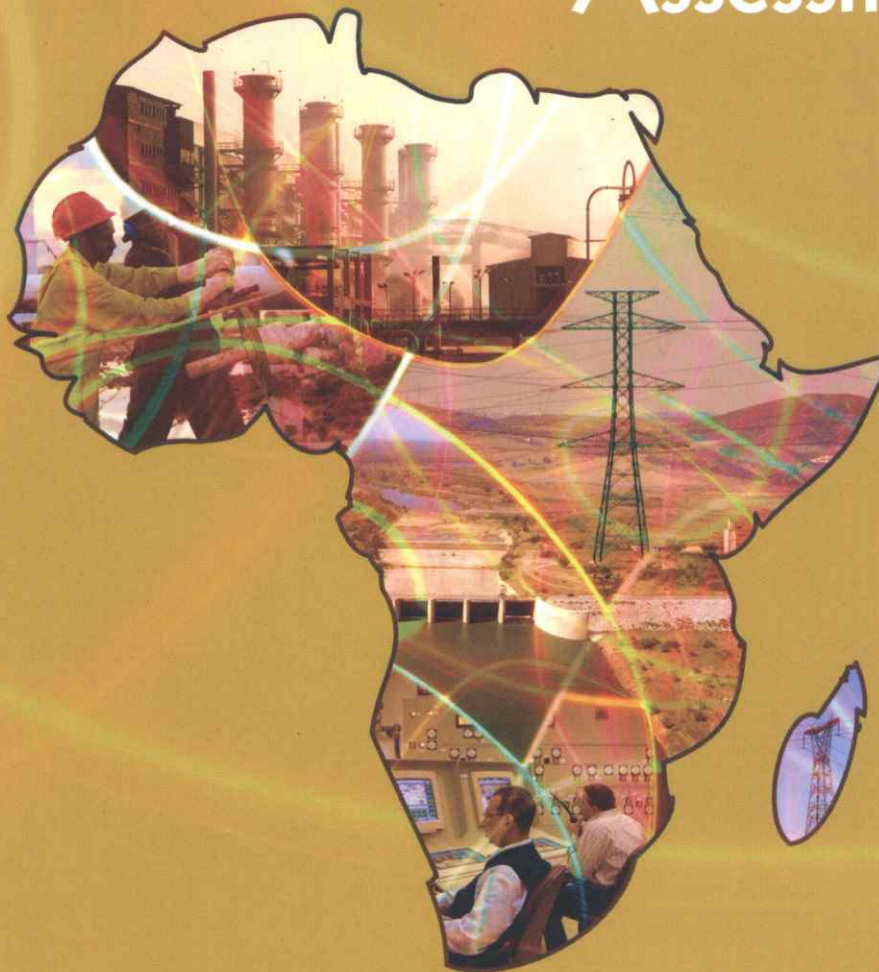


Energy Sector Capacity Building Diagnostic & Needs Assessment Study



Volume 1
Sub-Saharan Power Sector
Capacity Building
Diagnostic & Needs Assessment

Volume 2
Power Sector Soft Infrastructure Programme (PoSSIP)

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Volume 2
Power Sector Soft Infrastructure Programme
(PoSSIP)



AFRICAN DEVELOPMENT BANK GROUP



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Foreword

The African energy sector is undergoing an interesting period of transformation. On the physical infrastructure side, the investment needs in the African energy sector are well documented. The continent remains the most energy poor region in the world with some of the highest prices per kilowatt hour. In some cases, unreliable supply and rolling blackouts have raised production costs for our private sector by over 20%. We estimate that Africa needs more than USD 40 billion worth of annual investments if we are to double current levels of energy access by the year 2030. This Report provides a comprehensive assessment of the constraints hindering energy sector performance and regional energy trade across the four power pools of sub-Saharan Africa.

In response, several African countries are looking to boost electricity generation. Some such as Côte d'Ivoire, the Democratic Republic of Congo (DRC), Ethiopia and Mozambique, have already begun to emerge as significant energy exporters. The discovery of significant natural gas and geo-thermal resources will further add to future energy generation capacity, which will in turn lead to an increase in regional energy trade.

Meanwhile the energy trading infrastructure, which includes the regulatory framework under the regional power pools, regional interconnections and transmission capacity, is gradually improving. At both pan-African and regional levels, African Heads of State have committed to investing in energy infrastructure under the continental *Programme for Infrastructure Development in Africa (PIDA)* and within their respective regional infrastructure master plans.

This report focuses on addressing the soft infrastructure challenges that hamper the efficient operation and financial performance of the energy sector in Africa. The challenges are many and diverse. However, the Report places emphasis on five critical areas, namely: (i) improving the legal and regulatory framework governing the energy sector; (ii) improving performance amongst the energy utilities that constitute the regional power pools; (iii) strengthening capacity in systems operations and dispatch; (iv) supporting reforms to nurture a conducive enabling environment to attract energy investments; and (v) upgrading energy sector skills through targeted energy Centres of Excellence.

Already, the Bank has begun to take on board some of the recommendations from the report. We are looking at ways to incorporate energy sector reforms and capacity building within all our future energy infrastructure operations. This will help ensure sustainability and buy-in from the beneficiary countries. We are also working to support energy Centres of Excellence, and we have been steadfast in providing legal and technical advice to structure PPPs and other vehicles for energy investments.

I encourage those who are interested in understanding the current state of the African energy sector to read this report. It will not only help to appreciate the nature of the challenges that need to be addressed, it will also provide great insights into the types of reforms and capacity that the Bank will support in order to improve the sector's operational and financial performance.



Janvier K. Litse
Director, NEPAD, Regional Integration and Trade Department (ONRI)

Preface

Increasingly today, the Bank and other development partners are being called upon to provide more resources to improve the technical and financial performance of the energy sector as a complement to physical infrastructure investments. This report provides a useful guide on how the Bank can package and utilize such resources. Ultimately, improving the enabling environment will encourage more investments into the energy sector.

Energy sector reforms, especially unbundling of vertically integrated public utilities and facilitating greater private sector investment have been on-going in Africa since the 1980s. However, reforms have not always translated into improved financial and operational efficiency. Recent investments into the sector and the establishment of inter-connected regional power pools have awoken renewed interest in sector reforms in order to improve the operational and financial efficiency of the sector. Underlying successful sector reforms are a number of key pre-requisites such as establishing an enabling regulatory framework, achieving financial viability amongst the energy utilities, and developing high-level skills to ensure sound technical, operational and policy performance.

For the Bank, as a major investor in African energy infrastructure, the establishment of the regional power pools and the emergence of [or at least efforts towards establishing] regional regulators and sector associations symbolizes a significant shift in the development of the sector. We wanted this study to examine what sort of reforms and skills would be priority requirements to serve the emerging interconnected energy sector in Africa. We also recognized that inefficient utilities and regulators, or even the absence of regulation, were major stumbling blocks to both investment into the sector, and the proper functioning of regional energy trade. We assembled a team of engineers with both operational and regulatory experience, as well as in-depth knowledge of the reform process underway in African countries. The team conducted a diagnostic assessment of the four regional power pools of sub-Saharan Africa, paying special attention to lessons learned and the potential for technical support from the utilities of North Africa. In addition to regional consultations, the team undertook a survey across the four regional power pools covering 88 stakeholders in the electricity industry that included the power pool secretariats, energy utilities, regulators, policy makers and energy training centres.

This report comprises two volumes. Volume I provides a diagnostic study which outlines the transformation taking place in the African energy sector at both national and regional levels, assessing developments within each regional power pool, and the role of regional energy institutions that are helping to shape the integration of energy markets. The Volume also examines past and present capacity building initiatives targeting national and regional stakeholders, and dissects the critical success factors, short-comings and lessons learned which should inform a Bank programme to support energy sector reforms. Volume II builds on this analysis and proposes the design, budget and implementation plan for a regional energy sector support programme addressing five (5) critical issues in the areas of regulation, technical and operational performance.

I believe that comprehensive improvements in the aforementioned areas as discussed in this report will help create an attractive environment for increased investments into the African energy sector. This will in turn facilitate improved technical and operational performance, thereby raising the prospects for increased regional energy trade.



Moono MUPOTOLA
Manager, Regional Integration and Trade Department

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The authors of the SSA Power Sector Capacity Building Diagnostic and Needs Assessment and the Power Sector Soft Infrastructure Programme (PoSSIP) would like to express their gratitude to the ONRI staff of the African Development Bank, in particular Christian Kingombe, Inye Nathan Briggs and Olumide Abimbola for the support they provided through active participation in the data collection, stakeholder interviewing process, and constructive feedback during the compilation of the report.

We wish to express our gratitude to all the internal and external stakeholders who were consulted as part of a needs assessment exercise, including the following organizations: the African Union Commission's Department of Infrastructure and Energy; the African Forum for Utility Regulators (AFUR), the Association of Power Utilities of Africa - APUA/ASEA (formerly UPDEA); the NEPAD Planning and Coordinating Agency (NPCA); the United Nations Economic Commission for Africa (UNECA); the Central African Power Pool (CAPP), the East African Power Pool (EAPP), the Southern African Power Pool (SAPP), the West African Power Pool (WAPP); ECOWAS Regional Electricity Regulatory Authority (ERERA); the Regional Electricity Regulators Association of Southern Africa (RERA); the SADC Secretariat; the ECOWAS Secretariat; the Ethiopian Electric Power Corporation (EEPCo), the Ethiopian Electricity Agency; Delegation of the European Union to Namibia; Ministère de l'Energie et de l'Hydraulique (MEH) and the Direction de l'Energie (DRC); Société Nationale d'Electricité (SNEL) (DRC); Societe Béninoise D'Energie Electrique (Utility) (SBEE); Communauté Electrique du Bénin (CEB); Abuja Electricity Distribution Company / Power Holding Company of Nigeria (PHCN); the National Electricity Regulatory Commission of Nigeria (NERC); the Energy Commission of Nigeria; the Volta River Authority (VRA) (Ghana); the Electricity Company of Ghana (ECG); the Ghana Grid Company Limited (GRIDCO); the Energy Commission (Ghana); the Zimbabwe Energy Regulatory Authority (ZERA), the Zimbabwe Power Company (ZPC), the Zimbabwe Electricity Transmission and Distribution Company (ZETDC); ZESA Holdings (Pvt) Ltd National Training Centre (Zimbabwe); the National Energy Regulator of South Africa (NERSA); ESKOM; ESKOM Academy of Learning; the Department of Energy (DoE) South Africa; USAID (Pretoria); United Nations Environment Programme (UNEP). Special thanks also go to our layout designer Peggy Ford-Fyffe King.

The discussions were held during the last quarter of 2012 and in the first quarter of 2013. The report consists of two (2) volumes. Volume 1 presents results of the analysis of the status of capacity building in the SSA power sector, while Volume 2 presents the proposed capacity building programme, an implementation plan and a budget estimate.

Mr. Calvin Manduna (African Development Bank) was the project task manager, and Ms. Moono Mupotola (African Development Bank) provided overall supervision and guidance.

Volume 1

Sub-Saharan Power Sector Capacity Building Diagnostic & Needs Assessment

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Acronyms and abbreviations

ACBF	African Capacity Building Foundation	NADC	Norwegian Agency for Development Cooperation
AEEP	Africa – EU Energy Partnership	NAPTIN	National Power Training Institute of Nigeria
ADF	African Development Fund	NBI	Nile Basin Initiative
AfDB	African Development Bank	NELMCO	National Electricity Liabilities Management Company of Nigeria
ANARE	<i>Autorité Nationale de Régulation du Secteur de l'Electricité</i>	NELSAP	Nile Equatorial Lakes Subsidiary Action Programme
APUA	Association of Power Utilities of Africa (UPDEA)	NERC	Nigeria Electricity Regulatory Commission
AU	Units of Account	NORAD	Norwegian Agency for Development Cooperation
AVU	African Virtual University	ODeL	Open, Distance and e-Learning
BTC	Belgian Technical Cooperation	ONRI	NEPAD, Regional Integration and Trade Department
CAPP	Central Africa Power Pool	OSHD	Human and Social Development Department
CB	Capacity Building	PHCN	Power Holding Company of Nigeria
CEB	<i>Communauté électrique du Bénin</i>	PIDA	Programme for Infrastructure Development in Africa
CIE	<i>Compagnie Ivoirienne d'Electricité</i>	PPP	Private-Public Partnership
DFID	Department for International Development, UK	RERA	Regional Electricity Regulatory Authority for Southern Africa
EAPP	East African Power Pool	RURA	Rwanda Utilities Regulatory Agency
ECG	Electricity Company of Ghana	SAPP	Southern African Power Pool
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency	SATH	Southern Africa Trade Hub (USAID)
EOI	Expression of Interest	SBEE	<i>Société Béninoise d'Energie Electrique</i>
ERERA	ECOWAS Regional Electricity Regulatory Authority	SIDA	Swedish International Development Agency, Sweden
EU	European Union	SPC	Special Purpose Company
EWSA	Energy Water and Sanitation Authority (Rwanda)	SSA	Sub-Saharan Africa
EWURA	Energy and Water Utilities Regulatory Authority, Tanzania	TA	Technical Assistance
GIZ	<i>Gesellschaft für Internationale Zusammenarbeit, Germany</i>	TCN	Transmission Company of Nigeria
GRIDCo	National Grid Company of Ghana	UNPD	United Nations Development Programme
HFO	Heavy fuel oil	UPDEA	Union of Producers, Transporters and Distributors of Electric Power in Africa
IFI	International Financing Institution	VRA	Volta River Authority
IMF	International Monetary Fund	WAPP	West African Power Pool
IPD	Independent Power Distributor	ZERA	Zimbabwe Energy Regulatory Authority
IPP	Independent Power Producer	ZETDC	Zimbabwe Transmission and Distribution Company
JAES	Joint Africa-EU Strategy	ZPC	Zimbabwe Power Company
LuxDev	Luxemburg Cooperation and Development Agency		
NPCA	NEPAD Planning and Coordinating Agency		

Executive summary

The African Development Bank's Ten Year Strategy (2013-2022), the Capacity Development Strategy (2010-2014) and the Capacity Development Strategy (CDS) Mid-Term Review Report place capacity development at the centre of Africa's structural transformation. The policy documents envision the Bank becoming a leading enabler of capacity development in the area of infrastructure.

Pursuant to this vision, the objective of this Study is to perform a diagnostic assessment of capacity needs within the electricity sector in sub-Saharan Africa (SSA) in order to design a capacity building programme to support the development of the electricity supply industry through regional electricity trade.

The capacity building (CB) programme proposed under this Study is intended as an initiative independent of any particular infrastructure project although it is proposed to mainstream capacity building in the Bank's energy infrastructure projects over time.

The programme aims at developing specific expertise and capabilities related to the improvement of performance of individual operators, as well as preparing effective and safe operation of the interconnected regional markets in a power pool environment. In particular, the programme aims to strengthen the "soft" capacity needs of national utilities since they constitute the regional power pools.

The programme addresses capacity issues across the electricity landscape (generation, transmission, distribution – with related tariffs, metering, billing and customer service, operations and maintenance, trading, standards and quality of service, regulation and the legal framework). However, as resources are limited, interventions have to be prioritized as presented in Volume 2 of this Report.

In identifying the specific needs of stakeholders, the Consulting Team visited 13 countries across the four regions and interviewed 88 stakeholders of the sub-Saharan electricity industry. The respondents included the four power pools, energy sector policy makers, regional and national regulatory agencies and power utilities.

Over the past 40 years, the African Development Bank (AfDB) has been directing significant investment towards the development of energy infrastructure projects for power

generation and transmission in Africa. However, the Bank recognises that in the long run, success of such heavy infrastructure projects will critically depend on the emergence of the necessary modern institutional and regulatory arrangements, functional market conditions, financially viable utilities, development of critical mass of human skills and timely training of human resources, *i.e.* what the Bank refers to as "soft infrastructure" issues.

The NEPAD Regional Integration and Trade Department (ONRI) of the AfDB is in charge of the project to develop a capacity building programme that will deal with the "soft" infrastructure gaps in the sub-Saharan power sector through the development of capacity along the critical path.

The analysis of the power industry performance in sub-Saharan Africa indicates that rather than boosting economic growth, the power sector appears to be constraining it. This is because the African power infrastructure delivers only a fraction of the services found elsewhere in the developing world. The countries of sub-Saharan Africa, with a combined population of 800 million, generate roughly the same amount of power as Spain, a country of 45 million people.

Since independence, African countries have embarked on the road of electricity sector reforms and engaged in international power generation and power-sharing projects. Despite producing mixed results, the reform process has generated the required positive experience that prepared the ground for the development of regional integration in energy.

Paradoxically, it is observed that where there are more intensive energy investments and/or radical reforms envisaged by a government, the more capacity development is required to obtain the skills necessary to manage the new market situation. This is especially so where reforms are coupled with multinational operations within a larger regional market and involve the entry of private players.

The establishment of four regional power pools in SSA, namely: CAPP, EAPP, SAPP and WAPP, heralded a new era in the development of regional energy markets. The electricity markets in Central, East, Southern and West Africa are in different stages of development but they all require targeted capacity development to assure their effective operationalisation in the near and more distant future.

Currently, capacity development in SSA power sector is conducted using various methods ranging from provision of paid services by private operators (typically consultants) to provide the capacity building planned by regional operators – power pools, regional regulators and regulatory associations and other bodies, such as the Union of Producers, Transporters and Distributors of Electric Power in Africa (UPDEA)¹ and the African Forum for Utility Regulation (AFUR).

Yet, examples of successfully completed capacity building projects are few and far between. This is mostly due to difficulties in obtaining funding for preparation and implementation of CB – especially where it involves new content design and international travel for trainees. There are also challenges in measuring the impact of CB and ensuring its sustainability over the long-term.

Three notable successes that were identified include:

- (i) the Regional Power Trade Project (RPTP), conceptualised and implemented by NBI/NELSAP, which trained over 600 experts in East Africa over the period of 2005 – 2011;
- (ii) the ECOWAS Agency for Renewable Energy & Energy Efficiency (ECREEE), which trained more than 742 experts (140 in 2011 and 602 in 2012) from different target groups in West Africa since its establishment in 2010; and
- (iii) the World Bank / AfDB / Standard Bank-financed Morupule B coal-fired power station in Botswana which involves training for 300 staff in new technology, and, support for the establishment of an energy and water regulator.

The RPTP was funded from the Nile Basin Initiative Trust Fund managed by the World Bank with the main contributors being the NBI member countries, Sweden, Norway and the World Bank. The ECREEE training programmes were financed through funds allocated to ECREEE under the MOU between ECOWAS and the Governments of Spain, Austria, as well as, from UNIDO.

The success of the above programmes can be attributed to the presence of clear commitment from the participating governments, availability of funds and rigorous

management by respective project teams. However, the training implementers stress that their CB achieved significant results first and foremost because the preparation was demand-driven and tailored to meet the real capacity development needs of stakeholders.

A critical review of capacity development for the power industry indicates that donors are typically experiencing difficulties with funding stand-alone capacity building programmes. Once again, this is partly due to problems related to measuring the tangible impact of such initiatives relative to their cost. However, this trend is slowly changing through recognition of the fact that on-going capacity building is critical to ensure the success of energy infrastructure projects, as the competent technical and managerial capacity will be required to operate the generation and transmission facilities to be commissioned or upgraded.

The AfDB does not have a policy making CB element mandatory for all energy projects, nor any previous experience of implementing stand-alone CB programme for power sector. However, the Bank has a number of CB initiatives that are either under development or in the “request” pipeline. Such initiatives include projects for the development of enabling legal and policy environment for integration of regional power sectors and the establishment of regional Centres of Excellence. These CB projects present opportunities for synergy with the efforts of other development partners.

Based on our analysis of the data collected through stakeholder consultations and analytical research, we identified a number of lessons learnt from the capacity development experience in Africa to date and propose the following recommendations for designing the AfDB Capacity Building Programme for the SSA power sector:

- CB must be viewed as a core goal in its own right rather than a collateral objective. However, to increase the impact, in addition to stand-alone programmes, CB activities need to be mainstreamed and incorporated in all energy infrastructure projects as well. This is already accepted practice in the Bank’s water projects.
- CB is a long-term exercise and should be viewed as an investment project with limited immediate pay-offs.

¹ In December 2012, the UPDEA was rebranded into the Association of Power Utilities of Africa (APUA).

The total funding requirement of the CB Programme proposed under the title of “**Power Sector Soft Infrastructure Programme (PoSSIP)**” is estimated as follows:

Major Element	Short term (US\$)	Medium Term(US\$)	Long Term (US\$)	Total (US\$)
Legal & Regional Regulatory Framework, including development and strengthening of national regulators	4,320,000	3,480,000	3,280,000	11,080,000
System Operations and Dispatch	2,160,000	2,322,000	2,002,000	6,484,000
Conducive Financing Environment	1,580,000	950,000	640,000	3,170,000
Strengthening of member utility companies of power pools	4,760,000	3,680,000	2,440,000	10,880,000
Sub-Total	12,820,000	10,432,000	8,362,000	31,614,000
Total Cost for Upgrading Centres of Excellence				7,000,000
PoSSIP Total				38,614,000

- To succeed, capacity building must be stakeholder-owned rather than donor-driven, while making use of local and regional expertise wherever possible.
- It is important to use an integrated approach to capacity development, imposing a cooperative framework affecting individuals, organisations and markets.
- Partnerships are critical, and the programme will need to work closely with regional and continental bodies, as well as, other development partners that are already active on the ground.
- Since the end goal is to bolster regional power trade, certain pre-requisites for achieving viable regional power trade and energy markets need to be put in place and/or strengthened, such as financially viable utilities and effective regulators, as well as, the regulatory framework.
- In order to ensure sustainability, CB should be migrated over time to the Centres of Excellence, tertiary institutions, and the utility affiliated academies of learning.

- Strengthening the Bank's energy research capacity is important in order to position the institution as a key knowledge broker that can advance transformational ideas on energy sector development.

In order to ensure financial sustainability for the CB programme, the following financial model is proposed:

- The cost for upgrading the Centres of Excellence and equipment purchase for the laboratories and workshops to be funded by the AfDB and other donors.
- Sharing of CB programme delivery costs among AfDB, other donors and beneficiary stakeholders. Donors could fund the cost of course preparation and part of the cost for course delivery, while stakeholders pay the balance for the course delivery costs (for example, travel to training venue).
- Implement a “fee-for-service” business model starting from year 4 to ensure full cost-recovery. This is expected to lead to the programme's financial sustainability from year 5 onwards.

1.1. Context of the study

Reliable and affordable power supply is a crucial prerequisite for competitiveness and income generating activities that lead to economic development. Although Sub-Saharan Africa (SSA) has some of the world's fastest growing economies, it faces major challenges in the power sector, requiring a collective response from development partners, governments and the private sector in light of the fact that infrastructure challenges hold back Africa's GDP growth by 2 percent.²

Africa spends about US\$ 11.6 billion per year on developing power sector infrastructure, which is only about a quarter of the annual financing requirement. To plug the investment gap, African countries will require private sector investment. Although some countries have succeeded in attracting Independent Power Producers (IPPs), a lot more is required, if Africa is to overcome its chronic underinvestment problem.

The AfDB Energy Sector Policy 2012 states that implementation of energy reforms has been inadequate in most African countries due to inappropriate design, lack of implementation capacity and financial resources. Various risk factors make conditions unfavourable for private investment in the energy sector. These include among others: (i) financial factors and inadequate cost recovery; (ii) weakness of regulatory systems; (iii) weak institutional capacity; and (iv) political instability or conflicts. To resolve these problems, countries need to work on improvement of the business environment in the energy sector.

The financial and operational viability of power utilities is central to the development of the power sector. Financially viable and creditworthy utilities can operate more efficiently and in turn, attract investments, while allocating resources towards maintenance and expansion. Moreover, robust national utilities form the building blocks of regional energy markets (power pools), and, therefore, their financial sustainability and efficient operations are crucial.

The promotion of regional energy trading and development of regional energy markets, spearheaded by the regional power pools, is an area of major interest for the Bank. This would help address the power shortages being experienced in some African countries while unlocking untapped

export potential in others, thus boosting overall economic competitiveness and reducing poverty. It is expected that regional integration projects and cross-border trading are likely to enhance the creation of more bankable projects and enable African countries to utilise their huge untapped energy resources for power generation.

In addition, comprehensive institutional reforms and the introduction of legislation by countries to permit private sector participation, as well as establishing a robust regulatory framework, would catalyse private sector investment.

While the Bank enjoys a strong track record in financing the development of physical energy infrastructure, it also recognises that there is a need to enhance support for addressing "soft infrastructure" issues such as regulatory reforms, institutional strengthening and the development of energy markets to enhance regional trade and overall sector performance.

The Bank Group's Ten Year Strategy (2013-2022), the Capacity Development Strategy (2010-2014) and the Capacity Development Strategy (CDS) Mid-Term Review Report place capacity development at the centre of Africa's structural transformation. The policy documents envision the Bank becoming a leading enabler of capacity development in the area of infrastructure. Pursuant to this vision, the NEPAD, Regional Integration and Trade Department (ONRI) of the AfDB commissioned this project to design a capacity building programme that will support the development of the electricity supply industry through regional electricity trade and address various soft infrastructure weaknesses in the power sector.

The capacity building programme proposed under this assignment will complement the previous and on-going work of the Bank's short-term training activities and economic sector work in the power sector.

1.2. Study objectives

The objective of the study is to perform a diagnostic assessment of capacity needs and gaps in the sub-Saharan electricity sector, and design a corresponding capacity building programme in order to support the development of the electricity supply industry in the region, using allocated resources in the most efficient manner.

² Infrastructure Investor Africa: An Intelligence Report. February 2011.



Despite the last two decades of reforms, most energy utilities in Africa with a few exceptions, suffer from low capacity to attract commercial financing for infrastructure due to a combination of institutional risk, weak financial management and lack of creditworthiness. With the right support, policies and management, African utilities could be assisted in reaching desired levels of financial viability and efficiency – transforming them into credible partners for private investors.

This study seeks to propose a CB programme comprising short, medium and long-term measures to provide support to national and regional power institutions, as well as strengthening the institutional and regulatory frameworks to enhance regional electricity trade and power sector performance. The proposed programme design shall be based on solid reasoning and adopt adequate assumptions. It will include an outline of risks that might adversely affect the successful implementation of the programme.

The assessment of needs takes into account previous and on-going capacity building as well as technical assistance efforts undertaken by national electricity systems and regional power pools with support from the African Development Bank and other development partners.

1.3. Study scope and focus

The capacity building programme proposed under this Study is planned specifically for the electricity sector in sub-Saharan Africa (SSA), and intended as an initiative independent from any particular infrastructure project and at the same time supportive of all the infrastructure projects taken collectively to meet the most important needs of the African power industry.

The programme thus aims at developing specific expertise and capabilities related to the improvement of performance of individual operators, while helping them to prepare effective and safe operation of the interconnected regional markets in a power pool environment.

Capacity building is costly, and therefore, paying for capacity building should be regarded as an investment that pays off in the long run. Within the framework of improving performance of the sub-Saharan electric power sector, the capacity building is done by investing in organisations and employees of an organisation. Given the public service nature of the electricity supply industry, the ultimate objective of such investment is the development of new business culture to boost performance capacity of individuals and

organisations within the electricity sector, and bring sustainable benefits to electricity consumers and the national economies at large, today and in the future.

The AfDB's investments in the development of energy infrastructure have largely focused on power generation and transmission projects. Overall, the AfDB annual contribution to financing of the energy sector needs represents up to 15 per cent of the investments needed to achieve universal access by 2030, reaching UA 2.2 billion in 2009³ and accounting for 24.7% of Bank Group Loan and Grant Approvals in 2012.⁴

Between 1967 and 2011, the AfDB devoted 34 per cent of its total infrastructure commitments to the energy sector. Out of investments of US\$ 4.5 billion in the energy sector, about 90% went towards improving electricity supply.

However, the Bank recognises that, in the long run, success of such physical infrastructure projects will critically depend on the emergence of the necessary modern institutional and regulatory arrangements, functional market conditions, development of critical mass of human skills and timely training of human resources. These will ensure that the new infrastructure operates properly and contributes to the general objective of improving living conditions of African populations.

The AfDB distinguishes between “hard” and “soft” infrastructure issues, with the former related to the implementation of power generation, transmission and distribution projects, and the latter to such issues as regulatory reforms, institutional strengthening and the development of efficient electricity supply markets. In the Bank's view, “Physical interconnectivity is a means, but it certainly is not an end. Africa also needs to address the “soft” aspects of regional integration, especially trade.”⁵

The current study considers the CB assistance needs of the four regions of sub-Saharan Africa: Central, Eastern, Southern and Western, with a focus on regional power pools, their member electricity utility companies, national authorities in charge of energy planning and electricity sector regulators. The needs of other categories of energy stakeholders have also been considered, and these include the pan-African and regional regulatory authorities, river basin authorities, standardisation, power engineering and regulatory bodies, training institutions, rural electrification agencies, energy efficiency and renewable energy institutions.

Considering the scope as described above, and taking cognizance of the feedback from the SSA power pools and key stakeholders, the strategic focus of the proposed capacity building programme is primarily on the following aspects:

- Enhancement of stakeholder capacity to ensure effective cooperation and coordination, for the establishment of efficient regional markets (i.e. technical and financial issues for effective operation of power pools, generation and transmission infrastructure expansion, and governance as well as improvement and harmonisation of regional regulatory frameworks); and,
- Coordinated performance improvement of national power sectors (i.e. technical and commercial aspects) and enhancing their preparedness for operation in internationally interconnected systems.

The regional integration focus is used as a guiding principle, based on the understanding that while working on the regional electricity markets, it is also necessary to reach down to each individual participant of such markets.

1.4 Study limitations

In accordance with the terms of reference, the following limitations apply to the scope of this study:

- The study's scope is limited to developing a programme targeting critical issues where capacity building is required to accelerate the improvements in the regional power markets and enhance regional electricity trade. This is to enable the AfDB achieve its objective of contributing to the enhancement of operational performance and financial sustainability of the continent's power industry.
- Performance indicators of individual operators or infrastructure projects are not covered by this study if they do not affect the development of regional markets and come up as cross-cutting issues related to regional integration in energy.
- The geographical coverage is limited to sub-Saharan Africa where capacity needs are deemed to be highest. Nevertheless, neither power sector authorities nor utility operators in Northern Africa

³ Energy Sector Policy of the AfDB Group. AfDB (ORPC). 2012. P. 43.

⁴ See Bank Group Annual Report 2012

⁵ At the Centre of Africa's Transformation. Strategy 2013 - 2022. The African Development Bank, December 2012. P. 22.

should be excluded from the proposed capacity building programme given their involvement in some of the power pools and the existence of best practices that they are willing to share with SSA's power stakeholders.

- Review of capacity building programmes and initiatives performed in the SSA electricity sector was based on a representative sample of countries. This was done to enable consultants to identify general capacity gaps and recurring themes that present themselves across the continent.

- Being limited to the electricity sector, the study considers the needs of national and regional institutions dealing with other issues rather than electricity only if they are related to the development of significant generation and transmission facilities. This includes, for example, river basin authorities planning hydroelectric power development schemes, as well as, power producers from other renewable sources, provided their projects are likely to produce an impact on regional electricity systems.

