



# SMART VILLAGES

New thinking for off-grid communities worldwide

## High-level workshop on off-grid village energy in East Africa



**Workshop Report 9**

KIGALI, RWANDA

September 2015

Key words:  
Energy Access, Rural Energy,  
Biomass, Pico-lighting Systems,  
Entrepreneurship

## Smart Villages

We aim to provide policymakers, donors, and development agencies concerned with rural energy access with new insights on the real barriers to energy access in villages in developing countries— technological, financial and political—and how they can be overcome. We have chosen to focus on remote off-grid villages, where local solutions (home- or institution-based systems and mini-grids) are both more realistic and cheaper than national grid extension. Our concern is to ensure that energy access results in development and the creation of ‘smart villages’ in which many of the benefits of life in modern societies are available to rural communities.

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## SUMMARY

This report summarises the findings of the Smart Villages Initiative's high-level workshop on off-grid village energy in East Africa. Co-hosted by the Ministry of Infrastructure, Rwanda, the workshop brought together 47 key stakeholders from East Africa and the United Kingdom to share the findings of the Smart Villages Initiative's East Africa engagement, to review the current state of off-grid village energy in the region and in individual countries, and to discuss the way forward. The workshop served as a final input into the Smart Village's East Africa Policy Brief, which communicated the experiences, views, and recommendations of front-line individuals and organisations to policymakers in preparation for the United Nations Summit to ratify the Sustainable Development Goals in September 2015 and their subsequent implementation in East Africa.

Representatives from Burundi, Kenya, Malawi, Rwanda, Tanzania, and Uganda shared encouraging progress on providing access to modern energy to off-grid villages, tempered by the sheer scale of the task and the need to overcome a host of barriers. Country representatives, however, were adamant in their belief that answers are best found through collaboration in East Africa and internationally. The representatives of the African Union Commission and the Scottish government agreed and demonstrated the benefits of cooperation in achieving access to modern energy for off-grid villages.

Breakout sessions and plenary discussions brought to the fore the remaining obstacles to achieving off-grid village energy in East Africa. These included: the high cost of mini-grid systems and the need for financing; the lack of supportive policy and regulatory frameworks; insufficient capacity to support off-grid systems; counterfeit and poor quality

products and components; and not listening to the voices of end users, particularly rural women and youth.

Participants worked together to suggest novel ways to address these remaining obstacles. These included, for example, moving from an individualised approach to a balanced approach in which the government acts as a mediator between end users and the private sector. Other suggestions included: the use of financial instruments tailored to the off-grid sector; lobbying government to enact the proper supportive policy and regulatory frameworks; working with the international community to foster a good policy environment to increase the flow of private investment; taking a strategic and multi-pronged approach to building domestic technical capacity; and using media and marketing techniques to engage with end users.

## 1. INTRODUCTION

A high-level workshop on off-grid village energy in East Africa was hosted by the Smart Villages Initiative and the Ministry of Infrastructure, Rwanda in Kigali on 7 September 2015. The workshop marked the culmination of the Smart Villages Initiative's 15 month engagement in East Africa. The workshop brought together 47 stakeholders from East Africa and the United Kingdom, and provided a forum for the Smart Villages Initiative to share the findings of its East Africa engagement with key stakeholders.

Representatives speaking on behalf of the African Union Commission and the Scottish Government shared regional and international perspectives. This was followed by country perspectives from representatives of Burundi, Kenya, Malawi, Rwanda, Tanzania, and Uganda and a talk by the Smart Villages Initiative's East Africa Energy Innovation Challenge winners. Breakout groups discussed obstacles to off-grid village energy in East Africa and how to overcome them. Lastly, a plenary session encouraged participants to share their thoughts on ways forward to meet the challenge of enabling access to affordable modern energy for off-grid villages in East Africa.

