



RENEWABLE ENERGY AND ENERGY EFFICIENCY STRATEGY & ACTION PLAN

REEESAP 2016-2030

BOOKLET

“Secure energy, empower lives, brighten the future”



A project funded by
The European Union

ATKINS

A project implemented by
an Atkins led consortium

**RENEWABLE ENERGY AND ENERGY EFFICIENCY
STRATEGY AND ACTION PLAN**

Southern African Development Community (SADC)
Secretariat
Plot 54385 CBD Square
Private/Bag 0095
Gaborone, Botswana
Tel: +267 395 1863
Email: registry@sadc.int
Website: www.sadc.int
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FOREWORD

The Evolution of Renewable Energy and Energy Efficiency

An energy transition is underway in our region, as exemplified by our ambitious regional strategy and action plan on renewable energy (RE) and energy efficiency (EE). Lines are shifting for many reasons: an insufficient and uneven access to modern energy services, with an average of 42% overall and 10% in rural areas, an ongoing energy deficit since 2007, a pressing need to mitigate climate and an increased awareness of our huge potential for RE and EE development. The region is blessed with abundant renewable energy resources (hydropower, solar, wind, bioenergy...) and energy efficiency opportunities. Renewables already account for 23.5% of power generation in the SADC region and this figure could rise to 60% under favourable policy scenarios, according to IRENA.

This potential is challenging our traditional way of converting and utilising energy, characterized by a heavy dependence on fossil fuels and traditional biomass. It's an opportunity to rethink our development pathway: we can rapidly expand renewable energy in the overall energy mix, while also increasing levels of energy efficiency in key sectors to reduce energy intensity of

growth. It offers the fastest, cleanest, most reliable and economical way to improve energy access and security and meet fast-growing energy needs.

The market is promising for new industries, new businesses and new jobs

The regional market potential is also very promising for new industries, new businesses and new jobs. This will contribute to the SADC's Industrialization Strategy and Roadmap (2015-2063) and accelerate economic growth, poverty alleviation and regional integration, which are the pillars of the SADC Agenda stipulated in the SADC Treaty and the Revised Regional Indicative Strategic Development Plan (RISDP 2015-2020).

By so doing, we will also align with the UN Sustainable Energy for All Initiative (SE4All) launched in 2012, and with the new global 2030 roadmap and Sustainable Development Goals (SDGs), particularly SDG 7 ("Ensure access to affordable, reliable, sustainable and modern energy for all"), SDG 9 ("Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation"), SDG 13 ("Take urgent action to combat climate change and its impacts") and SDG 1 ("End poverty in all its forms everywhere").

Long neglected, sustainable energy is now a top priority on the international agenda, with a great number of initiatives and funding. This is not the only good news. The average costs for electricity generated by solar



“In sequence with the way the energy market is moving, REEESAP is an important landmark in forging a regional coherent commitment towards developing renewable energy and energy efficient technologies and services.”

Dr Stergomena Lawrence Tax, SADC Executive Secretary

power and wind - which are coming down significantly to be competitive with conventional sources - could decrease by between 26 and 59 percent by 2025, according to IRENA. There are also now proven sustainable business models in RE and EE, already in our region.

In sequence with the way the energy market is moving, REEESAP is an important landmark in forging a regional coherent commitment towards developing renewable energy and energy efficient technologies and services. Another important milestone is the creation of the SADC Centre for RE and EE (SACREEE), which will implement REEESAP, harmonize and coordinate efforts, act as a regional RE and EE promotion agency and a knowledge hub. Evidence shows that even if the region is very heterogeneous, there are several and common barriers that can benefit from a regionally coordinated approach. SADC can bring a real added value by driving liberalization and harmonization, leveraging knowledge, capacities and resources, scaling up exchanges of information, experiences and best practices. Many things are already happening in the region.

There are proven sustainable energy business models, already in our region

Some Member States like South Africa and Mauritius, to name but a few, have wealth of experiences with promoting RE and EE technologies and services,

that deserve to be shared across the region. We can create common and larger markets allowing economies of scale, large-scale investments, local manufacturing of the RE equipment that would bring about improved energy services, reduced costs and more benefits to SADC population. We should “think as a region”, take advantage of our vast resources and complementarities, and “act nationally according to Member States strengths”.

This is all the more important because challenges are very complex, multi country, cross-sectoral and cross-cutting. It entails, amongst other challenges, linking renewable energy and energy efficiency priorities with food and water security, within the context of climate change, and mainstreaming gender issues.

Based on extensive consultation with national and regional actors, the REEESAP is just the start of a long process. A set of actions is proposed as a roadmap for SADC Member States to fill gaps and fulfill their national targets. They will have to enact new national strategies and action plans to set the course for an accelerated sustainable energy transition. But the renewable energy and energy efficiency market “take off” doesn’t rely only on political will, ambitious targets and their integration into policy frameworks. Various players and enablers must be actively involved. We definitely need to work hand in hand, in order to empower our lives and energize a sustainable future for our region.

ACKNOWLEDGEMENTS

The SADC Secretariat would like to express its gratitude to all the stakeholders who contributed to the successful completion of the Renewable Energy and Energy Efficiency Strategy and Action Plan (REEESAP) 2016-2030.

In particular the SADC Secretariat would like to thank SADC Member States, various International Cooperating Partners (ICPs) and other key stakeholders (Private Sector, Development Banks and other financial institutions, Civil Society Organisations, Academia and Research/Training Institutions), for demonstrating their interest in, and commitment to, supporting the formulation of the REEESAP, and their participation in stakeholder consultations, workshops and report reviews.

The Secretariat is grateful for the financial support provided by the EU through the Directorate of Infrastructure and Services, to the development of the REEESAP, and the support provided by Ms Mercedes Marin Nortes, from the EU Delegation to Botswana and the SADC Region.

The EU Technical Assistance Facility (TAF) team of the consortium led by Atkins that led the development of the REEESAP is gratefully acknowledged.

The process of developing the REEESAP was made possible through the collaborative efforts of the SADC Secretariat staff in the Directorate of Infrastructure and Services. In particular, the Secretariat would like to express its appreciation and gratitude to the SADC Director of Infrastructure and Services, Mr Remigious Makumbe, as well as to Mr Moses Ntlamelle, Senior Programme Officer on Energy of SADC, Projects Coordinator (Power) & SADC/SAPP-PAU Liaison, Mr Odala Matupa and to Mr. Wolfgang Moser, Technical Advisor to the SADC Secretariat Energy Division, seconded from the Austrian Government.

CONTENTS



1

ENERGY, THE
BUILDING BLOCK
OF SUSTAINABLE
DEVELOPMENT

P. 8



2

ENERGY
ISSUES FACING
THE SADC REGION

P. 10



3

ASSETS
TO MEET THE
CHALLENGES

P. 16



4

CURRENT
SUSTAINABLE
ENERGY TARGETS
BY 2030

P. 24



5

FORMULATION
PROCESS

P. 26



6

BARRIERS
AND GAPS TO
OVERCOME

P. 30



7

STRATEGIC
INTERVENTIONS
AND ACTION
PLANS

P. 34



8

IMPLEMENTATION
FRAMEWORK

P. 46



9

MONITORING
AND EVALUATION
SYSTEM

P. 50

10

ANNEXES

P. 52

DEFINITIONS

P. 56

ABBREVIATIONS

Abbreviations / Acronyms Full Form

AA	Action Agenda
ACEC	Africa Clean Energy Corridor
ADC	Austrian Development Cooperation
AEEP	Africa-EU Energy Partnership
AFD	Agence Française de Développement
AfDB	African Development Bank
CFL	Compact Fluorescent Lamp
COMESA	Common Market for Eastern and Southern Africa
COP21	Conference of the Parties (2015 Paris Climate Conference)
CSO	Civil Society Organisations
CSP	Concentrating Solar Power
DBSA	Development Bank of Southern Africa
DRC	Democratic Republic of Congo
DSM	Demand-Side Management
EAC	East African Community
ECOWAS	Economic Community of West African States
EE	Energy Efficiency
ETG	Energy Thematic Group
EUD	European Union Delegation
FIT	Feed-In Tariff
FUNAE	Fundo Nacional de Energia
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
HIVOS	Dutch Organization for Development
I&S	Infrastructure and Services (SADC Directorate)
ICP	International Cooperation Partner
ICS	Improved Cook Stoves
IEA	International Energy Agency
IGMOU	Inter-Governmental Memorandum of Understanding
INDC	Intended Nationally Determined Contributions
IOC	Indian Ocean Commission
IP	Investment Prospectus
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
kW / MW / GW	Kilowatts / Megawatts / Gigawatts
kWh	Kilowatt hours
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas

M&E	Monitoring & Evaluation
M/toe	Mega / tons of oil Equivalent
MEPS	Minimum Energy Performance Standards
MoE	Ministry of Energy
MS	Member States
RE	Renewable Energy
REA	Rural/Renewable Energy Agency
REASAP	Regional Energy Access Strategy and Action Plan
RECs	Regional Economic Communities
REEEP	Renewable Energy and Energy Efficiency Partnership
REESAP	Renewable Energy and Energy Efficiency Strategy and Action Plan
REI4P /REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
REN21	Renewable Energy Policy Network for the 21st Century
RERA	Regional Energy Regulators Association of Southern Africa
RIDMP	Regional Infrastructure Development Master Plan
RISDP	Regional Indicative Strategic Development Plan
SACREEE	The SADC Centre for Renewable Energy and Energy Efficiency
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SARDC	Southern Africa Research and Documentation Centre
SDG7	Sustainable Development Goals (Goal 7 in energy)
SE4All	Sustainable Energy for All
SNV	SNV Netherlands Development Organisation
TAF	Technical Assistance Facility
TFEC	Total Final Energy Consumption
TPES	Total Primary Energy Supply
UK	United Kingdom
UN	United Nations
UNIDO	United Nations Industrial Development Organization
US	United States of America
WB	World Bank

1 ENERGY, THE BUILDING BLOCK OF SUSTAINABLE DEVELOPMENT

“

Sustainable energy is the golden thread that connects economic growth, increased social equity and an environment that allows the world to thrive.”

Ban Ki Moon, former UN Secretary General, 2014.



Access and efficient use of modern energy drives economic growth by improving standards of living and industrial productivity, thereby enabling social and economic development for all (see schematic diagram below). Energy is such a critical ingredient that it was often considered as the missing link in the achievement of the United Nations' Millennium Development Goals (MDG).

Recognizing its importance, the post-2015 global agenda has set a new course, including initiatives like the Sustainable Energy for All (SE4ALL) - which seeks to provide universal access to modern energy services, double the global rate of improvement in energy efficiency and double the share of renewable energy in the global energy mix by 2030, the adoption of the Sustainable Development Goals (SDGs)¹, and the historic commitments made in Paris at the COP 21 in 2015².

African governments, regional organizations and the international donor community now acknowledge that access to sustainable energy is a precondition to economic development in Africa. Investments in the energy sector have been identified as a priority, leading to an influx of new initiatives and programmes.

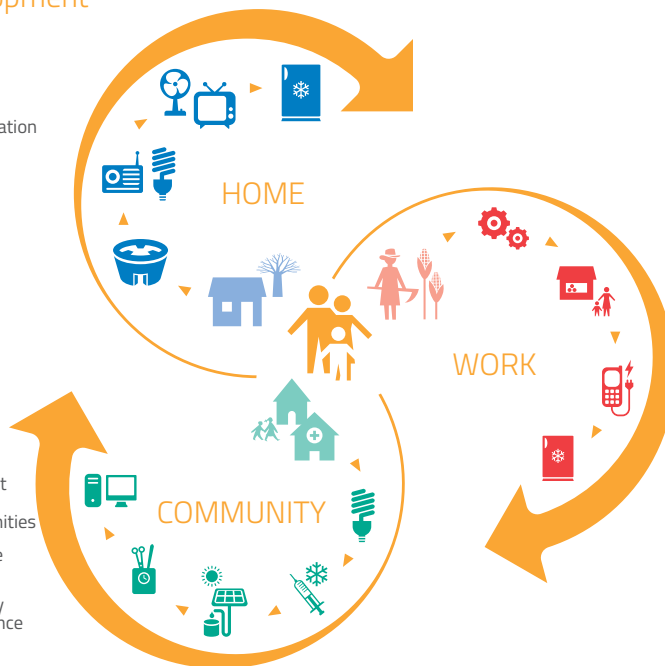
The UN initiative offers a timely stimulus for the SADC region as a whole to accelerate the deployment of renewable energy and energy efficiency technologies and services, in order to address the interlinked challenges of energy access and security, as well as climate change mitigation and adaptation, thereby contributing to its overall socio-economic development.

The provision of reliable and sustainable energy is a priority on the SADC Development Agenda and its vision of economic well-being and poverty eradication.

Total Energy Access is Achievable

Energy Enables Development

- 
 - Faster cooking
 - Less smoke: saves lives
 - More efficient, less wood
- 
 - Study after sunset
 - Connection and communication
- 
 - Increased comfort
 - Leisure and learning
- 
 - Less food waste
 - Better nutrition
- 
 - Reduced physical effort
 - Faster processing
 - Cheaper price
- 
 - Greater range of services
 - Business after dark
- 
 - Trade without travelling
 - Access market information
- 
 - Cool and frozen products
 - Fresher for longer
- 
 - Medical procedures at night
 - Evening education
 - Light streets: safe communities
- 
 - Cool vaccines, less spoilage
 - Reliable and rapid testing
- 
 - Clean, reliable water supply
 - Less time spent, less distance travelled
- 
 - Sterilised equipment
 - Fewer infections
- 
 - Ordered and accessible records
 - Digitised institutions



Adopt Total Energy Access as the approach to defining and delivering energy

Recognise energy needs across home, work and community

Measure energy services, not just supply

Prioritise and adequately finance decentralised solutions

Acknowledge the roles of government, private sector and civil society in achieving Total Energy Access

www.practicalaction.org/totalenergyaccess

PRACTICAL ACTION



¹ Three Sustainable Development Goals (SDGs) 7 (affordable and clean energy), 13 (climate action) and 11 (sustainable cities and communities) are all related to sustainable energy.

² Reduce greenhouse gas emissions, in order to limit global warming to no more than 2 degrees Celsius or 1.5 degrees Celsius, as compared to pre-industrial levels.

2

ENERGY ISSUES FACING THE SADC REGION



“

Energy and water are critical ingredients to the SADC Region's efforts aimed at advancing economic development, regional integration and poverty reduction strategies.”

Key note address by his Excellency, Lieutenant General Dr Seretse Khama Ian Khama, President of the Republic of Botswana, at the special SADC ministerial workshop on water and energy, June 20, 2016.

With an impressive 5% annual average GDP growth recorded over the last ten years, an important increase of its population (2%) and a rapid urbanization (6%), the Southern African Development Community Region is growing fast, and so are its energy needs. Its economic growth has already outpaced the development of its energy services (3% of annual growth over the same period). According to IRENA¹ (2013), “over the next 25 years, electricity demand will triple in Southern Africa”.

Lack of Access to Modern Energy Services

On average, SADC access to electricity stands at 42%², a percentage which drops below 10% in rural areas. These figures mask huge disparities. Overall electricity access rates range from less than 10% in Malawi, and below 20% in the Democratic Republic of Congo and Madagascar, to 100% in Mauritius and nearly full electrification in Seychelles (RERA, 2015).

FOCUS



Energy access definition³

Access to modern energy services provided through electricity, clean cooking fuels, clean heating systems, and energy for productive use and community services.