13. Study scope and focus

2.1 Definition of capacity building and capacity building needs

The following definitions apply for the purposes of this study, concerned with enhancing the performance of the sub-Saharan electricity sector:

- *Capacity building* is understood as strengthening the abilities of individuals and organisations in the electricity industry to make effective and efficient use of resources, in order to achieve the sector goal of supplying electricity to as many consumers as possible at a reasonable cost on a sustainable basis.
- A *capacity building need* is understood as a need to enhance existing or acquire new skills through training or any other capacity building activity, in order to improve an existing, or establish a new function within a power sector institution.

The AfDB programme seeks to respond to capacity building needs by enhancing performance of power sector stakeholders internally and also their external interaction with other players in the sector, for example, in a regional power market.

2.2 Methodology used

Getting the most benefits from the African power sector requires identifying and eliminating constraints, weaknesses and inconsistencies in its operations and development.

The existing and future capacity building needs assessment was performed taking into consideration the following issues:

- Review and analysis of available literature on the status of African power sector.
- Stakeholder consultation through a questionnaire and face-to-face interviews during country visits. This enabled the consultants to have a better understanding, and deeper insight of the capacity needs of the various stakeholders.
- Additional in-depth consultations with organisations that expressed interest and readiness to participate in the AfDB's CB Programme either as beneficiaries or providers.

The Consulting Team interviewed 88 stakeholders which included the 4 regional power pools, policy makers, regional and national regulatory agencies and power utilities.⁶ In addition, a total of 30 questionnaires were processed, bringing the total number of stakeholders consulted to about 100, allowing for those who were both interviewed and asked to submit the questionnaire.

The Study uses a regional approach to identify the problem areas in available expertise and to develop the appropriate CB Programme to address them. This implies two major analysis techniques:

1. Top-down approach to needs assessment:

Capacity assessment starts from regional institutions in charge of the electricity sector (regional power pools, regional regulators, and regional associations) and descends to the level of national authorities, agencies and country utility operators.

2. Bottom-up approach to prioritisation of CB activities:

Specific capacity building activities are selected to meet the needs of individual institutions, while keeping in mind their place in the regional system.

The regional integration process concerns first and foremost the four SSA power pools, regional regulators and regulatory bodies, while at the same time it takes into consideration the needs of national operators (irrespective of whether they are members of any power pool), regulators and national electricity sector policy-makers.

The regional approach is fully in line with the Bank's Ten Year Strategy where the Bank has indicated that given the small size of many African economies, regional integration is crucial for Africa to realise its full potential. It is in this regard that the AfDB signals in its Ten Year Strategy document that "it will pursue a regionally integrated approach to infrastructure development"⁷.

The Bank, however, acknowledges that in trying to achieve this it is important to keep pace with investments at the national level since such investments "serve as building blocks for regional infrastructure development". The issue of developing an enabling legal and regulatory environment to support regional projects has been highlighted by the Bank in its Ten Year Strategy, where it has indicated its preparedness to work with national governments and other multilateral and bilateral financial institutions to achieve that.

⁶ The full list of the consulted stakeholders can be found in Annex C.

⁷ At the Centre of Africa's Transformation: Strategy 2013 – 2022. The African Development Bank. December 2012. P. 22.

This reinforces the need to use both the top-down and the bottom-up approach, as part of the needs prioritisation process.

The Bank has also noted that since physical interconnectivity is a means to an end, it is imperative that the “soft” aspects of regional integration be addressed. To achieve this, the Bank will be supporting energy sector reforms in the required direction, and helping energy stakeholders to develop their skills. These issues are well encapsulated in the strategic orientation of the Bank’s recent Energy Sector Policy that was approved by its Board of Directors on 26 September 2012. The Policy provides a general framework to the Bank Group’s energy sector operations. The Policy views regional integration in energy as a cross-cutting issue and “to make regional energy markets functional, the Bank will strengthen the existing power pools and will support the development of the requisite infrastructure, capacity, policy and regulatory frameworks.”⁸

Moreover, the new Energy Policy identifies four key pillars of implementation; namely:

- (i) Increased access to affordable and reliable energy services;
- (ii) Increased energy efficiency;
- (iii) Greater use of renewable energy sources; and,
- (iv) Enhanced governance and increased viability of the sector (focusing on the financial and technical performance of energy utilities, support for sector governance, regulatory reforms and capacity development).

The proposed capacity building programme is intended to help fulfil the above objectives.

2.3 Structure of the final report

The Report was compiled based on the consultants’ knowledge of the African power sector, using the results of analytical research, processing of the information collected during the questionnaire and field survey, and regular communication with the AfDB during the period from October 2012 to April 2013.

The Final Report consists of two volumes, namely:

Volume 1: SSA Power Sector Capacity Building Diagnostics & Needs Assessment.

Volume 2: Power Sector Soft Infrastructure Programme (PoSSIP) – Design and Budget.

Volume 1 presents results of the analysis of the status of capacity building in the SSA power sector and comprises the following seven sections.

Chapter 1 describes the context, objectives, scope and limitations of the AfDB Capacity Building Study for the SSA power sector.

Chapter 2 introduces the methodology used for the Study development and describes its work plan and deliverables.

Chapter 3 analyses integration processes in SSA’s power industry from an historical perspective and the viewpoint of its future development trends. The situation of each regional power market is described to provide an overview of capacity status of its stakeholders.

Chapter 4 gives an overview of capacity development in the SSA power industry and lists various completed and existing programmes in order to critically summarise stakeholders’ views on capacity development. The Section concludes with analysis of the lessons learnt that will be used as inputs when recommending activities for the future AfDB Capacity Building programme.

Chapter 5 is dedicated to the role that international financing institutions play in the capacity development for the SSA electricity sector. It reviews positioning of IFIs, their views on CB and the programmes they are supporting in the power sector in Africa. Section V concludes with analysis of the lessons to draw from the donor community experience in capacity building in SSA power industry.

⁸ Energy Sector Policy. The African Development Bank, 2012. P. 23.



Chapter 6 reviews the role of the African Development Bank in capacity development for the African power sector. It starts with a policy statement, describes different capacity building initiatives completed, in progress and in the pipeline. It also gives recommendations with respect to the Bank's strategic orientations related to capacity development in the SSA power sector.

Chapter 7 introduces fundamental characteristics and guiding principles used for designing a new CB programme and drawn from the analysis of the data collected, stakeholder consultation and the consultants experience in the area of CB.

The **Annex** to Volume 1 includes the following documents:

- A.1. The terms of reference of the Study.
- A.2. The data collection questionnaire sent out to stakeholders.
- A.3. The list of consulted stakeholder organisations in SSA power sector.

Volume 2, introduces the proposed capacity building programme proper, identifies the capacity needs of the key stakeholders, and recommends the corresponding implementation plan with its estimated budget.

3. Role of power sector integration in sub-Saharan Africa

3.1 Current state of electricity supply industry in sub-Saharan Africa

Today, sub-Saharan Africa is in the midst of an historic transition with most economies experiencing dramatic growth. It is now the second fastest growing region in the world after Asia. According to the International Monetary Fund, for the past decade, GDP across sub-Saharan countries has risen at an average of 5% to 7% with many countries growing faster than China and India.⁹ However, despite this success, huge challenges remain, especially in the area of reliable and affordable electricity supply, which are pre-requisites for achieving sustainable and inclusive development.

The Africa Infrastructure Country Diagnostic (AICD) project that was completed in 2009, identifies infrastructure as a major constraint to doing business in Africa, which depresses business productivity by about 40%.

In particular, African companies report that power outages result in a loss of 5% of revenues to those that rely on an emergency diesel generator and 20% to those who cannot afford one. On the whole, it is estimated that the cost of power outages in sub-Saharan Africa ranges between 1% and 4% of the GDP.¹⁰

As the largest infrastructure deficit is found in the African power sector, it is not surprising that rather than boosting economic growth, the African power sector is actually constraining it. This is because the African power infrastructure delivers only a fraction of the services found in more advanced developing regions. All the countries of sub-Saharan Africa, with their combined population of 800 million, generate roughly the same amount of power as Spain – with a population of 45 million people.¹¹

As a result, even though Africa is very rich in natural resources, it remains one of the least-developed parts of the world. Per capita income on the continent amounts only to 15% of the world average with less than 20% of Africa's

population and less than 5% of its rural communities having access to electricity, compared to over 90% in developed economies. Moreover, Africa's average electricity consumption per capita in 2011 was estimated at about 600 kWh, representing about 22.2% of the world average.¹²

Sub-Saharan Africa's countries are home to 9% of the world's population,¹³ predominantly in western and central Africa, and concentrated along the Congo, Nile, Niger, Volta and Zambezi rivers. Due to its location across the equator, SSA has abundant and consistent solar exposure ranging from 5 to 7 kWh/m². It also has an estimated geothermal energy potential of 15,000 MW found mostly in the East African Rift System (EARS).¹⁴

Based on these reserves, it is possible to achieve a well-balanced energy generation mix and a prosperous energy electricity industry south of the Sahara. Yet, this is not happening and instead over the past four decades, some countries in SSA have been facing a gradual deterioration of their national electricity supply systems.

The AfDB Energy Sector Policy Report 2012 notes that "Africa has the lowest electrification rate of all regions. It is estimated that only 42 percent of the population has access to electricity, compared with 75 percent in the developing world. In Sub-Saharan Africa the ratio is much lower and even when modern energy is available, it is expensive and unreliable. If current trends continue, less than half of African countries will achieve universal access to electricity by 2050."¹⁵

The underlying reasons behind the poor performance of SSA's power industry

The most often cited reasons are those related to conflict, poor management, high levels of poverty and consequent affordability issues on the part of consumers, lack of financial resources, uneven distribution of energy resources among nations and regions.¹⁶

⁹ Africa Rising. Time, December 3, 2012. P. 30 – 37.

¹⁰ UNEP Report, Financing Renewable Energy in Developing Countries, Switzerland Geneva, February 2012, P. 17.

¹¹ Vivien Foster. Overhauling the Engine of Growth: Infrastructure in Africa. AICD Working Paper. The World Bank. September 2008. P. 1-2.

¹² Africa Region Report. Energy Policy Scenarios to 2050. World Energy Council. 2007.

¹³ The list sub-Saharan countries provided by the USA Library of Congress includes fifty names.

(<http://www.loc.gov/rr/amed/guide/afr-countrylist.html>). Forty-seven of them are eligible for World Bank borrowing.

¹⁴ The EARS countries are: Burundi, Comoros, Democratic Republic of Congo, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Tanzania, Uganda and Zambia.

¹⁵ Energy Sector Policy. The African Development Bank, 2012, P. 11.

¹⁶ Tipo Yepes *et al.* Making Sense of Africa's Infrastructure Endowment. AICD Working Paper 1. World Bank. January 2008. P. iv.

Africa's low population densities by global standards do not permit the introduction of large economies of agglomeration in the provision of infrastructure services.¹⁷ Chronic inefficiencies and low productivity within system operations are also commonplace due to institutional rigidities and political considerations which have influenced operational decisions. As a result many SSA countries practice load shedding and experience gradually declining quality of service.

In ideal circumstances, the energy sector should be characterised by formal market arrangements, ensuring adequate cost-recovery, allowing for the expansion of electricity generation, transmission and distribution capacities, and the enhancement of service quality. Tariffs not reflecting all of the costs of electricity, and revenues used inefficiently result in restricted investment and re-investment rates, leading to rapid asset deterioration due to deferred maintenance, repair and rehabilitation.

At the same time, providing expansion of electric infrastructure from public funds, even when borrowing from external sources at discounted rates, is not very cheap in Africa, given that loans would ultimately have to be reimbursed partly through tax revenues, whereas it costs \$1.20 to raise one dollar of tax revenue because of economic distortions associated with levying taxes.¹⁸

It is estimated that "public investment [in African infrastructure] could increase by 50% without any increase in spending, by addressing institutional bottlenecks".¹⁹ These include inefficient operations and management, coupled with high system losses (both technical and non-technical), low collection rates, market distorting subsidies and "electricity theft".

Poor management practices lead to outright sector failure. This was the case in the electricity sector in Guinea (Conakry) over the past ten years. An emergency programme was jointly initiated by ECOWAS and WAPP in July 2011 to save the city of Conakry from chronic black-outs and cost tens of millions of dollars. Another example is electricity utility – Société National d'Electricité (SNEL) –

in the Democratic Republic of Congo. The EU estimates that between 2006 and 2010, the Congolese electricity sector received support worth US\$1 billion from various donors with limited impact due to poor performance of SNEL and with close to half of existing plants in the DRC in need of refurbishments.²⁰ Indeed, SNEL's inefficiencies are estimated to absorb as much as 4.7 percent of the gross domestic product (GDP).²¹

Today, in order to meet the ever increasing demand for electricity to support economic growth, the power sector in Africa needs to install about 7,000 MW of new generation capacity per year. Adequate financing for the development of the energy sector in sub-Saharan Africa will require about US\$ 41 billion per year, which represents 6.4 % of the region's GDP.²²

Consequently, the SSA countries consider it a priority to expand national electricity generation, transmission and distribution infrastructure. Various reform measures have been undertaken to improve the electricity sector performance and ensure its sustainability. They include, unbundling and liberalising the sector legacy structure to open the way for private participation and investment; establishing of multinational energy projects; developing power exchanges across-national borders; and, finally, taking advantage of the economies of scale through regional power pools and inter-regional cooperation.

3.2 Evolution of national electricity sectors in sub-Saharan Africa

3.2.1 Electricity sector reform and unbundling

The electricity supply industry in post-independence Sub-Saharan Africa was almost invariably government-owned, highly centralised and politically regulated. Most power utilities were vertically integrated and lacked a business framework to promote viability and management efficiencies. This resulted in declining performance during the 1980s.

¹⁷ Vivien Foster. Overhauling the Engine of Growth: Infrastructure in Africa. AICD Working Paper. The World Bank. September 2008. P. 4.

¹⁸ Idem P. 16

¹⁹ Idem P. 11

²⁰ Summary Energy Profile. Democratic Republic of Congo. European Union. July 2012.

²¹ See Vivien Foster and Daniel Alberto Benitez. 2010. The Democratic Republic of Congo's Infrastructure: A Continental Perspective. Africa Infrastructure Country Diagnostic. World Bank.

²² AfDB, Committee of Ten Policy Brief: Financing of Sustainable Energy Solutions, 2010; IEA, Clean Energy Progress Report, Paris, OECD/IEA, 2011.

Important activities towards the sector's reform were initiated as early as the 1970s and still continue to this day. Most governments in Sub-Saharan Africa have demonstrated political will and support to undertake the energy sector reforms. The reforms were generally designed to achieve the following:

- Enhance performance of the state-owned utilities with respect to inadequate expansion, access to electricity and poor quality of service delivery;
- Permit private sector participation in the sector;
- Allow charging of cost recovery prices;
- Ensure adequate capital outlay to prevent deterioration of infrastructure;
- Promote energy conservation and efficiency;
- Encourage interconnection to neighbouring countries, as a way of reducing the high cost of supply.

Perversely, the introduction of power reforms can leave the national sector in a vulnerable situation as in most cases the **changes are not accompanied by rapid deployment and training of the necessary human resources to manage the new market arrangements**. This is the current difficulty faced by many countries, as it was pointed out to interviewers during the data collection process in Congo-Brazzaville, the DRC, Ethiopia and other countries.

Reforms involved changes in structure, ownership, and management. Structural changes concerned the process of unbundling vertically integrated utilities into separate generation, transmission and distribution entities (vertical unbundling), or unbundling large national utilities into smaller utilities (horizontal unbundling).

While the results from the reforms have so far been mixed, they have nonetheless paved the way for major new developments in the sub-Saharan electricity supply industry, ultimately leading to greater regional integration in energy.

This is an important consequence, given the experts' consensus that in infrastructure, as in many other areas, a regional approach is needed.²³

3.2.2 Establishment of independent power producers and distributors

In a number of SSA countries, reforms have brought about energy market liberalisation and the establishment of national legislative and regulatory frameworks to facilitate private sector participation. One of the major achievements of such reforms was the introduction, albeit on a limited scale thus far, of independent power producers (IPPs) and independent power distributors (IPDs).

IPDs have been created in Cameroon, Ghana, Namibia, South Africa, Uganda, Zambia and Zimbabwe. Also, a number of countries have succeeded in attracting private investors in the development of IPPs, particularly in Ghana, Kenya, Senegal, Tanzania and Togo. Côte d'Ivoire has two major IPPs with capacity totalling more than 500 MW (210 MW for CIPREL and 300 MW for Azito) installed during the period of 1994 to 1999.²⁴

The introduction of private-public partnerships in sub-Saharan Africa resulted in growing awareness that:

- Take or pay power purchase agreements with IPPs tend to lock national electricity sectors in long-term (20 to 35 years) mandatory power procurement. The common complaint is that such long-term arrangements may stifle any impetus towards further experimentation with market restructuring in search of better efficiencies.

Another adverse impact is that bilateral exchanges became a preferred method and it became very difficult to shift away from bilateral to regional trading, as no alternative experience was available.

²³ Vivien Foster. Overhauling the Engine of Growth: Infrastructure in Africa. AICD Working Paper. The World Bank. September 2008. P. 4.

²⁴ Getting the IPPs was for Côte d'Ivoire almost a chance development, as the owners of Azito power plant in Côte d'Ivoire signed a contract with the government only a few days prior to a coup d'état.

- An inefficient or non-existent electricity regulatory framework (i.e. rules and institutions) can frustrate private investors seeking to enter the energy market in a given country. Building the capacity of independent regulators is, therefore, critical.

3.2.3 Bilateral and multilateral trade in electricity

The major impact of the creation of IPDs has been their contribution to increased electricity purchasing capacity, while the establishment of IPPs increased the quantity of electricity available for sale in SSA. The IPPs have now become one of the major forces behind the development of bilateral electricity trade as well as the growing experience with electricity wheeling in the region.

Most bilateral electricity exchange agreements were signed in the 1950s and 1960s, which helped in the development of new interconnections and the signing of additional exchange agreements. However, the terms and conditions of most of these bilateral agreements need to be modified to suit the present day reality of a restructured and integrated power industry. Under bilateral agreements, the amount of electricity to be exported and imported could not be sustained in certain areas, hence the need for such bilateral agreements to be supplemented by other pooling arrangements such as:

- System planning, dispatching and operations
- Dispute resolution mechanisms
- Price settlement among market players
- Transparent principles of price-setting.

The transition from bilateral to multilateral energy exchanges involving many countries under power pooling, inevitably increases transaction and regulatory costs, imposes greater capacity requirement for trading, settlements, verification and market monitoring.

This ultimately requires a new set of skills, both technical and non-technical to ensure smooth operation of the emerging type of electricity markets.

Despite the [intended] transition to competitive power pools, to this day, bilateral trading still remains the predominant exchange method even in the regions with the most developed power pooling arrangements.

For example, in the SAPP the innovative spot market attracts only a very small amount of regional electricity trade – with transmission bottlenecks identified as a major constraint.

According to the SAPP Annual Report 2012, annual values amounted to just under 0.3% of the volumes traded bilaterally for the last two years. Since going live in December 2009, the spot market had fluctuating revenues reaching a total of US\$1,623,195 on the 21 March 2012.

3.2.4 Multinational energy projects

Another factor contributing to electricity integration and cooperation across national borders is the development of multinational electrical energy projects. Notable projects include the Manantali hydroelectric scheme, which supplies Mali, Senegal and Mauritania, and the interconnected grid built by the Economic Community of the Great Lakes Countries (ECGLC) and managed by international operator *Société Internationale d'Electricité des Grands Lacs* (SINELAC), the grid interconnects the Lake Kivu network in the eastern part of the Democratic Republic of Congo with the networks of Burundi and Rwanda.

In some cases, it has taken 15 to 20 years from the conceptualisation of a multi-national electricity project to its commissioning. Nevertheless, such projects gave participants the relevant experience in combining resources and sharing risks they needed to increase the security and reliability of electricity supply. *They also significantly contributed to building the capacity of the participating national utilities in harmonising the requirements of their respective grid codes for joint operation.*

3.3 Blueprint for regional integration in power

3.3.1 African power pools

'Power pooling' in energy is a relatively new phenomenon in Africa. SSA nations began transitioning towards integrated regional markets after observing the benefits deriving from joint operation of electricity networks in the USA and Europe. They also relied on their own experience in reforming national electricity sectors, as well as developing bilateral exchanges and building multinational electricity generation projects over the past 30 to 40 years.

The establishment of the region's four power pools, namely SAPP, WAPP, CAPP and EAPP, has introduced a trend that will foster regional trade and enhance a more business-oriented sector with its attendant positive effects on access, system efficiency, cost and sustainable development.

3.3.2. Benefits of regional integration in power

African power pooling experts define a power pool as "a group of organisations that operate their power systems jointly to obtain *net benefits* for each organisation".²⁵

Much has been said in favour of benefits expected from developing interconnections and operating power pools in the long term: lowering the operating and capital costs of

individual systems; improving power system reliability with reserve sharing; enhancing the security of supply through mutual assistance; and, the cascading effect of electricity service extension to areas that were previously out of reach.

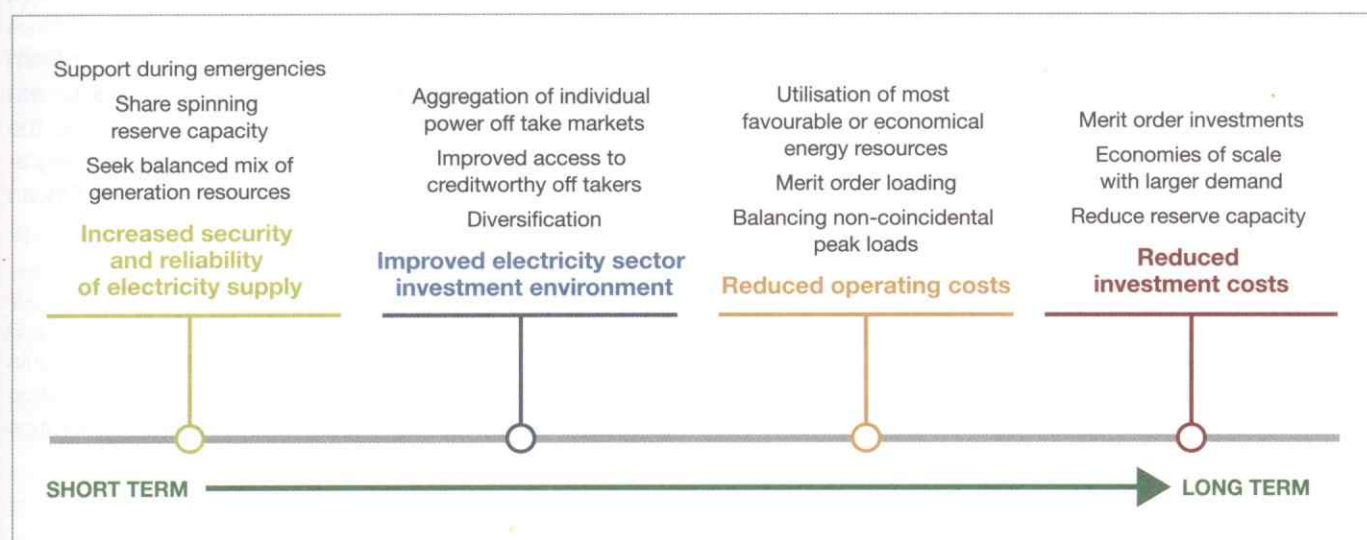
These generic benefits are captured in the figure below with an indication of the time frame within which some of them could be realised by pool members.

Regional cooperation and integration through power pools and other associations seeks to foster Africa's economic development by securing an electricity supply that is affordable, accessible, and environmentally sustainable. It also means a step towards inter-regional cooperation in energy and the interconnection of existing power pools into a pan-African electricity network.

However, in the African context, there are other tangible benefits resulting from power pool development, namely:

- The establishment of a structured and coordinated investment climate and market to facilitate the financing of priority regional generation and transmission projects;
- Preparation of coherent master plans for regional energy infrastructure development for presentation to the investment community;
- Pro-active capacity building in electricity supply industry operation and management.

Figure 1
Core Benefits of Power Pools



²⁵ Dr. Lawrence Musaba and Pat Naidoo, Power Pools in Africa. Energize, July 2005, P. 38-41.

If, on one hand, the establishment of power pools requires targeted capacity building, then, on the other hand, the evolution of power pools in SSA can also be viewed as a long-term capacity building exercise in its own right.

For example, active development of WAPP over the last decade contributed to shifting national mentality from the position entrenched in national independence in energy at all costs to the one favouring lucrative cooperation with neighbouring countries.

This is attributable at least in part to the impact of constructive discussions within the WAPP working groups during the initial establishment period

Locking in the aforementioned benefits requires the SSA power pools to ensure availability of the right competences to manage regional power trade under new conditions.

The capacity building aspect refers to a very real need to prepare competent specialists to operate the electricity system in a power pool environment.

Regional integration also facilitates the dissemination of best practices, cross-learning and training.²⁶

For example, the East African Rift Countries consider the lack of an integrated and holistic regional approach as one of the key challenges of the accelerated development of geothermal resources.

3.4 Regional electricity markets in sub-Saharan Africa

This sub-section provides a brief exploration of the current status of regional power markets and their respective governance frameworks in Southern, West, East and Central Africa. It assesses the general capacity requirements in the respective regions.

3.4.1 Southern Africa

Electricity Sources and Consumption

The AfDB's Regional Integration Strategy Paper (RISP) 2011–2015 for Southern Africa characterises the regional energy sector in the following terms:

- Southern Africa has a huge potential for electricity generation, but low investment leads to shortages;
- Unclear regulatory frameworks for public-private partnerships (PPP) and lack of power-purchase agreements (PPAs) hinder investment;
- Low generation and grid bottlenecks lead to black-outs and load shedding with high economic costs;
- Coal remains a key source of power in the short to medium term, given previous investments in coal-powered plants and the existence of vast coal reserves.²⁷

Twelve countries in the region are members of the Southern African Development Community (SADC) – the driving force behind the regional integration in energy, while six of them belong to the Common Market of Eastern and Southern Africa (COMESA). Both SADC and COMESA pursue the vision of “economic prosperity through regional integration”, ultimately leading to the establishment of the African Common Market.²⁸

The Southern African region power system is dominated by thermal generation, largely due to the coal fired capacity in South Africa. Within the region, South Africa alone accounts for at least 76% of the region's total installed generation capacity. The Figures below illustrate the installed generation mix which includes thermal, hydro and nuclear sources.

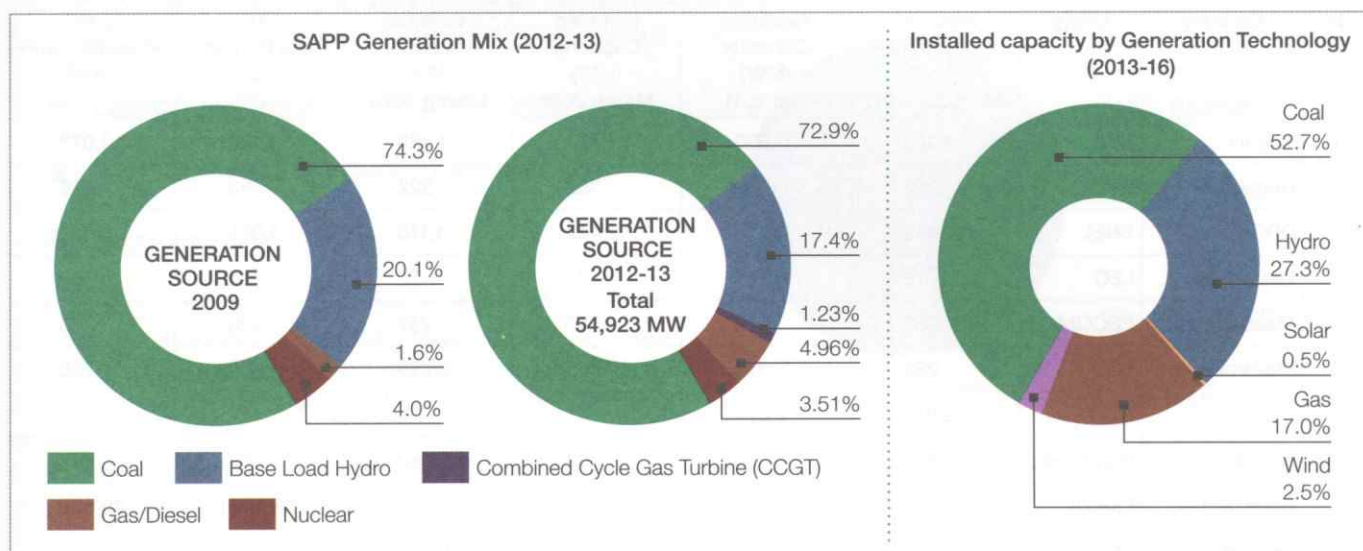
²⁶ Status, Strategy, Gaps and Support Programmes in the 11 Countries of the East African Rift System for development of their Geothermal Resource. African Union. April 2010. P. 24.

²⁷ AfDB Southern Africa Regional Integration Strategy Paper 2011–2015. AfDB - 2011. P. 1.

²⁸ To be achieved between 2019 and 2023 according to the Abuja Treaty of 1991.

Figure 2

SAPP generation mix and installed capacity by generation technology



Source: SAPP 2013 Annual Report

SAPP Generation Contribution vs Demand (2012/2013)

Country	Installed MW Capacity (March 2013)	Available MW Capacity (March 2013)	Suppressed Demand and Forecast Demand
South Africa	44,140	44,074	42,416
Mozambique	2,308	2,279	636
Zambia	1,870	1,845	2,287
Zimbabwe	2,045	1,600	2,267
DRC	2,442	1,170	1,398
Tanzania	1,380	1,143	1,444
Angola	1,793	1,480	1,341
Rest	1,174	1,111	2,044
TOTAL SAPP	53,722 MW	48,792 MW	50,636 MW

Source: SAPP 2013 Annual Report

SAPP is currently transitioning from a cooperative pool to a competitive power pool. This is a daunting task and, according to SAPP, significant capacity development is required for its Member utility companies for the competitive market to flourish.

The SADC Protocol on Energy (1996) acts as a policy framework for effective use and development of energy in the region, including the electricity sector.

The Protocol on Energy makes reference to SAPP which is linked to the SADC Directorate of Infrastructure and Services. SADC views the Southern African Power Pool as a key achievement of both regional integration and increased access to electricity.

Regional Market Integrator

The Southern African Power Pool (SAPP) was created with the primary aim of providing reliable and affordable electricity supply to the consumers of each of the SAPP members, consistent with the reasonable utilisation of natural resources and the effect on the environment and to facilitate the development of a competitive electricity market.

SAPP which initially began as an association of national power utilities, was officially established in August 1995 at the SADC summit held in South Africa, when the member governments of SADC (excluding Mauritius), signed an inter-government MOU. It was the first formal power pool in sub-Saharan Africa.

The electricity consumption data shows wide disparities existing among the various countries in the region South Africa having the highest per capita electricity consumption followed by Namibia and Botswana.

