THE FEDERAL REPUBLIC OF NIGERIA

NATIONAL RENEWABLE ENERGY ACTION PLANS (NREAP) (2015 – 2030)

FIRST VERSION

Adopted by the

INTER-MINISTERIAL COMMITTEE ON RENEWABLE ENERGY AND ENERGY EFFICIENCY (ICREEE)

APPROVED BY THE

NATIONAL COUNCIL ON POWER (NACOP)

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1. AKNOWLEDGEMENTS

The National Renewable Energy Action Plan (NREAP) for Nigeria has been developed through concerted efforts of over twenty Ministries, Departments and Agencies of the Federal Government of Nigeria, with inputs from representatives of 36 states and the FCT as well as the Private Sector, NGOs, Civil Society, Academia and Development Partners in Nigeria. The work was prepared with the support of ECOWAS Centre Renewable Energy and Energy Efficiency (ECREEE) additional support was received from SE4All Africa Hub-AfdB, GIZ-NESP, UNDP and several other Development Partners.

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2. FOREWORD

Adequate energy supply is generally considered the backbone for the sustainable development of any country. As a result, the UN Secretary General's Sustainable Energy for All (SE4All) Initiative launched in 2011 and the declaration of the current decade towards achieving universal energy access, has received worldwide attention. In response to these calls the ECOWAS member states have adopted the templates to formulate and implement National Energy Action Plans within the framework of the SE4All. The need for National Energy Efficiency Action Plans (NEEAP) and National Renewable Energy Action Plan (NREAP) has become more imperative as the world recently has passed 400 parts per million of atmospheric CO2—potentially enough to trigger a warming of 2 degrees Celsius compared with pre-industrial levels.

Aware of this situation, the Federal Government of Nigeria, through the coordination of the Federal Ministry of Power, Work and Housing in collaboration with the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), and with the support of its development partners, has developed the current actions plans towards achieving SE4ALL goals through the gathering of available data, exchanges and suggestion with the various relevant actors in both the public and private sector.

The Nigerian National Renewable Energy Action Plan (NREAP) has been developed with the contribution of several Nigerian stakeholders, it demonstrate FGN's commitment to matching her words with action as the National Renewable Energy & Energy Efficiency Policy (NREEEP) approved in May 2015 directs the Hon. Minister of Power to develop the NREAP within 6 – 12 months of the approval of NREEEP, 2015 - a summary of this is the intention of Nigeria to achieve an electricity vision of attaining 30,000MW of power by the year 2030 with at least 30% renewable energy in the electricity mix (Electricity Vision 30:30:30) which is vigorously pursued in a three-prong stages of attaining the stable, then the sustainable and the uninterruptible power supply in Nigeria.

On behalf of the Federal Government of Nigeria, I would sincerely like to thank all those who have contributed to the successful production of the actions within the framework of a sustainable energy for all. These include the Interministerial Committee on Renewable Energy and Energy Efficiency, (ICREEE), relevant Ministries and Agencies, private institutions in the industrial sector.

The NREAP provides useful information on the renewable energy potential and market in Nigeria, the relevant policies and barriers to overcome, and I trust that this NREAP will be a useful tool for the development, implementation and promotion of renewable energy measures.

H.E. Babatunde Raji Fashola, SAN
Honourable Minister of Power, Works and Housing

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NATIONAL RENEWABLE ENERGY ACTION PLAN (NREAP) OF NIGERIA

1. INTRODUCTION

The template used for this work was initially designed by the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) and adopted by the 15 ECOWAS members-states. This National Renewable Energy Action Plan (NREAP) includes baseline data and information on renewable energy sources and technologies, various activities and programmes in Renewable Energy (RE), in Nigeria, barriers to the development and promotion of RE in the country, and suggested achievable RE targets, incl. gender disaggregated indicators based on national potentials and socio-economic assessments. An overview on concrete policy and regulations, laws, incentives and measures, to be implemented by the country to achieve the targets are also included.

The implementation of the NREAP will be monitored by the Federal Ministry of Power, Works, and Housing.

The NREAP development process has been supported by a broad range of our development partners, both national and international such as: the GEF Strategic Programme for West Africa, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Governments of Austria and Spain.

2. SUMMARY OF NATIONAL RENEWABLE ENERGY POLICY

THE IMPORTANCE OF RENEWABLES IN NIGERIA

The development of renewable energy policy and the national action plan are key elements to the current electricity reform and Nigeria's energy strategy. Nigeria needs to radically increase its use of renewable energy. Nigeria has been blessed with wealth of resources in both renewables and non-renewable energy sources. Until now, the country has relied on the use of conventional oil and gas supplies to meet homes' energy demand and support businesses energy needs. As the country looks forward to capitalising on its recent economic growth potential and the privatisation of the power sector, it is important to ensure that the country also makes the most of its renewable resources to provide a secure basis for Nigeria's future energy needs. The depletion of domestic fossil fuel reserves, combined with projected growth in global energy demand, puts Nigeria's security of energy supply at risk. Exploiting available

renewable resources will make a strong contribution to the country's energy needs and allow it to be less reliant on conventional, internationally traded energy resources.

The drive to increase the proportion of energy obtained from renewable sources will not only increase the security of energy supplies in Nigeria, it will also provide opportunities for investment in new industries and new technologies. The Nigerian Government seeks help to develop businesses in this area to put Nigeria at the forefront of new renewable technologies and skills in the West African region.

The Nigerian Government believes that climate change is one of the threats facing the country, and that urgent action at home and abroad is required. Nigeria needs to use a wide range of levers to decarbonise the economy. The development of renewable energy sources, alongside other clean energy technologies and the development of a strategic energy efficiency approach will also enable Nigeria to play its full part in regional efforts to reduce the production of harmful greenhouse gases.

The National Action Plan presents the expected development and expansion of renewable energies in Nigeria in order to achieve the national target under ECOWAS Renewable Energy Policy (EREP), and thus Nigeria's contribution to the overall ECOWAS target of 23 % and 31% renewable energy in 2020 and 2030. It contains existing and currently planned measures, with which the national target is to be achieved. The National Action Plan was prepared in accordance with section 4 of the EREP. Through its extensive and detailed character, the National Action Plan is a key document of the Federal Government's national promotion of renewable energies and supports its policy objectives of security of supply, climate protection, competitiveness, promotion of technology and innovation, as well as of securing and providing electricity access to the populace of Nigeria.

The Way Forward

The overall objective of the National Action Plan is to advance the development of renewable energies in Nigeria. Thus, this National Renewable Energy Action Plan provides details on the sets of measures and plans that would enable Nigeria to meet its 2020 and 2030 targets. But it is important to go a lot further. The Government will also seek to secure the country's energy supplies through 2030 and beyond and provide a sound framework for businesses to develop in the new industries, providing jobs and cutting harmful greenhouse gases. The Nigerian Energy Roadmap, and the new National Renewable Energy and Energy Efficiency Policy sets out a range of pathways to ensure that Nigeria goes as far as possible in exploiting its renewable energy resources.

The Inter-Ministerial Committee on Renewable Energy and Energy Efficiency will be strengthened to review the renewables target and provide advice on increasing the level of ambition. The Federal Government will also commit to making an Annual Energy Statement to

the Federal Executive Council to set strategic energy policy and guide investment in all forms of energy including renewables. At the ECOWAS level, Nigeria is also pushing for greater leadership strategy in tackling international climate change by supporting an increase in the ECOWAS emission reduction plans to a minimum level by 2030.

Nigeria's 2020 and 2030 target

The history of energy production in Nigeria has been based around natural resources of fossil fuels. Until recently Nigeria has not been as active in the exploitation of its renewable resources potentials. Compared to some ECOWAS Member States, Nigeria is starting from a very low level of renewable energy exploitation and this means that the country's challenge to meet the 2020 and 2030 targets are even greater. The National Renewable Energy and Energy Efficiency Policy 2015 set a target for Nigeria to achieve 16% of its electricity consumption from renewable sources by 2030. This compares to only 0.8% in 2012. While there has been a small increase in renewable energy use in recent years, the deployment shall be greatly enhanced over the next decade in order to meet the target.

The Energy Commission of Nigeria (ECN) published draft results of analysis and modelling to demonstrate how it might be possible to meet the 16% renewables target by 2030 as part of the Nigerian Renewable Energy Roadmap in 2012. The results of this analysis are the basis of the analytical work in this document. This analysis indicates that delivering 16% renewable energy by 2030 is feasible through domestic action and could be achieved with the following proportion of energy consumption in the electricity sector coming from renewables: Small Hydropower (7.07%); Solar (5.90%); Biomass (2.78%); and Wind (0.25%).

These figures are purely illustrative of how the overall 16% target for Nigeria could be met, and should not be taken as an upper limit to the country's ambition for renewables deployment. Given the dynamic nature of the energy market and the advances in technology that are being made, it is likely that the balance between different sectors could change as we go forward. Whatever the precise breakdown may be, the Federal Government is putting in place the framework and taking the actions necessary to ensure that Nigeria meet its renewable goals.

The Nigerian Policy framework for action

Nigeria is establishing a financial/economic instrument framework that provides long-term, comprehensive and targeted support for renewable technologies. The Nigerian Electricity Regulatory Commission on behalf of the Federal Government is looking at establishing a system of feed-in tariffs in electricity, as well as other incentives in order to ensure that the

country's greater ambitions for renewable energy are supported and have the required investment. In addition to this support, Nigeria is looking into the possibility of a Green Equity Fund and Green Fund to help fund the introduction of renewable energy. As part of the creation of these schemes, financial products will be created to provide individuals with opportunities to invest in the infrastructure needed to support the growing renewable energy market in Nigeria. It is not only the generation companies (GenCos) and the distribution companies (DisCos) which will see benefits from higher levels of renewables, the Federal Government through relevant agencies will be providing opportunities for communities and businesses to benefit through the promotion of community-owned renewable energy schemes as well. The rural electrification strategy currently being finalised provides the opportunity for communities to host renewable energy projects to keep the additional business rates they generate as part of these schemes. This way, local people will benefit from the local energy resources they are harnessing and the power they are producing.

The Federal Government of Nigeria through relevant Ministries, Departments, and Agencies will also be taking steps to identify barriers and address those issues that affect the timely deployment of established renewable technologies such as: the planning system and public acceptance; regulatory matters and supply chains; connection to the grid; and availability and sustainable use of all forms of renewable energy sources.

The Nigerian Government is taking positive steps to encourage off-grid electrification solutions across the country's rural areas. And where grid connection is available, existing grids shall be retrofitted towards smarter grid systems. A smarter grid will enable the efficient use of networks, and greater renewable and distributed generation as such the Government is looking into ways to accelerate the rollout of the smart grid. Industry view on this is widely sort as NERC is currently engaging with various stakeholders.

Developing emerging technologies

Onshore wind, solar (PV, Solar Thermal, & CSP), bioenergy and small hydro are key renewable energy technology strands for development. Nigeria will work to develop these renewable energy sources for electricity generation and connection to the grid to support the Federal Government's continuing commitment to being regional leaders in these technologies. These new generations of various renewable energy sources will play a key role in meeting our 2020 and 2030 targets and add value to domestic low carbon industrial development.

Geothermal, wave and tidal energy are also priority renewable energy sources for development in Nigeria. Nigeria is a country blessed with countless natural resources including geothermal energy and wave and tidal resource in the coastal areas. Geothermal

energy exploration is similar to oil and gas processes, so Nigeria can leverage on its oil and gas sector technology to explore its geothermal potential in all locations of the country. The Government has also inaugurated the National Council on Power as a key organ for further development, and will work with stakeholders to develop a strategy for delivering this national renewable energy commitment. It was recommended by the National Council on Power 2014 that the Federal Government should consider in detail how to create a network of renewable energy clusters to push the sector forward. Each renewable energy cluster will be unique and different; building on the strengths of the region in which it is based.

Co-ordinating Delivery

The Federal Ministry of Power has the mandate for renewable energy electricity deployment. This mandate is within the Federal Government's strategy to ensure Nigeria meets its national and regional targets for renewable energy. The Minister of Power carries out this mandate by working closely with the Renewable Energy and Rural Power Access (RRD) Department of the ministry, partners and stakeholders that are involved in providing technical assistance in renewable energy deployment. The RRD department is currently undertaking a wide range of projects around the country and are working to develop a coordinated delivery plan to implement the commitments made in this National Renewable Energy Action Plan.

It should be noted that, while energy in Nigeria is generally on the concurrent legislative list of the Federal Government, many of the mechanisms to help deploy greater levels of renewables are matters for concerning the States and Local Governments. The Federal Government is working closely with States and Local Governments in Nigeria who have a key part to play in meeting the country's overall target. States and Local Governments are keen to increase the use of renewable energy, which adds to the overall target of 8% of energy to be derived from renewable sources by 2020.

Human Capacity Development

Beyond developing emerging technologies and co-ordinating delivery of national targets, human capacity development is equally important. This cuts across the whole value chain of renewable energy technologies in the country. The approval of the National Renewable Energy and Energy Efficiency Policy by the Federal Executive Council in May 2015 is a positive sign that renewable energy sources are now receiving significant attention at the national level and also forms part of the key sources to the delivery of the much needed energy demand across the country. It is therefore important that strategies for training of professionals across each of the renewable energy value chains are developed and implemented. Currently, the GIZ NESP Capacity Building component is working with the National Power Training

Institute of Nigeria (NAPTIN) to develop training modules for power sector professionals. This effort is expected to help to bridge the professional shortage in the power sector. In addition to this, renewable energy modules could also be developed and integrated into curricula of polytechnics and universities and vocational schools so as to develop national professionals to meet the demand of a growing domestic renewable energy sub-sector.

3. SUMMARY OF TARGETS

Table 1: Targets for grid connected RE

In MW installed capacity	**2010**	**2020**	**2030**
Renewable energy installed capacity in MW (including large and medium scale hydro)	916	5,325	13800
Renewable energy share of the total installed capacity in % (including medium and large hydro)	21	52	43
Grid Connected Generation (GWh)	**2010**	**2020**	**2030**
Total renewable energy generation in GWh (including medium and large hydro)	4,749	20,031	49766
Renewable energy share in the electricity mix in % (including medium and large hydro)	17	38	29

Table 2: Targets for off-grid applications

	2010	**2020**	**2030**
Share of rural population served with off-grid (mini-grids and stand-alone) renewable energy electricity services in %	1.2%	25%	40%

Table 3: Targets for domestic cooking energy

	2010	**2020**	**2030**
Share of population using improved cookstoves in %	0.24%	40%	59%
Share of charcoal produced by efficient charcoal production technologies in %	2%	5%	7%
Use of modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers , ethanol gel fuel, etc) - % of population*	97.66%	55%	34%

Table 4: Targets for solar water heaters

	2010	**2020**	**2030**
Solar water heaters for sanitary hot water and preheating of industrial process water:			
- No. of residential houses with solar thermal systems	0	5%	7%
- Share of district health centres, maternities, school kitchens and boarding schools with solar thermal systems in %	0	0.5%	5%
- Share of agro-food industries (preheating of process water) with solar thermal systems in %	0	2%	5%
- Share of hotels with solar thermal systems in %	0	5%	10%

Table 5 : Targets for biofuels

	2010	2020	2030
Biofuels (1st generation) - Ethanol as share of gasoline consumption - Biodiesel as share of Diesel and Fuel oil consumption	8.5 1.8	33.18% 6.2	57.34% 17.45

4.1 RENEWABLE ENERGY TARGETS AND TRAJECTORIES

4.1 Grid- connected Renewable Energy Targets

Table 7: ***Targets for the share of grid-connected renewable energy in 2010, 2020 and 2030***

In MW installed capacity	**2010**	**2020**	**2030**
Renewable energy installed capacity in MW (excluding medium and large hydro)	0	2,785	9,100
Renewable energy share of the total installed capacity in % (excluding medium and large hydro)	0	27	28
Large- and medium scale hydropower capacity installed in MW (more than 30 MW)	916	2,540	4,700
Large- and medium scale hydropower (more than 30 MW) share of total electricity generation in %	21	25	15
Total renewable energy capacity in MW (including large and medium scale hydro)	916	5,325	13,800
Renewable energy share of the total installed capacity in % (including medium and large hydro)	21	52	45
Grid Connected Generation (GWh)	**2010**	**2020**	**2030**
Renewable energy electricity generation in GWh (excluding medium and large hydro)	0	6,864	25,402
Renewable energy share in the electricity mix in % (excluding medium and large hydro)	0	13	15
Large and medium scale hydropower generation in GWh (more than 30 MW)	4,749	13,167	24,365
Large and medium scale hydropower generation (more than 30 MW) as share of electricity mix in %	17	25	14
Total renewable energy generation in GWh (including medium and large hydro)	4,749	20,031	49766
Renewable energy share in the electricity mix in % (including medium and large hydro)	17	38	31

