

ABSTRACTS OF CHANGE PROJECTS

RENEWABLE ENERGY PROGRAMME (REP) 4

The Abstracts cover the main findings
from each Change Project

Country Teams:

Kenya
Rwanda
Tanzania
Uganda
Zambia

RENEWABLE ENERGY PROGRAMME (REP) 4

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FRAMEWORK FOR PUBLIC-PRIVATE COLLABORATION ON THE DEVELOPMENT OF E-MOBILITY CHARGING INFRASTRUCTURE IN KENYA

Country (Kenya)

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Justification of the Change Project

The effects of climate change are being felt globally. Many countries have shifted their attention towards curbing emissions and Kenya, being the Paris Agreement signatory, has an ambitious plan to reduce emissions by 30% by 2030.

In line with SDG 7, Kenya's commitment is enhanced by the abundance of renewable resources within its borders. Over 90% of the electricity generation comes from renewable sources, with geothermal playing a key role in this agenda. To achieve 100% clean energy by 2030, the transport sector whose emissions contributions is at 37%, has been flagged to reduce over-reliance on fossil fuels. This has led to the government's promotion of the adoption of electric mobility. The country has a target of 5% of imported electric cars annually by 2025.

This project seeks to formulate a guideline that promotes public and private sector collaboration in setting up charging infrastructure to ensure safe, reliable, accessible, and affordable electric mobility services.

Purpose

The overall purpose was to develop a framework for public-private collaboration on the development of e-mobility charging infrastructure. Specifically, the project aimed to provide guidelines on:

- a) Development of Electric Vehicles charging infrastructure.
- b) Collaborative financing approach for the development of EV charging infrastructure;
- c) Collaborative approach for mapping charging locations.

Results and Conclusions

It was clear from various interactions that, there is a real need to change the transportation sector for the better. Sustainable mobility is the way to do this but the different teams agree that putting their heads together is better than working in silos. The sentiments were that the private sector are the doers and funders and the public sector are the enablers through ensuring the right standards and policies are put in place to help the industry move in the right direction as well as setting the right kind of incentives for the industry as a whole.

Specifically, where charging infrastructure is concerned, the public sector which includes government entities and county governments can make the process easier by providing public land and giving incentives to the private sector to set up the infrastructure. The other opportunity for growth would be to come up with a one-stop shop for the necessary documentation and processes required to establish an E-mobility company or factory which will attract investors to invest in Kenya.



Figure 1: Photo depicting a solar EV charger commissioned in Total Energies Gigiri by Knight Energy a good example of collaboration between different parties

Impact of the Change Project

A Collaborative Public-Private Approach to EV-charging infrastructure development is necessary to trigger the much-needed investment in the EV space leading to a sustainable transportation sector in Kenya and as a result, promote faster achievement of the Nationally Determined Contributions (NDCs). The use of fossil fuels, especially with regards to internal combustion engines (ICE) in the transport sector, is also projected to reduce significantly.

The greatest impact of developed electric mobility infrastructure will be creation of electricity demand which will directly increase consumption of renewable energy especially from geothermal sources during off-peak periods and off-grid renewable energy installations.

Other long term impacts will be job creation and reduced congestion especially in cities due to the public embracing use of the robust public transportation system.

Key Words

Adoption, Electric Vehicles, E-mobility Charging Infrastructure, Financing, Public-Private Collaboration, Internal Combustion Engine.

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Framework for the implementation of street lighting in Rwanda

Rwanda

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Justification of the Change Project

The initiation of this project was prompted by the observed lack of coordination in the development and implementation of streetlight projects across Rwanda. Different institutions were independently carrying out these projects without adhering to existing guidelines for some instances, leading to inefficiencies and misalignments. Therefore, there was a pressing need to develop an implementation framework to enhance streetlight guidelines in the country. This project's primary contribution lies in its ability to improve safety, energy efficiency, cost-effectiveness, environmental impact, smart city integration, user experience, technological advancements, and regulatory compliance regarding street lighting. By addressing these areas, the project aims to enhance the overall quality of public lighting and its contribution to urban development in Rwanda.

