

Enhancing Energy Access in Asia and the Pacific: Key Challenges and G20 Voluntary Collaboration Action Plan

(Final Version)

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A. Background

1. Energy access is defined both as the provision of adequate amounts of high-quality and reliable modern energy supplies, such as electricity, gas and liquid fuels (or equivalent complementary alternatives) as and when needed, and as the ability of individuals to purchase such supplies in the amounts deemed necessary for their daily use. It is instrumental in reducing poverty and ensuring sustainable development. Access to sustainable energy must therefore be available to all.¹
2. Universal access to affordable, reliable, sustainable and modern energy services- is embraced in Sustainable Development Goal 7 of the 2030 Agenda for Sustainable Development. Energy access is intertwined with many other development issues including poverty, social inclusion, public health, food security and the environment. While progress has been made in recent years towards closing the gap, in 2012 about 1.1 billion people worldwide lacked access to electricity and 2.9 billion people lacked access to non-solid fuels for cooking². The majority of the people without access to electricity and clean cooking are overwhelmingly concentrated in rural parts of Sub-Saharan Africa and Asia.
3. In 2014 the G20 Leaders' Summit endorsed the *G20 Principles on Energy Collaboration* agreeing to work together to ensure access to affordable and reliable energy for all. In 2015, G20 Energy Ministers adopted the *G20 Energy Access Action Plan: Voluntary Collaboration on Energy Access*, the first phase of which focused on enhancing electricity access in Sub-Saharan Africa. It is intended as the

¹*Sustainable Energy for All - Tracking Progress in Asia and the Pacific: A Summary Report*, ADB, UNDP, ESCAP, ENERGIA, Energy Access Practitioner Network

²Author calculation based on international Energy Agency (IEA) and the World Bank. 2015. "Sustainable Energy for All 2015—Progress Toward Sustainable Energy" (June 2015), World Bank, Washington, DC. Doi: 10.1596/978-1-4648-0690-2.

first part of a multi-phase plan that aims to “strengthen collaboration of G20 members on energy access in a flexible way, taking account of existing initiatives, and adding value through sharing of knowledge, experience and good practices, in accordance with national circumstances and developmental priorities”.

4. This document represents the second phase of the plan that focuses on the Asia-Pacific region which will be implemented in tandem with the first phase of the Action Plan which focuses on Sub-Saharan Africa, building on the same momentum. There has been progress toward universal energy access, alongside substantially strengthened energy demand in the Asia Pacific region. At present, the Asia Pacific region with almost 60% of the global population, still has around 455 million people who lack access to electricity and 1.9 billion people still dependent upon traditional solid fuels for cooking and heating³. On current estimates more than 50 million people will still be without access to energy in 2040.⁴ The Asia-Pacific region continues to face significant challenges in delivering universal access to affordable reliable, sustainable and modern energy services. This document prepared in consultation with Asia and the Pacific countries outlines major challenges and possible options that G20 members could embrace to address access deficits and accelerate trends towards universal access.
5. In the Asia Pacific region, energy poverty is the highest in the sub-regions of South Asia, Southeast Asia and in the Pacific Island Countries. Most people without energy access are located in areas that face the most difficult geographic challenges (e.g. rural, remote and islands). In absolute terms, the countries in the Asia-Pacific region with the largest electricity access deficit are India, Bangladesh, Pakistan, Indonesia and Myanmar. Countries with high proportion of the population without energy access tend to be located in the Oceania region including Papua New Guinea, Solomon Islands and Vanuatu. Additionally, the countries with the largest dependence on inefficient and unhealthy cooking methods are in the region, including in India, China, Bangladesh, Indonesia, Cambodia, Myanmar, Mongolia, Laos, Vietnam and Fiji. Even in areas where electricity access has improved, unhealthy cooking methods can persist. This situation requires significant effort across the region to encourage

³At present there are 2 versions of statistics adopted by the international community: 525 million from the IEA WEO modeling and SE4All – Tracking Progress in Asia and the Pacific: A Summary Report; 455 million from UN Global Tracking Framework.

⁴ IEA 2015, WEO Chapter 2: Global Energy Trends to 2040 (Developing Asia)

clean and efficient cook-stoves and fuels. Benefits include reducing energy poverty, deaths and illness from household air pollution, and enabling success in other areas of development.

6. Addressing energy poverty in the Asia-Pacific region will require, *inter alia*, enhanced international cooperation to promote innovative technological solutions, develop and scale up sustainable business models and increase financing and investment as a means to realize the goals set under the 2030 Agenda, in Sustainable Development Goal 7 on energy. However, the region is ready for energy transition towards sustainable and modern energy services. Many Asian and Pacific countries submitted Nationally Determined Contributions ahead of COP21 which signal strong intention to transform their existing energy sectors and in particular embrace renewable energy and energy efficiency. All developing countries, in particular least developed countries and small island developing States⁵ are also a specific focus of the Addis Ababa Action Agenda, which encourages international cooperation to provide adequate support and facilitate access to infrastructure and technology for supplying modern and sustainable energy services. The outcomes of the Paris Agreement, and the implementation of the 2030 Agenda, is expected to further enhance deployment of climate financing for renewable energy and energy efficient technology and infrastructure in the region.

Sub-regions within the Asia Pacific will have distinctly different needs for energy access, mostly due to geographical realities. The Pacific Island region and countries with large archipelagos, such as Indonesia and the Philippines, will need to go beyond traditional approaches to rural electrification and grid extension. Enabling policy for private sector investment, innovation, and regional integration will be important across the Asia Pacific region, but will have to adapt to sub-regional and country driven needs.

B. Progress on Implementation in Sub-Saharan Africa since the 2015 G20 Leaders' Summit

G20 Members and International Organizations have been engaged in supporting the implementation in sub-Saharan Africa (SSA) of the activities outlined in the G20 Energy Access Action Plan in many ways. Overarching initiatives such as the AfDB's New Deal on Energy for Africa, the Africa Renewable Energy Initiative (AREI), the Africa EU Energy Partnership (AEEP), and the UK's Energy Africa Campaign and Sustainable Energy for Girls and Women (SE4G&W) initiative are promoting access across the

⁵ Based on AAAA Outcome paragraph 49

(http://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf)

board. Numerous bilateral energy partnerships between G20 members and SSA states are in place. The AfDB, African Union Commission, and UNDP are supporting SE4All Action Agendas and Investment Prospectuses to promote coordination and to create investment opportunities. The Global Alliance for Clean Cook stoves is working to reduce the number of people without access to clean cooking solutions.

Various facilities are available to strengthen the enabling environment: Canada supports the Africa Legal Support Facility, the Kenya Extractives Enabling Environment and also the Enhanced Oversight of Extractive Industries in Francophone Africa, the UK provides the Public Private Infrastructure Advisory Facility (PPIAF), the Infrastructure and Cities for Economic Development (ICED) as well as the East Africa Geothermal Energy (EAGER) Technical Assistance facility. The SE4All Africa Hub with funding of the AfDB's Sustainable Energy Fund for Africa (SEFA) started the implementation of the Green Mini-Grid Market Development Program (MDP) in coordination with SE4All's Clean Energy Mini-Grid High Impact Opportunity.

Funds and programs to support project preparation and implementation have been made available, such as Germany's Project Development Programme (PEP), The Clean Technology Fund, the UK's CDC Group, Private Infrastructure Development Group (PIDG), Green Africa Power (GAP), Results Based Financing (RBF) for Low Carbon Access, and Uganda Get-FiT. For the period 2014-2020, the European Commission has earmarked EUR 1.5 billion of grant allocations to contribute to increasing renewable energy generation in Sub-Saharan Africa, and initiate "The Electrification Financing Initiative" to improve the sustainable business models there.

G20 members provide capacity building programs for various technologies. Brazil undertook technical missions on bioenergy to Swaziland and Ethiopia and offers a distant learning course on the bio energies. Japan supports geothermal capacity-building, feasibility studies and trial digging in countries such as Ethiopia. The Republic of Korea aids Cameroon to understand its potentials for renewables, to formulate its renewable energy strategies, and to implement the strategies with the long-term perspectives by supporting the Master Plan for the Development of Renewable Energy in Cameroon. Germany funds the Secretariat of the West African Power Pool in Cape Verde.

Many efforts on the regional level are underway. South Africa provides technical assistance to its neighboring countries and works through ESKOM in the Southern African Power Pool to improve the

regional energy infrastructure. The African Energy Leaders Group, supported by AfDB and UNDP, brings together public and private sector representatives to enhance regional cooperation. Australia supports the North-South Power Transition Corridor between Kenya, Tanzania, Malawi, Zimbabwe, and Mozambique. Regional planning and coordination are also assisted by a mapping of African energy initiatives undertaken by the Africa EU Energy Partnership (AEEP). Finally, various conferences and meetings have been organized and funded to bring together stakeholders in support of coordination. South Africa hosted the International Renewable Energy Conference (SAIREC) and the Africa Utility Week. Japan organized the Tokyo International Conference on African Development (TICAD) in collaboration with the UN, UNDP, AUC and the World Bank under the framework of multilateral cooperation.

In conclusion, G20 members and international organizations are very engaged in supporting implementation in sub-Saharan Africa of the activities outlined in the G20 Energy Access Action Plan. Yet, much more needs to be done and the creation of access to energy needs to be drastically accelerated if the G20 wants to help to ensure the attainment of SDG7.

C. The Difficulties and Challenges in Addressing Access in the Asia-Pacific Region

Strengthening Investment, Financing and Institutional Capacity

7. The Asia-Pacific region faces significant gaps in investment for energy access. Globally, around USD 50 billion in annual investment is estimated to be required up to 2030 to ensure universal access to clean, modern energy compared to current flows of around USD 13 billion a year.⁶ The majority of this investment required is to develop electricity generation, and transmission and distribution infrastructure.³ South Asia, South East-Asia and the Pacific face the largest investment gaps⁵, along with Sub-Saharan Africa³.
8. Domestic resources alone will not likely be sufficient to close the financing gap in the Asia-Pacific Region, and financing from international financial institutions and the private sector will play a crucial role with public sector financing playing a catalytic role. Many countries in the region have yet to put in

⁶International Energy Agency (IEA) World Energy Outlook 2015, OECD/IEA.

place enabling policies, legislation, regulations and incentives to attract such financing and also to minimize risks, mobilize micro-finance, and support technology demonstration.

9. The region requires support to build the capacity of policy makers to create the appropriate domestic policy, legal and regulatory environment. The technical and managerial capacity of energy practitioners working in energy utilities, the private sector and communities needs to be strengthened. Communities need training on sustainable operation and energy-use for value addition, including suitable management approaches. Knowledge needs to be transferred, and capacity built, in manufacturing, on procurement and improved business practices.

Disseminating Technological Options

10. More is needed to effectively disseminate information widely and encourage uptake of the use of innovative methods, technological options, proven business and distribution models and indigenous energy resources tailored to local context. It is important to develop energy systems with maximum resilience, given the vulnerability of many countries in Asia and the Pacific to natural disasters
11. Almost 52%⁷ of the region's population is rural with low per capita energy demand. Extending the grid in these communities is not financially feasible in many cases making decentralized solutions using local resources preferable. For example, the IEA found that delivering universal electricity access in India would see the vast majority of Indians continue to receive their power via the grid, but that mini-grid and off-grid solutions would provide more than half of the electricity supply to those gaining access for the first time.⁸ Business models such as Energy Service Companies (ESCO) or community management with effective operation and management systems are needed to ensure nationally appropriate reliable energy supplies.
12. The economies of the Pacific Island countries are heavily reliant on diesel fuels for power generation. Countries in the Pacific in particular Papua New Guinea (PNG), Vanuatu, and Solomon Islands, need support to enhance energy access through cleaner, hybrid solutions with appropriate technological options that suit the local conditions. Integrating mini and off-grid electricity access solutions into

⁷ ESCAP Population Database

⁸ International Energy Agency (IEA), India Energy Outlook: World Energy Outlook Special Report, OECD/IEA (2015).

national electrification plans can be a complementary strategy for cost effective on-grid solutions. G20 countries can share knowledge on establishing and enhancing appropriate national standards to provide quality assurance for the range of technologies providing such solutions

13. In the long term, a key challenge for the region is the transition to modern, clean and affordable renewable energy generation for ensuring energy access.

Integrating Energy Access and Other Development Needs

14. The region has a number of least developed countries (LDCs), landlocked developing countries (LLDCs) and Small Island Developing States (SIDS), as well as conflict affected countries, which have large number of poor people. It is therefore important to consider strategies that will build local capacity to manage and service energy access solutions.

Technical training and strengthening vocational education that supports the deployment of energy technologies is a crucial strategy to ensure the success of energy access initiatives and reap broader development benefits. Community ownership and understanding of the energy technologies is crucial.

Strengthening the capacity for systematic planning, including with energy authorities, is crucial to success. There are also many opportunities to integrate energy access development with broader development and livelihood promotion activities, for example the provision of energy efficient lighting or household energy solutions in the context of improved housing, or the integration of modern energy systems with water pumping for irrigation and sanitation. G20 members support for such efforts in SIDs, LLDCs and LDCs, directly relate to the goals under the 2030 Agenda for Sustainable Development and Addis Ababa Action Agenda on Financing for Development to support infrastructure investment for sustainable energy.

Enhancing Regional Cooperation and Collaboration

15. In the 2014 *G20 Principles on Energy Collaboration* leaders agreed to “Work together to make international energy agencies more representative and inclusive of emerging and developing countries.” Furthermore, harnessing the knowledge of international and regional agencies and organizations in support of the challenges and needs of emerging and developing countries will be

crucial in eliminating energy poverty, securing energy supplies to meet demand and promoting free markets that foster economic growth.

16. Energy collaboration issues at the national level pose challenges in addressing energy access. The sustainability of energy systems could be enhanced through measures that promote synergy and coordination across relevant ministries on energy access, restructure utility companies, enhance sub-national collaboration on energy collaboration, and support establishing service centers near the load centers to support operation and maintenance. Standardizing equipment and service, and regulatory services for tariff and fee determination are also important.
17. Initiatives implemented at the national level need to avoid duplication. They should be combined with effective monitoring, evaluation and reporting mechanisms that allow updates on energy access and the quality of services provided.

D. Find a solution—Experience and Suggestions

Enhancing Energy Access Solutions, Experience from China and Other G20 Members

Remote and far-flung areas in the central western part of China lag the socio-economic development levels of the rest of the country. China still had about 40 million people without access to electricity by end of 1999. It was a significant challenge to the Chinese government in providing electricity to these people. The government has prioritized enhancing electricity access to those regions lacking electricity access as an important task of national electric power construction and livelihood improvement.

To improve the electricity access to these areas, China implemented the following:

- i. Rural power grid renovation and upgrading Project
- ii. Village-level electricity access project
- iii. 3-year action plan to realize availability of electricity for no-electricity population

Major components undertaken under these were *power grid extension, micro-grid and independent power supply*. During 2013-2015, efforts to extend access to electricity were targeted at 2.73 million persons living in the inaccessible areas of Xinjiang, Tibet, Sichuan, Qinghai and other provinces covering 8000 administrative villages and 40 cities on electrification.

Two case studies on independent power supply and the extension of the power grid in China are presented in

Independent Appendix (II. Case Studies for the Creation of Energy Access in Asia-Pacific, China) along with case studies contributed by other G20 Members and International Organizations. Factors, including lessons learnt from the G20 case studies and important policies which have contributed to the successful implementation of these programs are explored below.

Success Factors: Realizing strong planning, guidance and policy supports

Strong planning, guidance and policy support is indispensable in efforts to achieve universal access. China prepared a phased approach to prioritize electricity access to populations without electricity in target areas. The planning looked into the area- that could be electrified with power renovation in rural areas, and implementation of independent power projects at the village level in targeted areas supported with appropriate policy formulation for this purpose. With plans in place, electric power construction in these areas was implemented in 2006 and National Energy Administration (NEA) formulated and implemented the *Three-year Action plan to thoroughly Realize Electricity Access for No-electricity Population (2013-2015)*.

The Brazilian “Light for All” program is another good example of the importance of public sector planning and involvement in promoting universal access. Economic barriers were overcome by long-term planning, the identification of target populations, and the allocation of significant funding by the Government. As the case of Singapore demonstrates, planning and coordination can be helpful not only on the local and national levels, but also between countries and at the regional level.

Success Factors: Ensuring investment support from Central treasury and enterprises

Enhancing energy access in rural areas requires high initial investment. The Central Treasury of China provided site specific investment support to cover part of the financing mix. For example, providing 80% of investment funds in Tibet, and 50% in Xinjiang and Tibetan region of Sichuan to reduce the investment pressures on power grid operators. Similarly, large-scaled power generation enterprises provided supports to decentralized systems as a part of their corporate-social-responsibility in enhancing electricity access.

The Australian case study on Vietnam is both demonstrative of the challenges of finding adequate finance and instructive on possible solutions. Interesting in this regard are the insights of the Korean case on accessing climate finance, demonstrating that this can bring additional investments into energy access projects. The instruments for blending finance presented in the Canadian contribution may incubate new financial models building on public, philanthropic, and private funds.

Success Factors: Engaging enterprises on providing public services to perform their social responsibility

Engaging enterprises and also local communities can contribute significantly to the success of access programs and projects. In providing services to no-electricity areas of China, the national and local power companies worked together on extension of transmission lines, construction of a sub-station and providing electricity meters. The State Grid Corporation and local power grid companies of Sichuan, Inner Mongolia and other places

provided electricity access to 1.545 million persons. Further, they were also providing supports to the power projects such as implementing village solar PV power projects.

The important role of corporations, large and small, is also highlighted by the German contribution on the Indo-German Energy Programme. Large companies offer scalable delivery channels and financial resources that can complement initiatives by smaller local and social entrepreneurs that provide solutions to meet local customer needs. The Korean case study on the Philippines shows the benefits of corporation between government funds, multilateral development banks, and local enterprises. Promoting innovative business models is key, which is evidenced most clearly by the inputs from the ASEAN Centre for Energy: importantly, the business model for an off-grid rural electrification project must have some degree of flexibility and fit the specific conditions of the community implementing the project. But as the World Bank case studies on Vanuatu and the UK case study on India demonstrate particularly well, it is also essential to engage the local communities in order to create awareness and ensure local applicability of the respective technological solutions. This is essential to reach a critical mass of consumers who can sustain a market for energy services and products.

Success Factors: Ensuring Sustainability of Energy Access Solutions

The success from China's experience is replicable for many other countries seeking to enhance energy access to populations without electricity by providing support for planning, policy formulation, implementation of appropriate measures and technology. It shows how the targeted support on key areas with engagement of private sector and government on financing and investment accelerates electricity access. The sustainability of the intervention requires local capacity building on operation and maintenance, quality of equipment and services, engagement of stakeholders and also use of such electricity services in enhanced livelihood with creation of several other opportunities.

In the Chinese case studies, sustainability issues on enhancing electricity access to the rural areas are addressed with:

- ☐ Implementing projects in collaboration of central government, local governments, power generation enterprises, power supply enterprises and operation and maintenance service providers with capacity development support provided to these institutions to overcome technical, financial and operational barriers.
- ☐ Selecting appropriate technology for power generation based on locally available resources that meets the demand and is also the most economic option with availability of operation and maintenance services. The Japanese case studies in particular highlight the need to invest in

technology development and innovation in order to diversify options and increase economic viability.

- Providing training to the operators of these energy systems and local grid operators. The local government and enterprises have worked together to compile user manuals, organized training and maintenance services in local languages. As the Australian case study on Kiribati shows local capacity can be a significant restraint that needs to overcome by investment in sustainable capacity. For Singapore, such investments were key in its efforts to guarantee a stable supply of energy. The case studies of the Global Alliance for Clean Cookstoves suggest that setting-up intermediary institutions can help with capacity-building, but also with a range of other issues.
- Engaging professional teams for the implementation to ensure quality and reliability of services in difficult geographical conditions. As the case studies contributed by the UK and the Pacific Community demonstrate, there is also a need to ensure quality standards for products, while avoiding the creation of unwarranted market barriers.

E. Energy Access Goals and Joint Actions in the Asia-Pacific Region

18. The global community committed to an ambitious global agenda '*Transforming our World: The 2030 Agenda for Sustainable Development*' in September 2015 with 17 Sustainable Development Goals (SDG) including SDG 7 on energy. This embraces the goals to ensure universal access to affordable, reliable, sustainable and modern energy by 2030, closely aligned with SE4All's objectives.
19. In March 2016, the Inter-Agency and Expert Group (IAEG) on SDG indicators proposed an indicator framework for global follow up and review of the 2030 Agenda for Sustainable Development to the UN Statistical Commission. For energy access the following indicators are proposed: Percentage of population with access to electricity (indicator 7.1.1); and Percentage of population with primary reliance on clean fuels and technology at the household level (indicator 7.1.2).⁹
20. Many countries in the Asia-Pacific region have prepared road-maps and strategies including set quantitative targets for achieving energy access with associated plans and investment pipelines to

⁹ Report on the Inter-Agency and Expert Group on Sustainable Development Goal Indicators, Economic and Social Council, 19 February, 2016, E/CN.3/2016/2/Rev.1

achieve these targets. Indicators have been set at the national level such as India's target of 100% electrification in 2019, Indonesia's target to reach 100% electrification in 2020, China's goal of 40 million households adopting clean cook-stoves and fuels by 2020, implementation of the SIDS Accelerated Modality of Action (SAMOA) Pathways¹⁰ on sustainable energy for Pacific Island countries – however the region will still fall short of achieving the SDG 7 target. The quality and affordability of energy services remains a challenge for many. Further support will be needed to strengthen the quality and reliability of services especially for productive use, and transition towards cleaner energy systems.

21. Short-term targeted support is needed to assist countries to develop clear policy framework, targets, and commitments. Longer support will be needed to assist countries in implementing programs, attracting investment and building energy infrastructure to make considerable progress towards the SDG7 indicators.
22. In defining energy access goals for the Asia-Pacific region under this voluntary action plan, long-term support should be in line with achieving global targets on SDG7 that could be met by 2030 and focused on initiatives for enhancing access to meet future demand growth triggered by enhanced economic activities and population growth. Most efforts on energy access for the rural population have applied intermittent technologies such as Solar Home Systems, and small-scale Micro Hydro plants. Further support is needed to transition these communities to higher tiers of energy services that can also serve for livelihood enhancement through energy availability for productive uses, as well as enable inclusive growth and public health gains.
23. Short-term support in the next 5 years is needed to address those populations without access to electricity and clean cooking fuels, such as technology transfer- where appropriate for renewable energy based or hybrid type energy systems, and innovations in developing new technologies and delivery models for better, clean energy access for thermal, cooking, and electricity usage. For clean cooking fuels efforts in the short term, the focus should be on enhancing the efficiency of existing cook-stoves and minimizing indoor air-pollution. In the longer term efforts should focus on the transition towards non-solid fuels.

¹⁰<http://www.sids2014.org/samoapathway>

Voluntary Joint Actions for the Asia-Pacific Region

24. The G20 Energy Minister Communiqué during the 2015 Turkish presidency committed to collaborate to move SDG 7 goal forward to realize the development of a balanced, clean affordable, viable and reliable energy mix.
25. The first phase of the *G20 Energy Access Action Plan: Voluntary Collaboration on Energy Access* focuses on six thematic areas: Policy and Regulatory Environment, Technology Development, Dissemination and Deployment, Investment and Finance, Capacity Building, Regional Integration, and cooperation taking into consideration national needs and contexts. These thematic areas are equally applicable to the Asia-Pacific Region for energy access.
26. Considering national needs and demands in the Asia-Pacific region, the G20 may engage in dialogues on specific gaps in the national policy and regulatory environment, investment and finance, regional integration and coordination and collaboration, cleaner energy deployment and innovative business models including Public-Private Partnerships (PPP), while utilizing all indigenous resources.
27. Given the large population and diversity of geophysical conditions in the Asia-Pacific Region, the voluntary action plan will focus on strengthening collaboration of G20 members and participating countries from the Asia Pacific region on energy access issues in a flexible way, taking into account existing initiatives including on financing and focusing on value addition through sharing knowledge on experience and good practices, in accordance with national circumstances and developmental priorities.
28. Monitoring mechanisms for the implementation of the G20 Voluntary Energy Access Action Plan can rely on the global tracking framework put in place by UNSE4ALL. Relevant global, regional and national institutions should be engaged to support reporting arrangements, analysis and compilation of data.
29. G20 members are committed to work together on a voluntary basis with the Asia-Pacific countries on energy access including through possible joint actions below,- with full respect to the specific needs and special situations of each country and in harmonization with relevant regional organizations.

A. *Enhance Capacity for Investment and Financing*

- i. Encourage the private sector to contribute to technology and business innovation and capacity building for sustainable energy access in the region.
- ii. Help Asia Pacific countries to develop business models and financial instruments that support investment and finance flows for long-term national plan's on energy access, including implementation of the SE4All Action Agendas and Investment Prospectuses, and strengthen the capacity of Asia-Pacific countries to develop project proposals for the Global Environment Facility (GEF), the Green Climate Fund (GCF) and other funds through use of readiness support programs and project development facilities.
- iii. Enhance national and regional capacity to formulate policy and strategy on investment and financing of energy access projects in collaboration with multi-lateral banks such as The World Bank (WB), Asian Development Bank (ADB), Asian Infrastructure Investment Bank (AIIB), and the New Development Bank (NDB). Build on existing mechanisms for capacity enhancement such as ADB's support to establish a Centre of Excellence in Singapore and Indonesia, technical support to develop SE4All country action agendas and investment prospectuses, and the organization of investor forums at the country and regional level that bring together project developers with potential financing institutions.

B. *Provide Support to Adopt National Enabling Policies and Foster an Environment for Private Sector Investment*

- i. Bring in best practices from G20 members with experience in other developing countries on how to foster an enabling **national** policy environment that supports private sector investment on energy access.
- ii. (i) Leverage on international and regional energy conventions, such as the G20 Energy Access Workshop jointly organized by UNESCAP and Singapore in October 2016 as a focal point for key stakeholders, to exchange and contextualize best practices, as well as a platform to foster business partnerships.

- iii. Promote PPP models for energy access in feasible areas by supporting the formulation of enabling policy for such partnership.

C. Develop and Apply New Technology

- i. Support the identification and implementation of technologies with sustainable business models for communities that are relevant to Asia-Pacific countries that lack access to energy services and are geographically difficult to reach.
- ii. Support the development and innovation of new technology required for grid integration of isolated systems, smart metering for efficient tariff collection, development of small-scale hydro, solar, wind, biomass based technology, hybrid technology for electrification; efficient and clean technology on biomass based cooking, manufacturing and standardization of efficient cook-stoves and pilot these in particular location for future replication.
- iii. Assist on research and development activities to enhance the efficiency of locally available technology with appropriate technology transfer and support to develop equipment standards for quality assurance to expand energy access services.

D. Provide Targeted Support for Developing countries and Their Capacity Development

- i. Provide targeted support on capacity development, financing and technology transfer, where appropriate to the countries with special needs such as the LDCs, LLDCs, and SIDs.
- ii. Promote the sharing of knowledge on the policy, legal, institutional and regulatory environment to support energy access through south-south and triangular cooperation.
- iii. Promote government support for energy access programs in poor areas with smart subsidy, community ownership, micro utilities, sustainable operation and innovative management models with focus on income generating activities and wider socio-economic development of communities.