### Introductory address

**Professor Sir Brian Heap & Dr Bernie Jones,  
Smart Villages Initiative**

Brian Heap and Bernie Jones opened the Smart Villages Initiative's final event in East Africa. Brian Heap praised the advances in development in East Africa that the Smart Villages Initiative had witnessed over the previous 15 months of regional engagement. Special mention was made of the support for the workshop from the Rwandan High Commissioner in London, the Hon. Williams Nkurunziza, and Brian Heap thanked MININFRA for their assistance in organising the workshop in Rwanda, a country with impressive recent developments and ambitious plans for off-grid village energy. He continued by

providing an introduction to the Cambridge- and Oxford-based Smart Villages Initiative, its objectives, and its organisational structure.

The Smart Villages Initiative aims to provide policymakers, donors, and development agencies concerned with rural energy access with new insights on the real barriers to energy access in villages in developing countries—technological, financial, social and political—and how they can be overcome. These insights will be produced through a three-year period of workshops and follow-up engagement activities in six regions (East and West Africa, South and Southeast Asia, and Central and South America). These workshops will bring together the diverse set of players—scientists and engineers, entrepreneurs, villagers and civil society organisations, NGOs, financiers, policy makers and regulators—who are actively involved in addressing the challenges of village energy for development.

Bernie Jones illustrated the rationale behind the Smart Villages Initiative. Specifically, he showed the magnitude of the off-grid energy challenge by noting that more than one billion people do not have access to electricity, 3 billion people continue to cook on dirty, inefficient, and harmful stoves and as a result, over 4 million people are dying each year. To meet the United Nations' Sustainable Energy for All target of ensuring universal access to modern energy services by 2030, mini-grid and home-based solutions need to be harnessed to serve approximately 70% of the currently unserved population.

Bernie Jones also introduced the concept of smart villages as a rural analogue to smart cities. In smart villages, energy acts as a catalyst enabling the provision of key services, such as health, education, clean water, and sanitation, and the productive use of energy, which brings additional income into the village and enables progression up the energy and development ladders.

## Welcome address

**Mr Christian Rwakunda, Ministry of Infrastructure, Rwanda**

Christian Rwakunda, the Permanent Secretary of the Ministry of Infrastructure, welcomed participants to the high-level workshop on off-grid energy for villages in East Africa. He thanked the Smart Villages Initiative and his colleagues at MININFRA for organising the workshop and participants for attending. He emphasised that energy is the epicentre of development and an engine for growth. Rwanda considers energy as a priority of priorities.

In Rwanda, ensuring modern energy access for all is difficult due to the country's geographic characteristics. However, the government has chosen to take advantage of Rwanda's resource endowments by focusing on sustainable energy generation. Grid extension is the current priority of the Rwandan government, but off-grid solutions should be given equal priority.

Christian Rwakunda recognised the unique opportunity to strengthen synergies among participants through this workshop and to establish a holistic approach to integrate energy and development.

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## 2. WORKSHOP PROCEEDINGS

### Summary of findings: Smart Villages Initiative's East Africa engagement

**Dr John Holmes, Smart Villages Initiative**

John Holmes summarised the Sustainable Development Goals, which set the development agenda until 2030. Access to affordable, reliable, sustainable, and modern energy for all—often referred to as the missing goal in the now superseded Millennium Development Goals—is included as Goal 7. In addition to ensuring modern energy access for all as a goal in its own right, energy is a key enabler of achieving the other Sustainable Development Goals.

John Holmes gave an overview of the Smart Villages Initiative's engagement in East Africa from June 2014 to September 2015, which included an international workshop in Arusha, Tanzania; a workshop with science academies in Entebbe, Uganda; a workshop for journalists in Kigali, Rwanda; and an entrepreneurial competition for young East African scientists/engineers. The Smart Village Initiative also gave input to conferences on mini-grids and on recycling in Kenya, ICT in Rwanda, and rural electrification

in Malawi. It organised a workshop in Terrat, Tanzania for village elders from across East Africa and, lastly, carried out a research project on the development impacts of electricity access in Rwanda.