SADC promotes stronger regional integration of its Member States' electricity sectors, considering that such integration has the potential to save the region \$1.1 billion a year in energy costs. Existing SADC interconnections were mostly inherited from the pre-SAPP era, and the region estimates that it requires close to US\$6 billion to complete identified interconnection projects – illustrated in the Figure above.

Installed Capacity vs Peak Demand (2011-13)

No.	Country	Utility	Installed Capacity (MW) As of Jan 2011	Available Capacity (MW) Jan 2011	Installed Capacity (MW) March 2013	Available Capacity (MW) March 2013	2010 Peak Demand (MW)	2012 Peak Demand (MW)
1	Angola	ENE	1,187	990	1,793	1,480	1,100	1,072
2	Botswana	BPC	202	190	352	322	553	578
3	DRC	SNEL	2,442	1,170	2,442	1,170	1,081	1,040
4	Lesotho	LEC	72	71	72	72	121	129
5	Malawi	ESCOM	287	287	287	287	300	278
6	Mozambique	EDM	233	174	2,308	2,279	560	706
		HCB	2,075	2,075				
7	Namibia	NamPower	393	360	393	360	564	611
8	South Africa	Eskom	44,170	41,074	44,170	41,074	36,705	35,896
9	Swaziland	SEC	70	70	70	70	204	204
10	Tanzania	TANESCO	1,008	780	1,380	1,143	833	900
11	Zambia	ZESCO	1,812	1,215	1,870	1,845	1,600	1,681
12	Zimbabwe	ZESA	2,045	1,320	2,045	1,600	2,100	2,029
TOTAL SAPP			55,996	49,777	57,182	51,702	45,721	45,124

Source: SAPP 2013 Annual Report

Having made an effort in 2007 to open its membership to operators originating from other regions, SAPP now has the total of 16 members, including 11 operating, 3 non-operating and 2 members with observer status.

Among others, the main objectives of the membership are the following:

- Provide a forum for the development of a world class, robust, efficient, reliable and stable interconnected electrical system;
- Coordinate and enforce common regional standards of quality of supply, measurement and monitoring of systems performance;
- Facilitate the development of regional expertise;
- Increase power accessibility in rural communities.

One of the major achievements of the SAPP is the move from a “cooperative” power pool to a competitive pool. This was achieved through the establishment of the Short-Term Energy Market (STEM) in April 2001, and the Day-Ahead Market (DAM), which commenced operations in December, 2009.

In February 2000, SAPP established its Coordination Centre in Harare, Zimbabwe, which has a small staff responsible for coordinating the power pool activities. Nowadays, SAPP operations represent a combination of short and long-term arrangements, which effectively characterize it as a hybrid regional market that combines bilateral exchanges with competitive trading (on a much lesser scale).

Regional regulator

There is no specialised regional regulatory authority for the electricity sector in Southern Africa. However, the Regional Electricity Regulators Association of Southern Africa (RERA) was established by the SADC as a **formal association** of electricity regulators in July 2002 in terms of the SADC statutory documents and in pursuit of the broader initiative of the New Partnership for Africa's development (NEPAD) and the African Energy Commission (AFREC).

RERA's aim is to facilitate the harmonisation of regulatory policies, legislation, standards and practices within the SADC region. Its key objectives relate to the following areas:

- *Capacity building and information sharing,*
- *Facilitation of policy, legislation and regulation,*
- *Regulatory cooperation.*

In accordance with the above objectives, RERA has been involved in undertaking key technical studies to help shape the regulatory terrain and enhance regulatory decision-making within the region. RERA has also been organising training programmes for its members in key areas related to economic regulation, regulatory economics, renewable energy and energy efficiency, with the view to enhancing the overall capacity of its members.

3.4.2 West Africa

Electricity sources and consumption

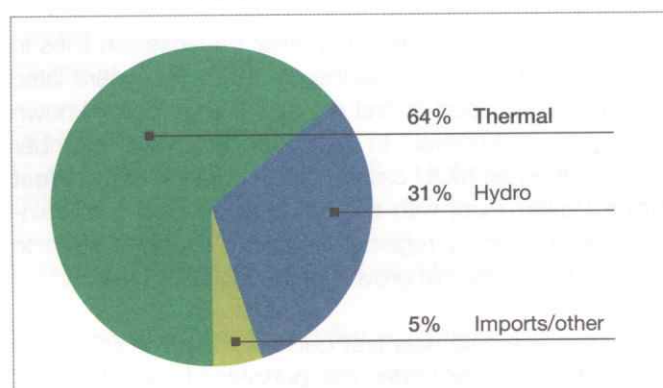
With a population of nearly 300 million people and GDP of US\$ 316 billion, the ECOWAS region represents 4.5% of the global population, but just 0.5% of the world's GDP.

In West Africa, electricity generation is based mainly on hydro and thermal sources with negligible contribution from renewable energy resources. Most of the thermal plants use diesel and HFO, except Nigeria, Côte d'Ivoire and now Ghana, where natural gas is used for power generation.

Coal is generally not used except in Nigeria where there is a small 30 MW coal plant. Although Nigeria has more than 250 million tons of coal reserves it produces on the average, only 70,000 tons per annum.²⁹ Senegal has plans to develop 800 MW from coal-based generation.

Hydropower, represents a major available resource for electricity production in West Africa, but this has largely remained unexploited. Currently, hydro generation is dominated by Nigeria (43%) and Ghana (43.4%) and Côte d'Ivoire (40.9%).³⁰ The current regional generation mix is illustrated in the figure that follows.

Figure 3
Generation mix in West Africa



Source: Draft Energy Outlook

Access rates as at the end of 2011 were estimated to be 45%.

The institutional set up of West African electricity sector is one of the most diversified in sub-Saharan Africa. It is developed under the auspices of the Economic Community of West African States (ECOWAS), whose Vision 2000 aims to deepen the integration process. The ECOWAS Commission has an energy department at the Commission headquarters in Abuja, Nigeria, and three regional agencies specialised in energy, namely:

- West African Power Pool (WAPP)
- ECOWAS Regional Electricity Regulatory Authority (ERERA)
- ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE).

In addition, the West African Economic and Monetary Union (WAEMU) headquartered in Ouagadougou, Burkina Faso, also makes the effort to contribute to the development of the regional electrical infrastructure. River basin development authorities, namely the Gambia River (OMVG), the Senegal River (OMVS), the Mano River (Mano River Union) and the Niger River (ABN), are also involved in the development of their respective water courses for power generation.

²⁹ WAPP Business Plan, 2012 – 2015, P. 10.

³⁰ Regional Power Status in African Power Pools, ICA, November 2011, P. 65.

Regional market integrator

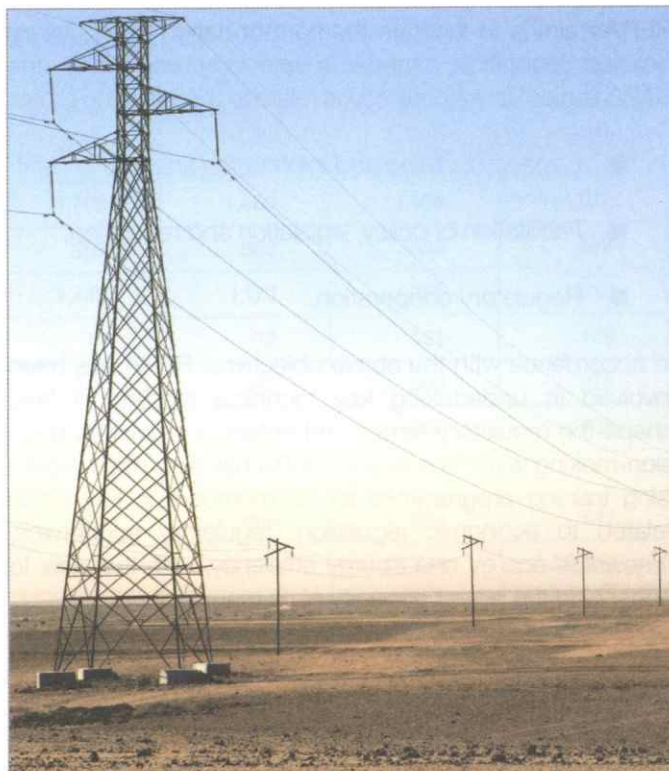
The first cross-border electric power transmission lines in West Africa were commissioned in 1971. Ten years later, ECOWAS introduced its first regional energy policy known as “Energy of Survival.” In 2000, the ECOWAS Member States signed an MOU calling for the creation of the **West Africa Power Pool** with a mission to develop a sustainable interconnected regional electricity supply system to promote the economic growth of the ECOWAS region.

WAPP membership was first defined in April 2002, when WAPP was directly under the purview of the ECOWAS Secretariat in Abuja. The Articles of Agreement were adopted in 2005 opening access to WAPP to a wider spectrum of enterprises.³¹ They define WAPP as “The association of public and private power entities that constitute the WAPP Organisation.” This effectively ushered in a new era of moving the control of the power pool away from administrative authorities and into the hands of the power utilities that comprise its membership. In 2006, WAPP headquarters were established in Cotonou, Benin.

The key objective of WAPP is to integrate the national power systems into unified regional power systems and ensure that citizens of ECOWAS countries have stable and reliable electricity supply at competitive prices.

Of the sub-Saharan power pools WAPP enjoys the biggest political clout in promoting the development of regional infrastructure for electricity generation and transmission. To achieve this, WAPP maximises the use of Members’ human resources through secondments, introduces innovative mechanisms like special purpose vehicles (SPVs) for infrastructure project implementation, and holds bi-annual donor coordination meetings. It is instructive that SAPP officials were planning a study tour to WAPP during the first half of 2013.

Capacity building for its members is also the major focus and to this effect WAPP has commissioned a strategic assessment of its needs in capacity development completed in 2008³² (and in need of updating by now) to analyse the organisation’s needs in capacity development and started producing annual capacity building programmes³³ for implementation using its own resources and donor funding.



Regional regulator

The ECOWAS Regional Electricity Regulatory Authority (ERERA) was established in January 2008 as a regional structure charged with regulating cross-border electricity exchanges between ECOWAS Member States. It became a specialised institution of ECOWAS with “the status of a legal entity, with independence and the autonomy necessary for carrying out its missions”.³⁴ It is based in Accra, Ghana.

ERERA has jurisdiction over the territory of all ECOWAS member states. However, the preparatory work carried out, starting in 2002, indicated that some national regulatory agencies had certain apprehensions with respect to potential overlaps with their own authority in national jurisdictions. Therefore, WAPP took special care to avoid such duplication of regulatory attributions at the regional and national levels.

In particular, Article 23 on regulatory matters of the WAPP Articles of Agreement states that “Nothing in the formation or operation of WAPP Organisation under the auspices of the ECOWAS Energy Protocol is in any way intended to diminish existing regulatory jurisdiction and authority of

³¹ Articles of Agreement of the West Africa Power Pool. Organisation and Functions. Accra 2005.

³² Capacity Building Program Initiative (CBPI) Strategy Document. Nexant, July 2008.

³³ WAPP Capacity Building Programme for 2012. WAPP Secretariat. October 2011.

³⁴ Supplementary Act Establishing the ECOWAS Regional Regulatory Electricity Authority. Ouagadougou, 18 January 2008.

the Agencies of ECOWAS member states or the Regional Regulatory Development Office to be established pursuant to A/DEC.6/01/05 of the Heads of States and Government of ECOWAS. Regulatory bodies of each ECOWAS member state expressly reserve the right to exercise all lawful means available to protect their existing jurisdiction and authority.”

Thus, ERERA commenced operation in June 2008 with the following specific attributions:

- Regulation of cross-border interconnections and trading, including non-discriminatory access;
- Establishment of transparent transmission tariff setting principles and methodology
- Technical regulation;
- Monitoring regional market operations;
- Dispute resolution;
- Capacity building for national regulators.

The ECOWAS Regional Centre for Renewable Energy and Energy Efficiency was established by the ECOWAS Commission in Praia, Cape Verde in 2009 and commenced operations in July 2010 with a public mandate to promote sustainable development in West Africa by creating and enabling environment and framework conditions for renewable energy and energy efficiency markets by supporting activities directed towards mitigating existing barriers.

The ECREEE vision and mission are in line with the energy policy decisions of ECOWAS. The establishment of ECREEE reflects the increased drive towards regional approaches in addressing the region’s development challenges.

In the area of capacity development the Centre carries out the following activities, among others:

- Execution of a regional capacity needs assessment and formulation of a capacity development programme for different sectors and technologies.
- Provision of tailored trainings for different market enablers by using the added value of regional inter-exchange and train-the-trainer approaches.

ECREEE’s activities and training programmes are financed through funds allocated to ECREEE under the MOU between ECOWAS and the Governments of Spain, Austria, as well as, from UNIDO.

Since commencing operations in 2010, ECREEE has trained more than 742 experts (140 in 2011 and 602 in 2012) from different target groups (technical experts, policy makers, financiers) on various issues (e.g. incentive and policy schemes, small scale hydro power and gender issues).

Moreover, the Agency applied a more sustainable train-the-trainer approach, as in the case of a highly successful RETScreen Clean Energy Project Analysis Software supported in all fifteen ECOWAS countries. The national training courses aim at strengthening the local capacities on financial structuring and appraisal of renewable energy (RE) and energy efficiency investment projects.

Building on the success of RETScreen, ECREEE is preparing a new train-the-trainer programme to support dissemination of the HOMER energy modelling software, which is a powerful tool for designing and analysing hybrid power systems, which contain a mix of conventional generators, combined heat and power, wind turbines, solar photovoltaic, batteries, fuel cells, hydropower, biomass and other inputs.

For either grid-tied or off-grid environments, HOMER helps determine how variable resources such as wind and solar can be optimally integrated into hybrid systems. The software is currently used all over the world.

The tuition fees and all other logistical costs are covered by ECREEE. In return, the participants are required to pass an on-line exam and have to organise a national training course in their respective institutions within a period of one year after the training in Praia.

Overall, the ECREEE activity can be considered as successful in West Africa due to support from ECOWAS and interest from national beneficiary institutions. However, the implementers also cite difficulties with measuring the actual impact of the programme on the RE&EE development in West Africa.

As part of its Strategy for West Africa, the Bank plans to support the capacity building efforts in RE³⁵ in collaboration with ECREEE, to enhance the utilisation of renewable, clean and sustainable energy for the region.

³⁵ Regional Strategy Paper for West Africa 2011 – 2015. African Development Bank, March 2011.

3.4.3 East Africa

Electricity Sources and Consumption

Within the East Africa region, thermal power accounts for over 80% of the total generation capacity, hydro 17%, about 2% comes from non-hydro RE resources, such as geothermal and wind, and roughly 1% is isolated generation. According to a UNEP Report, “the only sub-Saharan African Country where electricity generation from renewable non-hydro energy sources has played a significant role over the last decade is Kenya.”³⁶

With the exception of Djibouti and Ethiopia which have electricity access rates of 41% each, 30% for Sudan and 20% for Kenya, the other regional countries have access rates ranging between 14% and 2.3%.³⁷

Regional Market Integrator

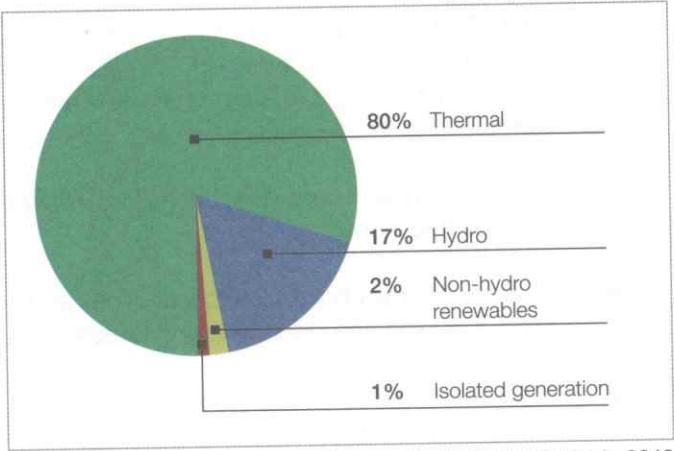
The **Eastern Africa Power Pool (EAPP)** is an inter-governmental body based in Addis Ababa, Ethiopia with the mission of pooling of electrical energy resources in a coordinated and optimised manner to provide affordable, sustainable and reliable electricity in the region.

EAPP is the newest power pool in SSA that was created by COMESA in 2006 to drive the provision of electrical energy in the region. Currently, the EAPP has 12 members from Burundi, DRC, Egypt, Ethiopia, Kenya (3), Libya, Rwanda, Sudan, Tanzania and also SINELAC – the operator of the tripartite generation facility. Other East African countries yet to join are Djibouti, Eritrea and Uganda.

The EAPP area has a population of 310 million people, a gross domestic product of approximately \$127 billion, and an electricity demand of approximately 100,000 GWh. The total installed generation capacity at the beginning 2012 was estimated at 36,436 MW.³⁸

EAPP’s objective is “to make available for the Eastern Africa Region affordable and reliable electricity, by pooling together all available electrical energy resources in the region in an optimised and coordinated manner, in order to increase the access rate to electricity by the population of the region and thereby promote regional integration

Figure 4
Generation mix in East Africa



Source: Draft Energy Outlook, 2040

The EAPP aims to:

- Create a conducive environment for energy investment;
- Ensure optimisation of energy resources within the sub-region, by coordinating regional investment in electricity generation, transmission and distribution;
- Use power systems interconnection and power exchanges to reduce electricity cost;
- Provide effective and efficient coordination between various initiatives in the areas of power production, transmission as well as power exchanges.

Regional regulator

As part of the existing EAPP structure, an **Independent Regulatory Board (IRB)** has been created to regulate international power trading. The IRB reports to the regional Conference of Ministers for Electricity and derives its authority from the Inter-governmental MOU. It is responsible for the design of the regional market rules and grid codes, as well as monitoring, enforcing and ensuring adherence to the rules. It will also arbitrate in disputes and set regulated tariffs required for cross border trading.

³⁶ UNEP Report, Financing Renewable Energy in Developing Countries, Switzerland, Geneva, February, 2012, P. 22.
³⁷ EAPP - Final Master Plan, SNC Lavallin and Brinckerhoff, May 2011.
³⁸ EAPP/EAC Regional Power System Master Plan & Grid Code Study. SNC Lavallin International and Parsons Brinckerhof, 2012. May 2011. P.ES-8.

Given the relatively limited experience in regulation of regional markets, IRB personnel and their constituents will require significant training in the field of international electricity markets oversight, tariff setting, quality of service, dispute resolution and other related matters.

During the data collection process, national regulatory authorities in some member states expressed a wish to be associated with the capacity building to be provided to the IRB in order to achieve better synergy between regional and national regulatory frameworks.

In the region, there also exists an association for regulators called the **Energy Regulators Association of East Africa (EREA)** established in 2008 to contribute to harmonisation of energy regulatory frameworks within the East African Region.

Other market integrators in East Africa

Eastern Africa is said to have the largest number of RECs and intergovernmental regional bodies in Africa.³⁹ Likewise in the energy sector there are also several overlapping institutional arrangements. Two notable institutions that are responsible for driving regional energy policy and energy infrastructure development are the Nile Basin Initiative (NBI), based in Entebbe, Uganda, and the East African Community (EAC) Secretariat, headquartered in Arusha, Tanzania.

Having drawn lessons from the preparation of a Regional Power Master Plan jointly for the EAPP and the EAC (completed with AfDB funding in 2011), the **East African Community (EAC)** decided that it would need a separate Master Plan (and grid code) to avoid potential complications during implementation. The EAC also unveiled plans to establish the **East African Community Power Pool (EACPP)** under its auspices as well as for the establishment of a centre for renewable energy and energy efficiency. The Austrian Government has committed one million euros towards the establishment of the centre and the feasibility study and project documents are said to be complete.⁴⁰

A capacity assessment of the EAC Secretariat's ability to implement the EAC Strategy on Scaling Up Access to Modern Energy Services (adopted in 2006) was completed in March 2012.⁴¹ It made several findings as follows:

The assessment makes several recommendations that include:

- The establishment of an information system with data on EAC energy access, projects, actors, financing sources, best practices etc.
- Identification and prioritization of policy harmonization needs (at regional and national levels), followed by the development and implementation of an action plan

Indicator	Findings
Sector developments and activities	<ul style="list-style-type: none"> • very high number and diversity of ongoing activities across the region • increasing private sector participation, great variation between countries • lack of access to financing for end-users and entrepreneurs
Capacity development and training	<ul style="list-style-type: none"> • technical capacity constraints with large variation across countries and sub-sectors, including inadequate qualified and capable project developers • training and capacity development opportunities are insufficient
Institutions and Policy Frameworks	<ul style="list-style-type: none"> • improved but largely insufficient institutional capacity in public bodies • improved but still inadequate policy and regulatory frameworks • policies and frameworks are not yet harmonized well across the region
Information and Communication	<ul style="list-style-type: none"> • severe lack of information and data, e.g. statistical data, but also information on stakeholders and their activities • low level of communication and exchange between the stakeholders
Awareness / relevance of the Strategy	<ul style="list-style-type: none"> • low awareness about the Strategy • lack of linkage between impacts achieved and Strategy

³⁹ Eastern Africa. Regional Integration Strategy Paper 2011 – 2015. AfDB. October 2010.

⁴⁰ See www.eac.int

⁴¹ See Final Report. EAC Secretariat Capacity Assessment: Effective and Efficient Delivery of Support towards the Implementation of the EAC Strategy on Scaling Up Access to Modern Energy Services (March 2012). Available online at <http://www.eac.int>

- Identification and mobilization of relevant institutions to drive the implementation of capacity development; and
- Mainstreaming climate issues by identifying synergies between climate change mitigation, adaptation activities and promotion of energy access.

The Nile Basin Initiative (NBI) was set up in 1999 to support the integrated water resource management among the member countries. The NBI's two flagship investment programs in energy are the Nile Equatorial Lakes Subsidiary Action Program (NELSAP), and the Eastern Nile Subsidiary Action Program (ENSAP) – which are critical for “strengthening transboundary planning, coordinating the construction of the regional transmission grid, and encouraging further integration of the regulatory and supervisory framework”.

One of the major achievements of the NBI in the electricity sector was successful promotion and completion of the Nile Basin Regional Power Trade Project (RPTP), which was a capacity building programme that allowed over 600 delegates from NBI member countries and other regional institutions to benefit from training seminars, study tours and workshops.⁴²

The RPTP was funded from the NBI Trust Fund managed by the World Bank on behalf of the Bank and the other main contributors being the NBI member countries, Sweden and Norway. This project is unique in the sense that it went through both needs assessment and implementation phases.

Some very important lessons can be learnt from the RPTP implementation experience. First, the RPTP achieved significant results because the preparation was recipient-driven and tailored to meet the real capacity development needs of stakeholders. Wide stakeholder participation in CB areas was organised with stakeholders proposing over 30 specialised areas for CB. The following topics were suggested most frequently:

- Market design,
- Tariff design and,
- Power sector regulation.

Second, the implementers funded participation of two delegates per country (with some exceptions for fragile countries). Yet, the countries sent more delegates to be trained at the sender's expense and causing significant competition for available training places among stakeholders. This highlights the fact that the lack of funding is often not the most critical reason for failing to implement capacity building, and that the stakeholders are prepared to fund their personnel provided they feel the CB activities bring solution to real issues.

Going forward, the NBI recognizes that it would need to enhance its human and institutional capacity in areas such as project planning and management, hydropower project preparation, transmission and substation design. It would also need to build the necessary capacity in areas related to utility regulation, regulatory economics and PPA design.

Thirdly, the RPTP was initially conceptualised as a Centre of Excellence that would assume responsibility for capacity building in the NBI power sector. However, by the time the programme was designed, it was realised that it would be simpler to ensure the programme implementation by a rigorous management team put in place for the purpose. The Centre of Excellence was put on hold owing to the following considerations:

- the urgent nature of the capacity needs to be addressed by the RPTP.
- Uncertainty whether the Centre of Excellence would be able to assure its financial sustainability or it would remain dependent on donor funding over the long-term.
- Uncertainty whether the stakeholders were prepared to assimilate the Centre of Excellence as their common CB mechanism.
- Lack of experience in support of Centre of Excellence concept elsewhere in Africa.

The NBI Secretariat has recently approached the Bank with a proposal to develop the Centre of Excellence concept – and this is incorporated in the PoSSIP design.

⁴² NBI. Regional Power Trade Project – Phase II Project Completion Report. July 2009 – December 2011. Dar es Salaam, Tanzania, December 2011.

In conclusion, it could be pointed out that notwithstanding the somewhat overlapping institutional landscape of the regional energy sector in East Africa, one issue common to all the stakeholders involved in the development of the regional market is that they all have significant capacity development needs.

The AfDB is aware that the energy sector in East Africa requires significant capacity building to prepare for the future. A Strategic Framework for Capacity Development (SFCD) of regional integration institutions is under preparation to target such soft issues, as “reforming and harmonising policies, regulations, tariffs and grid codes in order to facilitate regional integration and thereby attract investment to the development of the sector”.

For the energy infrastructure, “the focus will be on skills development in the areas of policy and regulations, project planning and formulation, PPP and IPP arrangements, negotiation related to cross-border projects, tariff formulation and Power Purchase Agreement (PPA), best practices in operation and maintenance of energy facilities and project management.”⁴³

3.4.4 Central Africa

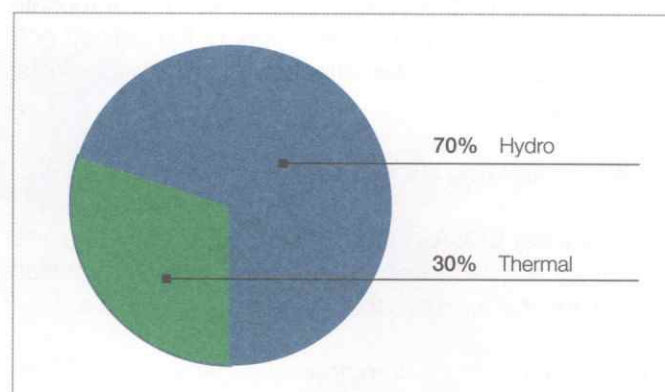
Electricity Sources and Consumption

Compared to other regional power systems, the Central African region possesses the largest share of hydro power in its generation mix, due to hydroelectric schemes in Cameroon and the Democratic Republic of Congo (DRC). Currently, hydropower accounts for about 69.3% with thermal contributing 29.7%. The current contribution from other renewable energy resources is negligible.⁴⁴ In terms of installed capacity, three countries namely the DRC, Cameroon and Angola account for over 83%.

Average electricity access rates within the region are generally low and estimated to be 11%. Electricity consumption per capita varies from 1,325 kWh for Gabon, 532 kWh for Equatorial Guinea, 210 kWh for Cameroon and 9 kWh for Chad.

The region has two economic communities: ECCAS and CEMAC with “mutually consistent and complementary” visions.⁴⁵ With CEMAC being primarily a monetary union,

Figure 5
Generation mix in Central Africa



Source: Draft Energy Outlook, 2040

electricity sector integration is conducted under the auspices of the **Economic Community of Central African States (ECCAS)**, constituted in 1983 and currently comprising of 10 member states: Angola, Burundi, Cameroon, Chad, Congo, Gabon, Equatorial Guinea, Central African Republic, Democratic Republic of Congo and São Tomé.

The ECCAS Treaty imposes cooperation in energy and the exploitation of natural resources among its member states, particularly in the development of hydropower resources.

Regional Market Integrator

Established in April 2003, the **Central Africa Power Pool (CAPP)** brings together members with combined hydroelectric potential of about 144,000 MW.

CAPP has a mandate to contribute to the establishment of a regional electricity market that meets the electricity needs of its industries and populations, while ensuring a reliable supply of affordable electricity to support economic and social development and respecting the environmental concerns. CAPP's objectives include:

- Increasing the reliability of electricity supply amongst ECCAS member countries;
- Expanding the population's access to electricity and reducing poverty;
- Improving the performance and supply quality of electricity systems in the region;

⁴³ Idem. P. 21 - 23.

⁴⁴ Regional Power Status in African Power Pools, ICA, November 2011.

⁴⁵ Central Africa. Regional Strategy Paper 2011 – 2015. African Development Bank, February 2011.

- Creating a regional forum for discussion of energy sector problems and searching for appropriate solutions within the framework of the defined policies and with due attention to the environmental impacts;
- Establishing a liberalised energy marketplace.

CAPP is a key ECCAS institution for achieving the regional market agenda. However, the institution suffers from limited human and institutional capacity.

There is a need to strengthen the capacity of CAPP, including those of the member countries in the electricity sector areas of cross-border and regional electricity trading.

The AfDB recognises that Central Africa is characterised by fragile political stability and very weak governance. It affirms that “building the capacity of regional institutions is essential, particularly to coordinate the management of infrastructure”.⁴⁶

It is expected that effective human and institutional capacity building under the current CB project will be a catalyst for the regional electricity market integration agenda, and will help to consolidate the ownership of projects at both regional and member states levels. CB will also facilitate the implementation of regional electricity infrastructure plans.

3.5 Role of pan-African institutions

There are a number of institutions contributing to regional integration in energy with a continental span in Africa. They play a significant role in advancing the common standards, concepts and disseminating know-how in specific areas. These agencies are AFUR, AFREC and UPDEA (now APUA). In this section we provide a brief snap-shot of these agencies, which will also play a key role in the implementation of the CB programme.

3.5.1 AFUR

The African Forum for Utility Regulation (AFUR) is based in Pretoria, South Africa. It was established in November 2002, with its vision and objectives derived mainly from Clause 110 of the NEPAD Framework Document. AFUR's establishment was further supported in the declaration of the First Conference of African Ministers responsible for Electrical Energy, held in Addis Ababa, Ethiopia, from 20-24 March 2006.

AFUR's establishment was driven by the need for a pan-African regulatory body that could support the development of effective utility regulation through facilitating harmonisation of regulatory policies, information exchange and experience-sharing among regulators. AFUR was also expected to provide capacity building support for regulators in Africa to enhance the socio-economic development of the continent.

AFUR's membership comprises of utility regulators from all the sub-regions of the continent. As part of its capacity building efforts, AFUR has, since its inception, sought to enhance the capacity of its members through workshops, conferences, lectures on various topics such as: utility regulation, regulatory economics and tariff design, renewable energy, energy efficiency, public-private partnerships, power pools and cross-border trading, among others. AFUR has also undertaken a number of technical studies to assist the national regulators in their decision making processes.

Going forward, the strategic position of AFUR as a pan-African regulatory agency can be leveraged to provide training to African regulators and utility companies which belong to SAPP, WAPP, EAPP and CAPP in various specialised topics.

⁴⁶ Central Africa. Regional Strategy Paper 2011 – 2015. African Development Bank, February 2011. P. iv.



3.5.2. AFSEC

Also based in Pretoria, South Africa, the **African Electrotechnical Standardization Commission** was founded as a result of a collaborative effort among stakeholders since 2005, underpinned by a declaration of the Conference of African Ministers of Energy held in Algiers in February 2008.

