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UPDATE OF THE ECOWAS REVISED MASTER PLAN FOR THE GENERATION AND TRANSMISSION OF ELECTRICAL ENERGY

Final Report Volume 4 : Executive summary

Economic Community
Of West African States

Communauté Economique
Des Etats de l'Afrique de l'Ouest

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WEST AFRICAN POWER POOL (WAPP)

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UPDATE OF THE ECOWAS REVISED MASTER PLAN FOR THE GENERATION AND TRANSMISSION OF ELECTRICAL ENERGY

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1. INTRODUCTION

The present document is the executive summary of the Final Report of the 'Update of the ECOWAS revised Master Plan for the generation and transmission of electrical energy'.

The system of the West African Power Pool (WAPP), a specialized institution of ECOWAS, constitutes the institutional framework of the regional electric system. The WAPP's strategic objective is based on a dynamic vision of the integration of the operation of the national electrical networks in a unified regional market. This unified regional market has to ensure in the medium and long term an optimal and reliable electricity supply at an accessible cost for the population of the different Member States.

The objective is to aim at the common economic welfare, thanks to a long-term co-operation in the energy sector and with the development of trans-border exchanges of electricity.

The purpose of the present study is to update the regional generation and transmission plan for submission to the General Secretary of the WAPP and the whole electric sectors of the Member States. This plan will allow the various actors of the electricity sector to have a clear, global and coherent view of the future development of the infrastructures for electricity generation and transmission in the area and a rational base of decision making for their implementation.

The important gap between the objectives of the last regional master plan (Nexant study in 2004) and the effective development of WAPP power systems at the regional level as well as national level highlighted the need of an update of this generation and transmission master plan.

This executive summary presents the list of regional priority projects and the recommendations in terms of operation and implementation strategy.

2. STUDY PHASES

The global development program and the final list of regional priority projects were built step by step throughout the following stages:

The data collection phase

After a data collection carried out in the whole set of the Member States, the Consultant proposed a complete and detailed inventory on generation units, transmission networks and electricity demand assessing the supply/demand balance for the 14 Member States and the 15 coming years. The purpose of this inventory is to have a clear view of the energy situation and the development potential of each country.

The economic study

The economic analysis first highlighted, in the frame of a reference scenario, the necessary generation and transmission investments to supply the load demand of the region at the least cost.

Starting from this regional development plan of the reference scenario, a complete sensitivity study was carried out on different key parameters (load demand, fuel prices, ambitious objective of renewable energy penetration,…) in order to better identify the weak and strong points of each project.

This step of the study concluded to a preliminary generation and transmission development plan based on economical criteria.

The technical study of the transmission network performance and stability

This technical study was based on the results of the economic study to check that the proposed investments lead to stable and reliable operation conditions. The regional power system planned for the years 2015, 2020 and 2025 was modelled and analysed.

This technical study lead to recommendations to face the operational problems expected for the coming years by improving the system stability and meeting the security criteria.

This study also contributed to modify and complete the development plan initially proposed by the economic study.

The environmental analysis

The environmental and social impacts of the proposed projects have been evaluated. The list of regional priority projects has been adjusted integrating this analysis and the additional costs related to environmental constraints have been integrated in the final results.

The financial analysis

The financial situation of the regional utilities was investigated to evaluate their capacity to support the required investments. The regional aspect of the project and the phasing proposed for the priority projects takes into account the limitations on available capital funds.

The list of regional priority projects

The compilation of the conclusions of the different studies allowed setting up a realistic and economically optimum development program that includes the technical, environmental and financial constraints. From this development plan, the priority list of generation and transmission regional projects was established taking into account the regional criteria defined with the WAPP.

The Implementation Strategy

In order to successfully implement the regional projects, an implementation analysis was performed in two stages.

First the weaknesses of the approach followed to implement the projects from the previous WAPP master plan of 2004 were identified and analyzed by studying the passed evolutions of the implementation of different projects.

Secondly, recommendations were proposed for the future implementation of the regional projects integrating the legal, financial and institutional aspects.