E. Harmonize Approach with Global Commitments

- i. Provide support for the implementation of national and sub-regional plans for energy access that support the implementation of SDG7 and SE4All Action Agendas and investment prospectuses as priorities.
- ii. Work together with thematic agencies and international agencies such as SE4All's Asia-Pacific regional hub, international agencies - UNDP, UNESCAP, IEA, IRENA, ADB, WB, GACC, Energy Charter, and the Sub-regional organizations -ASEAN Centre for Energy (ACE), the SAARC Energy Center, and the Pacific Center for Renewable Energy and Energy Efficiency (PCREEE) in implementation of the second phase of the G20 Energy Access Action Plan .
- iii. Provide support for community mobilization, raising awareness, information dissemination and implementation at the local level.

F. Possible Voluntary Cooperation Models

A. Voluntary Financial Support

- i. Encourage voluntary financial support for energy access for Asia and the Pacific, including for complementary initiatives that will bring in positive multiplier impacts such as the productive use of energy, enterprise development, and integrated resource management.
- ii. Strengthen and support existing mechanisms implemented through multilateral development banks such as the Scaling-up Renewable Energy in low income countries Program (SREP) supported by the Climate Investment Fund (CIF). ADB is also supporting energy access programs through various funding facilities such as Clean Energy Financing Partnership Facility (CEFPF), Energy for All- Project Development Facility (E4ALL-PDF), and Climate Change Fund (CCF). These mechanisms provide opportunities for collaboration on implementation of these joint actions¹¹ .

¹¹CEFPF and CCF funds are designed to provide co-financing for ADB projects only through the various Operations Departments of the Bank.

- iii. Support existing donor coordination services, for example the Pacific Regional Infrastructure Facility (PRIF) (details can be found in Independent Appendix), which respond to country needs and energy plans to provide technical, research and project design support matched to available infrastructure funding for energy access

B. Community Participation, Decentralized Energy Systems

- i. Promote the sustainability of community-based decentralized energy systems and services, including community participation and ownership. Support the necessary establishment of enabling environments, for example, through **national** policies at the central government and at the sub-national level that ensures effective engagement of communities through the entire process including resources assessment, design and construction of the power system and its management.

C. Capacity Development

- i. Engage in regional dialogues to share knowledge on challenges and opportunities, lessons learned and experience accumulated from formulating, implementing, monitoring and evaluating national policies and programs.
- ii. Support regionally coordinated development by contributing to technical cooperation, capacity building, and market development programs that supports energy access and facilitate the transfer of technology and know-how, where appropriate.
- iii. Support the establishment of an enabling **national** policy environment and facilitate institutional management through regional cooperation activities that facilitate energy access programs and policies, attract financial investment and deliver development assistance.
- iv. Ensure the success of energy access initiatives and reap broader development benefits through technical training and strengthening vocational education that supports the deployment of energy technologies.

D. Regional Connectivity

- i. Build up partnerships for regional connectivity that link supply centers with various and complementary energy resources and demand centers with varying peak load patterns and enhance energy access to communities among participating countries through such connectivity.
- ii. Share best practice on existing cases of regional connectivity such as CASA 1000, ASEAN Power Grid and the proposed Asian Energy Highway to explore benefits for energy access through trans-boundary power trading.

E. Coordinated Country Support

- i. In recognition of the country-owned SE4All Action Agendas and Investment Prospectuses as tools for the implementation of SDG7, align national policies and targets with SDG7 and create synergies in international support for developing countries on its implementation.
- ii.
- iii. Share data and information among countries and relevant institutions on energy access to facilitate effective monitoring, policy making and program design.
- iv. Develop regional projects on enhancing energy access based on similar socio-economic conditions, resource availability, and on enhancing productive use, gender equality and livelihood.

F. Innovative Business Models

- i. Collaborate on development of innovative business models that are bankable and scalable, to enhance financial visibility and attract investment considering energy usage pattern.
- ii. Provide support to enhance the financial viability of energy access program with demand side management, residential sector energy efficiency program, and private sector engagement for service delivery.



INDEPENDENT APPENDIX

I. Efforts in Support of the G20 Energy Access Action Plan in Sub-Saharan Africa

1.1. G20 Member States

Australia

Responses relate to the North-South Power Transmission Corridor covering Kenya, Tanzania, Malawi, Zimbabwe and Mozambique. The project was delivered as part of the Infrastructure Skills for Development Program, supported by Australia and the African Union. The power corridor was identified as a priority by the African Union.

Policy and Regulatory Environment:

North-South Power Transmission Corridor

- Training through the delivery (by distance education) of an accredited Australian curriculum that provided participants with project management competencies while on the job;
- Access to sector-specialist mentors; and
- Exposure to stakeholders.

Technology Development, Dissemination and Deployment:

North-South Power Transmission Corridor

- Exposure to stakeholders including banks and engineering and mining companies active within the infrastructure sphere;
- o Customised specialist training including negotiation skills, structuring of Public-Private Partnerships (PPPs); and
- o Access to sector-specialist mentors.

Investment and Finance:

North-South Power Transmission Corridor

- Exposure to stakeholders including banks; and
- Customised specialist training including negotiation skills, structuring of PPPs.

Capacity Building:

North-South Power Transmission Corridor

- A work-based project relevant to Program for Infrastructure Development in Africa (PIDA) infrastructure priorities;
- Training on project management competencies;
- Access to highly experienced sector-specialist mentors;
- Customised specialist training including negotiation skills, structuring of PPPs, community consultation

Regional Integration:

North-South Power Transmission Corridor

- Establishment of a structured peer network which had monthly meetings, enabling participants to create their own regional networks.

Coordination and Collaboration:

North-South Power Transmission Corridor

- Customised specialist training including negotiation skills, community consultation, impact assessment and public communication skills.

Challenges and Lessons Learned:

North-South Power Transmission Corridor

- Nomination of engaged and senior public-sector staff that can make a difference is critical to success.
- Selection of strong mentors is essential – sector specialists were selected and taught to be mentors.

Potential Focus Area:

The Australian government is unable to commit to additional work in any of the six issues listed at this time.

Brazil

Policy and Regulatory Environment:

- a) **Feasibility Study on the Production of Biofuels in the WAEMU (West African Economic and Monetary Union)** - the document consolidates key learnings and recommendations of the feasibility study for the production of biofuels in the WAEMU region and it was officially presented in Dakar, Senegal, on October 1st, 2015. The WAEMU countries have a large latent demand for electricity, and a low rate of electrification, causing surplus electricity to be a highly valued byproduct of the production of sugar and ethanol.

The study proposes mechanisms for a regulatory framework, a tax structure, executive branch policies and operation of the market itself. The document was judicious to provide a detailed implementation guide, with the potential to speed up the creation of the biofuels market and cogeneration of electricity with the hope to motivate initiatives with positive impacts not only on the trade balance and the energy matrix of each country, but also for their populations. The study is available at:

http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/produtos/download/Executive_Summary_english.pdf.

- b) **MoU on Renewable Energy between Brazil and Mozambique** – On March 30th, 2015, a Memorandum of Understanding on Renewable Energy between both countries was signed. The objective of this document is to establish the basis for a cooperative institutional relationship to encourage and promote bilateral cooperation, exchange of information and public policies on new and renewable energy issues, as well as the joint research and development of new technologies on this field and the exchange of experts and the promotion of conferences and seminars, alongside with the establishment of a dialogue on trade, including measures to foster the bilateral trade on goods and services related to biofuels.

Capacity Building:

- a) **Swazi Technical Mission on Bioenergy** – during the technical mission on Bioenergy to Brazil that took place in December 2015, the representatives of the Kingdom of Swaziland learned about the Brazilian experience and public policies on biofuels and the cogeneration of electricity from bagasse in sugar factories and decentralized energy generation.
- b) **Ethiopian Technical Mission on Bioenergy** – during the technical mission on Bioenergy to Brazil that took place in April 2015, the representatives of the Ethiopia learned about the Brazilian experience and public policies on biofuels and the cogeneration of electricity from bagasse in sugar factories. Negotiations for the signature of a Memorandum of Understanding on Bioenergy, including energy generation, were also initiated.
- c) **Course on the Biogas Energies** - This is a Distance Learning course, designed to facilitate the participation of students from diverse geographic regions, promoted by the International Center on Renewable Energy (Biogás CIBiogás-ER), a science, technology and innovation institution partially state-supported. The course content was designed by experts with the aim of providing professionals with updated knowledge for application in the biogas energy field. After several successful Portuguese editions of the course, which has qualified students from Angola, Cape Verde, and Mozambique, Brazil started in late 2015 an English version with facilitated access to participants from Africa and Asia.

Canada

The following two projects supported by the government of Canada correspond to all or some focal areas mentioned in the questionnaire.

The Energy Sector Capacity Building Project in Tanzania

This project of \$15.5 million aims to promote the responsible and sustainable development of Tanzania's natural gas and energy sectors and to develop public private partnerships for power generation. It supports the Government of Tanzania in developing and implementing clear and comprehensive policies and regulatory frameworks to maximize the financial, social and environmental benefits of natural gas development, in line with international standards and best practices.

The Project activities include: 1) developing a petroleum policy and legal framework; 2) providing strengthened sector coordination and governance; 3) preparing and implementing a vocational education and skills development plan; 4) developing and implementing a public-private partnership action plan; and 5) providing technical advice related to the oil and gas sector.

The project is implemented by the World Bank through the Ministry of Energy and Minerals, the Tanzania Electric Supply Company Limited, the Tanzania Petroleum Development Corporation, and the Energy and Water Utilities Regulatory Authority.

The expected intermediate outcomes for this project include: (i) improve participation of local petroleum professions in the gas and energy sectors; (ii) improved enabling climate for private sector investment in the oil and gas sector, in a socially and environmentally responsible manner; (iii) improved responsible management of gas and energy sectors by key institutions involved in the country's gas and

power generation sectors; and (iv) improved Petroleum Policy and Legal Framework to maximize value arising from natural gas development (financial, social and environmental).

The Clean Technology Fund

This initiative of \$200 million aims to reduce greenhouse gas emissions over the long term by supporting the use of clean, low-carbon technologies such as wind, solar, geothermal or tidal power, in several developing and middle-income countries. The Clean Technology Fund (CTF) provides new, large-scale financial resources for clean energy projects that help to successfully demonstrate deploy and transfer low-carbon technologies with significant potential for long-term GHG emissions savings. The CTF supports investments in energy efficiency and in the power and transport sector.

The CTF, a multi-donor trust fund created in 2008 as part of the Climate Investment Funds, provides concessional financing to cover the identifiable additional costs of the investment in clean technology necessary to make a project viable. CTF financing leverages significant public and private sector funding, as well as funding from multilateral development banks. The CTF supports 15-20 country or regional investment plans that show significant GHG emissions savings, demonstrate the potential to be replicated elsewhere, are ready to be implemented, and promote environmental and developmental co-benefits that show how low-carbon technologies can contribute to national development goals and strategies.

The expected intermediate outcomes for this project include: Transformed energy supply and demand to low carbon development pathways. The results achieved as of June 2014 include: approval of investment plans in Colombia, Egypt, India, Indonesia, Kazakhstan, Mexico, Morocco, Philippines, South Africa, Thailand, Turkey, Ukraine, and Vietnam as well as a regional project in the Middle East and North Africa. Together, they have resulted in: (1) 12.3 million tons of greenhouse gas emissions reduction; (2) 2,255 megawatts of installed capacity of renewable energy; (3) USD 7.022 billion of direct finance leveraged by the CTF investments; and (4) 11,166 gigawatt hours of energy savings.

The following projects supported the Policy and Regulatory Environment, Regional Integration and Coordination and Collaboration focal areas.

Africa Legal Support Facility (\$10.25 M)

The initiative aims to help level the playing field for African governments in the negotiation of fair and better quality contracts in the extractives sector. While African governments conclude a wide range of complex contractual agreements with investors for large investments in the extractives sector, many are disadvantaged by a large gap in financial and/or human resources capacity to negotiate effectively or on an equal footing with legal teams on the investor side. The African Legal Support Facility (ALSF) is an independent international organization, hosted by the African Development Bank (AfDB), which provides legal advice and capacity building assistance to African governments. Canada is supporting the five-year Medium-Term Strategy (2013-2017) of the ALSF, earmarking its contribution for extractives sector activities in the following areas 1) review and negotiation of complex contracts and legal frameworks; and 2) training African government officials to carry out these negotiations themselves

Enhanced Oversight of Extractive Industries in Francophone Africa (\$18.3 M)

The project aims to improve regional and national oversight of the extractive sector in four target countries - Cameroon, Madagascar, Burkina Faso, Mali - by strengthening the capacity of national Supreme Audit Institutions (SAIs) to undertake auditing of the extractives industry. Through a partnership with francophone Africa's regional association of supreme audit institutions (SAIs), the Conseil Régional de Formation des Institutions Supérieures de Contrôle des Finances Publiques d'Afrique Francophone Subsaharienne (CREFIAF), the project would develop a regional approach to the audit of extractive activities that incorporates gender equality and environmental concerns. Key activities would include the development of regional and country-specific extractive industry (EI) audit guidelines and other technical resources aligned with international best practices; development of regional EI audit training curricula (including specific modules on gender and environmental issues) and roll-out of training to the four national audit bodies; completion of EI pilot audits in target countries; and the development of guidelines and processes for systematically engaging stakeholders, including citizens, women's groups, civil society organizations, media and industry, in EI auditing processes.

Kenya Extractives Enabling Environment (\$950,000)

The purpose of the project is to develop a comprehensive sector-wide plan for the effective governance of the nascent oil and gas sector, contributing to the development of an internationally accepted regulatory framework to support inclusive growth, transparency and sustainable development in Kenya.

Key challenges facing Asia Pacific in promotion of access to energy include the following:

- i) Limited energy planning capability
- ii) Weak capacity within government agencies and regulatory authorities to manage and monitor sector development and to effect necessary changes to regulatory framework
- iii) Mitigation and adaptation to Climate change
- iv) Environmental management
- v) Lack of appropriate technology

The Government of Canada is also making contributions which impact energy access in Africa in the context of the G7.

The African Renewable Energy Initiative

In conjunction with G7 partners, the Government of Canada is contributing \$150 million toward the African Renewable Energy Initiative which support renewable energy in Africa. More specifically, this Canadian climate financing project supports the 2015 G7 declaration which formulates that the objectives to reach up to 10 GW of additional installed renewables capacity by 2020 in Africa and "to improve sustainable energy access in Africa by 2030 by accelerating the deployment of renewable energy". It thereby supports corresponding goals of the Africa Renewable Energy Initiative.

This contribution is part of Canada's pledge of Can\$2.65 billion over the next five years to take action on climate change in developing countries, representing the most significant Canadian climate finance contribution ever.

Would your government be interested in working on one or two of the above six issue areas? Please specify which areas.

Global Affairs Canada is in the midst of wide-ranging consultations on its International Assistance Review. Once the consultations have taken place, we may be in a better position to provide a response to this question.

France

Each year, the Agence Française de Développement (AFD) launches a Facility for NGOs designed to address innovative operations (FISONG). In 2015 the FISONG aims to grant projects that provide access to sustainable energy to remote populations in Sub-Saharan Africa, as well as develop the local economic fabric. The NGOs should partner with a local organization and present a financing, organizational, and/or technical innovation. In particular, the AFD has financed service centers electrified with solar energy in localities of Madagascar, support for local energy operators in Senegal and Madagascar, energy recovery of cashew seed for businesses in Ivory Coast.

In Kenya, the AFD is implementing the 30 M€ regional component of the DFID Green Mini-grids Program. The objectives are to support a promising model for rural electrification: the private mini-grid power systems supplied by renewable energy sources. A recruited Managing Entity will provide financial incentives such as connection grants to developers, as well as technical assistance for project preparation and support to public authorities for the formulation of a regulatory framework conducive to private investment in the sector. In addition, some project could benefit from the existing AFD credit line to local banks designed to promote renewable energies and energy efficiency.

Investment and Finance: The Fond Français pour l'Environnement Mondial (FFEM) designed in 2015 the **Pioneer Facility**. This Facility aims to provide working capital loans to social businesses, in particular companies that are focused on domestic energy and conversion of waste into energy. The beneficiary of the FFEM's grant will identify a list of eligible companies, design and monitor the loans, report and evaluate the program. The Pioneer facility will start its activities in South-East Asia and extend to some African countries in the next few years.

Germany

Germany supported its partner countries in Sub-Saharan Africa in all six of the above-mentioned issue topics in 2015 in manifold ways and on different levels, namely through:

Bilateral German energy programmes of the German Federal Ministry of Economic Cooperation and Development in

- Senegal,
- Nigeria,
- Tanzania,
- Uganda,
- Madagascar and
- South Africa.

Our bilateral interventions are long-term programmes that are jointly implemented with the Ministries of Energy in our partner countries. Bilateral programmes normally comprise a component for technical and one for financial cooperation, i.e. extending support capacity development on the national level, improving cooperation of the various national energy sector stakeholders and improving the regulatory framework for energy access projects in the countries of operation as well as extending financial support for generation and transmission infrastructure.

The **Africa EU Energy Partnership (AEEP)** and the **European Union Energy Initiative's Partnership Dialogue Facility (EUEI PDF)**. Germany is co-financing, both the EUEI PDF as well as the AEEP, and hosting their secretariats respectively. Through the AEEP, Germany is providing a high level dialogue forum for policy makers and relevant energy actors, as well as a platform for energy expert exchange on know-how, knowledge and policies. The AEEP is structured as a long-term institutional framework for political dialogue and cooperation with Africa and the EU. Through the EUEI PDF as a multi-donor facility in general, Germany as one of the donors of the EUEI PDF, is supporting high-level political dialogue and information dissemination activities as well as the implementation and integration of sustainable energy solutions into national, regional and local development strategies and policies in 27 countries in Sub-Saharan Africa.

The multi-donor programme **Energising Development (EnDev)**. Germany as one of the seven donors of EnDev and with its implementing agency GIZ host to the EnDev project management has been supporting the facilitation of sustainable access to modern energy services for millions of people since 2005. EnDev is operating in 15 countries in Sub-Saharan Africa (Burkina Faso, Burundi, Ethiopia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Rwanda, Senegal, Tanzania, Uganda). EnDev follows a market-based approach, supporting initiatives and ideas that meet the needs of the beneficiaries while matching donor focal. Each EnDev intervention is assessed based on the number of people who have gained access to modern energy services per EUR spent. Activities range from supporting access to cooking energy, solar lighting, the development of RE mini grids to grid densification schemes. For the successful implementation of its interventions, EnDev is closely collaborating with partners on all levels in its partner countries (national, district regional, local; Government, private sector, civil society).

The **German Technology and Climate Initiative (DKTI)** of the German Federal Ministry of Economic Cooperation and Development as an instrument for facilitating transfer of know how and climate friendly technologies between Germany and its partner countries. From 2012 to mid 2015, Germany supported projects in 9 countries with a total volume of 1.2 billion EUR under the DKTI. One of the DKTI projects was operating in Sub-Sahara Africa in 2015 – ProSolar in Kenya. In cooperation with the Kenyan Ministry of Energy and Petroleum as well the Rural Electrification Agency, ProSolar is aiming at improving the national regulatory framework for the development of solar-hybrid mini grids in cooperation with the private sector.

The **Project Development Programme (PEP)**. PEP operates as part of the export initiative “renewables – Made in Germany”, which is led by the German Federal Ministry of Economy Affairs and Energy. It combines typical German foreign trade promotion tools with instruments of development cooperation. It supports German companies in their efforts to assess and enter the markets of sub-Saharan Africa, and assists them with market preparation and market development. It carries out studies, provides market intelligence and hosts information events on the new African markets.

The **German South African Energy Partnership** which was signed in February 2013 is aiming at improving and developing a sustainable energy infrastructure in particular through the increased use of EE and RE. The partnership is designed as a platform for high-level dialogue for various topics, among them rural electrification through RE.

Germany's support to the **West African Power Pool (WAPP)**. Through GIZ, Germany is supporting the WAPP secretariat located with the ECOWAS Centre for Renewable Energies and Energy Efficiency in Praia, Cape Verde, in pursuing its Capacity Building Master Plan. This is to ensure that any infrastructure planned and installed as part of the WAPP, such as grids and power stations, is effectively used and properly maintained. Through KfW, Germany funds generation and transmission infrastructure for the further development of WAPP.

Challenges and Lessons Learned:

- High population growth rates in some of the partner countries: Outcomes of actually successful interventions are curtailed by rapid population growth rates, i. e. an ever increasing dimension of the problem situation which grows faster than development interventions generate outcomes in some countries. This phenomenon can be especially observed as regards the heavy reliance to modern cooking energy.
- Remoteness of beneficiaries, high costs involved with reaching beneficiaries
- Lack of sufficient institutional capacities: The institutional capacities of power utilities, rural electrification agencies, energy ministries and sub-ordinated agencies may not be strong enough to absorb financial support and advisory services that come with large-scale infrastructure programmes.
- Delay in procurement processes: mostly centralized, but also decentralized infrastructure interventions are subject to tedious procurement processes that can substantially delay implementation of the programme.
- Lack of financially proven business models: the majority of the existing mini grids are not entirely financially viable, but rely on public funds, project grants. Setting tariffs that would increase the economic viability of mini grids may be prohibitive for rural communities. Therefore, rural electrification programmes should comprise activities for increasing productive uses of energy, fostering local economic growth and income of the beneficiary group.
- Persisting lack of policy and regulatory policies: responsibilities and communication flows among all national stakeholders need to be clearly defined, new institutions established.
- Lack of access to long-term finance: sustainable financing for scaling-up successful projects and approaches is still not available as needed especially in developing economies the banking sector is not able to offer adequate financing services. International financing instruments often come with rigorous requirements, e.g. risk mitigation. Effective risk mitigation needs adequate policies...
- The sustainable operation and maintenance of mini grid infrastructure requires specific technical, business and managerial capacities and a solid business plan. At the same time it is important to involve all involved stakeholders (including local communities) in all stages of project planning and implementation.
- Continued heavy reliance on traditional biomass for cooking energy: Especially in rural areas, the majority of the people living in Sub-Saharan Africa will continue to rely on traditional biomass (woodfuel, charcoal) for their cooking energy needs in the medium-term. This comes with the widely

known risks for respiratory health of especially women and children, the environment and climate. Therefore, it is absolutely mandatory to include interventions for fostering access to modern cooking energy services in any programme aiming at increasing energy access in Sub-Saharan Africa.

Potential Focus Area:

Germany is committed to continue its engagement in all six of the above mentioned issue topics in the energy sector in Sub-Saharan Africa.

Japan

Japan has been supporting developing countries through Official Development Assistance (ODA). For energy sector, total amount of financial aid in five years (2010-2014) has reached \$ 12 billion, which makes Japan as the top donor among the OECD / DAC members. Some examples of the projects which Japan has started in Sub-Saharan Africa since 2015 are summarized in Table 1. Outlines and challenges of each project are described in the following six issue areas based on the questionnaire from SE4All.

Policy and Regulatory Environment

Since 1993, focusing on the development of Africa, Japan has organized the Tokyo International Conference on African Development (TICAD) in collaboration with United Nations, United Nations Development Programme (UNDP), the African Union Commission (AUC) and the World Bank under the framework of multilateral cooperation. Next TICAD will be held in Kenya on August 27-28, 2016, which would cover the relevant topics such as “Policy and Regulatory Environment”.

Technology Development, Dissemination and Deployment

For energy access in Sub-Saharan Africa, Japan continues to implement technical support related to strengthening transmission and distribution networks. To cope with the rapid increase of electricity demand, not only developing power plants but strengthening transmission and distribution networks is essential for a stable electricity supply system.

> No.1:Olkaria V Geothermal Power Development Project

Kenya's peak demand of electricity was 1512MW in 2015, in which approximately 37% of it was from hydro. The challenge in Kenya is that electricity supply is easily affected by drought, which has been frequent in recent years. In response to this challenge, in Olkaria geothermal field of Nakuru County, central Kenya, geothermal power plant (2 units of 70 MW), steam-water transport pipeline and transmission lines (about 5km) will be installed to provide an affordable and low-carbon power generation for a base-load capacity.

> No.2: The Project for Improvement of substations and Distribution Network (Phase 2)

By installing a substation and expanding a power transmission and distribution network in Kigali, the capital of Rwanda, this project will contribute to realizing a stable and efficient supply of the required amount of electricity to promote economic and social development for Kigali.

> No.4: The Project for Reinforcement of Power Supply to Accra Central

By installing a backbone network of power transmission and distribution in Accra, the Capital of the Republic of Ghana, this project will contribute to realizing a stable electricity supply and reducing energy loss in a power line of transmission and distribution. The challenge was to secure an adequate

space for constructing in urban narrow area. This challenge was resolved by adopting a compact GIS (Gas Insulated Switch) substation facilities from Japan.(Project description: The construction of Accra Central Substation and the newly-built transmission line of 3.4km from the new substation to the existing power grid)

➤ **No.5: The Project for Reinforcement of Transmission Network in Nacala Corridor**

This project is to construct a new substation and strengthen the existing substation of in Nampula province of northern Mozambique. The region is facing power shortage and the rapid growth of electricity demand is expected. The challenge is to build a stable and efficient electricity supply system by strengthening the existing grid in parallel with developing electricity generating capacity for middle and long-term perspective. This project would contribute to resolve this challenge.

Investment and Finance

There are two ways to support the developing countries from Japan. One is bilateral aid and the other is multilateral aid through international organizations, which is carried out through international organizations that Japan is supporting. Bilateral aid is implemented as a "donation" or "loan assistance". The donation has two forms, i.e., "grant aid" and "technical cooperation". "Loan assistance" is also referred to as the "yen loans". In table 1, projects of the "yen loans" and "grant aid" in Sub-Saharan Africa are listed.

Capacity Building

Japan has been consistently supporting the development of institutional environment for partner countries by capacity building, feasibility study and business model from human resource development perspective. For example, to employ geothermal power generation in Ethiopia with the rich geothermal resources, on the basis of the result of feasibility study, master plan studies and the grant aid based trial digging by Japan, the workshop for geothermal power generation was held with relevant persons of Ethiopian government in Nov., 2015.

Regional Integration

The following project will lead to regional electricity market integration.

➤ **No.3 Kenya-Tanzania Power Interconnection Project**

In the framework of accommodating affordable and stable electricity within the region (power pool), power interchange is planned from Ethiopia, which has a high potential of hydropower, to Kenya and Tanzania of high electricity demand. In line with this background, this project is to realize a stable power supply system in the region by installing international power transmission line connecting the Ishinya, Kajiado County of Southern Kenya and Singida of central Tanzania (total length; 507.5 km).

Coordination and Collaboration

Prior to the implementation of projects or programs, Japan always discusses with recipient countries intensively about the significance and positioning of them. Also by sharing project information among relevant donors, a coordination process is embedded in the planning procedure of Japan.

In addition, Japan has been working on the preparation of master plan which can play an important role in the adjustment and promotion of projects. Japan explains its content to major donors as well as recipient countries when appropriate.

To execute this kind of coordination and promotion, it is very important to develop human resource in the recipient government. Japan will continue to promote grant aid-based training programs for a

cooperation issue to contribute to the energy access in Sub-Saharan Africa

Table 1: Examples of Japan's contribution to Energy Access in Sub-Saharan Africa

No.	Country	Project Name	Facilities Overview	Type of Investment and Finance	Agreement date
No.1	Kenya	Olkaria V Geothermal Power Development Project	Geothermal Power Plant (140MW)	Yen Loan	Mar09, 2016
No.2	Rwanda	The Project for Improvement of substations and Distribution Network (Phase 2)	Substation and T&D network in Kigali City	Grant Aid	Mar08, 2016
No.3	United Republic of Tanzania	Kenya-Tanzania Power Interconnection Project	International Power Transmission Line between Kenya and Tanzania	Yen Loan	Jan15, 2016
No.4	Ghana	The Project for Reinforcement of Power Supply to Accra Central	Backbone T&D facilities in Accra City	Grant Aid	Dec08, 2015
No.5	Mozambique	The Project for Reinforcement of Transmission Network in Nacala Corridor	Extension of substations in northern Mozambique	Grant Aid	Apr02, 2015

Note: Agreement date corresponds to the date of signature of Loan Agreement or Grant Agreement.