In the field of electricity, electronics and related technologies, the AFSEC is responsible for harmonising existing standards, through either the adoption of international standards; or where necessary their adaptation to African conditions.

3.5.3 UPDEA (APUA)

Headquartered in Abidjan, Côte d'Ivoire, the **Union of Producers, Transporters and Distributors of Electric Power in Africa** is a non-profit pan-African organisation which was established in 1970 to promote the growth and integration of Africa's power sector. At the 46th General Assembly of UPDEA held in Alger, Algeria, on 3 - 5 December 2012, the Union's role and positioning with respect to its members and African power pools were revised leading to its renaming as the **Association of Power Utilities of Africa (APUA)**.

UPDEA is a permanent member of the Executive Council of the African Energy Commission (AFREC). It has partnership agreements with the AfDB, the United Nations Commission for Africa (UNECA), the African Union Commission (AUC), NEPAD, COMELEC, WAPP, SAPP and EAPP.

UPDEA's main goal is to serve as a catalyst towards enhancing electricity accessibility on the African continent. In line with its objectives, UPDEA has over the years been involved in building capacity of its members through training seminars, workshops, conferences and study tours. It has also undertaken a number of technical studies in areas of power system operations and utility sector regulation and tariff reforms to assist its members.

In the past, the UPDEA/APUA provided a valuable example of an educational project for African electricity industry through the establishment of bilingual (English/French) "Inter-African Electrical Engineer College" (IEEC) in Bingerville (Côte d'Ivoire) in 1979. The college trained more than 250 engineers from a number of African countries in network planning and operation (generation, transmission, and distribution) during the period between its inception and year 2001. Most of the graduates are currently holding significant posts within their utilities.

Currently, UPDEA is involved in a study to define and measure an African system for training in electricity trading, based on the concept of Regional Centres of Excellence, which is being undertaken with financing from the French Development Agency (AFD) and the Bank. When completed, skill training is expected to cover areas related to power generation, transmission and distribution, customer management and general management. The Centres are also expected to provide specialised training in renewable energy and energy efficiency.⁴⁷

The Centres future core activities on training will be focused on technical aspects related to electrical installations operation and maintenance, while the UPDEA management would like to include a wider spectrum of subjects ranging from tariff design, utility management, quality of service to institutional design of electricity utility companies and power pools.

3.6 Overview of the capacity status of SSA regional power markets stakeholders

Synthetic overview of capacity status of regional power markets stakeholder in sub-Saharan Africa is provided in the tabular format overleaf.

3.7 Concluding remarks

Capacity building is urgently required to prepare for the future as many multinational energy infrastructure projects are taking shape, especially since they will transform the landscape of the electricity sector in SSA. In the current situation, it is difficult for the electricity sector authorities, electricity utilities and other stakeholders of African countries to adequately plan for the future needs of the electricity sector, as they sometimes work in challenging and constrained institutional environments. Regional integration naturally

introduces a capacity building element into the development process. Therefore, it is useful to think of capacity development for African power sector in terms of what is required to ensure successful establishment of regional electricity markets, as well as, what prevents the stakeholders from actively developing international electricity trading.

The integration of the power sector requires specific and targeted capacity building measures driven by regional organisations in the electricity industry. The establishment of power pools and regional regulatory bodies has helped to promote regional capacity building exercises (though sometimes costly) as the pool members learn to work together and understand each other - sometimes despite differences in language, political views and culture.

The regional power markets of SSA are in different phases of transition. They are dominated by bilateral exchanges, and given the slow pace of introduction of competitive practices they are bound to remain hybrid markets for some time. Building capacity in the field of power trading is one of the ways of facilitating the transition towards competitive markets, as is evident in the case of SAPP.

Proactive capacity building in support of regional integration of the power sector targeting very specific skills is critical. Many countries in SSA have embarked on various types of sector reforms in order to boost performance and sustainability. Paradoxically, it appears that the more radical the change or intensive investment in infrastructure, the more capacity development is required to obtain skills necessary to manage the new market situation, especially when reforms are coupled with operations within a larger regional market and involve the entry of private players.

Therefore, stakeholders such as power pools, individual operators, planning and regulatory authorities both at regional and national levels must be involved with in the capacity building process. Pan-African institutions in electricity play a significant role in development of new skills; and in turn they need support to continue their contribution.

⁴⁷ Terms of Reference for Selection of a Consultant to support UPDEA in defining and sizing a network of Regional Centres of Excellence, Providing Training in Electrical Trades", UPDEA, 2012, P. 6.

Table 1
Capacity Status of SSA Regional Power Markets Stakeholders

Regional Market	Market Stakeholders	Capacity Status
Southern Africa	SAPP and 16 Member Utilities RERA SADC	<ul style="list-style-type: none"> SADC Infrastructure Vision 2027 and Regional Infrastructure Development Master Plan (RIDMP) identifies electricity generation projects costing between US\$114 billion to US\$233 billion between 2012 and 2027, with related transmission investment costs (starting with 11 priority lines) to support new generation estimated at US\$540 million. There is a need to strengthen SADC Secretariat capacity on energy issues (only 2 staff). SAPP is the most advanced power pool that achieved significant progress in certain technical areas and in the field of environmental management. SAPP is experiencing problems in some technical areas especially with introduction of competitive market arrangements with capacity building required to reinforce this effort. Regional regulation is non-existent. RERA provides a forum for national regulators, but requires a strengthened mandate. RERA has a track record for implementing CB in Southern Africa with support from USAID.
West Africa	WAPP and 20 Member Utilities ERERA ECREEE ECOWAS WAEMU River Basin Authorities	<ul style="list-style-type: none"> WAPP achieved progress in preparation of regional infrastructure projects using resources available in-region and makes an exemplary effort in coordinating donors' support. Power pool's capacity building requirements are defined but need an update. The regional regulator is not very well known and/or visible in the region and not yet capable of providing CB to national regulators as it is supposed to do. ECOWAS and WAEMU each have a department running energy programmes. River basin authorities are taking a long time to promote their hydroelectric schemes due to lack of competent resources.
Central Africa	CAPP and 11 Member Utilities ECCAS CEMAC	<ul style="list-style-type: none"> Central Africa is characterised by overall weak governance, with capacity being a binding constraint in achieving the targets across ministries and agencies. CAPP Permanent Secretariat is in need of technical assistance, through studies and consultancies in specific areas. ECCAS is set to receive assistance from the AfDB to build capacity under a separate project. Many countries are in the early stages of the process to reform their national electricity sector with very little capacity to manage and regulate the new arrangements.
East Africa	EAPP and 12 Member Utilities IRB EREA COMESA EACPP EAC NELSAP NBI	<ul style="list-style-type: none"> Regional institutional landscape involves various institutions requiring capacity support – creating some degree of overlapping needs. EAPP has a clear vision of its capacity needs for the near future and a well defined implementation plan. IRB is not yet functional and is in need of initial capacity development. EREA can be viewed as resources for CB implementation purposes. National regulatory authorities desire to be part of a CB process for regional regulation. EACPP does not exist yet and when established, it would need initial capacity building. EAC Members are generally benefiting from CB under EAPP and NBI frameworks. NBI/NELSAP possess useful experience of successfully completing a capacity building programme for their members over the period of 6 and a half years and also in supporting infrastructure development.
Pan-African Institutions	AFREC AFUR UPDEA	<ul style="list-style-type: none"> The three pan-African organisations are capacity providers in their own right, with significant influence in their respective technical areas. The pan-African organisations in energy should be viewed as parallel CB implementers and synergies should be exploited with their respective programmes. The CB projects of pan-African organisations present opportunities for synergies of effort with the CB programmed envisaged under this study.

This section focuses on the programmes, projects, individual activities, and other examples of capacity development viewed as common issues that are cross-cutting and valid for all regional power markets in SSA. The section documents the most important capacity gaps and needs in the sub-Saharan power sector.

4.1 Commercial CB in SSA power sector

Private market participants who are driven by the need to develop their own market niche offer some capacity building in the energy sector in general and the electricity sector in particular. One example is an Ethiopian-Dutch joint venture company SolarMan selling “adequate and sustainable solar energy technological solutions”.

In order to boost demand in its products, the company “provides the public with awareness creation on solar energy and offers training for those who have technical backgrounds in electricity. In addition, it offers business development ideas for the trainees throughout the country using its centres. Thus trainees are able to assemble solar energy equipment, including solar batteries, regulator, lamps and DC with inverter used for Church and Mosque amplifiers.”⁴⁸

It can be argued that the CB provided by commercial operators is relatively efficient, as it provides value for money while targeting individual end-users and resellers of equipment and technological solutions. However, as the electricity supply is a public service, and commercial CB is not sufficient to cover the needs of the electricity supply industry at large.

4.2 Examples of capacity building at national level

The lack of human professional capacity to manage the issues of the power sector translates into failure to realise important reforms. For example, in Angola the insufficiency of the human resources skills have increased the risks of project delay, lack of synchronisation and redundancy among current investments.⁴⁹

Thus, in addition to the traditional approach of reorganising the sector's structure, investing more money and welcoming foreign players, the country also needs to build up its human resources. Angola's Ministry of Energy has partnered with Agostinho Neto University to train specialists in pertinent technical and legal areas.

The same approach is used, or at least conceptualised, in Ethiopia, Rwanda, Cape Verde and other countries. In these countries the authorities in charge of energy sector have variously commissioned capacity assessments and action plans for national energy sector to introduce required competences within the Ministry, regulatory authority, utility company and other stakeholders.

“Capacity building...cannot be achieved only through short-term training of local staff. Sustained institutional capacity building measures are required. Training in sector planning, PPP structuring, tariff monitoring, generation resources, system distribution, etc, will require years of training at the post-graduate level”.

*(The Electricity Sector Development Strategy
2011-2017 of the Republic of Rwanda)*

Rwanda, with assistance from the Belgian Technical Cooperation finalised, in 2011, a capacity needs assessment of its energy sector and is planning to develop a national energy sector capacity building master plan with a specific focus on electricity sub-sector needs.

The objective of the Rwandan CB Master Plan is to support the implementation of activities in the Energy and Power Sector in order to reduce the barriers to investment and economic growth.

The capacity building project is meant to address shortfalls in expertise in the Energy Sector in Rwanda, not only in the Ministry itself but also in the utility regulating agency, Rwanda Utilities Regulatory Agency (RURA), the energy utility and project development agency, the Energy Water and Sanitation Authority (EWSA) and the private sector.

⁴⁸ “Solar Energy for Households.” The Ethiopian Herald, Saturday, 20 October 2012, p. 8.

⁴⁹ The National Energy Security Strategy and Policy. Republic of Angola. Ministry of Energy and Water. 2011. P. 16.

In Cape Verde, the Luxembourg Cooperation is supporting the establishment of the Training Centre for Renewable Energy (wind and solar sources) and Industrial Maintenance (refrigeration systems, water distribution networks etc). The Centre, to be created at the request of the Government of Cape Verde, will facilitate training of specialists for the island's electricity sector (initial qualification) and provide continued professional training. Construction work on the building to house the training centre is underway and commissioning is planned for January 2014.

Indicatively, the cost of CB for trainers' recruitment and initial training is estimated at just below 50% of the costs related to construction and equipment procurement, at a ratio of €3.0m / €6.3m respectively. The centre encourages cooperation with various stakeholders as it might not have enough students to enrol in the courses on offer. It is also hoped that the ECOWAS Agency for Renewable Energy & Energy Efficiency, based in Praia, will also use the Centre's facilities to organise its training sessions.

In Ethiopia, a special CB effort is planned within the framework of the Government's programme for the development of hydropower resources to bring the installed capacity to 10,000 MW within the framework of the five-year Growth and Transformation Plan. Under the envisaged programme, eight local universities were nominated to carry out post graduate programmes by having twinning arrangements with foreign universities, which have track records in hydro-power engineering to produce MSc and PhD degrees in hydropower.

Among proposed CB features the following notable indicators:

- Establishment of a cooperative framework between the national electricity institutions and educational / training institutions to establish educational programmes that support the energy sector mandate.
- Recruitment of international experts in specific fields (energy sector planning, transaction advisors for PPA and IPP projects, project structuring for electricity sector etc) to train the local staff on site.

- Ensuring that existing staff gain the necessary skills and experience through training and work placements inside or outside their country of residence.
- Introduction of measures for retention of capacity in the sector.

It must be stressed that such programmes are ambitious and require significant management effort. Financing is an issue and implementation depends partially on donor funding, which is not easy to obtain for comprehensive capacity development of this nature. So far, such integrated approaches, even though very commendable, are quite new and none of the national CB programmes in energy have been completed.

On the operational side, for example, KEPCO, a recent TSO formation in Kenya, is in charge of all new transmission in the country. The company is in need of dispatcher training and proper certification.

In the DRC capacity building is required to advance preparation of the famous power highways of Africa based on the potential of the Inga Dams along the Congo River. The total value of the infrastructure projects exceeds US\$8 billion, with the capacity building element estimated at over US\$100 million.⁵⁰ There is renewed optimism based on an agreement reached in March 2013, in terms of which South Africa hopes to secure 2,500 megawatts from the first phase of the Inga project.⁵¹ Limited capacity on the DRC side is said to be a contributing factor to delays in the Inga project.

On the regulatory side, even though nominally independent regulatory authorities are already in place in some African countries, this alone may not be sufficient to achieve the desired improvement. Regulatory bodies need to co-exist with other market reform variables such as private sector participation and competition, among others. Most regulatory agencies in Africa are still developing their capacity and competency due to non-availability of key skills and experience. It is, therefore, imperative that the capacities of key professional staff in regulatory agencies be enhanced.⁵²

⁵⁰ *Amélioration de la desserte en eau potable et en électricité 2012 – 2016. Besoins financiers pour le renforcement des capacités du Ministère, les études et la réalisation de projets du programme 2012 – 2016. République Démocratique du Congo. Kinshasa, octobre 2012.*

⁵¹ http://www.businessweek.com/news/2013-03-08/south-Africa-secures-energy-promise-from-congo-s-inga-dam#rshare=email_article

⁵² *Econometric Assessment of the Impact of Power Sector Reforms in Africa: A Study of the Generation, Transmission and Distribution Sectors of the Power Sector*, Gbone, W., City University, London, UK, 2009

A 2010 study conducted for the World Bank and AFUR to assess the performance of regulators in Africa, found that “No regulatory agency has been able to achieve the standard Independent Regulatory Model”⁵³. This finding is corroborated by the results of the African Infrastructure Country Diagnostic (AICD) study, which stated that “Africa’s institutional framework for infrastructure is no more than half way along the path to best-practice”⁵⁴.

In addition, new regulatory attributions arise due to the reform process, as in Ethiopia, where the new electricity sector set-up entrusts the existing regulator - Ethiopian Electricity Agency - with performing a dispute resolution function. Yet, the regulator has no experience in dispute resolution and needs critical training in the field. Regional cooperation in the electricity sector offers a real chance for boosting capacity development for all stakeholders.

⁵³ Overview of Africa’s Infrastructure and Regulatory Frameworks, Report for AFUR and the World Bank, 2010, Gboney, W., P.7.

⁵⁴ Foster, V. and Garmendia-Briceno, C. Africa’s Infrastructure: A Time for Transformation, A Flagship Report Prepared for Africa Infrastructure Country Diagnostic, World Bank 2009.

4.3 Capacity building at regional level

As mentioned previously, capacity building becomes important when pooling resources on a regional basis. For this reason, a number of regional institutions have already

managed to carry out assessments of their CB needs, develop implementation plans, and (albeit rarely), implement them to induce market integration.

The CB programmes all have different preparation and implementation status, as reviewed in the table that follows.

Table 2
Overview of Existing and Planned CB Regional Assessments and Programmes in SSA

Institution	Name of CB Programme and Duration	Year Prepared	Total Est. Value	Target Areas	Suggested Method	Status
SOUTHERN AFRICA						
SAPP	Capacity Building Requirements on Market Issues 1 year	2012	\$0.92 million	Accelerate transformation from cooperative to a competitive power tool Introduce the upgraded DAM trading platform to SAPP traders	Trainings and a study tour for SAPP member utility traders: <ul style="list-style-type: none"> • Electricity pricing and bidding strategy • Traders course on Day-Ahead Market (DAM) • Overview of electricity markets • Balancing markets • Financial markets • Transmission and ancillary services access 	Funding sought
RERA Regional Market Southern Africa	Peer Review of Regulatory Performance: On-going	2010	\$1.55	Regulatory Competence and Capacity	<ul style="list-style-type: none"> • Review performance of regulators in Southern Africa to recommend actions to enhance regulatory practice 	Funding sought
	Develop Technical Standards and Norms: On-going	2010	\$0.65	Technical standards Quality of Service	Technical Standards and Norms in: <ul style="list-style-type: none"> • Grid Code • Quality of Service • Safety Code • Energy Efficiency Practice • Off-grid codes of practice 	Funding sought
	Best Practice legal & Regulatory Framework: On going	2010	\$0.23	Enhance legal and regulatory frameworks Enhance legislation	Best Practice Legal and Regulatory Framework with respect to: <ul style="list-style-type: none"> • Model Law • Enhanced regulatory Legislation 	

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Table 2 (continued)

Overview of Existing and Planned CB Regional Assessments and Programmes in SSA

Institution	Name of CB Programme and Duration	Year Prepared	Total Est. Value	Target Areas	Suggested Method	Status
WEST AFRICA						
WAPP	Capacity Building Programme Initiative (CBPI) 5 years	2008	\$23 million	WAPP Governance Regulatory Framework WAPP Operationalisation (System Operations) Financing Environment Overall Programme	Mostly workshops and training courses on: <ul style="list-style-type: none"> • Advocacy • Project Development • Tariffs • PPP / PPA • Regional markets / codes / interconnection standards • Power pool operations • Transaction/dispatch 	Not followed with implementation and requiring an update.
ECREEE	Capacity Building Needs Assessment and Action Plan in Support of the ECREEE Development Strategy Unlimited	2012	N/A	<ul style="list-style-type: none"> • Build capacity of market enablers and players to implement RE/EE programs in the ECOWAS Region. • Share knowledge and information on good (and poor) practices in RE/EE. • Promote research in RE/EE technologies and services in Members states. • Enhance technology transfer through linkage programs with other universities, research institutions/centres. 	<ul style="list-style-type: none"> • Action planned recommends introduction of Masters Degree in hydropower technology, solar, wind and biomass energy and Bachelor Degree in Biomass processing; Electric motors; Wind turbines; General electricity; LV in building and/or industry. • Short-term training courses in specific RE/EE subjects are already being implemented by the Centre in-region on a regular basis. 	<p>Implementation aspects are not fully developed in the CB Action Plan.</p> <p>Since 2010, ECREEE has trained more than 742 experts (140 in 2011 and 602 in 2012) on various issues.</p>

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Table 2 (continued)
Overview of Existing and Planned CB Regional Assessments and Programmes in SSA

Institution	Name of CB Programme and Duration	Year Prepared	Total Est. Value	Target Areas	Suggested Method	Status
WEST AFRICA						
ERERA	Strategic Regional Plan for Capacity Building Strategic Plan 2013 – 2017 and regional scheme for CB 5 years Under development	2013	N/A	Regional regulation issues for ERERA, National Ministries and Regulators	Mostly workshops and training courses on a wide range of subjects: <ul style="list-style-type: none"> • Regulatory governance • Electricity sector reform • Tariff setting and rate design • Aggregate technical and commercial losses • Trading and financial settlement • Electricity market rules • Licensing • Dispute resolution • DSM and EE / RE • Role of Access to networks and dispatch • Consumer protection • Economic of competitive markets • Power project finance 	ERERA requested (from the AfDB) the following training (number of participants indicated in brackets): a. Basic regulatory principles (200) b. Role of regulation in reforms of national markets and regional exchanges (600) c. Regional exchanges tariffs (200) d. Cross-border contractual arrangements (200) e. Dispute resolution & regulatory hearings (200)

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Table 2 (continued)

Overview of Existing and Planned CB Regional Assessments and Programmes in SSA

Institution	Name of CB Programme and Duration	Year Prepared	Total Est. Value	Target Areas	Suggested Method	Status
CENTRAL AFRICA						
CAPP	No specific CB programme announced	N/A	N/A	CAPP formulated a request to AfDB for training activities for a total of 1,550 regional experts in the areas indicated to the right	a. O&M or generation and transmission installations (300 experts over 5 years. b. Legal and institutional aspects of interconnected networks. c. Renewable energy / Energy efficiency d. IT and energy metering in interconnected network e. Project financing and preparation f. Regulation and tariff-setting g. System for quality of service management	a. 300 experts over 5 years b. 250 experts over 5 years c. 150 experts over 5 years d. 80 experts over 5 years e. 400 experts over 5 years f. 400 experts over 5 years g. 120 experts over 5 years
EAST AFRICA						
EAPP	Institutional Development Strategy (IDS) 5 years	2012	\$27 Million	<ul style="list-style-type: none"> • EAPP Governance • Regulatory Framework • EAPP Operationalisation excluding Energy infrastructure investments • Financing Environment • Overall Programme Management including upgrades to existing Training Centres within Member Utilities 	Mostly workshops and mostly training courses on: <ul style="list-style-type: none"> • Regional planning • Project development • Tariffs and tariff policy • PPP / PPA • Regional markets / codes / interconnection standards • Power pool operations • Certification for system operators • Etc. 	No action plan to follow with implementation yet.

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Table 2 (continued)
Overview of Existing and Planned CB Regional Assessments and Programmes in SSA

Institution	Name of CB Programme and Duration	Year Prepared	Total Est. Value	Target Areas	Suggested Method	Status
EAST AFRICA						
NBI / NELSAP	Regional Power Trade Project	Phase I 2005 - 2009 Phase II 2010-2012	N/A	<p>To facilitate the development of regional power markets among the Nile Basin countries.</p> <p>This was to advance the project's long-term goal "to contribute to poverty reduction in the region by assisting the NBI countries in developing the tools for improving access to reliable, low cost, sustainably generated power"</p>	<p>Trainings and workshops:</p> <ul style="list-style-type: none"> • Multi-criteria Decision Analysis • Power Purchase Agreements design • Power System Simulation & Modelling • Private-Public Partnership Models • Power Sales Agreements & Contract Negotiations • Best Practices in Generation and Transmission System Planning • Tariff Design and Contract Settlements for power market operations • Legal and Regulatory frameworks • Power Markets Design, Planning and Operations • Hydropower Multipurpose Regimes • Best Practices in Management of Generation shortfalls • Resource Mobilization for Power Infrastructure Projects <p>Study tours to:</p> <ul style="list-style-type: none"> • WAPP • SAPP / ESKOM • Egyptian Power Utility & Training Centres • Ethiopia-Sudan-Egypt Interconnector 	<p><u>Fully completed.</u></p> <p>Over 6 and a half years, over 600 delegates from NBI Member countries and other regional institutions benefited from training seminars, study tours and workshops.</p> <p>NBI issued a <u>new request to the AfDB</u> covering three objectives:</p> <ul style="list-style-type: none"> • Building and strengthening regional capacity in the power sector [including the development of a regional Technology Centre of Excellence] • Establishing a regional database and information on regional power trade; and • Creating an enabling legal and policy environment for integration of regional power sector trade

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Table 2 (continued)

Overview of Existing and Planned CB Regional Assessments and Programmes in SSA

Institution	Name of CB Programme and Duration	Year Prepared	Total Est. Value	Target Areas	Suggested Method	Status
PAN AFRICAN						
UPDEA	African Network of Regional Centres of Excellence Providing Training in Electrical Trades.	2013	N/A	Training mechanisms to cover areas such as: <ul style="list-style-type: none"> • Power generation, transmission and distribution • Customer management • Utility management • Renewable energy 	Training for all levels for UPDEA Members. Choice of 3 - 4 centres of excellence	Under development
AFUR	AFUR benefits from USAID and EU technical assistance	2013-2015	N/A	Additional support needed for CB programmes for a total number of over 500 participants on the subject areas indicated to the right.	a. Database development b. Challenges of transparency in relationship between regulator and stakeholder c. Renewable energy & energy efficiency: policy, institutional, regulatory, economic and financial issues d. The effects of climate change in energy e. Tariff design and financial modelling f. Regulatory economic fundamentals g. Private-public partnerships h. Electricity market, cross-border trading and power pools	a. Consultancy b. 120 participants c. 80 participants d. 80 participants e. 80 participants f. 80 participants g. 80 participants h. 120 participants
AFSEC	AFSEC did not receive significant donor assistance and performed 3 technical workshops mostly with own funds and help from local industry	2011-2012	Total estimated value of under €100,000	AFSEC needs support in the field of implementation of technical standards for over 150 participants, as detailed to the right:	a. IEC 61850 in year 2013 b. IEC 61968 in 2014 -2015 c. Power quality measurement & management in 2014 - 2015 d. Smart metering in 2015 - 2018 e. Smart grid design in 2015 - 2018	a. 30 participants b. 30 participants c. 30 participants d. 30 participants e. 30 participants

4.4 Critical assessment of stakeholder capacity building needs & gaps

The needs assessment performed indicates that gaps and capacity bottlenecks exist in both the technical and non-technical areas which would need to be addressed, to

enable the regional markets and power trading to develop and function effectively in sub-Saharan Africa. Functional areas with capacity gaps are summarised in Table 3.

Strengthening the capacity of power pools members both the technical and non-technical areas will help build a solid foundation for cross-border energy trading.

Table 3
Areas where capacity gaps exist

Area	Power Pools and other Regional Organisations	Utilities	Regulators	Ministry / Policy Maker
Approach for funding of regional projects (PPP, IPP, SPV)	√	√	√	√
Market design and rules, grid codes and system operation	√	√	√	√
System planning and load forecasting techniques	√	√	√	√
Electricity trading, including competitive markets	√	√	√	
Transmission system operation and dispatch	√	√		
Standard template for bilateral contracts	√	√	√	√
Wheeling and transmission network tariffs	√	√	√	√
Data acquisition and management information system (MIS)	√	√		
Quality of supply (QOS)	√	√	√	√
Economic regulation and regulatory economics		√	√	√
Environmental issues and climate change	√	√	√	√



4.5 Characteristics of CB desired by stakeholders in SSA power sector

The critical analysis identified the following characteristics desired by stakeholders with respect to delivery of CB in the SSA power sector:

1. On-going and sustained CB projects are preferred to initiatives limited in time.
2. CB activities leading to acquisition of specific certifiable skills are preferred.
3. A rigorous and targeted approach to selection of trainees based on previous experience and training is preferred.
4. Capacity development must focus on development of competences or functional abilities that are common to a cross-section of stakeholders.
5. Examination to test the assimilation of knowledge, where feasible, is encouraged.
6. Capacity delivery should favour methods ensuring transfer of know-how through twinning arrangements under which consultants deliver a final product by working side-by-side with local staff to assure knowledge transfer in the process.

7. Isolated countries such as small islands feel excluded from CB efforts and would benefit from CB in specific technical areas common to all systems.
8. There are reservations with respect to e-learning due to problems of connection to the Internet and the practical nature of many aspects of training in the electricity sector. However, those who have been exposed to e-learning as enabling technical environment are encouraged to continue using this method.

The above characteristics indicate overall that the majority of stakeholders are in favour of simplifying the CB delivery and making sure it produces measurable results and sustainable impact.

4.6 Projects with potential for synergy of efforts

Several notable requests for CB were submitted to the AfDB during the course of preparing this study and are worth considering for potential synergies with the objectives of this CB programme. Two examples of such projects are presented in Table 4 (page 40).

The new NBI project is expected to result in increased capacity to manage the regional power sector, while building a critical mass of regional experts in regional power, generation and transmission. A key focus will be

Table 4
Pipeline of Requests for CB from the SSA Power Industry

Initiating Beneficiary	Requested Assistance Period	CB Objectives)	Estimated Amount	Recommendation
NBI	2013 - 2015	<ul style="list-style-type: none"> • Building and strengthening regional capacity in the power sector through a regional Centre of Excellence • Establishing a regional database and information on regional power trade; and • Creating enabling legal and policy environment for integration of regional power sector trade 	US \$9 million	AfDB needs to consider providing support given successful track record of the pervious CB project (please refer to previous sub-section 4.3
UPDEA / APUA	2013 - 2015	<ul style="list-style-type: none"> • To promote Electricity Trading through an African Network of Regional Centres of Excellence • The Consultant is expected to produce an economic survey for the approval of 3-4 pilot centres 	US \$16 million	AfDB should streamline its response and support to UPDEA with PoSSIP depending on future UPDEA implementation plan

on training programmes and secondments, both in-region and abroad. It is important to underscore the urgency of the needs raised by the NBI Secretariat. The construction of transmission lines linking six countries in the Nile Basin region is scheduled to commence in 2013, adding to existing interconnections between Djibouti, Ethiopia and Sudan. These are capital intensive projects worth more than US\$1.5 billion for interconnectors alone.

The core delivery mechanism of the NBI programme is planned as a regional Technology Centre of Excellence. UPDEA also proposes to create a network of centres of excellence to promote power trading with potential candidates including STEG of Tunisia, SONELGAZ of Algeria, EEHC of Egypt, ONE of Morocco, SENELEC of Senegal, CIE of Côte d'Ivoire, VRA/GRIDCo/ECG of Ghana, AES-SONEL of Cameroon, SNEL of DRC, ZESCO of Zambia and ESKOM of South Africa. This list is not exhaustive.

The concept of Centres of Excellence is gaining popularity in Africa with a number of donors evaluating the possibilities of establishing such centres in different regions, and several training facilities are being proposed as candidates for excellence.

The African power industry has some outstanding performers in CB provision that are often cited as centres of excellence. For example, the management style of the Kafue Gorge Training Centre in Zambia is widely lauded. The Eskom Learning Academy is also practicing innovative solutions to training and e-learning. The African Virtual University is quickly gaining speed in developing its commercial operations.

However, it has been noted that certain training facilities that might be considered as achieving exemplary results in training provision often become profit-oriented and much less available to wider stakeholders than during initial phases of operation. There seems to be an inherent contradiction between an efficient and commercially sustainable centre of knowledge transfer and its availability to disseminate such knowledge in an easily accessible manner. These are issues which would be carefully considered during the programme design stage in Volume 2 of the report.

Overall, it should also be remembered that a Centre of Excellence could in one way or another divert resources from the desired capacity development, as it will introduce additional structures that would absorb resources. Therefore, a Centre of Excellence must be extremely efficient in its management to ensure its long-term financial sustainability.

Finally, in order to use resources judiciously, it might be advantageous to upgrade an existing training institution into a Centre of Excellence. Also, in order to meet urgent needs, it might be useful to use services of existing institutions such as Eskom Academy of Learning, Kafue Gorge Training Centre or/and the Africa Virtual University.

5.1 Role of international financing institutions

The international financing institutions traditionally focus on the physical infrastructure projects and generally tend to include capacity building only as part of specific generation and transmission infrastructure projects. Moreover, financing for CB has been a major challenge due to difficulties related to measuring potential impact of such programmes. As a result, capacity building in governance development and networks operation in the interconnected environment tends to be limited.

However, a new paradigm shift in this approach has gradually been emerging due to the impact of the successful implementation of certain infrastructure projects that were commissioned but experienced residual problems during integration into the regional grid.