3. REGIONAL PRIORITY PROJECTS

This chapter describes the generation and transmission projects considered as decided by Member States and candidate projects that have been included in the list of regional priority projects. A short description of each project is provided showing its characteristics, its estimated cost and its progress status.

Regional generation projects, which will be supported by the WAPP and shared among the countries, were selected based on the following criteria:

- A minimum size of 150MW;
- A regional vocation (location, energy sharing between neighbouring countries, regional importance);

The adequacy with the Regional Transmission Master Plan (proximity and / or coupling with a transmission project) is presented.

The study also highlighted the national priority projects of each Member State. An exhaustive list of these projects is included in the final report for each of the 14 member countries.

At last, the progress of the studies is given for each project with the following abbreviations:

- Identification: no studies available but project idea
- FS : Economic and technical feasibility study
- ESIS : Environmental and social impact study
- DS : Detailed study
- CS : Complementary study

3.1. Projects description

1- **Project of coal power plant in Sendou (Senegal)**

Coal power plant in **Sendou** – 875MW – 2532 M$

Commissioning: 2016 – Identification (***decided project***)

2- **Gouina project : Interconnection Kayes (Mali) –Tambacounda (Senegal) for evacuating the power of Gouina power plant (Mali)**

Hydroelectric plant **Gouina** – 140 MW – 565 GWh -329 M$

225kV line Kayes (**Mali**) –Tambacounda (**Senegal**) – 280 km – 65 M$

Commissioning: 2017 – FS and ESIS available for Gouina (***decided project***)

2017-2019 – FS in progress for Kayes–Tambacounda

3- **Wind Farm 200 MW Senegal-the Gambia**

Wind Farm Senegal / The Gambia– 200MW – 318 M$

Commissioning in stages between 2017 and 2021 – Identification

4- **Hydroelectric plants of Boureya (OMVS) – Badoumbé (OMVS) – Balassa (OMVS) and Koukoutamba (OMVS) and interconnection between Linsan (Guinea) and Manantali (Mali)**

Balassa – 181 MW – 401 GWh – 171 M$

Commissioning: 2017-2019 – Identification

Badoumbé – 70 MW- 410 GWh – 197 M$

Commissioning: 2017-2019 – FS available

Koukoutamba – 281MW – 455 GWh – 404 M$

Commissioning: 2019-2021 – FS in progress

Boureya – 160 MW- 455 GWh – 373M$

Commissioning: after 2021 – Identification

225kV double circuit line Linsan (**Guinea**) -Manantali (**Mali**) -131 M$

Commissioning: 1st circuit: 2017-2019; 2nd circuit: 2019-2021

Identification

Reinforcement of Manantali-Bamako-Sikasso (Mali) section – 151 M$

5- **Interconnection project Ghana-Burkina Faso-Mali**

225kV line Bolgatanga(**Ghana**) – Bobo Diolasso(**Burkina**)- Bamako(**Mali**) -742 km -230 M$

Commissioning: 2015 – FS and ESIS available CS in progress (***decided project***)

6- **Hydroelectric Plant Kaléta (Guinea)**

Kaléta – 240 MW – 3 x 80 MW – 946 GWh -267 M$

Commissioning: 2015 – DS and ESIS available (***decided project***)

7- **Project OMVG : 225 kV loop between Senegal, The Gambia, Guinea-Bissau and Guinea, and hydroelectric plant of Sambangalou**

Sambangalou – 128 MW – 4 x 32 MW – 402 GWh – 433 M$ – Commissioning: 2017

OMVG loop 225kV – 1677 km – 576.5 M$ – Commissioning: 2015-2017

DS and ESIS available (decided project)

8- **Hydroelectric plant of Digan (OMVG)**

Digan – 93.3MW – 243 GWh – 112 M$

Commissioning: after 2021- Identification

9- **Hydroelectric plant of Souapiti**

Souapiti – 515MW – 2518 GWh – 796M$

(Additional cost due to environmental problems)

