy. The pressing issue in the energy challenge has always been how Africa can convert its huge energy resources into sustainable and modern energy services to meet basic human needs as well as productive uses. The African Union Commission (AUC) and its continental, regional and national partners are already working on many programmes and initiatives aimed at improving modern energy access in Africa. One of such initiatives is the Geothermal Risk Mitigation Facility (GRMF).

2. The Geothermal Risk Mitigation Facility (GRMF)

The GRMF was established in 2012 by the African Union Commission (AUC), the German Federal Ministry for Economic Co-operation and Development (BMZ), and the EU-Africa Infrastructure Trust Fund (EU Africa ITF) in cooperation with the German government-owned development bank, KFW. The overall objective of the GRMF is to encourage public and private sector developers by providing grants for partial financing for surface studies and drilling for reservoir confirmation in order to mitigate the risks associated with geothermal resource exploration. The GRMF awards grants that cover project costs related to surface studies (80%), drilling (40%), infrastructure (20%) and continuation premium (30%).

The AUC serves as the Regional Geothermal Coordination Unit (RGCU) with the mandate to (1) coordinate and provide information to countries, developers, donors, etc., and (2) carry out monitoring and evaluation of the GRMF geothermal projects.

The GRMF programme initially targeted five (5) countries that include Ethiopia, Kenya, Rwanda, Tanzania and Uganda, but due to continued success of this programme, it has been extended to include six (6) additional countries that include Burundi, Comoros Islands, Djibouti, D. R. Congo,, Eritrea and Zambia. There are also plans to expand the GRMF to more countries such as Malawi, Mozambique and Sudan.

2.1 Outcomes of the GRMF Application Rounds

a. First Application Round: The first application round, launched in October 2012 focused on receiving applications and evaluating projects from Ethiopia, Kenya, Rwanda, Tanzania and Uganda, as start-up countries. As a result, four (4) projects (two (2) each from Kenya and Ethiopia) were awarded GRMF grants totalling US$16.9 million. The developers could also benefit from an additional US$6.5 million as continuation premium, which is an additional incentive set in GRMF programme.

b. *Second Application Round:* The second application round was launched in October 2013, focusing on projects in all the eleven (11) eligible countries. Four (4) projects from three countries (Ethiopia, Kenya and Comoros Islands) that include two (2) surface studies and drilling projects each were awarded

grants in the second application round. The total grant awarded in this application round amounts to US$8 million, which could increase by an additional US$2.5 million if continuation premium is included.

c. *Third Application Round:* The third application round for the GRMF programme, which was launched in October 2014, has been more successful than the previous two applications rounds in terms of the number of countries and projects covered. The 3rd application round has resulted in the pre-qualification of eleven (11) projects from seven (7) countries along the East African Rift, which have already been invited to submit full applications for grants awards by mid-July 2015. The total GRMF grants to be awarded in the third application round could reach US$ 31.7 million while an additional US$8.3 million could be awarded as a continuation premium.

The successes recorded in the application rounds of the GRMF are also attracting development partners in promoting geothermal energy development in Africa. For example, in November 2014, the AUC received a contribution of 10 million Pound Sterling from the Department for International development (DFID), UK to enhance its activities in the GRMF programme. DFID has also pledged further contributions of up to 37 million Pound Sterling, depending on further success in the GRMF programme. The GRMF programme now has a total funding of about US$140 million.

2.2. Benefits of the GRMF Programme

- The GRMF programme is helping to mitigate the risks and the large upfront costs associated with geothermal energy resources exploration and field development in the region.
- The GRMF programme is playing a significant role in attracting the required financing for early exploration by sharing the investment risks with both public and private developers in East Africa. For example, the total grants awarded to projects in the first and second application rounds represent about 40% of the total costs of the projects. The GRMF programme also envisages to attract more investments for geothermal field development as well as power plants construction.
- The GRMF programme is also playing a significant role in enhancing sustainable energy access in the Eastern African Rift valley System (EARS) countries through the promotion of geothermal energy development. It is expected that the projects awarded grants in the first and second application rounds, when fully developed, will increase power generation capacity by over 1,000 MW by 2022.

3. Challenges in Geothermal Energy Development in Africa

Despite the achievements of the GRMF so far, there still remain several challenges and gaps that need to be filled in order to accelerate the development of geothermal energy in East Africa. These challenges include lack of appropriate policies, weak institutions, absence of legal frameworks and regulations, lack of geothermal information databases, and low levels of financing and technical skills available in the region. Addressing these challenges requires the GRMF programme to partner with other existing geothermal energy development initiatives within the region as well as enhancing its partnership and co-operation with development partners and financing institutions.