One famous example is the 330 kV Ikeja West – Sakete interconnection line between Nigeria and Benin, designed to interconnect the systems of four countries (Nigeria, Benin, Togo and Ghana) to become part of the Coastal Transmission Backbone sub-programme of what later became WAPP. The project was successfully commissioned in February 2007 but caused severe synchronisation problems along the coastal interconnection backbone.

This was a complex project that seemingly over-estimated the quality of underlying capacities in the technical and regulatory systems into which it was going to be embedded. It is estimated that an additional amount of up to US\$30 million is required to resolve the synchronisation problem stemming mainly from Nigeria.

Nowadays, development partners increasingly recognise that:

- Infrastructure impact tends to be muted until supportive conditions and institutions are created or strengthened.
- Completed electricity infrastructure cannot be considered successful if it is unable to operate efficiently or to its full design potential.

- It is necessary to design and implement capacity building measures to make sure there are capabilities to operate the new infrastructure correctly.
- As a result, capacity building should be viewed as an on-going concern in addition to infrastructure projects.

The following sub-sections provide a summary evaluation of the lessons learned from various donor-financed capacity building initiatives in the power sector - which provides invaluable lessons for this programme's design. While some IFIs are active supporters of regional electricity expansion schemes and prefer working with power pools, a number of bilateral agencies are mostly focussed on assisting individual countries or operators.

5.2 The World Bank Group

The World Bank recognises that the international donor community has traditionally treated public sector capacity building as a collateral objective rather than as a core goal in its own right.⁵⁵

An assessment of the WB work in CB in Africa conducted in 2005 revealed that over the previous decade the Bank provided some \$9 billion in lending and close to \$900 million in grants and administrative budget to support CB in Africa.

Aiming for innovation, since 1999, the WB funded 14 distance learning centres in Africa "as a means of expanding the reach of training and knowledge sharing".⁵⁶

The major lessons that can be deduced from the WB experience in CB delivery with relevance to the current study can be summarised in the following manner:

- Enhanced capacity should be treated as a goal in its own right, not merely as a means of achieving other development objectives.
- CB is a long-term process requiring systemic approach to achieve improved sector public performance through supply of well-structured organisations and skilled personnel.

⁵⁵ Capacity Building in Africa. An OED Evaluation of World Bank Support. The World Bank, Washington, D.C. 2005. P. 5.

⁵⁶ Capacity Building in Africa. An OED Evaluation of World Bank Support. The World Bank, Washington, D.C. 2005. P. 9.

- As challenges of capacity building vary across sectors and countries, sector-specific (as opposed to multi-sector) capacity building approaches need strengthening.
- Capacity building must be founded on adequate needs assessments and well-defined objectives, as a means of customising and targeting CB preparation and delivery.
- External assistance cannot directly influence the cultural norms and political economy underpinning the demand for public sector performance.
- Some traditional tools like technical assistance and training often prove ineffective in helping to build sustained public sector capacity, as it is difficult to coordinate individual skills development and organisational change.

This last point explains at least in part why such forms of CB as workshops and seminars (especially for multi-sector audiences), even though capable of bringing knowledge to individual participants, might not be producing significant impact on the institutions.

Workshops and seminars tend to remain largely dissociated from the development frameworks of specific organisations, requiring a comprehensive approach to HR management including training of individuals to obtain particular competences.

In the power sector, the WB was not successful in introducing capacity building programmes “as a core goal in its own right”, despite efforts to provide support to certain regional organisations.

For example, WAPP has been negotiating for some time for a programme of capacity development with the WB, which includes specific consultancy services to develop WAPP operating procedures, guidelines for pool operations and harmonisation of market rules for the development and implementation of WAPP Dispatcher Training & Certification Programme. The programme is yet to move the implementation phase.

One positive effect was achieved in West Africa during 2005-2007, when the WB added ratification of the ECOWAS Energy Protocol by Member States a condition

for a beneficiary country's access to the Adaptable Lending Program that could be used for WAPP infrastructure development. This facilitated rapid adoption of the ECOWAS Energy Protocol.

Another positive example of CB worth emulating is the World Bank/AfDB/Standard Bank-financed Morupule B coal-fired power station in Botswana. The project comprises of a number of technical assistance activities such as:

- 1) The contractor, China National Electric Equipment Corporation and Shenyang Blower (CNEEC-SBW) would provide approximately 240 staff who would in turn train approximately 300 new staff of the Botswana Power Corporation (BPC) over 24 months in operation and maintenance. This would help expose BPC to manage the Circulating Fluidised-Bed Coal (CFBC) technology. The training programme was estimated to cost US\$1.3 million and took place in Botswana and China.
- 2) Two consultants funded by the World Bank will provide assistance in establishing an independent regulatory authority for energy and water, recruit staff and build the regulator's capacity to set tariffs at a level that will ensure that the Corporation operates as a commercially viable entity and can attract private investors in the sector in a sustainable manner.
- 3) Skills transfer through technical assistance on transmission network (automatic generation control (AGC) system software, system harmonic studies, control area establishment) funded by the World Bank; formal training and study tours for six BPC technical staff in Power Plant Consultant Fitchner's design office in Stuttgart.

5.3 NORAD

The Norwegian Agency for Development Cooperation (NORAD) is a major provider of CB to the power sector in SSA. Being a Directorate under the Norwegian Ministry of Foreign Affairs (MFA), the Agency organises its activities through Norwegian embassies abroad.

In East Africa, for example, between 2009 and 2011 the EAPP benefited from Norwegian assistance through a grant of US\$2.2 million received from MFA of Norway to pursue the following objectives:



- Increase power trade through implementation of priority interconnection project;
- Operationalisation of EAPP Coordination Centre (CC) and Independent Regulatory Board (IRB) through:
 - Establishing organisational structures and related documentation (job descriptions, staff rules and operational manuals) for the institutions;
 - Development of necessary human capacity for the institutions and the necessary infrastructure (data-base and communication) to facilitate power trade
- Formulation and negotiation of power pool agreements and contracts (power purchase, construction and operation),
- Grid Code development in cross-border trading,
- Cross-border project formulation and appraisal,
- Financial evaluation, project financing and tariff setting in cross-border projects.

NORAD prepares a follow up assistance programme for the total value of US\$2.6 million. Implemented over three years, the programme will focus on:

The implementers of the assistance project cite as lessons learnt the need to have realistic outputs and outcomes and sufficient budget for each activity. The operationalisation of the EAPP Coordination Centre (CC) and the Independent Regulatory Board (IRB) were not achieved during the project lifetime. However, the project provided significant effort in development of the institutional design of the power market in East Africa and in capacity building through training, including the following topics:

- Power pool planning, design and operations,
- Power pool policy and regulatory framework,
- Institutional development and capacity building (training for the IRB and CC staff),
- Regional market development (rules and trading software),
- Harmonisation of the regulatory environment,
- Harmonisation of power systems operation practices and standards.

In the past (2003 – 2011), NORAD also assisted SAPP with the development of the day-ahead market (DAM) through development of the DAM Trading Platform and corresponding training and study tours for the total amount of over US\$10 million.

5.4 USAID

United States Agency for International Development (USAID) has probably made the biggest contribution in support of the development of power pools and regional power trading in sub-Saharan Africa by means of building capacity in a variety of ways and over some time.

USAID's assistance to African power pools is focused on the following tasks:

- Economic modelling and analyses of supply, security and cost-benefits of power pool and regional market development (e.g., WAPP and CAPP business plans);
- Support power pool operations and development of facilities (e.g., WAPP development; SAPP Coordination Centre establishment, EAPP equipment, furniture and staff costs);
- Design regional and national governance structures that permit commercial transactions and private capital to participate in the sector (e.g., WAPP and CAPP decision/protocols, SAPP regional agreements);
- Define needed technical rules for power pool and market operation, organisation staffing, computerised tool development, and environmental impact assessment, and build capacity in African counterparts to implement and maintain those rules (EAPP, SAPP);
- Design and implement internet and other communications/information systems to facilitate pool and market operations (CAPP);
- Perform feasibility, environmental impact and other studies of needed transmission and generation plants (SAPP)
- Perform cross-border electrification feasibility and design studies.

In addition, the United States Energy Association (USEA) has been active in organising executive study tours for African experts involved in power pools implementation and in setting up partnerships between power pools in Africa and the USA.

Between 1996 and 2007 energy partnerships were organised for utilities in countries such as Angola, Botswana, Ghana, Kenya, Mozambique, Namibia, Nigeria, Senegal, Tanzania, Zambia to develop capacity in a number of technical, economic and regulatory issues.

Whereas much of USAID's previous assistance has focused on capacity building and improving the enabling environment within the sector, the goal of its new assistance programmes is to leverage new investment in generation and transmission, as well as, provide its typical form of capacity building assistance.

A current vehicle for providing sector-specific technical assistance to the electricity sector is a programme called the *Africa Infrastructure Program (AIP)*. A major focus of AIP is to provide assistance aiming to leverage over \$1 billion of new electricity sector investment during the next few years.

At the same time, AIP continues its assistance to build the capacity of the four SSA regional power pools through targeted technical assistance to the pools and selected regional stakeholder organisations.

The Agency has also completed in 2012 a \$2.4 million "Powering Progress Project for EAPP" in East Africa that focused on delivery of workshops (market development, Renewables and Energy Efficiency), development of Power Market and Power Trade, introduction of PPAs and Harmonised Transmission Standards as identified by the Grid Code, as well as study tours to PJM and WAPP.

The major activities of this project were to identify the gaps between national grid operation practices and the provisions in the EAPP Grid Code. It was also anticipated to apply improved power purchase agreements to at least three contracts. Under this project a guideline and formats were developed for use by utilities to identify gaps between their power system operations practices and the provisions in the EAPP Grid Code. Ethiopia and Kenya were chosen to perform the exercise as a pilot project. Operating and planning staff drawn from both countries were given training on the procedures and deployed to execute the pilot project.

Other programmes of support to SSA power pools are in progress, or under consideration by USAID, as detailed in Table 5 (page 45).

Table 5
USAID Assistance to Power Pools

Region	Programme Name, Period and Value (US\$)	Nature of Assistance
Southern Africa	2010 – 2014 Capacity building, energy sector structural and regulatory reform, and transaction advisory service to foster deployment of clean energy technologies. \$4,050,000	<ul style="list-style-type: none"> • Advisory support to draft legislation to establish South Africa's Independent System and Market Operator (ISMO) and developing South Africa's Integrated Resource Plan in 2010. • Capacity building to incorporate renewable energy into the regulatory frameworks in Mozambique, Namibia, and Lesotho.
	2011 – 2014 Energy Utilities Partnership Program \$350,000	<ul style="list-style-type: none"> • Assistance to SAPP and member utilities through study tours to U.S. and other international utilities for exposure to worldwide "best practices" in energy efficiency, DSM and energy trading. • Assisting SAPP in improving policy and legal frameworks to establish market conditions for the private sector and environmental management.
	2011 – 2015 Climate Technology Initiative Private Financing Advisory Network \$300,000	<ul style="list-style-type: none"> • Targets mid-size Clean Energy, Renewable Energy, and Energy Efficiency projects in the \$1 million to \$50 million range, whose developers do not otherwise have access to financing or advisory services.
	2010 – 2014 Southern Africa Trade Hub (SATH) \$3 - \$4 million	<ul style="list-style-type: none"> • Support renewable energy policy and framework assessments in Botswana, Mauritius, and Namibia and training SADC energy planners in the USA. • SATH and RERA designed a roadmap for establishing Swaziland's Energy Regulatory Authority (SERA) and conducted its initial capacity building and developed course content for training of professional regulator practitioners.
West Africa	On annual basis for estimated annual value up to \$0.5 million Ghana Field Office	<ul style="list-style-type: none"> • Supplying funds for capacity building (consultancy and training activities) directly managed by WAPP Secretariat under a separate strategic grant agreement.
East Africa	2013 – 2016 USAID Addis Ababa Estimated \$4,297,444	<ul style="list-style-type: none"> • Assistance with compiling an inventory of the renewable energy resources for inclusion in the regional master plan, primarily solar, and wind. • Institutional strengthening for EAPP sustainability. Provision of resources for communications, planning and operational activities of the EAPP. The financing of CC and IRB staff salary beginning second quarter of 2013 is also expected to be covered.
Central Africa	N/A	<ul style="list-style-type: none"> • USAID funded CAPP Implementation Action Plan, regional energy treaty, IT and accounting systems for CAPP PS and other projects between 2004 and 2010. • No new activities are currently scheduled for CAPP in Central Africa (as indicated by USAID office in Kinshasa)

5.5 The European Union

The European Union (EU) is providing active support to Africa within the framework of the 2007 Joint Africa-EU Strategy (JAES), adopted by 80 African and European Heads of State and Governments in Lisbon in December 2007.

One of the main objectives of the JAES is promoting regional and continental cooperation, as it is understood that regional integration furthers peace, stability and growth and thus has multiple positive affects for Europe since it is Africa's neighbouring continent. The Strategy's Second Action Plan 2011 – 2013 sets out eight areas for strategic partnership. Energy is one of them.

The Africa – EU Energy Partnership (AEEP) pursues the overall objectives of dialogue on energy access and energy security, improved access to reliable, secure, affordable, climate friendly and sustainable energy services for both continents and increased energy infrastructure investments, including the promotion of renewable energy and energy efficiency. The AEEP partners and stakeholders include the African Union Commission, the European Commission, African and EU Member States, African Regional Economic Communities (COMESA, SADC, UEMOA, EAC, and ECOWAS), regional Power Pools and specialised energy institutions along with the private sector, civil society and the research community.

Specifically, during the last three years, with funding under one of the AEEP facilities a number of medium voltage cross-border electrification projects were realised by the WAPP in West Africa in the border areas of Ghana – Togo, Ghana – Burkina Faso, Benin – Togo, and Côte d'Ivoire – Liberia.

Moreover, the EU is providing direct capacity building in the form of resident and external technical assistance to all the sub-Saharan power pools and the African Forum of Utility Regulators. The essential elements of technical assistance contracts for the total value of just under €16 million are summarised in Table 6 (page 47).

In West Africa, training programmes were specifically developed to meet the urgent training needs of the English-speaking national electricity system operators LEC (Liberia),

NAWEC (The Gambia) and NPA (Sierra Leone) and French-speaking EAGB (Guinea Bissau) and ECG (Guinea, Conakry) to help them to enhance professional capability of their technical staff.

The training sessions were designed and delivered by fellow member utilities, namely, Electricity Company of Ghana (ECG) and SENELEC in Senegal, respectively.

In 2010, a total of 80 electrical engineers and technicians were trained areas such as:

- Transformer and substation maintenance and repair,
- Overhead line maintenance and underground cable techniques, and,
- Distribution system engineering design, protection, operation and SCADA management.

The analysis of the training practical implementation showed distinct advantages of delivering such initiatives in-region.

Not only was the training highly efficient due to the high standard of its contents customisation through careful analysis of participants' needs, it was also implemented at a reduced cost compared to programmes with similar objectives paid for outside West Africa.

Another important lesson was summarised by the participants who expressed a wish that training included provision of tools that they would be able to use upon returning to their companies. This request was repeated by other stakeholders, for example, engineers trained to use software tools for power system planning and optimisation. Their wish is that they take along with them the software tools they are taught to use.

One of the major forthcoming investments of the EU is related to operationalisation of the WAPP Information & Coordination Centre (WAPP ICC) at a cost of €60 million.

The European Union is also active in CB for African power sector through its associated institutions, such as the European Investment Bank, the French Development Agency, KfW and GIZ, which are all active supporters of regional integration projects in electricity.

Table 6
EU Technical Assistance and Capacity Building Support

Beneficiary	Assistance Period	Nature of Assistance	Amount (€ million)
SAPP	2008 – 2012 Completed	<ul style="list-style-type: none"> • Strengthening network operation capacity and system planning capacity. • Transfer of know-how on European experience in trade. 	€0.80
	2012 – 2015 In progress over 30 months	<ul style="list-style-type: none"> • Improvement of private sector participation via PPP. • Strengthening utility management capacity. 	€1.20
WAPP	2008 – 2012 Completed	<ul style="list-style-type: none"> • Reinforcement of technical capabilities at WAPP Secretariat (infrastructure, project preparation, institutional development, donor coordination etc). 	€1.78
	2013 – 2016 Under preparation for 24 months	<ul style="list-style-type: none"> • Capacity building as transfer of know-how and development of skills through training programmes (WAPP Members and Secretariat personnel). 	€1.52
EAPP	2008 – 2012 Completed	<ul style="list-style-type: none"> • Strengthening the capability of the EAPP Secretariat to contribute in the improved integration of the electricity markets with a view to creating a regional electricity market. 	€2.70
	2012 – 2015 In progress over 30 months	<ul style="list-style-type: none"> • Strengthen the capacity of the EAPP in planning and technical issues related to interconnected networks and regulatory issues, especially at regional level. 	€1.70
CAPP	2009 – 2012 Completed	<ul style="list-style-type: none"> • Enhancement of Central Africa electricity market integration with the view to establish a regional market. 	€1.50
	2013 – 2016 Under preparation for 24 months	<ul style="list-style-type: none"> • Capacity building for the CAPP Secretariat and pool member utility companies: (i) Operation of interconnected HV networks; (ii) Regulation of electrical systems; (iii) Cross-border MV electrification. 	€1.58
AFUR	2009 – 2011 Completed	<ul style="list-style-type: none"> • Assistance in training for AFUR Member regulatory agencies in regulation for regional transmission system operators. 	€1.25
	2012 – 2014 In progress over 24 months	<ul style="list-style-type: none"> • Assistance in roundtables to promote discussion on renewable energy sources, CDM, regulatory information dissemination and public participation etc.). 	€1.82
TOTAL			€15.95



5.6 The French Development Agency

AFD is an experienced provider of targeted capacity building in the SSA power sector. Thus, the French Agency was the sole agent to conceptualise and finance the establishment of the ECOWAS Regional Electricity Sector Regulatory Authority (ERERA). The project was completed between 2005 and 2007 for the total budget of €5 million. This is a prime example of an establishment of a regional regulatory function in one of the SSA regions.

AFD is also contributing towards elaboration of clear contractual and pricing frameworks in West Africa through continued support to the ERERA.

Moreover, AFD is assisting UPDEA in defining modalities for an African system for training in electrical trades – that will be based on the network of regional centres of excellence. The main deliverable, due in 2013, is expected to describe training mechanisms to cover areas such as power generation, transmission and distribution, customer management and management. Special attention will be paid to the training needs for RE.

5.7 JICA

The Japanese International Cooperation Agency is active in CB through bilateral relationships with individual countries. For example, JICA has completed a project for electrification promotion in Malawi and has on-going projects in the SSA power sector in Ghana and Zambia, as presented in Table 7 (page 49).

Japan presents an instructive example of pro-active capacity building during the Era of Establishment of the Electric Power Industry. “Japan absorbed the institution and technology of developed countries by sending delegations to Europe and the U.S., hiring foreign experts, and sending students to developed nations at government expense”.

This was done to import the technology and know-how. The Japanese also developed a combination of pre-service (engineering and technician degrees within educational system) and in-service (placement, on-the-job) training to assure sustainability of their fledgling electricity sector from the capacity development viewpoint.

*Source: The History of Electric Power Industry in Japan.
Case Studies in Capacity Development in Power Sector
with South-South Cooperation Components*

JICA's most noteworthy CB valued at US\$ 3 million, is provided to the Electricity Company of Ghana (ECG) to update and improve the training system at the ECG training centre, which is one of the better performing training centres in SSA but with aging equipment. The overall project objective is to improve the distribution system operation and maintenance in ECG. The project implementation will result in strengthening of the training capacity on distribution system operation and maintenance for ECG and, by extension and at WAPP Secretariat's insistence, in some neighbouring countries.⁵⁷ JICA advocates an integrated approach to capacity development, imposing a long-term cooperative framework affecting individual; organisational and institutional levels.⁵⁸

⁵⁷ In continuation of a training project for the three English-speaking countries found in difficult situation that WAPP realized in Ghana with funding from the EU and the USAID in 2010 /11, as described above.

⁵⁸ Capacity Development Handbook for JICA Staff, Task Force on Aid Approach, JICA, March 2004.

Table 7
JICA Capacity Building Support

Country	Project	Beneficiary	Period
Ghana	Project on Electrical Engineers Training in African Countries (EETA)	Electricity Company of Ghana (ECG) Ltd Training Centre in Tema, Greater Accra, Ghana.	2012 - 2015
Zambia	Capacity Development for Rural Electrification	Ministry of Energy and Water Development and the Rural Electrification Authority	August 2009 to August 2013
Zambia	Increased Access to Electricity Service Project	ZESCO Ltd.	March 2009 to December 2013

5.8 Lessons learnt from donor community

Key CB lessons distilled from the afore-going discussion are that:

- 1) CB must be viewed as a core goal in its own right rather than a collateral objective.
- 2) CB should be viewed as an investment project with pay-offs over the long-run.
- 3) CB is more efficient when it is sector-specific.
- 4) Outside actors alone cannot directly develop capacities in a partner country. Joint efforts with the participation of stakeholders are important.
- 5) CB must be stakeholder-owned and use local or regional expertise if possible.

In conclusion, we note that there are a variety of CB methods ranging from training activities in specific areas, study tours abroad, twinning arrangements with similar organisations overseas and to placement of resident technical assistants within a beneficiary institution, and payment of salaries to expert staff. The impact of such activities depends on the prevailing attitudes within a recipient institution and the way a particular technical assistance project is organized. It is possible to anticipate opportunities for cooperation with partners like the World Bank, USAID, NORAD, JICA, AFD and the EU. These partners are already active on the ground. However, this is inferred purely from the viewpoint of the extent of past and current CB activities conducted by these agencies, as well as, the focus of their technical assistance to SSA power sector.

6. AfDB's support to capacity building in SSA power sector

6.1 AfDB energy policy context

The African Development Bank has a long track record in providing capacity building to African nations. The Bank's Ten Year Strategy (2013-2022), the Capacity Development Strategy (2010-2014) and the Capacity Development Strategy (CDS) Mid-Term Review Report place capacity development at the centre of Africa's structural transformation. The policy documents envision the Bank becoming a leading enabler of capacity development in the area of infrastructure.

The AfDB Energy Policy (2012) states that "Capacity building and knowledge management are key factors for successful projects and programmes aimed at enhancing energy access, security and sustainability. Moreover, research, development, and innovation are critical to increase the continent's technological and industrial capacity to provide innovative and cost-effective solutions in the generation, storage, transmission and use of energy, notably in the renewable energy sub-sector."⁵⁹

In conformity with these principles, the AfDB country policies advocate provision of capacity building support at national levels. One example is in Kenya, where projects implemented with the AfDB assistance have included a CB component. Kenya's geothermal potential is in excess of 7,000 MW spread over more than 14 locations. The Government plans to harness 5,000 MW through PPP projects by the year 2030.

The AfDB provides support to geothermal power generation projects at a level of US\$ 120 million. Although no in-depth details of the future CB programme could be communicated, it is valued at US\$7 million and will include procurement of a simulator to train the drilling personnel, as well as providing enhanced capacity to negotiate with private operators.⁶⁰

The Bank's pro-active support to CB is further evident from its participation in creation of pan-African institutions devoted to CB in various areas of expertise. One example is that of the **African Capacity Building Foundation (ACBF)** that was established in 1991.⁶¹

Another example is that of the AfDB's role in the establishment of the **African Virtual University (AVU)**, with headquarters in Nairobi, Kenya to pioneer e-learning leading to professional certification in Africa.⁶²

Since its foundation in 1997, the AVU has trained more than 40,000 students, working across borders and language barriers in English, French and Portuguese-speaking Africa. In the field of energy, the AVU has developed a Certificate in Renewable Energy option Production of Electricity covering solar photovoltaic, wind power and micro hydroelectricity generation.

6.2 AfDB's CB Support to SSA electricity sector

As with other development finance institutions, despite significant active involvement in the financing of the electricity generation and transmission infrastructure, the African Development Bank does not have comprehensive stand-alone programme for capacity building in support of the sub-Saharan electricity sector.

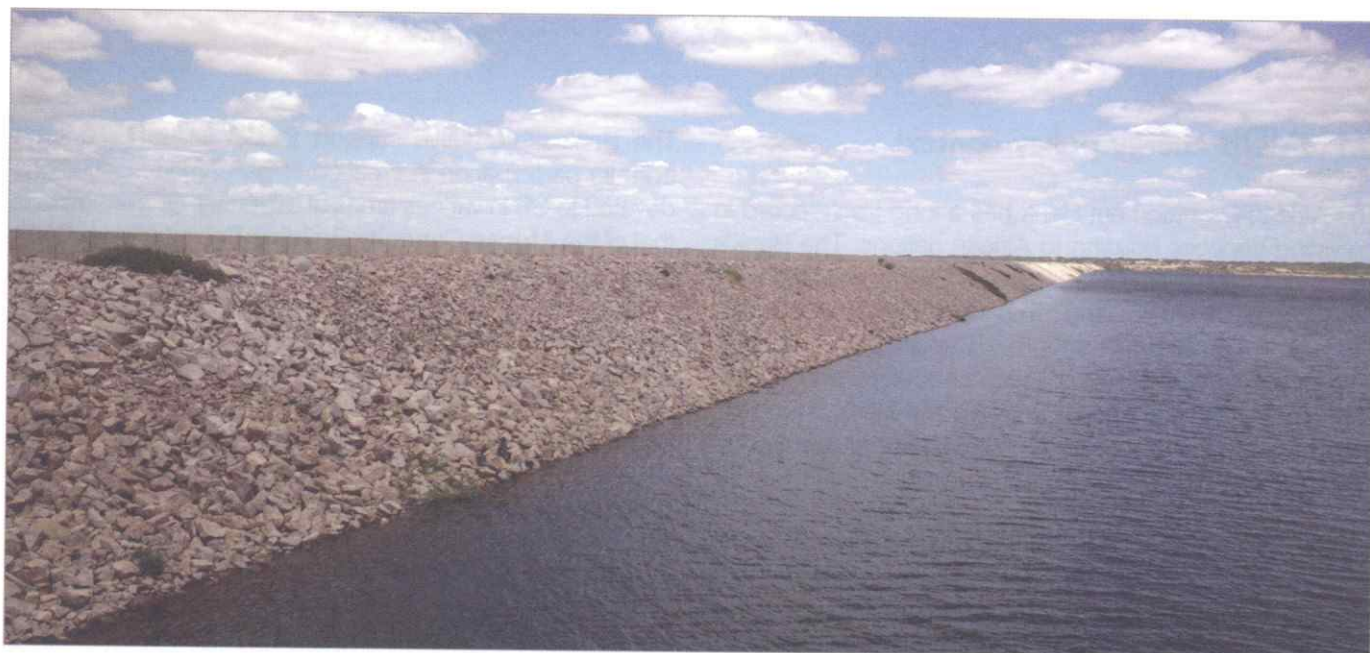
However, the Bank routinely includes a capacity building component when supporting infrastructure projects, but there is a need to ensure this is mainstreamed and that lessons learned are properly captured. The continent-wide Programme for Infrastructure Development in Africa (PIDA) Priority Action Plan (PAP) provides a list of 51 infrastructure projects, including 15 in energy, focusing on major hydro-power generation and transmission lines, as well as, gas and petroleum pipelines.

⁵⁹ Energy Sector Policy. The African Development Bank, 2012. P. 18.

⁶⁰ This CB project is planned in cooperation with the Geothermal Development Company (GDC) established by the Government in 2008 to cover the drilling risk. The fact that GDC has sound management practices is helpful in realization of this CB project. For details of GDC operations please visit www.gdc.co.ke.

⁶¹ <http://acbf-pact.org>

⁶² <http://www.avu.org>



The capacity building element is an integral part of the PIDA implementation process with capacity building “for effective delivery of the PIDA-PAP” requested for the Core Teams within RECs, the African Union Commission (AUC), NEPAD Planning & Coordination Agency (NPCA) and other central institutions.

In fact, this request has already been translated into a follow up action for the Economic Community of Central African States (ECCAS), with the inclusion of a capacity building element for PIDA-PAP implementation in Central Africa in the proposed plan to finance the general building of “institutional, human and operational capacity” with ADF grant of AU 7 million over the period of 2013 – 2016.⁶³

Measurability of the impact of CB becomes difficult under this approach where CB is distanced from actual project implementers and policy makers.

Moreover, even though the PIDA is continental, it excludes the island nations of Cape Verde, Madagascar, Sao Tome and Principe, Seychelles, Mauritius and Comoros islands.⁶⁴ This means that the isolated electricity systems of these African nations do not benefit from the capacity building effort as it is currently configured under the PIDA framework.

6.3 Pipeline of capacity building projects

The Bank has accepted for consideration a number of CB projects for the electricity sector that are important from the viewpoint of understanding the general trend developing within the Bank with respect to CB, as such projects have certain similar strategic orientations.

One such project is **Skills Development and Job Creation in the Power Sector in Rwanda**.⁶⁵ Worth US\$800,000, the programme is to design training for employees of the power sector with the objective of enhancing the efficiency and management of the power sector in Rwanda, as well as providing the companies with a pool of skilled technicians to maintain and operate plants. This project complements the US\$25 million loan made in 2011 to KivuWatt for the construction of a methane gas extraction facility and a 25MW methane gas-fired power plant, and is specifically designed to mitigate the risk by developing local technical skills for the power sector.

This is a pilot operation focusing on the design of the programme, and the actual training components will be paid for by stakeholders, including the firms, government and students. The project will be documented for replication

⁶³ ECCAS Institutional Capacity Building Support (PARCI-ECCAS). Project Appraisal Report. September 2012.

⁶⁴ Study on Programme for Infrastructure Development in Africa (PIDA). Phase III Report Energy. SOFRECO-led Consortium. 2011. P. 4.

⁶⁵ Preliminary Evaluation Note for Technical Assistance Proposals (For internal use only). AfDB, Tunis. August 2012.

and scalability in other sectors and countries. The use of a grant is necessary to test the model and to identify key success factors and lessons learned.

This CB assistance is aligned with the two pillars of the Bank's private sector development strategy and FAPA, building competitive infrastructure and SME development. It is also in line with the Bank's decision to focus more on inclusive development in all its operations. Finally, it is synchronised with the Bank's new Human Capital Development Strategy. If approved and implemented, this CB programme will see the AfDB working in cooperation with the Japanese and Austrian technical assistance.

Another indicative programme is **"Support to the Enhancement of Quality and Relevance in Higher Education, Science and Technology Project" in Kenya**⁶⁶ aiming to improve quality and relevance in engineering faculties in line with Kenya's Vision 2030 priorities for science, technology and innovation and human resource aspirations of the East Africa Community integration. It is designed to support surging demand for quality higher education, science and technology (HEST) training and skills development.

The project is to be financed by an ADF loan of UA 28 million to the Government of Kenya it is estimated that a total of 12,600 students will benefit from the project with 11,900 obtaining undergraduate bachelor of science (BSc) degree level, 500 the masters level, and 200 at doctorate level.