Purpose

The purpose of the project is to develop an implementation framework for streetlight projects in Rwanda. The project aims to outline stakeholder roles, interventions, and responsibilities, propose an overseeing entity to ensure adherence to quality standards, and conduct community workshops and awareness campaigns to gather input and build support. Importantly, the project focuses solely on establishing this framework, excluding the development of technical guidelines rather propose the implementation of street light project.

Results and Conclusions

The implementation framework providing guidance for the planning, execution, and upkeep of streetlighting infrastructure across Rwanda. The included recommendations address various aspects of street lighting, ensuring consistency, sustainability, and efficiency in development efforts nationwide. The developed framework fulfills its intended purpose as a dynamic tool, prioritizing sustainability, community involvement, and continual enhancement. Serving as a valuable resource, it offers direction for both urban and rural development endeavours, promoting well-lit, energy-efficient, and smart environments throughout the country. By recommending custodians for implementation and tailoring steps based on project scope, it enhances effectiveness and adaptability.

In conclusion, the enhancement of street lighting guidelines in Rwanda represents a significant stride towards fostering a safer, more efficient, and sustainable urban landscape. This project effectively tackles issues of coordination, safety, and inefficiency in street lighting initiatives. Through collaborative engagement with stakeholders and a focus on environmental considerations, Rwanda emerges as a pioneer in adopting modern and sustainable street lighting practices.

Impact of the Change Project

The results of this project hold significant implications for the renewable energy sector, particularly in the context of street lighting infrastructure. By emphasizing sustainability and energy efficiency in the developed framework, the project encourages the adoption of renewable energy sources, such as solar and wind power, for street lighting purposes where applicable. Implementing energy-efficient lighting solutions, not only reduces energy consumption but also aligns with renewable energy goals. Moreover, the project's focus on environmental considerations, such as minimizing light pollution and promoting responsible lighting practices, resonates with the renewable energy sector's commitment to mitigating environmental impact. By incorporating these principles into street lighting guidelines, the project contributes to a broader shift towards sustainable energy practices. The recommendation of the framework developed can serve as a blueprint for integrating renewable energy solutions into street lighting projects, thereby advancing the renewable energy agenda and contributing to a more sustainable future.

Key Words

- Implementation framework
- Street lighting
- Lack of coordination
- Overseeing entity
- Environmental considerations
- Sustainable future
- Urban development

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A Business Case for Solar PV Usage in Commercial Centres

Country (Tanzania, United Republic)

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Justification of the Change Project

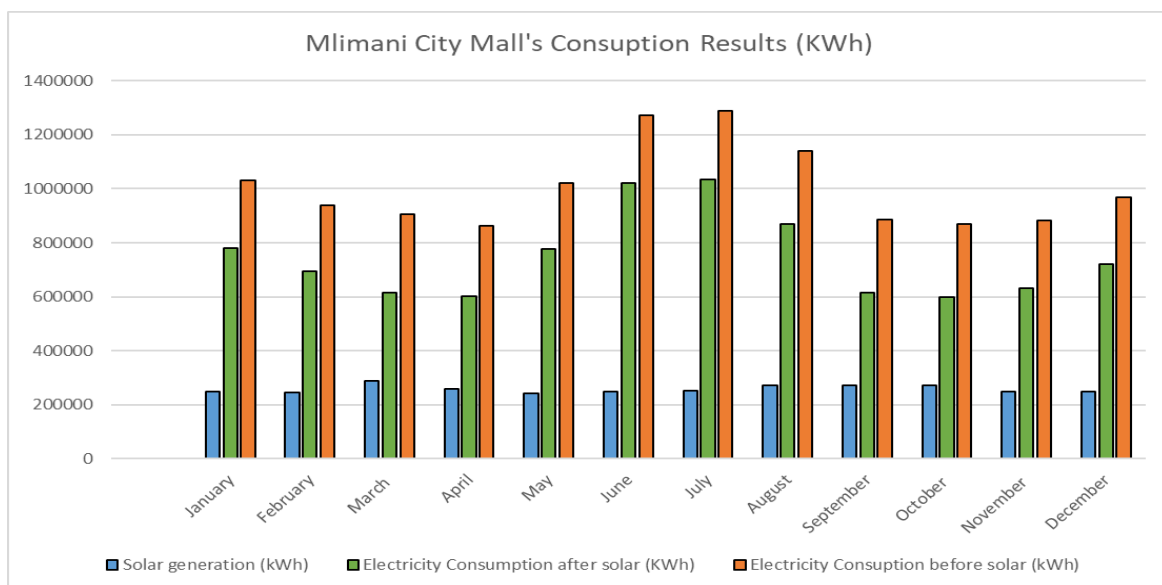
Low uptake of Solar Photovoltaic (PV) Systems as an alternative or supplement to the unreliable grid supply and fossil fuel power generators in commercial centres has led to high operation costs, energy inefficiency, and high carbon emissions in urban setups. The low uptake is attributed to high initial capital costs, the intermittency nature of wind and solar energy, perceptions as well as lack of promotion. The project's main objective is to promote the use of Solar PV systems as an alternative to traditional electricity in commercial buildings. Through educational campaigns, businesses will be informed about the benefits of renewable energy, with a focus on Solar PV technology. As sustainability and renewable energy become more important globally, companies are looking for ways to decrease their carbon footprint and save money on operations. This study assesses the viability, advantages, and obstacles of incorporating Solar PV technology into commercial centers.