Ongoing Energy Deficit

After enjoying surplus electricity until 2007, the SADC Region is now experiencing a deficit, demonstrated by power outages and rolling blackouts and brownouts across most of its Member States. The South African Power Pool (SAPP)⁴ reported a power shortfall of approximately 8GW in 2014. There are many underlying causes, such as insufficient generation capacity, and transmission and distribution losses in the national grids (SADC average is 19%, for both losses⁵).

1 Bringing Renewable Power to the People: the Africa Clean Energy Corridor Initiative

2 REN21, 2015, SADC Renewable Energy and Energy Efficiency Status Report

3 Based on SE4ALL-<http://www.worldbank.org/content/dam/Worldbank/document/Energy/se4all/SE4ALL-Energy-Access-Committee-Report-Corrigendum.pdf>

4 SAPP Annual report 2015 (it doesn't include Mauritius, Madagascar and Seychelles, and Malawi, Tanzania and Angola are still not connected to the SAPP grid)

5 REN21, 2015, SADC Renewable Energy and Energy Efficiency Status Report

This situation is holding back SADC's industrialization agenda, as new investments in energy intensive industries, such as mining and manufacturing, need consistent supply of cost-effective energy. If the region's energy demand grows by 6% until 2020 and 8% after 2020 at a similar level to that of the GDP growth (as stipulated in the SADC Industrialization Strategy and Roadmap), the power shortfall will grow and will not be bridged by the year 2020 as predicted, unless new sustainable energy systems are introduced into the energy mix.

KEY FIGURE



Energy-sector bottlenecks and power shortages cost Africa some 2 - 4 % of GDP annually, undermining economic growth, employment creation and investment (source: African Development Bank Group).

Overdependence on Traditional Biomass

Traditional biomass (e.g. wood, charcoal, animal waste) accounts for more than 45% of final energy consumption and 57.4% including modern biomass (e.g. bagasse for boilers in the sugar industry). The overwhelming majority of the rural and urban populations in the SADC Region use solid fuels for cooking and heating, with an average of 61.2%, and 5 Member States even reach 95%⁶. Apart from domestic use, wood fuel energy is used by some rural industries that consume significant amounts of firewood and include brick making, lime production, fish smoking, beer brewing, and the drying of coffee, tea and tobacco.

This heavy reliance on traditional biomass has resulted in overexploitation of the natural forest resources and serious health problems. Cooking is generally done using inefficient open fires in poorly ventilated huts, exposing the people (especially women and children) to indoor air pollution. As biomass will remain the primary source of basic energy consumption for families and small businesses in most parts of Southern Africa in the near future, it is crucial that the available energy is being used in a cleaner and safer way.

6 REN21, 2015, SADC Renewable Energy and Energy Efficiency Status Report

KEY FIGURE



More than 153,000 people die each year from household air pollution as a result of upper respiratory infections, due to indoor burning of solid fuels for cooking and heating (source: REN21, 2015, SADC Renewable Energy and Energy Efficiency Status Report).

SPOTLIGHT



Improved cook stoves in Zambia

Under the Improved Cook Stoves (ICS) programme, SNV supported local artisans in Zambia to make improved cook stoves and developed the supply chain to enable the artisans to produce and sell the environmentally sustainable cook stoves in rural Zambia. Since the onset of the project in 2012, a total of 12,720 improved cook stoves were produced and sold, reaching approximately 76,500 people, 106 local people were trained, and 2 organisations (Wind of Change and Zambia Environmental and Gender Organisation-ZENGO) are operational.



© Charcoal Stove - Wind of change, Zambia

Charcoal production has been cited as one of the biggest single contributors to deforestation.

Cross-cutting Issues

Climate change

Climate change poses a double challenge for the region. Coal is the backbone of power generation. But its high carbon content is not compatible with the pledges taken under the December 2015 Paris Agreement by all SADC Member States. A cleaner energy mix, deploying RE and EE, is an effective means the MS can use to reduce greenhouse gas emissions in the energy sector.

Moreover, the energy sector will have to adapt to climate change in the coming years. Temperature rise and increased frequency of extreme weather

events, such as floods, cyclones and droughts, will bring added risks to the energy security of SADC Member States. They can cause physical damage to energy infrastructure, lead to deficiency in resources such as water for hydropower, affect biomass production and indirectly the availability of biomass energy, impact equipment efficiency and increase energy demand (e.g. for irrigation). They have to be fully taken into account in energy planning. Under the uncertainty posed by climate change for hydropower generation (with the already observed reduction of river flows), other renewable energy sources and energy efficiency offer an alternative for a more sustainable and resilient energy system.

Water-food-energy nexus

Water, energy and food are inextricably linked. Energy is used to pump water, power tractors and irrigation machinery, and process and transport agricultural goods. In urban areas, 3% of the electrical energy is used on average to transport and treat water and waste water. Water is required for the production of energy, whether it is in the extraction and processing of fossil fuels, biofuel production, hydropower generation or in thermal power production. Water is used for producing and processing agricultural goods. Factors such as population growth, climate change, urbanization, improving living standards and food consumption are increasing both water and energy consumption.

Water, energy and food security are all vital for a sustainable future. Approaching them as a nexus is essential to manage the limited resources sustainably. Land use planning, water resource management, food production and agricultural productivity must be integrated in energy planning, especially in the cases of large hydropower and bioenergy projects. Hydropower competes with agriculture for water. Growing bioenergy crops can increase energy access and alleviate poverty, through employment creation and income generating opportunities, but it can also have serious negative impact on water availability and food security. Using water to irrigate crops can increase food production, but also reduce river flows and hydropower potential. Converting surface irrigation into high efficiency pressurized irrigation may save water, but may also result in higher energy use. These are only some examples of the numerous synergies and trade-offs that must be taken into account.

Gender

Access to energy is “gendered”. Constituting more than half of the population of most SADC Member States, women, and girls to a large extent, are the primary users of household energy and often the most adversely affected by the lack of access to modern, clean, affordable and sustainable energy services. They are responsible for almost all of the domestic energy supply, especially in rural areas. They work longer than men, providing human energy for activities such as cooking, collecting fuel, wood and water, as well as agricultural planting, harvesting, grinding and milling. When they have businesses, they often manage energy intensive activities (e.g. sale of food products, cooking, smoking fish, food processing). Therefore, the consequences of the high dependence on biomass and energy shortages weigh particularly on them.

This drudgery has dramatic impact on their status. They are deprived of time for education, as girls are often kept from attending primary schools, in order to help their mothers meet family subsistence needs. They have no time for productive activities or leisure, and they are at risk of long-term health problems and more vulnerable to physical or sexual violence. Improved access to electricity and modern fuels can reduce their physical burden and free up valuable time for engaging in income-generating activities and capacity building, improving their health and living conditions, and spending more time with their families.

Beyond this gender issue, sustainable energy can also empower vulnerable groups, such as single parent homes, orphans, elderly and people with chronic illnesses or disabilities, and help them break the cycle of poverty.

SPOTLIGHT

Biodigesters to increase energy access in rural areas



Biodigesters convert animal dung and various other organic materials into combustible gas commonly known as biogas, composed primarily of methane (CH₄) and carbon dioxide (CO₂). The methane is a valuable product as it is an effective energy carrier that has a wide range of uses from simple gas stove for cooking to lamps for lighting to powering of absorption coolers for milk chilling. The slurry left over from this process is easily collected and can be used as an organic fertilizer to improve soil fertility and hence increase crop yields. The CO₂ produced is equivalent to the quantity of CO₂ captured when the biomass was created. Biogas is therefore CO₂

neutral source of energy, popularly referred to as a renewable energy source. (Source SNV)



The Energy for Agriculture (E4A) project, funded by the Swedish International Development Cooperation (SIDA) and implemented by SNV Netherlands Development organisation, aims to develop viable markets for productive biogas in Zambia. Here, local technicians were trained to construct biodigesters called ZamDigesters, in Mochhipapa, Choma in Southern Province, Zambia.

FIGURES

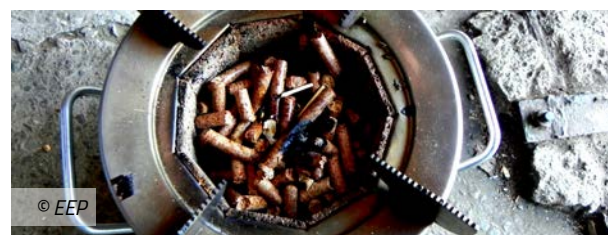


- Many rural women spend up to three hours a day gathering fuel and carrying heavy loads to meet their energy requirements, particularly for cooking food.
- Studies show that women reinvest up to 90% of their incomes into their families and education, compared to just 30-40% by men.

FOCUS



Turning waste into energy



Waste is potentially a resource. Briquettes made from agro crop residues (by the low-pressure compaction of paper, sawdust, agricultural or yard waste ...) can be a modern renewable alternative to charcoal, providing equivalent convenience of use and income earning opportunities.

Energy Issues at a Glance in the SADC Region

Access to Electricity

- 42% in SADC Region¹
 - Only 10% in rural areas²
- Compared to 44% in ECOWAS Region



Energy Security

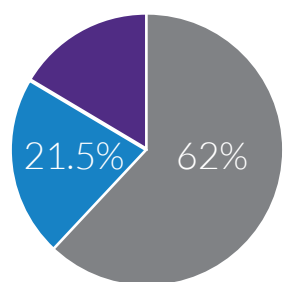


62 GW
of total installed capacity³

Power shortfall of 8 GW
in the SAPP - expected to
continue until 2020

Energy Supply and Use

Supply



62% = Coal
of total electricity capacity



21.5% = Hydropower
of total electricity capacity



16.5% = Other Types
of total electricity capacity

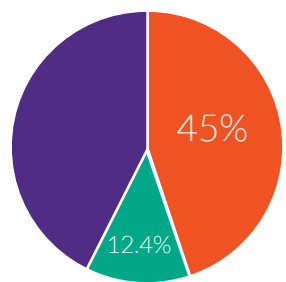


Large-scale
hydro = 97.6%



Small-scale
hydro = 2.4%

Consumption



57.4% = Biomass
of the final energy consumption



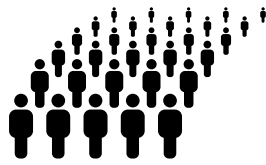
Traditional
Biomass ≥ 45%⁴



Modern
Biomass = 12.4%

1 REN21, 2015, SADC RE and EE Status Report
 2 RERA, 2015
 3 SAPP annual report, 2015 - (Mauritius, Madagascar and Seychelles are not part of SAPP)
 4 REN21 SADC RE Status Report, 2015





61.2%

of the population use solid fuels for cooking and heating



More than 153,000 people die each year from household air pollution due to indoor burning of solid fuels for cooking and heating



Share of Renewables in Energy Mix

Renewables account for **23.5%** of the total power generation

Energy Efficiency



4,500 MW of energy savings (2011-2015) under the SAPP Demand-side management programme



3/4 from CFLs installations⁵

Energy Intensity⁶



Average 9.4 MJ, Compared to 12.4 MJ for Sub-Saharan Africa and 14.5 MJ for ECOWAS (2012)⁷

Funding



Public spending on power sector is below **3%**

5 SAPP Monthly report, April 2016

6 See definition p.56

7 REN21 SADC RE Status Report, 2015

3

ASSETS TO MEET THE CHALLENGES

“

Africa has huge potential, young people and is fastest-growing region in the world. We have the vision, but we need a clear transformation of experts, policymakers and the economy in managing energy.”

Aboubakari Baba Moussa, Director of Infrastructure and Energy Department at the African Union, 2nd high-level meeting of the Africa-European Union Energy Partnership in Addis Ababa, Ethiopia (2014).

A Huge Potential for RE and EE Development

The significant energy challenges of access and security within the context of climate change are major policy drivers for Renewable Energy (RE) and Energy Efficiency (EE) development.

The SADC Region needs to make critical decisions about its energy future. Ageing assets need to be replaced and new assets need to be efficient, clean, reliable and climate-resilient. Sustainable energy can reduce fuel imports and spare some SADC economies from the volatile fossil fuel prices. The global fuel prices may be at their lowest now, but throughout history, oil prices have been erratic.

The region is blessed with abundant renewable energy sources and energy efficiency opportunities. RE and EE offer the cheapest way of investment into additional capacity to meet the ever increasing energy demand, improve energy access and security, lessen the region’s carbon footprint and significantly improve its socio-economic development.

Tapping the Abundant Energy Resources

The major RE source exploited at the moment is hydropower, contributing about 21.5% to the SAPP electricity generation mix. But the region has also significant small and medium hydropower, solar, wind, bioenergy and geothermal potential (see text box below) that have not started to be exploited substantially. These abundant resources are a perfect match to meet rising demand in a sustainable and cost-effective way. Providing renewable energy in a decentralized manner is faster than going through a centralized power plant system, and it can result in local employment for deployment and maintenance. The SADC Region can leapfrog into a sustainable

energy future, just as mobile phones recently leapfrogged landlines.

SPOTLIGHT

Distributed renewable energy systems and rural electrification



Containerized PV System improving access to energy for government institutions and households in Namibian rural areas.

Distributed renewable energy (DRE) systems are emerging as the most cost-effective, timely and reliable approach to meet the energy needs of rural communities. They include, among others, rooftop solar photovoltaic (PV) panels and wind turbines, small-scale hydropower and biogas plants. With declining costs and technological improvements in electricity storage and control systems, these off-grid solutions could become an important growth market for the future deployment of renewables. Green mini-grids also offer a very promising approach to rural electrification. Combining various energy resources (small hydropower, solar PV and/or biomass plants), they can serve the needs of communities too distant to be economically connected to the grid in the near to medium term, but densely populated enough to offer economies of scale in power delivery, compared with individual home systems.

	RE source	Potential	Total installed capacity
	Hydropower	40,874 MW	12,000 MW
	Solar	20,000 TWh/year (IRENA)	1% solar generated electricity
	Wind	800 TWh (/year) – REN21 SADC RE Status Report, 2015	Less than 1% wind generated electricity
	Biomass generated Electricity	9,500 MW (based on agricultural waste alone) REN21 SADC RE Status Report, 2015	2,500 MW biomass generated electricity
	Geothermal	4,000 MW (SADC/SARDC 2014)	

1 TWh = 1,000,000 MWh

The mini-grids' modularity means that they can be a stepping stone towards electrification, followed by integration with the grid at a later stage. The International Energy Agency has estimated that 40% of investment required to achieve universal electricity access by 2030 can most economically be achieved through mini-grids. However, their development is hindered by a lack of well-established rural electrification plans and policies, for instance in terms of where network expansion will go and whether mini-grids could be connected to the network when the grid reaches them.



KEY FIGURE

The International Energy Agency (IEA) estimates that 55% of all new power between now and 2030 will have to come from decentralized energy sources (with 90% of it being renewable), if universal energy access goals are to be met. -Source: REN21 Renewables 2015 Global Status Report.

SPOTLIGHT



A solar mini-grid project for rural communities



Decentralized energy promotes a participatory approach creating local jobs and development in local communities.