Commissioning: 2017-2019 – FS available

10- **Hydroelectric plant of Amaria**

Amaria – 300MW – 1435 GWh – 377M$

Commissioning: 2019-2021 – Identification

11- **Hydroelectric plant of Grand Kinkon and reinforcement of the western section of the OMVG loop**

Grand Kinkon – 291MW – 720 GWh – 298 M$

Commissioning : >2021 – FS available

Reinforcement of western section of OMVG loop (second line) -141 M$ – >2021

12- **Hydroelectric plant of Kassa (Guinea/Sierra Leone)**

Kassa – 135 MW – 528 GWh – 214 M$

Commissioning: 2019-2021 – Identification

13- **Interconnection project CLSG**

CLSG 225kV double circuit line – 1060 km – 430 M$

Commissioning: 2015 – FS available ESIS in progress (***decided project***)

14- **Hydroelectric plant of Mount Coffee (Liberia)**

Mount Coffee – 66 MW – 435 GWh – 383 M$

Commissioning: 2015 - FS available (decided project)

15- **Hydroelectric plant of Bumbuna (Sierra Leone) and reinforcement of the CLSG line**

Bumbuna (first stage existing + second stage + extension of the first stage)

Total : 400 MW – 1560GWh – 520 M$

Second circuit of « CLSG» line 225kV – 1060 km – 69 M$

Commissioning: 2017-2019 - FS and ESIS available for Bumbuna 2+ Yiben

16- **Hydroelectric plant of Félou (OMVS)**

Félou – 60 MW – 350 GWh -170 M$

Commissioning: 2013 – Construction in progress (***decided project***)

17- **Solar project 150 MW Mali**

Solar project 150MW - 549 M$

Commissioning: In stages between 2019 and 2021 – Identification

18- **Interconnection project Ségou (Mali)- Ferkessédougou (Ivory Coast)**

225kV line Ségou (**Mali**) - Ferkessédougou (**Ivory Coast**) – 370 km – 175 M$

Reinforcement of Ivorian grid Ferkessédougou-Laboa – 285km – 100M$

Commissioning: 2012 – Construction in progress (***decided project***)

19- **Hydroelectric Plant of Tiboto and interconnection Buchanan (Libéria) – San Pedro (Ivory Coast)**

Hydroelectric Plant of **Tiboto** – 225 MW – 912 GWh – 578 M$

225kV line Buchanan (**Libéria**) –San Pedro (**Ivory Coast**) – 400km – 100M$

Commissioning: 2019-2021 – Identification

20- **Hydroelectric plant of Fomi and Guinea-Mali interconnection (Fomi –Linsan, –Nzerkoré, –Bamako)**

Hydroelectric Plant of **Fomi** – 90 MW – 374 GWh – 156 M$

Commissioning: 2017-2029 – FS and ESIS available

225kV line Linsan-Fomi – Fomi-Nzerekoré – Fomi-Bamako – 1350 km – 550M$

Commissioning: 2017-2029 – Identification

21- **Evacuation axis Fomi (Guinea) – Boundiali (Ivory Coast)**

225kV double circuit line Fomi(**Guinea**) -Boundiali(**Ivory Coast**) –380km – 111M$

Commissioning: 2019-2021 – Identification

Reinforcement of **Linsan-Fomi** axis – 430km - 65 M$

Reinforcement of **Boundiali-Ferkéssedougou-Bobo Diolasso-Ouagadougou** axis – 716km – 103 M$

22- Hydroelectric plant of Soubré (Ivory Coast) and reinforcement of the evacuation line towards Abidjan (Soubré-Taabo)