The Smart Villages Initiative's team has been working to synthesise the lessons learned from these events to draft a brief for policymakers. The brief is intended to inform the positions of East African governments and other stakeholders in the UN Summit on the Sustainable Development Goals (September 2015) and to support the major national and international efforts that will be required to achieve the goals once they have been ratified.

In his presentation, John Holmes highlighted several lessons and recommendations included in the draft policy brief. These included:

- Maximising the leverage of public sector funding
- Developing supportive policy and regulatory frameworks

- Integrating with other development initiatives
- Improving access to affordable finance
- Creating public-private-community partnerships
- Expanding the range of accessible services and low energy appliances
- Reducing costs and increasing durability
- Investing in research and development

In addition, John Holmes emphasised the need for better collaboration, the value of sharing information and experiences, the need for a focus on capacity building, and the development of approaches to monitor and evaluate development outcomes.

### Regional and international perspectives

#### Eng. Bernard Barandereka, African Union Commission

Bernard Barandereka of the African Union Commission (AUC) stressed the importance of ensuring modern energy access as a prerequisite for development. He described the urgent need for efforts to increase energy access in Africa, a continent with impressive rates of economic growth but with more than 600 million people lacking access to modern energy. The African Union Commission supports off-grid energy as evidenced by its endorsement of the Sustainable Energy for All decade (2014-2024) and Agenda 2063: an African vision for the next 50 years. Agenda 2063 stresses that energy is the central pivot of social and economic development.

The AUC's support of off-grid energy initiatives is also driven by the need to address climate change and to empower women.

Bernard Barandereka noted that supporting off-grid energy in rural areas is a crucial channel to empowering women due to the fact that women are arguably the main beneficiary of receiving access to modern energy in rural areas. Moreover, women could actively participate in the business of electricity distribution in the household or village.

Initiatives currently being undertaken by the AUC included: the Renewable Energy Cooperation Program (launched in 2010) that aims to develop renewable markets and facilitate investments with a focus on energy access, energy security, renewable energy, and energy efficiency; the capacity-building Hydro-power 2020 programme; and a continental programme for solar energy development in Africa. The AUC is not currently involved in wind power, but there are about 3,500 MW of wind energy projects in the pipeline in Africa. Bernard Barandereka finished by pointing out that there are substantial challenges remaining, such as the urgent need to adopt improved cookstoves, build capacity, and bolster access to finance for decentralised off-grid systems.

#### Mr Peter Dauenhauer, University of Strathclyde

On behalf of the Scottish Government, Peter Dauenhauer presented on Scotland's contribution to the United Nations' Sustainable Energy for All programme. He explained how the Secretary General of the United Nations, Ban Ki-Moon, asked Scotland to become a formal Sustainable Energy for All partner given its world-leading expertise in renewable energy. Building on 150 years of cooperation and a historic cooperation agreement on international development between Scotland and Malawi, the Scottish Government committed to seconding policy experts to the Government of Malawi and to developing a community renewables toolkit for Malawi.

Scotland has invested £2.3 million in the flagship Malawi Renewable Energy Acceleration Programme (MREAP) and is now investing a further £1.2 million funding in two more off-grid community energy initiatives in Malawi. The aim is to pilot models for truly sustainable community energy which can then be scaled up and replicated by larger donors and investors. This cooperation has already resulted in significant impacts with nearly 80,000 individuals receiving improved access to energy. Fifty community energy projects having been developed, and sixteen 16 reports have been published to document the process and learning.

Going forward, Peter Dauenhauer discussed several aspects of expanding the Scottish and Malawi partnership, such as: seconding an energy policy expert to support development of Malawi's first renewable energy strategy, planning business awareness events to promote private sector opportunities, and exploring options for renewable energy skill sharing. He stressed that Scottish engagement is not limited to Malawi and that the Scottish Government is eager to share its knowledge and experience with other developing countries.

