

Country Case Study  
**Renewables Readiness  
Assessment**

**SENEGAL**

Preliminary findings



## Foreword



It is with pleasure that I present Senegal's Renewables Readiness Assessment (RRA) report. Renewable energy is an important part of the economic development strategy of Senegal, which was the first country in Africa to have a Ministry dedicated to renewable energy. This report follows from the first pilot study of RRAs undertaken under the International Renewable Energy Agency's (IRENA's) work programme, which started in 2011. Senegal fully supports IRENA's mission to upscale the deployment of renewables, by creating enabling frameworks.

Using the RRA process, and with the assistance of IRENA and its consultants, Senegal conducted a rapid review of conditions necessary to facilitate the deployment of renewables. We considered on-grid, off-grid and biofuels options, at all scales and in all locations. The report now presented focuses on the actions that we envision taking to increase our readiness. It also identifies the actors who would support our efforts in taking these actions forward.

The actions identified would make a major contribution to renewables deployment in Senegal. Their delivery requires the support of the Government of Senegal and of other actors in the country. External support can also play a major role. In this regard we thank those who are already at our side and those who will join us with their assistance in achieving our goals.

I hope that this report will serve to highlight and strengthen my country's progress in deploying renewable energies. I hope that it also acts as a source of inspiration to other countries undertaking their RRAs and who are elaborating their plans and strategies. I am delighted that two key examples of Senegal's good practices are included in the report. I welcome the opportunity to discuss both these and examples of good practice from other countries as we move together towards a future with greater use of renewable energies.

Louis Seck, Minister of Renewable Energy, Senegal. Dakar January 2012



## Preface



Receiving the first Renewables Readiness Assessment (RRA) – presented here by Senegal – is an important milestone for IRENA, whose mission is to promote the widespread and increased adoption and sustainable use of all forms of renewable energy.

During the past year, IRENA has operationalised its work programme, and RRAs are a central pillar of this work. RRAs will allow IRENA to identify and provide country-specific support and advice to the participating countries. More broadly, RRAs will also generate knowledge of good practice and the cooperation between countries which are essential to increasing deployment.

The RRA work is included in our 2011 and 2012 work programmes, and is led by IRENA's Directorate of Knowledge Management and Technology Cooperation. A template and process are being developed to enable countries to complete their own RRAs. IRENA offers its support, but it is the actions and insights that are developed through a country-owned process that provide the key to rapid deployment.

In keeping with its strong and consistent support of IRENA and its mission, Senegal kindly volunteered to host the first country pilot study. The process and details of RRAs will necessarily evolve with experience. We thank Minister Seck and his team for their patience and generosity in hosting this first study. Their engagement and input have gone beyond what we could have expected and IRENA is grateful for their important contribution.

In common with all countries, the RRA found areas where Senegal had examples of good practice that could be shared with others, areas where readiness was high and other areas where readiness could be improved in the short- to medium-term, under initiatives led by Senegal. The report now presented focuses on these actions and examples of good practice.

IRENA hopes that the RRA will enable Senegal to increase its deployment of renewables. We offer our continuing support, across all our functions and work programmes, to Senegal in implementing the actions identified.

*Adnan Z. Amin, Director General, IRENA. Abu Dhabi, January 2012*

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## List of Acronyms

ANCR	<i>Association Nationale des Conseils Ruraux</i> (National Rural Councillors Association)
APIX	<i>Agence nationale de Promotion des Investissements du Senegal</i> (Senegal Investment Promotion Agency)
ASER	<i>Agence Sénégalaise d'Électrification Rurale</i> (Senegalese Agency for Rural Electrification)
ASN	<i>Association Sénégalaise de Normalisation</i> (Senegalese Association for Norms and Standards)
CERER	<i>Centre d'Etudes et de Recherches sur les Energies Renouvelables</i> (Centre for Studies and Research into Renewable Energy), at the University of Dakar
CIER	<i>Comité Interministériel sur les Energies Renouvelables</i> (Inter-ministerial Committee on Renewable Energy)
CNB	<i>Comité National des Biocarburants</i> (National Biofuels Committee)
CRSE	<i>La Commission de Régulation du Secteur de l'Électricité du Sénégal</i> (Regulatory Commission for the Electricity Sector in Senegal)
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Regional Centre for Renewable Energy and Energy Efficiency
EDF	<i>Électricité de France</i>
ERIL	<i>Électrification d'initiative locale</i> (local initiative electrification projects)
FIT	Feed-in tariff
GET FIT	Global Energy Transfer Feed-in Tariff
IRENA	International Renewable Energy Agency
ISRA	<i>Institut Sénégalais de Recherches Agricoles</i> (Senegalese institute for agricultural research)
LPG	Liquefied petroleum gas
NGO	Non-governmental organisation
O&M	Operation & Maintenance
ONE(-Maroc)	<i>Office National d'Électricité du Maroc</i> (Moroccan National Electricity Office)
RE	Renewable Energy
RRA	Renewables Readiness Assessment
SADC	South African Development Community
SENELEC	<i>Société Nationale d'Électricité du Sénégal</i> (National Electricity Company of Senegal)
SPEC	Sustainable Power Electric Company