TABLE 7:NATIONAL 2020 AND 2030 TARGETS AND ESTIMATED TRAJECTORY OF GRID CONNECTED RENEWABLE ENERGIES (MW)

	2010	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
Large hydro (up to 30 MW)	916	916	1097	1200	1650	1920	2200	2540	2800	3100	3400	3700	4000	4200	4500	4600	4700	4700
Small and Medium hydro (more than 30 MW)	0	0	15	45	125	205	285	265	325	405	485	565	625	705	785	865	945	1200
Solar PV	0	0	0	100	500	1200	1600	2000	2300	2600	2900	3200	3500	3840	4180	4520	4860	5000
Solar Thermal	0	0	0	0	0	0	0	50	200	300	400	500	600	700	800	900	950	1000
Tidal, wave, ocean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	10	50	90	130	170	210	250	290	330	370	450	530	610	750	800
Bioenergy	0	0	0	0	50	180	240	300	360	420	480	540	600	720	840	960	1080	1100
Geothermal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**916**	**916**	**1112**	**1355**	**2375**	**3595**	**4455**	**5325**	**6195**	**7075**	**7955**	**8835**	**9695**	**10615**	**11635**	**12455**	**13285**	**13800**

Table 8: National 2020 and 2030 targets and estimated trajectory of grid connected renewable energy generation (MWh)

	2010	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	MWh	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**	**MWh**
Large hydro (up to 30 MW)	4748 544	4748 544	5686 848	6220 800	8553 600	9953 280	11404 800	13167 360	14515 200	16070 400	17625 600	19180 800	20736 000	21772 800	23328 000	23846 400	24364 800	2436 500
Small and Medium hydro (more than 30 MW)	0	0	77760	2332 80	6480 00	1062 720	14774 401	13737 601	16848 001	20995 201	2514 240	29289 601	3240 000	3654 720	4069 944	4484 160	4898 880	6221 000
Solar PV	0	0	0	1640 00	8210 00	1969 920	26265 60	32832 00	37756 80	42681 60	47606 40	52531 20	57456 00	63037 44	68618 88	74200 32	797817 6	8208 320
Solar thermal	0	0	0	0	0	0	0	151200	604 800	907 200	1209 600	43272 144	1814 400	2116 800	2419 200	2721 600	2872 800	3024 000
2Tide, wave, ocean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	23328	116640	209952	303264	396576	489888	583200	676512	769824	863136	10497 60	1236 384	1423 008	1749600	1866 240
Bioenergy	0	0	0	0	2765 52	9953 28	13271 04	16588 80	19906 56	23224 32	26542 08	29859 84	33177 60	39813 12	46448 64	53084 16	597196 8	6083 520
Geothermal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**4748 544**	**4748 544**	**5764 608**	**6641 408**	**1041 5792**	**1419 1200**	**17139 168**	**20030 976**	**23061 024**	**26250 912**	**29440 800**	**74390 832**	**35716 896**	**38879 136**	**42559 776**	**45203 616**	**478362 24**	**2783 9580**

4.2 Off-grid Renewable Energy Targets

Table 9: Contribution of renewable energy to electricity access targets

	2010	2020	2030
Share of population served by electricity services (%)	40	75	90
Share of population connected to the grid (%)	38	70	80
Share of rural population served by renewable energy and hybrid mini-grids (%)	2	5	10
Share of rural population served by standalone renewable energy systems (%)	1.8	4.7	5
Number of RE/hybrid mini-grids	NA	NA	NA

Table 10: National 2020 and 2030 targets and estimated trajectory for rural population served by RE

	2010	2013*	2015	2016	2017	2018	2019	2020	2021
Total Rural Population (number of inhabitants)	**85,823,500**	**89,322,300**	**91,729,000**	**92,780,800**	**93,542,500**	**94,457,300**	**94,892,400**	**95,574,000**	**97,963,350**
Rural population served with electricity services (number of inhabitants)	3,500,000	4,100,000	4,600,000	4,800,000	5,000,000	5,200,000	5,500,000	5,700,000	32,327,906
Rural population served with electricity services (% of total)	24	26	28	29	30	30	31	32	33
Rural population served with renewable electricity services (pure and hybrid) (number of inhabitants)	105,000	164,000	184,000	240,000	350,000	520,000	715000	912000	6,465,581
Rural population served with renewable electricity services (pure and hybrid) (%)	3	4	4	5	7	10	13	16	20

	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Rural Population (number of inhabitants)	100412434	102922745	105495814	108133209	110836539	113607452	116447638	117612114	120,552,417
Rural population served with electricity services (number of inhabitants)	35144352	36022961	37978493	43253284	45442981	47715130	48908008	50573209	53,043,063
Rural population served with electricity services (in % of total)	35	35	36	40	41	42	42	43	44
Rural population served with renewable electricity services (pure and hybrid) (number of inhabitants)	7,380,314	7,927,471	8,735,053	9,948,255	10,906,315	11,928,783	12,716,082	13,654,766	15,382,488
Rural population served with renewable electricity services (pure and hybrid) (%))	21	22	23	23	24	25	26	27	29

Table 11 : National 2020 and 2030 RE targets and estimated trajectory for rural population, disaggregated by gender

	2010		2013*		2015		2016		2017		2018		2019		2020		2021	
	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M
Total Rural Population (number of women (W) and men (M))	38620575	47202925	40195035	49127265	42195340	49533660	43606976	49173824	44900400	48642100	45339504	4.9E+07	46497276	48395124	46831260	48742740	48981675	48981675
Rural population served with electricity services (number of women and men)	1575000	1,925,000.00	1,845,000.00	2255000	2116000	2484000	2256000	2544000	2400000	2600000	2496000	2704000	2695000	2805000	2793000	2907000	16163953	16163953
Women and men of rural population served with electricity services (%)	13.63	15.37	11.7	14.3	12.88	15.12	13.63	15.37	14.4	15.6	14.4	15.6	15.19	15.81	15.68	16.32	16.5	16.5
Women and men of rural population served with renewables electricity services (pure and hybrid) (number of women and men)	47250	57750	73800	90200	84640	99360	112800	127200	168000	182000	249600	270400	350350	364650	446880	465120	3232791	3232791
Women and men of rural population served with renewable electricity services (pure and hybrid) (%)	1.35	1.65	1.8	2.2	1.84	2.16	2.35	2.65	3.36	3.64	4.8	5.2	6.37	6.63	7.84	8.16	10	10

	2022		2023		2024		2025		2026		2027		2028		2029		2030	
	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M
Total Rural Population (number of women (W) and men (M))	50206217.00	50206217.00	52490599.95	50432145.05	53802865.14	51692948.86	57310600.77	50822608.23	58743365.67	52093173.33	59075875.04	54531576.96	59388295.38	57059342.62	58806057.00	58806057.00	60276208.50	60276208.50
Rural population served with electricity services (number of women and men)	17572176.00	17572176.00	18371710.11	17651250.89	19369031.43	18609461.57	22924240.52	20329043.48	24084779.93	21358201.07	24811867.60	22903262.40	24943084.08	23964923.92	25286604.50	25286604.50	26521531.50	26521531.50
Women and men of rural population served with electricity services (%)	17.50	17.50	17.85	17.15	18.36	17.64	21.20	18.80	21.73	19.27	21.84	20.16	20.58	21.42	21.50	21.50	22.00	22.00
Women and men of rural population served with renewables electricity services (pure and hybrid) (number of inhabitants)	3690157.00	3690157.00	4043010.21	3884460.79	4454877.03	4280175.97	5272575.15	4675679.85	5780346.95	5125968.05	6202967.16	5725815.84	6485201.82	6230880.18	6827383.00	6827383.00	7691244.00	7691244.00
Women and men of rural population served with renewable electricity services (pure and hybrid) (%)	10.50	10.50	11.22	10.78	11.73	11.27	12.19	10.81	12.72	11.28	13.00	12.00	13.26	12.74	13.50	13.50	14.50	14.50

Table12 : National 2020 and 2030 targets and estimated trajectory for off-grid RE systems

	2010	2014*	2015	2016	2017	2018	2019	2020	2021
Mini-grids powered purely by renewables (in MW of installed capacity)	0	1	1	5	50	125	150	180	270
Mini-grids powered by hybrid systems (MW)	0	0	0.5	1	2	2.5	3	4	15
PV and Pico-Hydro rural systems (MW)	0.2	0.25	0.5	1	2	2.5	3	3.5	10
Total Off-grid RE installed capacity (MW)	**0.2**	**1.25**	**2**	**7**	**54**	**130**	**156**	**187.5**	**295**

	2022	2023	2024	2025	2026	2027	2028	2029	2030
Mini-grids powered purely by renewables(in MW of installed capacity)	405	608	911	1367	2050	3075	3691	4429	5314
Mini-grids powered by hybrid systems (MW)	40	55	78	92	108	123	139	155	171
PV and Pico-Hydro rural systems (MW)	20	25	32	40	44	48	52	56	60
Total Off-grid RE installed capacity (MW)	**465**	**688**	**1021**	**1499**	**2202**	**3246**	**3882**	**4640**	**5545**

4.3 Renewable energy applications for domestic uses

4.3.1 Domestic cooking energy targets

Table 13 Domestic cooking energy targets for 2020 and 2030

	2010	2020	2030
Share of the population using improved cookstoves in %	0.24%	40%	59%
Share of charcoal produced using efficient charcoal production techniques in %	2%	5%	7%
Share of the population using modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers, kerosene) - % of population	97.66%	55%	34%

(Source: Federal Ministry of Environment 2015)

Table 14: National 2020 and 2030 targets and estimated trajectory for domestic cooking energy

	2010	2013*	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population served with improved cookstoves (number of inhabitants)	0.4	0.72	8.8	16.8	26	40	56	80	88	104	120	128	144	160	176	184	200	208
Improved cookstoves: measured in terms of % of total population using improved cookstoves (% of total population)	0.24%	0.40%	5.04%	9.60%	14.44%	21.04%	28.72%	40%	44%	47.28%	48%	49.24%	51.44%	53.32%	55%	55.76%	58.84%	59.44%
Total charcoal production in ton s of charcoal	25,000	40,000	50,000	60,000	72,000	86,400	103,680	124,416	155,520	194,400	243,000	303,750	379,688	474,610	593,263	741,579	926,974	1,158,718
Charcoal production with improved carbonisation techniques (yield superior to 25%) in tones of charcoal	500	4,400	8,500	12,000	16,560	22,464	30,067	39,813	52,877	69,984	88,920	121,500	159,469	208,828	272,901	355,958	463,487	602,533
Share of charcoal produced by efficient charcoal production techniques in % (%)	0.02	0.11	0.17	0.2	0.23	0.26	0.29	0.32	0.34	0.36	0.38	0.4	0.42	0.44	0.46	0.48	0.5	0.52
Population using modern cooking fuel alternatives (LPG, biogas, solar cookers, kerosene) (number of inhabitants)	0.4	0.72	8.8	16.8	26	40	56	80	88	104	120	128	144	160	176	184	200	208
Use of modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers, kerosene) (% of the total population)	0.24%	0.40%	5.04%	9.60%	14.44%	21.04%	28.72%	40%	44%	47.28%	48%	49.24%	51.44%	53.32%	55%	55.76%	58.84%	59.44%

Source: Federal Ministry of Environment (2015); and Sources Online

Table 15: National 2020 and 2030 targets and estimated trajectory for domestic cooking energy disaggregated by gender

	2010		2013*		2015		2016		2017		2018		2019		2020		2021	
	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M
Number of women and men served with improved cookstoves (number of women (W) and men (M))	0.35	0.05	0.65	0.07	8.3	0.3	16	0.8	25	1	38	2	52	4	74	6	80	**8**
Improved cookstoves: measured in terms of % of total women and men using improved cookstoves (% of women and men)	0.21%	0.03%	0.37%	0.03%	4.74%	0.30%	9.14%	0.46%	13.89%	0.55%	20%	1.04%	26.67%	2.05%	37%	3%	40%	4.02%
Total charcoal production in tons of charcoal carried out by women and men	11250	13750	18000	22000	23000	27000	28200	31800	34560	37440	41472	44928	50803.2	52876.8	60963.84	63452.16	77760	77760

Charcoal production with improved carbonisation techniques (yield superior to 25%) in tons of charcoal carried out by women and men	225	275	1980	2420	3910	4590	5640	6360	7949	8611	10783	11681	14733	15334	19508	20305	26439	26439
Share of charcoal produced by efficient charcoal production techniques by women and men (%)	0.009	0.011	0.05	0.061	0.078	0.092	0.094	0.106	0.11	0.12	0.125	0.135	0.1421	0.1479	0.1568	0.1632	0.17	0.17
Number of women and men using modern cooking fuel alternatives (LPG, biogas, solar cookers, kerosene) (number of women and men)	0.35	0.05	0.65	0.07	8.3	0.3	16	0.8	25	1	38	2	52	4	74	6	80	
Use of modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers, kerosene) (% of the female and male population)	0.21%	0.03%	0.37%	0.03%	4.74%	0.30%	9.14%	0.46%	13.89%	0.55%	20%	1.04%	26.67%	2.05%	37%	3%	40%	

	2022		2023		2024		2025		2026		2027		2028		2029		2030	
	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M
Number of women and men served with improved cookstoves (number of women (W) and men (M))	94	10	108	12	113	15	127	17	141	19	155	21	160	24	170	30	175	33
Improved cookstoves: measured in terms of % of total women and men using improved cookstoves (% of women and men)	42.73%	4.55%	43.20%	4.80%	43.46%	5.78%	45.36%	6.08%	47%	6.32%	48.44%	6.56%	48.48%	7.28%	50%	8.84%	50%	9.44%
Total charcoal production in tons of charcoal carried out by women and men	97200	97200	123930	119070	154913	148838	201234.6	178453.4	251543	223067	308496.8	284766.2	378205.3	363373.7	463487	463487	579359	579359

Charcoal production with improved carbonisation techniques (yield superior to 25%) in tons of charcoal carried out by women and men	34992	34992	45349	43571	61965	59535	84519	74950	110679	98149	141909	130992	181539	174419	231744	231744	301267	301267
Share of charcoal produced by efficient charcoal production techniques by women and men (%)	0.18	0.18	0.1938	0.1862	0.204	0.196	0.2226	0.1974	0.2332	0.2068	0.2392	0.2208	0.2448	0.2352	0.25	0.25	0.26	0.26
Number of women and men using modern cooking fuel alternatives (LPG, biogas, solar cookers, kerosene) (number of women and men)	94	10	108	12	113	15	127	17	141	19	155	21	160	24	170	30	175	33
Use of modern fuel alternatives for cooking (e.g. LPG, biogas, solar cookers, kerosene) (% of the female and male population)	42.73%	4.55%	43.20%	4.80%	43.46%	5.78%	45.36%	6.08%	47%	6.32%	48.44%	6.56%	48.48%	7.28%	50%	8.84%	50%	9.44%

Source: Federal Ministry of Environment (2015); and Sources Online

4.3.2 Solar thermal water heating

Table 18: Solar thermal water heating targets for 2020 and 2030

Solar water heaters for sanitary hot water and preheating of industrial process hot water:	2010	2020	2030
No. of residential houses with solar thermal systems	**2010**	**2020**	**2030**
Share of district health centres, maternities, school kitchens and boarding schools with solar thermal system in %	0	5%	7%
Share of agro-food industries (preheating of process water) with solar thermal systems in %	0	2%	5%
Share of hotels with solar thermal systems in %	0	2%	5%
	0	5%	10%

Source: Federal Ministry of Land, Housing and Urban Development 2015

Table 17 : National 2020 and 2030 targets and estimated trajectory of solar thermal water heating applications

	2010	2013*	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Share of residential buildings with solar thermal systems (%))	0	0	0.5	3	3.5	4	4.5	5	5.2	5.4	5.6	5.8	6	6.2	6.4	6.6	6.8	7
Share of district health centres, maternity clinics, school kitchens and boarding schools with solar thermal systems (%)	0	0	0.2	1.2	1.4	1.6	1.8	2	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4	4.7	5
Share of agro - food industries with solar thermal systems (preheating of process water) (%)	0	0	0.2	1.2	1.4	1.6	1.8	2	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4	4.7	5
Share of hotels with solar thermal systems installed (%)	0	0	0.1	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
MWth S olar Thermal installed capacity	0	0	0.01	0.5	0.7	0.75	0.8	1	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5

Source: Federal Ministry of Lands, Housing and Urban Development

4.4 Biofuels

Table 18: Biofuels targets for 2020 and 2030

Biofuels (1st generation)	2010	2020	2030
Ethanol as share of gasoline consumption (%)	8.5	33.18	57.34
Biodiesel as share of Diesel and Fuel-oil consumption (%)	1.8	6.2	17.45

(Source NNPC 2014)

Table 19: National 2020 and 2030 targets and estimated trajectory of biofuel usage