Potential Focus Areas:

As Japan will continue to support the activities for energy access in Sub-Saharan Africa through the framework of bilateral and multilateral aid, there is no particular preference for the above six issue areas.

Mexico

Voluntary Collaboration on Energy Access in Sub-Saharan Africa

As result of the "General Climate Change Law" published in 2012, federal government published the National Strategy on Climate Change (ENCC, Spanish acronym) which establishes the pillars that policy on climate change. Additionally, the Inter ministerial Commission on Climate Change published the Special Program on Climate Change (PECC, Spanish acronym) which main objective is to determine specific action lines and targets regarding mitigation and adaptation to climate change during the present administration.

- The PECC has 199 action lines on adaptation and mitigation of climate change for all the sectors, 44 of which are responsibility of energy sector.
- Almost 62% of mitigation commitments established in PECC belongs to energy sector.
- Energy sector contributes with 11.25% of methane reductions.
- Energy sector contributes with 36.9% of total black carbon reductions.
- It is expected to decrease at least 25% of intensity of emissions per MW/h.
-

The national budget for energy R&D comes from a 0.65% duty on oil and gas extracted in the country. From this total budget, 65% is assigned to the Hydrocarbon Fund and 15% is assigned to the Mexican institute of Petroleum (IMP) for research, technological innovation, and human capital development in areas of interest for the hydrocarbon sector. The other 20% is assigned to the Fund for Energy Sustainability for research, technological innovation, and human capital development in areas of interest for the sustainability sector.

As of the energy reform approved in 2013, Hydrocarbon Fund and the Fund for Energy Sustainability have expanded possible recipients of funding from Institutes of Higher Education and Research Centers to now include NGOs, non-profit institutions, private companies and individuals.

The Fund for Hydrocarbons awards funds to projects that will promote research and innovation in new technologies for the energy sector in order for Mexico to take full advantage of the country's hydrocarbon resources in an efficient, socially responsible and environmentally sustainable manner, in accordance with the energy reform of 2013.

The Energy Transition Law established that by 2024 35% of total electricity generation should come clean energy sources. The Fund for Energy Sustainability has awarded over 3 billion MXN for the creation of the Mexican Centers for Innovation (CEMIE) in renewable energy sources including: solar (CEMIE-Sol), wind (CEMIE-Eolico), geothermal (CEMIE-Geo), bioenergy (CEMIE-Bio) and ocean (CEMIE-Oceano).

Large research consortia, such as the Mexican Centers for Innovation in Energy (CEMIE), made up of several institutions including public and private universities, research centers and private companies self-govern and self-organize their operations and report their activities to the Administrative and Technical Committee of the Fund for Energy Sustainability.

The Ministry of Energy's area for Research and Talent Development, along with the National Council on Science and Technology administer funding for research and development through the Hydrocarbon Fund and the Fund for Energy Sustainability

The following Programs and Strategies have been published to promote the use of renewable energies in Mexico:

- **National Energy Strategy (ENE) 2014-2027** (ENE for its acronym in Spanish); it explicitly states to provide more flexibility for transmission and distribution infrastructure as well as to diversify the power generation fleet by taking advantage of available renewable energy potential in the country.
- **National Strategy for Energy Transition and Sustainable Use of Energy 2014** (ENTEASE for its acronym in Spanish); it allocates public funds via the Federation's Expenditure Budget in order to foster energy efficiency measures in all economic sectors, power generation diversification, and renewable energy utilization.
- **Transition Strategy to Promote the Use of Cleaner Technologies and Fuels**, which integrates public policy recommendations towards the use of bioenergy, wind, solar, hydro and geothermal power, smart grid and distributed generation schemes.
- **Energy Sectorial Program 2013-2018** (PROSENER by its acronym in Spanish); it aims at meeting with Mexico's environmental commitments, while transitioning towards a low carbon economy and an enhanced use of renewable energies for power generation. It also promotes the sustainable use of energy and implement social and environmental responsibility programs in the energy sector.
- **Special Program for the Development of Renewable Energies 2013-2018** (PEAER by its acronym in Spanish), which establishes the objectives, strategies, lines of action and specific targets for the increase of participation of renewable energy in the mix for the period that ends in 2018.
- **Development Program of the National Electric System 2015-2029** (PRODESEN for its acronym in Spanish) envisages the development of the Mexican electric power system over the next 15 years. It includes an indicative program for generation capacity additions and retirements as well as the expansion/ modernization plan of transmission and distribution infrastructure.

On December 2015, the **Energy Transition Law** was published, and establishes that **25% of total generation** will come from **renewable and other clean energy technologies by 2018**, while the goals for **2021 and 2024 have been set to 30% and 35%**. To achieve this goal, the federal government has established **mechanisms** to promote clean energy generation:

- **Clean Energy Certificates (CEL)** for its acronym in Spanish); it is the main incentive for renewable energy and other clean energy technologies derived from the 2013 Energy Reform. CEL will be an additional revenue that power generators receive for selling electricity into the wholesale market or bilateral agreements with qualified consumers.
- **2016 Long-term power, energy and CEL wholesale market auction** will award long-term power purchase agreements (15 years) and CEL over a 20 years period for renewable energy and other clean energy technology project.
- **Net metering scheme (under revision by Mexico's Energy Regulatory Commission)** which is eligible for renewable energy projects with a capacity of less than 500 kW (Distributed generation scheme).

- **Tax Incentive** (Accelerated depreciation); established in 2005, it allows for 100% tax income deduction for machinery and other investments made in renewable energy and efficient cogeneration projects. As of November 18th, 2015, the addition of Article 77-A to the Law on Income Tax allows renewable energy and efficient cogeneration companies to create a specific purpose account for revenues from renewable energies.
- **Energy Transition and Sustainable Energy Use Fund** has allocated around 9 thousand million Mexican pesos distributed in 37 energy efficiency and renewable energy projects.
- **Risk mitigation mechanism** for potential geothermal projects during the exploration stage.
- **Soft loans** granted by the national development bank and other private financiers.

Similarly, there are other ongoing initiatives intended to ease the business environment for renewable and other clean energy technologies:

- **National Inventory of Clean Energies**; it is a statistical and georeferenced service that shows renewable energy potential and operational projects in Mexico. So far it does include a resource and project data base for wind, solar, geothermal, hydro, bioenergy and ocean resources.
- **National Atlas of Potential Zones for Clean Energy Deployment**; akin to Texas' Competitive Renewable Energy Zones process, the Atlas is intended to provide information on potential zones for power generation with renewable and other clean energy technologies. It is a georeferenced tool that incorporates exclusion zones based on technical, environmental and social constraints. It will also provide inputs for indicative Expansion Plans for National Transmission and General Distribution Grids.
- **Electronic One Stop Window for Renewable Energy Projects** aims at reducing in average from 620 to 465 the number of days required for licensing, permitting and constructing a renewable energy project. This initiative is align with current Mexico's Presidential initiative Gob.Mx.

Republic of Korea

In 2015, the Korean government launched a research project focusing on “the Master Plan for the Development of Renewable Energy in Cameroon”. This project is being conducted by Korea Energy Economics Institute through the fund provided by the Korean government. This project is initiated by the request of the Cameroon government and it will be completed within this year.

The size of the research project is around 2 million USD and the geographical range covers all the areas of Cameroon. The purposes of the project are 1) establishment of the Master Plan for the Development of Renewable Energy, 2) formulation of the action plans encompassing economic development, employment, diversification of energy sources, and reduction of greenhouse gas emission, and 3) enhancing the welfare of the people living without electricity access. The project is composed of renewable energy reserves of Cameroon, the Master Plan, and the development and technology roadmap for the next 20 years.

This project will enable Cameroon to understand its potentials, to formulate its renewable energy strategies, and to implement the strategies with the long-term perspectives. This project particularly contributes to the second and fourth action points of the G20 Energy Access Action Plans in 2015, which are Technology Development, Dissemination and Deployment and Capacity Building. Through this engagement of Korea, Cameroon's electricity access will be effectively increased, which is not a specific

aid project at the local and short-term level but a support for setting a comprehensive plan at the national and long-term level.

Potential Focus Area:

The Korean government is highly interested in the second action points, which is “Technology Development, Dissemination, and Deployment”. Under an appropriate setting, Korea might get involved in international cooperation and collaboration where countries share their experiences regarding the electricity industry and their efforts to increase energy access. Moreover, Korea is interested in cooperation with regard to innovative technologies and business models which can be helpful for energy access. They will encompass power generation from renewable energy, micro grid, energy storage system, and etc. In terms of technological cooperation, Korea will be able to play a role as an active contributor.

South Africa

Policy and Regulatory Environment:

At the government to government level the country signed cooperation agreements in the field of energy with many of the countries. The scope of these cooperation agreements includes exchange of information regarding energy policies, institutional arrangements, regulatory frameworks, as well as commercialisation of modern energy technologies to improve access. These signed agreements have implementation plans, as well as Technical and Ministerial governance structures, which meets periodically to assess progress and address challenges.

Technology Development, Dissemination and Deployment:

Our IPP procurement office which is behind South Africa’s flagship procurement programme for renewable energy continuously hosts delegations from the region. We share our processes and procedures that make the programme successful. We are also helping some of the countries with the development of their own programmes.

Investment and Finance:

The DoE IPP Office is currently providing a lot of advisory and consultancy service to many of the Sub-Saharan countries with keen interest to increase deployment of renewables to improve energy access. As part of integrated approach in providing the aforementioned service, the IPP also have the capacity mobilise regional multilateral development finance institutions, as well as commercial banks with whom they have successfully worked and managed to deliver the REIPPP in South Africa.

The signed Treaty between the governments of Republic of South Africa and the Democratic Republic of Congo for the development of Grand Inga Hydropower project will undoubtedly mobilise a lot of finance and investment in all phases of the project.

Capacity Building:

At the government to government level, the country continue to receive a lot of requests to host delegations from Su-Saharan countries on benchmarking and study visits from countries in Southern Africa with keen interest on Renewable Energy and Energy Efficiency with the aim to improve energy access. Areas of information exchange and capacity building are mainly on Solar Water Heating Programme, Regulatory framework for the Renewables, Energy Efficiency, Standards and Labelling, as well as Concentrated Solar Power.

Through the inter-utility agreements currently in place, our utilities to engage and share experiences and share best practices on continuous basis.

Regional Integration:

South Africa in 2015 ratified a treaty which enables South Africa to source 2.5GW of electricity from the planned Inga 3 project. This project entails the development and strengthening of the transmission network between DRC, Zambia, Zimbabwe, Botswana and South Africa.

In addition to this, South Africa has issued a Ministerial Determination to source just under 4GW of electricity from coal from neighbouring countries. There is also work in progress looking at how to best collaborate with neighbouring countries on our Gas to power programme.

Furthermore, our electricity utility, Eskom participates in a lot of power infrastructure and interconnectivity schemes in region either as a member of the Southern African Power Pool and or as a power exporting utility to many of neighbouring countries to improve access.

South Africa also firmly supports the SADCREEE initiative which also endeavours to improve the deployment of modern energy sources and technologies to improve access to energy, as well as energy efficiency.

Coordination and Collaboration:

South Africa participates actively in the regional energy initiatives that seek to promote universal access.

In 2015, the country hosted the first ever International Renewable Energy Conference on the African continent. SAIREC was attended by over 3,600 delegates from 82 countries under the theme of Re-Energising Africa. Delegates discussed the renewables value chain, needed regulatory frameworks for a transition to renewables, how to improve energy access and much more. SAIREC Declaration singled out the importance of universal energy as a prerequisite improved quality of life and economic development in Sub-Saharan Africa.

We also support and participate at the annual Africa Utility Week conference which provides a platform for African governments and utilities to share best practices. The 2016 conference was in May.

At the continental level, South Africa participates actively in the African Energy Ministers Forums. The country also participates at many of the Energy Working Groups of Binational Commissions (BNCs) and Permanent Joint Cooperation Commissions (PJCCs) at both technical and Ministerial levels. At the SADC level South Africa is the founding signatory of Energy Protocol and have hosted the recent last statutory annual (34th Session of) SADC Meeting of Energy Ministers in July 2015.

At the multilateral level, the country, through the Minister of Energy, serves on the advisory board of the United Nations Sustainable Energy For All (SE4ALL) initiative.

Challenges and Lessons Learned:

Financing, implementations, monitoring and evaluation is at times a challenge. Key lesson is that follow through on the initiatives is key

Potential Focus Areas:

Capacity building in the region;
Harmonization of domestic policies and standards; and
Regional Integration

Turkey

A brief information regarding the initiatives of the Ministry of Energy and Natural Resources with respect to Africa, implemented in parallel with the Government's policy on "Opening to Africa" is as follows:

1. Memoranda of Understanding in the fields of Energy and Mining: Starting from the year 2011 up until today, the Memoranda of Understanding have been signed with Egypt, Djibouti, Cameroon, Niger, Sudan, Kenya, Gambia, Tanzania, Somalia, Ghana, Guinea and Uganda to develop a bilateral cooperation in the fields of energy and mining.

2. Energy Team: With the purpose of creating an environment for both private and public sectors to get to know Africa as well as its investment opportunities, the "Energy Team" mechanism was established by the Ministry.

3. Donation to Djibouti: In 2014, a drilling rig was donated to Djibouti by the General Directorate for Mineral Research and Exploration (MTA) to be used in the applied drilling training on the development of geothermal sources of Djibouti. It is expected that this very donation could contribute to the development of cooperation with Djibouti in the area of geothermal energy.

4. Africa's problem of access to electricity: Various solutions are being pursued in the solution of Africa's problem on access to electricity including the powerships. One of the countries to which our private sector has sent the powerships, is Ghana.

Our private sector has several enterprises in the field of power generation and distribution in countries such as Botswana, Chad, Ivory Coast, Gambia, Ghana, Guinea, Cameroon, Kenya, the Democratic Republic of Congo, Mozambique, Namibia, Nigeria, Rwanda and Zambia.

Regarding policy and regulatory environment in Sub-Saharan Africa, in order to present the challenges and opportunities in terms of regulatory framework to achieve energy access goals in Sub-Saharan African countries. Energy Market Regulatory Authority of Turkey (EMRA) worked closely with regional regulatory authorities ECOWAS Regional Electricity Regulatory Authority (ERERA) and Regional Electricity

Regulators Association of Southern Africa (RERA), and a survey was conducted among member countries.

The checklist was submitted to ERERA and RERA, who declared their intent to cooperate with EMRA, during the 6th World Forum on Energy Regulation, which was held in Istanbul in May 2015, in order to ask their member organizations to fill in the checklist. A team of EMRA experts was sent to headquarters of ERERA and RERA to discuss on the checklist and the responses from their member organizations. As end of September 2015, out of 17 member countries whom the checklist was sent to be completed, only Burkina Faso, Gambia, Namibia, Senegal, and Sierra Leone responded, which does not allow sketching a realistic picture. Around 5 more countries are expected to submit the completed checklist. However, the discussions held particular with ERERA, enable a clear understanding about the issues in Western Africa.

The utmost important result of both responses to the checklist and discussions held with ERERA is the existence of a wide discrepancy in the level of development of regulatory frameworks within the region.

The installed capacity of the countries responded to the checklist is fairly low in comparison to any mid-scale country in Europe. Accordingly, per capita electricity consumption is well below world averages, except Namibia and Burkina Faso. The electrification rate is quite low in rural areas vis-à-vis in urbans.

As a result of these studies, it has been identified that the governmental bodies responsible for pricing electricity in Sub-Saharan and G20 countries can work together to establish cost-reflective, affordable and if deemed necessary subsidized pricing schemes that will improve the power access in the region. Cooperation of Sub-Saharan countries among themselves and with G20 countries gains importance. Twinning projects can be an example. G20 countries may help Sub-Saharan countries in facilitation of off-grid solutions. Sub-Saharan and G20 countries can cooperate and work together to improve the regulatory conditions that prevail in Sub-Saharan countries: At the regulatory level, there is particularly large room for cooperation and dialogue. Twinning projects between regulators of Sub-Saharan and G20 countries might be developed. Sub-Saharan and G20 countries can work together to establish an institutional dialogue that encompasses regulatory institutions. Expert exchange, study visits, benchmarking studies, capacity build-up projects should be seen among the possible means of cooperation.

5. Storage of Vaccines: The works related to the storage of vaccines, particularly in the healthcare centres of the rural areas of Africa with no access to electricity have been started. Within the scope of which, setting up the portable fridges operation of which is supported by solar batteries providing uninterrupted 1,5 MW power are ongoing with the sponsorship of the Turkish Airlines and under the coordination of our Ministry. At the first stage, 2 such blocks have taken into operation in Niger. Apart from these countries, such installations are expected to be completed in Uganda and in the Democratic Republic of the Congo in the near future. Within this scope, about 100 such fridges will be distributed and installed in the healthcare centres of Sub-Saharan African countries, where there is an urgent need due to no access to electricity.

United Kingdom

Policy and Regulatory Environment:

Energy Africa Campaign

Launched by the UK in October 2015, the Energy Africa Campaign aims to accelerate the expansion of the household solar market in Africa, helping bring universal energy access in the continent forward from 2080 to 2030. It aims to do this by removing policy and regulatory barriers to market expansion, and better co-ordinating donor support to the household solar sector as a whole. Key stakeholders in this effort include: African Governments, donors, investors and lenders, industry, NGOs, and the public.

Where does it work? Fourteen target countries of focus have been identified, which have huge potential and where the UK is in a position to help: Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, Tanzania, Uganda, Zambia and Zimbabwe.

How does it work? The Campaign is working towards the development and agreement of Compacts (agreements) with partner countries, (between governments and donor partners). These compacts will set out policy actions, particular to each country, to improve market conditions for the development and/or growth of the household solar sector, alongside coordinated support for governments and new businesses needed to deliver on these. Compacts are developed in partnership with countries, with input from a range of actors relevant to the sector, and are specific to the conditions in each country.

Current Status: To date 10 countries have signed partnership agreements with the UK, agreeing to work towards a formal Compact. Others are in progress. The UK is providing technical assistance to develop compacts and support implementation of a set of policy measures that can best unlock the household solar market in their country. On 10 May 2016, Sierra Leone became the first country among those participating in the Energy Africa campaign to sign a compact agreement with the UK. Others are in progress.

Challenges

Key challenges have been defining exactly what is meant to by a campaign, and getting wider buy-in.

Lessons

We developed campaign objectives until we got it to a strong position where it was tight enough to have buy-in from country offices.

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.

Challenges

- ☐ Establishing a suitable regulatory framework that can provide a stable legal environment for renewable projects
- ☐ Ensuring renewable projects have sufficient "payment-certainty" in the form of long-term Power Purchase Agreements with power companies and utilities

- Creating a tariff structure that promotes an increase in the use of renewable energy as a viable source of energy
- Governments need to bear some of the risk that if left entirely to the private sector will make the cost of renewable projects extremely expensive.
- The ability of governments to understand what Private Sector requires to invest in Energy infrastructure is still weak in many countries.

Lessons

- PPIAF's support to Kenya energy sector reforms came via three technical assistance activities from 2001–2005, which aimed to restructure, and eventually introduce private sector participation in the Kenyan power sector.
- The first and most important activity in 2001 was a large grant to carry out a comprehensive study to determine an optimal market structure for the power sector, one conducive to greater competition involving the private sector
- PPIAF's support to the energy sector also led to the 2006 KenGen initial public offering (IPO), which involved the sale of 659.51 million shares to 245,000 shareholders. The proceeds of the sale, the largest 4 IPO in Kenyan history at \$109 million, helped diversify power generation sources and limit the need for overall power price increases.
- KenGen's public infrastructure bond issue, sold in 2009, is a major sector reform achievement triggered by PPIAF's work beginning in 2001. The bond issue, sold without backing by national government guarantees, was oversubscribed by about 70%, bringing in a massive \$335 million in proceeds.

The sale of the 10-year bonds will help fast track the utility's power generation projects, which include the installation of an additional 1,500 MW of desperately needed generating capacity by 2012.

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.

East Africa Geothermal Energy (EAGER) Technical Assistance facility This demand responsive technical assistance puts in place geothermal policy, regulations and institutional structures that facilitate geothermal development and investment.

Challenges

The facility has worked hard to identify the key policies and regulations that are most critical to enable geothermal investment.

Lessons

As a demand responsive facility it has focused on the gaps in existing support, and avoided duplicating efforts of others. There has been a high demand for its services.

Technology Development, Dissemination and Deployment:

Energy Africa 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 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 also 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.

Challenges

The need to be prepared the possibility of an influx of products of varying quality as a likely side effect of the solar market expanding as some could have a detrimental impact on the take up of solar products long-term.

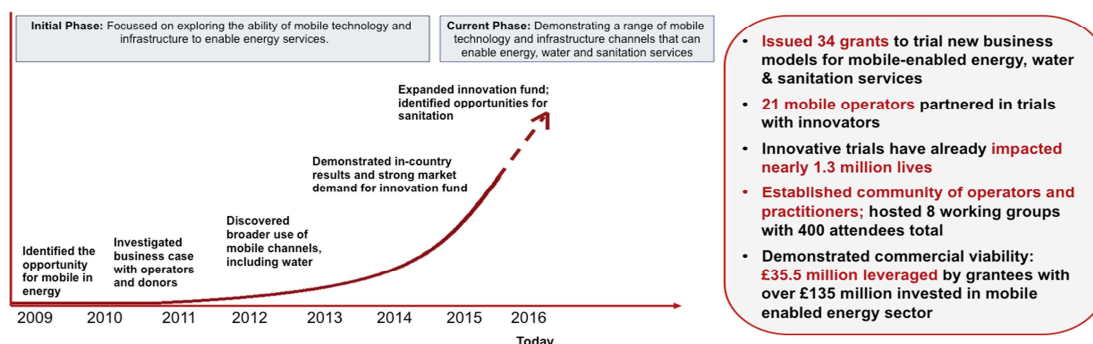
Lessons

We learnt we had to balance strict regulation to limit poor quality products so that it did not become a barrier to small solar companies that want to compete and grow in the solar market.

Mobile for Development (M4D) Utilities. Working jointly with the Foundation arm of the industry group representing mobile network 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 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.

The Mobile for Development (M4D) Utilities programme has continued to make strong progress towards achieving its overall objectives. The implementing partners are on track to exceed expectations in developing new applications and business models for energy, water and sanitation delivery supported by mobile technology. The programme to date has successfully expanded to include sanitation services and will have supported 34 new business models and applications (32 operational), reaching just under 1.4m people. The diagram people illustrates the Analyse, Activate and Advocate model and end user results achieved under the DFID supported GSMA M4D Utilities programme to date.

M4D Utilities: The journey so far



Beyond the beneficiary numbers, valuable research and learning about mobile-enabled services and business models has resulted from the Phase I grants and is currently being published to share with the broader sector and for scale up by partners. This learning covers:

- New models validated for improving service delivery (e.g. remote monitoring of water points), other models advanced and scaled in new markets (e.g. Pay-as-you-go solar)
- The benefits and challenges of replication through licensing
- The benefits of leveraging Mobile Network operators' branding, mobile money, and networks; the benefits for Mobile Operators through mobile money registrations and payments and associations with a life-enhancing service such as water, sanitation or energy.
- Best practices in customer education and support, sales and marketing strategies. The challenges and opportunities with incentives for key actors in service models to use mobile tools (e.g. water point operators)
- The challenges and opportunities serving bottom of the pyramid customers with sustainable businesses in emerging markets in service delivery.

Renewable Energy and Adaptation to Climate Technologies (REACT) - a window of the Africa Enterprise Challenge Fund. Support for private sector delivery of renewable energy services through the climate change 'window' of the broader Africa Enterprise Challenge Fund (AECF). The challenge fund is a means of leveraging private sector innovation and capacity to help meet development objectives. REACT focuses on incentivising low cost clean energy and services in rural areas by providing early stage catalytic funding. The businesses supported by REACT will deliver improved modern energy services and products for households in rural areas. The projects include expansion of the solar market, biogas and mini hydro.

Challenges

The challenge fund was open to businesses in Kenya, Tanzania, Rwanda, Uganda and Burundi. Because the enabling environment is most advanced in Kenya and Tanzania most of the successful businesses were from those countries followed by Uganda. It was more difficult for the fund to elicit good projects in the other countries.

Lessons

As well as direct support to businesses assistance to improve the enabling environment for a market based approach is required in future.

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.

Challenges

Green Mini-Grids is a relatively new area for African countries. Identifying the key barriers that prevent investment in mini-grids that should be the focus of the programme.

Lessons

There is much appetite in Africa to explore how mini-grids can contribute towards the energy access SDG.

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. 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. CDC also holds investments in a number of standalone power projects (Akiira geothermal in Kenya) and in power distribution companies (in Cameroon (ENEO) and in Eastern (Virunga Energy)).

Challenges

The number of utility scale IPPs in Africa over the last decade has been relatively small. Challenges which increase the risks faced by investors related to the policy and regulatory framework, tariff structure and offtake agreements remain.

Lessons

There are certainly investment opportunities in energy generation and distribution and DFIs – such as CDC – can play a critical role providing the more patient capital that can leverage increased flows of private finance and management expertise into the sector.

Private Infrastructure Development Group (PIDG)¹²(£700 million from DFID). The UK contributes towards the PIDG (8 private facilities providing support for different stages of the project cycle including TA, Early stage development, Long term debt and local currency guarantees, mezzanine finance) which mobilises private sector investment in infrastructure in frontier markets where no or few organisations are operating. PIDG's investments are heavily concentrated in energy generation, transmission and distribution (77.5% of PIDG commitments by sector in 2014 excluding the Technical Advisory Facility (TAF). 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).

Challenges

As PIDG facilities specifically look to invest in frontier markets the challenges they face are numerous but the main ones include; a) the lack of a supportive enabling environment with attractive regulatory frameworks, and pricing policies etc. that encourages investment c) lack of well-structured projects to attract investors b) political instability deters project investors d) lack of early stage project finance to de-risk project development.

Lessons

¹² Since it is a global effort, the PIDG is also mentioned as a case study for Asia-Pacific by Australia.

Solar PV power projects require aggressive debt to equity structures and long debt tenors in order to achieve a tariff that is competitive with alternative power generation sources.

Skill transfer and training and development of local employees are essential during the construction and operation phases of the project.

Green Africa Power (GAP) is a Facility under PIDG with a specific remit to provide long-term mezzanine financing for renewable energy projects in sub-Saharan Africa (DAC I-III).

Challenges and lessons – GAP started operation in 2014. It has not closed any deals yet. PIDG is currently conducting a review to understand the reasons for this and what lessons can be learnt.

Results Based Financing (RBF) for Low Carbon Access tests different forms of RBF, which aim to stimulate decentralised energy markets and to leverage private investment to increase people's energy access using off-grid renewable technologies (£40m). It provides incentive payments to businesses upon delivery of clean energy access products and services. The RBF Facility is housed within the multi-donor Energising Development (EnDev) partnership managed. It will improve energy access for 6.3m people; create or expand around 5400 enterprises providing energy products and services; avoid emissions of 8.6m tonnes of CO₂ equivalent; and funding will be matched at least 1:1 by private sector investment.

Challenges and lessons learned

RBF in the low carbon energy access space is still a relatively new concept and most of the projects are in the early phases of implementation, one of the challenges encountered and lessons learned so far is that it took longer than expected to set up and design the mechanism. Further lessons learned will be captured through the evaluation of the programme, which is currently ongoing.

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.

Challenges

Finding opportunities to replicate this programme in other countries is a challenge so that its successes can be built upon.