Implemented by Practical Action (the lead partner), Hivos and SNV, in partnership with local voluntary groups (Dabane Trust in Zimbabwe and CARD and Environment Africa in Malawi), the Sustainable Energy for Rural Communities (SE4RC-2015-2019) seeks to use solar energy to enhance agricultural productivity in isolated rural communities in Zimbabwe (Gwanda District) and Malawi (Nsanje, Chikwawa Districts). The solar technology will be used to draw water from nearby major rivers, Shashe and Thuli in Zimbabwe, and the Shire in Malawi. These solar-powered decentralized mini-grids will generate over 200kW to support productive end use, power schools and clinics and are set to benefit at least 30,000 people. Schools will be able to use

lights, computers, printers, photocopiers and other tools that improve learning and teaching. Clinics will have access to reliable energy, which enables the use of refrigerators to store vaccines and drugs. Electric lighting will improve 24-hour healthcare including maternity delivery and emergency services and the schemes can double their production by harvesting 2-3 crop yields per year, and by increasing the number of hectares under irrigation. This will increase the food available locally and the farmers will benefit from increased yields and links to markets. Electricity will also enable people to set up agro-processing businesses. And at least 19 small local entrepreneurs will have the opportunity to invest in Energy Services Centres (small energy 'kiosks' e.g. battery charging, small shops, or study centres - with Internet access).

Making Energy Efficiency the Region's First Fuel

The cheapest energy is the one not consumed. Often considered as "the first fuel", energy efficiency is one of the most cost-effective ways to ensure energy security and reduce greenhouse gas emissions.

The SADC Region has vast opportunities for energy savings, through more efficient technologies, fuel switching, and change of habits and processes. There is a large untapped potential for enhancing conservation measures across key sectors, like buildings and air conditioning, heavy industry and transport (all of which are major sources of energy demand growth).

Energy efficiency needs to be supported at each stage, from primary energy extraction, through transmission, and to end-use of energy. Challenges are high, because of the diversity of energy uses and markets for various equipment and services that result in improved energy efficiency. This support includes policy and regulatory measures, technologies and standards, capacity building, research and development, awareness raising and mobilization of appropriate investments in energy efficiency projects.

The efforts being made through some demand-side management need to be up-scaled and replicated, in order to realize larger benefits in the form of offset investments in new plant capacity.

SPOTLIGHT



Fuel switching and public acceptance

Switching fuels raises barriers that can be difficult to overcome. For instance, even if LPG (liquefied petroleum gas) has economic, environmental and health benefits and could be potentially better than using clean cooking stoves (especially in urban

areas), the consumers may find it unaffordable to purchase the gas stoves and the gas canisters. There is also a problem of social acceptance, e.g. due to perceived difference in the taste of food and new cooking processes. However, LPG is already widely used in some MS like Botswana, where over 50% of rural and 70% of urban households are already cooking with it. The country has well established distribution channels and technical standards, which could inspire other MS.



In Botswana, over 50% of rural and 70% of urban households are already cooking with LPG.

QUOTE

“When the potentials of energy efficiency and renewables are combined, the growth in total primary energy supply (TPES) can be reduced by up to 25% compared to business as usual in 2030.”
-Source: IRENA

SPOTLIGHT

SAPP and Demand-Side Management programmes



Solar water heating systems could play a major role in reducing the electricity demand and CO₂ emissions caused by fossil power plants.

Faced with an ongoing energy deficit, the Southern African Power Pool (SAPP)¹ has been promoting a number of Demand-Side Management (DSM) programmes, aimed at modifying consumer demand for energy through various methods such as the replacement of incandescent bulbs² with Compact

¹ Coordinates the planning, generation, transmission and marketing of electricity on behalf of Member States utilities in the SADC Region

² Zambia will phase out the use of incandescent bulbs by January 2017, while other MS have agreed to do it by December 2017, during the 35th SADC Meeting of Responsible for Energy (Botswana, 21 June 2016)

Fluorescent Lamps (CFLs) and Light Emitting Diodes (LEDs) bulbs, installation of solar water heaters and pre-paid meters³, improvement of commercial lighting, hot water load control, awareness campaigns. The energy efficiency measures have resulted in significant savings of about 4,500 MW as of September 2015 since the launch of the initiative in 2011. And the biggest savings have been realized from CFLs installation, accounting for 3/4 of the amount saved.

KEY FIGURES

- Residential lighting accounts for about 20% of the average home electricity bill in the SADC region. Compared to incandescent bulbs, CFLs save up to 80% of electricity consumption
-Source: SAPP, 2014.
- Installation of solar water heating appliances can easily drop household electricity bills by 40%
-Source: SADC Energy and Water Ministerial Joint Workshop, June 2016.
- Improved cooking stoves can save at least 50% of the quantity of fuel used for cooking.
-Source: GIZ Endev personal communication.

SPOTLIGHT

Building codes for greater energy efficiency

Buildings are responsible for more than a quarter of the final energy consumed worldwide. Building energy codes are therefore a key policy instrument used by governments to limit buildings' pressure on the energy sector and environment, while providing occupants with comfort and modern living conditions. However, only the South African Bureau of Standards has been able to develop a series of mandatory and voluntary building codes to regulate the market. These codes set the minimum requirements for energy usage in new buildings, but leave the choice of the technology to the developer, with the objective to promote innovation and the use of alternative energies for meeting the electricity and heating loads.

Botswana and Namibia have also developed programmes aimed at promoting EE in the building sector. Besides developing energy guidelines for new buildings, their programmes have also included the training of a number of auditors. It is foreseen that the guidelines developed in these two countries are incorporated in their national building codes.

³ Used by the majority of the SAPP utilities, they can help tackle meter faults, illegal connections and improve revenue collection

SPOTLIGHT**Building codes for greater energy efficiency**

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A Thriving Market

Technology developments and cost reductions

The RE and EE market is thriving. Renewable energy is undergoing rapid and significant technology developments and cost-reductions, in particular for wind and solar energy. Price of solar photovoltaic panels has plummeted in recent years, battery technology has radically improved, and electrical appliances have become more energy efficient. Solar PV and onshore wind technologies have become competitive with conventional sources of energy. Even if initial investment costs for introducing more renewable technologies into the power system are higher than those for fossil fuel technologies, the

cost savings effects (i.e. fuel saving and the reduction of transmission and distribution investments, especially with decentralized renewable options), far exceed the additional investment costs. Additional flagship projects for CSP with storage, ocean/tidal wave energy, biomass based power generation and geothermal sources need a concerted regional effort and further technology assessments and developments, as they promise to make also significant contributions to the sustainable supply of SADC's energy mix.

SPOTLIGHT**Southern Africa attracts increased interest in biofuel investments**

There is a growing interest in biofuels - ethanol, biodiesel, and biogas - which can be combusted in vehicle engines as transport fuels, in stationary engines for heat and electricity generation, and used for domestic heating and cooking (for example, as ethanol gels). Member States such as Malawi, South Africa, Zimbabwe, Swaziland and Mauritius have been producing ethanol from sugar cane molasses and are now exploring production of ethanol directly from sugar cane. Other Member States, such as Angola, Tanzania, Mozambique and Zambia are also stepping up efforts in this area. Apart from sugar cane, the region possesses a great potential for ethanol production from crops such as cashew nuts, manioc, maize, citrus trees, and productive land in relative abundance (Angola, Mozambique, Zambia and Zimbabwe). Considered as a highly promising energy solution, biofuel production can reduce dependence on imported fossil fuels and lower greenhouse gas emissions. It can also diversify the cropping systems, increase rural incomes and empower women. However, this approach needs adequate assessment and understanding of the economic, environmental and social implications, such as food security (see nexus approach p.12).



Sugar cane is currently the world's most commercially important energy crop.

FOCUS



Ocean energy

The oceans have the potential of providing a substantial amount of new renewable energy around the world and are close to many if not most concentrated populations. It is estimated that 0.1% of the energy in ocean waves could be capable of supplying the entire world's energy requirements five times over⁴. The movement of water in the oceans creates a vast store of energy in motion that can be harnessed to generate electricity to power homes, transport and industries. Ocean energy comprises wave energy (converting the energy of waves into electricity), tidal energy (generated from tidal movements) and ocean thermal energy (converting the temperature difference between surface water and water at depth into energy).



The oceans are a very promising source of renewable energy.

SPOTLIGHT

Converting bio-waste into green energy -
The Zandam cheese & piggery

Waste-to-energy is one of the most robust, effective alternative energy options to reduce CO2 emissions and replace fossil fuels.

The project was established to convert around 22 tons per day of pig manure into bio-methane via a 500m³ anaerobic digester. IBERT, which successfully uses advanced technology from Austria, planned, designed, constructed, commissioned and now operates the custom built biogas plant in South Africa. The plant will produce around 40m³/biogas per hour, which is used as fuel in a biogas Combined Heat and Power (CHP) system producing electricity and heat.



KEY FIGURES

- The average costs for electricity generated by solar power and wind could decrease by between 26 and 59% by 2025, according to a report by IRENA.
- Globally, the decentralized RE industry is expected to create at least 4.5 million direct jobs by 2030. -Source: IRENA, RE and jobs, 2013

A Clear Upward Trend in Renewable Capacity

Since 2000, RE capacity has been steadily growing up to 2013, after which the capacity addition of RE has been faster due to the increase in RE generation in South Africa. Over 80% of the new capacity added in 2014 into the SAPP grid came from renewable energy (through South Africa only). Renewable energy now accounts for approximately 23.5% of the total generation in the SADC Region⁵ and this figure could rise to 60%, under favourable policies, according to IRENA.



KEY FIGURES

Worldwide, 2015 was a record year for RE installations, with an estimated 147 gigawatts (GW) added to renewable power generating capacity, which represents the largest increase ever. -Source: REN21, Renewables 2016 Global Status Report.

QUOTE



“What is truly remarkable about these results is that they were achieved at a time when fossil fuel prices were at historic lows, and renewables remained at a significant disadvantage in terms of government subsidies. For every dollar spent boosting renewables, nearly four dollars were spent to maintain our dependence on fossil fuels.”

- Christine Lins, Executive Secretary of REN21.

4 European Commission, 2015

5 REN21, 2015, SADC Renewable Energy and Energy Efficiency Status Report

SPOTLIGHT

Chobe Game Lodge leads the way in eco technologies for tourism in Botswana

Botswana, a safari destination in Africa, is becoming one of the world's leading ecotourism destinations and Chobe Game Lodge is at the forefront. In 2014, it launched Africa's first ever CO₂ emission free silent electric fleet of 4 game-viewers and safari boats. The electricity that charges the long-life lithium batteries to power the vehicle and boat comes from the hydroelectric scheme at Victoria Falls. Through the use of electric vehicles, Chobe Game Lodge has saved a total of about 30 tons of CO₂ emissions. In 2015, the lodge was recognized as "the best property in Africa for resource management" and in 2016, it introduced the first fully autonomous solar powered safari boat.



Eco tourism at Chobe Game Lodge Botswana.

Emergence of New Policy Concepts

The emergence of new policy concepts, such as Feed-in tariffs (FIT), net metering, and auctioning of power supply from Independent Power Producers (IPPs), have led to an increase in renewable energy investments and they need to be scaled up and widely implemented throughout the region.

FOCUS

**"Tariffs and agreements"**

- *Cost-reflective tariffs*

Reflecting the true costs of producing energy or electricity generation at time of use, they encourage people to move their electricity consumption from peak to off-peak periods, by adjusting the price charged at certain times of the day. In the SADC Region, many utilities charge consumers lower for a unit of electricity than what it costs to produce it. The SADC Ministers responsible for Energy reaffirmed in July 2015 their commitment "to reach their full cost-

reflective tariffs by 2019, in accordance with the RISDP target of 2020".

- *Feed-in tariffs (FIT)*

A Feed-in tariff is a policy mechanism designed to accelerate investment in renewable energy technologies. It achieves this by offering long-term contracts to renewable energy producers, typically based on the cost of generation of each technology. Rather than pay an equal amount for energy, however generated, technologies such as wind power, for instance, are awarded a lower per-kWh price, while technologies such as solar PV and tidal power are offered a higher price, reflecting costs that are higher at the moment. FIT programmes exist in Namibia (for wind, solar and biomass projects less than 5 MW) and Tanzania (for small hydro less than 10 MW), and they soon will be introduced in other countries, e.g. Mozambique and Zimbabwe.

- *Power purchase agreement (PPA)*

This is a legal contract between an electricity generator and a power purchaser, lasting between 5 and 20 years. Such agreements play a key role in the financing of independently owned electricity generating assets. The seller under the PPA is typically an Independent Power Producer (IPP), an entity which generates and supplies power to the state utilities or directly to the end users. IPP is not a state utility, but it can be part of a Public Private Partnership entity, together with a state utility.

- *Net metering*

This policy is designed to foster private investment in renewable energy, by allowing a two-way flow of electricity between the electricity distribution grid and customers that have their own generation system. The customer pays only for the net electricity delivered from the utility (total consumption minus self-production). Some SADC Member States - Mauritius and Namibia - have instituted net metering, but others are following suit, e.g. South Africa and Zimbabwe that are planning similar programmes.

The Added Value of a Regional Approach

The SADC recognizes that regional integration is central to addressing the existing energy challenges. Even if each Member State relies on energy in a different way and starts with a different set of policies already in place, there are several and common barriers that can benefit from a regionally concerted approach.

The SADC can contribute to:

- create stable, predictable and conducive investment environments;
- upgrade grid infrastructure for better RE grid integration and reduce grid losses;
- drive key harmonization of policies and regulations, given the integration of the economies and the energy sectors and the transboundary nature of manufacturing industry;
- introduce regional labels, codes and minimum standards for RE/EE equipment or appliances that can be more effective than isolated and non-harmonized national rules;
- generate economies of scale and form larger competitive markets;
- create more local added value, business and jobs, through applied research and manufacturing;
- leverage knowledge, capacities and resources with relevant regional and international organizations;
- accelerate investment in the RE and EE opportunities by a coordinated approach;
- coordinate the relevant activities in the SADC Region and harmonize participation of ICPs in line with the Paris declaration on aid effectiveness;
- enhance capacity building and awareness raising;
- provide quality data for good decision making (regional database on RE and EE, potential quality projects, reliable contacts, opportunities...);
- scale up exchanges of information, experiences and best practices;
- address more efficiently the water-energy-food nexus, climate change and gender challenges, as well as the needs of the energy-poor lives;
- enable common progress in accelerating the deployment of sustainable energy, through a monitoring and evaluation system.

SPOTLIGHT



UNIDO/SANEDI low-carbon transport Project Collaboration.

Transportation of people and goods (by road, rail, air and sea) is responsible for around 25% of global energy use. This energy comes mostly from oil products, fueling climate change and causing air pollution. Smart transport systems powered by 100 percent renewable energy are therefore pivotal to a clean energy future. UNIDO is implementing a project on the promotion of energy-efficient, low-carbon transport in South Africa, in cooperation with the South African National Energy Development Institute (SANEDI). The objective is to promote the widespread use of electric vehicles (EVs) and non-motorized transport (NMT), as well as the development of the necessary infrastructure, as part of the Green Transport and Green Cities initiatives of South Africa.



Launch of a Solar PV Charging Station for Electrical Vehicles (EVs) for the City of Johannesburg at the IDC office in Sandton, during the Low-carbon Transport Project Event.

4

CURRENT SUSTAINABLE ENERGY TARGETS BY 2030

“

New and renewable energy technologies can help Southern African countries improve water security, extend electricity services and fight climate change.”

*Sakari Oksanen, Deputy Director-General,
International Renewable Energy Agency (IRENA).*

Sustainable Energy Targets

Regional Targets

Adapted from two key SADC energy instruments, the Regional Energy Access Strategy and Action Plan (REASAP) and the Regional Infrastructure Development Master Plan (RIDMP), regional targets have been set up to 2030, aiming to increase energy access and security, fuel socio-economic development and enhance environmental sustainability.



KEY FIGURE

According to IRENA¹, the share of renewable technologies in electricity production in the region could increase from the current level of 10% to as high as 46% in 2030.