	2010	2013*	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total national gasoline consumption (litres)	165.79	264.82	363.85	423.82	483.79	543.76	603.73	663.68	711.6	759.52	807.44	855.36	903.29	956.44	1009.59	1062.74	1115.89	1169.1
Total national diesel/fuel oil/DDO consumption (litres)	23.53	53.23	72.96	82.43	93.9	104.37	114.84	125.32	145.85	166.38	186.91	207.44	227.99	261.32	294.65	327.98	361.31	394.64
Total national raw vegetal/ biodiesel production (Litres)	0.4	1.2	2	2.28	2.56	2.84	3.12	3.4	5.47	7.54	9.61	11.68	13.74	23.97	34.2	44.43	54.66	23.7
Total national ethanol produced (litres)	1.06	3.18	5.3	6.18	7.06	7.94	8.82	9.7	17.64	25.58	33.52	41.46	49.39	52.35	55.31	58.27	61.23	64.2
Total national raw vegetal/biodiesel consumption (Litres)	0.96	2.88	4.8	5.23	5.66	6.09	6.52	6.94	8.22	9.5	10.78	12.06	13.35	14.58	15.81	17.04	18.27	19.5
Total national ethanol consumption (litres)	5.06	15.18	25.3	27.3	29.3	31.3	33.3	35.3	37.98	40.66	43.34	46.02	48.7	50.7	52.7	54.7	56.7	58.7
Ethanol as share of national gasoline consumption (%)	8.5	16.12	21.2	23.6	26.0	28.4	30.08	33.18	35.48	37.78	40.08	42.38	45 .3	47.71	50.12	52.53	54.94	57.34
Biodiesel as a sh are of national Diesel and Fuel - oil/DDO consumption (%)	1.8	2.82	3.5	4.04	4.58	5.12	5.66	6.2	7.24	8.28	9.32	10.36	11.39	12.6	13.81	15.02	16.23	17.45

Source: NNPC 2014

4.5 Market Development Indicators

Table 20 : Status of renewable energy investment in the country

		2010	2013*	2015	2016	2017	2018	2019	2020	2021
Total investment in newly installed RE electric capacity (in Euro) - excl. medium and large hydro	Small hydro (up to 30 MW)									
	Solar	0	NA	NA	NA	NA	NA	NA	NA	NA
	Tide, wave, ocean	0	NA	NA	NA	NA	NA	NA	NA	NA
	Wind	0	NA	NA	NA	NA	NA	NA	NA	NA
	Bioenergy	0	NA	NA	NA	NA	NA	NA	NA	NA
	Geothermal	0	NA	NA	NA	NA	NA	NA	NA	NA
Total investment in newly installed RE electric capacity (in Euro) - incl. medium and large hydro		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total investment in solar thermal		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total investment in other RE sectors (non-electricity e.g. biofuels)		NA	NA	NA	NA	NA	NA	NA	NA	NA
Volume of contracts for local manufactures/assembly industry's/local installers of total investments (in Euro)	Small hydro (up to 30 MW)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Solar	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Tide, wave, ocean	0	NA	NA	NA	NA	NA	NA	NA	NA
	Wind	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Bioenergy	0	NA	NA	NA	NA	NA	NA	NA	NA
	Geothermal	0	NA	NA	NA	NA	NA	NA	NA	NA
	Solar thermal	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of registered companies in the RE field (number of companies)		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total investment in newly installed RE capacity	Small hydro (up to 30 MW)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Solar	0	NA	NA	NA	NA	NA	NA	NA	NA
	Tide, wave, ocean	0	NA	NA	NA	NA	NA	NA	NA	NA
	Wind	0	NA	NA	NA	NA	NA	NA	NA	NA

medium and large hydro, with the participation of local commercial banks	Geothermal	0	NA	NA	NA	NA	NA	NA	NA	NA
	Solar thermal	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of commercial banks financing RE in the region (number of banks)		NA	NA	NA	NA	NA	NA	NA	NA	NA

		2022	2023	2024	2025	2026	2027	2028	2029	2030
Total investment in newly installed RE electric capacity (in Euro) - excl. medium and large hydro	Small hydro (up to 30 MW)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Solar	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Tide, wave, ocean	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Wind	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Bioenergy	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Geothermal	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total investment in newly installed RE electric capacity (in Euro) - incl. medium and large hydro		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total investment in solar thermal		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total investment in other RE sectors (non-electricity e.g. biofuels)		NA	NA	NA	NA	NA	NA	NA	NA	NA
Volume of contracts for local manufactures/assembly industry's/local installers of total investments (in Euro)	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Solar	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Tide, wave, ocean	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Wind	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Bioenergy	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Geothermal	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Solar thermal	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of registered companies in the RE field (number of companies)		NA	NA	NA	NA	NA	NA	NA	NA	NA

Total investment in newly installed RE capacity (in Euro) - excl. medium and large hydro, with the participation of local commercial banks	Small hydro (up to 30 MW)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Solar	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Tide, wave, ocean	NA	NA	NA	NA	NA	NA	NA	NA	
	Wind	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Bioenergy	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Geothermal	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Solar thermal	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of commercial banks financing RE in the region (number of banks)		NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 21: National 2020 and 2030 targets and estimated trajectory of registered companies owned by women and men

	2010		2013*		2015		2016		2017		2018		2019		2020		2021	
	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M
Number of registered companies in the RE field owned by women and men (number of companies owned by women and men)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	2022		2023		2024		2025		2026		2027		2028		2029		2030	
	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M
Number of registered companies in the RE field owned by women and men (number of companies owned by women and men)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

5. MEASURES FOR ACHIEVING THE TARGETS

5.1 Summary tables of policies and measures to promote the use of RE resources

Table 22: Overview of policies and measures for grid connected RE

Name of the measure	Type of measure*	Expected results**	Target group And/or activity***	Existing or planned	Start and end dates of the measure
Feed-in Tariffs (FIT)	Regulatory	Increase generation of renewable electricity from 1MW to 5MW for PV and biomass, and from 1MW to 10MW for wind, small and medium hydro power plants	Primarily medium scale renewable electricity generation by Independent Power Producers (IPPs)	planned	Start in 2016, no end date defined.
Competitive Procurement Programme	Regulatory	Increase generation of renewable electricity from 5MW and above for PV and from 10MW and above for wind, small and medium hydro power	Primarily medium scale renewable electricity generation by energy companies	Planned	start in 2016 no end date defined
GIZ-Nigerian Energy Support Programme: Capacity Building Component	Capacity Building	Develop professional and technical courses on renewable energy and energy efficiency	Working with National Power Training Institute of Nigeria and aimed at both public and private	Existing	March 2013 - March 2018

			institutions of power sector		
National Policy on Public Private Partnership (PPP)	Policy	Guidelines, policies, and procurement process for PPP	Collaborate with the States of the Federation to promote an orderly and harmonised framework for the development and market for PPPs	Existing	2012 to date
NREEEP	Policy	Promote renewable energy and energy efficiency	Public and private sector	Existing	2015 to date

Table 23: Overview of policies and measures for off-grid RE

Name of the measure	Type of measure*	Expected results**	Targeted group and or activity***	Existing or planned	Start and end dates of the measure
Soft loan	Financial	Assist with soft loans with low interest rates through the Bank of Industry and mainly for	Small scale renewable energy generation companies	Planned	
Renewable Energy Subsidy and Grant	Financial	Provision of subsidy of up to 30% of initial costs of renewable energy utilisation facilities	Communities, enterprises, and individuals that embark on RE generation projects	Planned	

Rural Electrification Strategy and Implementation Plan	Strategy/Plan	Promote electricity in rural areas	Public and private sector	Planned	

Table 24: Overview of policies and measures for biofuels

Name of the measure	Type of measure*	Expected results**	Targeted group and or activity***	Existing or planned	Start and end dates of the measure
National Biofuel Policy	Policy	To integrate the agriculture sector to the downstream section	Petroleum industry	Existing	2007 to date

5.2 Specific measures to fulfil the requirements under the EREP

5.2.1 Administrative procedures and spatial planning

a) List of existing national legislation concerning authorisation, certification, licensing procedures and spatial planning applied to plants and associated transmission and distribution network infrastructure:

The list below outlines the legislation, acts, and regulations concerning authorisation, certification licensing procedures and spatial planning.

Energy and Power issues are generally a reserve matter in Nigeria. EPSR Act 2005-The Electric Power Sector Reform (EPSR) Act came into being on the 11th of March 2005. It provides the legal backing for the reform of the Sector and repealed the National Electric Power Authority (NEPA) Act and the Electricity Act. The Act further provides for the establishment of the Nigerian Electricity Regulatory commission (NERC), the Rural Electrification Agency (REA) and the National Electricity Liability Management Company (NELMCO), which is a special purpose entity that shall take over and manage the residual assets and liabilities of the defunct NEPA after privatization of the unbundled companies. The Act also provides for the establishment of a Power Consumer Assistance Fund (POCAF), to subsidize under privileged electricity consumers. The Act encouraged the promotion of electricity generated from all sources of energy including renewable energy by mandating NERC to create a level playing field in the Nigerian electricity market. NERC is therefore responsible for creating regulations concerning authorisation, certification licensing procedures for renewable energy electricity generation in Nigeria.

The Building Legislation:

Before now, Nigeria's building legislation did not consider the application of renewable energy sources in buildings. However, a new building code is currently being designed and worked on by various stakeholders It is envisaged that matters relating to authorisation and licensing procedures will be fully integrated into the code and will be managed by the Federal Ministry of Lands, Housing, and Urban Development.

It is also recommended that planning legislation at Federal and State level be developed and such legislation should contain principles of spatial planning which highlights spatial requirements for an affordable, safe and environmentally sound energy supply, including the development of energy grids, in particular renewable energies.

b) Responsible Ministry(/ies) / authority(/ies) and their competences in the field:

Table 25: The list of ministries/authorities and their competences

Federal Ministry of Power	Responsible for overall electricity matters policy formulation and supervision of Nigerian Electricity Regulatory Commission, Rural Electrification Agency, National Power Training Institute, and Nigerian Electricity Management Service Agency
Federal Ministry of Water Resources	Responsible for overall water matters and policy development especially in managing dams for large, medium, and small scale hydro
Federal Ministry of Environment	Overall policy development on climate change, impact of energy use on environment and mitigating circumstances
Federal Ministry of Lands, Housing, and Urban Development	Responsible for overall policy development in sustainable housing and in leading the development of the building code for Nigeria
Nigerian Electricity Regulatory Commission (NERC)	Responsible for promoting a legal level playing field in the electricity market and issuing of licenses to renewable energy operators
Rural Electrification Agency	Promoting standard and quality living in rural areas by providing affordable electricity supply
Nigerian Bulk Electricity Trader (NBET)	NBET is responsible for buying power from IPPs and reselling the power to the distribution companies (DisCos) and eligible customers.
Electricity Distribution Companies (DisCos)	Responsible for buying and distributing electricity across the country.
Transmission System Provider of Nigeria (TSP)	TSP is licensed for electricity transmission, system operation and electricity trading in Nigeria.
System Operator (SO)	SO is also responsible for the overall security and reliability of the grid system, economic dispatch of available generation resources and maintaining system stability.
Standard Organisation of Nigeria (SON)	The Standard Organisation of Nigeria (SON) is a federal government entity tasked with the responsibility of ensuring that all products (imported and manufactured in Nigeria) adhere to stipulated standards

c) Summary of the existing and planned measures at regional / local levels (where relevant):

Although the landscape and relationship between the state and the local government is still very complex, the Federal Government in the draft Rural Electrification Strategy and Implementation Plan (RESIP 2015) seeks to strengthen the activities of the State in this regard. However the Rural Electrification Agency has the mandate to electrify rural areas using all viable options including renewable energy and using funds from the rural electrification fund defined in the EPSR Act 2005. As contained in the Act, the rural electrification fund is sourced from surplus from the activities of NERC and budgetary allocation from the federal government.

It is also planned that at local government level a regulatory office will be established and saddled with the responsibility delivering improved electricity supply to local communities. The Local government regulatory office will serve as advisory points and help build a robust planning system across the country.

d) Are there unnecessary obstacles or non-proportionate requirements detected related to authorisation, certification and licensing procedures applied to plants and associated transmission and distribution network infrastructure for the production of electricity from renewable sources, and to the process of transformation of biomass into biofuels or other energy products? If so, what are they?

A core challenge has been that renewable energy is currently just receiving significant attention both at the policy making level and the grass-root level; thus a new approach to licensing, planning, and regulation is planned. The Federal Government through relevant MDAs needs to take necessary or strategic steps to introduce reforms to planning and consenting renewable energy project developments to raise public awareness and make the process of authorisation faster.

e) What level of administration (local, regional and national) is responsible for authorising, certifying and licensing renewable energy installations and for spatial planning? If more than one level is involved, how is coordination between the different levels managed? How will coordination between different responsible authorities be improved in the future?

NERC is the only giver of electricity generation and trading licence. However, for effective administration of approved licensing, States and Local Governments in Nigeria have also planned to have defined roles in authorising, certifying and licensing renewable energy installations and spatial planning. Furthermore, Nigerian Electricity Management Services Agency alongside Standard Organisation of Nigeria will also be mandated to carry out due

diligence and inspection of renewable energy equipment installed across the country

.

f) How is it ensured that comprehensive information on the processing of authorisation, certification and licensing applications and on assistance to applicants is available? What information and assistance is available to potential applicants for new renewable energy installations on their applications?

It is the responsibility of the Nigerian Electricity Regulatory Commission (NERC) to provide information on application processes. This is available in various forms (soft and hard copies), through the organisation's website and in published guidance and information. It is planned that in the near future NERC will seek to improve and ensure that detailed and consistent information is provided to the applicants during the application process. A review of the forms of information should also be done regularly and should be simple to understand by all applicants. All applicants should be encouraged to provide information that is relevant, necessary and material to their planning and application process.

g) How is horizontal coordination facilitated between different administrative bodies, responsible for the different parts of the permit? How many procedural steps are needed to receive the final authorisation/ licence/permit? Is there a one-stop shop for coordinating all steps? Are timetables for processing applications communicated in advance? What is the average time for obtaining a decision for the application?

In line with international best practice, there is no single best way of licensing for renewable installations, albeit it is advised that consultation and application process for licensing is well coordinated between all relevant MDAs across the Federal, State, and Local Government bodies involved in the process. At the public sector level an Inter-ministerial committee on renewable energy exists which coordinates the issue/policies and incentive on renewable energy. NERC, the regulating and licencing institution, is part of this group. NERC also works with NBET and TCN to ensure best practice across the whole process of obtaining decisions for all applications.

h) Do authorisation procedures take into account the specificities of the different renewable energy technologies? If so, please describe how. If they do not, do you envisage taking them into account in the future?

Yes authorization procedures take into account specificities of the different renewable energy

i) Are there specific incentives for small-scale, decentralised off-grid installations (such as PVs or pico-hydro)? If so, what are the levels of incentives? Are there micro-credits available? Where are they published? Is the introduction of micro-credits planned in the future? If so, for which types of installation / system?

No special incentives are available yet, but under the Renewable Energy Micro Utility (REMU) concept a green bond issuing system is being worked upon for small scale renewable energy technologies especially for rural electrification.

j) Is there any official guidance available to local and regional administrative bodies on planning, designing, building and refurbishing industrial and residential areas to install equipment and systems using renewable energy sources in electricity and water heating? If such official guidance is not available or insufficient, how and when will this be addressed?

No

k) Are there specific trainings for case handlers of authorisation, certification and licensing procedures of renewable energy installations?

No special training has been designed. However, it is planned for the future that the National Power Training Institute of Nigeria (NAPTIN) would broaden the scope of training currently delivered and include in its courses generic training to planners, planning inspectors and councillors on renewable energy policy and technical issues. As a regulator, NERC will also organise on authorising, licensing, planning workshops for the interested stakeholders. This will increase project developers' awareness of national policy and regulations on renewable energy; improve their understanding of different renewable energy technologies and their impacts; and give them practical advice on how to develop local plans that assess the true potential for renewable energy in their area.

5.2.2 Technical specifications

To benefit from support schemes do renewable energy technologies need to meet certain quality standards? If so, which installations and what quality standards?