### **Country views: Burundi, Kenya, Malawi, Rwanda, Tanzania, and Uganda**

#### **Eng. Makuwa Moise, Ministry of Energy and Mines, Burundi**

Makuwa Moise presented the current status of off-grid energy in Burundi. The main actor in rural electrification is the Burundian Agency for Rural Electrification (ABER), which generates a total capacity of 0.473 MW (approximately 1.5% of national generation capacity). ABER currently has three operational micro-hydro plants, three micro-hydro plants in need of rehabilitation, and one micro-hydro plant that is non-operational. The other main actors in rural electrification in Burundi are private—the majority of whom are missionaries. Private

actors are currently operating eight micro-hydro plants. There are a further six privately-run micro-hydro plants that are non-operational due to lack of maintenance. Since 2005, the government has worked with NGOs to implement off-grid solar projects in health centres and schools with a total capacity of 2 MW.

Makuwa Moise pointed out three challenges facing Burundi: the absence of a master plan for rural electrification, a lack of financing, and limited capacity. The situation in Burundi points to the need to draft and implement a rural electrification master plan, reinforce ABER's capacity for developing off-grid energy infrastructure, and stimulate private investment.

#### **Eng. Samson Kasanga, Ministry of Energy, Kenya**

Samson Kasanga began by stating the Kenya government's strong commitment to rural electrification. It has installed more than 1,000 off-grid solar PV systems (total capacity of 2.1 MW) at a cost of US\$25 million to support Kenyan households that are distant from the national grid. Funds from the Government of Kenya, the African Development Bank, the World Bank, and the Nordic Development Fund were being used to install 33 solar/wind hybrid mini-grid systems. Additionally, a government initiative to introduce information communication and technology-based education to all schools in Kenya means that 1,600 primary schools located in rural areas will be fitted with solar PV systems.

A new energy bill was drafted in 2014 to align energy policy with the provisions and aspirations contained in Kenya's new constitution and in the country's Vision 2030 document. Despite the positive developments in Kenya's off-grid energy scene, improvements need to be made to the legal and regulatory framework. There are inadequate data and information on potential sites, and a discrepancy exists between the cost of mini-grids and end users' ability to pay.

**Eng. Joseph Kalowekamo, Department of Energy Affairs, Malawi**

Joseph Kalowekamo provided an overview of the current energy situation in Malawi, focusing on the fact that less than 2% of the rural population has access to modern energy. In Malawi, an estimated 85% of total energy supply is derived from traditional biomass. The lack of modern energy and dependence on biomass has led to environmental degradation and to severe bottlenecks to economic growth. As a result, the government has prioritised energy generation through the Malawi Rural Electrification Programme (MAREP). MAREP encompasses the promotion of grid- and off-grid electricity as well as clean and efficient cookstoves.

Challenges facing the successful implementation of MAREP are numerous. These include institutional capacity, a lack of incentives for renewable energy, financial constraints, and social and cultural barriers. Additionally, there is no clear ownership structure regarding energy systems installed by the Government of Malawi, and there is a proliferation of sub-standard products in rural areas. Joseph Kalowekamo suggested that the following actions are required to address these challenges: enacting a supportive policy and regulatory framework; implementing suitable business models; sharing information and fostering public awareness of the benefits of electrification and improved cookstoves; and technical and financial support.

**Eng. Robert Nyamvumba, Ministry of Infrastructure, Rwanda**

Robert Nyamvumba explained Rwanda's current success and ambition to continue to grow; its economy has grown at an average annual rate of 8.3% over the past five years. In order to sustain such growth rates, growth must be balanced. This is captured in the second Economic Development and Poverty Reduction Strategy (EDPRS 2), which aims to achieve rural development.