Soubré – 270MW – 1120 GWh – 620 M$

Reinforcement of 225kV line Soubré- Taabo (**Ivory Coast**) – 196 km – 69 M$

Commissioning: 2017-2019 - FS and ESIS available

23- Interconnection project Coastal Backbone

Interconnection project following the coast between Nigeria and Ivory Coast

- Ikeja West (**Nigéria**) - Sakete (**Benin**) commissioned
- Volta-Aboadze (**Ghana**) commissioned
- Volta (**Ghana**)- Lomé (**Togo**)- Sakete (**Benin**) – 84 M$ – 2013 – under construction
- Aboadze (**Ghana**)- Riviera (**Ivory Coast**) - 57 M$ - 2017 – FS and ESIS in progress

24- Project of thermal plant in Aboadze (Ghana)

Aboadze combined cycle – 400 MW - 356 M$

Commissioning: 2014 – Identification (***decided project***)

25- Interconnection Bolgatanga (Ghana) – Ouagadougou (Burkina Faso)

225kV line Bolgatanga (**Ghana**) – Ouagadougou (**Burkina Faso**) – 206 km – 74 M$

Commissioning: 2013 – Construction in progress (***decided project***)

26- 330kV project North-South Ghana

330 kV line between Prestea and Bolgatanga (**Ghana**) – 640 km – 240 M$

Commissioning: 2017-2019 – FS available, ESIS and DS in progress

27- Hydroelectric plant of Adjaralla (Togo)

Adjaralla– 147 MW – 366 GWh – 333M$

Commissioning: 2017– EF+EIES available, ESIS and CS in progress (***decided project***)

28- Project of combined cycle in Togo and reinforcement of the Coastal Backbone

Togo CC – 450 MW – 401 M$

Reinforcement of Lomé (Togo) –Sakete (Benin) section: 46M$

Commissioning: >2021 – Identification

29- Project of thermal plant in Maria Gleta (Benin)

Maria Gleta – 450 MW - 401 M$

Commissioning: 2014 - FS and ESIS available (***decided project***)

30- Solar project 150 MW Burkina Faso

Solar project 150MW - 549 M$

Commissioning: In stages between 2017 and 2019 – Identification

31- Project "North Core"

330 kV line – 832 km – 540 M$

Niamey (**Niger**) - Birnin Kebbi (**Nigeria**) - Malanville (**Benin**) - Ouagadougou (**Burkina Faso**)

Commissioning: 2017-2019 - FS available

32- Hydroelectric plant of Mambilla and 760kV network

760 kV network through Nigeria – 2700 km – 2000 M$

Commissioning: 2019-2021 – Identification

Mambilla – 2600MW – 11214 GWh – 4000 M$

Commissioning: > 2021 – Identification

33- Hydroelectric plant of Zungeru (Nigeria) and evacuation through the Median Backbone

Zungeru: 700 MW – 3019 GWh – 1077 M$

Commissioning: 2017-2019 – FS and ESIS available

Project « **Median Backbone** » 330kV – 713 km -238 M$

Commissioning: 2019-2021 – Identification

34- Wind Farm 300 MW Nigeria-North

Wind farm – 300MW – 477 M$

Commissioning: In stages till 2021 – Identification

35- Reinforcement Benin-Nigeria

330 kV double circuit line Sakete (**Benin**) - Omotosho (**Nigeria**) – 120km – 39 M$

Commissioning: after 2021 – Identification

36- Project of coal plant in Salkadamna (Niger) and connection to the ECOWAS interconnected network

Coal plant of **Salkadamna** – 200 MW – 573 M$

Possibility of increasing the size of the plant in the longer term

225kV line Salkadamna-Niamey (**Niger**) – 190km - 72 M$

Commissioning: 2019-2021 – Identification

3.2. Investment stages

In this section, the projects are classified into different stages using the following criteria:

- The decided projects have not been questioned during the study. They will be commissioned in the short to medium-term and are classified in a specific category.
- Other projects were spread between phases 1, 2 and 3 according to
  - The progress of related studies;
  - Their economic returns over the study period;
  - The interactions between projects: Some projects require the construction of other structures before they can be commissioned;
  - Geographical aspects: In order to maintain flexibility in the plan, each stage presents projects that are independent of each other and located in different regions of West Africa.