The deployment of Renewable energy technologies have enjoyed huge buy in from stakeholders, particularly in Nigeria. Many of these stakeholders have however been disappointed by the unsatisfactory performance and durability of these technologies as a result of poor quality of the RE products and workmanship. Most of the RE equipment are imported and as such required to meet the Standard Organisation of Nigeria Conformity Assessment Programme-SONCAP (off-shore certification) requirements prio r to importation into Nigeria. SON have elaborated/adopted some of the needed quality standards and codes of practice for RE products and installations as follows;

Solar photovoltaic modules and associated components (e.g battery, inverter)	NCP 031:2010ET Code of Practice for Deployment of Outdoor Lighting Systems; NIS IEC 61215: Crystalline Silicon Terrestrial
Solar photovoltaic modules and associated components (e.g battery, inverter)	NCP 031:2010ET Code of Practice for Deployment of Outdoor Lighting Systems; NIS IEC 61215: Crystalline Silicon Terrestrial Photovoltaic (PV) Modules – Design Qualification and Type Approval NIS IEC 61646: Thin-film Terrestrial Photovoltaic (PV) Modules – Design Qualification and Type Approval NIS IEC 62109-1: Safety of power converters for use in photovoltaic power systems – Part 1: General requirements NIS IEC 62109-2: Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters NIS IEC 62109-3: Safety of power converters for use in photovoltaic power systems – Part 3: Controller NIS IEC 62109-4: Safety of power converters for use in photovoltaic power systems – Part 4: Particular requirements for combiner box NIS IEC 61730-1 Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction NIS IEC 61730-2 Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing NIS IEC 61683: Photovoltaic systems – Power conditioners – Procedure for measuring efficiency NIS IEC 61427 Secondary cells and batteries for photovoltaic energy systems (PVES) – General requirements and methods of test NIS IEC 60364-7-712, Electrical installations of buildings - Part 7-712: Requirements for special installations or locations - Solar photovoltaic (PV) power supply systems.

With regards to equipment standards and installations NERC is also working updating and reviewing CAP 105. At the end of the stakeholder and public hearing/review it is expected practice.

5.2.3 Buildings

a) Reference to existing national and regional legislation (if any) and summary of local legislation concerning the increase of the share of energy from renewable sources in the building sector:

None

b) Responsible Ministry(/ies) / authority(/ies):

Federal Ministry of Lands, Housing and Urban Development is responsible for legislation on buildings, however policies and directives on the installation of small scale renewable energy technology and solar thermal water heating shall be developed. Such directive should make it mandatory for all lighting, heating and cooling systems to require planning permission under the new building code. New installations should also be encouraged to be environmentally friendly.

c) Revision of rules, if any, planned by: [date].

GIZ through the EU and German government funded Nigerian Energy Sector Programme, which is currently incorporating energy aspects into the Building Code. An Energy Efficiency Design Guideline is currently under preparation by the same programme. It is recommended that an energy standard review process within the building code be integrated into the building guidelines currently being developed for the country such that by 2030 buildings will have net zero carbon emissions.

d) Summary of the existing and planned measures at regional / local levels:

No measure currently exists but they are planned as stated above. It is therefore too early to give a summary of planned measures since they are not yet approved. Once approved it is expected that the measures would include a recommendation to develop an evidence-based understanding of the potential for renewable and decentralised energy in different locations of the country and a well grafted requirement for developing sustainable buildings. A step by step plan to meeting the requirement of using renewable electricity in old and new buildings will also be set out and contained in planning guidelines.

e) Are there minimum levels for the use of renewable energy in building regulations and codes? In which geographical areas and what are these requirements? (Please summarise.) In particular, what measures have been built into these codes to ensure the share of renewable energy used in the building sector will increase? What are the future plans related to these requirements / measures?

There are no minimum levels for the use of renewable energy for buildings in the country. However, the review of the building code is on-going and may take into consideration some of these issues.

f) What is the projected increase of renewable energy use in buildings until 2030? (If possible differentiating between residential, commercial, public and industrial.) (To answer this question you may use a table as the table below. Data could be given yearly, or for selected years.)

Increase of renewable energy use in buildings until 2030

Table 26: Increase of renewable energy use in buildings until 2030 (MW)

	2010	2015	2020	2025	2030
Residential	Nil	Nil	2%	3%	4%
Commercial	Nil	Nil	Nil	0.5	1%
Public	Nil	2%	2%	5	10%
Industrial	Nil	Nil	1	2	3%
Total	**Nil**	**Nil**	**1.6%**	**3.5%**	**6%**

Source: Federal Ministry of Land, Housing and Urban Development 2015

g) Have obligations for minimum levels of renewable energy in new and newly refurbished buildings been considered in national policy? If so, what are these levels? If not, how will the appropriateness of this policy option be explored by 2020 and 2030?

The obligation is in progress.

h) Please describe plans for ensuring the exemplary role of public buildings at national, regional and local level by using renewable energy installations?

This is currently planned for inclusion in our developmental plans

I) How are energy efficient renewable energy technologies in buildings promoted? (Such measures may concern biomass boilers, heat pumps and solar thermal equipment).

Through policies, incentives and advocacy; it is planned that the new building code will provide clear measures and programmes to promote energy efficiency in buildings. Since energy efficiency in building is just coming up in Nigeria, campaigns and public enlightenment programs will also be embarked upon to sensitize the population.

5.2.4 Information provisions

a) Reference to existing national and or regional legislation (if any) concerning information requirements

There is no existing national legislation concerning the specific information requirements However, it is recommended that the new Building Code and policy guidelines being developed should include a section requiring that information about fixed building services and renewable technologies installations be given to the building owner following installation to allow the services to be operated in such a manner as to use no more fuel or power than is reasonable.

b) Responsible body/(ies) for dissemination of information at national / regional / local levels:

Information about support measures is made available by the Federal Ministry of Lands, Housing, and Urban Development and other relevant Ministries, Departments, and Agencies.

c) Summary of the existing and planned measures at regional / local levels (where relevant):

Measures are currently being planned as led by the Federal Ministry of Lands, Housing and Urban Development. Since no measure is in place yet it is recommended that FMLHUD and relevant stakeholders develop public enlightenment campaigns through the media so as to reach wider audience. Also important is that they work with other Ministries with mandate on renewable energy to provide robust information to interested users of renewable energy technologies and for those wishing to know more about clean energy technologies.

d) Please indicate how information is made available on supporting measures for using renewable energy sources in electricity to all relevant actors (consumers, builders, installers, architects, rural developers, financial institutions and suppliers of relevant equipment). Who is responsible for the adequacy and the publishing of this information? Are there specific information resources for the different target groups, such as end consumers, builders, installers, architects, farmers, community leaders, rural developers, suppliers of equipment using renewable energy sources, NGO's, public administration? Are there information campaigns or permanent information centres in the present, or planned in the future?

There is no institution established to this effect, however the Federal Government of Nigeria plans to establish an independent organisation who will be responsible for the provision of free advice and information for people across the country looking to save energy, conserve water and reduce waste. A key task of the proposed organisation will be to work with all stakeholders (public, private, and civil society) to provide the general public with practical advice and support through their website and local advice centres enabling them to save energy. Information and guidance for DisCos, GenCos, and interested investors seeking to take

advantage of different renewable energy support incentive will also be made available by NERC, who is responsible to administer renewable energy support instruments. This information will be stated clearly on NERC's website. The Federal Ministry of Power, Nigerian Bulk Electricity Traders, and other relevant agencies will also collaborate with NERC in this regard.

e) Who is responsible for publishing information on the net benefits, costs and systems using renewable energy sources for electricity and water heating? (Supplier of the equipment or system, public body or someone else?)

As it stands there is no institution appointed yet by the Federal Government for this purpose. It is recommended that the Electricity Management Services Limited could be empowered to serve as the administrator for the Microgeneration Certification Scheme and provides information on approved products and installer companies. Wider information to support consumers on the performance and efficiency of microgeneration technologies should also be made available on the institution's website.

f) How is guidance for rural developers, microcredit financial institutions, NGOs and agribusinesses provided to help them to properly consider the use of renewable energy sources for powering rural microenterprises and homes? Who is responsible for that?

There is no guidance in place yet and no responsible institution is working on this yet however, it is planned that the Rural Electrification Agency (REA) will be empowered to handle this role and publish information on the institution's website and embark on public enlightenment campaign through the media.

g) Please describe the existing and planned information, awareness raising and training programmes for citizens (women and men) on the benefits and practicalities of developing and using energy from renewable sources. What is the role of regional and local actors in designing and managing these programmes?

The Rural Women Energy Security (RUWES)

5.2.5 Certification of installers for RE equipment

a) Reference to existing national and/or regional legislation (if any) concerning certification or equivalent qualification schemes for installers of RE equipment

In line with comment provided in 5.1.4 (e) it is planned that the Nigeria Electricity Management Services Agency (NEMSA) would be required by law to put in place competences and approved training for the installation of clean technology systems. In undertaking this task, NEMSA will work with National Power Training Institute of Nigeria (NAPTIN) and National Board of Technical Education (NMTE) to develop new courses in this regard and help provide

information and a simplified process for installers to identify training needs and access approved courses.

b) Responsible body/(ies) for setting up and authorising certification / qualification schemes by 2014 for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems;

Nigerian Electricity Management Service Agency; National Power Training Institute of Nigeria, National Board of Technical Education, and Nigerian Electricity Regulatory Commission

c) Are such certification schemes / qualifications already in place? If so, please, describe.

No they are not in place yet.

d) Is information on these schemes publicly available? Are lists of certified or qualified installers published? If so, where? Are other schemes accepted as equivalent to the national/ regional scheme?

No information is available yet in this regards

e) Summary of existing and planned measures at regional / local levels (where relevant).

Since no measures are currently in place, guidelines and policy initiatives in Nigeria are currently planned that will be linked to micro-generation certification scheme standards. The relevant institutions will be saddled with the responsibility to ensure compliance and implementation.

5.2.6 Electricity infrastructure development

a) Reference to existing national legislation concerning requirements related to the electricity grids:

The current version of the national grid code is being modified by the NERC, Transmission Service Provider, Independent System Provider and other relevant stakeholders and international organisations e.g. GIZ NESP to include renewable energy requirement i.e. in dealing with intermittency and safeguards.

b) How is it ensured that transmission and distribution grids will be developed with a view to integrating the targeted amount of renewable electricity while ensuring and improving security of the electricity system? How is this requirement included in the transmission and distribution operators' network planning?

A new publication on how to integrate renewable energy into the grid will soon be finalised by TCN and other stakeholders and made public. For example GIZ (via its EU and German government funded Nigerian Energy Support Programme) is about to conduct in cooperation

c) What will be the role of information technology tools and storage facilities? How will their development be ensured?

Current plans and efforts at ensuring efficient grid network across the country should consider making the grid smarter including intelligent networks, information technology tools and storage facilities. The national grid should be such that can react to changes in generation and demand patterns as the energy system experiences a step change in intermittent generation at a large scale and an increased number of small scale renewable energy distributed generation plants, more price responsive consumers enabled by roll out of smart meters, and changes in demand from the use of electric vehicles. Network operators will benefit from having more real time information on energy use and supply, and will be able to facilitate two-way flows of energy efficiently on the system through use of more automated response technologies.

d) Is the reinforcement of the interconnection capacity with neighboring countries planned? If so, which interconnectors/interconnection, for which capacity and by when?

Yes. With the current privatisation interconnection is planned with the West Africa Power Pool. Nigeria is also in strategic relationship/agreement to supply power to the Republic of Niger. The current plan does not include renewable energy sources but it is expected that with the coming up of renewable energy electricity into the power mix, the future supply will be a diversified mix.

e) How is the acceleration of grid infrastructure authorisation procedures addressed? What is the current state and average time for getting approval? How will it be improved? (Please refer to current status and legislation, bottlenecks detected and plans to streamline procedure with time frame of implementation and expected results.)

Licencing approval requirement is a maximum of 6 months for final approval for infrastructure authorisation. As a part of NERC requirements a short term target is ensured with the trust that all processes and procedures will be completed within the stipulated time. The grid infrastructure authorisation process includes Environmental Impact Assessment (EIA), due diligence on the company/investor, and other requirements.

f) How is coordination between grid infrastructure approval and other administrative planning procedures ensured?

Usually, it is required in planning procedures that system operators should prepare annual reports detailing the status and determine where grid infrastructure can be placed, so that power is available where it is needed. Bidding rounds follow the identification of supply paths; where; and how much power is required. To date, the grid report is the responsibility of the

system operator (SO). The Federal Ministry of Power has a policy-related mandate and coordinates with the TSP to plan grid infrastructure. They determine how investments are made, while NERC determines the tariffs. Federal Ministry of Lands, Housing and Urban Development (FMLHUD), NERC, and Nigeria Civil Aviation jointly determine the paths and heights of power lines and wind turbines by taking into account the requirements of air, rail, and road transport. These agencies have systems in place to check consistency in infrastructure development so it doesn't obstruct public rights

g) Are priority connection rights or reserved connection capacities provided for new installations producing electricity from renewable energy sources?

Yes. The current Feed-in law of Nigeria provides reserved connection for renewable energy capacities of at least 1MW and not more than 30MW capacity for hydropower.

h) Are there rules for sharing the costs between initially and subsequently connected producers? If not, how are the benefits for subsequently connected producers taken into account?

Yes. The Deep Connection Charges (borne by the GenCos; Shallow Connection Charges (borne by the TCN).

i) How will it be ensured that transmission and distribution system operators provide new producers wishing to be connected with the necessary information on costs, a precise timetable for processing their requests and an indicative timetable for their grid connection?

Processes regarding this are clearly spelt out in the licensing procedure provided by NERC. It is usually advised that new producers take time to read and understand these procedures before planning and operation.

5.2.7 Electricity network operation

a) How is the transmission and distribution of electricity from renewable energy sources guaranteed by transmission and distribution system operators? Is priority or guaranteed access ensured?

There are tariff guidelines in the Multi-Year Tariff Order (MYTO II) which give renewable energy based power plants access to the grid. Level of access will be clearer when the FIT and Competitive tender rounds are finalised and launched.

b) How is it ensured that transmission system operators, when dispatching electricity generating installations give priority to those using renewable energy sources?

The feed-in law mandates the Transmission Service Provider to take and feed into the grid electricity from renewable energy based power plants in the size-range of 1-30 MW capacity for hydropower and 1MW above for other renewable energy sources. NERC is also working on ensuring monitoring and strict compliance of same.
Further, NERC is working on a FIT Regulation granting priority dispatch to renewable energy power plants and of power generated from renewable IPPs.

c) Are plants generating electricity from renewable energy sources integrated in the electricity grid? Could you please describe how?

Not yet. However, this is currently being addressed in the revised grid codes which are at its final stage of completion.

d) What are the rules for charging transmission and distribution tariffs to generators of electricity from renewable energy sources?

Those using the transmission network are subject to three forms of payment for transmission services:
(i) A connection charge for new generators which is a one-off charge levied when new power stations are connecting to the existing transmission network. It is intended to cover the costs associated with the generator's connection to the nearest node on the system. This might include transmission lines and towers, a switch yard and transformer if necessary and any additional power conditioning equipment required for safe and reliable injection of power into the network.
(ii) A transmission use of system charge (TUOS) paid by distributor/retailers, which is levied on distributor/retailers and charged per unit of energy delivered to them at the bulk supply points. The TUOS charge is determined using the building blocks methodology, bringing together existing and forecast capital costs, an allowance for a return on capital and depreciation and efficient operating costs.
(iii) A loss factor applied to generation so that generators provide for transmission losses. Transmission losses are the marginal (or variable) costs of operating a transmission system. Losses vary with the position of generation with respect to load centres. They also vary from year to year according to changes that take place during the year in load growth and the location of new generation.

5.2.8 Renewable energy applications for domestic uses

Improved Cooking Stoves

a) Has a standard for improved cooking stoves been adopted by the Member State? If yes, how was it implemented at national level? (Is there legislation planned for implementation? What will be the institutional setup?)

No national standard for improved cookstoves has been developed so far. Such national standard shall be developed in the near future. So far, no public body has been assigned the responsibility for developing this standard, so the Government of Nigeria will develop a supportive framework and will involve regional/international development partners in the development of standards comparable to international best practice.

b) How will it be ensured that improved cooking stoves used in the Member State comply with the adopted standard?

An approved standard is being worked on for the near future, there is no public body in charge of elaborating this yet but a framework is being worked upon by the Federal Government of Nigeria, the planned framework will involve regional/international development partners in the development of standards comparable to international best practice

Efficient Charcoal Production

a) Has standards and processes for efficient charcoal production been adopted by the Member State? If yes, how was it implemented at national level? (Is there legislation planned for implementation? What will be the institutional setup?)

No standards or processes for efficient charcoal production have been adopted so far. An approved measure and regulation for an efficient production is planned for the near future. However due to the problem of deforestation and land use, charcoal production is currently not being encouraged

b) How will it be ensured that charcoal produced in the Member State comply with the adopted standards and processes?

An approved measure and regulation for production is planned for the near future. However due to the problem of deforestation and land use, charcoal production is currently not being encouraged

Use of modern fuel alternatives for cooking

a) What type of policies and strategies exist to promote modern fuel alternatives for cooking (LPG, biogas, solar cookers, kerosene)?

Currently there is no known policy/strategy in place to promote modern fuel alternatives for cooking (LPG, biogas, solar cookers, etc.). However, the National Renewable Energy and Energy Efficiency Policy was approved by the Federal Executive Council in May 2015, which will serve as basis to develop measures and strategies.