Purpose

The project aims to increase the utilization of Solar Photovoltaic (PV) systems in commercial establishments by raising awareness about the benefits of renewable energy and educating businesses about Solar PV technology and its potential to supplement or replace conventional electricity supply thereby contributing to sustainable production and consumption of energy.

Results and Conclusions

The findings reveal that integrating solar PV in Mlimani City offers substantial economic, environmental, and social benefits, including reduced electricity bills, carbon emissions, and reliance on grid electricity. Based on the grid consumption data established over eighteen (18) months, Mlimani City Mall had a peak demand of 3,072 kVA in November 2023 and a maximum monthly energy count of 1,134,832 kWh in March 2022. Additionally, the Mall incurred an average monthly cost of USD 10,000 to operate a diesel generator during power outages, resulting in a monthly energy bill of USD 100,000. Using the Mall's parking space of 9,677.5 square meters and the simulated irradiance data, a Solar PV yield of 3,090,069 kWh per year was generated from a system size of 2,115.85 kW. By implementing this solar PV system, the Mall could save at least USD 287,789 per year, which is equivalent to approximately three months of their current monthly energy bill. However, the Mall's roof space, estimated at 24,000 square meters, could not be included in the system design due to uncertainty on its structural integrity. Otherwise, the proposed project revealed a positive Net Present Value of USD 821,100.



Impact of the Change Project

Installing a 2.1 MW solar photovoltaic (PV) system at Mlimani City Mall would mitigate climate change by avoiding approximately 912 tons of carbon dioxide (CO₂) emissions annually hence demonstrating a shifting from traditional energy sources to a cleaner, sustainable future. Economically, the project demonstrates advantages through sustained cost savings and revenue generation opportunities.

Key Words

Solar PV, Emission, Savings, Net Present Value (NPV), Sustainability.

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Adoption of EPCS through Enhanced Financing Initiatives.

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Justification of the Change Project

Uganda has significantly invested to increase electricity access up to 41% of her population. Despite this, biomass (in the form of charcoal and firewood) continues to be the predominant fuel for cooking because it is affordable, hence incentive enough for households/consumers with low-purchasing power (majority of the population) to use it, even when it releases greenhouse gases into the environment. Furthermore, the high cost of energy-efficient clean-cooking appliances like Electric Pressure Cookers (EPCs) has deterred people from using them. To encourage the use of EPCs, the financial issue needed to be addressed.

The project developed a framework of several financing options which when applied, enable consumers to purchase EPCs using cost-friendly approaches, thereby making them more affordable to encourage their uptake. This in turn would result into increased use of energy-efficient clean-cooking appliances & practices, reduced dependence on biomass fuel for cooking, and decreased greenhouse gas emissions into the environment.

Purpose

The primary aim of the project was to create a structure that would encourage the extensive adoption of electric pressure cookers (EPCs) in Uganda, with a specific focus on addressing affordability challenges. The core objectives involved devising creative financing solutions, enhancing awareness to promote EPC adoption, cultivating partnerships, advocating for policy backing, and implementing continuous impact monitoring for improvement.

Results and Conclusions

The project results were categorized into outputs, outcomes, and effects.