## 1. Introduction to RRAs and to the Report for Senegal

This document is a precursor to a forthcoming detailed report on the Renewables Readiness Assessment (RRA) conducted by, and for, Senegal in November 2011. RRAs—which will be rolled out across the world—are a pillar of the work programme<sup>1</sup> of IRENA, the International Renewable Energy Agency. An RRA is a **rapid assessment of how a country can increase readiness and overcome the main barriers to the deployment of renewable energy technologies**. It is a **national document**, owned by the government of the country.

**Renewables** encompass all possible applications: on-grid; off-grid applications (thermal, electricity services, motive power); biofuels for transport.

**Readiness** is when actors are able to deploy renewables where they are the best option, accounting for all economic, social and environmental criteria.

**Assessment** is of the *current* state of *national* readiness, across the project lifecycle, from national energy strategy and policy, to building, operation and maintenance, with capacity-building cutting across all these items.

The RRA process is designed to:

1. **Rapidly identify where action is needed** to improve readiness;
2. Identify **the partners and organisations who can help deliver** these actions; and
3. Allow more **focused discussions to be held with bilateral and multilateral partners**, allowing them to buy into the set of actions developed and avoiding the need for further reviews and assessment.

The RRA process in Senegal benefitted from the expertise of many experienced professionals. The mission conducted from 14- 18 November, 2011 comprised two major elements:

1. A series of fact-finding interviews with stakeholders from the renewable energy sector;
2. Working sessions with officials from the Ministry of Renewable Energy to fill in templates for different renewable energy (RE) resources and services.

The penultimate day was a site visit to a recently electrified village many kilometers from the grid, featuring wind, solar and diesel generation and a novel business model. The last day of the mission was a seminar with stakeholders, aimed at presenting findings from the week, eliciting further feedback on these findings and developing the set of actions that form the last stage of an RRA.

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<sup>1</sup> The first phase of the RRA program comprises methodology design and testing. The first pilot mission took place in Senegal (November 2011) and the second in Mozambique (December 2011). The first phase will develop materials by the IRENA Assembly in January 2012 and be complete by the end of February 2012. The second phase will see further pilot studies outside Africa, and roll out in Africa to certain countries in the Economic Community of West African States (ECOWAS) and Southern African Development Community (SADC) regions.

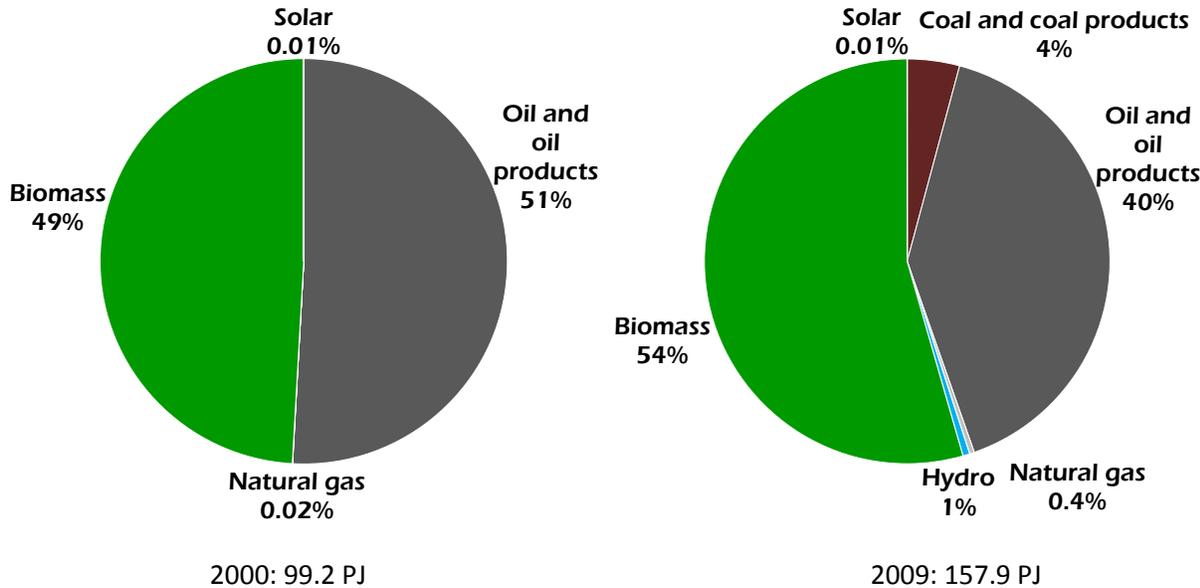
The key output of RRAs is the concrete actions identified. IRENA is committed to supporting these, through the exchange of information between those facing similar issues and opportunities and through finding partners and linking them. A key resource from the RRA project is the database of good practices.