5.2.9 Biofuels– sustainability criteria and verification of compliance

a) Has a sustainability criteria for biofuels been adopted by the Member State? If yes, how was it implemented at national level? (Is there legislation planned for implementation? What will be the institutional setup?)

Nigerian Biofuel Policy and Incentives: Pursuant to the August 2005 government directive on the Automotive Biomass Programme for Nigeria, the Nigeria National Petroleum Cooperation (NNPC) was given the mandate to create an environment for the take-off of a domestic fuel ethanol industry. The aim is to gradually reduce the nation's dependence on imported gasoline, reduce environmental pollution while at the same time creating a commercially viable industry that can precipitate sustainable domestic jobs.

According to the policy document, the following plan will be followed in implementing the national bio-fuel programme:

Phase1: Seeding the Market: This will involve the blending of up to 10% of gasoline with fuel ethanol to achieve a blend to be known as E-10. This phase will commence with a seeding of the market through importation of cargoes of fuel ethanol until such a time that sufficient capacity and capability would have been developed in the country for large scale production of bio-fuel feedstock and establishment of bio-fuel plants. The seeding phase is expected to commence with the initial penetration of selected cities during the first 3 years of the programme, while a national roll-out is expected within 5-10 years.

Phase 2: Bio-fuel Production Programme: This phase will commence concurrently with the seeding programme. This will be the core of the agricultural integration programme and will entail the establishment of plantations and the construction of bio-fuel distilleries and plants. Based on current demand for gasoline in the country, at 10% blend ratio with fuel ethanol, about 1.3 billion litres will be required for the country, which is estimated to increase to about 2 billion litres by 2020. It is also estimated that market demand for bio-diesel will be about 900 million litres by 2020 as compared to current market possibility of about 480m litres for a 20% blend for bio-diesel. The Bio-fuel Production programme aspires to achieve 100% domestic production of bio-fuels consumed in the country by 2020. Investment in domestic production of bio-fuels will be private sector driven, with the government through its various agencies providing an environment conducive to players in the industry.

With regards to the institutional set up, the Ministry of Petroleum Nigeria has powers vested on it under Section 9 of the Petroleum Act, to make regulation relating to bio-fuel activities in Nigeria.

Federal Government of Nigeria Official Gazette of the Nigerian Bio-fuel Policy and Incentives 2007.

b) How will it be ensured that biofuels that are counted towards the national renewable target are they eligible for financial support with the adopted *sustainability criteria? (Will there be a national institution / body responsible for monitoring / verifying compliance with the criteria?)*

According to the policy, two key ways of ensuring that biofuels are counted towards national renewable energy target is by (i) creating market demand for biofuels- the federal government of Nigeria approves the blending of biofuels as a component of fossil-based fuels in the country as required for all automotive use.(ii) market entry- the registration of bio-fuel plants manufacturing fuel ethanol or/and biodiesel with the possible addition of a co-generation power plant by the Department of Petroleum Resources (DPR). The organisations/investors interested in Bio-fuel production in the country shall be duly registered with DPR (Nigeria Bio-fuel policy and Incentives 2007).The policy document also proposes the establishment of a Biofuel Energy Commission, a composition of Bio-fuels Energy Commission, and establishment of a Bio-fuel Research Agency.

c) If a national authority / body will monitor the fulfilment of the criteria, does such a national authority / body already exist? If so, please specify. If not, when is it envisaged to be established?

It is not certain when the monitoring body will be established, but the Ministry of Petroleum resources works with NNPC and the Energy Commission of Nigeria to handle all matters relating to bio-fuels in Nigeria.

d) How is compliance with good agro-environmental practices and other cross compliance requirements ensured and verified at national level?

The Bio-fuel policy clearly defines roles of Government Ministries and Agencies responsible for compliance and verification at national level.

5.3 Support schemes to promote the use of energy from renewable resources

Regulation for grid connected RE

(a) What is the legal basis for this obligation/target?

The EPSR Act 2005 forms the legal basis for grid based electric utilities while the feed-in tariff is the regulation for obligations/target. Currently, the Nigerian Government, supported by GIZ NESP, is working on a Competitive Bidding System for RE >5MW/10MW, and a FIT for RE<5MW/10 MW, which are both technology-specific. In case of the bidding system, the legal basis is the Regulation for the Procurement of New Generation Capacity; technology specific MW targets/ capacity caps will be set, based on which NBET will run a tender; there will be no percentage or MW obligations for DISCOs and GENCOs.

(b) Are there any technology-specific targets?

Technology-specific targets have been defined for wind, solar, biomass, and small hydropower; other renewable energy sources e.g. wave and tidal and geothermal are not included at the moment but are also being considered as a future option.

(c) What are the concrete obligations/targets per year (per technology)?

Targets per year/per technology will be set in the course of 2015 by a Policy Directive and will be integrated into NERC's FiT Regulation, which is under progress and into the Competitive Bidding Framework. Target adjustments will be made in the context of feed-in tariffs revisions based on regular progress reports.

(d) Who has to fulfil the obligation?

This requirement towards the DisCos is voluntary at the moment. NERC is currently working on making this obligation mandatory, and a system is being worked on to ensure compliance and penalties in case of default.

(e) What is the consequence of non-fulfilment?

See Above

(f) Is there any mechanism to supervise fulfilment?

NERC is responsible for supervision, and all DisCos are required to register with NERC for accountability, monitoring, and compliance purposes.

(g) Is there any mechanism to modify obligations / targets?

Target adjustments will be made in the context of feed-in tariffs revisions based on regular progress reports.

Regulation for rural electrification

(a) What is the legal basis for this obligation for rural utilities/target for rural electrification?

Sections 88-91 of the Electric Power Sector Reform Act, (EPSRA) 2005 set the legal basis for rural electrification.

(b) Are there any technology-specific targets? What type of electrification (grid extension, minigrids or dispersed systems) is promoted?

Section 88 (9) of the EPSRA, 2005 states that the Minister of Power shall, once in a quarter, submit to the President reports, prepared in consultation with the Rural Electrification Agency and the Commission, on the progress and achievement of the Rural Electrification Strategy and Plan, which shall include information relating to:

- The expansion of the main grid
- The development of isolated and mini-grid systems; and
- Renewable energy power generation

(c) What are the concrete obligations/targets per year (per type of electrification)? Is there any minimum level of electrification?

The FGN has also established its targets for the RE program. In the National Electric Power Policy and the more recent Rural Electrification Policy, the FGN has set an ambitious target: to make reliable electricity available to75% of the population (rural or urban) by 2020 from the current level of less than 40% and at least 10% of renewable energy mix by 2025 from its current level of 1.3%. Pursuing this target is part of the FGN's overall objective of providing access to electricity for all Nigerians in order to stimulate economic development and improve the quality of rural life. This will be accomplished by encouraging a range of service providers to deliver cheaper, cleaner electricity. In order to support these objectives, the FGN is committed to improving the standards of service, the affordability, and the financial sustainability of rural service operators. GIZ NESP is also in the process of elaborating electrification plans for 5 states (Sokoto, Niger, Plateau, Cross River, Ogun) which will contain such targets. The World Bank is undertaking a similar exercise for the Kano and Enugu DISCO. Ultimately this should lead into a National Electrification Master Plan. No such plan (and hence no yearly targets) exists as yet.

(d) Who has to fulfil the obligation?

The Federal Government through the Rural Electrification Agency will fulfil the obligation of ensuring rural electrification. The DisCos over the last year also play a crucial role (all of the 11 DisCos have grid access targets in their key performance indicators (KPIs).

(e) What is the consequence of non-fulfilment?

Rural electrification is currently supervised through the monitoring and coordination activities of the REA and Minister of Power.

Although no legal and administrative consequences would ensue, it is envisaged that non-fulfilment would lead to unemployment, rural-urban migration and underdevelopment.

(f) Is there any mechanism to supervise fulfilment?

The monitoring and coordination activities of the REA and Minister of Power

(g) Is there any mechanism to modify obligations / targets?

Obligations and targets can be modified through the review of the Rural Electrification Strategy and Plan, and the yearly report of the Minister of Power to the President of Nigeria. The current yearly report is awaiting approval.

Rural Electrification Policy of the Federal Republic of Nigeria, 2005, p.10. (approved 2009).

Financial support

(a) What is the name and a short description of the scheme? Is the target grid-connected systems or rural off-grid electrification?

A FiT guideline does exist that however has not yet been applied. In order to foster this instrument a regulatory feed-in tariff for grid connected renewable energy generation of 1 MW to 10 MW is under preparation for wind, small and medium hydro power plants and of 1 MW to 5 MW for PV and biomass.

Equally, the Nigerian Government, supported by GIZ NESP, currently works on a Competitive Bidding System for wind, small and medium hydro power >10 MW and PV > 5 MW. A policy directive will set the targets for renewable energy capacity addition (i.e. trajectories) under these two support schemes taking into consideration transmission capacities of the existing network as well as funding of incremental cost cover.

(b) Who manages the scheme? (Implementing body, monitoring authority)

Nigerian Electricity Regulatory Commission (NERC) manages, implements, and monitors the regulatory feed-in tariff. The Nigerian Bulk Electricity Trading Plc. (NBET) manages and implements the Competitive Bidding process for transmission grid connected RE generation capacity. The NERC approves and monitors the FiT established by Competitive Bidding.

(c) What are the measures taken to ensure availability of necessary budget/funding to achieve the national target?

A Policy Directive will require NERC to establish a regulation on funding of incremental cost based on prior levy impact assessment to ensure that levies charged to consumers are reasonable and decline over time. It is envisaged that when the Rural Electrification Fund (REF) is put in place, it can be used to fund off-grid capacities.

(d) How is long-term security and reliability addressed by the scheme?

Feed-in will be guaranteed for 20 years and the tariff-level (ruled by the NERC or established by Competitive Bidding) will be fixed for the same period.

(e) Is the scheme periodically revised? What kind of feed-back or adjustment mechanism exists? How has the scheme been optimised so far?

The current support schemes are revised periodically. According to the current guideline the Multi Year Tariff Order II (MYTO II) and the proposed feed-in tariff undergo two types of reviews. (i) Minor- a yearly review; and (ii) Major- a 5-year review. The FiT Regulation currently under preparation will rule a reviewed FiT for a fixed period of time. After this fixed period the scheme will be reviewed again. Structured Competitive Bidding allows adjusting the tender criteria defining the level of tariffs offered for each bidding window.

(f) Does support differ according to technology?

Support differs depending on technology.

(g) What are the expected impacts in terms of energy production?

The Competitive Procurement Program will lead to the deployment of several hundred MW of utility scale RE generation capacities (exact bidding window will be defined in the course of 2015) between 2016 and 2017, in particular of PV generation capacity. Increased volumes of generated power will allow improving power supply and grid stability.

(h) What are the expected impacts in term of energy access?

Energy access is expected to increase, because the volume of power generated increases and improves network stability. In particular consumers at the extreme end of the grid usually do not receive high voltages. Additional power fed into the grid in closer distance to these consumers will help to address this challenge.

(I) Is support conditional on meeting energy efficiency criteria?

Support is not linked to energy efficiency. What is fed into the grid is what is paid for at the moment.

(j) Is it an existing measure? Could you please indicate national legislation regulating it?

The EPSR Act 2005 forms the legal basis for the feed-in tariff. The EPSR Act provides the legal basis for regulating the electricity market in the most efficient manner.

(k) Is this a planned scheme? When would it be operational?

Guidelines for a regulated FiT are currently in place and binding FiT regulation is currently under preparation, as well as a policy directive setting the benchmarks for this RE FiT Regulation. A structured Competitive Procurement Program is further under preparation and will be launched in 2016.

(l) What start and end dates (duration) are set for the whole scheme?

Regulated FiT: MYTO 2.1 rules tariffs for the period of 2012 to 2018. This period will be extended in the RE FiT Regulation, which is currently under preparation, for small-scale renewable energy project. The FiT established by Competitive Bidding: The regulatory framework will be prepared until beginning of 2016. The programme will start in 2016 and will not have a specific end date but will most likely be limited by an overall capacity cap.

(m) Are there maximum or minimum sizes of system which are eligible?

The size of eligible systems may vary between 1 MW-30MW of renewable energy capacities for small hydropower, whereas there is no cap for wind, solar, and biomass.

(n) Is it possible for the same project to be supported by more than one support measure? Which measures can be cumulated?

More than one support measure may be applicable. Other incentives include tax relief and exemptions, import waivers etc.

(o) Are there regional / local schemes? If so, please detail using the same criteria.

There are no regional/local schemes currently in place.

Financial support for investment:

(a) What is granted by the scheme? (Subsidies, capital grants, low interest loans, tax exemption or reduction, tax refunds)

The FIT and the Competitive Procurement System provide for an increased tariff to RE IPPs. No other incentive is granted by the scheme. Other incentives come as an addition to the scheme.

(b) Who can benefit from this scheme? Is it specified for certain technology (/ies)?

All interested private generators can benefit from the scheme. The regulated FiT scheme is specified for wind, solar, biomass, and small hydro. The Competitive Procurement System will be applicable to PV and potentially to wind and small hydro.

(c) Are applications continuously received and granted or are there periodical calls? If periodical, could you please describe the frequency and conditions?

Regulated FiT: Applications are continuously received for renewable energy generation Competitive Bidding: periodic bidding rounds will call for proposals

Specific questions for feed-in-tariffs:

(a) What are the conditions to get the fixed tariff?

Once generated capacity is fed into the grid, the generator qualifies for the tariff. However, as the years go by, new installations may receive lower tariffs because it is assumed that the cost of renewables would have decreased further – inter alia due to further progress on the learning curves. The fixed tariff is granted for a period of 20 years. Tariff adjustments are foreseen either during major reviews (every 5 years) or during minor reviews (annually).

(b) Is there a cap on the total volume of electricity produced per year or of installed capacity that is entitled to the tariff?

The cap is being worked upon by NERC and will be made public as soon as the new regulation is approved.

(c) Is it a technology specific scheme? What are the tariff levels for each?

The FiT scheme is technology specific. No other criteria apply for differentiating tariffs. The tariffs are currently under review by the NERC and will be published with the RE FiT Regulation

which is under preparation.

(d) Are there other criteria differentiating tariffs?

No differentiation

(e) For how long is the fixed tariff guaranteed?

20 years

(f) Is there any tariff adjustment foreseen in the scheme?

Yes, during major reviews (every 5 years) and minor reviews (annually).

Specific questions for tendering:

(a) **What is the frequency and size of the tenders?**

The frequency and size of tenders will be defined in course of 2015.

(b) **Which technologies are specified?**

The scheme is yet to be defined for RE. It is however planned to conduct technology-specific bidding rounds for PV and potentially wind and small hydro. A policy directive which will form the basis for this process is currently under preparation.

(c) **Is it integrated with grid development?**

Studies are being undertaken on the potential integration with grid development.

Rural electrification:

(a) Are there Financial Support Schemes for Rural Electrification Programmes?

In accordance with the EPSR Act 2005, the FGN has established a Rural Electrification Fund (REF) whose objectives will be to:

- Achieve more equitable access to electricity across regions;
- Maximize the economic, social and environmental benefits of rural electrification subsidies;
- Promote expansion of the grid and development of off-grid electrification; and
- Stimulate innovative approaches to rural electrification.

(b) What is granted by the scheme?

The Fund will provide subsidies towards the initial capital costs of RE schemes.

. Funding will take the form of grants to be applied to project start-up costs. Grants will not be made for operational or maintenance costs.

(c) Who manages these schemes?

The REF will be administered by the REF Management Directorate, comprised of selected REA staff at the Federal and Zonal level, working together to establish and implement policy, subject to the RE Board's approval. The REF Management Directorate will be responsible for establishing eligibility requirements, evaluation criteria and procedures, and guidelines for the size of grants to be issued.

(d) What type of rural electrification programme can benefit from the scheme? Who can benefit from this scheme? Is it specified for certain technology (/ies)?

- The expansion of the main grid
- The development of isolated and mini-grid systems; and
- Renewable energy power generation

(e) Do the incentives stimulate cross-cutting application for other sectors (e.g. education, health)?

The objectives of the FGN's Rural Electrification Program, as set out in the Rural Electrification Policy, are to:

1. Promote agriculture, industrial, commercial, and other economic and social activities in rural areas;

2. Raise the living standards of rural populations through improved water supply, lighting and security;

3. Promote the use of domestic electrical appliances to reduce the drudgery of household tasks typically allocated to women;

4. Promote cheaper, more convenient and more environmentally-friendly alternatives to the prevalent kerosene, candle, and vegetable oil lamps and fossil fuel-powered generating sets;

5. Assist in reducing migration from rural to urban areas; and

6. Protect the nation's health and environment by reducing indoor air pollution and other energy-related environmental problems.

(h) Is there any special Financial Support Schemes for the use of RE in Rural

(h) Is there any special Financial Support Schemes for the use of RE in Rural Electrification Programmes?