Targets	2020 (%)	2025 (%)	2030 (%)
Access to electricity ²		71	85,5
RE mix in the grid	33		39
Off-grid share of renewable energy as per total grid electricity capacity	5		7,5
Cooking/heating efficient devices penetration	10		15
Ethanol blending ratio with gasoline	10		20
Biodiesel blending ratio with diesel	5		10
Energy efficiency % savings achieved from grid consumption	10		15
Efficient charcoal production share in the charcoal market	5		5

National targets

Targets, like the share of RE in the energy mix and access to modern clean energy or electricity, vary considerably among MS, while some do not have any specific targets, and they are set for different time frames. Therefore, it is impossible to compare or combine them to form a SADC level target. The table (below) shows targets for RE and energy access that have been obtained for the MS to date, with their contributions or with the help of various third party sources (World Bank, UNEP, EU, SE4ALL...).

MS Targets on RE Share and Energy Access

Country	RE Mix (%)	Energy Access
Angola		60% (electricity) by 2025
Botswana		90% (electricity) by 2030
DRC		60% electricity access by 2025
Lesotho		At least 50% electrification by 2020
Madagascar	54% (share of final energy, 2020)	
Malawi	7% (share of final energy, 2020), 10% (share of energy, 2050)	30% electricity access by 2030
Mauritius	35% (share of electricity by 2025)	
Mozambique	24.4% of new RE installed capacity by 2030	56% (electricity) by 2030; 30% (modern fuel for cooking) by 2030
Namibia	70% (of grid electricity mix being considered by 2030)	50% (modern energy services) by 2020, 100% access by 2030
Seychelles	15% (share of electricity, 2030)	
South Africa	42% (share of electricity, 2030)	
Swaziland	50% (share of electricity, 2030)	Universal Access (100% Electricity) by 2030
Tanzania	50% (electricity, including off grid 2030), >2.6% rate of EE improvement per year	>75% by 2030 (electricity access)
Zambia		66% (electrification rate by 2030)
Zimbabwe		Universal by 2030

1 SOUTHERN AFRICAN POWER POOL: Planning and Prospects for Renewable Energy (2013).

2 Based on the REASAP defined progression to increased energy access and on the 2015 electricity access of 42%

5

FORMULATION PROCESS

“

The breadth and ambition of the objectives we have set ourselves are unprecedented, as are the challenges we will need to confront to realize a sustainable future for all. Only by mobilizing all actors to contribute to this endeavour, with each and every one bringing to the table their respective strengths, capacities and resources, will we be successful.”

*Achim Steiner, UNEP Executive Director,
Sustainable Development Goals Summit,
New-York, 26 September 2015.*

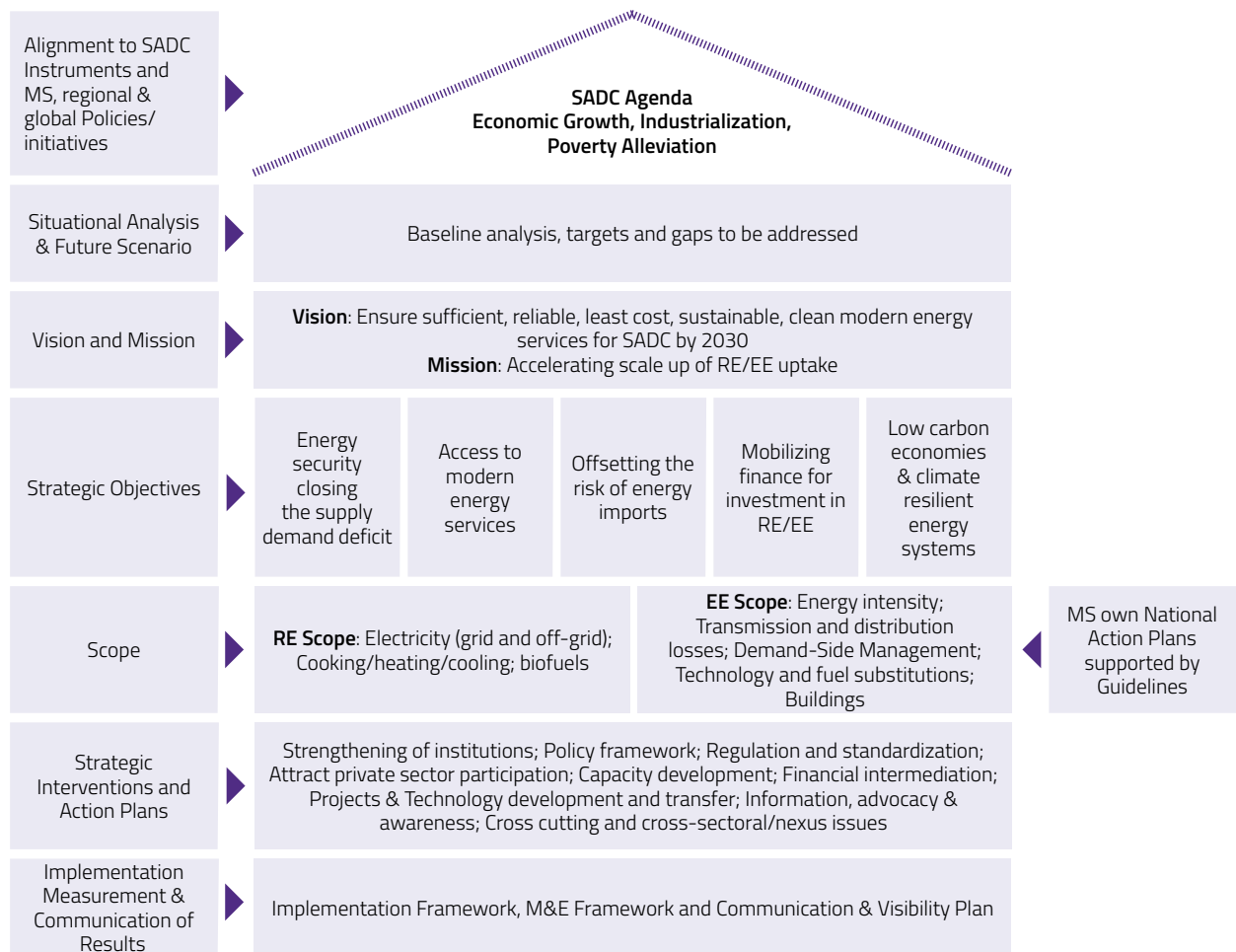
A Broad Consultative Process

REEESAP is the result of a broad consultative process, over several months, including the SADC Secretariat, its implementing agencies (SAPP, RERA, SACREEE), intergovernmental organisations (COMESA, IOC), International Cooperating Partners (EU, UNIDO, IRENA, EEP, UNDP, GIZ, AFD, JICA, etc.) and a wide array of stakeholders from the 15 SADC Member States: public sector (Ministries, agencies and other key government departments and state-owned entities in charge of energy - power utilities, energy/electricity regulators, rural electrification/renewable energy Agencies/Commissions), private sector (chambers, associations), development banks and other financial institutions, civil society organizations (NGOs...), academia and research/training institutions...

Through field visits across the region and two workshops (formulation and validation), this open process of collaborative thinking, decision-making and inputs from various stakeholders was crucial to sharpen the analysis, provide the most up-to-date and comprehensive overview of the renewable energy and energy efficiency situation, opportunities and challenges in the region, and prioritize regional strategic interventions, in order to unleash the potential and scale up investment priorities.

Conceptual Framework

Aligned with SADC instruments and other global initiatives and objectives, REEESAP intends to rapidly increase, at an affordable cost, energy access and security, by setting ambitious regional and national targets by 2030.



REEESAP has been elaborated within the framework of the overall Southern African Development Community (SADC) Development Agenda of regional economic integration and poverty eradication, in consistency with key SADC energy instruments and Agency Plans and roles, listed below.

SADC INSTRUMENT	OBJECTIVE
SADC Treaty (1992)	Regional economic integration and poverty reduction.
Energy Protocol (1996)	Cross-sectoral issues/approach with water, agriculture, forestry, demand sectors.
Regional Energy Access Strategy and Action Plan (REASAP -2010)	Halving the proportion of people without access to adequate, reliable, least-cost, environmentally sustainable energy services within ten years for each end use (lighting and small power, heavy power and heat), and halving it again in successive five-year periods, until there is universal access for all end users.
Regional Infrastructure Development Master Plan (RIDMP, 2012-2027)	Harnessing the huge potential of renewable energy resources and energy efficiency opportunities, and diversifying the energy mix.
Regional Indicative Strategic Development Plan (RISDP, 2015-2020)	Stipulating various targets for energy access: <ul style="list-style-type: none"> ▪ SADC Renewable Energy Strategy and Action Plan is implemented in all Member States by 2019; ▪ SADC Protocol on Energy is revised by 2020; ▪ Regional Energy sector-wide Regulatory Framework is developed by 2018; ▪ Planned electricity generation and transmission expansion capacity is implemented by 2020; ▪ Migration to cost-reflective tariffs is achieved by 2020.
SACREEE Project Document	Promote markets for RE/EE technologies and services.
SAPP Plans	Regional electricity planning and trading; project development and implementation.
RERA instruments	Electricity regulatory framework.
Energy Ministers Decisions	Informing on direction being pursued.

Apart from the SADC energy instruments, the development of REEESAP has been also inspired by various regional and global initiatives and supports, such as SE4ALL, IRENA, AEEP and REN 21 (see below).

SE4ALL

Every Member State that has ratified SE4ALL is expected to undertake a process - setting RE/EE and energy access targets and measures to achieve them - and producing 3 main documents:

- Rapid Assessment and Gap Analysis (RAGA)
- Action Agenda (AA)
- Investment Prospectus (IP)

International Renewable Energy Agency (IRENA)

This Centre of excellence for RE under SE4ALL also supports participating members to conduct RE resource assessments, RE Rapid Assessment and develop RE-Roadmaps, hence availing technical resources towards improved adoption of RE (more info p.40).

The African Development Bank (AfDB)

AfDB has set an ambitious goal to help the continent achieve universal electricity access by 2025 under the New Deal on Energy Initiative on which MS can align to benefit from financing resources. It will support 160 GW of new RE generation capacity, 130 GW on grid; 130 million new on-grid connections; 75 million new off-grid connections, and provide 150 million households with access to clean cooking solutions.

Africa-EU Energy Partnership (AEEP)

AEEP aims to provide by 2020 an additional 100 million Africans with access to sustainable energy services; double the number of electricity interconnections between African countries; raise the proportion of renewable energy in the energy mix, generating at least 15,500 megawatts (MW) of new hydro, wind and solar power; and increase energy efficiency across all sectors.

REN 21

The global RE network generates planning data that can guide decision making on future RE/EE investments.

Energy & Environment Partnership programme (EEP)

Jointly funded by the Austrian Development Agency, the Ministry of Foreign Affairs of Finland and the UK's Department for International Development, this programme is funding projects in all fields of renewable energy and energy efficiency, bridging the gap between a good idea and a bankable project (more info p.40).

Power Africa

Launched by US President Barack Obama in 2013, this US\$7 billion initiative aims at doubling electricity access in Sub-Saharan Africa, including a "Beyond the Grid" initiative with a focus on off-grid and small-scale energy. Power Africa's goals are to add 60 million new electricity connections and generate 30 GW of new generating capacity by 2030.

Power Africa offers the combined resources of 12 U.S. government agencies, the World Bank Group, the African Development Bank, the Government of Sweden, partner African governments, and many other Power Africa public and private sector partners.

Austrian Development Cooperation (ADC)

ADC is actively involved in RE and EE programmes in Southern Africa, mainly through the establishment of the SACREEE (also supported by UNIDO and other ICPs), and financial support of specific programmes (EEP, SOLTRAIN, low energy house project in Namibia...). Since 2009, Austria has committed EUR 8,5 million in support of sustainable energy solutions to the SADC region and pledged another EUR 3,5 million until 2018.

6

BARRIERS AND GAPS TO OVERCOME

“

A world that has just reached a population of seven billion must take into account industrial energy efficiency, if it wants to address such challenges as green growth, employment generation, security, climate change, food production and poverty reduction. Industrial energy efficiency is essential for strengthening economies, protecting ecosystems and achieving social benefits.”

Kandeh K. Yumkella, UN Secretary General's Special Representative for Sustainable Energy for All (SE4All) and former Executive Director of UNIDO.



Although SADC has great potential to harness renewable energy and energy efficiency, and diversify its energy mix, a number of barriers still have to be overcome, in order to create a market environment in the region that can attract investments into RE and EE projects.

Here is a list of the main barriers and gaps reported across the region:


Socio-economic barriers	<ul style="list-style-type: none"> ▪ Endemic and widespread poverty in the region (40% of the population live in extreme poverty) and high unemployment rates, affecting affordability of RE and EE technologies ▪ Relatively small markets for RE/EE technologies at individual MS level
Institutional gaps	<ul style="list-style-type: none"> ▪ Understaffed SADC Implementing agencies (SADC Energy Division, RERA, SAPP) limiting the support to RE/EE uptake ▪ SACREEE, dedicated to promoting RE/EE, still to be operationalized ▪ Some MS still without energy regulators, hindering an impartial and conducive environment for private sector investment ▪ Unclear institutional arrangements for implementation of RE/EE programmes and unclear mandate given for off-grid systems at both MS and SADC level ▪ Absence in most MS of well equipped, experienced and dedicated institutions to engage with potential private sector investors ▪ Insufficient local industry for RE/EE, often coordinated through poorly supported associations in most MS ▪ Inadequate collective coordination of energy sector planning and policy frameworks between SADC, COMESA, EAC and IOC
Policy/legal gaps	<ul style="list-style-type: none"> ▪ Absence in many SADC MS of dedicated RE and EE policies and strategies with clear targets ▪ Integrated Resource Plans (IRP) or Energy Master plans - guiding future targets for RE/EE in MS and at SAPP level - either not fully developed or under revision, and demand forecasting also underestimated, considering that they do not include unmet demand and expected growth in industrialization ▪ Limited conducive policy instruments (like IPP Frameworks –only operational in South Africa, and being developed in Zambia -, multi buyer models - allowing large consumers to buy directly from RE producers - or well formalized tariffs for mini-grids, consumer owned generation and other off-grid systems), with “one stop shops” providing all information and services required by potential investors ▪ No harmonized methodology and auditing review to determine if MS have reached cost-reflective tariffs targeted for all MS by 2019 ▪ No clear framework guiding the introduction of efficient cooking/heating and cooling systems (maybe a reason why previous programmes have not been sustainable or up-scaled)