## 2. Increasing Readiness in Senegal

### 2.1 Overview of the energy situation

The Total Primary Energy Supply (TPES) of Senegal in 2009 was 157.9 Petajoules (PJ). Biomass accounts for 54% of the country’s energy supply and oil products for 40%; coal, hydro, natural gas and solar (whose combined share has greatly increased since 2000) are the other energy sources used. All the fossil fuels used are imported – in particular the oil products that are used in the transport sector and for electricity generation – and make a significant contribution to the country’s imports. This leaves Senegal very vulnerable to increases in the price of oil products.

**Figure 1: Total Primary Energy Supply\* in 2000 and 2009**



\*excluding electricity trade

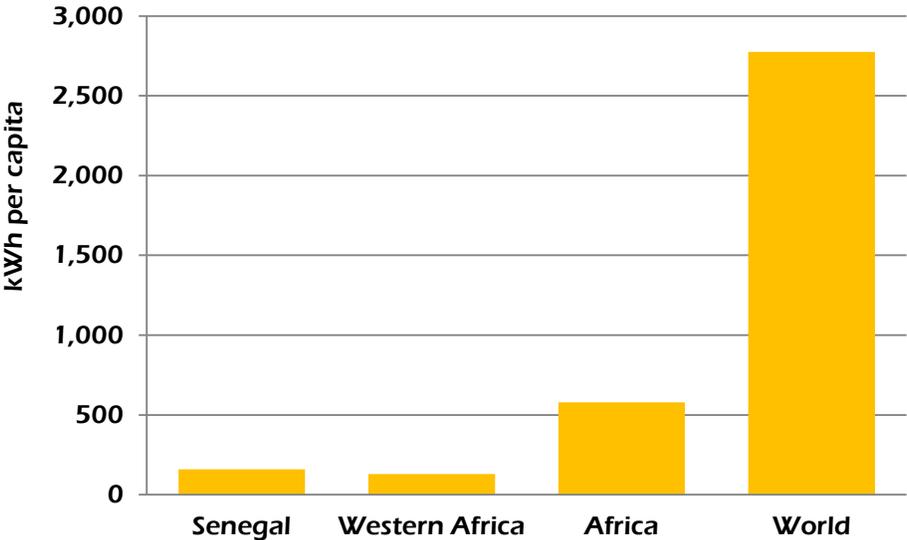
**Box 1: Energy national profile 2009**

Total Primary Energy Supply: 158.4 PJ – of which renewables: 86.8 PJ (54.8 %)  
Energy self-sufficiency: 55.5%  
Fuel imports: 1.1 billion USD (23.2 % of total imports)  
Electricity generation: 2,858 GWh – of which renewables: 292.0 GWh (10.2 %)  
Electricity use per capita: 189 kWh  
Electrical capacity (2008): 548 MW – of which renewables: 2 MW (0.4 %)  
Share of population using solid fuels: around 25%

Both biomass and the oil products used in Senegal are sources of concern: the use of traditional fuels—wood and charcoal—is putting great pressure on forests and contributing to a degradation of the environment, and Senegal has had a policy of subsidising liquefied petroleum gas (LPG) supplies to reduce the use of traditional fuels for more than two decades.

With an electricity consumption per capita of 158 kiloWatt-hours (kWh) in 2008, Senegal ranks fourth among western African countries – after Cape Verde, Ghana and Côte d’Ivoire – yet is well below the African and world averages of 579 and 2777 kWh respectively. More than one-quarter of the households in Senegal have access to electricity, principally through SENELEC’s interconnected grid. The rate of electrification is progressing both via new connections to this main grid and through small, off-grid projects. The existing high cost of electricity to consumers means that it is not possible to finance further new connections through increased consumer tariffs. Further, the scarcity of capital available to the State means that investment relies heavily on donors.