Lessons

It is important to have high quality and responsive technical assistance.

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 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.

Challenges

Building capacity to ensure that all recipient countries are able to move their renewable energy programmes forward.

Lessons

Ensuring that all stakeholders are on board helps move the programme forward. Sometimes this can take time but needs to move at a pace that recipients are comfortable with.

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. CICs are currently established in Kenya, Ethiopia, Vietnam, Morocco, South Africa, the Caribbean and Ghana. The CIC in Kenya is the furthest advanced in Sub-Saharan Africa with a strong portfolio of firms and technologies. The £16.6m Global Network of Climate Technology Innovation Centres programme with World Bank InfoDev, supports the design and establishment of another generation of CICs and the co-ordination and cross-learning of the growing CICs network, such that individual CICs are more interconnected and efficient.

Challenges and lessons learned

Experience in the set up and implementation of the CICs has shown that it took much longer than initially expected to set up a CIC. Adapting the CIC model to fit the circumstances of local regulatory environments has added time and complexity to project implementation.-

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).

Challenges

How to manage SE4All funding in a Fund that initially focused purely on regional (ie. cross-border) projects. Given funding comes from the EDF, how to maintain original geographical pattern of allocations?

Lessons

It takes a considerable amount of time to incorporate a new “window” into an established Trust Fund, especially when the proposed change introduces new funding allocation issues. Lessons learned from the ITF informed design of the EU’s new Africa Infrastructure Facility.

Coordination and Collaboration:

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 £4.75m support to 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. UK funds to SE4ALL started flowing in autumn 2015. It's too early to yet communicate progress (6 months).

The Energy Africa 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.

Challenges

Identifying and engaging stakeholders in the campaign.

Lessons

The campaign decided to make this a priority, held a deep-dive session to establish and map out the direction we wanted to take with different groups of stakeholders in order to have clarity and clear steps to take forward.

Potential Focus Areas:

We currently do not have the capacity to work on an area.

European Union

The EU support to Sub-Saharan African countries in the sustainable energy is build on three main pillars. First and foremost, strong political ownership for policy reforms needed to attract sustainable energy investments and for which the EU Delegations carry out policy dialogue at all levels and with all partners and stakeholders. Second, support with substantial technical assistance, the partner countries' efforts to increase their capacity in successfully implementing energy policies, to improve the regulatory framework and to create an enabling environment that is indispensable to attract investments, in particular from the private sector. Third, stimulate and leverage with funding provided through innovative financial instruments, new renewable energy infrastructure. For the period 2014-2020, the European Commission has earmarked EUR 1.5 billion of grant allocations to contribute to increasing renewable energy generation in Sub-Saharan Africa.

The Electrification Financing Initiative - ElectriFI is an innovative mechanism to unlock, accelerate and leverage investments increaseing access to affordable, reliable, sustainable and modern energy by (i) providing financing throughout all stages of the business cycle from preparation to scaling up, aiming at bridging the financial gap for sustainable business models where own resources are made available; (ii) creating markets by awarding support to financially sustainable projects and (iii) de-risking investments putting emphasis on development impact.

ElectriFI was launched at COP21 and is currently being implemented by the Dutch Development Bank, FMO, acting on behalf of all European Development Finance Institutions (EDFI) and other financiers active under the EU blending framework. The first invitation for applications under ElectriFI has already generated 264 applications for EUR 694 million to leverage investments of more than EUR 7 billion. The next invitation for applications under ElectriFI is expected to be launched in the last trimester of 2016. Considering the needs of the partner countries for access to energy and the response of the private sector and development financiers to partner and invest in access to energy, support to ElectriFI will be further scaled up.

Policy and Regulatory Environment :

EU provided various types of support via the TAF to partner countries in the field of policy and regulatory framework. This concerns the preparation of SE4all action agendas agenda prospectuses, strategies and action plans, as well as drafting of some energy renewable laws , electricity feed in tariffs and regulatory activities.

Investment and Finance:

Through various blending facilities (such as Africa Infrastructure Trust Fund, African Investment facility) and the setting up of new financial instruments such as ElectriFI, the EU has been promoting IPP, PPP and the leveraging of significant additional private and public funds for sustainable energy.

Capacity Building :

The EU has provided capacity building of several Ministries of Energy as well as regional organisations including regional power-pools, national utilities - with the aim to facilitate reform design and implementation in the energy sector.

Regional Integration:

EU funded, through T the Africa blending facilities, large generation projects such as construction of hydro-electrical plants (such as Rusumo fall, Ruzizi 3, Jiji Mulembé) as well as transmission grids extension. To date, €400 million grants have leveraged about €6 billion worth of projects since 2007.

Coordination and Collaboration:

The EU has been very active and supportive of the SE4all initiative as well as regional policy coordination in the energy sector.

The EU is committed to continue its support and collaboration in policy and regulatory environment, technology development, dissemination and deployment, investment and finance, capacity building, regional integration, and coordination and collaboration.

1.2. International Organizations

African Development Bank

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.

2.

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, prioritize the following policy options:

- 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.

The SE4All Africa Hub provides technical assistance to African countries to develop national SE4All Action Agendas, specifically the Hub at the request of the respective Governments has been supporting Angola, Cameroon, Democratic Republic of Congo, Kenya, Malawi, Rwanda, Tanzania, Zambia and Zimbabwe¹³. The Hub is also currently procuring TA support to Botswana. The status of these processes is as follows:

- Kenya and Tanzania finalized their Action Agenda and Investment Prospectus in late 2015, setting ambitious targets for access (electricity and clean cooking), energy efficiency and renewables.
- Rwanda finalized its Action Agenda, the document is expected to be tabled in June 2016 for final approval by the economic cluster cabinet meeting.
- DRC and Angola are in the final stages of the development process of their AA and IP, pending technical and political validation.
- In Cameroon, Malawi, Zambia and Zimbabwe, AA and IP development process is ongoing, and is expected to be finalized by September 2016.
-

Early adopters such as Kenya and Tanzania are developing follow-up activities, particularly in terms of setting the institutional structures in place for follow-up and promotion of the investment opportunities. The Africa Hub received requests from Government of Kenya and Tanzania in April 2016 to support the operationalization of their SE4All Secretariat and to mobilize resource for implementation of SE4All AA/IP priority projects.

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.

3.

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

¹³The support is being provided through the AfDB's and GEF-funded Africa Climate Technology and Finance Center project

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.

2.3. 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.

The SE4All Africa Hub with funding of the AfDB's Sustainable Energy Fund for Africa (SEFA) started the implementation of the Green Mini-Grid Market Development Program (MDP) in coordination with SE4All's Clean Energy Mini-Grid High Impact Opportunity (HIO) stakeholder group to scale-up of investments in commercially viable GMG projects through a broad range of interventions to improve the enabling environment. The project seeks to remove or reduce market barriers at regional scale and strengthen the ecosystem for the emergence of a thriving GMG sector in Sub-Saharan Africa.

The MDP is implemented through five business lines, with specific activities envisaged for the Programme's first phase which started at the end of 2015:

1. **Market Intelligence:** The objective of this component is to develop a mini-grid market opportunity assessment methodology and generate comparable data across countries. An evaluation of the methodologies and best practices available for assessing GMG potential has been done and a new assessment methodology is being developed. This methodology will be applied in five countries to analyze their mini-grid market opportunities (Mozambique, Ethiopia, DRC, Cameroon and Mali).
2. **Business Development Support:** This component is now operational and will provide advisory/helpdesk services to Green Mini-Grid developers, assisting them on a wide range of issues, from business planning, market development and grid design to project finance, grid operation and maintenance.
3. **Policy and Regulatory Support:** the MDP will prepare a pan-African GMG strategy, to be presented for adoption at the next African Energy Ministerial meeting at the end of 2016.
4. **Access to Finance:** A market study has been commissioned to assess available financial instruments in support of GMGs and to design a concept for a financial intermediation initiative.
5. **Quality Assurance** (implementation to start in later phases).

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.

4.

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.

As per the above, the SE4All Africa Hub provides technical assistance to African countries to develop and implement national SE4All Action Agendas and Investment Prospectuses. The hub also supports Governments focused on attracting energy access-related investments in the development of their SE4All Action Agendas and Investment Prospectuses and with the follow-up stage of resource mobilization (cf. Policy and Regulatory Environment section). In particular, the Africa Hub will support Tanzania and Kenya to mobilize resource for implementation of SE4All AA/IP priority projects.

As a result of the SE4All Africa workshop discussion held in February 2016 in Abidjan, the Africa Hub is working jointly with IRENA and the GFT on solutions to effectively link demand as expressed in SE4All AAs and IPs with available financing instruments through a web-based platform such as the IRENA Sustainable Energy Market Place (SEM).

4. 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.

5.

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.

The SE4All Africa Hub works jointly with the AELG Secretariat, which is hosted by the AfDB in conjunction with the SE4All Africa Hub. The AELG is a community of energy leaders dedicated to promote a sustainable energy transition in Africa in support of the objectives of the SE4All Initiative. It intends to advance solutions for regional energy sector problems, to unblock trans-boundary energy projects, to build regional and thematic collaborations, to push the agenda of regional economic integration.

Following the launch of the West-AELG in June 2015, a work-programme was prepared by the Secretariat that builds on the discussions at the technical and ministerial sessions. This work-program includes policy issues, such as regional gas market development, regional LPG roll-out, support to the West Africa Clean Energy Corridor, and advancing the SE4All country action processes but focus also on identification of issues/angles for AELG intervention to “de-bottleneck” a selection of regional priority projects. Implementation of this work plan is ongoing as are discussions about the launch of the other regional chapters of the AELG (e.g. East Africa).

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).

5. 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.

6.

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.

The SE4All Africa Hub provided technical assistance to African countries to develop and implement national SE4All Action Agendas and Investment Prospectuses (cf. 1.1.e. and 3.1.). The Hub cooperates closely with other key stakeholders in this process.

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.

Regarding the institutionalization of the SE4All process at national level, the Africa Hub will support Tanzania and Kenya to mobilize resource for the operationalization of their SE4All Secretariat (cf. Policy and Regulatory Environment section) and will gather and make accessible best practices on institutionalization on the SE4All Africa website.

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.

Coordination between donors and stakeholders plays an important role for the implementation of the SE4All initiative. Since 2013, the SE4All Africa Hub promotes coordination both at the national level, through the Action Agenda process, and at the international level, working with the major international players to more effectively serve the needs of African countries. The Hub convened in February stakeholders at the SE4All Africa workshop in Abidjan and one of the workshop conclusion in line with earlier recommendations stressed the importance of “formally establishing the AA as a framework for SDG7 implementation at national level”.

To facilitate the coordination of the many energy initiatives in Africa, information about who is doing what must be available and exchanged to avoid duplication. A mapping was carried-out with the support of the Africa-EU Energy Partnership (AEEP) and launched in May 2016 at the AEEP Stakeholder meeting in Milan. As mentioned in the Milan stakeholder communiqué, the SE4All Africa Hub will continue this work by regularly updating the data and analysis to keep pace with the sector dynamics, using the new SE4All Africa website as platform.

More generally, the Hub is acting as repository for SE4All in Africa, collecting and categorizing all relevant information and documentation on the implementation of the SE4All initiative in the continent, including focal point contact details. The SE4All Africa website launched in February 2016 facilitate a one stop shop for information exchange and knowledge management. The website will gradually increase its outreach and will provide a good platform for information exchange on SE4All activities in Africa.

Moreover, the AfDB launched the **New Deal on Energy for Africa** with the aspirational goal of universal energy access by 2025 and its Transformative Partnership on Energy for Africa that provides a platform for coordinated action amongst partners (private and public). AfDB, building on its existing efforts such as its role as the SE4All Africa Hub, will step up coordination and envisages playing a central coordinating role across a variety of institutions to achieve the objective of universal access. The New Deal intends to focus on seven themes that are holding back the development of the energy sector. These strategic themes are: (i) setting up the right enabling policy environment, (ii) enabling utility companies for success, (iii) dramatically increasing the number of bankable energy projects, (iv) increasing the funding pool to deliver new projects, (v) supporting ‘bottom of the pyramid’ energy access programmes, (vi) accelerating major regional projects and driving integration and (vii) rolling out waves of country-wide energy ‘transformations’. The Bank will address these themes through a series of flagship programmes.

African Union Commission

With special consideration of the action points in the *G20 Energy Access Action Plan: Voluntary Collaboration on Energy Access* for Sub-Saharan Africa that was adopted in 2015, describe how your Government has been engaged since 2015 on:

Policy and Regulatory Environment:

TAF

The Technical Assistance Facility (TAF) is currently supporting the AUC/Department Infrastructure Energy (DIE) to analyse existing regional and continental regulations including assessment of regulatory frameworks and institutions in the African energy sector; identifying gaps, recommending best practices and developing a harmonised continental and regional regulatory framework in the African energy/electricity sector. This will enhance greater co-ordination and co-operation, and aims at enabling energy markets and infrastructure development.

Capacity Building:

The Renewable Energy Cooperation Program (RECP) between Africa and Europe together with the Pan-African University Institute of Water and Energy Sciences (PAUWES) co-organised a research symposium with the objectives of fostering the dialogue on renewable energy research between African and European research institutions and the private sector and promoting Africa-EU academic networking and research cooperation for sharing information on available research support mechanisms

RECP has also re-established the Renewable Energy Master's Programme (REP) at University of Zimbabwe (UZ) with the aim to internationalize it and will be launched in September 2016

Coordination and Collaboration:**Coordination dialogue and Mapping of Pan African Energy Initiatives**

A high-level group of **African and European energy policy makers**, international donors and multilateral energy initiative representatives conducted a series of **coordination dialogue meetings of 2015** and have unanimously agreed that there is a need for coordination of the numerous number of energy initiatives operating in Africa.

The series was to place at:

1. **SE4ALL Forum** in New York in May 2015,
2. Vienna Energy Forum (**VEF**) in June 2015,
3. Financing for Development Conference (**FFD**) in Addis Ababa in July 2015
4. **SAIREC** in Cape Town in October 2015,
5. **COP21** in Paris in December 2015

In this context the Africa EU Energy Partnership secretariat was requested to spearhead a Mapping exercise of Pan-African Energy Initiatives which has now been launched as of 16th May 2016 (www.aeep-forum.org)

Potential Focus Areas:**Coordination and Collaboration & Policy and Regulatory Environment**

Global Alliance for Clean Cookstoves

Policy and Regulatory Environment:

The government of Ghana has introduced policy to advance access to and use of LPG for cooking to enable improvements in public health, reduction in deforestation, and further empowerment and engagement of women in their local economies. These efforts have included targeting specific customer segments with the greatest needs for cooking fuel, extending the LPG distribution supply chain to more rural and remote areas, and continuing to support further investment opportunities in the LPG sector.

The Kenya Bureau of Standards has played the secretariat role, along with the American National Standards Institute, for the International Organization for Standardization Technical Committee 285 on cookstoves and fuels. The Kenyan government has taken a regional and international role in developing the standards and ensuring that they are applicable to the needs of local markets. Technical Committee 285 has the most participation from developing countries of any international standards process and

their work is essential in creating an enabling environment for a clean cooking sector that meets the needs of consumers.

Technology Development, Dissemination and Deployment:

There are now over a dozen Regional Testing and Knowledge Centers (RTKC) that focus specifically on cookstoves and fuels testing and/or design. They provide assurances on technology performance and quality for manufacturers, customers, and other stakeholders. RTKCs also support local producers and manufacturers to improve products, communicate performance to customers, and provide training and other resources to catalyze stoves and fuels activities.

The Clean Cooking Catalog is a global database of cookstoves, fuels, fuel products, and performance data. It includes information on features and specifications, as well as emissions, efficiency and safety based on laboratory and field-testing. Core functions of the Catalog are to champion the adoption of international clean cookstove standards and to serve as a tool for delivering robust monitoring and evaluation information to key stakeholders.

Investment and Finance:

Member states have supported financing mechanisms required to scale the clean cooking sector and enable investment viability. In SSA, the country-specific Catalytic Small Grants program, which includes monetary and capacity building resources, has played an especially important role in enterprise development and growth.

Capacity Building:

National alliances dedicated to strengthening local clean cooking markets have played particularly instrumental roles in convening stakeholders and enhancing capacity to enable greater access to clean cooking solutions in SSA. The national alliances are made up of diverse stakeholders and are able to carry out the activities most useful for their constituents, such as specific trainings of technology development, enhancement to product design or fuel production, support with awareness and behaviour change communication and building relationships with financing entities. National alliances of stakeholders in the clean cooking sector will help ensure lasting sustainability of these emerging markets.

Regional Integration:

SE4All is playing an important role in regional integration when it comes to energy access more broadly and clean cooking specifically. Lessons on fuel distribution and national policies are being spread through initiatives like SE4All and the Global Alliance for Clean Cookstoves.

Coordination and Collaboration:

Serving as a connector, catalyst, and facilitator, the Global Alliance for Clean Cookstoves has helped build a solid foundation for transformative change in the spheres of energy access and sustainable development. By working with 1,500+ partners to build partnerships, spur innovation, develop standards, advocate for enabling policies, and expand the base of evidence, the Alliance has created cohesion among what was a fragmented set of actors. The Alliance has supported the development of

country action plans and local Alliances in each of its focus countries – 4 of which are in SSA. In addition the Alliance has strengthened the supply of clean and efficient cookstoves and fuels through increased funding and capacity building for enterprises and entrepreneurs. This support has driven greater investment to the clean cooking sector and enabling the scale up of effective business models. The Alliance is working increasingly to enhance demand for clean cooking solutions through behavior change communications, recently launching awareness campaigns in Ghana, Kenya, and Uganda with local partners. Similarly, the Alliance has worked on a global, regional, and country level to inform and coordinate the development and implementation of policies aimed at improving access to safe and sustainable household energy. The Alliance holds biannual conferences that bring together all stakeholders from SSA to join others from around the world working to enhance the adoption of clean and efficient cookstoves and fuels.

Challenges and Lessons Learned:

1. Develop a comprehensive systems approach to a problem, particularly as development challenges are understood to be more interconnected and complex than previously thought. Occasionally, stakeholders choose to cherry pick interventions without implementing the comprehensive suite and then do not end up reaching their desired outcomes.
2. In order to truly transform a sector and build a sustainable market, consistent funding flows for five to seven years is required.
3. Inclusive, accessible finance that allow for appropriate stacking of capital that is both reflective of the sector's stage of maturity and accessible to all relevant stakeholders is critical.
4. Accountable intermediary institutions are an important model to utilize, particularly to coordinate complex ecosystems of actors.
5. Many prioritize energy access but limit their efforts to electrification, which will not single-handedly address energy poverty, particularly in the short-run.

Potential Focus Areas:

The Global Alliance for Clean Cookstoves is already completely dedicated to improving comprehensive, sustainable energy access. The Alliance is committed to working with the G20 to scale progress.

United Nations Development Programme

Policy and Regulatory Environment:

The ECOWAS Regional Bioenergy Policy were completed by the ECOWAS Center for RE & EE (ECREEE) with technical and financial support from UNDP. The purpose of the Regional Bioenergy Policy is to promote partnership and ownership and to provide guidance to ECOWAS Member States in developing national policies and regulations for sustainable and socially friendly bioenergy policies and implementation plans. The Policy completed is built on a comprehensive baseline assessment report at regional level along with three country case studies (Ghana, Mali and Senegal). The regional validation brought together over 80 participants with high level representatives from ECOWAS and all ECOWAS Member States, UNDP, AUC/NEPAD, SE4All Bioenergy HIO, Global Bioenergy Partnership (GBEP), Department of Energy in Brazil, other international and regional organizations;

- ✓ Within the context of SE4All Country Action, UNDP supported selected SSA countries in drafting/completing SE4All rapid assessments/gap analysis (RAGA) and AA/IPs. For example, in

Angola the RAGA was adopted in November 2015 and the country built on this process to engage the development of its SE4All AA/IP with a TA support provided by the AfDB under the Hub umbrella. In Tanzania, Swaziland, Kenya, UNDP provided support to the AA and IP process in partnership with the Africa Regional Hub partners (AfDB, AUC and NEPAD);

- ✓ UNDP has been a key supporter of the AGN and the SSA countries in the development of their INDCs, which include national energy mix set targets to meet the CC objectives. In these lines, UNDP, jointly with the IFDD provided technical and financial support to the ECOWAS, WAEMU and CILSS in convening a High Level Ministerial meeting to strengthen the common African position on CC toward the preparation of the COP 21 in Paris.

Technology Development, Dissemination and Deployment:

- ✓ Within the framework of UNDP experience in the implementation of demonstration initiatives and decentralized energy delivery system known as Multifunctional platform (MFP), a regional assessment of technologies and innovations has been carried out in nine countries, namely (Burkina Faso, Mali, Senegal, Guinea, Niger, Benin, Togo, Chad and Mauritania), encompassing UNDP Multifunctional Platform (MFP) experience over a decade in SSA. The inventory of decentralized energy delivery technologies & innovations include diesel, solar, biogas, biofuel, pico-hydro and hybrid applications;
- ✓ In Ghana, with support from the UNDP, the Energy Commission of Ghana commissioned the “Cookstove Testing and Expertise Laboratory”. The laboratory seeks to test cookstoves performance quality in terms of thermal efficiency and emission, but also it provides research and development to enhance technological innovation within the cookstove manufacturing sub-sector. UNDP has also supported the solar irrigation project in the Northern Region, implemented by NewEnergy (a Ghanaian CSO).

Investment and Finance:

- ✓ UNDP is supporting the Africa Energy Leaders Group which is expected to leverage political support and investment resources for high priority, regional, large scale energy infrastructure in Africa. The AELG was launch in April 2015, in Abidjan. UNDP supports the Secretariat of the AELG to assist it to enhance its task communicating clear visions, building coalitions, catalyzing public-private partnerships, leveraging political support, and mobilizing funds for sustainable energy and development initiatives on the continent.

Capacity Building:

- ✓ In April 2015, the Africa Hub convened a regional meeting, financed and organized by UNDP, to initiate the AA/IP process in Angola, DRC, Malawi, Zambia, Swaziland, and Cameroon, to be financed by AfDB and UNDP. In total, 49 experts and senior representatives from national ministries of Energy, ECCAS, CEMAC, Central African Power Pool (CAPP), AUC, NEPAD, AfDB, UNDP, GIZ, European Union, researchers and civil society organizations (CSOs) participated in the training process in Yaoundé under the Hub umbrella;
- ✓ Building on its decentralized and local level managed energy services delivery/models known as multi-functional platforms (MFPs), UNDP has developed an M&E IT Tool encompassing an online Observatory, including a database with associated GIS and online shop (e-commerce). The tool was launched by ECOWAS Energy Directorate in December 2015, along with a regional training which

gathered fifteen countries, namely Mali, Burkina, Senegal, Guinea, Niger, Togo, Benin, Ghana, Gambia, Guinea Bissau, Chad, Mauritania, Rwanda, Gabon and DRC, and partner CSOs and senior energy experts from the ECOWAS region;

Regional Integration:

- ✓ The ECCAS and CEMAC Communities' Energy Policy document for universal access to modern energy services, "the White Paper", gives concrete expression to the process of the harmonization of the programmes and missions of the two Institutions, as decided and reaffirmed by the Heads of States who adopted the at the 16th Conference of ECCAS Heads of States (May 2015). This is a perfect illustration of the process of rationalization of the two Regional Economic Communities. The White Paper reflects the ambition of the ECCAS and CEMAC Member States to achieve the objectives of the « Sustainable Energy for All » Initiative (SE4ALL) by 2030. The White Paper was developed with technical and financial support of UNDP;
- ✓ With UNDP support and guided by the White Paper and its development process at both national and regional levels, ECCAS and CEMAC further drafted a regional implementation Programme document for the White Paper, encompassing the three key pillars on Regional Energy Information System; Regional Financing Mechanism and the on Promoting rural electrification, RE & EE.

Coordination and Collaboration:

- ✓ The Africa Hub is the principal coordination and collaboration support mechanism for country level AA/IP development. UNDP is an active member of the Africa Hub, in collaboration with the Hub to support SSA countries by joining hands with AfDB, NEPAD and AUC. In these lines and under the Hub umbrella, UNDP partnered with NEPAD (NPCA) and AfDB to develop AA/IPs in Kenya, UNDP is collaborating with AfDB in Tanzania and initiated the AA/IP process in Zimbabwe.
- ✓ At national level, an example of coordination and collaboration was the convening by the Democratic Republic of Congo (DRC), with the support of the UNDP, of stakeholders for the 2nd Forum on Renewable Energy (FoDER) in the context of the SE4ALL AA and IPs jointly supported by UNDP and AfDB under the Hub Umbrella. The FoDER High Level Ministerial meeting brought together over 50 national institutions/ministries representatives (include 14 Ministers) and more than 70 Development partners, CSO and Private sector representatives (UNDP and other Agencies, AfDB, EU, USAID, DFID, Germany, AFD, Japan, SNV,...) and the Central Africa Power Pool (CAPP). The FoDER advanced the key priorities of the DRC AA&IP and launched its active phase of development which is jointly supported by UNDP and AfDB under the Hub umbrella.

Challenges and Lessons Learned:

- ✓ Policy processes may require time for necessary stakeholders' consultation and ownership in order to lead to action;
- ✓ Local/national expertise is often under-utilization in project interventions may increase delay in ownership and potential duplications;
- ✓ Upstream and downstream interventions' linkage is key for sustainability and mobilizing domestic resources;

Potential Focus Area:

- ✓ UNDP has been an essential partner along with the AUC, NEPAD and AfDB in establishing the SE4ALL Hub to meaningfully respond to SE4All. UNDP will continue to work hand in hand with the Hub Partners to support SE4All Country Actions through technical and advisory assistance, including through the country offices. Led by the UN Resident Coordinator, UNDP's Country Offices represent a ONE UN response to SE4ALL. The UNDP Country Offices are in a unique position to compliment the SE4All partners' contribution by facilitating country level processes, especially the domestication and implementation of the SDG#7. Therefore, through its regional mechanisms and the country offices, UNDP will further work on:
 - Policy and regulatory environment, (regional and national)
 - Technology Development, Dissemination and Deployment, (national)
 - investment and finance, (regional and national)
 - Capacity development (regional)
 - regional integration (regional)
 - coordination and collaboration (regional and national)

II. Case Studies for the Creation of Energy Access in Asia-Pacific

2.1. G20 Member States

Australia

Australian funded case studies in Asia-Pacific region (see case studies below): Vanuatu Utilities Regulatory Authorities Project (utility capacity building to support energy access improvements), Kiribati Grid connected solar photovoltaic (PV) project (516kWp grid connected solar PV at community facilities); Vietnam CocSan Hydropower project (29.7MW supplying 130,000 people)

Examples of innovative business models:

Australia provides ODA to Multilateral Development Banks including Asia Development Bank and the World Bank to support energy access and energy infrastructure development in the Asia-Pacific region. For example, Australia has provided \$1.5m in FY15/16 to the World Bank's Energy Sector Management Assistance Program (ESMAP). This is a multi-donor Trust Fund that support Variable Energy Projects in the Pacific. ESMAP is working in 10 Pacific Island countries to integrate solar and wind into electricity grids while maintaining reliability, affordability and adequacy of supply. Countries include Fiji, Micronesia, Kiribati, Marshall Islands, Palau, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

In addition, Australia supports innovative financing structures that have the flexibility to coordinate multiple donors or to leverage private funding for energy projects. These include the Private Infrastructure Development Group (PIDG), the Private Financing Advisory Network (PFAN), and specific to the Pacific region, the Pacific Region Infrastructure Facility (PRIF).