To achieve its development goals, Rwanda has realised that it is imperative to ensure access to affordable and modern sources of energy in off-grid areas through home- and institution-sized systems as well as mini-grids. The government has a target of providing access to affordable modern energy to 22% of the rural population by 2018. This builds on the 7,900 households, 335 schools, and 50 health centres currently powered by solar PV systems, and the 3,065 households connected to hydro mini-grids. To accelerate progress, the government has simplified licensing frameworks and put in place legislation, for example, to mitigate investor risk to extend the national grid into off-grid areas. Further incentives include results-based financing programmes and taxation exemptions for renewable energy and certain key components.

The presentation concluded with an examination of the solar home-based systems market in Rwanda. Robert Nyamvumba began by highlighting the economic, education, and health benefits of solar home-based systems. In particular, it has been estimated that the average rural family saves around US\$60 per year by shifting away from traditional energy sources. If more families shift, it could reduce the current US\$16 million spent on importing kerosene each year. A strong point was made, however, that the current market-based approach to disseminating solar home-based systems in Rwanda was not working. Less than 1,000 units are sold each month. The reasons for the poor performance of solar home-based systems included: the proliferation of poor quality products, low consumer awareness, high prices, and a constrained supply chain. Policies addressing import standards, awareness raising, and government subsidies and installation assistance could address these problems.

**Professor Etienne Ntagwirumugara,  
University of Rwanda**

Etienne Ntagwirumugara presented on the collaborative pilot project between Colorado State University and the Government of Rwanda to electrify Karami village in Mutete sector through a smart micro-grid. The micro-grid is constructed from affordable and readily-available components and is scalable. It will be able to provide a number of electricity services to Karami village, including: lighting, phone charging, agriculture processing, micro-business development, internet, clean water, improvements in public health, and wealth generation. A village assessment survey will be carried out to track progress, validate the smart micro-grid as a concept, and identify lessons to share with the wider community.

**Eng. Matthew Matimbwi, Tanzania  
Renewable Energy Association**

Approximately 7% of Tanzania's off-grid population has access to modern energy. 2% of the off-grid served population access solar PV, with the remaining 5% obtaining their energy from wind, mini-hydro, biogas digesters, or diesel generators. In his presentation, Matthew Matimbwi highlighted the main challenges facing rural electrification in Tanzania. These included an unreliable grid extension plan that makes it difficult for developers to site off-grid projects and foster the required long-term approach. He also noted that limitations include incompatibilities with standard project financing requirements from financial institutions; inadequate environmental and taxation regulations; electricity theft; inadequate technical capacity; and the increased presence of substandard or counterfeit components and products.

Tanzania has begun addressing these challenges by promoting relevant vocational training and market surveillance initiatives

by the Tanzanian Bureau of Standards and drafting of a new supportive regulatory framework. Further actions, however, are required. Matthew Matimbwi suggested that these actions should include

- Establishing energy desks at district councils
- Accrediting relevant technical courses at artisan and bachelor degree levels
- Certifying solar PV installers
- Tackling the problem of substandard and counterfeit goods and components internationally

**Eng. Benon Bena, Rural Electrification  
Agency, Uganda**

Benon Bena began his presentation with an overview of the Energy Policy Framework in Uganda, which intends to increase access to modern energy services through rural electrification. Expanding energy access is crucial as only 7% of rural Ugandans had access to electricity in 2013. Mini-grids will play a major role in Ugandan rural electrification, especially due to the development of rural trading centres that provide suitable customer bases for mini-grids.

There are significant challenges to rural electrification in Uganda. These include high upfront costs compared to conventional energy technologies, nascent legal and institutional frameworks for off-grid energy generation, inadequate or inappropriate capital, working capital and end user financing arrangements, inadequate standards and quality insurance, and insufficient information and data on off-grid energy resource availability and appropriate technologies. Energy planners' mind sets also need to shift: they often view the grid as the only approach to providing electricity.