**Figure 2: Electricity use per capita for 2008**



Note: Western Africa includes Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo.

Senegal has a clear need to develop new energy sources and does not have commercially exploitable deposits of oil, natural gas or coal. Senegal is endowed with a large solar energy resource. Over most of the territory, the solar irradiation is above 2000 kWh/m<sup>2</sup>/y for Global Horizontal irradiation, and above 1800 kWh/m<sup>2</sup>/y for the Direct Normal Irradiation. This provides good perspectives for photovoltaic and concentrated solar power projects. The falling prices of photovoltaic panels and system components make solar a very attractive solution, particularly when the costs of the alternatives—imported oil products—are high. Solid biomass, wind, hydro and liquid biofuels all have potential in parts of the country.

The development of affordable energy in sufficient quantities is key to achieving Senegal’s economic development goals. Renewables need to be exploited. The current institutional context is favourable to a step change in deployment. The table below summarises the status of renewables for five key issues of common concern for all countries, and which feature in all RRA reports.

**Table: Status of renewables by issue of common concern**

Issue	Status in Senegal
Rural electrification	Responsibility is with the Senegalese Agency for Rural Electrification (ASER), an autonomous public organisation independent of the electricity utility (SENELEC). ASER’s approach is based on concessions which are granted for off-grid areas outside those for which SENELEC is responsible and/or local initiative electrification projects (“ERILs,” or <i>électrification rurale d’initiative locale</i> ), which are smaller concessions granted to operators. Tariffs for electricity can be set individually for each area. Donor funding remains very important for investment.
Integrating variable renewables into the electricity grid	Little experience to date. Capacity-building is likely to be required, for wind power in particular.
FIT (feed-in tariff) and other preferential financial conditions for renewables	Being elaborated, and at an advanced stage— independent power producers can supply to the grid, at tariffs not greater than SENELEC’s average cost of electricity production. Preferential tariffs for renewable energy and other financial support (such as tax incentives) require the adoption of decrees, to apply the existing Renewable Energy Law (Act 2010-21). Adoption is underway.
Off-grid thermal and motive power	Water pumping is one of the most common applications of renewable energy, largely based on solar photovoltaic, but also with some wind power. Maintenance is contracted at the local level to private sector operators. The solar thermal supply chain needs strengthening at all points.
Biofuels for transport	Largely at the conceptual stage at present. Development needed across the supply chain. Land-use decision making is at the local authority level.

## 2.2 Actions Identified to Upscale Renewables Deployment in the Short- to Medium-Term

The RRA process identified the actions below. They are not given in any order of priority, and the list of actions from a rapid assessment is unlikely to be exhaustive. They identify a range of actions which could increase the readiness of Senegal to upscale its deployment of renewables. The actions are designed to be implementable in the short- to medium-term, largely by decisions taken by the Government of Senegal.

<b>Action</b>	<b>Adapt the rules of intervention for the regulator in the specific case of small electricity producers (ERILs)</b>
<b>Resource-Service pair(s)</b>	Off-grid electricity, all resources
<b>Description</b>	<ul style="list-style-type: none"> <li>- The regulator (La Commission de régulation du secteur de l’électricité du Sénégal, or CRSE) is currently obliged to approve tariffs for electricity supply, to the final consumer, no matter what the size of the installation. This process is time-consuming and acts as a barrier for implementation of small concessions (ERILs),</li> </ul>

	thus limiting their more general implementation. Measures to alleviate this constraint could include, for example, exempting installations below a certain capacity (e.g. below 50 kilowatts) from requiring regulatory approval for the proposed tariff and allowing approval by village community. The decentralisation of regulatory powers, following decentralisation at governmental level, and associated capacity building at the local level to respond to tariff proposals, could assist the process.
<b>Actors</b>	CRSE, Ministry of Energy, Ministry of Renewable Energy, Private Operators, SENELEC to participate in review. Educational and training institutions for capacity-building in decentralised institutions.
<b>Timing</b>	Mid-2012
<b>Keys for success</b>	Engagement by the regulator, improved staffing in the regulator, decentralisation of power and building capacity of the regulator. Such capacity-building activities will be a focus of the future IRENA work programme, both in Senegal and elsewhere.