The **Private Infrastructure Development Group (PIDG)** is a multi-donor company that uses donor funds to mobilise and increase flows of local and investor capital, lending and expertise to infrastructure projects in frontier markets, including south and south-east Asia. PIDG leverages public dollars to attract private capital to commercially viable infrastructure projects with a measurable development impact, a large proportion of which are in the renewable energy sector. The \$1.2bn committed by PIDG Members to the PIDG Facilities since 2002 has leveraged over US\$20bn in private sector investment and over US\$9bn from other International Finance Institutions and Development Finance institutions.

The **Private Financing Advisory Network (PFAN)** is an ODA eligible clean energy technology initiative that seeks to bridge the gap between investors and clean energy projects in need of finance by bringing together private sector companies with experience in financing climate-friendly projects and technologies to screen business plans and select the most economically and environmentally beneficial projects. Since 2006, PFAN has leveraged over USD\$800 million for new energy generation capacity. Projects focus on biogas, biomass, waste-to-energy, clean transport, wind, solar, small hydro and energy efficiency sectors.

Australia has committed funding to the new phase of PFAN (\$200,000) for activities in India. In its new phase, it will be delivered in partnership with United Nations Industrial Development Organisation (UNIDO) and the Renewable Energy and Energy Efficiency Partnership (REEEP). The reason why it is a particularly interesting model is that it is lean, flexible and blends a mix of private, public and charitable money with an average leverage ratio of 1:80-100.

The **Pacific Region Infrastructure Facility (PRIF)** is a coordination mechanism for the delivery of development assistance from donors and partners to the infrastructure sector in the Pacific region (covering the 13 Pacific Islands Forum countries). The PRIF provides technical and research expertise to match available donor funding to Pacific countries' infrastructure needs and can assist Pacific countries with energy access project development and capacity building. Since 2008 Australia has committed over AU\$20 million to establish and operationalise the PRIF.

Key challenges facing the Asia-Pacific region in the promotion of access to energy:

IEA projections indicate that developing Asia is already trending towards increased levels of energy access along with substantially strengthened energy demand. Around one billion people have gained access to electricity in developing Asia since the year 2000. According to the IEA World Energy Outlook projections (NPS, 2015), the number of people without electricity in developing Asia will fall by around two-thirds by 2030 (185 million) and will stand at 50 million in 2040, just 1% of the Asian population at that time¹⁴. Most of these people will be located in rural and geographically isolated areas.

The picture for Pacific countries is similar to rural Asia. Energy poverty is widespread in Pacific countries. It is estimated that 70 per cent of Pacific Islander households do not have access to electricity – roughly equivalent to access rates in Sub-Saharan Africa¹⁵. Where electricity is available it is often reliant on imported fossil fuel (diesel) making Pacific Island countries vulnerable to fuel and currency price fluctuations¹⁶. Affordability and reliability of electricity supply are major concerns.

There is considerable variation in the electrification rates of different Pacific Island countries. For example in Palau, Cook Islands and Fiji access to electricity is relatively widespread and some micro-states such as Nauru and Tuvalu have universal access. However, the larger populations of Papua New Guinea, Solomon Islands and Vanuatu have very low levels of access to electricity with the vast majority without access residing in rural areas¹⁷. Traditional approaches to rural electrification which prioritise grid extension are not always suited to the Pacific Islands region, where the population is located on around 500 islands scattered over an area equivalent to 15 per cent of the globe's surface.

Given this general picture, promotion of access to energy in the Asia Pacific region will require that:

- Trends towards increased electricity access in the Asia-Pacific region are strengthened; particularly for rural populations and including improvements to the quality of supply.
- Progress towards energy access is accelerated in geographically isolated, remote and rural communities, including Small Island Developing States in the Pacific.

¹⁴ IEA, 2015, WEO Chapter 2: Global Energy Trends to 2040 : 107

¹⁵ UNDP, Energy and Poverty in the Pacific Island Countries, UNDP, 2007: Dornan, M (2014) Access to Electricity in Small Island Developing States of the Pacific: Issues and Challenges, Renewable and Sustainable Energy Reviews, 31 (726-735)

¹⁶ The Pacific Energy Summit (2013) noted that on average 10% of Pacific island countries' GDP goes towards importing petroleum products, but in some cases this figure exceeds 30%.

¹⁷ Rural populations electrification rate: Vanuatu (7%), Solomon Islands (5%), PNG (10%): ADB Pacific Energy Update 2015: <http://www.adb.org/sites/default/files/institutional-document/160785/pacific-energy-update-2015.pdf>

The Pacific region is ready for energy transition towards sustainable and modern energy services that can better service greater numbers of these communities. Pacific Island Countries (all those who are members of the UNFCCC) submitted intended Nationally Determined Contributions ahead of COP21, signaling a strong intention to transform the existing energy sector in the Pacific and embrace renewable energy and energy efficiency. Small Island Developing States are also a specific focus of the Addis Ababa Action Agenda, which encourages international cooperation to provide adequate support and facilitate access to infrastructure and technology for supplying modern and sustainable energy services. The outcomes of the Paris Agreement, and the implementation of the 2030 Agenda, will further enhance deployment of climate finance for renewable energy and energy efficient technology and infrastructure in the region.

The selection of appropriate technology will be a central part of improving energy access in the Pacific. Very remote Pacific island and rural communities, or households, can benefit from off-grid solutions. Systems need to have high resilience, given the frequency of natural disasters (cyclones/tropical storms/tsunami) that can disrupt supply in the Pacific. Reinstating energy services quickly and efficiently following severe weather events (such as the recent Cyclone Winston, Fiji) is critical to post-disaster and longer term reconstruction efforts. Renewable energy and enabling technologies can play a significant role in post-disaster power restoration. Support for education and training in maintenance of appropriate technology is also crucial for local communities to ensure upkeep and maintenance and improve resilience.

Case Studies:

Vanuatu: Utility Regulatory Authority Project
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1. Background introduction

1. **Geographic and demographic information:** Vanuatu is an archipelagic nation of 82 islands, extending over 12,200 square kilometres. The population of Vanuatu is approximately 270,000. The national household count stands at an estimated 50,740, of which about 25 per cent are located in urban areas and the remaining 75 per cent are dispersed in rural areas.
2. **Socio-economic conditions:** The average household monthly income in Vanuatu is US\$ 972 in urban areas and US\$ 792 in rural areas. Approximately 27 per cent of the Vanuatu households and public institutions have access to electricity via connections to a grid network. Of the largest four islands, there are still large parts of the population without access to electricity from 24 per cent in Efate, to 84 per cent in Malekula. In rural areas, the population without access to electricity increases even further from 83-85 per cent in Tafea and Shefa to 97 per cent in Torba.
3. **Challenges:** There are severe weather events that impact Vanuatu's livelihood and economic growth. Tropical Cyclone Pam caused widespread damage to Vanuatu in March 2015. The overall economic impact of Tropical Cyclone Pam has been significant, with real GDP expected to decline in 2015.

2. Project description

The Utility Regulatory Authority (URA) Project began in 2011 and is aimed to support and strengthen the capacity of the URA to implement its mandate as the economic regulator of electricity and water services in Vanuatu. URA approves tariffs for electricity and water services for private providers under concessions contracts and the State owned water enterprise. URA also assists in resolving consumer complaints and advises the Government of Vanuatu on policy and legislative matters related to electricity and water.

1. **Technological features:** The URA project aimed to strengthen the capacity of the URA in Vanuatu to develop and execute its work programs through the provision of technical assistance, including training and workshop activities for URA staff and knowledge dissemination activities, such as media presentation and publications and URA website content management.

In 2012, the URA project was expanded and extended to cover a wider range of support mechanisms to the URA including: support to URA budget and financing systems; training and development for URA staff; increasing consumer awareness through communications strategies; assisting in recruitment and training of URA staff.

The URA program also reviewed national policy mechanisms, such as tariffs for electricity concessions, and the electricity safety and reliability standards. The program will audit existing policies such as the Sarakata Hydro scheme and review of pre-payment electricity metres. The program will also assist the URA to work with the Department of Energy to review legislative amendments to further strengthen the URA Act in Vanuatu's national legislation.

2. **Stakeholders involved in the project:** The Government of Vanuatu (through the Prime Minister's Office) is responsible for running the program, operating jointly with the Department of Energy, which coordinates the Energy Road Map Taskforce and Road Map Technical Committee. Donor stakeholders are the Australian Government, through DFAT, the Small Islands Developing States Multi-Donor Trust Fund, and the Scaling-up Renewable Energy Program through the Strategic Climate Fund.
3. **Investment scale and financial mechanism:** The URA project total funding was US\$ 2.121 million disbursed under regular mechanisms of the world bank.
4. **Plan for operation, maintenance, and possible future upgrade:** Based on the success of the URA project the Vanuatu Department of Energy developed a Scaling UP Renewable Energy Investment Plan that includes development of hydro in Malekula and mini grids.

The URA program is in line with the National Energy Road Map, which seeks to:

- (i) provide modern electricity access to 100 percent of households in off-grid areas, via individual home systems and basic power products by 2020, and
- (ii) electrify 90 percent of public institutions in off-grid areas by 2015 and 100 percent by 2020.

3. **Impact of the project**

Energy is an important driver of economic growth, and will make a significant contribution to improving the living standards of the people of Vanuatu. Modern energy sources provide a key platform for achieving the Government's vision of "an educated, healthy and wealthy nation." Access to electricity reduces mortality, and improves all dimensions of human welfare such as education, literacy, health care, essential communication, and clean cooking solutions.

The URA program to provide greater energy access is part of a larger Vanuatu National Energy Road Map, which will promote diversification of Vanuatu's energy sources towards clean and renewable energy sources, using geothermal, hydro, and solar energy where possible and green site standalone mini/micro-grid hybrid networks. This will also assist in meeting climate change targets.

4. **Experiences learned**

The URA project achieved significant results strengthening the capacity of this authority, including developing a plan for its financial stability, appointment of a Chief Executive Officer, and Chief Economist, undertaking tariff reviews on four electricity concessions to reduce tariffs and strengthening the legislative frameworks related to energy and water policy in Vanuatu.

Kiribati: Grid connected solar photovoltaic (PV) project

1. **Background introduction**

1. **Geographic and demographic information:** Kiribati is one of the most remote and geographically dispersed countries in the world. It is composed of 33 islands spread over 3.5 million square kilometers – an area larger than India. The estimated population of Kiribati is about 110,000 who live on 20 coral atolls and a single volcanic island, with a total land area of less than 800 square kilometers.
2. **Socio-economic conditions:** Kiribati had a GDP in 2015 of US\$ 169.8 million (purchasing power parity). Kiribati is dependent on foreign development assistance, which contributed 43% to the GDP

in 2013. The Revenue Equalization Reserve Fund (RERF), a national sovereign wealth fund, had an estimated balance of \$668 million in 2013, equivalent to 381% of GDP. Earnings from fishing and fishermen remittances are important sources of income. In 2013, fishing license revenues contributed close to half of government's total revenue and total remittances from seafarers were equivalent to 6% of GDP.

3. **Challenges:** Comparative advantages are limited because of permanent cost wedges associated with Kiribati's small size and remoteness from markets. Systemic volatility is exacerbated by Kiribati's exposure to natural hazard risks, particularly drought and the loss of groundwater. Kiribati is unique even among Pacific Island countries for its remoteness and very low level of skilled capacity in the country.

At the time of the commencement of the project, the Kiribati electricity grid was dependent entirely on imported diesel fuel for electricity generation.

2. **Project description**

The Kiribati grid connected solar PV project objective is to contribute to reducing Kiribati's dependence on imported petroleum for power generation in order to improve energy security and to reduce the Greenhouse Gas (GHG) emissions from diesel fuel use for grid electricity supply in Kiribati.

The project includes operations and maintenance for a period of time and training and capacity building within the country for integration of renewable energy into electricity grids.

1. **Technological features:** The project seeks to replace the diesel based electricity generation grid with a grid-connected solar PV supply of electricity through investment in 516 kWp (kilowatt peak capacity) of grid connected solar PV without storage. The solar PV array are installed and managed at four of technically suitable locations that have been identified with associated inverters to enable grid in-feed at each location (institute of technology, sports complex, hospital, school).
2. **Stakeholders involved in the project:** The Public Utilities Board (PUB), a Kiribati Government - State Owned Entity (SOE) providing essential utility services, is the owner and operator of the solar power stations, and maintenance services for the solar PV power stations. Stakeholder coordination was necessary locally with the Ministry for Public Works and Utilities, Ministry of Environment, Lands and Agricultural Development, the Public Utilities Board and development partners. The project is funded by the Australian Government, and the Global Environment Fund (GEF) through the World Bank.
3. **Investment scale and financial mechanism:** Investment of about US\$3.9million, thereof US\$ 2.9 million financed by Australian Government and US\$1.0 by GEF Trust Fund/World Bank in a 100% grant model. Donor coordination has been essential to ensure optimization of the project outcomes.
4. **Plan for operation, maintenance, and possible future upgrade:** The project aims to reduce diesel fuel use by 230,000 liters per annum and reduce GHG emissions by 765 tons per annum. Savings from the reduction in diesel fuel use will reduce the level of direct and indirect subsidies transfers from the Government to the PUB.

3. **Impact of the project**

The main beneficiaries of the project are the electricity consumers of Kiribati South Tarawa by stabilizing prices over the longer term through fuel diversification, the PUB/KSEC and Kiribati Institute

of Technology (KIT) in terms of medium term renewable energy plan and capacity to integrate renewable energy into the grid and the Government in terms of reduced financial support to the PUB.

This project has begun a systematic process and ongoing dialogue in the medium term for achieving a shift from the business-as-usual ad hoc approach, towards a well sequenced, strategic and operational “roadmap” approach for joint Government and partner engagement in the electricity sector in Kiribati which will drive a systematic and staged process of strengthened institutional and technical capacity in country and enhanced financial sustainability of the sector.

4. Experiences learned

Despite an early positive impact in the electricity sector, full implementation of the project design has experienced some challenges given capacity constraints. Appointments of key staff to implement this project have taken over 12 months to finalise. These delays necessitate extension to the closing date of the project which will be considered by the World Bank based on future progress on the project.

Kiribati is working on two other grid connected solar PV projects of 400kW system funded through the Pacific Environment Community Fund, and a 500 kW system funded by the United Arab Emirates. Kiribati has been working to coordinate these projects to ensure grid stability and achieve as much standardization as possible. The development partners agreed to coordinate the operations and maintenance and capacity-building programs in the Kiribati energy sector to maximize benefits.

Vietnam: InfraCo Asia’s Coc San Hydropower project

1. Background introduction

- 1. Geographic and demographic information:** The Socialist Republic of Vietnam (Vietnam) borders China, Laos, Cambodia, the Gulf of Thailand and the South China Sea. Its 90 million people constitute the world's 13th largest population inhabiting the 66th largest country. Population density in parts of Hanoi is among the world’s highest at around 35,000 per square kilometre, but there are also sparsely populated remote areas, where remaining poverty is concentrated, principally among the 53 minority ethnic groups.
- 2. Socio-economic conditions:** Vietnam is now a middle-income country. GDP per capita was US\$ 2,170 in 2015 and its wealth is the second most evenly distributed in ASEAN after Indonesia. It is the world's 37th largest economy, and is in transition from agrarian to industrialised and from centrally planned to market-based. Vietnam is cited as having the fastest growing middle class in the Southeast Asian region. While significant reforms remain outstanding, changes to date have resulted in economic benefits for Vietnam, particularly through increased exports and foreign direct investment. Vietnam has spectacularly reduced its poverty rate from 58 per cent in 1993 to around 10 per cent in 2010 (basic needs poverty line).
- 3. Challenges:** The Vietnamese Government is gradually loosening foreign investment limits, for example, by lifting the foreign ownership limit in listed companies to 49 per cent, and in unlisted companies to 40 per cent. The legal system is also undergoing major change to better align commercial statutes with international norms. The implementation of WTO commitments is gradually contributing to a better operating environment over the medium and longer-term as tariffs are cut, investment restrictions loosened still further, and a more transparent and predictable

commercial legal and administrative system comes into place. This process will take some years to begin to show real benefits.

Electricity demand in Vietnam is growing 15 per cent annually, creating huge pressures to increase capacity of generation, transmission and distribution. Vietnam is focused on developing generation of renewable energy, and establishing a competitive electricity market. Hydropower accounts for about 44 per cent of energy generated, followed by oil and gas and thermal with 34 per cent and coal with 19 per cent.

2. Project description

Prior work had started on Coc San, but was stopped in 2011, when the initial capital was expended and the project company was unsuccessful in securing long-term loan financing. The Private Infrastructure Development Group (PIDG), through its subsidiary Facility InfraCo Asia Development and assistance from the broader PIDG family were able to fund the project and see it through construction to completion. The plant will open in June 2016.

The Coc San hydropower plant is located in the Lao Cai area of Vietnam, where there is a shortfall in generation capacity until 2020 when peak demand will be 512 MW. Previous power generation capacity was 84 MW of hydropower. To fill the gap, Vietnam is importing power at a high price.

1. **Technological features:** The project seeks to add 29.7 MW of clean energy to the power grid.
2. **Stakeholders involved in the project:** InfraCo Asia Development is funded by the Private Infrastructure Development Trust by donors that include the United Kingdom, Australia and Switzerland. Suppliers and developers for construction of this project are private entities from China and Vietnam.
3. **Investment scale and financial mechanism:** The total capital expenditure for this project was US\$44.9 million. InfraCo Asia Development funded US\$7.54 million of this, and InfraCo Asia Investment funded \$10 million as a joint venture partner. The Private Infrastructure Development Groups Technical Advisory Facility (TAF) also funded a prefeasibility study of the project and provided a one-off grant of US\$5 million to cover a financing gap during the project's construction phase.
4. **Plan for operation, maintenance, and possible future upgrade:** The hydropower plant is part of a provincial power development plan that seeks to reach production capacity of 1,000 MW by 2020 and will supply clean renewable energy into the local grid.

3. Impact of the project

The project will increase electricity reliability, which will support a long-planned industrial zone in the area that will in turn attract investments in mineral processing facilities to support existing mining projects in the region.

130,000 people are expected to benefit from access to this new power source
250 temporary jobs were created during construction, 40 permanent jobs are expected to be retained during operation. The project has strong local support from communities.

This project will also reduce the need to import expensive, unreliable power from external sources. Generation of clean energy from hydropower will reduce pollution.

4. Experiences learned

In late 2014, the project secured adequate debt and equity financing, enabling financial close. The PIDG was instrumental in this regard, have entered into partnership with the local developers when the project had stalled. Capital had dried up and investors were deterred from lack of clarity around risk. The PIDG was able to reassure stakeholders regarding the environmental and social impact of the project and restructured the construction arrangements and contract terms to ensure it was a commercially viable venture.

Brazil

Case study: Brazil's universal electrification experience – "Light for All" Program

1. Background introduction

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 recovery 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.

2. Project description

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 2000. 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 2016), reaching 15,7 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\$ 22,9 billion (US\$ 6.5 billion) – R\$ 16.9 billion (US\$ 4.8 billion) of which provided by the Federal Government.

Throughout the execution of the program, more families than previously expected without access to electricity at their homes were identified. Because of that, at the end of 2015, the Brazilian Government decided to extend the project up until 2018. In this new phase, over 1 million people mainly located in the North and Northeast regions of the country will benefit. The main target is to bring to an end the "electrical exclusion" in Brazil.

3. Experiences learned:

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 121,000 meters of underwater cables were already deployed – of which 88,000 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. Besides being 90% lighter than the conventional electricity poles (which weigh 1,000 kg on average), the new poles float in water and, as a consequence, may be moved by canoes in rivers through the Amazon. About 68,000 of such posts have been already deployed, 65,000 of which at the state of Amazonas alone.

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 where 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 41.3%, household income increased, and 40.5% found better job opportunities. 50.8% of interviewees also referred to a notable increase in the quality of night school activities.
- 4.9% of the surveyed families (around 788,000 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 R\$ 7.1 billion (US\$ 2 billion) into the economy, which provides evidence to the fact that the R\$ 16.9 billion investment is starting to pay off.

Brazil's experience with its Light for all program served as one inspiration for the "Sustainable Energy for All" initiative, created by the United Nations. The UN goal is to mobilize governments and private

institutions to face the challenge of providing access to energy to about 1.4 billion people worldwide, mainly in Asia, Africa and Central America. In order to share its experience, Brazil signed cooperation agreements with Colombia, Nicaragua, Guatemala, Peru and Mozambique and welcomed technical missions from several countries such as Angola, Burkina Faso, Cameroon, Nigeria, Kenya, Zambia, Nicaragua, China, India and Vietnam.

Canada

The Canadian Climate Fund for the Private Sector in Asia

This Government of Canada initiative of \$75 million supports private sector projects across Asia and the Pacific that help countries reduce their carbon footprint and adapt to the adverse impacts of climate change. It focuses on increasing renewable energy and energy efficiency, supporting urban infrastructure and sustainable transportation, and reducing greenhouse gas emissions. It helps countries overcome technology risks and cost hurdles in order to initiate and scale-up projects to reduce greenhouse gas emissions and increase climate resilience. Clean energy projects supported by the Fund may include wind, solar, geothermal and hydro projects. The Fund provides concessional financing to catalyze private sector climate mitigation and adaptation projects that require loans with concessionary terms to be viable. The Fund may provide up to a third of its financing in repayable contributions offered in the local currency, rather than US dollars, to encourage local companies to invest by protecting them from unexpected borrowing costs that might result from fluctuations in the US dollar. All Fund investments are co-financed by the Asian Development Bank. During the four-year investment period, the Fund also provides technical assistance to select private sector projects or public sector projects that improve the enabling environment for private sector investments.

Canada's contribution to the Fund is expected to leverage up to US \$300 million in private sector investment over the Fund's 24-year life and help to reduce greenhouse gas emissions by up to 750,000 tons per annum.

In Indonesia, the Fund is supporting the construction and operation of three geothermal power generation units in Sarulla, with a total renewable energy capacity of about 320 megawatts. Construction began in 2014 with operations expected to begin in 2016. The project is expected to avoid 1.3 million tonnes of greenhouse gas emissions per year. The ADB is providing \$330 million in co-financing, and the Fund's support is expected to leverage \$698.8 million and \$533.6 million of private and non-private sector investments, respectively.

In South West Georgia, the Fund is supporting the construction and operation of two run-of-the-river hydropower plant with combined capacity of 185 megawatts. The project is expected to generate 450 gigawatt-hour per year of clean energy and would result in the expected reduction of approximately 200,000 tons of carbon dioxide per year. The ADB is providing \$75 million in co-financing, and the Fund's support is expected to leverage \$138.0 million and \$203.5 million of private and non-private sector investment, respectively.

Examples of innovative business models:

Global Affairs Canada supported the launch of the Convergence blended finance platform at the World Economic Forum's annual meeting in Davos, Switzerland, on January 20, 2016.

Convergence will facilitate the blending of public, philanthropic and private funds for investments in sustainable development in emerging and frontier markets.

Convergence provides three offerings potentially useful to Global Affairs Canada and other development funders:

- an information and training portal on blended finance called Market Building Tools;
- an online platform called Investment Network to connect public and private sectors interested in co-investing in development projects; and
- an incubator called the New Product Design Facility to pilot new blended finance models.

The Government of Canada is a member of the **Sustainable Development Investment Partnership (SDIP)**, which aims to mobilise USD 100 billion in financing over 5 years towards infrastructure projects in developing countries in order to close the funding gap required to achieve the United Nations Sustainable Development Goals (SDGs). This public-private partnership brings together both developed and developing country government and investors in a coordinated approach to more efficiently use public tools and investments to reduce potential risks and leverage growing private capital flows towards investment in emerging and developing countries.

The approach: The Partnership provides a sustained and co-ordinated approach that has the potential to deliver the scale, speed, transaction efficiency, and risk mitigation necessary to unlock billions of dollars per year of additional finance. It will support inclusive growth and poverty alleviation through investments in areas such as water and sanitation systems, transportation, clean energy, agriculture, health, telecommunications, climate adaptation. Concretely, the partnership's work will be organised along different work streams. All streams cater to the goal of advancing transactions, which is in particular a central and permanent feature of the partnership.

Key challenges facing the Asia-Pacific region in the promotion of access to energy:

- The share of private participation in overall energy investments must increase. More work is therefore needed to set up enabling policy environments to promote public-private partnerships, as well as competitive procurement programmes for independent power producers.
- While on-grid electricity connections remain a priority since they often have the largest positive effects for development, a key focus must remain on funding small scale on-grid and off-grid solutions, as well as infrastructure for the adoption of clean cooking facilities (e.g. such as LPG infrastructure).

China

I. Independent power *supply* system for nursing home of Xiadawu Xiang, Qinghai Province

Xiadawu Xiang is located in the northwest of Maqin County, Golog Tibetan Autonomous Prefecture, Qinghai Province and it is a place of animal husbandry with a gathering of Tibetans. The nursing home of Xiadawu Xiang has 49 elderly people aged between 70 and 80 and all of them are subsidized by the government. However, the nursing home has had no power supply as it is located in the remote area of the plateau.

With the launch of the electric power construction project in the no-electricity region in Golog, Yushu of Qinghai Province In 2014, Xiawuda Xiang was incorporated into this project and relevant enterprises have funded for the construction of several centralized photovoltaic power stations, one 1,60kW centralized photovoltaic power station specifically for the nursing home of Xiadawu Xiang with a total investment of 5.22 million Yuan to satisfy the electricity demands of the nursing home and its surrounding regions, covering a total no-electricity population of 300+ people.

"It is more convenient and safer in the nighttime with electricity. We can watch TV and listen to radio". The elderlies happily talked about changes of their life after energization. The nursing home, once silent, is filled with TV and radio broadcasts, traditional Tibetan operas, recitals of scriptures and the laughter of the residents. According to head of the nursing home, the elderlies can feel the care and love of the government and the society with improvement of their living conditions and they have greater confidence in the days to come.

Today, electricity is available to all households in Xiadawu Xiang. A high-capacity centralized photovoltaic power station is constructed for Anyemaqen Tibetan Cultural Center, the Health Centers, the boarding school and the local governmental building. The electronic classroom of Xiadawu Xiang Boarding School is launched into use again after eight years of being left out of operation.

II. Extension of power grid to no-electricity areas in three prefectures in the south of Xinjiang

Project conditions

The three prefectures in the south of Xinjiang comprise Kashi Region, Hetian Region and Kizilsu Kirghiz Autonomous Prefecture in the south of Xinjiang with a covering area of 482,200sqkm and it accounts for 29.1% of the total area of Xinjiang. It borders five countries, including India, Pakistan, Afghanistan, Tajikistan and Kyrgyzstan, and has 9 frontier counties and cities within its jurisdiction. In 2015, it had a total population of 6.7 million, 93.1% of which are ethnic minorities. Its ethnic minorities accounted for 45.9% of the total ethnic minority population of Xinjiang. Uygur is the primary ethnic group and there are also 20+ other ethnic minorities there, including Kirghiz and Tajik. It also has 5 National Class 1 ports.

Project features

Firstly, the natural environment is rough and the living and production conditions are poor. Most parts of three prefectures in the south of Xinjiang are deserts, Gobi and mountainous regions. 96.3% area of Hetian are deserts and Gobi and over 90% area of Kirghiz State are mountainous regions. The three prefectures in the south of Xinjiang is basically an arid and highly arid region with a mean annual rainfall of less than 80mm, a mean annual evaporation of over 2,300mm and about 92 days of sandy weathers on the average per year. There are over 220 days of floating-dust weathers in Hetian each year. There

are also frequent and extensive occurrences of natural disasters, including geological disaster, high wind, drought, hail, rainstorm, flood and landslide that result in heavy losses.