The implementation of this master plan should follow the following schedule to ensure the load supply throughout the region:

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

The stages were balanced to share the amounts of investment over the study period.

Figure 1 shows the projects distribution among the different stages. Interactions are highlighted with arrows showing the interests of some projects in other projects.

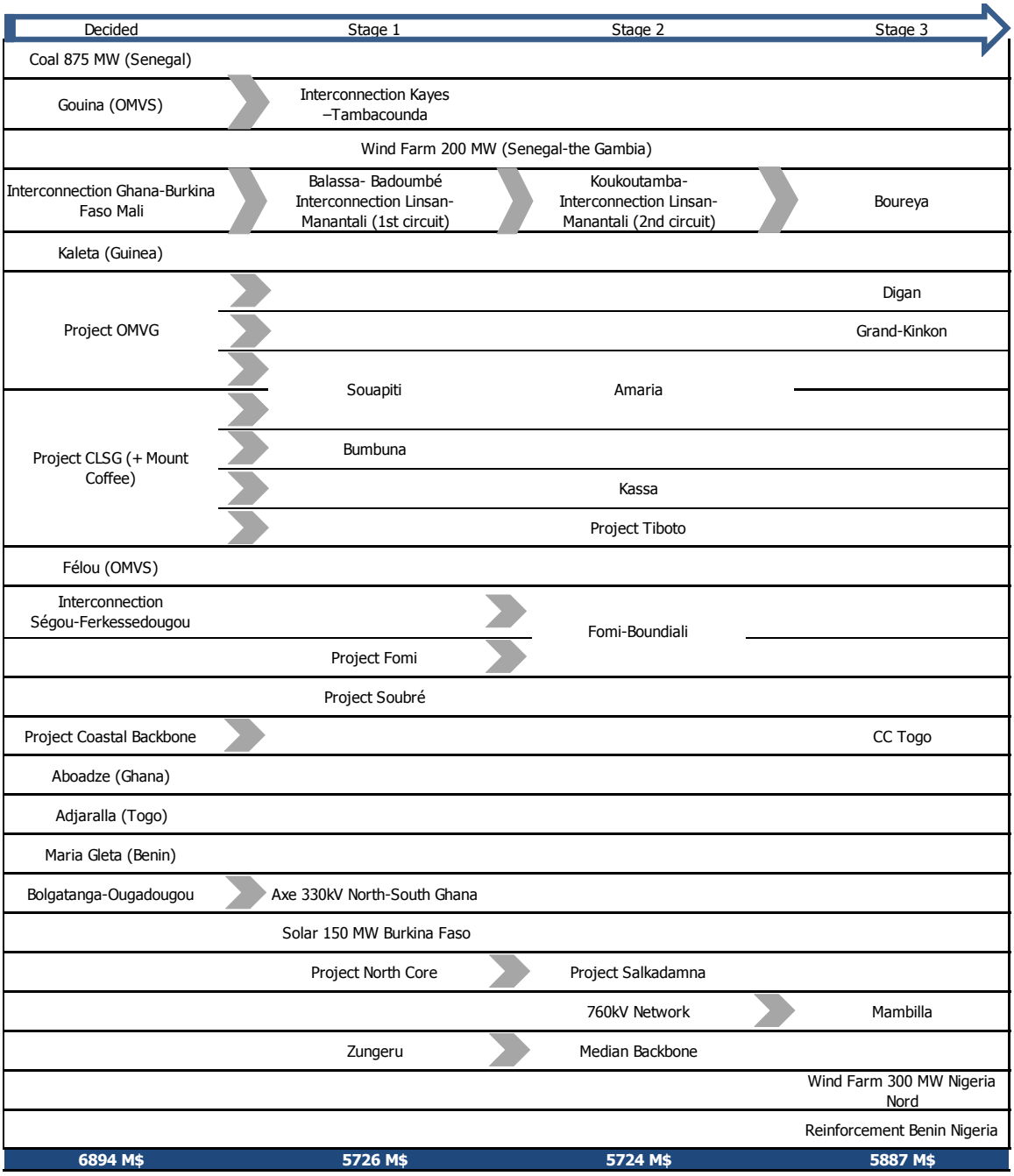

Figure 1: Classification of projects and presentation of interactions

It is also of utmost importance to emphasize the impact of the development of thermal generation in Nigeria on the regional Master Plan. Indeed Nigeria has an important plan for developing thermal generation in the short term, based on gas turbines. It is strongly recommended to complete the already decided gas turbines by steam turbines to form combined cycles that would be operated as base generation allowing the reduction of generation costs and securing the energy supply. This development of thermal generation in Nigeria should be closely followed and fully supported by the WAPP.

3.3. Conclusions on the list of regional priority projects

The economic study showed the interest of developing massively **the hydroelectric resources** in Western Africa and to build a reliable transmission network to share the resources in the whole region.

Nevertheless, within a regional framework where the macro-economic parameters could strongly influence the discounted cost, it is important to maintain a **balanced energy mix** between the different resources in order to secure a reasonable development cost in all circumstances and to ensure the technical and financial viability of the master plan.