<b>Action</b>	<b>Finalise and sign the implementing decrees of the framework laws on RE</b>
<b>Resource-Service pair(s)</b>	On-grid and off-grid electricity, all RE resources
<b>Description</b>	<p>The framework laws on renewable energy provide a structure for deployment, but this deployment is dependent on finalising the implementing decrees. These decrees would enhance the attractiveness of renewable energy investment by giving certainty to:</p> <ul style="list-style-type: none"> <li>- the conditions of purchase and remuneration for electricity generated by power from renewable energy plants and the conditions of their connection to the network;</li> <li>- conditions for purchase and remuneration of surplus electricity from own-generation renewable electricity sources; and</li> <li>- tax and customs duties applicable to renewable energy equipment.</li> </ul> <p>Implementation of decrees will require funding sources to be identified and secured, and this should also form part of the action. One particular action that could be explored is the Global Energy Transfer Feed-in Tariff (GET FiT), which seeks to use public sector (or donor) funds to create stable incentives for renewable energy, and in doing so attract private financing into the sector.<sup>2</sup> Identification of partners willing to support implementation in Senegal would provide a route for securing funding.</p> <p>Complementary actions could include exploring funding opportunities with multilateral and bilateral donors and with potential investors from private companies, utilities and commercial banks. Strengthening engagement with the Ministry of Finance and Economics, and awareness building within the ministry in order to ensure budgetary provision could also be</p>

<sup>2</sup> For further details and an application to an African country, see W. Rickerson, C. Hanley, C. Laurent, & C. Greacen (2010). *Implementing a Global Fund for Feed-in Tariffs in Developing Countries: A Case Study of Tanzania*. World Renewable Energy Congress: 2010.

	important.
<b>Actors</b>	Government of Senegal, Ministry of Energy, Ministry of Renewable Energy, Ministry of Economics and Finance, Donors and other potential investors (private companies, utilities and commercial banks). IRENA could bring together donors and country representatives to investigate a global initiative.
<b>Timing</b>	Mid-2012
<b>Keys for success</b>	Finalisation will require consensus on the terms of the text. Effectiveness of proposed decrees will depend on the extent to which they give incentives for renewable energy. The availability of funds to support deployment in the form of FIT (and any other fiscal incentives) will also be crucial and will depend in part upon continued engagement with donors

<b>Action</b>	<b>Facilitate an agreement on the integration of electricity generated from renewable sources onto SENELEC's grid, and define the associated technical and capacity-building requirements for integration.</b>
<b>Resource-Service pair(s)</b>	On-grid electricity, all resources
<b>Description</b>	<p>The Inter-ministerial Committee on Renewable Energy (<i>Comité Interministériel sur les Energies Renouvelables</i>, or CIER) has been charged, among other tasks, with coordinating the policies for integration of renewable energy and the grid code. Their finalisation will assure more coherence in integrating renewables onto the interconnected grid.</p> <p>Technical aspects of integrating variable energy sources into the grid is an area in which the grid operator, SENELEC, does not have any experience, and capacity-building measures in terms of how to manage these sources will be required.</p>
<b>Actors</b>	CIER, SENELEC, Ministry of Renewable Energy, Ministry of Energy, organisations with experience of similar issues in other countries and regions (e.g., Morocco, Egypt)
<b>Timing</b>	End 2012
<b>Keys for success</b>	Engagement of SENELEC and adequate resources within SENELEC. Establishing good links and exchanges with other countries with experience of similar issues can also be valuable—IRENA can play a co-ordinating role in this.

<b>Action</b>	<b>Promote small-scale production of biodiesel</b>
<b>Resource-Service pair(s)</b>	Biofuels for transport (and also electricity)
<b>Description</b>	<p>Plans for production of biodiesel from the jatropha plant focus on small producers, but engagement by these producers is limited by lack of market structures and supply chains. Securing further production depends, among other factors, on the production technology available to farmers for biodiesel and the ability of farmers to secure financing for projects and sell their output. Actions to address this could include:</p> <ul style="list-style-type: none"> <li>- setting of the price at which farmers can sell output—this should be</li> </ul>