6.4 Problem CB projects

An interesting project that has unfortunately not been implemented is the **Capacity Building for PPP Infrastructure in Nigeria (CB4PPPi)**.⁶⁷

PPPs are seen as part of the solution to Nigeria's huge infrastructure deficit and previously the WB has approved a US\$150 million loan over a five-year period to the Federal Government of Nigeria (FGN) for capacity building for PPP. DFID also provided a GB£19.5 million grant to the FGN which includes elements of general capacity building and direct consultancy.

The AfDB in turn has provided the FGN with Institutional Support Projects (ISP) in the areas of governance, capacity building and poverty reduction since 2001. The CB4PPPi was prepared in response to reiterated requests from the FGN following a High-Level Identification Mission from the Bank to Abuja and Lagos that recommended a wider capacity building project for PPP in infrastructure for Nigeria.

The project's strategic intent is to build capacity for PPP projects in the Ministries, Departments and Agencies (MDAs) at the federal and state levels over three (3) years at a total cost of UA 22.89 million. The project has stalled due to concerns raised by Nigerian parliamentarians on the value-for-money of a CB project dealing with raising general awareness of Government officials. The impact of the CB on the Nigerian power sector will be difficult to measure in the absence of any discernible performance criteria. It has been pointed out that because the Bank operations are demand driven, "there has tended to be less demand from Member Countries (certainly in terms of borrowing) to address soft infrastructure capacity building and training issues."⁶⁸

Interestingly, one of the suggested measures to reduce the negative perception of the project within the Government was to change its name to avoid any reference to capacity building. This shows that non-targeted capacity building aiming at raising general awareness is difficult to account for and can be perceived as a wasteful exercise.

6.5 Specific CB in the SSA power sector

Certain areas of expertise are clearly very important for regional interconnected infrastructure expansion and market development. Attention is most often drawn to areas such as Public-Private Partnerships (PPP) and Power Purchase Agreements (PPA). The former, as seen from the previous CB example in Nigeria, is considered the most potent solution for electricity infrastructure projects implementation, whereas the latter is an important tool for efficient power trading.

In the field of PPP, the Bank's African Development Institute (EADI) in cooperation with the NEPAD Regional Integration and Trade Department (ONRI) prepared and implemented a number of PPP seminars in Africa over the last five years including workshops in Mauritius (2009) and South Africa (2010).

⁶⁶ Support to the Enhancement of Quality and Relevance in Higher Education, Science and Technology Project. Country: Kenya. Memorandum to the Board of Directors. AfDB, Tunis. 25 October 2012.

⁶⁷ Capacity Building for PPP Infrastructure (CB4PPPi). Country: Nigeria. Project Appraisal Report. AfDB, Tunis. August 2010. December 2011. P. 9.

⁶⁸ Power Sector Soft Infrastructure Programme (PoSSIP). African Development Bank. NEPAD, Regional Integration and Trade Department.

One of the lessons drawn from the two training events was that it was not always practical to combine participants from different sectors (transport, ports, electricity) in the same workshop and it would be advantageous to maintain a sector-specific approach. As a result, at the request of the WAPP Secretariat, the EADI organised the next training event in Ghana in September 2011, exclusively for WAPP representatives.

The training was high in quality and rich in material that could be used for future reference. The cost of each workshop, tuition fees and logistics, can be roughly estimated at about US\$200,000. A workshop was typically planned for five days. A follow up was organised by the EADI staff for some time upon completion. The training modules remained in the AfDB's possession for further dissemination.

The EADI continues to develop new training programmes covering different industries and areas of knowledge, including 5 workshops on PPP planned for African power pools and RECs in the course of 2013.⁶⁹

In the field of PPA, no specific training was provided by the Bank to electricity professionals in Africa, although it would be part of the training on PPP process. However, the Infrastructure Consortium for Africa (ICA) released in 2011 a diagnostic study of technical assistance for the negotiation of power purchase agreements.

The report points out that even though all considered countries successfully negotiated PPAs with 14 operating IPPs and 27 more negotiations were in progress, there was no specific CB for PPA negotiation but the need for such was confirmed in all the countries. In particular, it was concluded that "All institutions suffer from a strong

need for support in (i) quality training for employees; (ii) donor support in elaborating adequate energy policy and regulatory framework, and, [of course] (iii) finance for power development.⁷⁰

The most applicable forms of CB were cited as "revolving capacity building programmes", pointing out to the need for continuous character of CB support.

In conclusion, it should be pointed out that both PPP and PPA subjects are rather complex and require specialised knowledge and even more importantly, regular practical application to maintain proficiency. However, given the lengthy life cycle of an electricity project, a Government official might get a chance to negotiate a PPP only once during his entire professional career. Therefore, targeted approach to the audience selection becomes of paramount importance for successful PPP training - and any training in general, of course.

The EADI made an effort to enhance the training impact by following up with the participants for some time after the course completion. However, this effort could not be extended too far given the absence of formal links between the parties and the pressures of every day work in the office.

In addition, the PPP courses awarded participants completion certificates. However, such certificates, have limited professional value in the eyes of both the recipient and employers, as their award is not conditioned on any examination or accredited by a formal certification body. This confirms the need for such training to be undertaken (over the medium to long term) by certifying institutions such as the Centres of Excellence and Universities – with the Bank playing the role of an initial funder and provider of technical assistance and expertise.

⁶⁹ EADI - Training Programme & Related Activities, 2013.

⁷⁰ Diagnostic of Technical Assistance for the Negotiation of Power Purchase Agreements. ICA, March 2011. P. 11.

6.6 Analysis of AfDB position on CB delivery

In general, within the AfDB Group there is an acceptance that capacity building related exclusively to preparation of specific infrastructure projects is insufficient to assure efficient / viable operation and profitability of electricity markets as a whole.

The analysis of the Bank's experience in provision of CB to the African power sector can be used to draw some conclusions useful for development of a new capacity building programme for the SSA power industry. Table 8 below provides some analysis of the AfDB's positioning on CB in SSA power sector.

Table 8
Analysis of AfDB's position on Capacity Building in SSA Power Sector

No.	Observation	Inference / Action to Adopt
1	Recognition that infrastructure development must be accompanied by capacity to manage and operate the new infrastructure, as well as regulate modern market arrangements.	The Bank is on the right track with the development of a CB programme for the SSA power industry.
2	AfDB's capacity building effort is dispersed over a number of initiatives, while there is no sector-specific programme for SSA power industry targeting introduction of specific functions / competences.	A CB programme for SSA power sector needs to adopt an integrated approach targeting specific gaps and insufficiencies
3	AfDB tends to participate in complex projects designed to build capacity of people who will be responsible for building capacity of others.	Preference must be given to capacity delivery focussed on those who are dealing directly with infrastructure of market conditions development, as opposed to developing complex delivery mechanisms.
4	Some expectations that CB will produce breakthroughs in difficult / stalled infrastructure projects.	It has to be realised that CB will not solve infrastructure problems immediately. CB is to be viewed as a long-term exercise.
5	There is a belief within the AfDB that CB must increasingly involve African expertise.	Intra-African mutual support and exchange of best practices should be preferred methods for CB wherever possible, but recognizing that experience from outside Africa has its value.
6	The AfDB would like to see CD evolving in an innovative manner.	Use of modern tools (like e-learning) should be integrated in programmes design, for example, within the Centres of Excellence.
7	Some stakeholders of the African electric power sector are sceptical with respect to the ability of DFIs to provide financing for capacity building solutions in a timely and efficient manner.	It is necessary to reverse the prevailing perception of stakeholders that the AfDB and other DFIs have long preparation lead times.
8	There is a lag of almost 1 year between the conduct of the needs assessment, and the securing of resources under the ADF XIII – during which time, beneficiaries may have sourced resources for specific CB projects from elsewhere else.	On-going dialogue with stakeholders is necessary. It is also essential to discuss the PoSSIP with other development partners.

Fundamental principles of the capacity building programme design

7.1 Fundamental characteristics of the envisaged CB programme

Based on the analysis performed in the previous sections it is recommended that the AfDB CB programme should engender the following guiding principles:

- Address the real needs in the electricity sector through promotion of regional power pools and electricity markets, to facilitate regional power trading, while addressing cross-cutting issues affecting stakeholders in the electricity sector.
- Strengthen the “soft” capacity needs of national utilities since they form the bedrock and foundation of the regional power pools.
- Address capacity issues across the entire electricity landscape (electric power generation, transmission, distribution – with related tariffs, metering, billing and customer service, operations and maintenance, trading, standards and quality of service, regulation and the legal framework).
- Be sustainable rather than planned for a limited period of time.
- Be able to continuously update the proposed curriculum or curricula in line with the emerging requirements.
- Be associated with well-established educational institutions for the purposes of accreditation and certification in specific professional areas.
- Require participants to pass both theoretical and practical exams to certify their successful acquisition of knowledge.
- Provide CB relevant to the industry needs, so that participants can directly apply the acquired know-how in their day-to-day work.
- Leverage a mutually beneficial relationship between educational systems and electricity sector requirements in order for theory and practice to become well aligned to respond to the needs of the African electricity supply industry.
- Maintain the efficacy of the CB by ensuring that the programmes are targeted directly to the beneficiary institutions, as opposed to third parties.
- Be accessible to all stakeholders of the African power supply industry regardless of whether they are operating interconnected or in-country isolated electricity systems.
- Favour inter-African mutual assistance and cooperation among operators, regulators and national authorities in charge of electricity, as well as enhance the dissemination of locally existing best practices.
- Recognise multi-language and multi-cultural character of African nations.
- Have a preparation to start-up period of 9 to 12 months.
- Be a visionary and innovative project, making a significant difference to the African electricity supply industry with a potential for becoming an internationally recognised and sustainable brand name for Africa and hence for the AfDB.
- Ensure that CB is mainstreamed into all Bank energy projects.

7.2 Measurability of results

The following observations are deemed relevant with respect to measurability of CB impact:

- Stakeholders are likely to be reluctant to assume responsibility for managing CB programmes presenting difficulties in measuring their results.
- Programme measurability must be built into the CB process in order to render it efficient.
- Measuring impact of capacity building on the training participants is difficult and almost practically impossible if the acquired knowledge is not tested and certified.

- Formal certification procedures from recognised institutions will enhance the impact and value of a CB initiative and would be welcomed by sector stakeholders.
- To produce a measurable impact, a CB initiative must be credible to the concerned African stakeholders.
- Employers sending their staff to CB events providing specific know-how that is examined and certified need to propose incentives for retaining experts after training (especially where training is of considerable duration).

7.3 Screening of CB topics

In selecting specific areas for capacity building programmes, the following criteria will be used:

- A substantial weakness has to be identified in the knowledge and experience base of a substantial number of stakeholders in the region.
- The identified shortcomings impair regional market and/or participation in power pool operation and planning, not just individual company or government operations.
- A feasible training or reform programme could remedy the identified shortcoming of the power industry through creation of a rule, establishment of a new function or transfer of knowledge and know-how.

Similarly, the following criteria will be used to screen candidate topics or programmes for further analysis:

- They are matters, which, if not addressed will, and can prevent countries effective participation in the power pools.
- They are matters that can be addressed immediately or in the immediate future.

- They are matters that will cause substantial harm (usually substantial additional cost or delay in energy infrastructure investments) if addressing the gap is delayed by several years, until regional markets are fully developed and functioning.

7.4 Criteria for selection of specific CB activities

The selection of types of capacity building activities into the programme will be achieved based on the following criteria:

- Complexity of activity;
- Availability of expertise for training;
- Availability of equipment for participants to be used for hands-on training;
- Extent of impact on the African power sector;
- Time delay for impact to take effect;
- Operational and financial sustainability of CB programme;
- Potential for replication in other areas;
- Degree of interactivity or overlap with other activity initiatives included in the programme;
- Level of local involvement in the activity implementation (potential for experience exchange and best practices dissemination);
- Impact for enhancing regional cohesion and cooperation in electricity sector;
- Cost effectiveness and level of the recipient employer's involvement in the funding the activity;
- Potential for implementation and impact synergies with other CB programmes in the pipeline (AfDB or other source).

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Annex A

Terms of Reference

NEPAD, Regional Integration & Trade Department

Energy sector capacity building diagnostic & needs assessment study, September 2012

1. Background

1.1 Reliable and affordable power supply is a crucial pre-requisite for competitiveness and income generating activities that lead to economic development. Although Sub-Saharan Africa (SSA) has some of the world's fastest growing economies, it faces major challenges in the power sector which require a collective response from development partners, governments and the private sector.

1.2 The African Development Bank (AfDB) has accorded high priority to supporting the development of power sector in Africa. Between 1967 and 2008, the AfDB allocated 12% of approvals (USD 4.5 billion) to the energy sector, with about 90% of this amount going towards improving power supply. This includes support to regional power pools for the development of regional power master plans and the development of regional PPP frameworks to enable more private sector participation in the power sector. Support also targeted rural electrification, multinational grid interconnections, renewable energy development, and sector reforms.

1.3 The financial and operational viability of power utilities is central to the development of the power sector. Financially viable and creditworthy utilities can operate more efficiently, and in turn, attract investments, while allocating resources towards maintenance and expansion. Moreover, robust national utilities form the building blocks of regional energy markets. The promotion of energy trading and development of regional energy markets – spearheaded by the regional power pools is a major area of interest for the Bank. This would help address the power shortages being experienced in some African countries while unlocking untapped export potential in others, boosting overall economic competitiveness and reducing poverty.

While the Bank enjoys a strong track record in financing the development of physical energy infrastructure, there is a need to enhance support for addressing 'soft infrastructure' issues such as regulatory reforms, institutional strengthening and the development of energy markets. The Infrastructure Consortium for Africa (ICA) recently completed a *Diagnostic of Technical Assistance for the Negotiation of Power Purchase Agreements (PPAs)*, focusing on five pilot countries

and a *Study on the Regional Power Status in African Power Pools*. This process involved consultations with the five "power pools" – CAPP, COMELEC, EAPP, SAPP and WAPP. It is intended that the capacity-building activities proposed under this assignment will help to address the soft infrastructure gaps and complement the work of the ICA and also the Bank's on-going short-term training activities and economic sector work in the power sector.

2. Objectives

2.1 The Consultant Firm will assist ONRI in formulating a capacity building programme to support the power sector. There are two key deliverables expected of the Consultant Firm, namely:

- i. Undertake a diagnostic needs assessment study to identify existing gaps where the Bank could provide capacity building and technical assistance to power utilities, regulatory institutions and power pools in order to strengthen their operations, as well as the legal and regulatory frameworks;
- ii. Based on the assessment, the Consultant shall submit recommendations and a design for a multi-year Bank programme (comprising short, medium and long term measures) to provide capacity building support to national and regional energy institutions as well as strengthen the regulatory framework to enhance regional energy trade and energy sector performance.

2.2 The diagnostic and needs assessment study will build on previous studies both within the Bank, and developed by partner institutions. The objective of the study is to provide a comprehensive Bank-wide programme, targeting "soft infrastructure" issues in the power sector that will complement and support the Bank's involvement in the development of physical energy infrastructure, the growth of domestic and regional power markets and cross-border power trade. "Soft infrastructure" refers to issues such as the policy and regulatory environment, transparency, efficiency and the predictability of power administration, the quality of the business environment, and involves various institutions which are required to maintain an efficient and vibrant power sector. With a special focus on the four power pools, utilities and energy regulators, the proposed work will complement the objectives of existing Bank initiatives such as PIDA and the ICA. The work programme is ultimately aimed at promoting increased access to cleaner energies and developing regional power markets and energy trade.

3. Scope of services

3.1 The work consists of two related components. With the assistance of ONRI and in consultation with other relevant Bank departments, the Consultant firm is expected to:

- A. Undertake a diagnostic needs assessment report identifying existing gaps where the Bank could provide capacity building and technical assistance to **selected** power utilities, regulatory institutions and power pools in **Sub-Saharan Africa**, in order to strengthen their operations, as well as the legal and regulatory frameworks. A key underlying objective should be how support for the aforementioned actors and activities could boost regional energy trade in Africa. The report should consider previous and on-going capacity building and technical assistance related to the legal and regulatory frameworks, which has been undertaken by Africa countries and the regional power pools with support from the African Development Bank and other development partners.

Based on their assessment, the Consultant firm shall:-

- B. Submit a design and recommendations for a multi-year Bank programme (comprising short, medium and long term measures) to provide capacity building support to national and regional energy institutions as well as strengthen the regulatory framework to enhance regional energy trade and energy sector performance. The Consultant firm shall **provide reasons supporting his / her recommendations** as well as **outline the assumptions and risks** that could affect the success of such a programme.

3.2 The programme design shall:

- Identify short-term (up to 1 year); medium-term (1-3 years) and long-term (3-5 years) support interventions to be provided by the AfDB;
 - Indicate the suggested priorities for such interventions;
 - Suggest possible approaches to the capacity building, for example, region-specific focus, focus on a pilot group of energy exporting countries etc.
 - Consider the use of the Bank's infrastructure programmes such as the Programme for Infrastructure Development in Africa (PIDA), and power sector projects as a means to deliver capacity building.
 - Outline what each of the proposed interventions would entail in terms of objectives, expected outcomes, activities, assumptions / risk;
 - Provide an **estimate of the resource requirements** to successfully implement this programme (human resources, skills and funding etc);
 - Provide a summary outline of energy sector capacity building activities being undertaken by other development partners with respect to regional integration in electricity;
 - Make recommendations on how the AfDB might **leverage partnerships** with other development institutions in implementing this programme to avoid duplication and in order to benefit from pooled resources and lessons learned.
 - Make recommendations on how the Bank might utilize its **e-learning** capabilities and other innovative training techniques in implementing the programme, based on discussions with EADI.
 - Recommend ways in which the Bank can partner with African and overseas tertiary education institutions to develop a training and research in support of this programme.
- Propose a name for the programme;
 - Articulate who the beneficiaries will be;
 - Provide a summary assessment of previous Bank capacity building in the energy sector based on the inputs from ONEC, ONRI, OPSM, EADI and OPEV, to be provided by the Bank to the Consultant during the kick-off meeting;

4. Reports and time schedule

4.1 The assignment will require the services of the Consultant firm for a period of **four (4) months** and is expected to commence not later than on the **22nd October 2012**.

4.2 The Consultant firm will commence the assignment in Tunis, and thereafter will undertake field missions and desktop research from their respective home station. It is expected that Consultant firm will visit the following stakeholders which represent a balanced sample of countries in terms of geographical coverage and levels of developed (*i.e.* fragile states, post-conflict states, small-island states, least developed countries, middle income countries, net importers and exporters of power etc:

- 1) Congo-Brazzaville (Central African Power Pool (CAPP); national utility, energy ministry and regulator)
- 2) DR Congo (national utility, energy ministry and regulator)
- 3) Ethiopia (East Africa Power Pool (EAPP), national utility, energy ministry and regulator)
- 4) Kenya (national utility, energy ministry and regulator)
- 5) EAC Secretariat
- 6) Rwanda (national utility, energy ministry and regulator)
- 7) Namibia (RERA, national utility and energy regulator)
- 8) South Africa (AFUR, national utility and regulator)
- 9) SADC Secretariat
- 10) Zimbabwe (Southern African Power Pool (SAPP), national utility, energy ministry and regulator)
- 11) Benin (West African Power Pool (WAPP), national utility and regulator)
- 12) Côte d'Ivoire (UPDEA, ANARE, national utility and regulator)

13) Nigeria (national utility, energy regulator and ECOWAS)

14) Ghana (ERERA, national utility, energy ministry and energy regulator)

15) Cape Verde (national utility, energy ministry and energy regulator)

Using electronic and other means as may be necessary; the Consultant firm shall also consult with a selection of development partners. Travel costs for the missions under this assignment will be borne by ONRI. Additional tasks may be included by ONRI if deemed necessary for the success of this assignment.

The Consultant firm will closely work with ONRI and other Bank departments responsible for the power sector in undertaking this assignment, and will report to the **Task Manager, Mr Calvin Manduna (ONRI2)**.

4.3 Deliverables

During the course of the assignment the Consulting Firm will provide the AfDB with:

- i. A **brief interim report** will be submitted on or before 14th December;
- ii. A **First Draft Report** will be submitted for comments on or before 14th January 2013.
- iii. A **Final Report and programme design** will be submitted on 8th February 2013. The diagnostic needs assessment report shall *inter alia* include an executive summary with main findings; an outline of the methodology; the main text and an annex of institutions and individuals consulted, as well as a sample of the survey instrument(s) utilized. The main text of the report shall contain recommendations and the design of a targeted AfDB programme for capacity building support to the power sector in Sub-Saharan Africa as outlined in section 3 above (scope of work).
- iv. Consultant Firm shall participate in **validation workshop** in Tunis on 15th February 2013.

- v. Consultant firm shall be required to participate in an Expert Group Meeting convened by the Bank, **not later than 4 months following the validation workshop** to present the findings of the report and recommended programme.

The final report will be edited and disseminated within the Bank and on appropriate websites.

5. Required qualifications and experience

5.1 The project team is expected to have demonstrated experience with the power sector and power sector reforms in Africa; international best practises and comparative capacity building experiences; the legal and regulatory environment prevailing in different African countries; regional power pools and power industry associations in Africa; data collection in the national power sector and production of reports; and fluency in English and/or French. In particular, the Project Team is expected to possess the following expertise:

- i. **Lead Expert / Team Leader** with at least 15 years' experience related to power sector development and at least 10 years progressive experience with power sector projects in Africa. The Lead Expert shall possess excellent writing and analytical skills. The Lead Expert will have strong experience in working with African power utilities, energy departments, Ministries and regulatory agencies in member countries, regional power institutions such as the power pools and other power industry associations.
- ii. **Energy Sector Specialist** with at least 15 years' experience related to power sector development and at least 10 years progressive experience with power sector projects in Africa.
- iii. Suitable **back-stopping and logistical support**, led by a Project Director to ensure resources and time are allocated efficiently, to ensure the project deliverables remain on schedule, to maintain effective communication between the project team and the AfDB, and to identify and resolve problems that can affect the execution of the assignment.

Annexes: background documents

- A. ICA Report On Regional Power Status in African Power Pools (2011)
- B. Annexes to ICA Report on Regional Power Status in African Power Pools (2011)
- C. Study on Programme for Infrastructure Development in Africa (PIDA): Draft Africa Energy Outlook 2040 (July, 2011)
- D. Diagnostic of Technical Assistance for the Negotiation of Power Purchase Agreements (March 2011)

Annex B

Capacity Building Needs Assessment Questionnaire

Introduction

The current questionnaire is an open-ended survey that offers you a possibility to provide input leading to the best possible understanding of your organisation's capacity building needs.

In this context, a need is understood as a requirement to enhance the existing or acquire new skills through training or any other capacity building activity in order to improve an existing function or establish a new function within your organisation. Meeting such requirements can be related to enhancing performance of your organisation internally, assuring its correct interaction with other organisations (like in a power pool, for example), or developing enabling framework and /or environment for infrastructure financing, markets development and regulation, assuring regional networks operation etc.

All suggestions will be considered and the inputs provided by you will be used to formulate specific activities that would permit involvement of your organisation in the implementation of the capacity building programme to be funded by the African Development Bank.

This programme is planned specifically for the African electricity sector, and intended as a stand-alone capacity building initiative to meet the wide range of the most important needs of the African power sector in development of specific expertise and capabilities, related to the improvement of performance of individual operators, as well as, preparing effective and safe operation of the interconnected networks in a power pool environment.

The programme will target African professionals representing national authorities in charge of energy, national and regional regulatory authorities, electricity sector operators and other stakeholders. The activities would be structured over a short-term (up to 1 year); medium-term (1–3 years); and long-term (3–5 years).

When completing the questionnaire please keep in mind that the wider the range and more in-depth description of specific capacity building needs of your institution that you provide, the more likely it is that they will be considered and covered by the programme.

Please do not hesitate to attach soft copies of any documents that you might have in your possession, which describe in any way your organisation's capacity building needs and/or future plans to meet them. Please be assured that all the documents submitted with this questionnaire will be treated with the highest level of confidentiality and be used exclusively for the purposes of designing the AfDB capacity building programme for the African power sector. The information contained in these documents will not be communicated to third parties without your prior consent.

The questionnaire is in Word format – please feel free to modify the size of boxes (i.e. rows or columns) to accommodate all the information you need to communicate or transmit as feedback. This questionnaire has been prepared for different types of organisations in the power sector, and, you may please indicate N/A to the questions or sections that are not relevant to your situation.

We ask you to kindly return the completed questionnaire by e-mail to the following addresses not later than by the close of business on Friday, 12 November 2012. If you have any questions, please do not hesitate to contact any of the following persons via their e-mail addresses:

Calvin Manduna: c.manduna@afdb.org

Igor Zakharov: i_zakharov@yahoo.co.uk

William Gboney: wkgboney@yahoo.com

Please submit the completed questionnaire to the same e-mail addresses above.

PAGE 1 OF 6

• Name of your country

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• Name and Location of Your Organization

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• Contact Details of the Person Who Completed this Questionnaire

Name	
Position	
E-mail Address	
Telephone Number	

• Capacity Building Needs Assessment

Has a capacity building needs assessment been performed for your organization so far?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
If the answer is "Yes", please complete the following:		
In what year was it completed?		
What is the full name of the programme or project?		
Under what funding was it performed (own funds, name of donor)?		
Who were the executing agents? (name of consultant(s))		
Are you satisfied with the final product?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
If the answer is "No", please state the reason(s) for dissatisfaction? If the answer is "Yes", were the drivers for success?		
Will you kindly provide a copy of the document to the ADB? (Please remember to attach electronic copy if your answer is "Yes")	Yes <input type="checkbox"/>	No <input type="checkbox"/>

• Capacity Building Exposure in the Last 5 Years (2007 - 2012)

Please list capacity building projects implemented in your organization during the past 5 years

(Please add additional lines as necessary or attach electronic version of supporting documents)

Project Name and Objectives	Form of Capacity Building Activity	Venue and Year	Number of Participants	Project Amount and Sources of Funding

Please summarize lessons learned from the above activities.

(You can also attach soft copies of any documents of any project appraisal report or lessons learnt if available, please.)

Looking back which capacity building activities will you classify as most successful for your institution, and why?

With the past capacity building activities, have any of them been unsuccessful or not as successful as they should have been? Why?

Are you aware of another organisation that has had a success or implemented an interesting capacity building or technical assistance programme of policy that you would like to be considered by the ADB? Please describe.

• Preferred Forms of Capacity Building

Please Indicate the Forms of Capacity Building that Are Used in your Organisation:

Seminars, workshops or training of officials abroad	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Seminars, workshops or training of officials in country (in-house training programmes)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Seminars, workshops or training of personnel in other African countries	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Long-term resident international experts (more than 6 months)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Short-term international advisors (less than 6 months)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Study tours abroad	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Secondment to other organisations	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Twinning arrangement with other organisations	Yes <input type="checkbox"/>	No <input type="checkbox"/>
On-line training (e-learning)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Access to on-line data, documentation, and information on specific websites	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Other (specify)

Please indicate your preference for any specific forms of capacity building and why?

• Capacity Building Exposure in the Next 5 Years (2013 - 2018)

Please list areas in which your organization would want to implement capacity building / technical assistance measures over the next 5 years. (Please add additional lines as necessary.)

Please list any future capacity building areas you think might be relevant to interconnected regional markets establishment and their effective regulation (i.e. power pool operations, system expansion - project management, technical norms and quality standards, regulation, legal frameworks, tariff setting, financial modelling, dispatcher accreditation and language training etc.; or related to the improvement of individual companies performance (electricity system design and protection, power lines and underground cable networks, generation maintenance, work safety, customer care, technical and commercial losses reduction etc.)

Please mention any training and non-training activities (ex., technical assistance).

Area / Topic	Suggested Activity or Programme	Preferred Implementation Period (2013; 2014 - 15; 2015 - 2018)	Estimated Number of Participants

Please suggest ways on how you think capacity building support provided by the ADB can be made more effective?