Lastly, the alternatives showed the interest of a voluntary **development scenario of renewable energy** on the scale of West Africa. An objective of 10% of renewable energy of the total installed capacity by 2020 is considered as an ambitious but realistic target by the different member states. In that case, the discounted cost would be only fairly impacted (2%) and would allow reducing the energy dependence of certain areas having only few hydroelectric or gas resources. Therefore, some important projects of renewable energy have been selected as regional priority projects. Besides these projects, it is strongly recommended to develop other renewable projects of smaller size at national level especially in countries having high solar, wind or biomass potential. Some countries have already planned such projects in their national development plan.

Taking into account these different aspects, the energy mix proposed for the West African region in a scenario with a voluntary development of renewable energy is as follows:

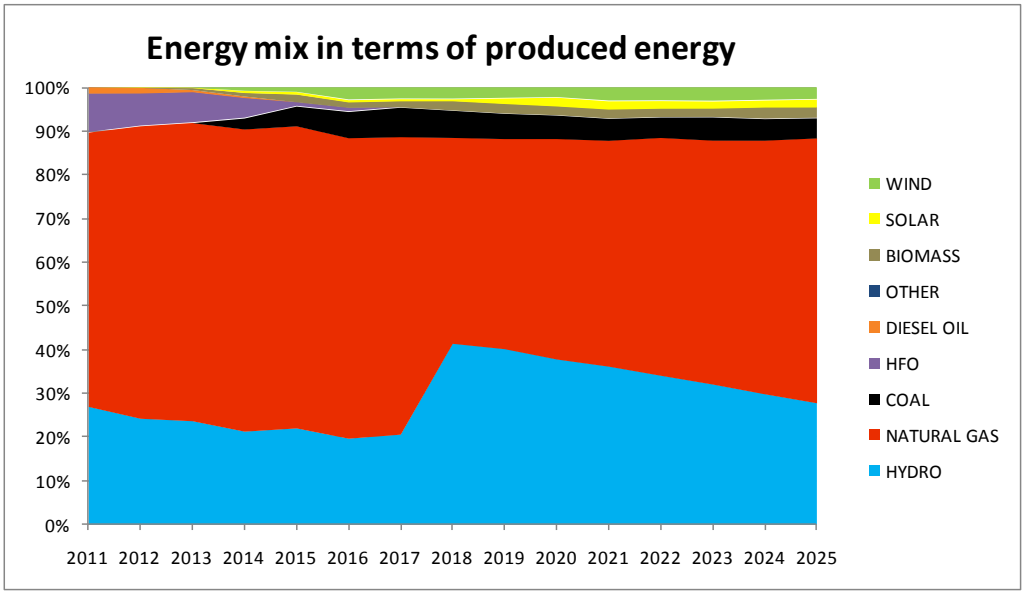

Figure 2: Energy mix for West Africa (scenario with voluntary development of renewable energy)

At last, a first calculation of **CO_2 emission credits** (Certified Emission Reduction – CER), expressed in tCO_2, was carried out allowing the estimation of additional gains that could result from the Clean Development Mechanism (CDM) of Kyoto protocol. The total gain for the regional priority hydro/wind/solar projects was evaluated at 19 millions tCO_2.