	<p>set with the finalisation of the implementing decrees on biofuels;</p> <ul style="list-style-type: none"> <li>- establish markets for sale of output—as of 2013 this will be supported in part by domestic blending mandates;</li> <li>- increase availability of financing for farmers wishing to invest in production—this will require better understanding of the technology and associated risks;</li> <li>- review of technology requirements for improved production, and subsequent dissemination of the technology and best practices; and</li> <li>- development of physical infrastructure as necessary to support distribution of biofuels.</li> </ul>
<b>Actors</b>	<i>Comité National des Biocarburants</i> (CNB), Directorate of Biofuels and Biomass, Ministry of Energy, Ministry of Agriculture, National Rural Councillors Association (ANCR), finance institutions
<b>Timing</b>	Complete action plan by mid-2012
<b>Keys for success</b>	<ul style="list-style-type: none"> <li>- Development of better understanding and awareness of biofuels at all levels, including among farmers, government institutions and the public;</li> <li>- Further work to understand the business model risks associated with various parts of the supply chain to help overcome barriers to micro-finance lending (e.g., for small-scale producers), and dissemination of this work to finance and micro-finance institutions; and</li> <li>- Finalisation of terms on which farmers can sell their output.</li> </ul>

<b>Action</b>	<b>Proceed to a review of the institutional, legal and regulatory conditions and modalities necessary for utilising land in support of the National Biofuels Strategy</b>
<b>Resource-Service pair(s)</b>	Biofuels for transport (and also electricity)
<b>Description</b>	<p>In 2006, Senegal launched a National Biofuels Strategy, focusing on the production of ethanol and biodiesel. Under the Strategy, the government aims to plant a total of 320,000 hectares of jatropha by 2012, with each of 321 rural communities planting 1000 hectares of jatropha seedlings provided by the government. These seeds will be used to produce a total of 1.2 billion litres of oil to meet petrol and diesel needs.</p> <p>Among other factors, realisation of these targets is dependent upon the availability of land for production, the distribution of high quality agricultural inputs and on maintaining production. In Senegal, this needs to take account of the complex structure of land rights. Associated actions are:</p> <ul style="list-style-type: none"> <li>- review land requirements for the successful implementation of the strategy (it will also be necessary to consider other resources, such as water);</li> <li>- identify land tenure rights wherever possible and incorporate into land availability assessments;</li> <li>- Identify the potential for increased productivity through technology advances and agricultural techniques, and how these can be secured;</li> </ul>

	<ul style="list-style-type: none"> <li>- assess environmental, economic and social impacts of strategy implementation—such assessments are currently conducted on a project-by-project basis; and</li> <li>- identify the extent and basis of private company participation.</li> </ul>
<b>Actors</b>	Ministry of Agriculture, Ministry of Renewable Energy (Directorate of Biofuels and of Biomass), Village Community Organisations, Legal Advisor, ISRA and other agricultural research institutions, non-governmental organisations (NGOs).
<b>Timing</b>	Mid-2012
<b>Keys for success</b>	<ul style="list-style-type: none"> <li>- Identification and addressing of public concern relating to land use pressures and associated conflicts;</li> <li>- Inclusive participation of all relevant actors throughout the review; and</li> <li>- Understanding of current status of the strategy and its implementation.</li> </ul>

<b>Action</b>	<b>Identification of conditions needed to increase private sector involvement in RE manufacturing</b>
<b>Resource-Service pair(s)</b>	Off-grid and on-grid services, wind and solar resources
<b>Description</b>	<p>Senegal has significant experience in the deployment of certain renewable energy technologies (e.g., small-scale solar, wind for water pumping), and some domestic manufacturing capacity has grown up around this (most recently SPEC, an assembly facility for solar panels). There is also a considerable level of research capacity regarding manufacturing (e.g. design and development of solar pumping technology at CERER, the Centre d’Etudes et de Recherches sur les Energies Renouvelables).</p> <p>These strengths could be captured to further build manufacturing capacity in the country, thereby positioning Senegal as a supplier of technologies and facilitating local industrial development. As a first step, a round table of manufacturers and suppliers of technologies would provide a forum to identify their requirements and actions to address these. Other actions include:</p> <ul style="list-style-type: none"> <li>- finalising implementing decrees for renewable energy, including provisions relating to fiscal treatment of renewable energy technologies. In addition to giving financial incentives, this would also help to ensure market demand;</li> <li>- identification of priority areas for development of manufacturing capacity;</li> <li>- identification of training and education requirements to build the necessary skills for the development of the manufacturing sector; and</li> <li>- creating a forum to support collaboration between private and research sectors.</li> </ul>
<b>Actors</b>	Private sector manufacturers and suppliers of equipment, Ministry of Renewable Energy, Ministry of Industry, Ministry of Higher Education, Ministry of Technical Education, CERER and other research institutes, APIX,

	foreign investors.
<b>Timing</b>	2012
<b>Keys for success</b>	<ul style="list-style-type: none"> <li>- Participation of key actors and commitment by the Government of Senegal;</li> <li>- Engagement with foreign investors and/or donors could help to secure financing for subsequent actions; and</li> <li>- Review of previous experience regarding manufacturing capacity and research, including success factors (e.g., regarding the closure of the Industrial Society for Applications in Solar Energy).</li> </ul>