Regulatory gaps	<ul style="list-style-type: none"> ▪ Inadequate quality equipment and service standards for various RE and EE equipment ▪ Inadequate regional harmonization and standardization of grid codes and Power Purchase Agreements (PPAs) to simplify power trade and contracts for private sector participation ▪ Inadequate monitoring and verification systems for utility transmission and distribution losses and for savings by demand-side measures ▪ Inadequate regional harmonized Minimum Energy Performance Standards (MEPS), labelling and standards for appliances (including for cooking/heating and cooling), apart from South Africa ▪ Lack of harmonized building codes across the region (absence of well-established mandatory and also voluntary standards that MS can adopt to improve their buildings energy efficiency) ▪ Phasing out of incandescent bulbs only by some MS (implications of this regulation still to be assessed on trade agreements and inadequate quality assurance for CFLs and LEDs entering the market) ▪ Absence of established routines for accreditation of ESCOS/energy, of education and licensing of accredited auditors
Investment and financing gaps	<ul style="list-style-type: none"> ▪ Under developed financial sector to support Public Private Partnerships (PPP) and IPP frameworks and limited small supplier and end user financing schemes in the MS for uptake of RE/EE technologies ▪ Little finance available for project preparation and for small RE projects \leq 5MW that have high relative transaction costs and don't attract project financing, including Development Finance Institutions (DFIs) ▪ Difficulties for some utilities, running a deficit, to obtain finance for investment in public projects ▪ Little effort made so far to encourage investment in manufacturing of RE/EE technologies ▪ Limited participation of both national and regional commercial and development banks in RE and EE, limiting availability of counterpart funding for the local industry players ▪ Absence of clear policies in terms of how off-grid/mini-grid investments will be accommodated when the national grid reaches such areas currently far from the grid
Projects, technology development and transfer gaps	<ul style="list-style-type: none"> ▪ Insufficient comprehensive assessment of potential capacity required and options to meet the SE4All targets, using current and/or future technologies, with a balance of on-grid and off-grid/mini-grid alternatives. ▪ Network expansion plans are required in addition to capacity to guide investment in RE projects ▪ Unsustainable cooking/heating/cooling programmes due to the absence of strong policy frameworks (lack of purchasing capacity by the general population and lack of incentives to produce and supply this type of equipment) ▪ Local production and supply required, but the implications of either local production versus imports need a full analysis

Capacity gaps	<ul style="list-style-type: none"> ▪ Insufficient entrepreneurial skills to propagate uptake of RE/EE technologies through business models ▪ Limited capacity to prepare Integrated Resource Plans (IRPs), energy sector Master Plans and related economic analysis and demand forecasting analysis ▪ Limited capacity to develop and execute IPP frameworks ▪ Limited capacity for RE resource assessment ▪ Inadequate capacity by national development and commercial banks to assess RE/EE project risks, to support project preparation and structuring, and to design appropriate funding packages that can augment other sources of financing for these projects. ▪ Limited skills of project developers for project development/preparation and for accessing various financing opportunities (like Power Africa, ElectriFI, EEP, Global Climate Fund, carbon financing and AEEP) ▪ Inadequate skills by utilities for assessing grid capacity and conducting grid stability analysis to determine how much RE can be connected to the grid networks and how much more investment and planning is required to accommodate the aspired RE capacities in the MS ▪ Inadequate capacity for reengineering of RE technologies to support technology development or adaptation of existing technologies to the local environment ▪ Limited local technical capacity to undertake energy audits that can meet requirements of financing institutions, and accreditation is not demanded for service providers at the moment
Information, knowledge and awareness gaps	<ul style="list-style-type: none"> ▪ Inadequate processed information to assist planning and project implementation, including lack of adequate and verifiable data that can guide investments in RE/EE projects (RE resource potential and characterization, socio-cultural factors- including gender - and environmental impacts ...) ▪ Limited awareness of the technical and economic possibilities of RE/EE technologies and their applications ▪ Insufficient awareness on potential economic, social and environmental benefits of RE and EE ▪ Limited knowledge of international best practice in policy instruments, business models...
Cross cutting and cross-sectoral gaps	<ul style="list-style-type: none"> ▪ Insufficient integration of energy needs to alleviate poverty in energy planning ▪ Insufficient climate change mainstreaming in energy planning and development and limited efforts to introduce low-carbon development policies/strategies to adapt to imminent climate change impacts ▪ Little attention given to gender mainstreaming in the development of energy policies and programmes ▪ Limited integration of land use, food security, water, forestry, biodiversity and social issues in energy planning ▪ Limited approach of water, energy use and food production as a nexus (e.g issue of biofuels and food security still topical-although MS have set blending targets for biofuels, the type of feedstocks to be used has not yet been resolved). ▪ Low inflows of Direct Foreign Investment (DFI) allocated to the deployment of renewable energy and energy efficiency

7

STRATEGIC INTERVENTIONS AND ACTION PLANS

A man in an orange safety vest is working on a solar panel installation on a roof. He is standing on a ladder and adjusting the panel. The background shows a clear blue sky and a building with a corrugated metal roof. The text is overlaid on the left side of the image.

“Electricity is a basic need in our modern society. It brings light for the school child to study by; information to communities through radio and TV. Storekeepers can stock perishable foods and new opportunities are created for small business...”

South African President Nelson Mandela, Launch of Shell/Eskom Solar Electrification Programme, 1999.

© Devery

Action plans to achieve the REEESAP's strategic objectives (p.27) are framed along the following strategic interventions:

1. Strengthen national and regional institutions to adopt and implement RE/EE projects
2. Create policies, strategies, plans and other frameworks to ensure an enabling environment for RE/EE investments
3. Have appropriate regulation and standardization frameworks for RE/EE projects and investments
4. Attract private sector participation in investments for RE and EE
5. Build capacity to design, develop, build, implement and maintain RE/EE projects
6. Avail financing for RE/EE projects
7. Develop projects, technologies and know-how transfer to meet demand targets
8. Promote adoption of RE/EE through information, advocacy and awareness
9. Consider cross-sectoral and cross-cutting issues when implementing RE/EE projects

1-Strengthening of Regional and National Institutions

SADC agencies and national institutions in charge of energy need to be strengthened to adopt and implement RE/EE projects. The division of tasks between these various market enablers should be efficient, in order to avoid duplications, capitalize on the existing and create synergies.

- **Set up an independent energy regulator in each Member State and strengthen the Regional Electricity Regulatory Association (RERA)**, to give appropriate support to transboundary energy trading, as well as to the existing national regulatory bodies and to the three remaining national energy regulators - being set up - (under RERA there are 12 Regulatory Agencies and 3 still missing in the 15 SADC MS), and oversee the mandates and independence of the regulators.
- **Operationalize the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE)** to promote RE & EE, through knowledge sharing and technical advice, in the areas of policy and regulation, technology cooperation, capacity

development, information and awareness raising, as well as investment mobilization.

- **Establish Renewable Energy Agencies in all Member States with a specific mandate for off-grid systems**, and coordinate their actions at regional level to achieve wider clean energy access through off-grid systems (although MS have created Rural Electrification Agencies/Rural Energy Agencies, and in some cases Renewable Energy Agencies -REAs, these agencies require harmonized mandates).
- **Create IPP/PPP Units at government level** to prepare and execute IPP frameworks in an effective, fast and transparent way, in order to increase the confidence of the private sector.
- **Support the creation and strengthening of an RE/EE Association in each Member State** (with a regional coordination), acting as nuclei for mobilizing participation of local private sector, including financial institutions.
- **Facilitate the establishment of green building councils** to promote RE/EE in the built environment
- **Create a framework to harmonize and synergize planning and policy frameworks with COMESA, EAC and IOC** (there is an existing Tripartite Subcommittee on Infrastructure between SADC, EAC and COMESA that may be considered as a platform for such planning).

2-Creation of National Frameworks for RE/EE

Scaling up sustainable energy requires long-term planning, coordination between relevant authorities, development of policy and regulatory frameworks, to ensure an enabling and conducive environment for RE/EE investments.

- **Develop National Action Plans (NAPs) and align RE/EE targets with SADC targets.**
- **Develop a comprehensive and realistic "Integrated Resource Plan" (IRP)**, taking into account unmet demand and scenarios of higher GDP growth rates for industrialization and poverty reduction¹, cross-sectoral issues and distributed generation.
- **Adopt a "Market reforms and investment framework"** to attract significant investment for RE and promote regional power trading through an efficient IPP framework supervised by IPP

¹ 6% to 2020 and 8% to 2050, and hence electricity demand growth at similar rates

Units, regulators and RERA.

- **Introduce multi buyer models** to give RE producers a more flexible market regime.
- **Develop and adopt cost-reflective tariff methodology and guidelines for both grids and mini-grids** (in coordination with RERA) to meet the SADC target of cost-reflective tariffs² by 2020, while ensuring that the poor are not prejudiced.
- **Set technical and economic regulations for rooftops/embedded generation** (that could be harmonized at regional level by RERA, based on the mini-grid framework it is undertaking) to address the issue of tariffs for mini-grids, consumer-owned generation and other off-grid systems (learning from experiences of some municipalities in South Africa and distribution authorities in Namibia). Connection of mini-grids to the main grid also needs favourable policies.
- **Tailor policy frameworks for cooking/heating and cooling programmes** to encourage the business sector to participate, hence creating sustainability.

SUCCESS STORY

South Africa's Renewable Energy Independent Power Producer Procurement Programme (REI4P)



South Africa offers an interesting example of a renewable energy auctioning system that is attracting significant investment at highly competitive prices. Blessed with abundant renewable energy (RE) resources, South Africa aims to encourage the participation of the private sector in the electricity generation, in order to add 17.8 GW of RE generation capacity and create 400,000 new direct jobs by 2030. Launched in 2011 by the Department of Energy (DoE), the Renewable Energy Independent Power Producer Procurement Program (REIPPPP or REI4P) is used to tender large-scale installations (over 5 MW), although there are 100 MW which are reserved for small-scale projects (between 1 MW and 5 MW). Eligible technologies include solar PV, onshore wind, CSP, small hydro, landfill gas, and biomass. After a pre selection, bidders are assessed on the price they offer (70%) and the local economic development (30%) they will induce. Successful bidders sign a PPA for 20 years with the transmission system operator Eskom, and an implementation agreement with the Department of Energy (DoE). This competitive auctioning system has delivered remarkable investment and price outcomes. It has become the

leading contributor towards the growth in renewable energy capacity, specially the development of solar in South Africa, which is now a global leader in applying this technology to on-grid power supply. In the four REI4P rounds up to April 2015, solar PV has accounted for 1,899 MW and CSP for 400 MW. REI4P has seen US\$19 billion in private investment (in 92 projects, totalling 6327 MW), and electricity prices of wind power falling by 46% and solar PV electricity prices by 71%³.

SPOTLIGHT



A first concentrated solar power plant in South Africa



KaXu Solar One is South Africa's first concentrated solar power plant using parabolic trough technology.

Inaugurated in March 2015, at Pofadder (Northern Cape Province of South Africa), the KaXu Solar One concentrated solar plant, the largest in the Southern hemisphere, will ease pressure on the state-owned utility Eskom and light up 80,000 households, with the additional benefit of reducing South Africa's carbon emissions by 315,000 tons a year. With 360,000 parabolic trough mirrors, reflecting and concentrating rays of sunlight to heat steam that can power turbines, this first Solar Thermal Electricity (STE) power plant in South Africa incorporates a storage system that enables production of 100 MW for 2.5 hours after sunset or before dawn. This project has benefitted from a well arranged public-private partnership under REI4P programme (it will sell electricity to Eskom under a 20-year power purchase agreement), a technology transfer from the developer -Abengoa Solar-, loans from the International Finance Corporation, and indirect involvement of the EIB (refinancing domestic commercial and development banks, namely First Rand Bank and the Development Bank of Southern Africa).

² Cost items such as taxes and subsidies, and externalities need to be considered while developing a cost-reflective tariff

³ "Renewable energy auctions in South Africa outshine feed-in tariffs"- Anton Eberhard¹ & Tomas Kåberger (2015)

3- Regulation and Standardization

Standards can contribute to a wider acceptance and application in the region of RE and EE technologies, which have been often discredited in the past due to their poor quality. They help ensure product quality, increase innovation, boost consumers' confidence in energy products and enhance their market share.

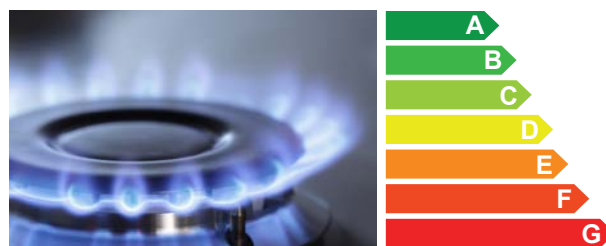
- **Develop/adopt RE/EE technical and quality of service standards** to boost cross border trading and support accreditation of service providers.
- **Develop/adopt grid codes at national level and harmonize them at regional level** to introduce specific on grid RE regulations and standards and norms to facilitate regional electricity trading.
- **Develop/adopt standardized PPAs** to facilitate negotiations with private investors for RE/EE projects (e.g South African's experience of executing standardized PPAs).
- **Prepare regional guidelines to minimize transmission and distribution losses**, to put a cap to what losses utilities can incur, in order to reduce demand on the power systems.
- **Establish Minimum Energy Performance Standards (MEPS) and appliance labelling at national level**, coordinated at regional level to direct consumers for more energy-efficient products and patterns.
- **Establish minimum building codes/standards in MS** (coordinated at regional level).
- **Establish a Measurement and Verification system for EE savings from DSM** (coordinated through RERA) to confirm the energy savings.
- **Assess the impact of regulations to phase out incandescent bulbs on trade regimes and industrialization effort**, to give informed decision-making for enacting legislations.
- **Establish standardized performance contracts for energy audits** to map the applicable EE measures they can apply, identify the so-called 'low hanging fruits' and estimate potential savings.

FOCUS

Labels and Minimum energy performance standards

A Minimum Energy Performance Standard (MEPS) is a specification, containing a number of performance requirements for an energy-using device that effectively limits the maximum amount of energy that may be consumed by a product in performing

a specified task. It is usually made mandatory by a government energy efficiency body and generally requires use of a particular test procedure that specifies how performance is measured. Minimum Energy Performance Standards (MEPS) provide uniformity among energy uses for similar products, while labelling ensures that consumers have the necessary information available to assess the energy requirements of different product options. South Africa has initiated a mandatory labelling programme in 2012 for household appliances. The programme now targets the most energy intensive appliances in the residential sector, namely air conditioners, dishwashers, washing machines, electric ovens, refrigerators and freezers, electric water heaters and lighting. Mauritius also initiated a voluntary labelling programme in 2014 for household appliances, but the labelling will become mandatory by 2017.



MEPS are an effective way to increase the energy efficiency of products.

SPOTLIGHT



Family watching TV.

"Tanzania has been a leader in developing policies promoting small-scale off-grid projects, due to its innovative use of standardized Power Purchase Agreements (PPAs). There is expanded electrification and increased energy access, using solar mini-grids to 16 villages, i.e. 11,000 households, 2,600 businesses, 42 public offices, 32 schools, 12 health centres and 77 religious buildings. The Tanzania Rural Energy Agency has 90 off-grid projects in its pipeline of mini-grids, solar PV or mini-hydro" (SADC Energy Monitor 2016).



FOCUS



The replacement of energy-intensive incandescent bulbs with CFLs by the Zimbabwe electricity Transmission and Distribution Company (ZETDC) has saved almost 300 MW. This may be viewed as having built a power station, without putting a brick on a foundation.



CFLs have been shown to save 80% of the electricity consumption, compared to the incandescent bulbs.

4- Attraction of the Private sector in RE/EE Investments

Attracting private investment requires robust policy and institutional arrangements laying the foundations for a sustainable sector.

- **Analyse the applicability of IPP framework across SADC MS** to attract private sector participation in RE and EE investments in a significant way.
- **Adopt standardized IPP frameworks and model contracts**, such as government guarantees, licensing and standardized contracts for IPP/PPP. Transparent frameworks for Feed-in tariffs are also required to cater for small and medium projects, further simplifying the process.
- **Manufacture RE/EE technologies (and cooking/heating/cooling appliances) regionally**, to contribute to the SADC industrialization drive, and investors' appetite to undertake.
- **Prepare bankable projects** to reach the desired standards of project preparation and bankability, in order to secure finance.
- **Facilitate establishment of green building councils** to promote RE/EE in the built environment.