It must be noted that the following countries already have CDM projects registered: Mali, Senegal, Ivory Coast and Liberia. Particularly, the Felou project in Mali was registered as CDM project in 2010. For the other projects, a deeper analysis will be necessary to confirm the CDM feasibility.

4. OPERATIONAL CONCLUSIONS

The technical study, in addition to its contribution in creating the regional priority projects list, highlighted some operational constraints the West African network will have to deal with in the coming years.

First of all, the interconnection of the different systems will be progressive, and within this progression towards a stable and strongly interconnected system, the network will have to pass by an intermediate state where it is less stable and weakly interconnected. This state will experience the following stability issues:

- Small signal stability issues. Poorly damped oscillations will appear, due to the long distances crossed by the grid. These oscillations will reduce the stability and could even make it unstable for operation. It is recommended, as best solution, to install Power System Stabilizers (PSS) on the largest machines existing in the network, and to impose the installation of PSS to all new units.
- The non conformity with the N-1 operation criterion. The system development as it is planned will not comply with the N-1 criterion. Respecting this criterion would imply massive transmission investments that would not be justified economically. Oppositely, it is recommend to rely on special protection schemes and on defence schemes (Under Frequency and Under Voltage Load Shedding (UFLS and UVLS), out of step protections). Less expensive, these schemes will have to be harmonized among the countries.

Secondly, the load growth, active as reactive, will require the network reinforcement. In order to limit these reinforcements and the associated investments, it is recommended to reach a power factor of 0.9 minimum at the distribution level in order to unload the transmission line of the reactive power that could flow. In cities and industrial areas, it is even recommended to reach a value of 1.

Thirdly, some countries plan to import large amounts of energy. This import is feasible only if the voltage can be supported in the grid. But these countries, because they import, will run less generation units to support the voltage. It is consequently recommended to keep always a minimum level of generation in each country and to install compensation devices (SVC) to support the voltage where its management is the most difficult.

At last, because of the long distances of the interconnection lines, the electricity exchanges between countries will be limited by the stability of the system. Limiting these exchanges to fix values is possible but these values would have to be sufficiently low to face all possible situations. This solution is unacceptable from an economic point of view. To maximize the exchanges while ensuring the system security, it is necessary to calculate the stability limits on a daily basis, to adapt the operation to the network conditions. It requires a communication system that is performing and common to all countries of West Africa, to share the national forecasts of the networks of each country in order to carry out day-ahead calculations for identifying the future stability limits. To this purpose, WAPP's Information and Control Centre (ICC) could be of great help.

5. IMPLEMENTATION STRATEGY

5.1. Risks identification

The major factors affecting the pace of implementation of the WAPP priority projects include:

- Inability to match commissioning of transmission projects with commissioning of adequate generation. This led to deficits in supply still persisting even after some interconnection projects have been completed. The situation has compelled the countries to continue to pursue their individual supply programs instead of committing fully to the WAPP regional program.
- Limited ability of the General Assembly and Executive Board to execute WAPP decisions which require action from other sectors of their countries' economies. This is because members of these teams are mainly energy industry experts who do not necessarily have the links and influence on other sectors whose actions impact on WAPP activities. The constitution of the Board of Directors of the GCC Interconnector Authority is a good example of how state participation in project development has worked successfully.
- The approach adopted for implementation of cross-border transmission projects has led to delays due to lack of convergence in priorities between different countries, differences in economic conditions and differences in project management capabilities.
- Non availability of gas in sufficient quantities for power generation in the region is likely to cause further delays in the commissioning of the Maria Gleta and Takoradi Thermal Plants.
- The poor financial state of the utilities has been a major obstacle to mobilization of funding for the projects.
- Inadequate human and financial resources to meet the requirements of the WAPP Organization in project conception, development and implementation.