<b>Action</b>	<b>Identifying conditions needed for O&amp;M (Operation &amp; Maintenance) of off-grid motive and thermal power</b>
<b>Resource-Service pair(s)</b>	Off-grid motive power (wind and solar); off-grid thermal power (solar)
<b>Description</b>	<p>While Senegal has long-standing experience in the deployment of off-grid motive (primarily water pumping) and thermal (primarily water heating, also cooking and drying) power, the long-term lifetimes of each of these systems has been compromised by problems with operation and maintenance (O&amp;M). In particular:</p> <ul style="list-style-type: none"> <li>- Motive Power: Experience of solar pumping has shown that in the case where O&amp;M services have been provided by third-party service companies and paid for by villages using funds from the sale of water, a number of weaknesses have occurred which need to be overcome to assure the viability and sustainability of systems. In particular are the absence of a legal framework, inadequate financial systems to ensure that customers honour their bills and the low competence level of maintenance staff. O&amp;M problems are worse for wind than solar due to wind having more moving parts. Thermal power: The small current market for new equipment and small number of systems in operation make the market unattractive to private sector suppliers. The absence of standards and quality testing for equipment entering Senegal compounds the difficulties in developing these applications.</li> </ul> <p>Therefore, there is a need to implement actions to improve O&amp;M provision. These should be based on a review with the parties below and subsequent development and implementation of a plan of action: Preliminary suggestions:</p> <ul style="list-style-type: none"> <li>- Both: Develop and fund training programmes to address capacity gaps.</li> <li>- Motive Power: <ul style="list-style-type: none"> <li>o Define and formalise legal status and framework for service providers;</li> <li>o Incentivise deployment of hybrid technologies.</li> </ul> </li> <li>- Thermal Power <ul style="list-style-type: none"> <li>o Introduce standards for quality control testing and service requirements;</li> <li>o Identify and enable implementation of business models for</li> </ul> </li> </ul>

	improved maintenance.
<b>Actors</b>	Both: Ministry of Renewable Energy, Equipment Manufacturers, Training Institutes Motive: Village communities, service providers, equipment manufacturers, Ministry of Renewable Energy, Ministry of Hydrology, donors, Thermal: Private sector suppliers, Equipment providers, Agency for Standards.
<b>Timing</b>	Mid-2013
<b>Keys for success</b>	Understanding the motivation of all actors in the supply chain and providing incentives for them to act as desired; existence of sufficient organisations with the knowledge, capacity and interest to provide services; general support to the development of markets for off-grid motive and thermal power.

<b>Action</b>	<b>Elaborate a process for comprehensive mapping of resources in key areas</b>
<b>Resource-Service pair(s)</b>	Wind, Solar and Bioenergy, for all applications.
<b>Description</b>	<p>There is currently a broad-based understanding of resource availability and potential, but this is generally not sufficient to enable project development or a comprehensive assessment of potential. Similarly, there is some data collection from actual projects, but this is not comprehensive or centralised.</p> <p>Comprehensive data will facilitate the implementation of the draft renewable energy strategy and future project development. Particular gaps exist in the areas of solar, wind and biofuels; benefits could also be gained from an assessment of bioenergy potential. Likely actions in implementing a mapping process could include:</p> <ul style="list-style-type: none"> <li>- engage with existing initiatives for data collection, including observatory currently being established by the ECOWAS Regional Centre for Renewable Energy and Energy Efficiency (ECREEE);</li> <li>- identify precise requirements for resource mapping, based on priority areas for renewable energy development;</li> <li>- establish a plan for collection of data; and</li> <li>- explore the potential for funding ground measurement campaigns with multilateral/ bilateral organisations .</li> </ul>
<b>Actors</b>	Ministry of Energy, Ministry of Renewable Energy, ECREEE, Project Developers, CERER and other research institutes, donors.
<b>Timing</b>	Mid-2012 for definition of requirements and establishing protocol, ongoing for data collection.
<b>Keys for success</b>	Technical and human resources available for data collection, identifying and securing funds for data collection, establishing a protocol for sharing data.