SUCCESS STORY



Programme National d'Effacité Energétique (Mauritius)

Based on a study showing a potential annual energy efficiency savings of 30 million € in the industrial and tertiary sectors, and on a successful pilot and demonstration phase, showing savings on fuel bills between 10% and 40 %, the "Programme National d'Effacité Energétique" (PNEE) has been launched in 2015. It aims to develop a quality energy efficiency market, through awareness raising campaigns and provision of subsidies to energy audits in the private sector, improve competitiveness of Mauritian companies, reduce needs for power generation infrastructures (~40 MW) and imports of fossil fuels, and reduce 173,000 tons of CO₂ emissions per year. Developed by AFD (Agence Française de Développement) and Business Mauritius, and co-funded by the EU (through the SE4All), the Ministry of Energy and Public utilities (MEPU), this programme plans to carry out a hundred audits by the end of 2017. It is divided into 8 projects, ranked by sectors of activity (textile, hotel, and supermarket) or by the use of energy (cooling system, steam, compressed air, pumps, hot water). The first audits started in 2015, and so far, the PNEE involves 50 partner companies (hotel, textile, cooling system, steam, compressed air, supermarkets).



Energy audits are a core component of the PNEE.

Three success factors have been identified: 1/a truly public-private partnership between the Ministry of Energy and Public utilities (MEPU) and Business Mauritius (a private sector organization); 2/energy audits ensured by a technical assistance 3/and financial support through SUNREF, a green credit line offered by AFD to Mauritian banks for implementation after energy audit. This programme is planned to be replicated by the IOC Energy Programme (funded by the EU) in other IOC Member States (Comoros, Madagascar and Seychelles), in partnership with AFD.

5- Capacity Development

From policy and regulatory design to project preparation, evaluation, development, management, operation and financing, there is an urgent need to build up a wide array of skills to support sustainable energy deployment and massive investments planned in the coming few years.

- **Develop integrated resource planning** to chart national paths to sustainable energy development, with potential support from other MS experiences and training from centres of excellence.
- **Develop and implement IPP/PPP projects:** government officials and banks should be able to prepare IPP frameworks (with specific guarantees, licensing, and contracts), negotiate with the private sector and ensure that contracts deliver desired results. They should also understand the technologies to assess the project risks and support project preparation and structuring, and design appropriate funding packages to increase other sources of financing for RE/EE projects.
- **Develop bankable projects,** write proposals that can qualify for funding from the various financing opportunities (like Power Africa, ElectriFI, EEP, Global Climate Fund, AEEP, etc.).
- **Assess grid capacity and stability analysis** to determine investment and planning required to accommodate the sought RE capacities (see support offered by IRENA below).
- **Capitalize on regional initiatives (like SOLTRAIN) and existing national training centres,** like the South African Renewable Energy Technology Centre (SARETEC), specializing in RE and EE technology aspects (e.g. re-engineering of wind turbines and solar PV), or in energy auditing (e.g. University of Potchefstroom), while encouraging energy service companies to go through such accreditation.

SUCCESS STORY

SOLTRAIN promotes use of solar thermal technologies



Southern Africa is turning to solar energy to address shortages of electricity afflicting most Member States in the region. One example is the Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN), a regional initiative on capacity building and demonstration of solar thermal systems.

The main objective is to help the region switch to renewable energies and focus on solar thermal or heating systems. The focus is deliberate because solar radiation levels in Southern Africa are high (some SADC countries have up to 3200 hours of sunshine annually), about 40-50% of the electricity in the residential sector is used for hot water preparation, and these systems can readily be manufactured or assembled in the region.



Lesotho practical training, installation of collectors.

Started in 2009 with financial support from the Austrian Development Agency and the OPEC Fund for International Development, SOLTRAIN has contributed in five Member States - Lesotho, Namibia, Mozambique, South Africa and Zimbabwe - to raise awareness about the potential of solar heating technology, build competencies in production of solar heating technology, create discussion and lobby platforms and establish demonstration projects to show that the technology works. During its first two phases (2009 - 2016), 2,150 people were trained and some 187 small to large-scale solar heating systems were installed, with systems' applications ranging from small-scale thermo siphon systems for single family houses to medium-sized systems for industrial and commercial applications.

In its third phase (2016-2019), including also Botswana, SOLTRAIN will strengthen the partner institutions and the governmental bodies in the implementation of their solar thermal roll-out programmes. And in the call for demonstration systems, a special focus will be put on institutions supporting women (e.g. girls' schools, maternity clinics, shelters for battered women) and marginalized groups. About 7,000 persons will directly benefit from these systems, by reducing their energy bills and by improving the hygienic standard.

www.soltrain.co.za and www.zessa.co.za

SPOTLIGHT

International Renewable Energy Agency (IRENA)



Launched in 2014 by the International Renewable Energy Agency (IRENA), the Africa Clean Energy Corridor (ACEC) aims to meet the continent's fast-growing electricity needs through the accelerated development of renewable energy potential and cross-border trade of renewable power within the Eastern and Southern African Power Pools. Power generation developed through the ACEC could potentially meet 40-50% of regional power needs by 2030. SAPP Member States are supported by IRENA through ACEC on a number of RE aspects:

1. Zoning and resource assessment to site renewable power plants in areas with high resource potential and suitable transmission routes.
2. National and regional planning to consider cost-effective renewable power options.
3. Enabling frameworks for investment to open markets and reduce financing costs.
4. Capacity building to plan, operate, maintain and govern power grids and markets with higher shares of renewable electricity generation.
5. Public information and awareness to raise awareness on how the corridor can provide secure, sustainable and affordable energy.

ACEC now includes more than 30 governments, regional organizations, development partners and financial institutions and there is a growing interest from new partners to join.

6- Financial Intermediation

Renewable energy and energy efficiency investments are often perceived to be risky. Initial development costs, the lack of start-up capital, or equity, limited know-how of project financing, and an inadequate enabling environment, often prevent these projects from becoming a reality. It is thus urgent to unlock private investments that will expand access to clean energy and stimulate job creation.

- **Create a special purpose investment fund for RE/EE projects of <10MW and to support project structuring and packaging of bankable**

projects <20MW, to give adequate access to financing for small projects, potentially viable from both technical and commercial perspectives.

- **Mobilize national and regional development banks to create investment packages and counterpart funding for implementation of RE/EE projects**, help them create and manage national/domestic and regional investment funds for RE/EE projects, strengthen project preparation and advice on common guarantee instruments and project structuring.
- **Create innovative micro credit financing for cooking/heating/cooling RE and EE projects and off-grid electrification**, to upscale adoption of sustainable energy equipment such as ICS⁴ and solar lanterns by the poor and other disadvantaged groups.
- **Compile and disseminate various financing facilities available in the region** to help match project developers and MS with potential funders for their requirements, and access financing initiatives that can combine grants, equity and debt facilities.
- **Determine utility creditworthiness to honor PPAs** (through a peer review mechanism), to benefit from national, regional and international investment funds.

SUCCESS STORY

The Energy & Environment Partnership programme (EEP)



© Mobisol Tanzania

Mobisol Technicians installing PV Panel.

As a challenge fund, the Energy & Environment Partnership programme in Southern and East

⁴ Previously nine (9) SADC MS were involved in a GIZ supported programme, the Programme for Basic Energy and Conservation (PROBEC) that lasted from 2004 to 2010 to promote efficient use of energy devices, policy advice, research into biofuel, but the programme could not be sustained after the donor funding was terminated.

Africa (EEP S&EA) provides grant funding to small and medium size companies, organizations and institutions working in the field of renewable energy and energy efficiency. Funded by Finland, the UK and Austria, and implemented by KPMG, EEP has provided grant funding to approximately 130 renewable energy and energy efficiency projects in the SADC Region. The overall objective of the EEP is to reduce poverty through inclusive and job creating green economy and improved energy access and security in the Southern and East Africa regions, while mitigating global climate change. EEP invites for proposals from mainly small and medium size companies, organizations and institutions working in the field of RE/EE. Knowledge management and business development support are further integrated, as the other core areas of the Programme. The projects EEP co-funded in the SADC Region are targeted to result a/o in over 150,000 households getting access to modern and clean energy sources. EEP is technology neutral and has supported a wide range of projects ranging from solar PV, wind energy, small hydropower, biogas and biomass waste to energy. The Programme fills a gap not filled by other initiatives. It triggers investment and innovation in projects that address the under-served, poor market segment due to an emphasis on both sustainable business models and development impact. Through its interventions, EEP has assisted nine SADC Member States in creating a pool of small and medium sized companies that provide energy access, mitigate climate change and have created sustainable jobs. The SADC Secretariat participates in the projects Supervisory Board.

<http://eepafrica.org>



Launched in February 2014 by international music star, Akon, leader Thione Niang and entrepreneur Samba Bathily, Akon Lighting Africa aims to provide innovative, clean and accessible solar solutions (street lamps, pre-paid micro-grids, lamps and recharge stations) for rural areas. In less than one year, thanks to a private-public partnership pre-financing model and a well-established network of partners (including SOLEKTRA INT, SUMEC and NARI), a wide range of quality solar solutions have been installed in 15 African countries, including Madagascar in the SADC Region. With credits from partnering banks, the initiative can provide prepaid clean energy. Credits can be refunded by governments, which can then be paid back through installments. Solektra International is developing a

service model that should allow for users to pay less than what is spent collectively on candles - ideally less than \$10 a month per household for access - through home-based kits. As a result, a number of households, villages, community houses, schools and health centres have been connected to electricity for the first time ever. A network of young people has been employed to learn how to install and maintain solar solutions, and to acquire technical expertise. And many other indirect local jobs have also been created (small businesses, cafes, evening classes...). With this model considered as a best case study easy to replicate, Akon Lighting Africa has been honoured and supported by the United Nations and the World Bank. <http://akonlightingafrica.com/>



Launched in 2012, SEFA is a US \$95-million multi-donor facility funded by the governments of Denmark, the United Kingdom, the United States and Italy. It supports the sustainable energy agenda in Africa, through grants to facilitate the preparation of medium-scale renewable energy generation and energy efficiency projects; equity investments to bridge the financing gap for small and medium-scale renewable energy generation projects; and support to the public sector to improve the enabling environment for private investments in sustainable energy. SEFA played a key role in structuring the first truly Pan-African US\$200 million private equity fund focused on renewable energy, the Africa Renewable Energy Fund (AREF), contributing US\$35 million. SEFA is hosted by the Energy, Environment and Climate Change Department of the AfDB.

<http://www.afdb.org>

SPOTLIGHT

A "Green soft loan" to boost solar energy installations in Namibia



The SME Bank of Namibia in partnership with the Environmental Investment Fund of Namibia (EIF)

has launched this “Green soft loan” scheme in 2013. Namibians can borrow up to N\$100,000 for solar energy installations (both solar thermal, and photovoltaic), at a prime rate of 4.25% below the interest rate charged by commercial banks.

7- Projects, Technology Development and Know-how Transfer

Meeting the energy needs of millions of people while transitioning to clean, low-carbon and climate-resilient energy systems, requires advanced energy technologies. Furthermore, the assessment being made by IRENA shows that it will be difficult for the majority of SADC Member States to meet the target of doubling RE in the energy mix by 2030 using current technologies. This calls for concerted effort to explore new technologies and accelerate technology development and transfer.

- **Ensure alignment of MS targets and planned projects with SADC targets for 2030**, allocating to MS a share of the regional target they should meet, depending on their resources and capacity.
- **Create a pipeline of on-grid and off-grid/mini-grids projects** that will meet the stipulated targets including RE projects and EE programmes.
- **Pilot regional flagship projects for emerging technologies** to further explore CSP with storage, ocean energy, waste to energy, biomass (e.g. invasive species⁵) and geothermal sources (so that MS with those resources can benefit).
- **Optimize RE/grid network zoning**, match zoning of RE resources with transmission and distribution requirements, establish an updated network expansion plan (including for rural electrification) and on the distribution side, introduce more consumer-owned generation, particularly in urban settings, such as municipalities.
- **Conduct a pilot grid stability assessment** to establish the limit of the capacity of grids to absorb intermittent generation without creating instability (lessons can be learnt from initiatives led by IRENA in the island states and replicated for selected Member States on the mainland).

⁵ An invasive species is a plant, that is not native to a specific location and which has a tendency to spread to a degree believed to cause damage to the ecosystem with impacts e.g. on water availability, livestock grazing areas, arable land. Removing the plant species is creating a feedstock that can be used to generate energy- e.g. as charcoal, or combustion in heat or electricity plants.

- **Adapt and replicate good initiatives for cooking/heating/cooling learning**, such as SOLTRAIN.
- **Manufacture components for RE/EE systems in the region**, ensuring availability of LEDs in the region (the plant producing CFLs in Lesotho -closed 2 years ago- could use its economies of scope to start LED production) and developing a regional strategy based on existing plants (e.g. PV panel factory in Mozambique).

SPOTLIGHT



Energy Efficient Building of Namibia (EEBN)

A demonstration and research house, where 60 -70% of energy is saved in a residential building through thermal envelope, air tightness, sub-soil heat exchangers, was constructed at Namibia University of Science and Technology (NUST) by the Department of Civil Engineering, in collaboration with Carinthia University of Applied Sciences from Austria for research purposes and to support the Namibia Energy Efficiency Programme in Buildings (NEEP). The house was co-funded by NUST, Carinthia University and the Energy and Environment partnership (EEP). This concept can lead to 100% energy savings, by using solar energy for passive solar gains, solar panels, solar chimneys and thermal protection of indoor climate at a constant soil temperature by the use of thermal storage of soil or ground mass. The house is using passive solar architecture for heat gain in the cold season and a ventilated, shadowed roof in the hot season.



This concept of building can lead to 100% energy savings.

SUCCESS STORY



A first solar panel factory in Mozambique to accelerate rural electrification

Inaugurated in 2013 in Bebeluane, the first factory of solar panels in Mozambique was built by the state-owned Energy Fund (Fundo Nacional de Energia, FUNAE) with technical and financial support from India, to expand access to electricity in rural areas. The construction and equipping of the plant

cost 13 million dollars, a joint investment by the Governments of Mozambique and India (through a credit loan). Its current production capacity is 5 MW/year, but it could increase to 20 MW. It produced 0.5 MW in 2015 and is expected to produce 1.2 MW in 2016 and 4.4 MW afterwards. The factory manufactures four types of solar panels with various - especially off-grid - applications (illumination of homes, schools and health clinics; shops and public lighting; water pumping systems). Production is guaranteed by Mozambican technicians, trained in India and Mozambique. Apart from improving day-to-day living in rural communities, the construction of the factory has created 700 jobs, and it has currently 32 employees. FUNAE's objective is to reduce by half the price of solar panels, compared to the prices charged by the competitors (with quality standards) and they are already the cheapest in the market. In July 2016, the factory was awarded the Seal "Made in Mozambique" and is striving to receive "ISO quality standard". This certification is part of the Government's efforts to stimulate and value national goods and services, so that they can be consumed at the Member State level and beyond. It is expected to increase significantly the demand, as some projects require the use of certified PV panels.

www.funae.co.mz



The objective is to reduce by half the price of solar panels in Mozambique.

8- Information, Advocacy and Awareness Creation

Information, perceptions and awareness are key elements for successful RE and EE deployment, and various issues need to be addressed:

- **Ensure that planning is informed by adequate, reliable and up-to-date data, monitored against clear targets** (MS and SAPP can contribute to this, as part of their IRP and SAPP Pool Plan development).
- **Change the general perception among**

stakeholders that RE/EE technologies are riskier and less reliable than traditional energy sources. There is also a perception that countries are risk destinations for investment and that also needs to be averted by good information on the opportunities that exist in the region.