Benon Bena finished by describing some of the strategies used by Uganda to overcome barriers to off-grid energy. These included tax and licensing exemptions and a light-handed approach to meeting environmental regulation conditions for small developers. Regarding financial instruments, the Uganda Energy Credit Capitalization Company (UECCC) provides a number of financial products targeted to developers, such as a liquidity insurance, partial risk guarantees, bridge financing, and transaction advisory services.

### Smart Villages Initiative's Energy Innovation Challenge

Mr James Ogingo & Mr Clifford Owino, Chemolex

The recent winners of the Smart Villages Initiative's Energy Innovation Challenge, James Ogingo and Clifford Owino, presented their winning innovation to workshop participants. Chemical engineers by training, they identified the use of kerosene lamps by rural households as a problem due to high cost, poor lighting quality, and indoor air pollution. As a solution, James Ogingo and Clifford Owino proposed to provide off-grid rural households with a clean, affordable home lighting system by harnessing and storing solar energy in rechargeable batteries.

Upon registration (at a fee of US\$2), households would be provided with a system that provides lighting and phone charging for up to 20 hours. Discharged batteries are then collected and brought to a solar charging station before being redistributed to end users at a fee of US\$0.25 per charge. As winners of the Energy Innovation Challenge, James Ogingo and Clifford Owino have founded a company to deliver on their innovation: Chemolex Ltd. They believe that through Chemolex, rural households will benefit from lower lighting costs, reduced indoor air pollution and fires, and increased employment.

### Plenary feedback on breakout sessions

Chair: Dr Bernie Jones, Smart Villages Initiative

Participants divided into three breakout groups. Each breakout group discussed two questions: what are the key remaining obstacles to achieving affordable modern energy access for off-grid villages in East Africa? And what will need to be done (and by whom) to overcome these obstacles? Each group reported on their discussions and thoughts in a plenary session chaired by Bernie Jones.

### Remaining obstacles

Participants highlighted a number of issues regarding the remaining obstacles to achieving affordable modern energy access for off-grid villages in East Africa. The first issue concerned the relatively high costs of mini-grids and the difficulty of financing such systems. Despite technological advances, East Africa cannot afford to wait for costs to come down to affordable rates to induce private sector investment. Regarding end users, participants expressed a concern about rural households' ability to pay for larger generation technologies such as mini-grids. In particular, rural households may regularly overstate their willingness to pay versus their actual ability to pay, leading to problems with the sustainable operation of mini-grids. Participant discussed the challenges of financing mini-grids. Numerous pilots are unable to achieve scale because they need for grant financing. The uniqueness of each project and its recipient end user community are also challenges.

The second issue discussed by participants was the lack of a supportive policy and regulatory framework. Participants view this framework as a necessary condition to enable investment in the sector. The third issue was the insufficient capacity to support off-grid energy systems. This has led to many working energy systems no longer being operational in households and

villages. The fourth issue concerned the proliferation of counterfeit or poor quality goods, particularly in the pico-lighting solutions and solar home systems markets. This lack of quality assurance has become an increasingly severe issue in East Africa and has led to significant market spoilage. The fifth issue honed in on rural communities. In particular, participants felt strongly that inadequate attention is being paid to the needs and voices of women and youth—two groups with transformative roles and immense potential in rural communities. More attention needs to be paid to raising awareness of off-grid technologies and to creating a sense of ownership.

### Overcoming obstacles

To address the first obstacle—high costs and financing difficulties—participants presented a range of solutions. Conceptually, participants advocated a move from an individual approach, where each actor—government (including individual ministries), private sector and community—acts purely in their own interest, to a balanced approach with the government serving as a mediator. For example, the government would enable the private sector to seek, within reason, their profit objective. It would also enable end users to have access to affordable modern energy by creating a policy and regulatory framework and through mechanisms such as top-up tariffs and tax credits. Further solutions included viewing mini-grid projects across their life cycle rather than purely through up-front cost and short-run financial feasibility. Participants also suggested moving towards a standardised and modular approach to mini-grids to enable scale-up and undertaking in-depth village-level surveys to better understand end users' ability to pay. Policymakers need to consider off-grid approaches, such as mini-grids, on parity with grid extension. By supporting off-grid approaches, public efforts and financing into the area would be bolstered.