Secondly, the economy develops slowly. Due to long-term vile natural environments, scarce farmland resources and rapidly growing population, three prefectures in the south of Xinjiang have nearly half of the farming population on merely 20% of the farmlands of Xinjiang and that severely restricts the development of local farming and animal husbandry. The manufacturing industry is weak and small in scale and basically at the fledging state. It neither contributes to the local treasury nor feeds the agricultural industry.

Thirdly, there is a high concentration of poverty-stricken people and it is hard to eliminate poverty here. Among the 24 counties within the jurisdiction of three prefectures in the south of Xinjiang, 19 are poor counties included in the national plan for poverty alleviation through development, accounting for 70.4% of the regional total. In 2015, three prefectures in the south of Xinjiang had 1.39 million poverty-stricken people, accounting for 20.7% of the local population and 40.79% of the total poverty-stricken population of Xinjiang. Considering the high concentration, high proportion and multitude of poverty-stricken people of three prefectures in the south of Xinjiang, it has always been the focus of poverty relief efforts of Xinjiang.

Construction principles

Considering the enormity of no-electricity population of South Xinjiang, long distance from the no-electricity villages to the master power grid and poor transportation conditions, new 220KV and 110KV substations must be constructed to increase the transmission capacity, expand the power supply radius, maximize the extension of power grid and thus ensure availability of electricity to all families.

Power grid is extended to address the problem of power supply if the target village is within the reasonable supply radius of the power grid, i.e. in the no-electricity village (no-electricity administrative village) within 45km from 35kV power grid and within 20km from 10kV power grid, and has a relatively high concentration of users (over 20 households within 500m).

Where power grid is extended to address the problem of power supply if the target village, with a relatively high concentration of users (over 20 households within 500m), is within 45 to 60km from the 35kV power grid or within 20 to 30km away from the 10kV power grid, 35/0.4 and 10/0.4 voltage rating is adopted for the power supply at the initial stage. New 35kV substations will be considered for construction at the end of the "Twelfth Five-year Plan Period" or beginning of the "Thirteenth Five-year Plan Period" to strengthen the power grid framework and make sure that the power supply radius is reasonable.

Construction scale

During the "Twelfth Five-year Plan Period", 1 new 220KV substation with an additional transforming capacity of 150MW, 15 new 110KV substations with an additional transforming capacity of 670MW, 21 new 35KV substations with an additional transforming capacity of 142MW, 180km-long new 220kV lines, 644km-long new 110kV lines, 1,052km-long new 35kV lines, 82km-long renovated 35kV lines, 4,338km-long new 10kV lines, 1,082km-long renovated 10kV lines, 7,020km-long new LV lines, 770km-long

renovated LV lines and 4,869 new distribution transformers with a total transforming capacity of 605MW were constructed.

Investment scale

In order to ensure availability of electricity to the no-electricity areas of three prefectures in the south of Xinjiang, a total investment of 3.262 billion Yuan was made in extension of the power grid, including central governmental budget of 1.631 billion Yuan. The investments are listed as follows as per voltage rating:

190 million Yuan on 220kV infrastructures, including 44 million Yuan on transformation for the construction of 1 new 220kV substation with an additional transforming capacity of 150MW; 146 million Yuan on line construction, including 180km-long new 220kV lines.

691 million Yuan on 110kV infrastructures, including 355 million Yuan on transformation for the construction of 15 new 110kV substations with an additional transforming capacity of 670MW; 366 million Yuan on line construction, including 644km-long new 110kV lines.

691 million Yuan on 35kV infrastructures, including 493 million Yuan on transformation for the construction of 21 new 35kV substations with an additional transforming capacity of 142MW; 381 million Yuan on line construction, including 1,052km-long new 35kV lines and 82km-long renovated 35kV lines.

1.066 billion Yuan on 10kV infrastructures, including 301 million Yuan on transformation and distribution for the construction of 4,869 new distribution transformers with an additional transforming capacity of 605MW; 1.066 billion Yuan on line construction, including 4,338km-long new 10kV lines and 1,082km-long renovated 10kV lines.

765 million Yuan on LV infrastructures, including 7,020km-long new LV lines and 770km-long renovated LV lines.

Implementation effects

Through the investments during the "Twelfth Five-year Plan Period", power is delivered to 130 villages and 9 Xiangs without electricity supply in three prefectures in the south of Xinjiang, realizing the availability of electricity to 594,700 no-electricity populations and 152,800 no-electricity households and launching the local farmers and herdsman into the era of electrification. Totally 9 border defense regiments and 4 frontier ports had access to electricity and the border trades were promoted; the safety, reliability and automation of the rural power grid are increased and the electricity supply conditions of 2 million farmers and herdsman are improved; it further guarantees reliable power supply for the rural economic and social development of the local people, effectively promotes the local economic development and improves the living standards of the local farmers and herdsman. The enormous benefits of the electric infrastructure project are well reflected.

Through large-scaled power grid construction and renovation, the per capita living electricity consumption reached 267.93kWh in three prefectures in the south of Xinjiang in 2015, up by 139.5%

compared with that in 2010; rural power supply reliability reached 98.86%, up by 0.39 percentage points compared with that in 2010; the rural general voltage conformity rate was 98.04%, up by 1.6 percentage points compared with that in 2010; the rural general line loss rate was 8.85%, down by 1.98 percentage points compared with that in 2010; the per capita income of farmers and herdsman reached 6,296 Yuan, up by 130.7% compared with that in 2010.

France

In 2014 the AFD launched a green microcredit project in Cambodia with microfinance institutions (MFI) in order to enhance access to solar individual systems for rural populations.

1、Background introduction

- Only 15% of households and 23% of villages have access to electricity in Cambodia, with 80% of the population living in rural areas
- The microfinance sector is concentrated on 8 main microfinance institutions, for more than 1,4 millions of borrowers on a total population of 14 millions

2、Project description

- The project aims to provide access to electricity to rural households with off-grid solutions by supporting 3 MFI in developing a “solar microloan” offer
- In the long term the project should allow the structuration of a sustainable value-chain for solar with quality solar systems
- Components : a 6 MUSD subsidized credit line to the 3 MFI, and a 2 MEUR grant from the Asian Investment Facility to support solar system companies
- The 3 MFI will be in competition to disburse the funds
- The project target 25,000 solar systems (80-100 Wp) installed in 4 years

3、Experiences learned:

- A key point is the articulation between each player : in the project, a coordinator had been recruited
- The project designed a certification scheme and a subsidy mechanism for solar firms depending of their performance (output based aid)
- The solar firms should prove that they have a dense network of qualified repairers in order to meet the needs of rural households

Still in Cambodia, the AFD designed in 2013 a project focused on enhancing access to credit for Small Private Electric Operators with a monitoring and training component.

1、Background introduction

- Only 15% of households and 23% of villages have access to electricity in Cambodia , with 80% of the population living in rural areas
- The Government aims to strengthen the role of the private sector in the electric distribution; this involvement is a specificity of Cambodia

2、Project description

- In this context the project will remove the most important constraint to small private operators development : access to credit with local financial institution
- The AFD provided a 20 MUSD loan to a Local Bank and a 5 MUSD portfolio guarantee; the Asian Investment Facility has also granted a 4 MUSD subsidy
- The Selected Local Bank is implementing the project by providing to small electric operators long-term loans eligible to the guarantee (in order to finance their needs for investment)

- The AIF subsidy finances a technical assistance program addressed to the Bank (training a project team) and the operators (structuring their projects)
 - The project should allow 35,000 new households to be connected to a grid
3. Experiences learned:
- Appropriation of the project by the bank and the final beneficiaries : this risk is reduced with the technical assistance program
 - The project is combining various financial tools with a specific application point : this innovative structuration will allow to better address the question of access to the banking financing of small private operators

Germany

Innovative business models:

Upgrading Watermills in Uttarakhand

In Uttarakhand, water mills have traditionally been used primarily for grinding of food grains. However, these watermills were being gradually replaced by diesel and electric mills. Recognizing the potential benefit of energy from hydro sources in the hilly regions, there have been efforts from UREDA to revive this technology. The GIZ IGEN-Access programme is providing support to the Uttarakhand Renewable Energy Development Agency (UREDA) to strengthen the existing Improved Watermills Programme in Uttarakhand with a view to increase the uptake under this scheme.

As a first step under this initiative, IGEN-Access undertook a preliminary study to assess the current status of the Improved Watermills Programme (IWMP) in Uttarakhand. Based on the findings from the study, IGEN-Access has decided to implement 3-5 pilots in select districts of Uttarakhand. For the pilots, closely located watermills will be selected to form clusters which will then be linked with existing value chains and self-help groups for value addition and marketing and with rural banks for financing.

Key challenges facing the Asia-Pacific region in the promotion of access to energy:

Limited Access to Finance

Access to energy is costly. With limited public funds available, leverage of private funds requires a number of efforts including detailed understanding of risks and challenges associated with particular technologies as well as plant sizes. Gathering information on inherent risks, facilitating dialogue and developing adequate mitigation instruments are pivotal elements to bridge the access to finance gap.

Low level of Productive Use of Energy

Productive users of energy can be the backbone of rural energy projects. A low level of productive users makes rural energy access projects more difficult and potentially more costly. Productive use of energy should hence be a criteria for site selection or in cases of low level of productive uses, adequate support mechanisms should sideline energy access efforts.

Enabling Institutional Environment

Sufficient capacity development institutions, clear ownership transfer procedures, up-to-date rural electrification plans or long-term warranty systems are all elements that are needed to provide a beneficial environment for energy access deployment. The challenges differ in the cooking energy sector

but for both energy access sectors there are multiple elements which are important to establish conducive framework conditions.

Case Studies:

- **IGEN-Access, India**

As per Census 2011, almost 400 million Indians do not have access to electricity and about 600 million use polluting, health-hazardous and inefficient biomass stoves for cooking their daily meals; the majority of them reside in rural areas. Even where available, access to electricity is erratic and unreliable hampering the development of rural industries and enterprises.

Access to sustainable and clean energy in rural areas can act as means for poverty reduction by providing economic opportunities and improving the quality of life of the rural population.

Considering the existing gap between demand and supply of energy in the country and dwindling conventional sources of energy, renewable energy sources can play an important role for India's future energy supply. Rural India holds significant potential for utilizing local energy resources like biomass, water, and solar radiation; however a large amount of this potential still remains untapped.

3. Project description:

The Energy Access component of the Indo-German Energy Programme (IGEN-Access) was initiated in 2010 as a collaboration project between the Ministry of New and Renewable Energy (MNRE) and GIZ to strive jointly for the promotion of renewable energy in rural areas. Aside ministerial partners on national (MNRE) and state level - Uttar Pradesh New and Renewable Energy Development Agency (UPNEDA), West Bengal Renewable Energy Development Agency (WBREDA), Bihar Renewable Energy Development Agency (BREDA) or Uttarakhand Renewable Energy Development Agency (UREDAs) – private and civil society stakeholders are also involved, including enterprises, providers of financial services or NGOs.

The objective of IGEN-Access is to improve the conditions for energy supply based on renewable energy in rural areas. In order to achieve that goal IGEN-Access is engaging in the following types of interventions:

- Implementing pilots together with the private sector to demonstrate replicable business models
- Facilitating the development and implementation of supportive policies and programmes at state and national level
- Capacity development & support for key stakeholders in the rural renewable energy sector
- Facilitating knowledge dissemination through conferences, workshops, and strengthening of practitioner networks

Various technologies are explored under the framework of IGEN-Access. These include solar PV water pumps, watermills, cleaner cookstoves, biomass gasification and solar mini-grids. Impacts vary according to intervention. In the solar pumping sector, IGEN-Access set-up demonstration sites, undertook a study of the current status and potential for solar water pumping in Bihar, entered into a public private partnership agreement with a start-up solar pumping solutions company to explore innovative business models and enable end-user financing for solar water pumping.

3. Experiences learned:

- **Facilitating access to finance for rural energy entrepreneurs**

In the absence of a detailed understanding of risks and challenges associated with particular technologies as well as plant sizes and risk mitigation measures, designing interventions to attract investments to the rural renewable energy market becomes very challenging. To fill this knowledge gap, IGEN-Access has initiated a study that analyses different barriers to finance to rural renewable energy enterprises. The study will suggest solutions for these barriers of which the most promising will be implemented through pilots.

- **Involving Corporates in the Energy Access Sector**

There is a critical role which larger enterprises can play as a solution provider in expanding access to energy. Large companies offer scalable delivery channels and financial resources that can complement initiatives by smaller local and social entrepreneurs that provide solutions to meet local customer needs. IGEN-Access is, therefore, exploring potentials to integrate national and international corporates into the energy access sector.

- **Ensuring Gender Equality in Energy Access**

IGEN-Access is undertaking a study to analyse the current energy situation in rural areas from a gender perspective. IGEN-Access has furthermore established gender indicators for all of the projects within its portfolio. These will ensure that gender mainstreaming is effectively embedded in the project planning, execution and monitoring of ongoing and future IGEN-Access activities

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

Project	Duration	Volume [Mio. €]	Targets	Approach	Partners
Project Development (ev)	2005 - 2019	275.42	<ul style="list-style-type: none"> - 18 Mio. people have access to sustainable energy services by 2019 - Development through access to energy 	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - Federal Ministry of Foreign Affairs (BMZ) - Directorate-General for Development Cooperation of the Federal Foreign Affairs (DGL) - Norwegian Ministry of Foreign Affairs (MFA) - Department for International Development (DFID) - Agency for Development Cooperation (SDC)
Project Development (ev)	2006-2019	15.14	<ul style="list-style-type: none"> - 1,008,090 people with energy for lighting/ electrical appliances - 20,544 people with cooking/thermal energy 	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - Rwanda Energy Group - Ministry of Infrastructure (MININFRA) - Federal Ministry of Foreign Affairs (BMZ) - Directorate-General for Development Cooperation of the Federal Foreign Affairs (DGL) - Norwegian Ministry of Foreign Affairs (MFA) - Department for International Development (DFID) - Agency for Development Cooperation (SDC)

wable y I – Solar m		16.5	- Promoting Solar Home Systems	<ul style="list-style-type: none"> - 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 - Training of and support for the users of the facilities - Introduction of prepayment meters 	<ul style="list-style-type: none"> - Federal Ministry of Cooperation and Development (BMZ) - Infrastructure Development Company Limited (I)
rification Nile		31.2	- 60,000 people in six cities and 40 commercial centres have access to sustainable and dependable electricity	<ul style="list-style-type: none"> - Expansion of two small hydro-electric power stations and enlargement of the grid - Construction of ca. 400 km of medium voltage lines 	<ul style="list-style-type: none"> - Federal Ministry of Cooperation and Development (BMZ) - European Union (EU)
erman te nology ive GIZ otion of Hybrid Grids in a olar)	2013- 2018	7.5	- Harnessing the efficiency and effectiveness of the private sector	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - Federal Ministry of Cooperation and Development (BMZ)

an-Indo y am s to y in Rural	2015- 2018	3	- Improving the conditions for energy supply based on renewable energy in rural areas	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - Ministry of New and Renewable Energy (MNRE) - Ministry of Power (NRE) - Federal Ministry for Economic Cooperation and Development (BMZ)
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Japan

Japan has been contributing to the sustainable development of the Asia-Pacific Region through the framework of both bilateral and multilateral aid through international organizations from long-term perspective. Some projects which signed since 2015, such as distributed power supply, geothermal power generation and transmission and distribution (T&D) network expansion are described below as case studies.

Japan has initiated projects which should contribute to the sustainable economic growth in developing countries through various supports such as human resources development by technical cooperation and engineering service (E/S) before installing facilities.

When introducing renewable energy in Small Island Developing states (SIDs) and remote depopulated areas to expand energy access, installing grid stabilization facilities, such as electricity storage, should be considered. Japan recognizes the importance of analysis on reformation of electricity system, including utilization of electricity storage systems and supports the development of its technology in collaboration with organizations such as IRENA.

[1] Project for Power Sector Improvement for the State of Kosrae

1. Background introduction

Location: Kosrae, Federated States of Micronesia

Date of Agreement: Apr 1, 2016

Challenges: Extension of regional power supply and stable utilization of renewable energy

2. Project description

Adopting technology: Diesel engine generators, Substations and Distribution equipment

Finance: Grant Aid (1193 million yen)

Project Impact: By installing diesel engine generator as a major capacity, it enables to operate regional power system with intermittent renewable energy. In addition, by introducing transformer, substation facilities, such as switches, and underground cables, this project will contribute to developing regional power system.

[2] Project for Capacity Development of Power Transmission and Distribution Systems

1. Background introduction

Location: Myanmar

Date of Agreement: Jan 22, 2016

Challenges: Capacity building for technology of T&D system

2. Project description

Project Type: Technical Cooperation

Project Impact: By establishing human resource development plan for Myanmar's T&D system technology, training programs, training function, this project focuses on capacity building of human resources engaged in operation and maintenance management and contributes to improving reliability and efficiency of power supply and energy access in the region.

[3] GDAP(Hululais Geothermal Power Plant Project (E/S))

1. Background introduction

Location: Indonesia

Date of Agreement: : Dec 18, 2015

Challenges: : Expansion of electricity supply

2. Project description

Adopting technology: : Geothermal Power Plant 110MW

Finance: Yen loan (657 million yen)

Project Impact: The promotion of engineering service for a construction of geothermal power plant, which utilizes clean energy resource existing abundantly in Indonesia, will lead to designing an appropriate facility of geothermal power plant.

[4] Dhaka-Chittagong Main Power Grid Strengthening Project

1. Background introduction

Location: Bangladesh

Date of Agreement: : Dec 13, 2015

Challenges: Improving Energy Access

2. Project description

Adopting technology: High-voltage transmission lines and substation facilities

Finance: Yen loan (43769 million yen)

Project Impact: The project enables electricity of the newly-built thermal power plant in Matabari district to transmit to Dhaka in a stable and efficient way by installing a high voltage backbone transmission lines between Dhaka and Chittagong and constructing substation facilities. It will contribute to economic development of Bangladesh.

[5] Tashkent Thermal Power Cogeneration Plant Construction Project

1. Background introduction

Location: Uzbekistan

Date of Agreement: Oct 25, 2015

Challenges: Improving Energy Access

2. Project description

Adopting technology: Cogeneration power plant supplying heat and power

Finance: Yen loan (12000 million yen)

Project Impact: A new cogeneration power plant with gas turbine and heat recovery boiler will be built in Tashkent, the capital. This project contributes to realizing stable and efficient energy supply of heat and power and bringing economic development in Uzbekistan.

[6] National Power Transmission Network Development Project

1. Background introduction

Location: Myanmar

Date of Agreement: : Phase I Mar 26, 2015, Phase II Oct 16, 2015

Challenges: Improving Energy Access

2. Project description

Adopting technology: Transmission lines and substation facilities

Finance: Phase I Yen loan (24678 million yen), Phase II Yen loan (41115 million yen)

Project Impact: The backbone transmission line of 500 kilovolts that connects the Bago region and the Yangon region with a substation will be constructed. It will enable to increase transmission capacity to southern Yangon with high electricity demand and contribute to economic development for whole Myanmar.

[7] National Transmission& Distribution Net.Dev & Eff. Improving Project

1. Background introduction

Location: Sri Lanka

Date of Agreement: : Aug 11, 2015

Challenges: Improving Energy Access

2. Project description

Adopting technology: T&D facilities

Finance: Yen loan (24930 million yen)

Project Impact: To increase capacity of T&D network and improve its efficiency, this project aims to realize stable electricity supply and vitalize economic activity throughout the country by implementing T&D facilities.

[8] Power Distribution Improvement Project in Yangon Phase I

1. Background introduction

Location: : Myanmar

Date of Agreement: : Jun30, 2015

Challenges: : Improving Energy Access

2. Project description

Adopting technology: Distribution facilities

Finance: Yen loan (6105 million yen)

Project Impact: By upgrading and enhancing a distribution network equipment of the Yangon region, this project aims to improve electricity generating capacity in the region with the largest electricity demand in the country and contributes to economic development in Myanmar.

[9] Odisha Transmission System Improvement Project

1. Background introduction

Location: : India

Date of Agreement: May 15, 2015

Challenges: Improving Energy Access

2. Project description

Adopting technology: T&D facilities

Finance: Yen loan (21787 million yen)

Project Impact: By installing transmission lines in Odisha State (about 971km) and constructing substations (18 locations), this project aims to stabilize the grid in Odisha State and realize electricity supply in a stable and efficient way and contribute to economic development there.

[10] Project for Establishment of the Combined Cycle Gas Turbine Operation and Maintenance Training Center

1. Background introduction

Location: Uzbekistan

Date of Agreement: Jan 27, 2015

Challenges: Capacity Building

2. Project description

Adopting technology: Technology for Combined Cycle Gas Turbine (CCGT) Operation and Maintenance

Finance: Technical Cooperation (570 million yen)

Project Impact: For further utilization of CCGT power plants which are the major electricity generating capacity in Uzbekistan, this project aims to establish a training system by developing training curriculum, institution, teaching materials and a program of training of trainers for CCGT operation and maintenance, which will contribute to strengthening a capability for the operation and maintenance of CCGT power plants.

Note: Date of Agreement corresponds to the date of signature of Loan Agreement or Grant Agreement.

Mexico

The **Integrated Energy Services Project (PSIE)** aims to electrify 36 rural communities that do not have access to grid electricity. It is partially financed with resources from the World Bank and the Global Environment Fund, each one provide the amount of 15 million dollars.

The states considered part of PSIE are Durango, Chihuahua, Coahuila, Guerrero, Nayarit, San Luis Potosi, Sonora and Baja California Sur, benefiting approximately 7,000 inhabitants.

On October 30th, 2015, the PSIE closed the Project implementation, thus benefiting an estimated of 7,000 people in various states of the Republic.

The aim of the project was to supply electricity to 36 rural communities with native participation through a scheme of micro networks powered by a solar power plant. For the implementation of PSIE, the process of International Competitive Bidding was considered, and the Federal Electricity Commission (CFE) was the one in charge to execute it given its experience in the field.

During 2013, the CFE published two of four calls to bid a total of 15 localities distributed in the municipalities of Canelas, Santiago Papasquiaro, San Bernardo, El Mezquital, Ocampo and Otaez located in the state of Durango, and Sierra Mojada in the state of Coahuila.

In early 2014, the convening of the third tender was published, which considered 10 locations in the municipalities of Aldama and Ocampo in Chihuahua; the Mezquital and Tepehuanes in Durango; Atoyac de Alvarez in Guerrero; the Nayar in Nayarit; Tierra Nueva in San Luis Potosi; Bacanora in Sonora and Ocampo in Coahuila.

Finally, at the beginning of 2015 a fourth and fifth tender were published, covering the municipalities of Santiago Papasquiaro, Tepehuanes and Topia in the State of Durango; and Luis Echeverria Alvarez in the state of Baja California Sur.

The National Program for Replacement of Incandescent Lamps with Ballasted Compact Fluorescent Lamps in localities of up to 100,000 is designed to support this vulnerable segment of the population, in the acquisition of efficient lighting technologies, after the departure of incandescent lamps in the domestic market. This, because the difference in price between energy-saving lamps compared to incandescent, impacts negatively on the economy of that segment.

The National Program for Replacement of Incandescent Lamps with Ballasted Compact Fluorescent Lamps seeks the replacement of 40 million incandescent lamps with saving lamps in support of localities with high and very high vulnerability.

1) innovative business models

- ☐ Program for saving and energy efficiency in the business sector better known as Eco-créditoEmpresarial:

The main objective of this program is to support the business sector through preferential financing rate in order to replace inefficient equipment for other high efficiency equipment approved by FIDE equipment. Through this program the government is seeking to enhance the efficient and sustainable use of energy, having a positive impact on the environment.

The target for this program is to incentivize SMEs to increase their energy saving. Any type of SME can access to the credit, from those oriented to industrial and commercial activities, or services sector.

For more information, please visit this link:

http://www.fide.org.mx/index.php?option=com_content&view=article&id=342Itemid=224

Republic of Korea

1) Background introduction

The project seeks to enhance the resilience capacity of the indigenous communities living in the rich carbon stock wetland ecosystem in the Province of Datem del Marañón in the Region 1 of Loreto, Peru, to improve their livelihoods through enhancing energy access, and to reduce greenhouse gas (GHG) emissions from deforestation. The target population is primarily low-income indigenous peoples from seven ethnic groups. The project aims to create social capital and agreed plans to entrust the management of the natural resource base to the indigenous communities. The budget of the project is 9 million USD, which will be provided by the Global Climate Fund (6.2m USD), the Korean government (1.8m USD) and the Peruvian Trust Fund for National Parks and Protected Areas (1m USD). The Peruvian Trust Fund for National Parks and Protected Areas is the principal operator of the project.

2) Project description

The proposed activities seek to: (a) facilitate the participatory preparation of land-use and operational management plans; (b) entrust natural resources management to indigenous communities and empower women in the decision-making process; and (c) strengthen and expand commercially viable and sustainable bio-businesses of non-timber forest products. All activities foster empowerment and community ownership, improve livelihoods, enhance learning opportunities, and consolidate indigenous peoples' basic rights. All the proposed activities are community-based adaptation and climate change mitigation good practices, which are complemented by strong monitoring and evaluation systems. The project includes a science and technology component to enhance the knowledge base in order to guide future activities aimed at preserving the carbon stock and enhancing community well-being.

Power generation from solar photovoltaic (PV), micro-grid, and energy storage system (ESS) will be the main component of the third activity. More specifically, the project will allocate funds to develop applications for solar PV energy in bio-business processes, such as equipment operation, lighting, cold storage and lyophilization (freeze-drying). This innovation is considered as a technological enhancement of bio-business, which improves their probability of success.

The project will receive support from the Government of the Republic of Korea to implement a pilot intervention for the adoption of solar PV and ESS technology on multiple fronts. The initial step will be a feasibility study to identify the variety of activities that could adopt this technology, and the available sources around the world that meet technical and cost specifications of the Korean assistance. In August 2015, a preliminary analysis in the project area was carried out by a delegation from the Government of the Republic of Korea, as a way to produce more specific information on electricity needs of bio-businesses and site conditions. Based on the preliminary analysis, the Korean delegation identified 6 potential bio-businesses where solar PV and ESS will be implemented – three existing bio-businesses (including one aguaje oil plant, one aguaje pulp plant and one ice plant); and three new bio-businesses (including one aguaje oil plant, one aguaje pulp plant and one ice plant). The expected capacity of solar PV in an aguaje oil plant, an aguaje pulp plant and an ice plant are 8kW, 8kW, and 21kW, respectively. In the project, there are 9 existing bio-business plants and 22 new bio-business plants consuming electricity for their bio-business processes, however only a select number of bio-businesses can be included for installation of PVs and ESS due to a limited budget, and these numbers will be finalized upon completion of a feasibility study. Installation of solar PV and ESS will act as a clean technology demonstration project and will have a significant replicability potential throughout the isolated communities in the Amazon area. These investments by the Government of Korea will add value to the proposed project through piloting an innovative approach to integrate clean energy into sustainable land use and forest conservation.

3) Experiences learned

This project was launched in March 2016 and will be completed in February 2021. Thus, this project will keep bringing experiences and lessons. The most meaningful point is that the project is the first one which the Global Climate Fund (GCF) officially supported. Through the project, the people of the focal area will ride a wave of energy access. The people will run their businesses depending on the generated electricity and it will secure the sustainability of the project. Moreover, the project will contribute to reducing greenhouse gas (GHG) emission. According to a deforestation reference scenario brought by the average of the last 10 years of observation, the estimated avoided deforestation over a 10-year period amounts to 140.6 hectares of aguajales (palm swamp forest) and 4,720 hectares of terra firma forests, equivalent to 2.63 Mt CO₂ eq. Likewise, we recommend there should be more efforts for both

reducing GHG and enhancing energy access simultaneously, to which more financial resources will be available than to projects only for energy access.