- **Inform project developers about financing opportunities offered through various global and regional initiatives**, such as Power Africa, ElectriFI, EEP, Global Climate Fund, AEEP, and other mechanisms. It is vital that these funds reach projects, especially the ones that provide energy services to the poorer segments of society. These are often aware of the benefits of RE/EE technologies, but do not have the purchasing power to acquire them.
- **Inform consumers about the credible suppliers of equipment and services in their countries and region.**
- **Conduct awareness and advocacy campaigns on RE and EE value and benefits**, to boost RE deployment- especially customer-owned generation- and convince businesses and consumers to change their behaviour, invest in energy audits, and select the right equipment to make substantial energy and cost savings.
- **Mobilize key stakeholders**, to build momentum, identify potential bottlenecks, and accelerate RE and EE development.
- **Train journalists on sustainable energy issues and improve skills for those tasked to share information to ensure that information dissemination and awareness is created.**
- **Introduce sustainable energy issues in school curricula and tertiary education** to sensitize the up-coming generation and create the required critical mass of qualified engineers and technicians in these fields. Platforms such as educational institutions must be encouraged to adopt curriculum that inform about RE/EE. Lessons can be learnt from the tertiary institutions that have set up Centres of energy and provide educational programmes on RE/EE.

SPOTLIGHT

"Power for All"

Supported by UK Aid, Power for all advances renewable, decentralized electrification solutions as the fastest, most cost-effective and sustainable approach to universal energy access. It unifies the voice of the "beyond the grid" companies and organizations, to advocate for specific supportive financial and policy enablers, mobilizes the broader sector-manufacturers, distributors, consumers-to



switch from fossil fuels, and proactively positions renewable, decentralized energy as premium-quality, climate-resilient products and services that enable a wide-range of productive uses for the global community. www.powerforall.org



9- Cross-sectoral Issues

Energy is interconnected with many other sectors (water, industrialization, agriculture, forestry, spatial planning and development, education, etc) and cross-cutting issues (gender⁶, climate change, governance, etc.). So a multi-sectoral approach must ensure that all needs are taken into account.

- **Ensure policy coherence between interconnected Sustainable Development Goals and sectors** (energy, water, improved public health and education, women's empowerment and increased food security...).
- **Formalize a dialogue among climate change, water and energy, at technical and ministerial level** (like the joint workshop of the Ministers of Energy and Water, held in Gaborone, in June 2016).
- **Conduct energy planning that incorporates industrialization and social development strategies** (for the latter to avoid environmental impacts, such as deforestation, erosion and indoor air pollution).
- **Create an enabling mechanism to facilitate access to public and private land for renewable energy developers** (in some countries, dedicated land Commissions are created to fast track land acquisition for infrastructure projects of national importance) and anchor the issue of biofuels in policies that will avoid conflict and create synergies with food security, learning from the on going example of ethanol being produced from sugar cane molasses.
- **Mainstream gender in the energy sector**, and enhance energy access for women and other vulnerable groups, especially in rural and peri-urban areas, through targeted programmes,

⁶ Gender mainstreaming needs to be promoted in the energy sector, in line with the SADC Gender Policy and the SADC Protocol on Gender and Development.

notably for cooking/heating and cooling, supported by gender disaggregated data and innovative financing mechanisms.

- **Support MS to realize their climate change obligations and implement their National Determined Contributions**, in order to benefit from the global climate change financing, through UNFCCC frameworks and other donors, and undertake regular assessments related to GHG emissions and impacts on energy sector systems.
- **Promote the productive use of mini-grids and other decentralized energy systems** to improve energy access, affordability and income generation.
- **Promote the development of small hydropower projects** to cater for power, irrigation and water supply and sanitation needs in MS that have this potential.
- **Develop an energy strategy mix to tackle the issues caused by rapid urban growth.**

SPOTLIGHT

"RETROFIT" of dams to create multipurpose uses"



The aim is to make the dams in SADC Member States more sustainable, through additional engineered installations of equipment to the existing facilities, in order to increase their benefits and create multipurpose uses (e.g. supply of drinking, irrigation water, hydro-electricity production, flood-control, municipal and industrial uses, recreation, fish and wildlife benefits...). A multipurpose dam (in any combinations of two or more uses) is a very important and cost-effective project, because the population receives several domestic and economic benefits from a single investment. A recent regional assessment of the potential for retrofitting small hydropower capacity at existing barrages/dams in SADC Member States, led notably by GIZ, has preselected three of them: Madagascar, Tanzania and Mozambique.



Hydro power irrigation aimed at increasing food safety.

SPOTLIGHT



Using water power to fight poverty

Micro-hydro power is the small-scale harnessing of energy from falling water, such as steep mountain rivers. Using this renewable, indigenous, non-polluting resource, micro-hydro plants can generate power for homes, hospitals, schools and shops. The EU-funded project Rural sustainable Energy Development in Zimbabwe (RuSED) implemented in the Himalaya Manicaland Province, and managed by Practical Action with Oxfam as project lead (2011-2016), has prioritized productive end use to enable the micro-hydro association to achieve financial sustainability. The scheme generates 80-130 kW at full capacity, supplying energy to 100 homes and two energy centres. More households are being reached through charging solar lanterns. The energy centres provide agriculture and forestry-related services to up to 100 households. This includes a saw mill, a grinding mill, as well as a pump house to pump water for irrigating 2 irrigation schemes. 88 people were trained (49 women) on maintenance and operation of micro-hydro such as the power house, transmission and distribution lines, charging systems at the energy kiosks, irrigation equipment and on the management of funds (business skills training).



© Practical Action

Queues to get maize pounded at Himalaya new grinding mill.

SPOTLIGHT



Women are a success factor

Research has revealed that the power sector will only achieve sustainable development, if gender analysis is integrated into policy formulation. It is crucial to involve at various levels those who stand to benefit most from the technologies - women - as agents of change. They should be trained in how to promote, set up and operate renewable energy and energy efficiency technologies (e.g. improved cook stoves), because RE and EE projects are much more effective when women are involved. Their input in the design phase makes energy appliances more user-friendly,

which greatly increases their sale ability. Women have proven to be excellent promoters of energy applications they recognize as useful and they are very successful green energy entrepreneurs.



© 'Off-Grid Electric Tanzania' - EEP Coordination Office

Women have proven to be excellent promoters of energy applications.

SUCCESS STORY



A clean stove sector in Tanzania

Organizations like TaTEDO Hivos partner in Tanzania, are involved in R&D for efficient stoves in all shapes and sizes. Women are the main users and are therefore called in as consultants when determining the most efficient and user-friendly designs. In 2009, over 1.1 million people used these clean stoves and more than 2,000 small entrepreneurs made a decent profit. TaTEDO provides the technical knowledge which enables others to build and maintain the stoves, but also raises awareness in villages on the benefits of clean cooking: people do not readily change their traditional cooking methods. With the support of Hivos, an entirely new business sector has emerged in Tanzania based on energy efficient stoves. -Source HIVOS



© HIVOS

As main users, women were called as consultants to determine the most efficient and user-friendly designs.

8

IMPLEMENTATION FRAMEWORK

“

I currently see a radical change in thinking around the role that off-grid electrification can play in bringing development to rural areas.”

Wim Jonker Klunne, Programme Director, Energy and Environment Partnership Southern and East Africa (ESI Africa, 2015).

Guiding Implementation Principles

The implementation of REEESAP will be guided by the following principles (see table below), that have been adapted from SADC policy directives.

REEESAP Guiding Principles

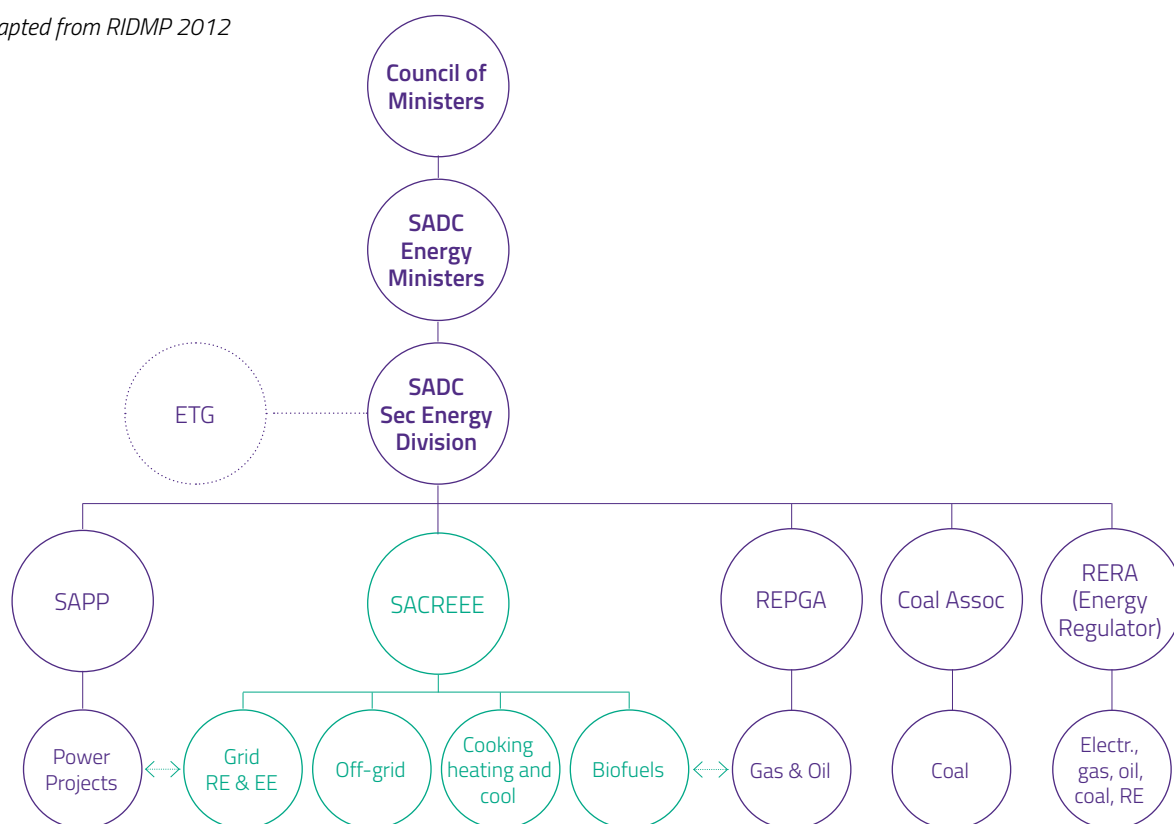
Responsibility	Member States have the responsibility to choose and implement those actions of REEESAP that are of priority to their countries.
Subsidiarity	REEESAP will be implemented at the most appropriate levels by relevant agencies in the Region and in Member States.
Additionality	Institutions others than the SADC Secretariat and its Agencies can implement REEESAP interventions. This includes public, private, civil society, academia, development partners.
Prioritization	REEESAP interventions are based on SADC development priorities and MS will have the liberty to prioritize those actions most important to their development priorities.
Rationalization	REEESAP will promote coherency and alignment of national, regional and global initiatives, objectives and goals.
Coordination	REEESAP will promote cross-sectoral and cross-cutting planning.
Flexibility	REEESAP is open to amendments and reviews in the course of its implementation to best respond to the highly changing environment.
Variable Geometry	Certain Member States can move faster with the implementation of certain activities where they have comparative advantage.
Best practices	REEESAP Strategic Actions will be executed, based on best practices and sharing of lessons learnt among MS.
Participatory	Relevant stakeholders are informed, consulted and involved throughout the implementation of REEESAP; and the development and implementation of MS Action Plans.
Sustainability	REEESAP promotes local ownership, awareness, capacity building and institutional development, and is anchored on participation of the MS.
Optimization	REEESAP will make the best use of available financial resources, prioritizing 'high impact/ low cost' solutions and match making actions with most appropriate funding mechanisms.

Institutional Roles

The energy sector institutional framework is presented in the figure below. The SADC Secretariat is key in implementing SADC programmes, reporting to the Ministers in charge of Energy, who in turn report to the Council of Ministers. SADC works with its agencies in the different energy subsectors, SAPP being responsible for power sector programmes and RERA coordinating regional regulatory frameworks. REPGA, which was to be created to coordinate oil and gas activities and a proposed coal association in the RIDMP (2012), does not exist yet. The major highlight is the creation of the SACREEE to support the SADC Secretariat on the coordination of regional RE/EE programmes. The Energy Thematic group (ETG) is an important partner in the REEESAP's implementation, as it provides financial and technical support directly to the SADC Secretariat programmes and bilaterally to MS.

Figure - Energy Sector Institutional Framework

Adapted from RIDMP 2012



The REEESAP has been developed by the Energy Division under the Directorate of Infrastructure and Services at the SADC Secretariat. The SADC Secretariat, through the Energy Division with support of SACREEE, has the responsibility to facilitate adoption of the REEESAP by the MS, including assisting MS in the development and implementation of their Action plans. Moreover, it will also support MS to secure resources to develop their Action Plans and also for implementation of their energy actions.

At a technical level, SACREEE can oversee the development of National Action Plans (NAPs) and arrange for peer reviews of MS NAPs, to make them fit for funding and ensure harmonization where necessary.

In the institutional arrangement of implementing REEESAP, SACREEE has potential to participate in grid RE/EE projects cooperating with SAPP, and in the RE/EE related regulatory framework cooperating with RERA. The linkage of biofuels and oil and gas subsector can be another responsibility of SACREEE working with the SADC Secretariat and, and the expected, REPGA.

SACREEE has other responsibilities to coordinate programmes on off-grid systems, cooking/heating/cooling, (as indicated in the figure below). SACREEE in this case would link up with its National Focal Institutions, through MS Ministries/Departments of Energy, in identifying actions and responsible MS organizations to implement the actions.

Projects are largely implemented at MS level hence the SADC Secretariat together with SACREEE have the responsibility to ensure that MS start developing their National Action Plans as soon as the REEESAP is approved, to meet the RISDP target of starting implementation of REEESAP in MS by 2019.

The REEESAP Actions that are to be implemented at regional level will be led by the SADC Secretariat with support of its agencies such as SACREEE, SAPP and RERA. Coordination with MS will also be required in relation to actions that will be implemented in more than one country (e.g. training, collection of baseline data and adoption of policy frameworks).

Resource Mobilization

The success of REEESAP implementation will depend on availability of resources, particularly financial resources. These will be required to domesticate the REEESAP by MS and also to implement actions at regional and MS level.

As mentioned before, the development of NAPs by each MS will be a priority of REEESAP. The SADC Secretariat and SACREEE can assist in mobilizing ICP financial and technical support for MS to develop their NAPs. Either ICPs can support MS bilaterally or SADC Secretariat can have a coordinated funding strategy using ICPs support. Support can also be provided from MS to MS through bilateral exchanges of know-how and technologies. In any case, MS should also demonstrate their commitment and ownership by making contribution to development of their NAPs.

There is a mixture of financing instruments/sources that can be used to fund the implementation of REEESAP; therefore, it will be important to match funding sources and strategies with specific REEESAP actions.

Particularly, actions that entail developing enabling environment (policies, institutions, capacity building, information systems and planning) are amenable to ICP grant funding. For projects type actions, both public and private sector funding can be deployed. Public funding will be a combination of government budgets, ICP grants and loans. Private sources will play an increasingly important role in financing clean energy projects when the investment environment is more attractive, mature and secure.

There are also various sources of financing that can be obtained by project developers, with facilitation of both SADC and MS by providing the necessary support, such as guarantees and letters of support.