Regarding the second obstacle of a lack of supportive policy and regulatory frameworks, participants noted that government strategies are needed specifically for off-grid energy and for renewable energy. New policies are only enacted by government after sustained and concerted pushes from stakeholders. It is therefore important for stakeholders in the East African community to come together to push for supportive policy and regulatory frameworks. A further point was made that there are good practices from individual countries in East Africa that should be shared across the region. Lastly, participants acknowledged that there is a lack of experience about how the policy environment can facilitate the flow of private investment. Participants suggested the need for international cooperation in this area. There was agreement that, within reason, all that can be done to reduce the risk of private sector investments should be done. However, it is important that the private sector understands that there will always be inherent unpredictability and risk in the off-grid sector.

Participants called for a multi-pronged approach to the insufficient capacity to support off-grid energy systems. There is a need for the training of skilled technicians at multiple levels. For example, the majority of maintenance is relatively straightforward and can be done by training rural residents. At the same time, however, there is the need to train technicians, engineers, and researchers. This requires clear direction and leadership from the Ministries of Energy and Education to ensure that there are appropriate training opportunities at the artisanal, vocational, and university levels.

The issue of the proliferation of counterfeit goods and poor quality products in the pico-solar lighting systems and solar home systems markets sparked a lively debate among participants. Although there are already standards in place, there is both a lack of capacity to enforce standards and a lack of motivation to tackle the

issue resolutely. Participants stated that the issue requires the international community to take action to stem the flow of counterfeit and poor quality goods flowing into domestic markets, in addition to increased investment in the capacity of standards enforcement at the East African and national levels.

Turning to end users, participants agreed unanimously that awareness about off-grid energy technologies needs to be raised. The entrepreneurial spirit of communities also need to be encouraged to make productive use of such systems. Practically, participants suggested that the media and marketing techniques should be harnessed, and keystone actors in the community should be targeted first. Success cases of other villages should be communicated to galvanise other communities. Instead of limiting community interaction to just village elders, participants made a point that women and youth must be consulted from the very beginning of any plan to bring off-grid energy into a rural community.

### Plenary discussion on next steps

**Chair: Dr Bernie Jones, Smart Villages Initiative**

Following the plenary discussion, participants actively put forward their thoughts on the next steps to take after the conclusion of the workshop. There was a consensus among participants that energy drives every aspect of human development and that off-grid technologies are crucial to enabling access to affordable modern energy for unserved communities in rural East Africa. Although governments advocate providing access to modern energy as a means to catalyse development, they tend to prioritise grid-based solutions. It is therefore imperative that governments consider off-grid solutions on par with grid extension. Similarly, participants stressed that the international donor community needs to become more sensitised to the challenges that are unique to off-grid areas.

Participants discussed the role of government in providing modern energy to off-grid villages in East Africa. In particular, they suggested that governments should support the mapping of renewable energy resources. This would help private sector developers and utility companies to explore the feasibility of off-grid energy projects. Governments need to take on an incubator role; they should work with the private sector to support the development of innovative business models in the off-grid sector. Lastly, governments were encouraged to take a long-term view of capacity building for off-grid energy systems and running them sustainably. They will also need to equip individuals with the skills and capital to make productive use of energy.

Participants stressed the need for an information portal to encourage collaborative learning at all scales: national, regional, and international. Information sharing can help to avoid making the same costly mistakes. Moreover, practitioners can learn best practices and adapt them to local situations. A point was made that all stakeholders, including NGOs and research institutions, need to contribute to the information portal as much of the work done by these sectors is not generally readily available. Lastly, participants were adamant that villages and households have important knowledge that should be made available to policymakers to ensure appropriate and effective policies.