Additionally, Korea wants to share a very brief introduction of another project case. The Korean government supported a decentralized off-grid power generation system project in the Cobrador Island, Philippines. The project was initiated in 2007 and completed very successfully in 2016. The fund was provided by Korea Energy Agency (300 thousand USD), the Asian Development Bank (100 thousand USD), and a local company (300 thousand USD). Through this project, we can obtain three lessons. First, cooperation with multilateral development banks can be a more effective way for enhancing energy access in a local area. Second, the participation of local companies increases the possibility of success. Finally, a hybrid system of solar photovoltaic, diesel, and energy storage systems significantly contributes to sustainability of a decentralized off-grid power generation system.

Innovative business models:

Korea suggests the Energy Self-sufficient Island model to the G20 as a desirable reference. The Datem del Marañón project of Peru, which is mentioned above, is also an application of the model. The Gapado project is another demonstration case for the model. 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 within 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 where financial aspects are seriously considered.

Key challenges facing the Asia-Pacific region in the promotion of access to energy:

The most critical challenge will be financing. Whatever projects they are, unless appropriate returns are assumed, private participants will be reluctant to invest. Without private investments, public efforts will be never sufficient. Therefore, governments should focus on establishing appropriate settings for participation. For example, governments can formulate environments which can contribute to higher returns and lower risks of investors on energy access. The options will include removal of barriers against financial flow, mechanisms for lowering financial risks, and etc. In addition, governments have to demonstrate a number of rewarding pilot projects which will help private investors to identify potentials of energy access projects. Through both direct and indirect supports, once projects are considered profitable, the energy access problem will get solved.

United Kingdom

Lighting the way to sustainable energy access in India and beyond

Background

Despite rapid economic growth 240m Indians remain in the dark because they can't access modern energy services. Over the past 4 years DFID support for The Energy and Resources Institute energy access campaigns have delivered solar home lighting systems and improved cookstoves reducing drudgery, and improving education, health outcomes for 3.5 million people.

Project description

The project had a particular focus on developing sustainable markets – and worked with 237 entrepreneurs to deliver solar systems and improved cookstoves to over 650,000 households

A recently concluded impact study showed that for:

Solar lighting 41% of households reported their children were now studying for longer, and 54% of women reported improved convenience and 11% had been able to undertake additional income generating activities.

For cookstoves around half (54%) of households reported reduced fuel consumption and more than one third (37%) reported that reduced smoke emissions. This was borne out by follow-up studies that showed measurable improvements in indoor air quality.

The programme also showed that the market based approaches were highly effective at delivering basic energy access when products were seen as desirable and affordable with improved mud stoves being perceived as particularly cost effective. Solar Home Systems now commercially available in the market in many areas of rural India.

In addition take off was only possible when a critical mass of consumers in an area were aware of the product and could act as advocates for adoption – requiring an approach that focused on specific areas for marketing and promotion.

The project also supported dissemination of approaches in East Africa with successful peer to peer learning activities in Kenya and Ethiopia on both technology and market based approaches transferred.

Providing Clean Energy to the Poor - Bangladesh

The UK is providing up to £20 million in Bangladesh to support improved access to clean energy for the poor. It is focused on off-grid renewables – solar home systems, solar mini grids and solar lanterns. The programme works alongside the Infrastructure Development Company Ltd (IDCOL), the Sustainable Renewable Energy Development Authority (SREDA) and GIZ. It supports the broader IDCOL solar home system programme which aims to bring solar power to more than 16 million by 2020 as well as piloting and scaling up the development of solar min-grids (with the private sector) and solar lanterns. Policy support is provided to SREDA as a new institution who will increasingly have the mandate to set

standards and regulations for the renewable energy space, and work to coordinate the investment of donors and others with an interest in the renewables sector.

European Union

Exemplary case studies:

Nine countries in the Asia – Pacific region have included substantial sustainable energy actions in their bilateral cooperation with the EU for the 2014-2020 period (VietNam, Philippines, Iraq, Marshall Islands, Micronesia, Nauru, Niue, Palau, Tonga). The actions proposed and / or under preparation under these bilateral programmes aim at supporting partner countries in achieving their sustainable energy goals. These actions are in different phases of approval/implementation but not yet possible to be considered exemplary case studies for the region (first results are expected starting with 2017).

Innovative business models:

Under the current EU thematic program for the period 2014-2020 - Global Public Goods and Challenges - a new Electrification Financing Initiative (ElectriFI) was put forward and launched at COP 21 in December 2015. ElectriFI is an innovative mechanism to unlock, accelerate and leverage investments increasing access to affordable, reliable, sustainable and modern energy. The initiative boosts investments by bridging the financial gap throughout all business stages and thus making projects bankable. The first invitation for applications was closed on 6 May and the assessment of the projects submitted is ongoing. This first round demonstrated clearly the high demand for this type of support generating proposals for more than 7 billion investment projects. Several projects in countries from Asia-Pacific region have been submitted for being funded under ElectriFI, confirming the relevance of this innovative model for this region also. The next invitation round for applications under ElectriFI will be launched in the last quarter of 2016.

Key challenges :

Non renewable energy sources are, by far, the most used to generate electricity in AsiaPacific region. Progress in access to modern energy is still to be made in several countries. Policy and regulatory framework conditions, aiming at providing attractive and enabling environment for increased public and private investment in energy access, energy supplies, renewable energy as well as energy efficiency, are crucial to achieve SDG 7 and to power sustainable development. Further close cooperation and coordination of actions are likewise needed in the Asia – Pacific region in order to increase climate change resilience and mitigation, to protect the local economies from the fossil fuels price volatility, to fight energy poverty and to exploit investment opportunities in renewables and energy efficiency.

2.2. Invited States

Bangladesh

1. Solar Home System (SHS) promotion through IDCOL, Bangladesh

Key Features:

- ☐ In Bangladesh, SHS program is implemented by Infrastructure Development Company Limited (IDCOL), a Government owned non-banking financial institution. This program achieved its

recognition as fastest growing Renewable Energy (RE) program of this world. It has brought rapid change in socio-economic condition of off-grid rural areas with an addition of progress in employment, education and women empowerment sector. Almost, 4 million household in Bangladesh are benefitted from this program.

18

- ☐ The program is implemented by selected NGOs working as a Partner Organizations (PO) for the program. The business model adopted is to provide wholesale lending from IDCOL to these POs and then the PO selling the system to individual household in micro-credit mechanisms with after sales services. The institutional governance mechanism and quality control is ensured through IDCOL.
- ☐ During implementation of SHS, the program leverages financing from the households, the participating organizations (POs), grant and credit support from various development partners through IDCOL.
- ☐ IDCOL provides the capacity development support to the POs, individual households on usage of SHS, its maintenance and also it does the commercial and technical audit for the systems to insure the financial and technical standards for the supported systems.

Key Challenges on enhancing energy access in Bangladesh

- ☐ Reaching out to most remote area, islands, ensuring last mile connectivity.
- ☐ Inadequate land for power projects.
- ☐ Investment and Financing for mega power projects.
- ☐ Lack of specialized human resources.

Success Factors

- ☐ Transparency and quality control ensured with separate committee for selection of PO, technical selection committee to ensure quality standards of products and operation committee for operation matters of the systems backed up by technical and commercial audit.
- ☐ Awareness raising at the community level through various communication medium
- ☐ Capacity building activities conducted for users, PO, and its staffs and development of dissemination of relevant manuals and guidelines.
- ☐ Linkage with economic activities, micro-financing, innovative and sustainable business models, women empowerment, private sector participation in the project.

Singapore

Background

1. Singapore currently 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. Besides ensuring that we have the necessary energy infrastructure in place, this was also

18 Info Provided during Policy Dialogue, ESCAP 2016

achieved through regular maintenance and upgrading of the infrastructure, investment in research and development (R&D), and developing a strong, capable workforce.

Project Description

2. This section outlines key initiatives introduced by Singapore in the areas of (i) energy policy and infrastructure development, (ii) R&D, and (iii) manpower development. These initiatives ensure that the electricity system in Singapore is able to adapt to future challenges, thus ensuring a stable and reliable energy supply to its residents.

(i)Energy policy and infrastructure development

3. Currently, about 95% of Singapore's electricity is generated using natural gas. Our first Liquefied Natural Gas (LNG) terminal commenced operations in 2013, which allows us to geographically diversify our sources of natural gas. Our tranche-by-tranche approach to procuring LNG also gives us the flexibility to react to price changes and new supply sources. We will be expanding our LNG terminal's capacity from the current 6 Mtpa to around 11 Mtpa by 2017 with a fourth storage tank to be completed by 2018. There are also plans for a second LNG terminal to be potentially built in the eastern part of Singapore.
4. On renewable energy, solar remains the most promising option for our electricity generation today. To facilitate the growth of the solar sector in Singapore, we introduced several regulatory enhancements, including streamlining connection time, simplifying payment procedures, and raising the Intermittent Generation Threshold in Singapore from 350MWac to 600MWac. Market interest has grown since 2008 with the number of solar photovoltaic (PV) installations increasing from 30 to 942 by end-2015. To overcome Singapore's inherent challenges such as the lack of available land, solar panels are being installed on rooftops of public housing blocks and on reservoirs.

(ii)Research and Development (R&D)

5. Catalysing energy innovation through R&D is one of our key strategies to address our energy challenges. The future power system must be able to cope with tighter integration of intermittent generation sources, such as solar energy; enable a wider range of demand-side applications; and be resilient against cyber threats. In this regard, EMA actively supports the strengthening of our research capabilities, system-level innovations, and the bridging of research-market deployment gaps.
6. To enhance grid stability, EMA has established a S\$25 million Energy Storage Programme (ESP) to develop and integrate large scale, cost-effective energy storage systems (ESS) to enhance the overall stability and resilience of our power system. Grid-level ESS, such as electrochemical batteries and flywheels, can store energy on a large scale within the power grid. In Singapore, ESS could help to reduce demand during peak periods, act as reserves for frequency regulation, as well as support the deployment of intermittent generation sources like solar energy.

(iii) Manpower development

7. For Singapore, strengthening manpower resilience in the power sector is a key priority. The power sector faces an ageing workforce and challenges in attracting and retaining young Singaporeans.

Technical professionals will continue to be needed in the sector to meet Singapore's energy demand. In this regard, Singapore launched several initiatives to ensure a capable workforce that is able to provide adequate support for the future energy market in Singapore. This includes (a) collaboration with Singapore Institute of Technology (SIT) and Newcastle University (UK) to introduce a full-time Electrical Power Engineering programme targeted primarily at polytechnic graduates, (b) Energy-Industry Scholarship (EIS) co-funded by the Singapore government and power sector companies to develop relevant talent, and (c) the National Energy Competency Framework (NECF) which lays out career pathways and competencies for power sector jobs.

Experience learned

8. In order to ensure continued access to reliable and affordable energy, forward planning in terms of infrastructure, policy and manpower capabilities is necessary. Moving ahead, to keep up with technological advancements and innovation, it would be useful for regular exchanges to take place for countries to share on the latest developments which could enhance energy access.
9. From the regional perspective, Singapore has played an active role as the Chair of the ASEAN Plan of Action for Energy Cooperation (APAEC) 2016 – 2025 Drafting Committee which focuses on enhancing connectivity and market integration within the ASEAN region. The Plan of Action includes flagship interconnection projects such as the ASEAN Power Grid and the Trans-ASEAN Gas Pipeline (TAGP) which could facilitate enhanced energy access in the region. For example, a key strategy for the TAGP is to enhance connectivity for energy security and accessibility via pipelines and regasification terminals. More details can be found at <http://www.aseanenergy.org/wp-content/uploads/2015/12/HighRes-APAEC-online-version-final.pdf>.

Solomon Islands

Key initiatives:

- ☐ Melanesia Million Miracle Program (MMMP):- This project is implemented to provide electricity to 1 million households during the period of 2014-2020. (Solomon, PNG and Vanuatu)
- ☐ Cooking for life program is implemented to provide healthier cooking environment for women and children and to save the remaining vegetation in coral atoll countries of the Pacific.
- ☐ In both of these programs, the Pacific community works with government, NGO, energy office and women groups.

Key Challenges on enhancing energy services in Solomon Islands

- a. Affordability for existing technology.
- b. Low quality equipment on SHS, reliability.

The focus of Melanesia Million Miracle Program is on providing electricity to the Melanesia Countries with focus on appropriate renewable energy technology.

2.3. International Organizations

ASEAN Centre for Energy

1. Introduction

The Association of Southeast Asian Nations (ASEAN) comprises of ten ASEAN Member States (AMS) within Southeast Asia. Despite disparity between the economic level and performance among the Member States, ASEAN is considered one of the fastest growing regions in the world. ASEAN has a combined total land area of 4,435,618 km² which is inhabited by more than 622 million people, of which more than 50% live in rural areas (2014). Having quickly recovered from the 1997 economic crisis, the region averaged GDP growth rates of 5.1% from 1990 to 2013. In 2014, ASEAN wide GDP at current prices was USD 2.6 trillion, equivalent to USD 4,135 per capita.

Providing citizens with access to electricity and modern energy is one of key goals under the ASEAN Plan of Action of Energy Cooperation (APAEC) 2016-2025 “Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All”.

Over the last decades, AMS have made efforts, including the utilisation of their Renewable Energy Technology (RET) potential, to increase their respective electrification rates. The number of people without access to electricity today is still more than 100 million people, but it is a significant reduction compared to 190 million in 2005.

2. Project Description in AMS: Cambodia and Lao PDR

2.1. Rural Electrification Programme in Cambodia

Cambodia lies entirely within the tropics and is dominated by the Mekong River. The country’s total land area is 181,035 km², of which approximately 49 percent is covered by forest, and inhabited by 14.8 million people (2014). In 2014, the GDP growth reached 7.1%, resulting GDP per capita \$1,130. Cambodia has moved closer to lower middle-income status with resounding economic growth driven by solid performances in garment manufacture, tourism, paddy and milled rice, and construction. The Cambodia Socio-Economic Survey indicated that poverty in Cambodia fell dramatically between 2007 and 2012, from about 50% to below 20%.

In recent decades, Cambodia has focused efforts on the rehabilitation and expansion of the commercial energy sector to fulfil the need of economic growth. A priority goal of the government is to reduce poverty, and a key strategy for this is the development of sustainable and affordable energy supplies for all its constituents. The Royal Government of Cambodia has set an ambitious target to reach 100% of the village with certain type of electricity by 2020 (including battery power) and 70% of household connected with grid-quality electricity by 2030. This target is further detailed in the National Strategic Development Plan Update 2009-2013 and Rural Electrification Master Plan (REMP) with Ministry of Mines and Energy as the focal point. Presently, 62% of villages and 53% of households have access to grid quality electricity in Cambodia.

According to REMP, the total cost to electrify all villages is about US\$ 427 million or US\$ 490 per household with 872,000 households to be connected. A total of 272,000 households will be electrified in

the off-grid areas by decentralized mini-grids and solar battery charging by the target year 2020. The gross investment costs will amount to about \$147 million. The remaining villages will be connected through grid extension.

The Royal Government of Cambodia has issued a Royal Decree to establish a public institution the Rural Electrification Fund (REF). The objectives of the REF are to facilitate access to electricity infrastructure and provide a secure, reliable, environmentally safe, and sustainable energy supply of various types, at reasonable and affordable price. The Rural Electrification Fund (REF) is also part of the Renewable Energy Action Plan (REAP) with the goal of providing financial support to achieve Cambodia's electrification targets. Renewable energy plays a role in its program. Mini hydro plants and solar home systems are eligible to receive subsidies up to 25% of total investment costs. The International Development Association (IDA) and Global Environmental Facility (GEF) provide financial support to the REF. REF's activities include:

- Grant assistance of US\$ 45 per connection (subsidy) to Rural Electricity Enterprises (REE) to increase household connections (the target of 50,000 additional connections is almost achieved) based on eligibility criteria such as location, distance from national grid, licenses, price/kWh, etc. An association of REEs has been established (2011) to collect information from REEs (possible improvements, challenges, etc.) and to spread technical knowledge and training information;
- Financial support to the 12,000 Solar Home System (SHS) rent-to-own program: around US\$ 3.85 million of which US\$ 1.2 million is grant and US\$ 2.65 million is loan;
- The repaid loans will be used for the project "Power to the Poor", to provide poor households a US\$ 100 soft-loan (no interest) to pay for the grid connection. This loan should be paid back over a two-year period with the monthly electricity bill. Households that are not connected one year after the construction of the grid, or households headed by females, are considered for this loan.

REF has started a pilot project in Kampong Speu with the first US\$ 10,000 repaid from the 12,000 SHS rent-to-own programme. The target of this pilot project is 1,000 households. REEs are identifying the families and managing the loans with the customers. Under this initiative, an ice husk gasification power system has replaced a diesel generator and is in operation since December 2008. The system consists of a rice husk gasifier, a 50 kW 100%-gas engine generator, a 150 kW dual gas/diesel engine generator (modified) and an existing mini-grid to supply electricity to 1,300 households in the village. With the new technology the electricity generated is sold at US\$ 0.58/kWh (36% lower than electricity price from diesel generators). The electricity production cost was estimated at US\$ 0.29/kWh. REE reported that the biomass gasification project would make a profit of up to US \$64,000/year and investment costs can be paid back within less than 1.5 years.

2.2. Rural Electrification Program in Lao PDR

Lao People's Democratic Republic (Lao PDR) is the only land-locked country in ASEAN. It has a border with five countries namely China in the North, Vietnam in the East, Cambodia in the South, Thailand and Myanmar in the West. Lao PDR has a total area of 236,800 km² and about 70% of that is covered by mountains. National Statistics recorded that in 2014, the GDP per capita reached USD 1,720 as the consequence of 7.65% growth of GDP in the same year. Lao PDR is considered one of the fastest growing economies in the East Asia and Pacific region.

The Rural Electrification Master Plan (REMP) in Lao PDR sets a National Electrification Target of 94.7% on household basis by 2020. This will be achieved through on grid systems, i.e. grid extension (90.9%) and by off-grid systems using mini/micro hydropower and Solar Home System (SHS) (3.8%). The electrification ratio in Lao PDR in 2014 was around 88%.

The rent-to-own Solar Home System (SHS) project is implemented in 16 provinces in three phases: phase 1 (1999-2004), phase 2 (2004-2009) and phase 3 (2009-2014). By the end of phase 2, a total of 15,000 SHSs had been installed. Each rent-to-own SHS consists of solar kit (i.e. solar panels, outdoor wiring, mounting pole and charge controller) and house kit (i.e. indoor wiring, saving lamps, car battery and battery box). The project costs are financed by grants (20%), soft loans (50%) and down (upfront) payment (30%) by the households. The project is managed by the Village Off-grid Promotion and Support (VOPS) office established by the Ministry of Industry and Handicraft (MIH) (now Ministry of Energy and Mines). The installation, operation and maintenance of SHSs are performed by trained Village Electric Managers (VEM). Newly-formed or existing Local Electricity Service Companies (ESCO) are responsible to support the VEMs during installation and O&M. A Village Electricity Advisory Committee (VEAC) is formed in each target village and plays an advisory role for the village electrification strategy and implementation. VOPS owns the SHS during the renting period of 5 or 10 years, and the household will own the SHS at the end of renting term. The households pay monthly rental fees, ranging from USD 2.0-5.0 for 5-year, or USD 1.0-2.5 for 10-year repayment period, depending on the size of the SHS (20 to 50 Wp). The household is also responsible for the cost of replacing house kit's components, which is estimated at USD 6.0-14.0 per year depending on whether the system is used carefully or not. The collected monthly rental fee is used by VOPS for paying the costs of services provided by VEM, VEAC and ESCO and for repaying the soft loan.

3. Learned Experiences

The success of off-grid rural electrification approaches with RET in ASEAN can be attributed to a broad range of influencing factors: geography, availability of natural resources, and reliability of technical solutions, financial feasibility, as well as human capacity and dedication of individuals. These factors vary greatly between countries and framework conditions are comparable only to a limited extent. However, from previous experiences, we have identified key factors contributing to successful rural electrification approaches; namely (i) a stable and predictable policy framework; (ii) reliable support policies and a feasible financing mechanism; (iii) a sustainable project setup and business models; (iv) the application of appropriate technology; (v) the due consideration of socio-economic aspects and community involvement; and (vi) continuous training and capacity building.

However, the ASEAN region is still facing many challenges regarding rural electrification. Increasing exchanges of experience and innovative approaches between the AMS and beyond is essential and high on the agenda of the ASEAN community.

- The ASEAN Centre for Energy (ACE) conducted a study to assess the experiences and lessons learnt from past and ongoing off-grid rural electrification projects in various AMS. Based on its finding under the publication "[ASEAN Guideline on Off-grid Rural Electrification Approaches](#)" in 2013, there are a number of key experiences that could be considered in the planning and implementation of off-grid rural electrification using renewable energy technologies. This includes: A clear legal framework for private investment in off-grid rural electrification needs to be established in order to mobilize the private sector to become actively involved in this market.
- A central institution/agency shall be created to coordinate the planning and implementation of all off-grid rural electrification activities in a country.

- The public sector should use its resources to finance off-grid projects in poor rural areas where business models can hardly be established and projects are less or not profitable. Wherever possible and economically viable, priority should be given to the private sector to get engaged for investment and project development.
- The business model selected for an off-grid rural electrification project shall have some degree of flexibility and fit the specific conditions of the community implementing the project. The business model may have to be modified along the way in order to cater to the actual developments and changes in the project structure during project implementation.
- Whatever is the selected business model, care should be taken to ensure that end-users have access to quality electricity services at affordable prices.
- The project design must not be technology driven. Technology choices are to be based on practical considerations. A cost-benefit analysis of different technology options (including grid extension) should be carried out to determine the least-cost solution.
- Productive and institutional applications of electricity not only help to improve standards of living (e.g. job creation, better health care) but also increase the economic attractiveness of the off-grid power project. The project developers therefore must consider initiating or enhancing productive activities as they significantly increase the sustainability of the project.
- Maximizing the awareness and involvement of the benefitting community in the early stages of the project cycle, especially during the project assessment phase, is vital to the success of off-grid project implementation. Key activities include public awareness campaign, regular meetings with community leaders and focus-group meetings.
- Capacity building and training to develop local capacities in design, implementation, management and O&M is essential for the success of off-grid rural electrification projects. Therefore, adequate resources should be devoted to developing local capacities.

Global Alliance for Clean Cookstoves

China Case Study:

1. Background introduction
 - a. Location, demographic information, and natural settings (e.g. local weather and indigenous resources): Heiqihe Village, Xiping Town, Xixia County in Henan Province, located in a remote and mountainous area – 3 kilometers to nearest town; 2,567 people or 678 households; humid and warm in summer but has long cold period in winter (3-4 months), which requires the use of heating stoves.
 - b. Socio-economic conditions: average annual income per capita of 9,100 Yuan; major local economy (income source) is mushroom, tea and kiwi plantation.
 - c. Challenges: many families in this village are scattered in mountainous area and 80% have the need for cleaner and more efficient stoves and fuels. Living with rich biomass and forest resources, most of households are using wood and low efficiency built-in stoves which causes health, environment and deforestation problems. In a study conducted before the launch of the project, surveys showed over 400 households of the total 678 households had the willingness to obtain and use cleaner cooking and heating technologies. The economy of this village is primarily dependent on farming, which produce tremendous waste of biomass each year and can be utilized as fuel for cooking and

heating. Specifically in this village, one million packs of mushrooms are produced annually with about 1.1 million pounds of wood log waste produced during the processes. Villagers burn these wood logs at home, leave them on the street, or dump them in the rivers, causing environmental problems. MOA has partnered with GACC to launch a few interventions addressing their cooking and heating needs as well as utilization of biomass waste and the associated environmental and health issues, in the following components:

- 1) GACC supports the local mushroom growing businesses by providing biomass pellets to power the drying and sterilization processes during mushroom production.
- 2) GACC supports to the building of a local pellets facility by providing upfront funding to purchase equipment, while the local government provides in-kind support for this facility on land and factory warehouse and offices.
- 3) MOA provides match funding to distribute biogas stoves, LPG stoves and induction stoves in this village.
- 4) GACC supports the extension and strengthening of the clean stove and fuel distribution network.
- 5) The local government mobilizes additional resources from other programs to install solar water heaters and water purifiers in this village.

2. Project description

- a. Technological features: (e.g. grid extension, off-grid or micro grid? Resources? Type of cook stoves?) Efficient pellets, cooking and heating stoves, LPG stoves, biogas stoves and induction stoves.
- b. Stakeholders involved in the project: MOA, national, provincial, county and village offices, GACC, Henan Hengxun Agricultural Technology Co, Ltd, Heiqihe Village leaders.
- c. Investment scale and financial mechanism: 1.05 million RMB in total, among which 300,000 RMB from GACC, 400,000 from MOA and 350,000 from consumer. The GACC grants enabled the MOA and local government to provide match funding to address the inefficient cooking and heating issue from energy, health, and environmental perspectives. This support also helped to leverage financing from the consumer and reduced use of government subsidies, in order to transition towards a sustainable market.
- d. Plan for operation, maintenance, and possible future upgrade? A biomass pellets production facility has been built and local staff will be hired to run to facility. GACC's grant supports the initial investment on equipment and human costs, the company will be self-sustained in the future by selling pellets to this village and the larger area. The distribution and use of pellets will drive adoption of cleaner stoves and fuels as well in this area. The longer term goal, once the pilots are completed, is to scale up this model in the entire county and even other counties that have similar local conditions in Henan province. At present, it is expected that the scale-up of this program would address energy access, economic, environmental, and health challenges.
- e. Impact of the project: tariffs, benefits for local community, improvement of livelihood, productive use of energy, combination with other development targets. This project is scheduled to complete by June 2016. As of April, the project had supported the building of a pellets facility; distributed 2159 clean and efficient stoves including pellet stoves, biogas stoves, LPG stoves and induction stoves covering 450 households; set up 36 stove retailers in Xixia County and hired 80 staff. The local government was able to utilize other resources to address multiple issues in this village and has provided 786 solar water heaters and 532 water purifiers.

Adopting clean and efficient stoves and fuels brings average saving of wood 1.5 kilogram per household per day; Switching to pellets during mushroom drying and sterilization processes will save 20,000 kilograms of coal in this village.

This project was conducted on a household and community level, but will have impacts at various levels, including positive gains that contribute to the achievement of the Sustainable Development Goals and combatting climate change.

3. Experiences learned:

There are a few unique features of this project that are applicable in other areas/countries with similar local context or natural settings:

1) For a low income community located in remote and mountainous/biomass-rich area, biomass pellets or briquettes are viable options for addressing poor access to energy and associated challenges, while also driving the adoption of more efficient cookstoves. This is a particularly advantageous solution when the infrastructure for electricity or LPG is not available or these types of fuels are not affordable to the consumers.

2) Policy interventions and technology solutions must adapt to local context, resource availability and must support the development of the local economy. In this project, the key technology solution was using the waste from mushroom production to fuel the mushroom production itself plus supplying household energy in this community.

3) Resources can be combined to solve multiple issues simultaneously. In this project, the GACC grant enabled MOA to provide match funding. The local government also provided funding from other programs to address various household issues in this village. We have seen in this intervention that resources can be used to bring about gains that assist the achievement of health, environmental, economic, and energy goals through household energy interventions that address cooking and heating needs.