Most of the REF will be applied to RE schemes and to support renewable energy projects.

(I) Is there an obligation to provide energy access with Renewable Energy sources?

The REF will also be used to support renewable energy projects

(j) Who has the obligation?

In the National Electric Power Policy 2001 and the Rural Electrification Policy, the FGN has set an ambitious target: to make reliable electricity available to75% of the population (rural or urban) by 2020 and at least 10% of renewable energy mix by 2025. Pursuing this target is part of the FGN's overall objective of providing access to electricity for all Nigerians in order to stimulate economic development and improve the quality of rural life.

5.4 Specific measures for the promotion of efficient cookstoves

How efficient cookstoves are being promoted? Please provide details regarding the awareness raising and other information campaigns being implemented or planned, including how messages are developed to target the differentiated needs, interests and literacy levels of women and men in the country.

There are no known measures put in the place by the Federal Government yet to promote efficient cookstoves, however, the Federal Ministry of Environment through its renewable energy programme had been involved with campaigns and advocacies to promote efficient cookstoves. The Rural Women Energy Scheme (RUWES) initiated by the Ministry of Environment has helped to reach over 2000 rural women. Besides, the Energy Commission of Nigeria is also undertaking research and development opportunities in this area.

5.5 Specific measures for the promotion of efficient charcoal production

How efficient charcoal production technologies are being promoted? Please provide details regarding the awareness raising and other information campaigns being implemented or planned, including how messages are developed to target the differentiated needs, interests and literacy levels of women and men in the country.

The Federal Government of Nigeria is currently working on discouraging deforestation and the use of wood from the forest for charcoal production.

5.6 Specific measures for the promotion of modern fuel alternatives for cooking

How modern fuel alternatives for cooking (LPG, biogas, ethanol, solar cookers, kerosene) are being promoted? Please provide details regarding the awareness raising and other information campaigns being implemented or planned, including how messages are developed to target the differentiated needs, interests and literacy levels of women and men in the country.

See 5.4

5.7 Support schemes to promote the use of biofuels

What are the concrete obligations / targets per year (per fuel or technology)?

The Nigerian Biofuel Policy and Incentives 2007 states that "based on current demand for gasoline in the country, at 10% blend ratio with fuel ethanol, about 1.3 billion litres will be required for the country, which is estimated to increase to about 2 billion litres by 2020. It is also estimated that market demand for bio-diesel will be about 900 million litres by 2020 as compared to current market possibility of about 480m litres for a 20% blend for bio-diesel. The Bio-fuel Production programme aspires to achieve 100% domestic production of bio-fuels consumed in the country by 2020".

5.8 Specific measures for the promotion of the sustainable use of energy from biomass

5.8.1 Biomass use (forestry residues, municipal waste, agricultural waste)

Is there any study on biomass (fuel wood) consumption?

There are only limited studies on biomass (fuel wood) consumption available.

(a) If yes, who is the ministry responsible for this calculation and the methodology used?

The Energy Commission of Nigeria (ECN) and the National Biotechnology Development Agency (NABDA) are responsible for the calculation and methodology of assessing biomass use.

(b) If yes, under this point Member States should assess the level of biomass consumption (which can be reported as m3 fuel wood/per capita.)

Available information on the level of biomass consumption is not coherent for now but it is planned that the Federal Government of Nigeria, through relevant MDA, will coordinate activities in this regard.

(c) Given the importance of woodfuel for firewood and charcoal production, please provide information and estimates on the following:

Table 27: Projections on woodfuel supply (in kilo tons)

	2010	2013*	2015	2020	2025	2030
Total woodfuel supply (kilotonnes)	NA	NA	NA	NA	NA	NA
Woodfuel supply for firewood (kilotonnes)	NA	NA	NA	NA	NA	NA
Woodfuel supply for charcoal production (kilotonnes)	NA	NA	NA	NA	NA	NA

Table 28: Projections on woodfuel consumption (in kilo tons)

	2010	2013*	2015	2020	2025	2030
Total woodfuel consumption (kilotonnes)	NA	NA	NA	NA	NA	NA
Woodfuel consumption for firewood (kilotonnes)	NA	NA	NA	NA	NA	NA
Woodfuel consumption for charcoal production (kilotonnes)	NA	NA	NA	NA	NA	NA

Table 29: Projections on Charcoal imports and exports (in kilo tons)

	2010	2013	2015	2020	2025	2030
Charcoal imports (kilotonnes)	NA	NA	NA	NA	NA	NA
Charcoal exports (kilotonnes)	NA	NA	NA	NA	NA	NA

5.8.2 Biomass supply

Measures to increase biomass availability

Mobilisation of new biomass sources:

Biomass from forestry residues:

(a.) Please specify how much land is degraded.

NA

(b) Please specify how much unused arable land there is.

NA

(c) Are any measures planned to encourage unused arable land, degraded land, etc. to be used for energy purposes?

NA

(d) Is energy use of certain already available primary material (such as animal manure) planned?

NA

(e) Is there any specific policy promoting reforestation?

The National Forest Policy 2006 promotes reforestation in Nigeria.

(f) What measures are planned to improve forest management techniques in order to maximise the extraction of biomass from the forest in a sustainable way? How will forest management be improved in order to increase future growth? What measures

are planned to maximise the extraction of existing biomass that can already be put into practice?

NA

Biomass from Municipal Waste

(a) Please specify the number of municipal waste facilities

NA

(b) Are there waste damp facilities or landfills?

NA

(c) What measures are planned to improve the municipal waste facilities in order to minimise the environmental impact and maximise the extraction of biogas? How will the management of municipal waste facilities be improved in order plan for future growth?

NA

(d) Is there any policy or mandate to municipalities to improve municipal waste facilities into landfills?

NA

Biomass from agricultural waste

(a) Is there any policy or mandate to reuse the wastes from agro-business?

Different agencies of government have mandates for the re-use of biomass from agricultural waste, examples include the National Research Institute for Chemical Technology, the National Biotechnology Development Agency, the Energy Commission of Nigeria and the Sugar Council of Nigeria.

(b) Please specify the type and number facilities that generate waste from agro -business activities?

The type of facilities generating waste from agro-business activities include:

I. Mills for paper, textile, cereals, floor, wood and oil palm processing
II. Breweries
III. Coffee and tea processing
IV. Natural cosmetic industries

(c) What measures are planned to improve the reuse of waste in order to minimise the environmental impact and maximise their reutilisation?

Planned measures to improve the reuse of waste to minimise the environmental impact and maximise their reutilisation include:

I. Buy-back policy for packaging, sachet bags, phones
II. Pelleting of waste plastic for-re-use by relevant industries

Technologies available for the sustainable conversion of biomass are:

a) Mechanical treatment for pellets production
b) Gasification for steam, electricity and heat production
c) Bioconversion for organic waste for biogas, organic fertilizer, heat production and emissions control
d) Enzymatic hydrolysis and transformation for ethanol and biofuels production
e) Mechanical-biological waste stabilization for emission control, biogas and organic fertilizer production in dumpsite/landfill management.

6. ARTICULATION WITH REGIONAL INITIATIVES

The ECOWAS region has a series of on-going regional initiatives on the field of renewable energy:

- The ECOWAS White Paper on a Regional Policy for Increasing Access to Energy Services in Peri-Urban and Rural Areas by 2015;
- Establishment of ECREEE;
- Adoption of the ECOWAS Renewable Energy Policy (EREP) with targets for 2020 and 2030;
- The ECOWAS Small Scale Hydropower Programme;
- The ECOWAS Solar Thermal Program
- The ECOWAS Bioenergy Strategy Framework; and
- The ECREEE Rural Electrification Programme.

A summary of these regional initiatives in renewable energy can be found in Annex I of this Plan.

Besides the activities in renewable energy, the ECOWAS region has also a series of on-going activities in energy access:

- The ECOWAS White Paper on a Regional Policy for Increasing Access to Energy Services in Peri-Urban and Rural Areas by 2015
- The ECOWAS Revised Generation and Transmission Master Plan ;
- The West Africa Gas Pipeline (WAGP);
- ECOWAS Rural Electrification projects.

A summary of the regional initiatives on energy access can be found in Annex II.

Synergies between these regional initiatives and the proposed measures in this Plan will be created.

7. Preparation of the NREAPand the follow-up of its implementation

(a) How were regional and/or local authorities and/or cities involved in the preparation of this Action Plan? Were other stakeholders involved?

The development of the NREAP involved national stakeholders in a comprehensive participatory process. The Inter-ministerial Committee on Renewable Energy and Energy Efficiency was involved from the onset as well as a wide range of other stakeholders. The data collection process also witnessed the engagement of international organisations, research institutions and NGOs. The validation exercise was also well attended by participants from Academic institutions across the country. ICREEE Meetings, Workshops, and creation of thematic working groups on the baseline data validation were held in September 2014 and a pre- approval meeting was held in August 2015.

(b) Are there plans to develop regional/local renewable energy strategies? If so, could you please explain? In case relevant competences are delegated to regional/local levels, what mechanism will ensure national target compliance?

The National Renewable Energy and Energy Efficiency Policy (2015) has been approved and made official by the Federal Executive Council. A stakeholder/ public consultation was held in September 2014 so as to get the support of practitioners and professionals.

(c) Please explain the public consultation carried out for the preparation of this Action Plan.

ICREEE Meetings, Workshops, and creation of thematic working groups baseline data validation exercise held in September 2014 and pre- approval meeting held in August 2015.

(d) Please indicate your national contact point / the national authority or body responsible for the follow-up of the Renewable Energy Action Plan?

The Federal Ministry of Power is coordinating all ICREEE activities, so it will be responsible for the follow-up of the National Renewable Energy Action Plan.

(e) Do you have a monitoring system, including indicators for individual measures and instruments, to follow-up the implementation of the Renewable Energy Action Plan? If so, could you please give more details on it?

A monitoring system is not yet in place, but the National Renewable Energy and Energy Efficiency Policy (2015) makes provision for monitoring systems. Furthermore, a regional monitoring framework will be developed.

ANNEX I - Definition of terms used in the action plan

Agrifuels: Solid biofuels obtained from crops, and residues from crops and other agricultural products. Residues from agricultural production include animal solid excreta, meat and fish residues. Agrifuel is subdivided into bagasse, animal wastes and other biomass materials and residues (check definitions for bagasse, animal wastes and other agricultural residues).
Animal waste: Excreta of animals which, when dry, are used directly as a fuel. This excludes waste used in anaerobic fermentation plants. Fuel gases from these plants are under biogases (see biogas).
Bagasse: the fuel obtained from the fibre which remains after juice extraction in sugar processing
Biofuels: liquid or gaseous fuel for transport produced from biomass. Other vegetable material and residues: biofuels not specified elsewhere and including straw, vegetable husks, ground nut shells, pruning brushwood, olive pomace and other wastes arising from maintenance, cropping and processing plants.
Solid biofuels: solid fuels derived from biomass.
Liquid biofuels: Liquids derived from biomass and generally used as fuels. Liquids biofuels comprise bio-gasoline, biodiesel and other liquid fuels (definitions of biogasoline, biodiesel and other liquid fuels are provided below).
Bio-gasoline: Liquid fuels derived from biomass and used in spark-ignition internal combustion engines. Common examples are: bioethanol; biomethanol; bio ETBE (ethyl-tertio-butyl-ether); and bio MTBE (methyl-tertio-butyl-ether).
Biodiesel: Liquid biofuels which are usually modified chemically so that they can be used as fuel in engines either directly or after blending with petroleum diesel. Biological sources of biodiesel include, but are not limited to, vegetable oils made from canola (rapeseed), soybeans, corn, oil palm, peanut, or sunflower. Some liquid biofuels (straight vegetable oils) may be used without chemical modification their use usually requires modification of the engine.

Biodiesel as a share of diesel and fuel-oil consumption (in %): The EREP sets conventional biofuels targets (1st Generation Biofuels) for the ECOWAS region as a whole, one of which is the biodiesel as a share of diesel and fuel oil consumption. In this template this is calculated by dividing the production of raw vegetal oil/biodiesel by the diesel oil/DDO/fuel oil consumption in the country.

Straight vegetable oil: When vegetable oil is used directly as a fuel, in either modified or unmodified equipment, it is referred to as straight vegetable oil (SVO) or pure plant oil (PPO). Other liquid biofuels: liquid biofuels not elsewhere specified.

Biogas: gases arising from anaerobic fermentation of biomass. These gases are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and

other biogases (check definitions for landfill gas, sewage sludge gas and other biogases). They are used mainly as a fuel but can be used as a chemical feedstock. . It is particularly relevant for cooking purposes or in the context of industrial uses (e.g. breweries, slaughter houses).

Landfill gas: biogas from anaerobic fermentation of organic matter in landfills. Sewage sludge gas: biogas from anaerobic fermentation of waste matter in sewage plants. Other biogases: biogases not elsewhere specified including synthesis gas produced from biomass.

Biomass: biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste. The uses of biomass for energy are very diverse: from the traditional, low-efficiency burning of wood in open fires for cooking purposes to the more modern use of wood pellets for the production of power and heat, and the use of biodiesel and bioethanol as a substitute for oil-based products in transport.

Base Load: Base load is the level below which electricity demand never drops, i.e. a site with a high maximum demand of 750 kVA whose demand never drops below 250 kVA would have a base load of 250 kVA. Large hydro power is an important renewable energy source for the provision of base load in the ECOWAS region. The significance will grow with the implementation of the WAPP hydropower project pipeline.

Charcoal: The solid residue from the carbonisation of wood or other vegetal matter through pyrolysis. The amount of biomass (usually fuelwood) necessary to yield a given quantity of charcoal depends mostly on three factors:

- parent wood density – the principal factor in determining the yield of charcoal from fuelwood is parent wood density, since the weight of charcoal can vary by a factor of 2 for equal volumes
- moisture content - moisture content of the wood also has an appreciable effect on yields - the drier the wood, the greater is the yield - ; and
- the means of charcoal production: charcoal is produced in earth-covered pits, in oil drums, in brick or steel kilns and in retorts. The less sophisticated means of production generally involve loss of powdered charcoal (fines), incomplete
- carbonization of the fuelwood and combustion of part of the charcoal product, resulting in lower yields.

Traditional non-efficient charcoal production methods: traditional charcoal production methods include open pits, oil drums and kilns with lower efficiencies. In the ECOWAS charcoal is mainly produced by traditional methods in the informal sector (e.g. open pits and kilns) which are inefficient (60-80% of the energy in the wood is lost) and has impacts on the health and on the environment.

Efficient charcoal production: efficient charcoal is the terminology used on this template for the charcoal produced by modern methods that are more efficient than traditional ones. The

modern methods use sealed containers and have higher efficiencies and thus higher yields. Within the EREP, under the targets for domestic cooking, a target for efficient charcoal production is set: 60%/100% of the charcoal production should be by improved carbonisation techniques (yield >25% in 2020 and 2030, respectively. In this template the MS is asked to set out its target and trajectory for efficient charcoal production. This is calculated by dividing the quantity of charcoal produced by improved carbonisation techniques with yield superior to 25% in tonnes by the total charcoal production in tonnes.

Conservation: The reduction of energy usage through increased efficiency and/or reduced waste.

DDO: stand for Distillate Diesel Oil

Distributed and Microgeneration: This is when electricity is generated for local distribution and is not connected directly to the national grid. Microgeneration is typically used to describe smaller scale generating technology.

Energy Efficiency appliances: Electrical devices or appliances that perform their task, and use less electricity than lower-efficient devices. Electrical inefficiency in many devices is directly related to the heat they produce. For example, energy efficient light bulbs use most of the incoming electrical energy to produce light, not heat. Inefficient air conditioning is a major cause of peak hours in the ECOWAS region.

Electricity: The transfer of energy through the physical phenomena involving electric charges and their effects when at rest and in motion. Electricity can be generated through different processes: e.g. by the conversion of energy contained in falling or streaming water, wind or waves or by the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells); or by the combustion of fuels.

Electricity demand: The total electricity consumption in GWh or MWh consumed by a country annually. This includes the demand of the complete system including the incircuital consumption and the losses.

Electricity mix: The range of energy sources of a region/country (either renewable or non-renewable) that is used to produce electricity,

Energy access: A universal and affordable access to modern means of energy. It implies access to modern cooking solutions defined as relying primarily on non-solid fuels for cooking. It also implies access to electricity, defined as availability of an electricity connection at home or the use of electricity as the primary source of lighting that can provide non-served communities and households with a modern life and economic development.

Energy Efficiency: the ratio of performance or output of performance of services, goods or energy to input of energy. The energy efficiency of a process is improved if it produces the same service using less energy. Energy-efficient light bulbs produce the same amount of light but use up to 75% less energy to do so. Improving energy efficiency helps reducing energy use or bringing more energy services with the same amount of energy consumed.