## 2.3 Examples of Good Practice in Senegal

Among the areas where Senegal is demonstrating good practice are the two examples below. These examples will form part of the good practice database being developed under the project, which will become a knowledge-management tool designed to help all countries identify and progress their readiness.

### **Good Practice Demonstration 1: Business Models Used for Rural and Off-Grid Electrification**

Rural electrification, using both conventional and renewable energy resources has been defined as a key sector to reduce poverty and increase rural living standards. Senegalese authorities plan to reach a 30% rural electrification rate by 2015, and a 60% rate by 2022. Responsibility for meeting the target is in the hands of the Senegalese Agency for Rural Electrification (ASER), an autonomous body reporting to the Ministry of Energy

Based on an economic assessment of conditions for electrification, ASER has defined 10 concessions and has launched tenders for electrification of these areas in a competitive bidding process. Each bidder will be required to indicate the percentage funding that they will provide; the remainder will be provided by the government. Each bidder will also be required to develop a local electrification plan, defining the technologies to be used. To date, the following concessions have been awarded:

- Concession for Dagana-Podor : awarded to ONE-Maroc
- Concession for Mbour : awarded to ONE
- Concession for Kaffrine-Tambacounda-Kédougou; awarded to EDF

Complementing these concessions are small local projects (ERILs) developed by local sponsors such as community associations and villages. These will also be funded through private–public financing; to date, the level of bilateral funding has been significant.

Through this model there is the potential to attract the private sector into rural electrification and with it the associated finance, skills and implementing capacity.

While the programme is still in process, the experience of Senegal suggests a number of actions that may be useful in implementing a rural electrification programme, based on a concession structure, including:

- definition of an agency with responsibility for rural electrification and autonomy to define the programme and method of operation for achieving objectives;
- transparent approach to tendering and awarding concessions;
- approach based on an understanding of economic conditions and viability;
- extension of decentralisation at government level into rural electrification; and
- integration of renewable energy into the implementation framework.

### **Good Practice Demonstration 2: Legal and Institutional Framework**

Senegal has shown a strong commitment to renewable energy, most notably with the establishment of a dedicated Ministry for Renewable Energy and the passing of framework laws on Renewable Energy

and Biofuels at the end of 2010 (Act 2010-21 of December 20, 2010 and Act 2010-22 of December 15, 2010). This commitment is currently being tested by the process of agreeing and finalising the implementing decrees for these framework laws. However, it is clear that renewable energy is viewed as both important in its own right but also as enabling the broader development of the Energy Sector, Rural Development and Poverty Reduction.

There are a number of institutions and frameworks dedicated to the further development of renewable energy, notably CERER (Centre for Studies and Research into Renewable Energy) at the University of Dakar, and the National Energy for Solar Energy. More broadly, agencies such as ASER (Agence Senegalaise d'Electrification Rurale), ASN (Association Sénégalaise de Normalisation) and CRSE (La Commission de régulation du secteur de l'électricité du Sénégal) include renewable energy as a central part of their remit. Cross-institution co-operation is facilitated by the establishment of an Inter-ministerial committee on Renewable Energy (CIER) and the National Committee of Biofuels. Maintaining and extending this co-operation will enable ongoing success in the implementation of the vision for renewable energy. In particular, efforts could be usefully directed at ensuring the participation of civil society.

The domestic commitment to renewable energy is reflected in the role that Senegal has assumed in regional and international forums. At the project level, there are many examples of cross-Sahelian initiatives in design and implementation. At the strategic level, Senegal has taken a central role in IRENA and ECREEE (ECOWAS Regional Centre for Renewable Energy and Energy Efficiency).

### **3. Future Co-operation**

This first pilot study in Senegal has identified a number of areas in which Senegal can take action to improve readiness for renewable deployment. Many of these actions can be taken in the near-term, building on the momentum that has already been established in the country through recent institutional developments in support of Renewable Energy. The support of bilateral and multilateral institutions, both now and in the future, is an important element in the successful realisation of these actions

The report can serve as a basis for the development of international co-operation on country-level and regional-level programmes. On the country-level, the report opens up the possibility of piloting a multilateral initiative to support feed in tariff to promote renewable energy in Senegal. On the regional level, Senegal is well positioned to become an active stakeholder in the global solar and wind atlas initiative that is being coordinated by IRENA.

In addition to highlighting actions to further deployment of renewable energy, the pilot study has also provided valuable inputs to the development of the RRA methodology and process. The improved methodology and process will be rolled out to a number of other ECOWAS countries in 2012. It is very much hoped that Senegal will be able to continue its exemplary leadership in this process by supporting this roll out.



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