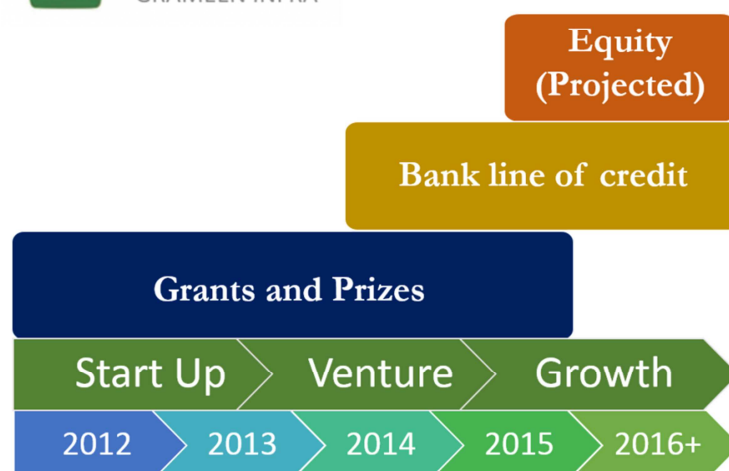
India Case Study:

1. Background introduction

- Location, demographic information, and natural settings (e.g. local weather and indigenous resources): Greenway Appliances works across India to develop and distribute products for base of the pyramid consumers. The enterprise specifically focuses on climate conscious product design and products that provide benefits to consumers, particular related to their management of household energy in rural settings. The company also works in Mexico and Kenya.
- Socio-economic conditions: The consumers that Greenway Appliances is looking to benefit are very poor and live in rural areas. They currently rely on burning biomass for cooking and are likely to continue to do so, but could utilize better technology to save the household money and time, and benefit the environment by using less natural resources and producing less smoke.
- Challenges:
 - Market demand in India is under developed and Greenway has had to spend a significant amount of funds on creating awareness and demand.
 - Scaling business operations with the right talent in marketing, finance and HR at the right price point has been difficult.
 - Competitors have started to copy Greenway's popular Smart Stove and brand.

2. Project description

- Technological features: (e.g. grid extension, off-grid or micro grid? Resources? Type of cook stoves?): Greenway Appliances produces the Greenway Smart Stove (details of the stove can be found on the Global Alliance for Clean Cookstoves Clean Cooking Catalog: <http://catalog.cleancookstoves.org/stoves/220>). Greenway Appliances has also launched the Greenway Jumbo Stove more recently, which is not yet on the catalog. In both Greenway cookstove models, wood fuel is fed into the side of an insulated, L-shaped combustion chamber. This design improves combustion and directs hot gases to the cooking vessel. These stoves are over 1.5 times as efficient and produce less than 50% of the emissions of an open fire.
- Stakeholders involved in the project: Greenway Appliances is an enterprise and the Global Alliance for Clean Cookstoves (Alliance) has supported their strengthening as a company that can scale and deliver to customers. This support has enabled the SME to gain greater access to other sources of funding and support and expand their efforts.
- Investment scale and financial mechanism and operations: Greenway Appliances, formerly Greenway Grameen Infra, has sought out capital from multiple sources as their company has matured and their capital needs changed. When entrepreneurs Neha Juneja and Ankit Mathur first became Alliance partners of the in 2012, they were leading a company that was still very much in start-up mode. They used their own funds and sought out prizes and grants to get the company going. Once they had developed a quality product and early partnerships with distributors, having achieved sales of 18,000 units, Greenway applied for the Alliance's Pilot Innovation Fund grant in 2013. After implementing a series of above the line marketing experiments and conducting a brand awareness analysis using the Pilot Innovation Fund, Greenway integrated the lessons they learned from the brand awareness analysis and applied for a Spark Fund grant in the fall of 2013 to scale up their operations. By then they had sold 60,000 units, activated 41 retail outlet partners, and were ready to diversify their product offering. Greenway submitted their business plan and following a due diligence process, the Alliance awarded them a Spark grant to implement their revised marketing strategy, diversify their product portfolio, build out a modern manufacturing facility, and strengthen their management team by adding marketing, management information systems (MIS), and human resources managers. The Spark Fund has allowed Greenway to grow their customer base and launch new products, however, their increase in sales resulted in a working capital need best filled by debt financing rather than grants. In 2014, they sought outside consulting to improve their accounting processes and conduct audits, and they hired a CFO. Soon after, they secured a line of credit of about 250,000 USD from their local bank and an international backer to help them purchase raw materials to produce enough product to keep up with demand. Greenway sought an initial round of equity investment in 2015 based on growth trajectory and were able to close a deal with Acumen and a consortium of impact minded investors.



- Impact of the project: tariffs, benefits for local community, improvement of livelihood, productive use of energy, combination with other development targets
 - o \$2,570,000 in investment, which will enable future sustainability
 - o Establishment of fully owned manufacturing unit with capacity to manufacture 800,000 stoves annually.
 - o Setting up of retail distribution network and hiring on new general manager to head partnership sales channel.
 - o Launched new product; The Greenway Jumbo Stove.
 - o The adoption of these products will improve energy access for thousands of consumers, reduce fuel use and emissions, save families time and money (reduced time and money spent on obtaining fuel), and benefit the quality of life of households.
 - o The Greenway stoves are over 1.5 times as efficient and produce less than 50% of the emissions of an open fire.
 - o The growth of Greenway Appliances has contributed to numerous local economies, particularly due to growth in good employment opportunities
 - o Greenway Appliances has also undergone gender capacity building and works to ensure that products cater to the needs of female customers and that women are fully integrated into the supply chain.

3. Experiences learned:

- Key elements that contribute to the success of the project: what could be learned by other areas/countries? What are unique features of this project?

There are a few unique features of this project that are applicable in other areas/countries with similar local context or natural settings:

- 1) Expanding energy access to bottom of the pyramid consumers takes significant resources, time, and most importantly, the right ecosystem.
- 2) A blended mixture of financing options are needed to support social impact enterprises from start up to market viability. This is particularly important to ensure the enterprises are receiving appropriate capacity building and are supported in innovation efforts, both in terms of their product and distribution models.

- 3) The financing mechanisms must be flexible and accessible, both the financing going to the intermediary (the Alliance in this case) and the enterprise.
- 4) Enterprises benefit from understanding the local context and from interacting and learning from global stakeholders.
- 5) It is critical to invest in effective business models and continue to assess the model being utilized, in addition to assess human capacity needs.
- 6) Additional enabling policies, such as reduced taxes and tariffs for products and companies with environmental, health, and social impacts, could be further utilized to support the scaling of enterprises that have the ability to serve hard-to-reach communities and export their technologies.

Additional note: India is also undertaking significant efforts to extend access to LPG. In 2015, the government launched the Give It Up campaign to encourage higher income consumers to give up their LPG subsidies in order to contribute to greater energy access for lower income Indians. This year, the government is launching an effort to connect 50 million Indian families to cooking gas over the next three years. A clean cooking program of this scale is unprecedented and could fundamentally change people's lives while simultaneously delivering a significant boost to India's ongoing battle against air pollution. The program could be particularly impactful for women, who do the large majority of cooking in India.

Pacific Community

The Pacific Community <http://www.spc.int/> is presently working on two energy access partnerships launched at the Third SIDS Conference in Samoa in 2014.

The Melanesia Million Miracle Programme aims to bring the miracle of electricity to 1 million people in Melanesia by 2020.

The Cooking for Life Programme is aimed at providing a healthier cooking environment for women and children and to save the remaining vegetation in coral atoll countries of the Pacific.

See <http://sustainabledevelopment.un.org>

Innovative business models:

In the above two partnerships, the Pacific Community works together with government energy offices, NGOs and women groups

Key challenges facing the Asia-Pacific region in the promotion of access to energy:

- ☐ Affordability
- ☐ Technology – For instance, so much has been said about solar PV being proven, commercialised etc yet we still find solar lanterns, solar panels, batteries etc not working in remote areas. We have quality products but we can't control the influx of inferior and quick-buck technologies.

Case studies:

Progress report on Melanesia Million Miracle Programme (M3P)

PNG

1) Rural Electrification of Gorari and Kou kou villages (along the Kokoda Track), Oro Province

Partnership with Kokoda Track Foundation (KTF), Kou Kou & Gorari women's groups, Clean Energy Solutions, PNG and Department of Petroleum and Energy.

Gorari village

- Out of the 100 solar pico lanterns, 66 households in Gorari village, 4 households are the school teachers at Gorari Primary School compound received the solar pico lanterns. A total of 1,200 people have access to solar electricity in Gorari.
- Both charging stations are full operative and able to charge 32 solar pico lanterns. 87% households charge their solar pico lanterns once a week and 13% charge twice a week.
- Maintenance check of the charging station and solar pico lanterns are normally conducted by the technicians who were trained on managing the solar systems. The village technician managed to change fuse of 1 of charge controller and is operative again. Two solar pico lanterns were not working and this is replaced by the Supplier in November, 2015.
- The solar shop is operating smoothly and the Gorari women's collected a total amount of PGK 3,516 from the period April – February 2016.
- A bank account for the solar shop is now open with all the cash received from the payment of the solar pico lanterns and charging fees deposited to the account. These funds are kept for spare parts, fuses for the charging stations and solar pico lanterns.

Kou kou village

- Out of the 100 solar pico lanterns, 81 households in Kou kou village and 19 households in Waju village. A total of 1,200 people have access to solar electricity in Kou kou and Waju.
- Both charging stations are full operative and charging 16 lanterns. 89% households charge their solar pico lanterns once a week and 11% charge twice a week.
- 1 of the charging controller was not working last year November, this problem has been fixed by the village technicians. Two solar lanterns were not working and this has been replaced by the Sunlabob (supplier).
- The solar shop is operating smoothly and the Kou kou women's collected a total amount of PGK 4,061 from the period April – February 2016.
- A bank account for the solar shop is now open with all the cash received from the payment of the solar pico lanterns and charging fees deposited to the account. These funds are kept for spare parts, fuses for the charging stations and solar pico lanterns.

2) Faseu Micro Hydro Scheme Rehabilitation Project

Partnership with Friends of Faseu (Faseu Trust in NZ), Appropriate Technology & Community Development Institute of the University of Technology (UniTech) and Faseu community.

Total project cost: FJD 47,859.13

SPC funding – FJD 22,340.03

Friends of Faseu (Faseu Trust) funding – FJD 25,519.10

- Light was finally switched on at Faseu Micro hydro project on Wednesday 23rd March.
- ATCDI team work on connecting couple of 125mm poly couplings to the pipeline and some minor rehab on the intake.
- A re-magnetising test was done using a DC 12 V battery and power was restored in the generator. Second test run of the turbine with water running at full opening was conducted and finally light was switched on which brought much delight to the many who witnessed the event.

- The Faseu hydro will restore access to electricity for the school and 215 people in the Faseu community
- SPC is now in the process for the 2nd tranche payment.
- Work at Faseu should be completed by May and anticipate to commission the hydro in early June.

Solomon Islands

Partnership with Choiseul Provincial Council of Women, Taba, Tavula, Tepazaka & Vuruvachu wards Women Association and Department of Energy, SI.

3) Rural Electrification of Taba, Tavula, Tepazaka and Vuruvachu wards

- The six (6) charging stations in Taba ward (Chivoko village), Tavula ward (Sirovanga & Vurago villages), Tepazaka ward (Voza village) and Vuruvachu ward (Nukiki & Moli villages) are in operation. A total of 5 solar pico lanterns were replaced by the supplier (Sunlabob).
- Maintenance check on charging stations and lanterns are normally carried out by the village technicians in the four (4) wards.
- 1,200 people now have access to solar electricity in the four wards. 85% of the total households normally charge their solar pico lanterns once a week and only 15% charge twice a week.
- The solar shop is operating smoothly and the 6 charging station has collected a total amount of SBD 18,142 from the period May – November 2015.

4) Hulavu Conference Centre Energy Project

Partnership with Honiara Based West Guadalcanal Constituency Association Trust (HBWGCA), Hulavu Community, SuperFly and Department of Energy, SI.

Total project cost: FJD 31,000 (equivalent to SBD 115,605)

SPC funding – FJD 16,000 (equivalent to SBD 59,667)

HBWGCA funding – FJD 15,000 (equivalent to SBD 55,938)

- The centre is now equipped with 650 watts solar panels that was successfully installed by SuperFly. The centre is powered by solar electricity for lights and refrigeration for storage of food.
- The centre also provides accommodation (bungalows) for its guests using the centre.
- The centre recently hosted 80 Pathfinders and youths from a Seven day Adventist in Honiara from 25th – 27th of March, 2016.
- The centre with the solar system is able to store main frozen food available in the supermarket in Honiara. The youths and the pathfinder group who are mainly kids brought up in the urban settings are amazed at how easily electricity can transform the place into a new environment.
- The centre has generated an income of about SBD 5,000 Solomon dollars in a matter of three days and this clearly indicates that the project can sustain itself.

5) Taroniara Clinic Solar Energy Project

Partnership Anglican Church of Melanesia Solomon Islands (ACOM), Taroniara mission station, Department of Energy, SI.

Total project cost: FJD 30,000 (equivalent to SBD 111,876)

SPC funding – FJD 25,000 (equivalent to SBD 93,230)

ACOM funding – FJD 5,000 (equivalent to SBD 18,646)

- Received the three quotations for the solar system. In the process analysing the quotations and recommending the supplier for the system.

- Procurement of the hardware to be completed this month.
- Installation of the system is scheduled for early next month (May).

World Bank

Case studies:

Country: Solomon Islands

Proposed Project: P151618: Solomon Islands Electricity Access Expansion Project

1. Background introduction

- a) Location, demographic information, and natural settings (e.g. local weather and indigenous resources)

Solomon Islands is an archipelago of about nine hundred islands scattered over an ocean area of 29,000 km² in the South Pacific. The country is endowed with rich forest resources and minerals, as well as tourism resources such as the rich oceanic biodiversity.

- b) Socio-economic conditions

It has a population of 572,000 people dispersed over nearly a 100 islands. About 95% of Solomon Islanders are Melanesian with smaller Polynesian, Micronesian, Chinese and European communities. The capital city of Honiara on the Guadalcanal Island has a population of about 65,000 people.

- c) Challenges

This geographical characteristics as well as the low population density of 19 persons/km² makes delivering public services a challenge. Electrification rate is 9% nationally, excluding those only with small PV panels (e.g. 20 Wp). The rate is about 50% in the urban areas but only 5% in rural areas and outer islands where 80% of the people reside.

The power system is operated nearly 100% based on diesel generation, and given the high cost to import diesel fuel and to further distribute to the outer islands, the nationally-uniform average retail tariff is US cent 85/kWh. The World Bank is financing studies to assess the cost of services and is also facilitating the development of indigenous renewable energy resources to lower the retail tariff.

The national power utility, Solomon Islands Electricity Authority (SIEA), is expanding its grid system (in Honiara and developing new mini-grids in the outer islands) towards meeting an ambitious target to double the number of customers from 15,500 to 30,000 by 2021. However, the high initial connection cost, including the in-hose wiring cost, which must be shouldered by new customers is a major obstacle to promoting energy access. Such costs can exceed US\$1,000 per connection due to expensive materials that are all imported and due to the market distortion caused by the limited number of suppliers and electricians who enjoy an oligopoly.

2. Project description

- a) Technological features: (e.g. grid extension, off-grid or micro grid? Resources? Type of cook stoves?)

The proposed project (expected for Bank management approval in June 2016) seeks to provide targeted subsidies to low-income households to subsidize a portion of the initial connection fee. The subsidies are to be delivered through the output-based aid (OBA) modality, whereas the project cost of US\$2.5 million is expected to be fully-funded by a grant from the Global Partnership on Output Based Aid (GPOBA).

The subsidies will target low-income households both in Honiara where the grid is being extended, and also the households in the outer islands where SIEA is currently developing hybrid solar-diesel mini-grids.

b) Stakeholders involved in the project

The main stakeholder is SIEA, the state-owned vertically-integrated power utility, and is supervised by the Ministry of Mines, Energy and Rural Electrification (MMERE). The low-income households (identified through “geographical selection” and “self-selection”) are the beneficiaries of the project.

c) Investment scale and financial mechanism

The project is requesting a GPOBA grant of US\$2.5 million of which \$2.225 million will be used directly as targeted subsidies to help finance the initial connection fee.

d) Plan for operation, maintenance, and possible future upgrade?

The project has been designed at a relatively small scale, expecting to benefit about 2,500 low-income households, but can be scaled-up once the OBA approach is proved to be effective.

e) Impact of the project: tariffs, benefits for local community, improvement of livelihood, productive use of energy, combination with other development targets

Provision of stable supply of grid electricity is expected to improve livelihood activities such as through refrigeration of fish catch to be sold in the market, processing of farm products, etc. While the retail tariff is high at the moment, the pre-paid meters allow customers to control their usage and expenditure on electricity. Since the unelectrified population currently spend a significant amount of their disposable income to purchase kerosene, candles and dry cell batteries for lighting, it is expected that grid electricity will lower their expenditure on lighting.

3. Experiences learned: Key elements that contribute to the success of the project:

a) what could be learned by other areas/countries?

The OBA approach needs to be tested for the first time in the Solomon Islands through this project. If proved to be successful, similar approaches can be considered in other island nations with similar constraints.

b) What are unique features of this project?

The uniqueness of the project is the deployment of the OBA mechanism for the first time in the Solomon Islands. In order to benefit as many low-income households as possible under the funding constraints, SIEA has stepped-up its function in an effort to lower the cost of the in-house wiring. While the traditional practice is for the new customers (households) to individually seek the service of a licensed electrician to supply and install the in-house wiring, SIEA has agreed to procure/import the in-house wiring materials in bulk by itself to lower the costs, and to procure the electricians for a large package of installations under a single contract (e.g. 200 connections) to promote competition among the licensed electricians and lower the unit costs.

Country: Vanuatu

Project: P133701: Vanuatu Improved Electricity Access Project

1. Background introduction

- a) Location, demographic information, and natural settings (e.g. local weather and indigenous resources)

The Republic of Vanuatu is an archipelago of 82 islands covering a total area of about 12,200 square kilometers in the South Pacific. While the country has no proven fossil fuel reserves and relies heavily on diesel generation, Vanuatu has considerable renewable energy potential, as well as tourism resources such as the rich land and oceanic biodiversity.

- b) Socio-economic conditions

Vanuatu has a population of approximately 294,000, almost evenly distributed among the six administrative provinces. The national household count stands at an estimated 50,740 households, of which about 25 percent are located in urban areas and 75 percent are dispersed in rural areas. The capital city of Port Vila on Efate Island has a population of about 44,000 people.

- c) Challenges

An estimated 27 percent of the Vanuatu population has access to electricity. Access rates in the main urban centers - Port Vila, Efate Island and Luganville, Espiritu Santo Island - are about 75 percent, dropping off considerably in rural areas with much smaller loads per customer and a far lower population density. Peri-urban and rural connections are less common due to the lower population density and large distances between customers, lower electricity loads and high connection costs.

The private sector is responsible for generating and supplying electricity under concession agreements with the Government of Vanuatu. Union Electrique du Vanuatu Ltd. (UNELCO), a subsidiary of GDF Suez, has been operating in Vanuatu since 1939 and supplies the Port Vila, Malekula Island and Tanna Island concession areas. Vanuatu Utilities and Infrastructure Ltd (VUI), a subsidiary of Pernix Group, supplies the Luganville electricity concession. The utilities are required to connect any customer who requests a connection, provided they pay the costs associated with the connection. The average cost of connection is around VUV 65,800 (US\$ 700), excluding household wiring. The high connection costs are a significant barrier for low income consumers to connect to the electricity grid, thus denying them the potential social and economic benefits of electricity. Access to finance is difficult for low income households who do not have regular income, may not own land, and cannot demonstrate a credit history.

2. Project description

- a) Technological features: (e.g. grid extension, off-grid or micro grid? Resources? Type of cook stoves?)

The project, which became effective in September 2014, provides targeted subsidies to low-income households to subsidize a portion of the cost for electricity connections and household wiring. The subsidies are delivered through the Output-based aid (OBA) modality and is fully-funded by a grant from the Global Partnership on Output Based Aid.

The subsidies target low-income households in the four concession areas who currently have no formal connection or individual connection to the grid. The consumers will be connected with prepaid (where available) or postpaid meter connections as 'small domestic consumers'. A subsidy is also provided to meet the cost up to a predefined limit of household wiring, where household wiring is not to standard or not in place, for households accessing electricity services through the project. Households are wired according to a standard designs for the project in accordance with Australian and New Zealand (AS/NZS3000) and French standards (NF C 15-100).

- b) Stakeholders involved in the project

The main stakeholder and the project implementing agency is the Department of Energy. The existing utilities, UNELCO and VUI, undertake the service connections and household wiring. The utilities are subject to verification by the Department of Energy through an Independent Verification Agent. The low-income households (identified through “geographical selection” and “self-selection”) are the beneficiaries of the project.

c) Investment scale and financial mechanism

The project is funded by a GPOBA grant of US\$4.85 million of which US\$4.3 million will be used directly as targeted subsidies to help finance the electricity connections and household wiring.

d) Plan for operation, maintenance, and possible future upgrade?

The project will provide electricity connections to approximately 4,375 households, which represents approximately 21,440 people provided with access to electricity.

e) Impact of the project: tariffs, benefits for local community, improvement of livelihood, productive use of energy, combination with other development targets

The Vanuatu National Energy Roadmap (NERM), which was developed with support from the World Bank, lays the foundation for the future energy sector policy and investment in Vanuatu. It seeks to address key constraints that have prevented the energy sector from delivering affordable modern energy access in an efficient and sustainable manner. The NERM focuses on five energy sector priorities: (i) Access – access to secure, reliable and affordable electricity for all citizens by 2030; (ii) Petroleum Supply – reliable, secure and affordable petroleum supply throughout Vanuatu; (iii) Affordability – lower cost energy services in Vanuatu; (iv) Energy Security – an energy secure Vanuatu at all times, and (v) Climate Change – mitigating climate change through renewable energy and energy efficiency. The project will contribute to increased access and affordability of electricity in Vanuatu.

Provision of stable supply of grid electricity is expected to improve livelihood activities such as through access to lighting, refrigeration, water pumps, and access to communications and potential for income generating activities. The use of prepayment meters, where available, better suit the needs of the potential new consumers who have irregular income. It also gives the consumers control over the usage and budgeting for electricity, while addressing the utilities revenue collection and loss reduction.

3. Experiences learned: Key elements that contribute to the success of the project:

a) What could be learned by other areas/countries?

Initial success in project implementation can be attributed:

- the willingness and commitment from the utilities to implement the project, particularly in the Luganville concession area;
- the Department of Energy’s commitment to general community awareness raising through advertisements broadcast on the national radio station on a monthly basis within the first 12 months of project implementation; and
- strong oversight provided by the independent verification agent to ensure project outputs are completed in accordance the project operation manual and to project design.

b) What are unique features of this project?

The uniqueness of the project is the deployment of the output-based financing mechanism for the first time in the Vanuatu.

Country: Vanuatu

Project: P150908: Vanuatu Rural Electrification Project

1. Background introduction

a) Location, demographic information, and natural settings (e.g. local weather and indigenous resources)

The Republic of Vanuatu is an archipelago of 82 islands covering a total area of about 12,200 square kilometers in the South Pacific. While the country has no proven fossil fuel reserves and relies heavily on diesel generation, Vanuatu has considerable renewable energy potential, as well as tourism resources such as the rich land and oceanic biodiversity.

b) Socio-economic conditions

Vanuatu has a population of approximately 294,000, almost evenly distributed among the six administrative provinces. The national household count stands at an estimated 50,740 households, of which about 25 percent are located in urban areas and 75 percent are dispersed in rural areas. The capital city of Port Vila on Efate Island has a population of about 44,000 people.

c) Challenges

An estimated 27 percent of the Vanuatu households and public institutions have access to electricity via connections to a grid network. Even on the largest four islands, the share of those without access to electricity remains high: Efate Island (24 percent), Espiritu Santo Island (65 percent), Tanna Island (86 percent), and Malekula Island (84 percent). There is a severe imbalance in access between urban and rural areas; the population without access in rural areas ranges from 83-85 percent in Tafea and Shefa, 89 percent in Sanma, 92 percent in Malampa and 97 percent in Torba. The lower population density in rural areas, large distances between customers, lower electricity loads and high connection costs have meant that the extension or building of new electricity grids for supply to peri-urban and rural consumers remain uneconomic.

2. Project description

a) Technological features: (e.g. grid extension, off-grid or micro grid? Resources? Type of cook stoves?)

The project, which became effective in September 2015, subsidizes the retail cost of solar photovoltaic (PV) systems for rural households, aid posts and community halls in dispersed off-grid areas. The project focuses on solar PV system between 5 to 30 Watts peak capacity that are of 'plug-and-play' type, installed easily by the consumer and require little to no maintenance other than replacing batteries. The project does not fund smaller systems such as solar lanterns.

b) Stakeholders involved in the project

The main stakeholder is the Department of Energy, as project implementing agency. The project financed the establishment of the vendor registration and development of product registration arrangements. The Department of Energy published a request for expression of interest from local energy retailers to partake in the project as vendors. The Department received 6 applications and, following a review process, approved 2 energy retailers to become vendors. In parallel the energy retailers submitted to the Department products, which have been approved under the Lighting Global Program, to be approved products under the project. An initial six products were approved.

c) Investment scale and financial mechanism

The project is funded by New Zealand through the Pacific Regional Infrastructure Fund (PRIF). The funding total US\$4.7 million of which US\$3.1 million will be used directly for targeted subsidies.

d) Plan for operation, maintenance, and possible future upgrade?

The project targets approximately 17,500 household, 230 aid posts and 2,000 not-for-profit community halls. Vendors will submit a claim for payment of subsidies once a quarter or when the subsidy value reached Vatu1 million. All claims for payment of subsidies be verified by a verification agent following the verification process established in the subsidy implementation manual.

e) Impact of the project: tariffs, benefits for local community, improvement of livelihood, productive use of energy, combination with other development targets

The project brings to the rural users access to more than just lighting since the smallest of systems eligible for subsidies also have mobile phone charging capabilities. The project is supporting the creation of supply chains and access to new markets for solar products for local energy retailers. To encourage a self-sustaining market, the subsidies will be gradually wound back at the conclusion of each year of implementation. The project is being implemented in accordance with an Environmental Code of Practice (ECOP), which promotes the recycling and safe disposal of redundant solar systems and associated batteries. Vendors are also required to comply with the ECOP.

3. Experiences learned: Key elements that contribute to the success of the project:

a) What could be learned by other areas/countries?

The success of the project is dependent on community awareness of the project and the vendors' supply chains reaching communities in the dispersed rural areas of Vanuatu. The Department of Energy is on an ambitious awareness raising program. The Department is running a radio advertisement on national radio on a regular basis, following the initial success of the radio advert run for the Improved Electricity Access Project (P133701). The Department has also undertaken advertising in the newspaper, taking out two initial advertisements: one to provide an overview of the project details and the second time was to take out a full page advertisement for the product catalogue. However, the Department assessed traditional print media is not as effective on a cost basis. The Department has developed a VREP group on Facebook and is developing a short animated film to upload on YouTube and via Facebook. In addition to these efforts, the program manager has conducted awareness raising with members of parliament. Finally, the Department is holding briefing sessions with export groups, such as coffee and cocoa exports, church groups, the police network, and Vanwoods – a women's microfinance network across Vanuatu. The Department is providing details of key contacts in these export networks to the vendors so that the vendors can explore potential retailer opportunities to strengthening their existing supply chains.

b) What are unique features of this project?

The leveraging of the Lighting Global program by requiring vendors to only use approved Lighting Global products to ensure reliable and appropriate solar lanterns are supplied to rural communities. The project encourages private sector involvement through adopting a vendor model suited for the country context, microfinance opportunity for small business, and promoting ownership of the systems by the end user through a contribution (the retail cost of products not covered by the subsidy).