5.2. Recommendations

To ensure the effective implementation of the WAPP generation and transmission master plan, it is recommended:

- Closer collaboration between WAPP and its member countries/utilities and sub-regional organizations to ensure harmonization of power supply planning, synchronization of periodic updates of such plans and funds mobilization for priority projects. This will ensure greater commitment from the countries to the regional projects.
- The Specific Purpose Company (SPC) approach is an effective project implementation approach that can mitigate or eliminate the major weaknesses associated with the old implementation approach. SPCs could therefore take part in the contracts award, implementation monitoring stages and take full control of the operations and maintenance
- WAPP does not lack sources of funding for its initiatives. But the poor financial state of the utilities is a constraint on WAPP's operations. It does not provide comfort to lenders to support the projects. WAPP should therefore continue to advocate and to support individual country initiatives towards greater private sector involvement in the management of public utilities, pre-paid metering, investments in distribution loss reduction and efficiency in energy use as a means of improving the viability of the utilities. It should collaborate with ERERA and the national regulators to include benchmarks and specific targets to be achieved for loss reduction, bill collection and energy efficiency. The choice of cost reduction initiatives as against a tariff increase is informed by the fact that WAPP utility tariffs are already the highest on the African continent.
- The high upfront capital costs of some renewable technologies such as wind and solar energy adversely affects their viability when normal sources of financing are used. WAPP should explore the use of other financial products such as Carbon Credits as well as other concessionary funding windows that are available in the European Union, African Development Bank, the World Bank (IFC) for the financing of some of these renewable energy projects.
- A regular source of funding is required for the WAPP's project development activities. This should start with a legal enforcement of the provisions in the Articles of Association. Designing the WAPP priority program in such a manner as to include solutions to the immediate needs of individual countries in the very early stages of the program could also provide the motivation for countries to support and subscribe to funding of WAPP activities, willingly. The establishment of an ECOWAS Infrastructure Development Fund through special levies/subscriptions by member countries and institutions is another option that could be pursued by ECOWAS. The West African Economic and Monetary Union (WAEMU/UEMOA) has established a similar fund already. Such a fund could be leveraged with resources from multilateral institutions such as the World Bank, African Development Bank, ECOWAS Bank for Infrastructure and Development, The Bank for West Africa's Development and the ECOWAS Commission. An institution such as the African Finance Corporation has a lot of interest in infrastructure development the desire to play the role of a lead arranger in the mobilization of funding for viable WAPP projects.

- Finally we recommend the establishment of a WAPP Aggregator Unit/Entity. This entity could gather the small demands of individual countries into a bulk demand, expedite negotiations of bankable Power Purchase Agreements (PPA) for electricity supply at the regional level and secure appropriate payment security instruments from multilateral guarantee agencies. The creation of the National Bulk Energy Trading Company in Nigeria with the necessary guarantees from the World Bank Group and the Nigerian government is one of the ways a similar situation has been handled.

In terms of financial situation of Member States, the following recommendations are made:

- The prevailing tariffs in most WAPP countries are higher than the average long term tariff of about US$0.10 computed using the optimized WAPP program. The prevailing tariffs are also much higher than their counter-parts on the African continent. Cost reduction initiatives in areas such as loss reduction, efficiency in bill collection and energy use, increased private sector participation in the energy supply chain as well as more cost effective generation technology should be pursued as a means of improving the viability of WAPP utilities, instead of tariff increases. Each member state should propose a clear and concrete action plan to improve their performances. This action plan should be closely followed and audited by WAPP.
- Special concessionary funds and financing instruments such as Carbon Credits should be pursued for financing of renewable energy to make them viable.
- Other pricing options of the transmission service charge, such as Zonal Pricing and Mega-Watt Mile should be explored to take account of distinctive/peculiar costs imposed by individual countries on the transmission of energy, such as losses associated with transmission over long distances at the time of detailed negotiations for the implementation of the projects.

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