### 3. CONCLUSION

#### Closing remarks

**Dr Ignace Gatare, National Commission for Science and Technology, Rwanda**

Ignace Gatare of the National Commission for Science and Technology, Rwanda closed the high-level workshop on off-grid village energy in East Africa. He said that he was honoured that the workshop was held in Rwanda and praised the workshop as having been extremely productive in sharing challenges across the East Africa region. He stressed that solutions to off-grid village energy are not to be found in isolation but require workshops to share information across countries.

The community must be at the core of initiatives to enable off-grid village energy. Only when the community is at the centre can the public and private sectors effectively contribute. Ignace Gatare continued by stressing the roles of the public and private sector: the public sector should facilitate a fair and equitable business environment by enacting appropriate regulatory standards and supporting further research and development. The private sector should act responsibly and create value through business opportunities.

He concluded by expressing his wish that that the workshop report convey key messages to policymakers and relevant stakeholders, the dialogue be continued, and all stakeholders keep up the momentum to enable access to modern energy in off-grid villages in East Africa.

#### Conclusion

The high-level workshop on energy in off-grid villages in East Africa brought together 47 stakeholders from East Africa and the UK. Together, participants exchanged learnings from the Smart Villages Initiative's 15-month engagement period in East Africa and from regional and country-level experiences. The workshop also served as a final input into the Smart Village's East Africa Policy Brief, which communicated the experiences, views, and recommendations of individuals and organisations working on the ground to policymakers in preparation for the UN Summit to ratify the Sustainable Development Goals in September 2015 and their subsequent implementation in East Africa. Looking beyond the East Africa policy brief, the workshop generated impactful pathways forward and marked the beginning of a continued collaborative relationship between the Smart Villages Initiative and the East African off-grid energy community.

## ANNEX 1: WORKSHOP PROGRAMME

Tuesday, 8 September

**0830 Registration**

**0900 Introduction**

*Professor Sir Brian Heap and Dr Bernie Jones, Smart Village Initiative*

**0910 Welcome Address**

*Mr Christian Rwakunda (MININFRA)*

**0930 Summary of findings: Smart Villages Initiative's East Africa engagement**

*Dr John Holmes (University of Oxford and Smart Villages Initiative)*

**1000 Regional and international perspectives**

*Eng. Bernard Barandereka (African Union Commission) and Mr Peter Dauenhauer (University of Strathclyde)*

**1030 Break**

**1050 Country views: Burundi, Kenya, Malawi, Rwanda, Tanzania and Uganda**

*Eng Makuwa Moise (Ministry of Energy and Mines, Burundi)*

*Eng. Samson Kasanga (Ministry of Energy, Kenya)*

*Eng. Joseph Kalowekamo (Department of Energy Affairs, Malawi)*

*Eng. Robert Nyamvumba (MININFRA, Rwanda)*

*Professor Etienne Ntagwirumugara (University of Rwanda)*

*Eng. Matthew Matimbwi (Tanzania Renewable Energy Association)*

*Eng. Benon Bena (Rural Electrification Agency, Uganda)*

**1310 Lunch**

**1410 Smart Villages Initiative's Energy Innovation Challenge**

*Mr James Ogingo and Mr Clifford Owino, Chemolex*

**1420 Breakout sessions**

*Facilitated by: Eng. Matthew Matimbwi (Tanzania Renewable Energy Association) and Eng. Samson Kasanga (Ministry of Energy, Kenya).*

**1545 Break**

**1600 Plenary feedback**

*Chair: Dr Bernie Jones (Smart Villages Initiative)*

**1645 Plenary discussion on next steps**

*Chair: Dr Bernie Jones (Smart Villages Initiative)*

**1715 Closing Remarks**

*Dr Ignace Gatara (National Commission for Science and Technology, Rwanda)*

## ANNEX 2: WORKSHOP PARTICIPANTS

Name	Organisation
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# **SMART VILLAGES**

New thinking for off-grid communities worldwide

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