The project outputs (immediate indicators) included development of a comprehensive framework, extensive stakeholder engagement, policy integration, increased public awareness on EPCs and their benefits, financial institution participation and interest in providing financial products that support customers to purchase EPCs in an economically friendly way, government support, and the initiation of pilot programs to test the effectiveness of the framework.

Figure 1: Demonstrative use of EPCs to cook food during stakeholder engagements.



The expected outcomes derived from the project outputs included noticeable cost savings (reduction in money spent on fuel used for cooking food) experienced by consumers, increased used of energy efficiency practices and equipment while cooking, positive environmental impact due to reduced carbon emissions during cooking, and creation of jobs resulting from the expansion of the EPC supply-chain and after-sale services.

The anticipated effects/impacts of the project included increased widespread adoption of EPCs, anticipated technology innovation to manufacture more efficient EPCs, a transformative shift in consumer behaviour to embrace sustainable and energy-efficient cooking practices and mitigating climate change due to large scale reduction of carbon emissions during cooking.

Impact of the Change Project

The project impact of widespread adoption of EPCs would lead to increased use of energy efficient cooking appliances thereby reducing energy wastage at household level, and thus contributing to overall grid efficiency and stability.

The project's findings and conclusions suggested broad applicability, pointing to the need for customized finance structures to incentivise sustainable practices across various sectors within the renewable energy landscape and stimulate the adoption of sustainable technologies. This has the potential to spur energy efficiency initiatives beyond households, ultimately fostering a more sustainable and resilient renewable energy sector.

Key Words

Adoption, Financing, Energy-Efficient, Electric Pressure Cookers, Clean cooking, Uganda.

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Title of the Change Project (Consumer Sensitisation of Quality Low-Cost Solar Photovoltaic Products in Rural Communities of Zambia)

Country (Zambia)

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Justification of the Change Project

The urgent need to address energy poverty in Sub Saharan Africa by deploying off-grid solar PV solutions, has led to an increased influx of low and poor-quality Solar PV products on the market particularly for the rural population. This has resulted in reduced confidence in solar PV products, increased solar e-waste due to short products life span, thus contributing to low adoption of renewable energy and increased environmental concerns.

The main contribution of the project is to address the problem of inadequate awareness of solar PV products on the market specifically for rural consumers. Increased awareness would result in rural consumers purchasing more high-quality solar PV product which would lead to more high quality solar PV products on the market.

Purpose

The purpose of the project was to conduct awareness campaigns and ensure that the targeted rural communities are sensitised on the quality of off-grid Solar Photovoltaic (PV) products for households falling in Tier 0, Tier 1 and Tier 2 with power requirement up to 200Wp.

Results and Conclusions

The key results of the projects comprised of affordability, energy needs, and consumer awareness. The projects revealed that low income levels distributed seasonally, about 50% households earning less than ZMW 8,000 per year, resulted in limitations towards spending parity of the consumers. This severely constrained the ability to purchase higher quality solar products as consumers purchased only what they could afford. The results also showed that the number of household occupants influenced the energy needs and hence the off-grid solar PV energy solutions. Smaller households tended to use solar lanterns while bigger households settled for solar home systems. Furthermore, over 60% consumers purchased based on referrals and agent recommendations rather than product quality due to lack of awareness and ability to make informed purchase choices. However, this correlated with about 62% of consumers whose solar PV products were found to be working perfectly, high quality and durable and strong respectively. About 16% consumers with poor quality products correlated with 13% mix and match products purchased from shops. It was also discovered that knowledge about solar PV e-waste was non-existent among consumers. Overall, while gender was not influential, income, energy needs and affordability appeared to be the key drivers in the choices of purchased solar PV products.

Impact of the Change Project

Educated rural communities about quality solar PV products would result in better choices when purchasing these products and this would result in rural communities that could challenge the agents and others and only settle for high quality solar PV products. This is expected to influence the quality of solar PV products on the market. The increase in quality solar Pico and Solar Home Systems will result in increased confidence in off-grid solar PV solutions and, therefore, more households will be attracted to solar renewable energy solutions. In conjunction with introduction of cheaper high quality solar PV products, the expected impact on the sector would be accelerated renewable energy penetration and access to affordable, clean and sustainable energy in rural areas and, therefore, a significant step towards SD7 achievement.

Key Words

Off-grid, solar, quality, products, access, energy, rural