EREP: ECOWAS Renewable Energy Policy

Ethanol: also called ethyl alcohol, pure alcohol, grain alcohol or drinking alcohol, is a volatile,

, flammable, colourless liquid that can be used for several different purposes, being one of them as fuel. As fuel, ethanol is used as a motor fuel and fuel additive (e.g. Brazil relies in Ethanol as a motor fuel). Ethanol is also used for household heating as a relatively safe fuels.

Ethanol as share of gasoline consumption: The EREP sets first generation biofuels targets for the ECOWAS region as a whole, one of which is the ethanol as a share of the gasoline consumption. This is calculated by diving the quantity of ethanol produced by the quantity of gasoline consumed in the country and it is show in %.

Fossil Fuel: An energy source formed in the Earth's crust from decayed organic material. The common fossil fuels are oil, diesel, coal, and natural gas. Some ECOWAS countries are highly dependent on diesel electricity generation.

Fuelwood, wood residues and by-products: fuelwood or firewood (in log, brushwood, pellet or chip form) obtained from natural or managed forests or isolated trees. Also included are wood residues used as fuel and in which the original composition of wood is retained. In the ECOWAS region fuelwood is the principal source of energy for cooking and heating, however statistics on fuelwood are generally poor as it is mainly produced and traded in the informal sector.

Grid-connected: a system (photovoltaic, hydro, diesel, etc.) that is connected to a centralised electrical power network (power grid).

Generation (electricity): This covers the production of electricity at power stations.

Heat: Heat is an energy carrier primarily used for warming spaces and industrial processes

Hybrid System: a power system consisting of two or more power generating subsystems (e.g. combination of a wind turbine or diesel generator and a photovoltaic system)

Improved cookstoves (also called clean/efficient cookstoves): is a device that is designed to consume less fuel and save cooking time, convenient in cooking process and creates smokeless environment in the kitchen or reduction in the volume of smoke produced during cooking against the traditional stove; and thus addressing he health and environmental impacts associated with traditional cookstoves. Traditional cookstoves (open fires and rudimentary cookstoves using solid fuels like wood, coal, crop residues and animal dung) are inefficient, unhealthy, and unsafe, and inhaling the acrid smoke and fine particles they emit leads lead to severe health problems and death. Traditional cookstoves also place pressure on ecosystems and forests and contribute to climate change through emissions of greenhouse gases and clack carbon.

Within the EREP targets are set for improved cookstoves, as the pressure on the ECOWAS woodland will grow exponentially. Thus the policy includes the banning of inefficient stoves after 2020, enabling 100% of the population of the urban areas to use high efficient wood and charcoal stoves (with efficiencies higher than 35%) from 2020 onwards and 100% of the rural population to use high efficient charcoal stoves from the same date on. In this template the MS is asked to set a target for improved cookstoves measured in terms of the % of the population that uses efficient cookstoves. This is estimated by dividing the number of inhabitants that use improved cookstoves by the total number of inhabitants of the country.

Installed capacity: is the rated continuous load-carrying ability of a given electricity generation plant expressed in megawatts (MW) for active power

Kilowatt (kW): 1,000 watts

Kilowatt-hour (kWh): 1,000 watt-hours.

LPG: Liquefied petroleum gas

Load: In an electrical circuit, any device or appliance that uses power (such as light bulb or water pump)

Megawatt (MW): 1,000,000 watts

Megawatt-hour (MWh): 1,000,000 watt-hours

Mini-grids: set of electricity generators and, possibly, energy storage systems interconnected to a distribution network that supplies the entire electricity demand of a localized group of customers. This power delivery architecture can be contrasted with single customer systems (e.g. solar home systems) where there is no distribution network interconnecting customers, and with centralized grid systems, where electrical energy is transmitted over large distances from large central generators and local generators are generally not capable of meeting local demand. Mini-grids are particularly relevant in the rural context of ECOWAS where renewable energy powered hybrids can be the more cost-effective alternative. The EREP includes mini-grid targets.

Modern fuel alternatives (for cooking): known as non-conventional or advanced fuels, these are any materials or substances that can be used as fuels for cooking, other than conventional solid fuels such as coal, fuelwood and charcoal. These alternatives cover Liquefied petroleum gas (LPG), biogas, ethanol, solar power (e.g. solar cookers) and kerosene. In this template improved cookstoves are not considered within the modern fuel alternatives, as they are object of a separate analysis in this template.

Non-technical losses: in electricity distribution include mainly electricity theft, but also losses due to poor equipment maintenance, calculation errors and accounting mistakes. Non-Technical losses are caused by actions external to the power system or are caused by loads and condition that the Technical losses computation failed to take into account. Non- Technical losses are more difficult to measure because these losses are often unaccounted for by the system operators and thus have no recorded information. A reduction of the losses can contribute considerably to the improvement of energy security in many ECOWAS countries.

Offshore wind: wind projects installed in waters off the coast.

Onshore wind: Wind farms installed on land.

Operating costs: the costs of using a system. For fuel-based systems these costs include all fuel costs over system lifetime.

Off-grid applications: is a designation for facilities that produce all their own energy and are not connected to any external source, such as the electrical power grid.

Peak Load: maximum value of necessary capacity to face peak demand. In terms of this template, peak load is characterised for a given year in MW (this includes the load of the complete system including the in circuital consumption and the losses).

Photovoltaic (PV) system: a complete set of interconnected components for converting sunlight into electricity by photovoltaic process, including array, balance-of-system components, and the load.

Power grid: a system of high-tension cables by which electrical power is distributed throughout a region

Renewable Energy (RE): 'Renewable energy' is used to describe the energy produced using naturally replenishing resources. This includes solar power, wind, geothermal, bioenergy, wave and tide and hydropower.

Renewable energy sources – in this template the renewable energy sources refer to the following renewable energy technologies:

- Hydropower which includes:
  - Small scale hydropower (small-hydro or SSHP) up to a maximum installed capacity of 30 MW;
  - Medium (capacity between 30MW and 100MW) and large hydropower (capacity higher than 100MW); In the EREP hydropower is defined as follows: up to 30 MW small-scale, 30 to 100 MW medium-scale, more than 100 MW large-scale.
- Bio-energy covering three different fields:
  - Woodfuels (firewood and charcoal) used for domestic cooking purposes and commercial applications (restaurants, breweries, potteries, blacksmiths, brick makers). Excess woodfuels resources could be used for power generation with other biomass.
  - By-products from crops production for power generation (stalks, straw, husks, shells, kernels, etc.). These can serve as fuel for power generation when gathered together on an agro-industry site. Power can also be generated through biogas production using industrial or urban waste, manure and dung (resource concentration at dairies or slaughter houses or cattle and vegetable markets).
  - Energy crops for power generation or sustainable biofuels (e.g. jatropha) offer some interesting perspectives. EREP considers 2nd generation biofuels which do not compete with food crops for available land, and comply with the following minimum criteria; lifecycle GHG reductions, including land use change and social standards.
- Wind energy (on-grid and off-grid applications);
- Solar: PV, Concentrated Solar Power (CSP) and solar thermal water heating.
- Tide, wave and ocean and geothermal, although not considered in the EREP as renewable energy options, were included on the template as some of the countries have available potential for its use for generation of energy.
- Geothermal

Renewable energy share in the electricity mix: - is the share of renewable energy electricity

generation in the total electricity generation for a given year, measured in %. This is calculated in the template by dividing the electricity production from renewable energy sources (in MWh/year) by the total electricity production (in MWh/year) – renewable and non-renewable for the same year.

Rural Electrification: Provides a regular supply of electricity to rural residents. It implies the extension of power lines to rural areas, or the use of stand-alone, mini-grids or isolated power systems. The EREP includes targets for rural electrification.

Rural Population as referred for off-grid applications (mini-grids and stand-alone systems): Following EREP's definitions, it refers to the population for which the mini-grid and decentralised supply systems apply. Share of rural population served with off-grid (mini-grids and stand-alone) renewable energy electricity services: this is the percentage (%) of the rural population as defined above that is served with mini-grids and stand-alone system. This is calculated by dividing the number of inhabitants served by off-grid applications by the number of rural inhabitants (as defined above).

Rural communities: These includes population living in rural centres and villages with population between 200 and 2,500 inhabitants and some larger cities that due to its peripheral geographical location are away from the national grid. The EREP refers as well that some of the off-grid rural localities supplied before 2020 might be included in the grid extension as they will potentially grow up.

Solar cookers: or solar oven, is a device which uses the energy of direct sun rays (which is the heat from the sun) to heat, cook or pasteurize food or drink.

Solar thermal water heating: or solar hot water (SHW) systems comprise several innovations and many mature renewable energy technologies that have been well established for many years. In these systems water is heated by the sun using collectors. These systems are designed to deliver hot water for most of the year. They can contribute to the reduction of peak hours in the urban context. Moreover, they can be an effective tool to save energy costs in hotels, hospitals and industrial processes (e.g. beverage industry)

Stand–alone power systems (SAPS): also known as remote area power supply, is an off-the-grid electricity system for locations that are not fitted with an electricity distribution system. Typical SAPS include one or more methods of electricity generation, energy storage, and regulation.

Support scheme: means any instrument, scheme or mechanism applied by a Country or group of Countries, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased. This includes, but is not restricted to, investment aid, tax exemptions or reductions, tax refunds, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and premium payments.

Some support schemes for renewable energy:

- Production based incentives:
  - Feed-in-Tariff ("FIT"): is an energy supply policy that promotes the deployment of renewable energy resources. A FIT offers a guarantee of payments to renewable energy producers for the actual electricity produced ($/kWh). These payments are generally awarded as long-term contracts.
  - Quota system: is an energy supply policy that awards the generator with certificates that can be sold into a market (with no price guarantee)
  - Quota systems with competitive bidding: is the fixation of mandatory production quotas for green electricity supply. These quotas are imposed on power generating utilities and / or electricity distribution utilities (calculated as a percentage of production/sales). Operators can meet these obligations in three ways: (i) by producing their own green electricity, (ii) by buying the electricity under long term contracts, and (iii) by acquiring on the financial market the "Green Certificates" corresponding to the amount of electricity required.
  - Decentralized quota system with green certificate market also called tradable green certificates (TGC): is the fixation of mandatory production quotas for green electricity supply. These quotas are imposed on power generating utilities and / or electricity distribution utilities (calculated as a percentage of production/sales). Operators canmeet these obligations in three ways: (i) by producing their own green electricity, (ii) by buying the electricity under long term contracts, and (iii) by acquiring on the financial market the "Green Certificates" corresponding to the amount of electricity required.
- Investment based incentives
  - Capital grants and loans: investment instruments in which government provide grants or loans for the development of renewable energy projects. Grants do not have to be repaid, while loans have to be repaid.
  - Microcredits: is the extension of very small loans (microloans) to impoverished borrowers who typically lack collateral, steady employment and a verifiable credit history.
  - VAT Exemptions: allows households or investors not to have to pay VAT on renewable energy or energy efficiency equipment

Tidal And Wave (marine generation): The principle behind tidal generation is similar to wind turbines, except that instead of wind turning the turbine blades, the process uses underwater current caused by tides. One of the benefits of tidal power over wind power is the predictability of tidal currents, enabling the developers to know exactly when the turbines will be producing power. Electricity can also be generated by harnessing the energy waves. The aim is to capture the vertical movement in the water surface caused by waves and to convert

that energy to electricity by turning a generator.

Technical losses: Losses in power system that are caused by the physical properties of the components of the power system. Technical losses are naturally occurring losses (caused by action internal to the power system) and consist mainly of power dissipation in electrical system component such as transmission lines, power transformers, measurement system, etc.

Watt-hour (Wh): a measure of electric energy equal to the electrical power multiplied by the length of time (hours) the power is applied.

Waste: in energy statistics waste refers to the part of the waste that is incinerated with heat recovery at installations designed for mixed wastes or co-fired with other fuels. The heat may be used for heating or electricity generation. Certain wastes are mixtures of materials of fossil and biomass origin.

Industrial waste: non-renewable waste which is combusted with heat recovery in plants other than those used for the incineration of municipal waste. Examples are used tires, specific residues from the chemical industry and hazardous wastes from health care. Combustion includes co-firing with other fuels. The renewable portions of industrial waste combusted with heat recovery are classified according to the biofuels which best describe them.

Municipal waste: Household waste and waste from companies and public services that resembles household waste and which is collected at installations specifically designed for the disposal of mixed wastes with recovery of combustible liquids, gases or heat. Municipal wastes can be divided into renewable and non-renewable fractions.

Wind power: The conversion of energy in the wind into electrical power using a wind turbine. Wind farms can be sited on land or at sea, with those offshore able to take advantage of the much stronger and consistent winds found off the coast.

ANNEX II – REGIONAL INITIATIVES IN RENEWABLE ENERGY

The ECOWAS White Paper on Increasing Access to Energy Services in Peri-Urban and Rural Areas by 2015

The ECOWAS White Paper was adopted in 2006 by the ECOWAS Heads of States and Government in recognition of the key role that energy plays in the achievement of the Millennium Development Goals (MDGs). The White Paper aims to provide access to improved domestic cooking fuels and sustainable electricity services for the majority of the population by 2015. Moreover, it foresees that at least 20% of new investments in electricity generation should originate from locally available renewable resources, in order to achieve self-sufficiency, reduced vulnerability and sustainable environmental development.

The ECOWAS Energy Protocol

The ECOWAS Energy Protocol is a legal text that formalises the juridical framework of enterprises in the energy sector that was modelled after the European Energy Charter Treaty.

It promotes investment and trade by serving as a security for foreign direct investments in the energy sector. The ECOWAS Member States have completed the process of ratifying the Protocol which aims to provide a legal and regulatory framework for all regional energy integration initiatives and projects

The ECOWAS Bioenergy Strategy Framework

The ECOWAS Bioenergy Strategy Framework, adopted by the ECOWAS Council of Ministers in June 2013, aims to enhance the sustainable Bioenergy production and use within the Region that help address energy poverty, particularly in the rural and peri-urban populations, promotes food security, safeguard the environment, and enabling domestic and foreign investments. Development of National Action Plans should take into consideration the following objectives and initiatives:

- Universal access to modern energy services, especially in the rural and peri-urban areas by 2030 ;
- A more sustainable and safe provision of domestic energy services for cooking thus achieving the objectives of the White Paper for access to modern energy services by 2020 and
- Increasing food security within the region.
- Promote the transition from the traditional use of biomass towards a modern, efficient production and use of modern Bioenergy;
- Broaden regional dialogue and peer-to-peer learning to support the development of Bioenergy strategies in the ECOWAS Member States ;
- Promote regional policy planning for Bioenergy harmonized with national policies;
- Sensitize and share experiences on modern sustainable Bioenergy production that also promotes food security; and
- Create a vibrant and sustainable modern Bioenergy sector that promotes economic growth, rural development, and poverty alleviation.

The ECOWAS Small-Scale Hydropower Program

THE ECOWAS Small-Scale Hydropower Program, adopted by the ECOWAS Council of Ministers in June 2013, aims to contribute towards increased access to modern, affordable and reliable energy services by establishing an enabling environment for small-scale hydro power investments and markets in the ECOWAS region.

Between 2013 and 2018 the following specific program objectives will be achieved:

- At least six ECOWAS countries will have improved their legal framework (poverty reduction impact of SSHP evidence in their legal framework, feed-in tariff defined, transparent licensing procedure etc.);
- ECOWAS Member States integrate SSHP into their scenarios, planning documents and budgetary allocations;

- National SSHP initiatives and projects increasingly rely on local expertise from public and private sector (with limited international support). At least 1000 experts are trained.
- Quality guidelines are in use and quality of SSHP project proposals and feasibility studies improved.
- SHPP, planning tools and all other SHPP related publications are available on the ECREEE website.
- A least 35 additional SSHP projects per year are developed up to feasibility study level.

The construction of 50 projects has commenced. The more funding is mobilized the more projects can be developed.

- At least 10 companies established to provide various SSHP related services (planning, operation, repair etc.).
- Sustainability criteria and biodiversity offsetting will be mainstreamed throughout the planning and construction of SHP plants.

ECREEE Rural Electrification Programme (ERuEP)

The implementation of ERuEP will be done based on the four main pillars of ECREEE work programmes:

- Policy support (P);
- Capacity development (C);
- Project Development and Financing (D);
- Knowledge management (K).