• Willingness to Cooperate with the ADB Capacity Building Programme

Does your Institution have sufficient facilities (i.e. training centre) to ensure adequate capacity building and training?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
If yes, please give a short description of the facilities, location and provide contact information:		
If your Organisation has adequate training facilities, will you agree to provide capacity building to personnel of other organisations (Ex., personnel of electricity companies of other African countries)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
If yes, please list specific areas/subjects which can be offered by your training centre		
Do you know any specific best practices related to performance improvement or interconnectivity enhancement that your Organisation would be willing to share with others?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
If yes, please provide details:		

• Questionnaire Completion Date

Annex C

List of consulted stakeholder organizations

1. Abuja Electricity Distribution Company - Nigeria
2. African Forum for Utility Regulators – South Africa
3. African Union. Infrastructure and Energy Division - Addis Ababa, Ethiopia
4. *Agence de régulation du secteur de l'Electricité (ARSEL)* - Brazzaville, Congo
5. *Agence nationale de l'électrification rurale (ANER)* - Brazzaville, Congo
6. *Agência de regulação economica – Praia, Cabo Verde*
7. *Autorité Nationale de Régulation du Secteur de l'Electricité (ANARE)* – Côte d'Ivoire
8. AZITO Thermal Power Company - Côte d'Ivoire
9. Botswana Power Corporation - Botswana
10. Cabeolica S.A. - Praia, Cabo Verde
11. Central Africa Power Pool (CAPP) Permanent Secretariat – Brazzaville, Congo
12. *Centre des Métiers de l'Electricité, CIE* – Bingerville, Côte d'Ivoire
13. CIPREL Thermal Power Company - Côte d'Ivoire
14. *Communauté électrique du Bénin (CEB)* - Cotonou, Benin
15. *Communauté Électrique du Benin Training Centre* - Calavi, Benin
16. Compagnie Ivoirienne d'Électricité (CIE) – Abidjan, Côte d'Ivoire
17. Department of Energy (DOE) – South Africa
18. *Direction Générale de l'Energie* - Cotonou, Benin
19. East African Community (EAC) Secretariat - Arusha, Tanzania
20. East African Power Pool (EAPP) Permanent Secretariat - Addis Ababa, Ethiopia
21. ECOWAS Centre for Renewable Energy and Energy Efficiency – Praia, Cape Verde
22. ECOWAS Regional Electricity Regulatory Authority (ERERA) - Ghana
23. ECOWAS Secretariat, Energy Department - Nigeria
24. Electra Sarl - Praia, Cabo Verde
25. Electricity Company of Ghana (ECG)
26. Electricity Control Board (ECB), Namibia
27. *Énergies de Côte d'Ivoire (CI-ENERGIES)*
28. Energy and Water Utilities Regulatory Authority, Tanzania
29. Energy Commission of Ghana
30. Energy Commission of Nigeria
31. Energy Regulatory Commission (ERC) - Nairobi, Kenya
32. Energy Water and Sanitation Authority (EWSA) – Kigali, Rwanda
33. Eskom – South Africa
34. Eskom Academy of Learning – South Africa
35. Ethiopian Electric Power Corporation (EPPCO) - Addis Ababa, Ethiopia
36. Ethiopian Electricity Agency - Addis Ababa, Ethiopia
37. European Union Representative, Namibia
38. European Union – Gaborone, Botswana
39. Federal Ministry of Power, Nigeria
40. *Fond du développement du Secteur de l'Electricité (FDSEL)* – Brazzaville, Congo
41. Geothermal Development Company (GDC) - Nairobi, Kenya
42. Kenya Electricity Transmission Co. Ltd (KETRACO) - Nairobi, Kenya
43. Kenya Power & Light Company (KPLC) - Nairobi, Kenya
44. Luxemburg Cooperation and Development Agency (LUXDEV) - Praia, Cabo Verde
45. *Ministère des Ressources Hydrauliques et Électricité* – Kinshasa, the DRC
46. *Ministério do Turismo, Industria e Energia – Praia, Cabo Verde*
47. Ministry of Energy and Hydraulics, Congo
48. Ministry of Energy and Power - Zimbabwe

49. Ministry of Energy - Ghana
50. Ministry of Finance and Development Planning - Botswana
51. Ministry of Finance - Namibia
52. Ministry of Infrastructure. Capacity Building Advisory - Kigali, Rwanda
53. Ministry of Minerals, Energy and Water Resources - Botswana
54. Ministry of Mines and Energy - Côte d'Ivoire
55. Ministry of Mines and Energy - Namibia
56. Ministry of Water and Energy. Energy Study & Development Follow-up Directorate - Addis Ababa, Ethiopia
57. Namibia Power Company (NamPower) - Namibia
58. National Bulk Electricity Trading (PLC) - Nigeria
59. National Electricity Liabilities Management Company of Nigeria (NELMCO)
60. National Energy Regulator of South Africa (NERSA)
61. National Grid Company of Ghana (GRIDCo)
62. National Power Training Institute of Nigeria (NAPTIN)
63. National Training Centre - Zimbabwe
64. NEPAD NPCA – South Africa
65. Nigeria Electricity Regulatory Commission (NERC)
66. Nile Basin Initiative (NBI). NELSAP / Regional Interconnection Project - Kigali, Rwanda
67. Power Holding Company of Nigeria (PHCN)
68. Regional Centre of Excellence – Côte d'Ivoire
69. Regional Electricity Regulators Association (RERA) - Namibia
70. Rwanda Utilities Regulatory Agency (RURA) - Kigali, Rwanda
71. SADC Secretariat - Gaborone, Botswana
72. *Société Béninoise d'Énergie Électrique (SBEE)* - Benin
73. *Société Nationale d'Électricité (SNE)* – Brazzaville, Congo
74. Southern African Power Pool (SAPP) - Zimbabwe
75. Transmission Company of Nigeria (TCN)
76. UNIDO - Windhoek, Namibia
77. Union of Producers, Transporters and Distributors of Electric Power in Africa (UPDEA)
78. *Universidade Cabo Verde (UNICV)* - Praia, Cabo Verde
79. UNPD – Gaborone, Botswana
80. USAID - Southern African Region
81. USAID – Gaborone, Botswana
82. Volta River Authority (VRA) - Ghana
83. West African Power Pool (WAPP) Secretariat - Cotonou, Benin
84. World Bank Representative - Namibia
85. World Bank - Gaborone, Botswana
86. Zimbabwe Energy Regulatory Authority (ZERA)
87. Zimbabwe Power Company (ZPC)
88. Zimbabwe Transmission and Distribution Company (ZETDC)

Volume 2

Power sector soft infrastructure programme (PoSSIP)

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List of abbreviations

AFD	<i>Agence Française de Développement</i>	IRB	Independent Regulatory Body
AfDB	African Development Bank	PEAC	<i>Pool Énergétique de l'Afrique Centrale</i>
AFUR	African Forum for Utility Regulators	PPA	Power Purchase Agreement
APUA	Association of Power Utilities of Africa (formerly UPDEA)	RE	Renewable Energy
CAPP	Central Africa Power Pool	RERA	Regional Electricity Regulatory Authority
CB	Capacity Building	SADC	Southern African Development Community
CoE	Centre of Excellence	SSA	Sub-Saharan Africa
COMELEC	<i>Comité Maghrébin de l'Électricité</i>	TA	Technical Assistance
ECG	Electricity Company of Ghana	UPDEA	Union of Producers, Transporters and Distributors of Electric Power in Africa
ECOWAS	Economic Community of West African States	USAID	United States Agency for International Development
ERERA	ECOWAS Regional Electricity Regulatory Authority	VRA	Volta River Authority
IPP	Independent Power Producer	WAPP	West African Power Pool

Executive summary

The four SSA regions have all demonstrated the need to each have a fully functional power pool that operates at a desired level to promote regional electricity integration, so that the power needs of citizens can be met in a sustained manner and at an affordable rate.

The Consulting Team conducted a detailed diagnostic assessment of all the power pools, to determine their capacity requirements with respect to the key operational requirements which must be present for cross-border trading to occur. These elements, which are discussed below, form the **Power Sector Soft Infrastructure Programme (PoSSIP)**. The different elements are *complementary to each other and must co-exist* to support effective regional power integration and power trade.

1. Support for Robust Legal and Regulatory Frameworks to achieve the following:

- Development of sound national regulatory frameworks in countries that constitute the power pools. This is expected to support and encourage Independent Power Producers (IPPs) to invest in member countries' power sector.
- Harmonisation of tariff principles and methodologies for member countries of the power pools, to support regional power trade. This will catalyse private sector participation in regional power projects.
- Harmonisation of technical rules and standards to promote energy trade.
- Introduction of effective tariff regulation and ensure financial viability of member utilities by working through the national regulators. This will further assure IPPs of the credibility, transparency, consistency and legitimacy of the regulatory process.

2. Training on System Operations and Dispatch to achieve the following:

- Safe and reliable operation of the inter-connected power system.
- Harmonisation of codes and standards to support regional market integration.
- Harmonisation of technical operational manuals to promote regional power trade.
- Effective exchange of information to promote energy trading.

3. Establishment of a Conducive financing environment to support :

- Private sector investment.
- Project development, implementation and monitoring.
- Financing of regional power projects through partnership with commercial financing institutions.

4. Support to build financially sound and technically competent member utilities of power pools:

- With well-trained professional staff to support regional power integration.
- Which are commercially viable for regional power trade to take place.

The results of the capacity gap analysis and the recommendations to address these gaps are summarised below. The recommendations are based on a careful study of the programmes submitted by AFUR, RERA and ERERA, as well as those submitted by the four power pools (i.e. WAPP, EAPP, CAPP and SAPP) to the Consulting Team.

Strengthening the Regulatory Framework

Major Area	Short-term (Year 1)	Medium-term (Years 2 – 3)	Long-term (Years 4 – 5)
Developing Robust Legal and Regulatory Frameworks	Legal and Regulatory Framework	Regulatory Review Study	Regulatory Review Study
	Implementation of a sound and robust <i>legal and regulatory framework in member countries.</i>	To strengthen the performance of national regulators in Africa and ensure adherence to 'best' practice regulation.	To strengthen the performance of national regulators in Africa and ensure adherence to 'best' practice regulation
	Support for regulators: Support to establish legal and regulatory frameworks in countries without regulators (4 countries) Support to strengthen regional regulators such as RERA, AFUR etc.	Support for regulators: Support to establish legal and regulatory frameworks in countries without regulators (4 countries) Support to strengthen regional regulators such as RERA, AFUR, etc.	Support for regulators: Support to establish legal and regulatory frameworks in countries without regulators (4 countries) Support to strengthen regional regulators such as RERA, AFUR, etc.
	Develop Harmonised Tariff Rules	Rules Implementation	Rules Development and Implementation
	Develop and harmonise tariff-setting rules, principles and methodologies Develop Transmission Network Access Rules, including rules for wheeling charges Develop harmonised pricing framework for RE development	Implementation of Tariff Rules and Methodologies Implement pricing principles and methodology for ancillary services	Develop rules for monitoring and surveillance of power pools Develop Regulatory Accounting Guidelines
	Training programmes	Training programmes	Training programmes
	Regional Renewable Energy (EADI 2013 Draft Work Programme) Regulatory, Economic, Technical and Financial Analysis of RE technologies Basic Principles and fundamentals of Tariff Design Electricity markets, cross-border trading and power pooling concepts	Market Rules, Electricity Trading, Financial Markets and Settlement Regulation and governance of power pools. Role of system operators.	Power System Economics Advanced Course in Tariff Design and Modelling, including Hands-on Training

Training on System Operations and Dispatch

Major Area	Short-term (Year 1)	Medium-term (Years 2 – 3)	Long-term (Years 4-5)
Training on System Operations and Dispatch	Technical Rules and Regulations	Technical Rules Implementation:	Technical Studies
	Develop Technical Operations Manual for system Operations' Codes of practice	Implement and operationalise the technical manuals for system operators	Studies on Power System Analysis and Congestion management
	Develop guidelines for technical regulations, standards for cross-border interconnection and power trading	Implement technical regulations, standards for cross-border interconnection and power trading	Study on grid stability and impact of higher penetration of RE technologies
	Quality of Service Guidelines		
	Training programmes	Training programmes	Training programmes
	Accredited courses for System Operators.	Implement System Operators certification course. Rules and standards for interconnections and power trading	Implement System operators certification course

Establishment of a Conducive Financing Environment

Major Area	Short-term (Year 1)	Medium-term (Years 2 – 3)	Long-term (Years 4-5)
Conducive Financing Environment	Develop a Model PPA	Implementation of Model PPA	
	Standardised PPA which can be adapted and adopted by each power pool in each region	Implementation and adoption of model PPA	
	Training programmes	Training programmes	Training programmes
	PPP (Based on EADI 2013 Draft Programme) for WAPP, PEAC, SAPP, EAPP and COMELEC. Includes a programme on "Enhancing Negotiating Skills to become an effective Power Negotiator". Practical Simulation: Project Completion and Implementation Assumptions (EADI 2013 Draft Programme)	PPA's and IPP's concepts and their application in the power sector. Includes a programme on "Enhancing Negotiating Skills to become an effective Power Negotiator". Project Finance, Economic Evaluation of infrastructure Projects	Engineering Economics and Finance

Institutional Strengthening of Utilities: Generation, Transmission and Distribution

Major Area	Short – term (Year 1)	Medium-Term (Years 2 – 3)	Medium-term (Years 4-5)
Technical Capacity	System Studies	System Studies	Project
	Integrated Resource Planning for each region. Existing studies to be updated. Demand and load forecasting	Power Factor Studies, efficient use of power and impact on grid stability	Implement results of power factor studies for technical loss reduction and grid stability
	Training	Training	Training
	Modern maintenance practices for generating stations Modern Line (i.e. 'live line') and substation maintenance practices Protection and Control	Substation Design Hydro and thermal Plant Design	Modern Line (i.e. 'live' wire) and substation maintenance practices
Improving Financial Performance and Commercial Capacity	Studies	Studies	Studies
	Performance Benchmarking of member utilities for each region	Loss studies for each region: Technical and Commercial Losses Pre-payment and commercial loss reduction: Minimise billing and metering errors, electricity theft	Quality of Service evaluation for each regional power pool
	Projects	Projects	
	Quality of Service evaluation for each regional power pool	Pre-payment and commercial loss reduction: Minimise billing and metering errors, electricity theft	Quality of Service evaluation

Upgrading Existing Training Institutions to Centres of Excellence

The CB programme has identified five existing training institutions which can be supported to become Centres of Excellence. The estimated costs for upgrading these institutions are summarised in the table below.

Activity	Time Frame	Cost (US\$)	Total Cost (US\$)
Upgrade 5 Training Centres to operate as Centres of Excellence, including enhancing ICT capabilities	2 years	1,000,000 per year	2,000,000
Assistance to develop Business and Marketing Plans to ensure long-term sustainability	2 years	500,000 per centre per year	2,500,000
Equipment purchase for laboratories and workshops for 5 training centres	2 years	250,000 per centre per year	2,500,000
Total			7,000,000

The Consulting Team suggests that the recommended dedicated CB Implementation Team in the Bank should work with the training institutions, towards developing affiliations with well-established tertiary institutions in SSA. This relationship would serve as an impetus for ensuring the long-term sustainability of the programme and also allow for accreditation and certification of the CB programmes. Once the programme achieves accreditation, the training centres will be deemed to have achieved the status of "Centres of Excellence".

This is very crucial for the financial sustainability of the institutions, because as international recognised institutions, they will be able to provide training not only for power sector professionals from SSA, but also extend the service to professionals from other developing and even some developed countries.

Total Cost Estimates

The total estimated funding requirements for implementing the CB Programme are summarised below.

Major Element	Short-term (US\$)	Medium-term (US\$)	Long-term (US\$)	Total (US\$)
Legal & Regional Regulatory Framework, including development and strengthening of national regulators	4,320,000	3,480,000	3,280,000	11,080,000
System Operations and Dispatch	2,160,000	2,322,000	2,002,000	6,484,000
Conducive Financing Environment	1,580,000	950,000	640,000	3,170,000
Strengthening of member utility companies of power pools	4,760,000	3,680,000	2,440,000	10,880,000
Sub-Total	12,820,000	10,432,000	8,362,000	31,614,000
Total Cost for Upgrading Centres of Excellence				7,000,000
PoSSIP Total				38,614,000

Proposed CB Financing Model

In order to ensure financial sustainability for the CB programme, the following financial model is proposed:

- The cost for upgrading the Centres of Excellence and equipment purchase for the laboratories and workshops should be funded by the AfDB, other donors and the utilities.
- Donors could fund the cost of course preparation and part of the cost for course delivery, while stakeholders pay the balance for the course delivery costs (travel to training venue).
- Implement a "fee-for-service" business model starting from year 4 to ensure full cost-recovery. This is expected to lead to the programme's long-term financial sustainability from year 5 onwards.

Recommendations for CB Programme Delivery

The report has also recommended the following options for the CB programme delivery:

■ Hybrid delivery approach

A hybrid delivery approach which will comprise a combination of class-room lectures, hands-on training, using case studies and practical exercises, On-the-job training and site visits.

■ Use of Information and Communication Technology

Information and Communication Technology (ICT) could be utilised as a training delivery platform at the Centres of Excellence (CoE) under the “Virtual Classroom” or e-learning concept. This option could be used to deliver classroom-based courses at relatively low cost to participants within a short period of time.

■ Create a dedicated research team for energy market, policies and regulation

The Consultants recommend the creation of a dedicated team comprising Bank staff to undertake research work on “**Energy Markets, Policies and Regulation**”. The proposed Research Team could also be used to strengthen the energy sector research capacity of the Bank by leveraging on resources such as the Brazilian South-South Trust Fund¹, which aims to facilitate the sharing and dissemination of developed knowledge, expertise and appropriate technology between Regional Member Countries and other developing regions outside Africa under South-South cooperation. It is also important that results of research findings are used to support the development of physical energy infrastructure in Africa. In this regard, the Bank could consider partnering with other agencies such as UNIDO in South Africa, to develop mechanisms aimed at commercialising research findings to support the Bank’s effort.

■ Establish a dedicated team for programme implementation

In order to ensure a successful roll-out of the programme, it is recommended that a *dedicated team comprising Bank staff* from various departments should be constituted to roll-out the CB Programme implementation. This dedicated staff should comprise professionals with competencies in the following areas:

- Human Resources development, with training in capacity building.
- Specialisation in specific fields of knowledge and experience – for example an engineer with background in power systems economics, system operations and regional power integration; a regulatory economist with experience in regulatory reforms and tariff design.
- Logistical support.

It is also recommended that the implementation of the capacity building initiatives employ a modular approach, with modules in different fields of specialisation forming regular classes.

¹ In June 2011, the Government of Brazil and the Bank signed an agreement to establish a Trust Fund with an untied grant of US\$ 6 million to promote South-South cooperation.

1. Capacity building programme design

1.1 Basis for assessment

The terms of reference required that the proposed CB take cognisance of the following factors:

- CB needs should be common to all the stakeholders,
- The CB programme should have a direct impact on the implementation of power projects that which affect regional electricity market integration,
- CB should enhance regional electricity trade.

The detailed CB needs assessment was carried out by adopting a three-stage approach as follows:

Stage 1: Identification of CB needs using Gap Analysis,

Stage 2: Screening analysis to prioritise the CB needs,

Stage 3: Implementation Plan and Resource Requirements.

The assessment of the CB requirements revealed that irrespective of the institutional structures that have been adopted, there are four main requirements that must be present before a regional power pool can develop. These ingredients, which are discussed below, are complementary to each other and must *co-exist* to support effective regional power integration and power trade through the power pools:

1. Robust legal and regulatory framework to achieve the following:

- Development of sound national regulatory frameworks in countries that constitute the power pools. This is expected to encourage Independent Power Producers (IPPs) to invest in member countries.
- Harmonisation of tariff principles and methodologies amongst members of a power pool in order to support regional power trade. This will catalyse private sector participation in regional power projects.

- Harmonisation of technical rules and standards to promote energy trade.
- Introduction of effective tariff regulation and ensure financial viability of member utilities by working through the national regulators. This will further assure IPPs of the credibility, transparency, consistency and legitimacy of the regulatory process.

2. System operations and dispatch to achieve the following:

- Safe and reliable operation of the inter-connected power system.
- Harmonisation of codes and standards to support regional market integration.
- Harmonisation of technical operational manuals to promote regional power trade.
- Effective exchange of information to promote energy trading.

3. Conducive financing environment to support :

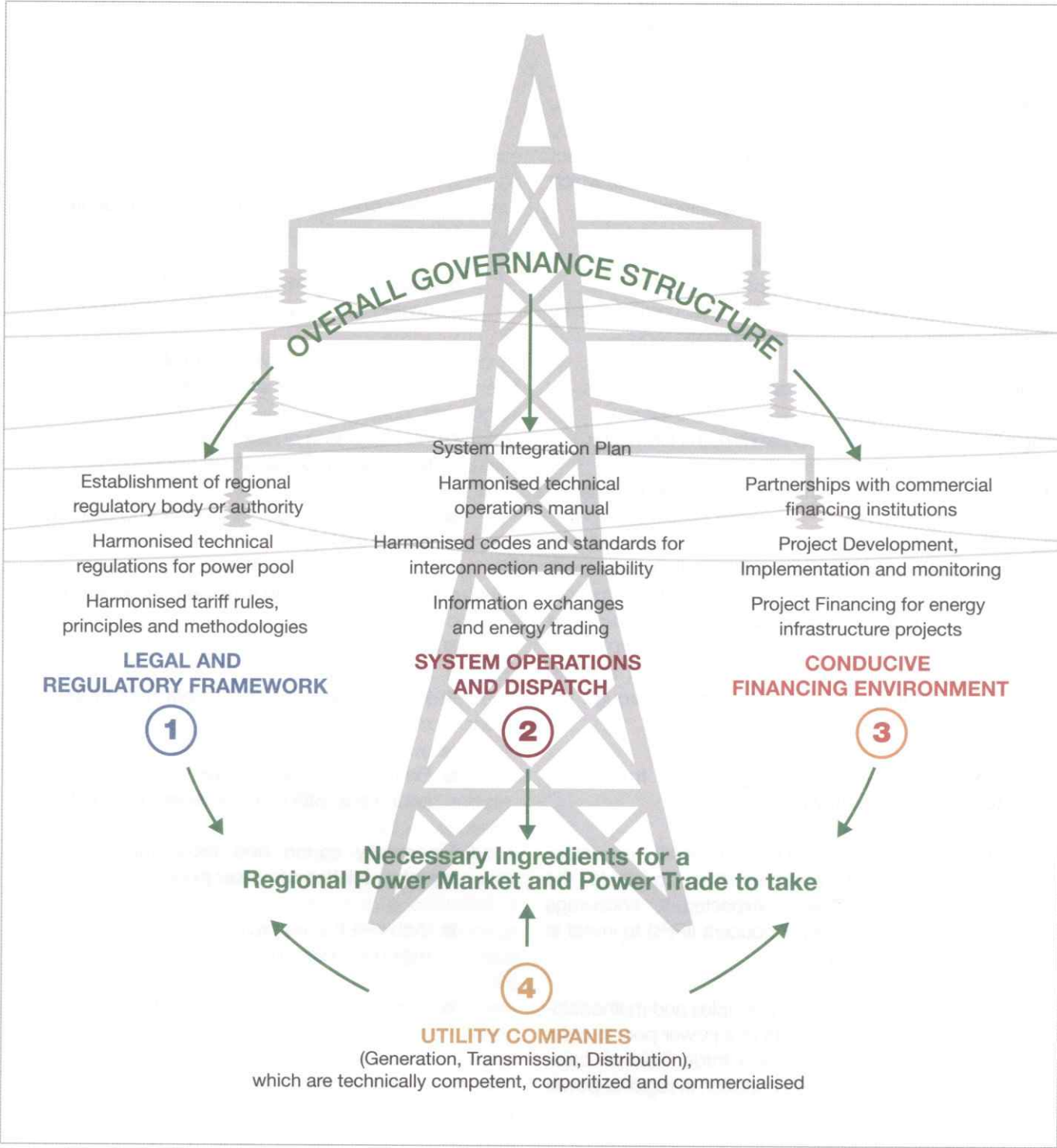
- Private sector investment
- Project development, implementation and monitoring.
- Financing of regional power projects through partnership with commercial financing institutions

4. Financially sound and technically competent member utilities of power pools:

- With well-trained professional staff to support regional power integration
- Which are commercially viable for regional power trade to take place

The above factors form the basis for identifying and prioritising the CB needs of the various power pools and other stakeholders. Figure 1 (page 2) depicts the key elements which must be present for an effective regional electricity market and power trade to take place.

Figure 1
Key Elements on an Effective Regional Electricity Market



1.2 Needs assessment and gap analysis

Based on analysis of the completed questionnaires and the feedback from the interviews, the Consulting Team was able to identify the gaps that, if not addressed, could hamper the operations of the power pools. The results of the gap analysis were used to prioritise the CB needs. The screening process involved the following steps:

Step 1: Identification of major CB Areas and sub-areas

Step 2: Classification of each “Sub-Area” as Short term (ST), Medium term (MT) or Long term (LT), based on the urgency of the CB requirement. The weighting has been skewed in favour of the urgent and immediate (i.e. ST) CB needs.

Step 3: Weights were assigned to each Major CB Area and “Sub-Area”. Weighted average scores were then used to prioritise the CB needs.

1.3 Legal and regulatory framework

One important *ingredient* which is required for effective functioning of a power pool is the establishment of *robust regional and national regulatory frameworks*. The results of the screening analysis for a regulatory framework are presented in Table 1 below. Table 2 (page 4) shows the list of countries in Africa without energy sector regulators. The table also indicates the countries which are recommended by the Consulting Team for technical assistance (TA) to establish regulators.

An empirical assessment of the performance of African regulators was carried out for AFUR and the World Bank in 2010. The result of that exercise showed that most regulators in Africa are fledgling and in need of capacity building to develop and enhance their skills. The key finding of that empirical study is summarised as follows: *in Africa, no regulatory agency has been able to achieve the Standard Independent Regulator Model²*. This finding is corroborated by the results from the African Infrastructure Country Diagnostic (AICD) study which stated among others that *Africa’s institutional framework, including the regulatory framework for infrastructure, is no more than halfway along the path to best-practice³*.

Table 1
Screening Analysis of Power Pools - Regulatory Framework

Major CB Area Identified	Weight	Sub-areas or Gaps	Sub-weight ⁴	ST 40%	MT 35%	LT 25%
Establishment of regional regulatory frameworks	1	Institutional support to 12 countries to develop legal and regulatory frameworks, establish regulators (see Table 2 (page 4); support to countries to strengthen existing regulatory framework	0.2	8.0	7.0	5.0
		Develop harmonised transmission tariff setting rules, principles and methodology, including those for feed-in tariffs, and Mandated Policies for promoting RE	0.2	8.0	7.0	-
		Develop rules for ancillary services pricing	0.2	8.0	7.0	5.0
		Develop rules for monitoring and surveillance of power pools	0.2	-	-	5.0
		Develop market rules, including financial settlement rules	-	8.0	7.0	5.0
		Develop operational manuals and technical rules	0.2	8.0	7.0	5.0
TOTAL			1.00	40.0	35.0	25.0

² Overview of Africa’s infrastructure and regulatory frameworks: prospects and challenges, Gboney, W. A study prepared for AFUR and the World Bank, 2010.

³ See details in Foster, V. and Garmendia-Briceno, C., “Africa’s Infrastructure: A Time for Transformation”, Report prepared for Africa Infrastructure Country Diagnostic (AICD), 2009.

⁴ The sum of the sub-weights for each major CB should equal 1.00

Table 2
Countries without Energy Sector Regulators in Africa⁵

	Country	Remarks
1	Benin	Technical Assistance Recommended
2	Botswana	In the process of establishing a regulator
3	Cape Verde	Technical Assistance Recommended
4	Central African Republic	Technical Assistance Recommended
5	Chad	
6	Comoros	
7	Djibouti	
8	Equatorial Guinea	
9	Eritrea	
10	Gabon	
11	Guinea	Technical Assistance Recommended
12	Guinea Bissau	Technical Assistance Recommended
13	Liberia	Technical Assistance Recommended
14	Libya	
15	Madagascar	Technical Assistance Recommended
16	Morocco	
17	Republic of Congo	Technical Assistance Recommended
18	Sao Tome and Principe	
19	Seychelle	Technical Assistance Recommended
20	Sierra Leone	Technical Assistance Recommended
21	Somalia	Technical Assistance Recommended
22	Sudan	
23	South Sudan	
24	Tunisia	

Table 3
Training and Consultancy Services on Regulatory Economics

Major CB Area	Weight	Sub – Areas or Gap	Sub-weight	ST 40%	MT 35%	LT 25%
Regulatory Economics	1	Economics of Regulation, regulation and governance of electricity markets	0.25	10.0	8.75	6.25
		Techniques in electricity pricing and tariff design, including transmission access pricing	0.25	10.0	8.75	6.25
		Power system economics, load flow analysis	0.25	10.0	8.75	6.25
		Financial Modelling for tariff design	0.25	10.0	8.75	6.25
TOTAL			1.00	40.0	35.00	25.00

⁵ Source: AFUR Secretariat, Pretoria, South Africa. The list of countries is correct as at 22nd April, 2013.

Table 4
Training and Consultancy Services on Regulatory Economics

Major Area	ST	MT	LT
Regulatory Framework	40.0	35.0	25.0
Regulatory Economics	40.0	35.0	25.0
TOTAL	80.0	70.0	50.0

Table 3 (page 4) presents results of the screening analysis of CB for regulatory economics.

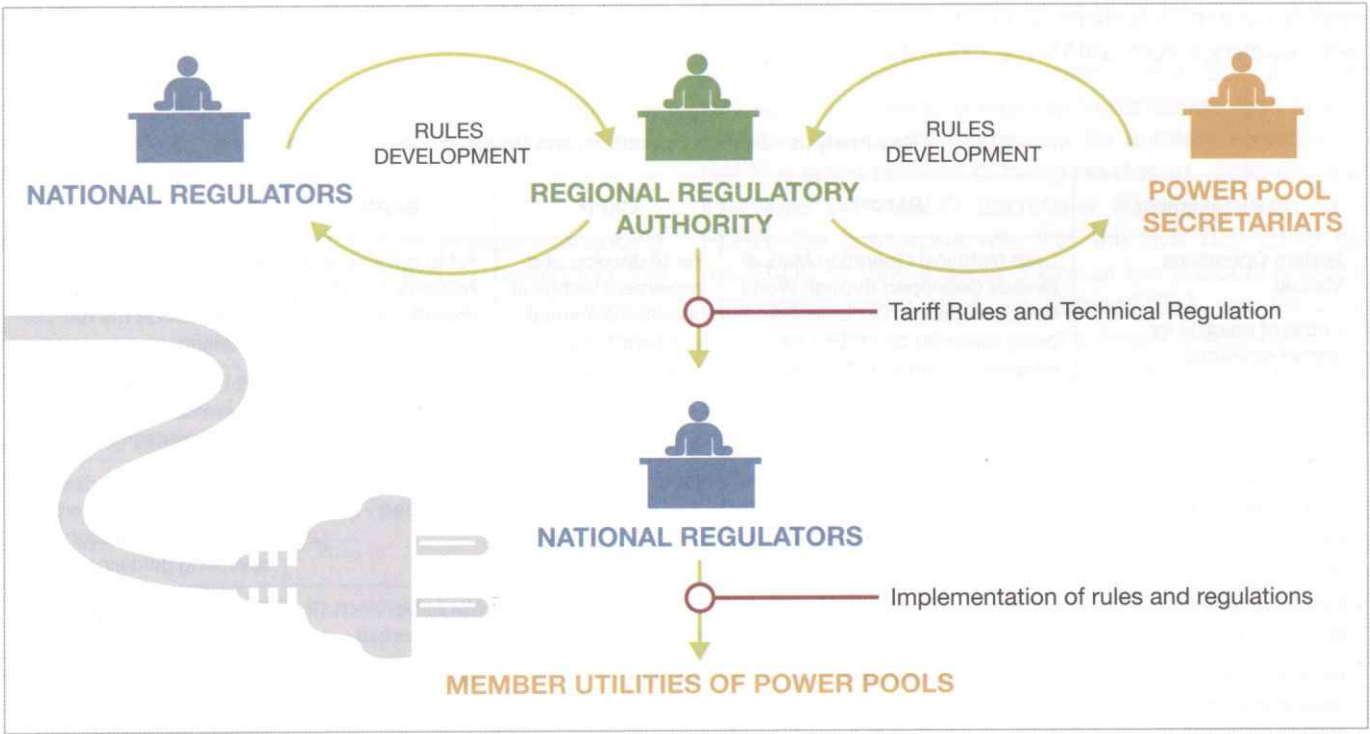
Table 4 ranks the importance of CB for regulatory framework and regulatory economics.

From the above results, it is clear that most regulatory framework issues need to be addressed in the short and medium-term. Delay in addressing these problems could result in some of them cascading into long-term issues. It is also

evident that training in courses related to regulatory economics are crucial for all the regional and national regulators given their impact on the effectiveness of the power pools.

It is therefore important that the national regulators have a deep appreciation of issues relating to regulatory economics. The figure below depicts the relationship between the regional and national regulators in the rule implementation process.

Figure 2
Relationship between National and Regional Regulators in Rule Implementation



1.4 System operations and dispatch

An interconnected system must be operated in a *safe, stable and reliable condition*. This implies that the *rules and regulations for system operations and dispatch* must be developed and operationalized. In addition, the technical capacity of system operators, both at the regional and country levels, need to be enhanced through well-designed training programmes.

The consulting team reviewed all the available documentation from the four Sub-Saharan Power Pools (i.e. WAPP, CAPP, EAPP and SAPP), and identified an urgent need to develop technical manuals and policies, which set out the principles, procedures and requirements for the safe operation of interconnected systems.

The results of the gap analysis of the four power pools with respect to system operations are shown in Table 5 below.

The results from the above table clearly indicate that SAPP is the most advanced power pool in Africa. Most of the technical issues confronting WAPP, EAPP and CAPP in the area of System Operations and Dispatch, can be resolved with assistance from SAPP. The Consultants are therefore

of the opinion that the 'learning curve' for the emerging three power pools can be shortened if mechanisms are put in place to ensure that there is effective knowledge transfer and sharing of experiences between SAPP and the other power pools.