The role of multilateral development banks is also central, particularly in project development, preparation and implementation. In addition to applying their own financing mechanisms, these institutions facilitate large-scale regional sustainable energy projects, by catalyzing public and private funds and mobilizing additional concessional and innovative finance.

Another source of funding for these projects is carbon finance, using different frameworks such

as the UNFCCC's Clean Development Mechanism, Voluntary Carbon Markets and the Global Climate Fund.

Both MS and SADC can also create special purpose investment funds particularly for small projects (currently without adequate access to financing, due to their inherent high transaction costs) involving both national and regional development banks. Some regional banks are already providing project development support, but these funds need to be better understood by the potential target beneficiaries, besides being sustainable in the long-run. Procurement procedures particularly for RE projects have been innovative in how government guarantees and private sector investments can be deployed to reduce final costs of energy production. A combination of competitive bidding for large RE projects (>5MW) and Feed-in Tariffs for small RE projects have attracted private sector investments in SADC MS and should be explored where applicable in future REEESAP Project implementation.

Also worth mentioning is the use of procurement tools to establish new markets for new technologies, especially in the EE and access to energy sectors. Governments could lead the negotiation/dialogue between buyers and manufacturers of these types of equipment in order to introduce and accelerate their adoption by the end-users.

These innovative procurement tools would improve the confidence of manufacturers to enter and adapt their technologies to the new markets.

In summary, the SADC Secretariat will have the responsibility to coordinate resource mobilization particularly for REEESAP actions that will be implemented at regional level, but also assist MS in securing the resources they need to domesticate the REEESAP in their countries.

The actual amounts of financial resources required to implement REEESAP at both regional and MS level will be determined on a case by case basis as the identified actions will need to be explored further and are expected to be different among MS.

9

MONITORING AND EVALUATION SYSTEM

“

Once the renewable infrastructure is built, the fuel is free forever. Unlike carbon-based fuels, the wind and the sun and the earth itself provide fuel that is free, in amounts that are effectively limitless.”

Al Gore, 45th Vice President of the United States under Bill Clinton, environmental activist, Nobel Prize winner in 2007 for his work on global warming.

Information should be readily available on Member States' performances in achieving their goals. Unreliable energy data affects negatively the capacity of governments and the SADC Secretariat to make informed decisions on the upscale of RE, EE and access to energy.

Objectives of the Monitoring and Evaluation (M&E) System

It is important to establish a robust M&E system to monitor the implementation of the strategy and action plan at national and regional levels. It will aid the SADC Secretariat¹ to track progress towards the achievement of SADC's goals and objectives, and identify any deviation or bottlenecks. The M&E system will be based on "sector performance indicators" to inform policy makers and constituencies on whether interventions in the sector are yielding the intended development results, and on "milestones" to advise implementers on the progress of the Action Plan execution.

A data platform related to the SADC energy sector, collecting data through standardized procedures, will be built to assist decision makers in evaluating the status of the sector and planning future interventions. And institutional arrangements (such as needs for additional resources and specific capacity development) will be developed to support sustainable monitoring and evaluation processes. Such system would provide a framework for frequent review and update of REEESAP implementation. It will contribute to establish trends over time, encourage policy dialogue within the MS and with cooperation partners, and aid the reporting of results concerning of the implementation of the SE4ALL targets set by each MS.

REEESAP's M&E system builds on current SADC monitoring and evaluation exercises and also links to the SE4ALL Global Tracking Framework (GTF), which proposes a holistic approach for tracking progress on all three SE4ALL goals, hence ensuring the provision of the most accurate data possible.

The SADC Secretariat will be the entity responsible for ensuring that the M&E system is applied correctly and that all the involved entities and stakeholders provide the necessary information and data in a timely and proper manner.

Monitoring System

Regional Performance Measurement Indicators

The performance indicators help assess the status of RE, EE and access to energy in the region and provide information about the key components of the REEESAP implementation in a clear, concise and systemic way. The table (presented in annex p.53) contains the proposed indicators in relation to the targets, along with sources of data, means of verification and assumptions for each indicator. Baseline information is required from which progress will be measured. However, baseline indicators are currently not available for most of these indicators with the only known baseline indicator being the RE on-grid mix that was 24% in 2014 (REN21, 2015). The existing targets included in the RIDMP (2012) also require updating, hence SADC and its MS can set targets to measure progress against or benchmark their performance with other regions.

Milestones of the Action Plan

A list of milestones has been selected to assess the implementation status of the Action Plan of REEESAP (see table in annex p.55). It is envisaged that MS and SADC Agencies will be monitoring and reporting on the implementation of the strategic Action Plans presented and there is assumption that reliable data for analysis and financial support shall be available to generate the information to produce the indicators.

Evaluation and Reporting Plans

The annual evaluation process will review the progress made, assess the adequacy of the adopted strategy to meet the targets as planned and take any corrective action, if needed. The yearly progress will be presented in a performance assessment report showing clearly the baseline scenario and the progress made against the targets and milestones set.

¹ Or the SACREEE

10 ANNEXES

“

To truly transform our economy, protect our security, and save our planet from the ravages of climate change, we need to ultimately make clean, renewable energy the profitable kind of energy.”

Barack Obama, Address to Joint Session of Congress, Feb. 24, 2009.

Sector Performance Indicators

Indicators	Description	Definitions	Sources and Means of Verification
RESULT: Increase the use of RE			
Renewable Energy mix in the grid	The RE mix in the grid measures the percentage of RE installed capacity in the total installed capacity in the grid each year. This yearly metric was developed to assess the penetration of RE in the energy system.	<ul style="list-style-type: none"> RE installed capacity divided by the total installed capacity connected to the grid in a given year. RE installed capacity may be from a power plant using a renewable resource, including: hydro, wind, solar, biomass, biofuels, geothermal and ocean energy. 	Ministries of Energy in each MS
Ethanol fuels share of total gasoline consumption	The share of ethanol of the total gasoline consumption measures the quantity of ethanol consumed in the total gasoline consumption in each year. This yearly metric was developed to assess the use of ethanol in relation to the total gasoline consumption.	<ul style="list-style-type: none"> Quantity of ethanol consumed divided by the total quantity of gasoline consumed in a given year. Ethanol is defined by each MS. 	Ministries of Energy in each MS
Biodiesel fuels share of total diesel consumption	The share of biodiesel of the total diesel consumption measures the quantity of biodiesel consumed in the total diesel consumption in each year. This yearly metric was developed to assess the use of biodiesel in relation to the total diesel consumption.	<ul style="list-style-type: none"> Quantity of biodiesel consumed divided by the total quantity of diesel consumed in a given year. Biodiesel is defined by each MS. 	Ministries of Energy in each MS
RESULT: Promote Energy Efficiency			
Energy efficiency savings achieved of grid use	The savings achieved through EE measures in relation to the baseline year.	<ul style="list-style-type: none"> Capacity or generation avoided compared to expected on grid electricity demand. 	SAPP and Ministries of Energy in each MS
Efficient charcoal production share	The percentage of charcoal produced using efficient methods. This indicator measures the quantity of charcoal being produced using methods that increase the charcoal yield per unit of wood used.	<ul style="list-style-type: none"> Quantity of charcoal produced using efficient methods divided by the total charcoal production in a given year. Efficient charcoal production methods are defined by each MS. 	Ministries of Energy in each MS

Indicators	Description	Definitions	Sources and Means of Verification
Energy Intensity	The energy intensity indicates the quantity of primary energy required to produce a unit of GDP.	<ul style="list-style-type: none"> Rate of total primary energy supply to gross domestic product (GDP) at purchasing power parity (PPP). 	Ministries of Energy in each MS
RESULT: Access to sustainable and modern energy services			
Electricity access percentage (%)	The electricity access percentage measures the percentage of the population with access to electricity in SADC	<ul style="list-style-type: none"> Access to an electricity service in terms of households in a given year. The electricity services may be of any kind: traditional, renewable, on-grid, off-grid. 	Ministries of Energy in each MS
Cooking / heating efficient devices penetration	The penetration of efficient cooking/ space heating devices measures the percentage of households that use a modern solution for cooking.	<ul style="list-style-type: none"> Percentage of the population that is using a modern solution for cooking/space heating purposes as the main cooking device. Modern cooking solutions are defined as per the SE4ALL GTF. 	Ministries of Energy in each MS
Solar Water Heaters (SWHs) penetration	The penetration of SWHs measures the percentage of households that use a modern solution for cooking.	<ul style="list-style-type: none"> Percentage of the population that is using SWHs as the main water heating device. 	Ministries of Energy in each MS
Percentage of households using LPG as primary fuel for cooking	The percentage of households using LPG measures the share of households that use LPG as the primary fuel for cooking.	<ul style="list-style-type: none"> Definition: Access to LPG for cooking as percentage of total households. 	<p>Responsible entity: Ministry of Petroleum</p> <p>Sources of information: PHC, GLSS, Rural LPG Promotion Programme report and National Petroleum Authority</p>

Milestones	
<p>Action Plans for Strategic Intervention 1</p> <p>Strengthening of national and regional institutions</p>	<ul style="list-style-type: none"> ▪ An IGMOU on SACREEE signed by each MS ▪ An independent regulator in each MS established ▪ An IPP/PPP unit capable to deal with the energy sector in each MS established ▪ RE/EE Associations and building councils in each MS and at SADC level established ▪ An annual meeting on RE/EE policy between COMESA, EAC and IOC
<p>Action Plans for Strategic Intervention 2</p> <p>National creation framework</p>	<ul style="list-style-type: none"> ▪ Development or reformulation of national policies and strategies in line with REEESAP in the 15 MS ▪ Up-to-date MS IRPs and a revised SAPP Pool Plan ▪ A methodology and guidelines to calculate cost-reflective tariff are developed and adopted ▪ MS on-grid and mini-grid procurement frameworks and regional RERA framework completed ▪ MS policy frameworks on cooking, heating and/or cooling are developed in each MS
<p>Action Plans for Strategic Intervention 3</p> <p>Regulation and standardization</p>	<ul style="list-style-type: none"> ▪ Grid codes are developed and reviewed at national level ▪ RERA develops standardized PPAs that are applicable to MS ▪ MEPS and associated labels are adopted at the regional level ▪ Building codes are adopted in MS and at regional level
<p>Action Plans for Strategic Intervention 4</p> <p>Attracting private sector participation</p>	<ul style="list-style-type: none"> ▪ A study on the applicability of IPP framework in MS ▪ A standardised IPP framework and model contracts are adopted ▪ Established MS electrification plans and policies to guide private sector investments ▪ A market assessment on RE/EE technologies and cooking, heating and cooling appliances
<p>Action Plans for Strategic Intervention 5</p> <p>Capacity development</p>	<ul style="list-style-type: none"> ▪ A regional programme on Integrated Resource Planning and Master Plan development ▪ A regional training programme on RE/EE technology development for the tertiary education ▪ A capacity programme for project structuring and packaging for banks and MS ▪ A capacity development programme on Energy Management
<p>Action Plans for Strategic Intervention 6</p> <p>Financial intermediation</p>	<ul style="list-style-type: none"> ▪ A fund targeting RE/EE projects of <10MW and to package projects <20MW is created ▪ A regional micro credit facility is created ▪ A database on various financing facilities available in the region for RE/EE projects is available online
<p>Action Plans for Strategic Intervention 7</p> <p>Projects, technology development and transfer</p>	<ul style="list-style-type: none"> ▪ Targets of MS are aligned with SADC 2030 targets for on grids, off-grids/mini-grids ▪ Project pipelines of MS and SAPP Pool Plan to meet set targets ▪ National targets are adopted for clean cooking /heating and cooling at MS level
<p>Action Plans for Strategic Intervention 8</p> <p>Information, advocacy and awareness</p>	<ul style="list-style-type: none"> ▪ A SADC knowledge hub on RE and EE is created ▪ A regional campaign on RE and EE value and benefits (with a focus on women) is implemented ▪ An online platform on financial facilities for customer-owned generation and EE is created ▪ A register of accredited providers of RE and EE services is created and updated every year ▪ A training workshop for media practitioners in the SADC Region is organised
<p>Action Plans for Strategic Intervention 9</p> <p>Cross sectoral /Nexus</p>	<ul style="list-style-type: none"> ▪ Annual SADC Energy and other relevant sector Meetings ▪ Guidelines for the development of multi-purpose small hydropower projects ▪ Nationally Determined Contributions are approved in each MS ▪ A regional study on the promotion of sustainable energy mix in cities facing rapid urban growth

Definitions

Bioenergy

Energy derived from any form of biomass, including bio-heat, bio-power and biofuel. Bio-heat arises from the combustion of solid biomass (such as dry fuel wood) or other liquid or gaseous energy carriers. The heat can be used directly or used to produce bio-power by creating steam to drive engines or turbines that drive electricity generators. Alternatively, gaseous energy carriers such as bio methane, landfill gas, or synthesis gas (produced from the thermal gasification of biomass) can be used to fuel a gas engine. Biofuels for transport are sometimes also included under the term bioenergy.

Concentrated Solar Power (CSP)

Also called concentrating solar power, concentrated solar thermal, these systems generate solar power by focusing sunbeams on using mirrors/receivers converting the solar energy into heat that in turn is used to create steam to drive a turbine that generates electrical power.

Cooking/Heating and Cooling

These terms collectively mean use of energy sources for cooking, heating and cooling. The heating could mean space heating or water heating. Cooling generally means space cooling and other related technologies of cooling, like refrigeration.

Energy Efficiency

Measures (practices, efficient devices & appliances, regulatory - e.g. labelling and codes) undertaken to reduce the losses in generation, transmission and distribution networks on the supply side and to reduce the consumption of energy in demand sectors that include household, industry, commerce. EE in this case includes deployment of solar water heating systems and improved building designs.

Energy Intensity

According to the World Bank, energy intensity level of primary energy¹ is the ratio of energy supply to gross domestic product measured at purchasing power parity. Energy intensity is an indication of how much energy is used to produce one unit of economic output. A lower ratio indicates that less energy is used to produce one unit of output and hence being more efficient.

Energy Mix

The energy mix of a country/region is the specific combination of different energy sources it uses to meet its energy consumption needs- often a combination of non renewable and renewable energy. Energy mix varies according to the energy resources available to a country/region either as national/regional resources or as imports.

Embedded Generation

Embedded generation is generation of power in a small scale, normally connected to a distribution network, as opposed to a transmission network, and is located close to the place where the power is consumed. An example of embedded generation is a PV panel connected to the grid and installed in a household rooftop.

Hydropower

Hydro power is the power that derives from the force of energy of the moving water using turbines and generators. Hydro power systems can be run-of-river (no significant dams or reservoirs) or use large dams and reservoirs. Hydro power refers to large hydroelectric power plants, and small and micro hydro systems. In the REEESAP, all hydro power has been considered as RE. Furthermore, small hydro and lower sizes have been defined as below:

Small hydro:	1 - 20MW
Mini hydro:	100kw - 1MW
Micro hydro:	5kW - 100kW
Pico hydro:	<5kW

Integrated Resource Plan (IRP)

It is a public planning process and framework within which the costs and benefits of both demand and supply side resources are evaluated to develop the least total cost mix of utility resource options. IRP considers environmental damages caused by electricity supply and transmission and identifies cost-effective energy efficiency and renewable energy alternatives.

Renewable energy

Use of solar, wind, geothermal, hydro, ocean and biomass energy sources to deliver power and heat (space, water and process heat) to end-users, as well as the use of biomass sources to provide fuels for transportation, cooking and other purposes.

¹ Includes all sources of energy

“Secure energy, empower lives, brighten the future”



A project funded by
The European Union