These four pillars are vastly interlinked, and their importance for programme development in ECREEE is that, it allows for planning to take into account all the aspects needed for a successful implementation. A feasible initiative must include policy mechanisms, capacity building initiatives, promote the development and financing of specific projects and appropriate knowledge management, starting with awareness raising and knowledge sharing. The main activities to be undertaken in the rural electrification initiative include:

1. Support Member States in setting up the enabling environment and institutional framework for Mini-grids.
   - Support MS in analysis and planning of rural electrification through GIS based rural electrification planning
   - Support the identification of national tailored approach to rural electrification
   - Support the establishment of appropriate institutional and legislative framework
   - Promote an enabling environment for private sector involvement
   - Promote regional policy on rural electrification

2. Strengthen the capacities on sustainable management, operation and maintenance of existing systems

Technical and entrepreneurial training to build capacity on local manufacturing of components

Mentorship to entrepreneurs

Support project preparatory activities

Support governments in fund mobilisation

Direct support to implementation through EREF calls

The ECOWAS Programme on Gender Mainstreaming in Energy Access (ECOW-GEN)

The ECOWAS Programme on Gender Mainstreaming in Energy Access (ECOW-GEN) was established against the background that women's potential, in the ECOWAS region, as producers and suppliers of energy services is under-utilized and that empowering women to make significant contributions in the implementation of the adopted regional renewable energy and energy efficiency policies is necessary for the achievement of the Sustainable Energy for All (SE4ALL) goals in West Africa. Moreover, the programme is founded upon the principles of the ECOWAS Gender Policy which emphasizes the “need to develop policies and programmes to provide alternative energy sources which would contribute to women's health and also alleviate their time burden”. To stimulate the development of women-led business initiatives in the energy sector, ECREEE, through the support of the Spanish Agency for International Cooperation and Development (AECID), established the ECOWAS Women's Business Fund. ECREEE will work with Member States to identify and support, through the fund, innovative energy projects implemented by women groups and associations. In addition to this, ECREEE will assist Member States to establish similar funds in their respective

The ECOWAS Solar Thermal Program

The overall goal of the Solar Thermal Program (SOLTRAIN) in West Africa is to contribute to the switch from a fossil fuel based energy supply to a sustainable energy supply system based on renewable energies in general but based on solar thermal in particular. The overall project will be coordinated by ECREEE and technically implemented by AEE INTEC in cooperation with 8 institutional project partners from 7 West African countries (Cape Verde, Nigeria, Burkina Faso, Ghana, Mali, Senegal, Niger and Sierra Leone).

The ECOWAS solar thermal capacity building and demonstration program therefore aims to remove existing awareness, political, technological, and capacity related barriers which restrict solar thermal energy deployment in ECOWAS countries. The program will also contribute to increase the grid stability and save national power reserves as solar thermal systems will significantly reduce the stress on electric grids due to the shift from electricity to solar energy. The program links precisely to the goals of the regional polices on Renewable energy and energy Efficiency adopted by the ECOWAS Authority of Heads of State and Government in 2013. The regional policies considered solar thermal as a least cost sustainable energy technology and set specific targets for its use to meet sanitary and industrial hot water needs in the region.

The goals of SOLtrain West Africa are:

- Capacity Building by theoretical and practical Train-the-trainer courses to selected universities and polytechnic schools in the area of solar water heating and solar thermal drying
- Identify, monitor, analyze and improve existing solar thermal systems together with the partner institutions (practical training).
- Technical support of local producers.
- Design and Install solar thermal systems on the partner institutions for teaching and demonstration purposes.
- The partner institutions will offer trainings to national companies, installers, producers and further training institutions within their countries.

  Installation of 200 Demonstration systems at social institutions as schools and hospitals engineered by the partner institutions and installed by national practitioners
- Trainings to administrative, political and financial stakeholders in each country
- Solar thermal testing facility in one of the countries

The ECOWAS GENERATION AND TRANSMISSION MASTER PLAN

The ECOWAS Renewable Energy Policy highlights renewable energy scenario that is fully complementary to the ECOWAS power supply strategy and conventional national supplies, both as a significant contribution to bulk power generation and as a prevailing contribution to universal energy access for rural areas. Projects to be developed under the renewable energy power generation are to be implemented by ECREEE.

The ECOWAS Generation and Transmission Master plan approved in September 2011, foresees 30 power generation projects selected as regional priority power projects with a total capacity of 10.3 GW and a cost of US$18 billion (€15 Billion). The major share of this new generation and transmission capacities is projected to be available from 2017 to 2019. The selected projects are based primarily on large hydro power (21) with 7,093 MW, on natural gas (3) with 1,300 MW, on coal (2) with 1,075 MW and on renewable energy (4) with 800 MW. It must be noted that some projects are already getting delayed, and, therefore, the proposed scenario will most likely not happen as scheduled. This would have serious consequences for the importing countries and countries relying on new large hydro. In this context, RE technologies might assume more competitive roles.

The tables below show the lists of projects (generation and transmission) earmarked for regional implementation or as a regional priority projects:

Table 1: REGIONAL PRIORITY GENERATION PROJECTS

Regional Project	Priority Capacity	Annual Energy Generation	Generation Cost	Year of Project Commissioning
Coal Power plant in Sendou- (**Senegal)**	875MW		2532 Million US $	2016
Gouina Hydroelectric Project: Interconnecting Kayes **(Mali)-** Tambacounda **(Senegal)**	140 MW	565 GWh	329 Million $	2017
Wind Farm(**Senegal-the Gambia)**	200 MW		318 Million $	2021
Hydroelectric plants of Boureya (OMVS) – Badoumbé (OMVS) – Balassa (OMVS) and Koukoutamba (OMVS) 1. Badoumbé 2. Balassa 3. Boureya 4. Koukoutamba (**Mali**)	 70 MW 181 MW 160 MW 281 MW	 410 GWh 401 GWh 455 GWh 455 GWh	 197 Million $ 171 Million $ 373 Million $ 404 Million $	 2017-2019 2017-2019 2021 2019-2021
Kaléta Hydro **(Guinea**)	240 MW- 3 x 80 MW	946 GWh	267 Million $	2015
Sambangalou Hydro (**Guinea**)	128 MW- 4 x 32 MW	402 GWh	433 Million $	2017

Digan Hydro (**Guinea**)	93.3 MW	243 GWh	112 Million $	2012
Souapiti Hydro (**Guinea**)	515 MW	2518 GWh	796 Million $	2017-2019
Amaria Hydro(**Guinea**)	300MW	1435 GWh	377 Million $	2019-2021
Grand Kinkon Hydro (**Guinea**)	291MW	720 GWh	298 Million $	2012
Kassa Hydro **(Guinea/Sierra**	135 MW	528 GWh	214 Million $	2019-2021
Mount Coffee Hydro (**Liberia**)	66 MW	435GWh	383 Million $	2015
Bumbuna Hydro(**Sierra Leone**)	400 MW – 1560GWh – 520 M$	1560 GWh	520 Million $	2017-2019
Félou Hydro **(Mali)**	60 MW	350GWh	170 Million $	2013
Solar project 150 MW **(Mali)**	150MW - 549 M$		549 Million $	2019-2021
Tiboto Hydro **(Cote d'Ivoire)**	225 MW	912 GWh	578 Million $	2021
Fomi Hydro ((**Guinea)**	90 MW	374 GWh	156 Million $	2017-2029
Soubré Hydro **(Côte d'Ivoire)**	270MW	1120 GWh	620 Million $	
Aboadze-combined cycle Thermal Plant (Ghana)	400 MW		356 Million $	2014
Hydro **Adjaralla (Togo)**	147 MW	366 GWh	333 Million $	2017
Project of combined cycle Thermal (**Togo)**	450 MW		401 Million $	2021

Project of thermal plant in Maria Gleta **(Benin)**	450 MW		401 Million $	2014
Solar project 150 MW **(Burkina Faso)**	150MW		549 Million $	2017-2019
Mambilla Hydro **(Nigeria)**	2600MW	11214 GWh	4000 Million $	2019-2021
Zungeru Hydro **(Nigeria)**	700 MW	3019 GWh	1077 Million $	2017-2019
Wind Farm 300 MW **(Nigeria)**	300 MW		477 Million $	2021
Coal plant of Salkadamna **(Niger)**	200 MW		573 Million $	

Table 2: REGIONAL PRIORITY TRANSMISSION AND INTERCONNECTION PROJECTS

Project	Length of Transmission line	Cost of project	Commissioning Year
Hydroelectric plant Gouina: 225 kV OMVG loop	280 km	65 Million $	2019
225kV OM VG double circuit loop Linsan (Guinea) - Manantali **(Mali)** Reinforcement of Manantali-Bamako-Sikasso (**Mali**) section		131 Million $ 151 Million $	1st circuit: 2017 - 2019; 2nd circuit: 2019-2021

225kV OM VG loop Bolgatanga (**Ghana**) – Bobo Diolasso (**Burkina**)- Bamako (**Mali**)	742 Km	230 Million $	2015
225 kV OMVG loop between Senegal, The Gambia, Guinea-Bissau.	1677 Km	576.5 Million $	2017
Grand Kinkon western section of OMVG loop		141 Million $	2012
CLSG 225kV OMVG double circuit loop.	1060 km	430 Million $	2015
Second circuit of CLSG line 225kV OMVG loop	1060	69 Million $	2017-2019
225kV OMVG loop Ségou (**Mali**) - Ferkessédougou (**Ivory Coast**)	370 km	175 Million $	2012
225kV OMVG loop Buchanan (**Libéria**) –San Pedro (**Ivory Coast**)	400 km	100 Million $	2019-2021
225kV OMVG loop Linsan-Fomi – Fomi-Nzerekoré – Fomi-Bamako	1350 km	550 Million $	2017-2029
225kV OMVG double circuit loop Fomi (**Guinea**) –Boundiali (**Ivory Coast**)	380 km	111 Million $	2019-2021

225kV OMVG loop Soubré- Taabo (**Ivory Coast**)	196 km	69 Million $	2017-2019
225kV OMVG loop Bolgatanga (**Ghana**) – Ouagadougou (**Burkina Faso**)	206 km	74 Million $	2013
330kV OMVG loop between **Prestea** and **Bolgatanga Ghana**	640 km	240 Million $	2017-2019
330 kV OMVG loop Niamey (**Niger**) - Birnin Kebbi (**Nigeria**) - Malanville (**Benin**) – Ouagadougou (**Burkina Faso**)	832 km	540 Million $	2017-2019
760 kV OMVG loop network through **Nigeria**	2700 km	2000 Million $	2019 2021 -
Median Backbone 330kV OMVG loop	713 km	238 Million $	2019-2021
330 kV OMVG double circuit loop Sakete (**Benin**) - Omotosho (**Nigeria**)	120 km	39 Million $	2021
225kV OMVG loop Salkadamna-Niamey (**Niger**)	190 km	72 Million $	2019-2021

4. ECOWAS-ACTION PLAN IMPLEMENTATION STRATEGIES AND STATUS

Regional Priority Projects planned for implementation **2011 – 2025:**

- **10 000 MW** to be installed of which **7 000 MW** will be hydro sources
- **16 000 km** of transmission lines

TOTAL INVESTMENT COST is **US$ 24 BILLION** with GENERATION COST of **US$ 18 BILLION** AND TRANSMISSION of **US$6BN**

Table 3: Status of implementation of ECOWAS transmission projects

Project	Status of implementation	Time of Commissioning
330 kV Riviera (Cote d'Ivoire) – Prestea (Ghana	Projects on-going	Expected commissioning 2015
330 kV Aboadze (Ghana) – Volta (Ghana)	Operational since 2010	Completed
330 kV Volta (Ghana) – Lome "C" (Togo) – Sakete (Benin)	Under-implementation	Completed
330 kV PHCN/TCN **(Nigeria)**	At level of preparation	Expected to be completed 2017
330 kV ABOADZE – PRESTEA – KUMASI – BOLGATANGA , Tumu – Han – Wa	At level of pre-investment	Expected to be completed 2015
Han (Ghana) – Bobo Dioulasso (Burkina Faso) – Sikasso (Mali)– Bamako (Mali)	Pre-investment	Expected to be completed 2015
225 kV Nzerekore (Guinea) - Fomi (Guinea) – Bamako (Mali)	Pre-investment	To be completed 2016
330 kV Birnin Kebbi (Nigeria) - Bemberke (Benin) – Niamey (Niger) Ouagadougou (Burkina Faso)	Pre-investment	To be completed 2017
147 MW WAPP Adjarala Hydropower Facility	Pre-investment	To be completed 2017
60 MW Felou Hydropower Project	At level of implementation	To be completed 2014

a. INTER-ZONAL TRANSMISSION HUB SUB-PROGRAM

(Burkina Faso, OMVS via Mali, Cote d'Ivoire via Mali, CLSG via Cote d'Ivoire).

The main transmission hub sub-programmes for the region include:

- 225 kV Bobo Dioulasso (Burkina Faso) – Ouagadougou (Burkina Faso);
- 225 kV Bolgatanga (Ghana) – Ouagadougou (Burkina Faso);
- 225 kV Cote d'Ivoire – Mali;
- 330 kV Aboadze (Ghana) – Prestea (Ghana) – Kumasi (Ghana) – Bolgatanga (Ghana) + Tumu (Ghana) – Han (Ghana) – Wa (Ghana);
- Han (Ghana) – Bobo Dioulasso (Burkina Faso) – Sikasso (Mali) – Bamako (Mali);
- 225 kV Fomi (Guinea) – Bamako (Mali) – Nzerekore (Guinea) – Linsan (Guinea)
- 147 MW WAPP Adjarala Hydro Power Facility

Both the generation and transmission projects identified under the ECOWAS Generation and Transmission Master Plan have been spread between phases 1, 2 and 3 according to:
The implementation of this master plan has been scheduled to ensure the load supply throughout the region. This will be implemented in line with following phases of development:

- **Phase 1: Commissioning in the period 2017-2019**
- **Phase 2: Commissioning between 2019 and 2021**
- **Phase 3: Commissioning at long-term (2021-2023)**

THE WEST AFRICA GAS PIPELINE (WAGP)

The West African Gas Pipeline project is an International Gas transmission system that will transport clean, reliable and cheap natural gas from Nigeria to customers in Benin, Togo and Ghana. The proposal for a natural Gas Pipeline across West Africa was made in 1982 by the ECOWAS Commission ECOWAS as a key regional economic goal. The World Bank undertook a study on this in 1992 which confirmed the viability of a Natural Gas Pipeline based on ample reserves of Nigerian Natural Gas and Regional Energy needs. The plan calls for Chevron and its partners to build a 620-mile offshore line capable of initially shipping 180 million cubic feet of Nigerian gas per day for sale to power plants and other major gas users in Ghana, Togo and Benin.
The main objectives of the gas pipeline master plan were three folds:

- To encourage Royal Dutch Shell and Chevron to tap into a vast resource that since the onset of oil production in the 1960s has been wasted in the associated gas burning-off process known as flaring.
- To provide a cheap source of energy in a region starved of electricity, by serving as International Gas Transmission System that will transport clean, reliable and cheap natural gas from Nigeria to customers in Benin, Togo and Ghana.
- Foster regional economic and political integration that would support economic growth, and in particular the development of the West Africa electricity market.

1.1 Agreement on project

In 2000, the four nations involved signed an Intergovernmental Agreement for a harmonized fiscal and regulatory framework for cross-border construction and operation of the gas pipeline. The four Nations and the West African Pipeline Company (WAPCo) signed International Project Agreement (IPA) for the development of the pipeline in 2003. Construction of the WAGP therefore began in 2005 and by 2008, the Pipeline construction had completed and gas introduced into pipeline.

1.2 The Project benefit

The project is the sub-region's solution to bringing energy for economic growth and environmental benefits to Ghana, Togo, Benin and Nigeria. To help in the energy access challenges in the sub-region, the WAGP aims to achieve the following benefits:

- provide a long-term supply of abundant, clean, relatively cheaper fuel from Nigeria to Ghana, Togo and Benin;
- transfer technical knowledge and skills to relevant public agencies, local consultants, contractors and their employees across the four countries
- Employ over 100 skilled people from the sub-region, on competitive selection basis. This number has been far greater during construction
- provide a new level of regional co-operation and economic integration to enhance regional stability under the auspices of ECOWAS
- serve as a catalyst for direct foreign investment in the project countries
- Provide Nigerian producers with benefit from additional revenues accruing from the sale of associated gas to WAPCo
- To provide each of the four countries with some direct tax benefits
- Provide the three gas recipient countries with some fuel gains
- Enhance the regional environment by substituting natural gas for less desirable fuels. It will also lead to reduction in gas flaring in Nigeria, reduction in greenhouse gas emissions, and serve as a springboard in the efforts against deforestation.

1.1 Status of Project implementation

The initial phase of the project implementation was completed in 2008 linking mainly an off-shore pipeline from Alagbado (Nigeria) to Takoradi (Ghana). Commissioning of the pipeline began in late Nov 2008. Gas introduced into the offshore pipeline on Dec 6, 2008 from Nigeria to Takoradi. Commissioning successfully completed on Dec 14, 2008. Construction of the Takoradi Regulating and Metering Station has been completed.

1.2 The future prospects

The project has the prospect of being extended from Takoradi in Ghana to Senegal. This will mainly be an off-shore development project and will augment the electricity and generation and distribution projects earmarked for the region in the Master Plan.