The results of the analysis have also revealed an urgent need to develop an accredited and certification programme to enhance the skills of system operators in the power pool coordination centres, and in the member countries. This process is crucial to ensuring that the interconnected power system can be operated in a safe and reliable manner, by well-trained technical staff. Proposed responses to the gaps identified are reflected in Table 6 (page 7).

Based on the above results, it is clear that issues relating to the development of *operations manuals and harmonisation of codes and standards* are short-term issues which must be addressed to avoid hampering the effective functioning of the power pools. The training for system operators spans the short to medium and long-terms. The significance of training and accreditation of System Operators was acknowledged by all the four SSA power pools during the interview phase of the assignment.

Table 5
Gap Analysis - System Operations and Dispatch

CB Requirement	WAPP	CAPP	EAPP	SAPP
System Operations Manual: Codes of practice for system operators	Draft technical Operation Manual already developed through World Bank assistance. Document is being reviewed by ERERA for adoption, under AFD funding	Yet to develop and implement technical operations manual, and harmonise codes of practice.	Yet to develop and implement system operation manual	Has already developed system operation manual, which provide the rules of operation. Will however require a review for updating of these documents
Development of harmonised codes and standards for system operators	Process not fully completed	Yet to be developed	Yet to be developed	Fully functional codes and technical standards implemented through operating guidelines
Functional System Control and Coordination Centre	Not implemented even though a site has been acquired in Benin	Yet to be implemented	Yet to be implemented	Fully functional control and coordination centre.
Development of programme for training of system operators	Yet to be implemented	Yet to be implemented	Yet to be implemented	SAPP has submitted and agreed on a detailed training programme with Kafue Gorge
Accreditation of programme for system operators	Yet to be implemented	Yet to be implemented	Yet to be implemented	On-going discussions with Kafue Gorge regarding programme accreditation.
Training and Certification of System Operators	Yet to be implemented	Yet to be implemented	Yet to be implemented	Yet to be implemented

Table 6
Screening Analysis – System Operations and Dispatch

Major CB Area	Weight	Sub-areas	Sub-weights	ST 40%	MT 35%	LT 25%
System Operations Manual	1	Develop System Operations Manual or codes of practice for operations	0.34	13.60		
		Develop Regulations and Standards for Cross-border interconnections	0.33	13.20		
		Training and certification of system operators to ensure the operators are internationally recognised	0.33	13.20	11.60	8.30
TOTAL SCORE			1.00	40.00	11.60	8.30

1.5 Conducive financing environment

The third important ingredient that must exist for efficient functioning of a power pool is a *conducive environment for infrastructure financing*. This is needed to catalyse private sector participation and encourage public private partnerships for regional projects. Such a financing environment should encompass key elements related to PPA's, PPP's and IPP's. It should also cover issues concerning project development, monitoring and evaluation.

The results of the gap analysis regarding the creation of an enabling financing environment are presented in Table 7 (page 8).

With respect to regulatory frameworks to support financing of regional projects, ERERA is currently developing the necessary tariff guidelines and methodologies to promote regional power market integration for ECOWAS. This project is funded under AFD Financing Agreement which covers "Regulatory Studies". The studies on transmission network pricing and project development involve the following:

- Development of Access Rules to the regional grid by eligible customers
- Development of tariff methodology for regional transmission cost
- Development of Best Contractual Practices

In the case of EAPP, an Independent Regulatory Board (IRB) has been established with the help of Norwegian TA. Additional support is required to help build the capacity of the newly established IRB and enhance its operationalization.

As can be gleaned from the above table, CAPP is yet to establish a regional regulatory framework. It is also yet to develop the necessary tariff policies and methodologies for transmission access pricing for regional electricity trading.

SAPP is currently the only power pool in SSA that has managed to develop a regional transmission tariff policy. However, the pricing framework for ancillary services for SAPP is in the process of being developed. Following the interviews with SADC Secretariat (Energy Division) and RERA, the consensus was that the time has come for the SADC to take a second look at the protocol and the cooperation policy which established RERA, with the view to elevating it from the status of a Regional Association to that of an Regional Regulatory Authority. The new status is expected to give more powers to RERA and ensure that its decisions and recommendations on technical issues are binding on the member countries.

From the gap analysis, it is also apparent that all the four power pools would require skill enhancement in areas such as project development, project management, project implementation and monitoring. In addition to the gap analysis, a screening analysis was also carried out to prioritise the various CB areas. The summary of results is shown in Table 8 (page 9).

Table 7
Gap Analysis - Financing Environment

CB Requirement	WAPP	CAPP	EAPP	SAPP
Creating Regulatory Frameworks to support energy infrastructure financing	Regional Regulatory Authority, ERERA has been established separate from WAPP. ERERA also requires CB for its staff	Regional Regulatory currently not established	Independent Regulatory Board has been established within EAPP	Support for SADC to review the SADC Energy Protocol and Cooperation Policy Agreement, to enable RERA to become a regulatory authority Need to develop ancillary services pricing guidelines and methodology
	ERERA is in the process of developing a tariff methodology for WAPP, including network and ancillary services tariffs	Yet to develop regional tariff methodology for network and ancillary services	TA support is currently available to build the capacity of IRB and Coordination Centre projects (Norway 2012 - 2015)	Need to review and update transmission pricing methodology, and finalise loss allocation principles
Project development, implementation and monitoring	More understanding of project development process is required Structuring and negotiating PPA's not fully understood for regional power projects	Require better understanding in project development, implementation and monitoring Need enhanced knowledge in PPA's, PPPs, legal, financial and commercial aspects of power pool operations	Need more understanding of project development, implementation and monitoring Increased knowledge in PPA design, negotiations needed	Need to enhance skills in project development implementation and monitoring
	Limited knowledge in carrying out due diligence, and contracts management for power project	Knowledge required in carrying out due diligence for power projects	Enhanced knowledge in legal, financial and commercial aspects of power pool operations Knowledge in carrying out due diligence for regional projects	

Table 8
Screening Analysis-Conducive Financing Environment

Major Area	Weight	Sub-areas or Gaps	Sub-weight	ST 40%	MT 35%	LT 25%
Robust Regulatory Framework	1	Establishment of Regional Regulatory Authority	0.20	8.0	-	-
Project Development, implementation and monitoring		PPA's, PPP's and contract negotiations and management	0.20	8.0	7.0	5.0
		Project Financing	0.20	8.0	7.0	5.0
		Project development, Project Implementation and monitoring	0.20	8.0	7.0	5.0
		Due diligence of regional power projects	0.20	8.0	7.0	5.0
		TOTAL SCORE	1.00	40.0	28.0	20.0

1.6 CB needs assessment of utilities: generation, transmission and distribution

The Consulting Team also interviewed a number of member utilities of the power pools in SSA to identify their CB needs. The Team took the view that since the power pools are constituted by member utilities, their technical operations and financial viability are crucial for the survival and operations of the power pools.

The Team observed that one of the key obstacles which has affected the timely development and implementation of regional (and national power) projects is *weak capacity in the state-owned utility companies and sector ministries on regulatory and project development issues*. Some of the stalled projects have had a direct impact on regional power market integration and power trade among member countries.

Policy makers (i.e. sector ministries) have indicated that they would like to have an in-depth understanding of all the key issues related to power pools, regulatory economics, utility operations and project finance. This request has been taken into consideration by the Consulting Team to ensure that policy-makers also benefit from whatever programmes are designed stemming out from this study. This approach would enable the sector ministries to be able to develop robust future policies to drive the power sector.

It can be seen that apart from the CB issues related to power system planning and development, and utility performance, all the other CB gaps are cross-cutting ones that also affect the regional and national regulators. The results of the CB needs assessment for the member utilities are shown in Table 9 (page 10).

The above gap analysis was used in the screening analysis presented in Table 10 (page 11).

The results of the screening analysis indicate that the capacities of the member utilities of the power pools need to be enhanced within the short, medium and long-term to ensure that they are financially viable and technically competent to carry out their operations in an efficient manner.

During the country visits, the utility companies also indicated the need to have some basic understanding of issues on economic regulation, regulatory economics, energy trading and project management. Since these are cross-cutting issues, the capacity building for the utilities in these areas would be integrated and synchronised with the programme for the regional and national regulators during the CB design stage.

Table 9
Gap Analysis for Member Utilities: Generation, Transmission and Distribution

Major Area	Gaps Identified
Generation System	<ul style="list-style-type: none"> • Enhance staff capacity in modern plant maintenance practices • Build capacity in the design of hydro and thermal systems: Both national and regional projects • Power Plant Maintenance Management
Network Systems Maintenance: Transmission and Distribution	<ul style="list-style-type: none"> • Enhance technical staff capacity in the use of modern maintenance practices, for example, 'live line' maintenance • Train engineers and technicians in substation design, transformer and substation maintenance • Electrical power system protection and control • Design and maintenance of High, Medium and Low Voltage Lines
Distribution System Performance	<ul style="list-style-type: none"> • Metering systems and impact on reducing non-commercial losses • Training in effective customer services and customer care • Performance benchmarking techniques with respect to: <ul style="list-style-type: none"> - Commercial Losses - Technical Losses - Technical performance - Financial Performance - Quality of Service : Duration and Frequency of Interruptions
Economic Regulation and Regulatory Economics	<ul style="list-style-type: none"> • Rationale for regulation of public utilities • Electricity Markets and Power Pool Operation • Basic techniques in utility pricing • Transmission Access and Wheeling Charges • Ancillary Services Pricing • Financial Modelling • Utility performance benchmarking e.g. SAPP / RERA experience, with support from USAID
Market Operations	<ul style="list-style-type: none"> • Grid Codes and Technical Manuals • Market Rules • Energy Trading
Project Management	<ul style="list-style-type: none"> • Legal, Contractual and financing issues • Project development, management and monitoring • PPAs • Project Finance and IPPs
Power Generation and Transmission Project Planning and Development, Load Forecasting Techniques	<ul style="list-style-type: none"> • Demand forecasting for various customer categories, using technical and econometric methods • Development of Integrated Resource Planning • Load forecasting and modelling • Planning and developing regional generation projects: hydro and thermal

Table 10
Screening Analysis for Generation, Transmission and Distribution Utilities

Major Area	Weight	Sub-areas or Gap	Sub-weights ⁶	ST 40%	MT 35%	LT 25%
Generation System	1	Plant Maintenance and Maintenance Management	0.10	4.0	3.5	2.5
		Hydro and Thermal Plant Design	0.10		3.5	2.5
Network Systems Maintenance: Transmission and Distribution		Modern Line Substation Maintenance Practices	0.10	4.0	3.5	2.5
		Substation and Transformer design and maintenance	0.10			2.5
		Procurement of goods – best practices, standards	0.10	4.0	3.5	
		Protection and Control	0.10	4.0	3.5	2.5
		Distribution System and Performance	Pre-payment metering and commercial loss reduction	0.10	4.0	3.5
Technical loss reduction			0.10	4.0	3.5	2.5
Performance Benchmarking and Quality of Service Monitoring			0.10	4.0	3.5	2.5
Power Generation and Transmission Project Planning and Development, Load Forecasting Techniques			Demand and load forecasting	0.05	2.0	1.75
		Planning and developing regional projects	0.05	2.0	1.75	1.25
TOTAL			1.00	32.0	31.50	22.50

⁶ Sub-weights should add up to 1.00

1.7 CB needs assessment of training institutions

Currently SSA lacks a critical mass of regional Centres of Excellence which are capable of providing high level training to support the development and implementation of regional (and national) projects for regional power market interconnection. It is in this regard that the Consulting Team decided to visit a sample of training institutions to assess their available training resources.

The Team also researched some of the existing Centres of Excellence in developed and developing countries to draw lessons that could shape the implementation of the CoEs for the current CB design. The result of that exercise is presented in Table 11 (page 13).

A critical assessment was performed to identify which of the institutions offers the best opportunity for leveraging existing resources to become a Centre of Excellence. The assessment is based on the following qualifying factors shown in Table 12 (page 14).

In addition to the aforementioned qualifying factors, the Consultants also took into account the following guiding principles.

- The Centre of Excellence should not be a green-field project.

Starting a new centre of Excellence from scratch would imply high start-up costs. This would also cause a delay of at least 3 years to complete the project before the centre could be ready to deliver the much needed CB programme.

- The Centre of Excellence should be located within an existing Institution.

The centre should be located within an already existing institution, such as a university or a training centre. This implies that either the centre possesses the basic infrastructure and training facilities, or may require some level of upgrade and TA, to acquire the necessary workshop equipment and modern simulators to enhance CB delivery.

Based on the above qualifying factors and guiding principles, a number of institutions have been selected as the potential candidates for Centres of Excellence, as detailed in Table 13 (page 15).

The training institutions should work towards developing affiliations / partnerships with some of the well-established tertiary institutions, and development organizations both in SSA and abroad, particularly those with sector-specific expertise. This relationship will help to ensure the *long-term sustainability* of the CoE, and also serve as a platform towards the accreditation and certification of the training programmes offered by the various CoE's. Once the programmes achieve accreditation and can deliver certification backed by the universities, the training centres would have been deemed to have achieved the status of 'Centres of Excellence'. This is very crucial for the future financial sustainability of the institutions because as internationally recognised institutions, they can provide training not only to power sector professionals from SSA, but extend their services to professionals from both developing and developed countries.

It is important to note that UPDEA (APUA)⁷ has already initiated consultancy work with the aim of *defining and sizing a network of Regional Centres of Excellence called 'Poles of Excellence'*, (i.e. to Select several Pilot Poles of Excellence) to provide training in Electrical Trades, under a project being financed by the AfDB and AFD. With the exception of the proposed Nile Basin Regional Centre of Excellence, all the other training institutions in Table 13 (page 15) were also identified by APUA as potential candidates for the proposed Pilot Poles of Excellence.

The results of the APUA exercise will no doubt have implications for the current CB assignment in the selection of Centres of Excellence for training professionals in all levels of electrical trades. It should be emphasised that while the current CB assignment attempts to identify Institutions which could be elevated to the status of Centres of Excellence to provide the training to support regional electricity trade and promote the implementation of regional projects, the APUA exercise basically focuses on identifying centres which can be used for the training of professionals in the electrical trade.

The outcome of that exercise could therefore assist AfDB identify other institutions which could be used to provide certification courses for System Operators.

⁷ UPDEA is now known by the acronym APUA. The name change occurred in December 2012.

Table 11
Centres of Excellence in Selected Countries and Lessons Learnt

Institution	Programmes Offered	Lessons Learnt	Implications for CB Programme
Japan Electric Power Information Centre (JEPIC)	<ul style="list-style-type: none"> • Research work • Exchange Programmes • International Cooperation • Research Publications 	The Centre Service as a medium for knowledge and information dissemination. Also networks with other organizations in USA, Europe and Asia	The proposed dedicated Research Team within AfDB can establish a link with JEPIC, for regular exchange of information and research findings on technical aspects of the power sector, and issues on power sector reforms
National Power Training Institute, India (NPTI)	<ul style="list-style-type: none"> • Offers long-term and short-term technical training courses in Thermal, Hydro, Transmission, Distribution. • Also offers courses in Maintenance Management • Organizes industry interfaced academic programmes up to the post graduate level 	<p>Programme was initiated by the Indian government.</p> <p>Initial funding was also provided by the Indian government</p>	The respective governments could contribute towards the establishment of the regional Centres of Excellence
Power Management Institute, India (PMI)	<ul style="list-style-type: none"> • Management courses • Technical courses • Employee Development Programmes • Thermal Power Systems • Organizes post -graduate programmes in collaboration with academic institutions 	The Institute was initially set up by a power generating company to address the manpower needs of the generating company. Later, it was used to provide training in both technical and management courses for other institutions in the power sector	The member utilities of the power pool, could take a key role in establishing the CoEs and ensuring their long- term sustainability
China Electric Power Research Institute (CEPRI)	<ul style="list-style-type: none"> • Undertakes research • Undertakes technical consultancies and product development • Owns a national engineering research centre focusing on power transmission, distribution and power efficiency • Owns a technological service centre • Has a graduate school and research centre • Undertake technical publication of all research findings 	Started as a small research centre, but has fully grown due to industry support	Member utilities of power pools should consider setting up technical research centres in some of the CoE's. This can be done in collaboration with the universities and AfDB
Central Research Institute of Electric Power Industry, Japan	<p>Undertakes research in the following areas:</p> <ul style="list-style-type: none"> • Nuclear Power Technology • Stable Power Supply Technology 	Research work is focused on solving problems faced by the power industry	Member utilities of power pools could fund research work aimed at solving common problems facing Africa's power sector
Centre of Excellence in Power Engineering, Sydney, Australia	<ul style="list-style-type: none"> • Undertake research in the power sector 	The CoE was initially set up within the Power Engineering Department of a university, to take advantage of expertise there.	Member countries or utilities could come together to set up research centres in collaboration with universities and AfDB
National Renewable Energy Centre Limited (NAREC), United Kingdom	<ul style="list-style-type: none"> • Established to assist the RE and power sector in general, in evolving technology systems and electrical networks to accommodate the changing characteristics of energy resources • Also, helps in commercializing viable technology for the power sector 	NAREC was established to provide support for grid integrated RE source. It is now providing training and solutions, to the problems faced in the use RE sources	<p>There is the need for member countries and utilities to come together to establish similar RE research centres in SSA.</p> <p>NAREC's assistance could be useful in this direction</p>

Table 12
Qualifying Factors for Selecting Training Institutions

No	Main factor	Sub-factors
1	Infrastructure and Resources	<ul style="list-style-type: none"> • Suitable accommodation for Executive, Middle and Junior Levels • Administration Block • Capable to provide on-site catering • Centrally located near to a transportation hub, for ease of accessibility
2	Classroom, Seminar and Conference Rooms	<ul style="list-style-type: none"> • Adequate classrooms, seminar and conference rooms • Computer laboratory for students with IT facilities • Facilities for distance learning
3	Workshops and Technical Laboratories	<ul style="list-style-type: none"> • Adequate laboratory facilities for all students • Equipment representative of what students will use in the work place • Simulators
4	Marketing and promotion of Centre	<ul style="list-style-type: none"> • Regularly updated website • Availability of catalogue of training programmes on-line • Brochure showing details of training programme offered
5	Administration of Centre	<ul style="list-style-type: none"> • Full-time Head of Training Centre • More than half of the instructors have relevant qualification and experience • Centre has external partnerships, especially with the universities, development partners and private sector, and can maximise that to provide external instructors and leverage additional resources, if required.
6	Type of courses offered	<ul style="list-style-type: none"> • Courses which support implementation of regional power projects • Economic Regulation of utilities • Financial Issues which support regional power projects • Technical courses at mechanics, technicians and engineers level • Project Management • Professional and Executive Management Programmes in Human Resources, Finance and Accounting, Procurement, Risk Management and Business Management
7	Quality of Training	<ul style="list-style-type: none"> • Whether the training centre is certified (i.e. ISO or its equivalent) • Regular update of course content • Accreditation and certification of courses
8	Language Translation Facilities	<ul style="list-style-type: none"> • Capable of providing the training programme in at least two regional languages
9	Financial Sustainability and Support	<ul style="list-style-type: none"> • Whether the centre has been investing in laboratory and workshop equipment • Gets support from state-owned utility company • Has partnership with equipment suppliers • Self-generated funds
10	Strengthen existing training centres owned by utility companies ^a	<ul style="list-style-type: none"> • Assist with the development of business plans to ensure long term financial sustainability • Enhance existing curricula in line with changing trend in the power sector • Enhance accounting, financing and overall business practices • Invest in modern equipment for training and enhance overall training facilities to the level of internationally recognised institutions • Maximise on relations with other development partners like AFD to build sound and robust training institutions

^a These centres must also appeal to the regional power pools.

Table 13
Potential Institutions for Centre of Excellence

No	Institution, Region	Strengths and areas for improvement
1	Regional Technology Centre of Excellence for the Nile Basin Initiative (NBI), East Africa	<ul style="list-style-type: none"> • This is a project which is based on a special request by the NBI to the AfDB • The project when completed, is expected to help support regional capacity building in the power sector, and catalyse regional power integration in the region • Potential to be a leader in training on hydro and thermal Systems • Could be used as one of the leading institutions in hydro and thermal plant design
2	Centre de Formation Professionnelle et de Perfectionnement de la CEB, Benin	<ul style="list-style-type: none"> • Possesses basic infrastructure (erected by French Government), and strategically located close to WAPP in Cotonou • Acquisition of new equipment and simulators is required • Curricula will need to be updated to develop tailor-made courses for system operators, regulatory economics and financial issues which affect regional power trade • Centre infrastructure requires upgrade • TA required to develop business plan to ensure long-term financial sustainability • Could be one of the regional training centres for System Operators because of its close proximity to the WAPP Secretariat and the Coordination Centre • Could also be a centre in the training for both High and Low Voltage systems
3	ECG Training Centre Tema, Ghana, or VRA Training School Akuse, Ghana ⁹	<p>ECG Training School:</p> <ul style="list-style-type: none"> • Possess the basic infrastructure • Curricula would have to be updated to make it relevant for regional electricity market integration • Could serve as a centre for training in technical subjects • Centre infrastructure requires upgrade • New equipment for training would have to be purchased • Could be a leader in the training of technicians and engineers in distribution systems design and maintenance <p>Existing VRA Training Centre in Akuse:</p> <ul style="list-style-type: none"> • To serve as a Centre of Excellence, the existing school would have to be upgraded • Training programmes would have to be upgraded to cover graduate engineers in the area of power system design, including substation design • Need to also upgrade existing curricula to be in line with evolving power sector market structure and regulatory reforms. • Centre when upgraded could serve as one of the leading training institutions on Hydro systems • Centre could serve as the one of the main institutions for training design engineers for power systems

(continued on following page)

⁹ Volta River Authority is in the process of constructing a new training centre in Akuse, Ghana, to be known as a Centre of Excellence. At the time of the visit by the Consultants to Ghana, the company was in the process of conducting a feasibility study for the project.

Table 13 (continued)
Potential Institutions for Centre of Excellence

No	Institution, Region	Strengths and areas for improvement
4	Energy Centre of Excellence, Abidjan	<ul style="list-style-type: none"> • Infrastructure is in place • Training facilities are not being utilised, because laboratory equipment and simulators are yet to be procured. • Equipment upgrading for training required • Expert support required to undertake comprehensive needs analysis and associated financial requirements as part of a Strategic Business Plan • Centre could be a leading institution in training engineers in Hydro and Thermal systems • Centre could be one of the training institutions to train technical staff in High and Low voltage line maintenance • Centre could also serve as one of the key institutions for training design engineers
5	AES-SONEL Training Centre, Cameroon	<ul style="list-style-type: none"> • Infrastructure is in place but will require upgrade and acquisition of modern simulators and equipment • Will also need programme upgrade in line with evolving power sector • The centre could be used as one of the key institutions in training technical staff in low and high voltage line maintenance
6	ZESA Training School (Zimbabwe) or Nampower Training Facility (Namibia)	<ul style="list-style-type: none"> • Infrastructure is in place but will require upgrade and acquisition of modern simulators and equipment • Tasteful accommodations and administrative area in place • Will also need curriculum upgrade in line with evolving power sector, including training on regulatory issues and energy economics, finance, project management • Business plan required to ensure financial health • Proximity to SAPP in Harare or RERA in Windhoek, make these ideal facilities for regional training once full capabilities installed

2. Implementation plan and estimated budget

2.1 CB programme design

The aim of the programme design is to facilitate CB of the power sector institutions in SSA within the context of regional power trade, so that member countries can address the common challenges confronting them. The priority CB programmes have been categorised based on the following three periods.

Short-term (Year 1): These are the *highest priority CB needs* which were identified at the screening stage. These CB programmes are the most urgent such as *developing the necessary technical rules and tariff methodologies by the regional regulators*, which are crucial for developing, planning and implementing regional power projects, for regional power trade to take place.

Medium-term (Years 2 – 3): These CB programmes will build on those initiated in year 1. During this phase of the programme, the Technical Rules and Regulation and Tariff Methodologies which were developed in year 1, are expected to be implemented by the national regulators in the various countries

Long-term (Year 4 – 5): During years 4 and 5, the focus will be on improving the understanding of regulatory, technical and financial issues which affect regional power trade.

2.2 Proposed CB programme name

The Consulting Team recommends that the CB programme be named:

Power Sector Soft Infrastructure Programme (PoSSIP)

The priority CB programme activities have been selected with respect to the *following key drivers of regional power integration* which were identified in Section I of this report. The programmes also aim at ensuring the long-term financial sustainability of the utilities which form the bed-rock of the power pools (i.e. Generation, Transmission and Distribution companies).

1. Existence of a robust Regional Regulatory Framework to achieve the following objectives:

- Build sound national regulatory frameworks for member countries
- Harmonise tariff principles and methodologies for member countries of the power pool to support regional power trade
- Harmonise technical rules and standards to promote regional energy trade and regional power integration
- Effective tariff regulation to support financial viability of member utilities, working in consultation with the national regulators

2. System Operations and Dispatch to achieve the following:

- Safe and reliable operations of the inter-connected power system
- Harmonisation of codes and standards to support regional market integration and good service quality
- Harmonisation of technical operational manuals to promote regional power trade
- Effective information exchange to support energy trading

3. Conducive financing environment to support:

- Private sector investment in regional and national projects
- Project development, implementation and monitoring
- Financing of regional power projects through partnership with commercial financing institutions

4. Strengthen the capacity of member utilities of the power pools:

- Enhance their technical capacity and capability
- Ensure long-term financial and commercial sustainability

2.3 CB activities

Tables 14, 15, 16 and 17 below highlight various CB activities which were identified as being crucial for regional electricity market integration and power trade to take place.

Table 14
Building and Strengthening the Regulatory Framework

Major Area	Short-term (Year 1)	Medium-term (Years 2 – 3)	Long-term (Years 4-5)
Building Robust Regulatory Frameworks and Training on Regulatory Economics	Legal and Regulatory Framework: Implementation of a sound and robust <i>legal and regulatory framework in member countries</i> . Template can be used to enhance existing frameworks. Can also be used by yet to be established regulators for guidance.	Regulatory Peer Review Mechanism: Study to strengthen the performance of regulators in Africa and measure adherence to 'best' practice regulation: Study can be coordinated by AFUR, RERA and regional regulatory bodies.	Regulatory Peer Review Mechanism: Study to strengthen the performance of regulators in Africa and measure adherence to 'best' practice regulation: Study can be coordinated by AFUR, RERA and regional regulatory bodies.
	New Regulatory Frameworks: TA for establishment of new legal and regulatory frameworks (4 countries) Strengthen regional regulatory bodies	New Regulatory Frameworks: TA for establishment of new legal and regulatory frameworks (4 countries) Strengthen regional regulatory bodies	New Regulatory Frameworks: TA for establishment of new legal and regulatory frameworks (4 countries) Strengthen regional regulatory bodies
	Develop Harmonised Tariff Rules Develop and harmonise tariff-setting rules, principles and methodologies Develop Transmission Network Access Rules, including rules for wheeling charges Develop harmonised pricing framework for RE development	Rules Implementation Implementation of tariff rules and methodologies Implement pricing principles and methodology for ancillary services	Rules Development and Implementation Develop rules for monitoring and surveillance of power pools Develop Regulatory Accounting Guidelines
	Training Programmes Regional Renewable Energy (EADI 2013 Draft Work Programme) Economic, Technical and Financial Analysis of RE technologies Basic Principles and fundamentals of Tariff Design Electricity markets, cross-border trading and power pooling concepts	Training Programmes Market Rules, Electricity Trading, Financial Markets and Settlement Regulation and governance of power pools. Role of system operators	Training Programmes Power System Economics Advanced Course in Tariff Design and Modelling, including Hands-on Training

Table 15
Training in System Operations and Dispatch

Major Area	Short-term (Year 1)	Medium-term (Years 2 – 3)	Long-term (Years 4-5)
System Operations and Dispatch	Develop Technical Rules and Regulations: Develop Technical Operations Manual for system Operations' Codes of practice Develop guidelines for technical regulations, standards for cross-border interconnection and power trading Develop Quality of Service Guidelines	Technical Rules Implementation Implement and operationalize the technical manuals for system operators Implement technical regulations and standards for cross-border inter-connection and power trading	Technical Studies Studies on Power System Analysis and Congestion management Undertake study on grid stability and impact of higher penetration of RE technologies
	Energy Efficiency Programmes: Undertake <i>energy auditing</i> of bulk customers and industries in selected countries	Energy Efficiency Programmes: Implement results of energy audit studies from year 1, to reduce peak load in countries.	Energy Efficiency Programmes: Implement power factor correction programme to improve energy efficiency in industries
	Training Programmes Develop accredited courses for System Operators. Also complete all related administrative procedures for successful programme take-off in year 2.	Training Programmes Implement System Operators certification course Rules, regulations and standards for interconnections and power trading	Training Programmes Implement System operators certification course

Table 16
Conducive Financing Environment

Major Area	Short-term (Year 1)	Medium-term (Years 2 – 3)	Long-term (Years 4-5)
Conducive and Enabling Financing Environment	Develop a Model PPA	Implementation of Model PPA	
	Develop a model or standardised PPA which can be adapted and adopted by any entity, in any of the regions This will minimise delay in structuring and negotiating future PPA's in the power sector	Implementation and adoption of model PPA. Coordinated through AFUR, RERA, and regional regulatory bodies.	
	Training Programme Based on EADI 2013 Draft Work Programme: PPP (Energy Sector): 1 programme per region as follows: WAPP, PEAC, SAPP, EAPP and COMELEC. Enhancing Negotiating Skills to become an effective Power Negotiator.	Training Programme Understanding PPA's and IPP's concepts, and their application in the power sector. Enhancing Negotiating Skills to become an effective Power Negotiator.	Training Programme Engineering Economics and Finance
	Practical Simulation: Scenario Modelling of Project Completion and Implementation Assumptions: -French-speaking region -English-speaking Region -Portuguese Region	Project Finance, Economic Evaluation of Infrastructure Project	

Table 17
Strengthen Utilities: Generation, Transmission and Distribution

Major Area	Short-term (Year 1)	Medium-term (Years 2 – 3)	Long-term (Years 4-5)
Technical Capacity	System Studies Integrated Resource Planning for each region. Existing studies to be updated.	System Studies Demand and load forecasting studies for each region.	Project Power Factor Studies, efficient use of power and impact on grid stability
	Training Modern maintenance practices for generating power stations Modern Line (i.e. 'live' wire) and substation maintenance practices Protection and Control	Training Substation Design and maintenance Hydro and thermal Plant Design	Training Modern Line (i.e. 'live' wire) and substation maintenance practices
Financial and Commercial Sustainability	Studies Performance Benchmarking of member utilities for each region	Studies System Loss studies for each region: Technical and Commercial Loss Assessment. Pre-payment and commercial loss reduction: Reduction in metering and billing errors, electricity theft	Studies Implement results of power factor studies to achieve technical loss reduction, and ensure grid stability
	Projects Quality of Service evaluation for each regional power pool	Projects Pre-payment and commercial loss reduction: Reduction in metering and billing errors, electricity theft	Quality of Service evaluation for each regional power pool

2.4 Approaches for delivering CB and training programmes

Irrespective of the institutional model which would be adopted, there are some basic principles which should guide the mode of CB delivery. These principles are:

■ Hybrid Delivery Approach

A hybrid delivery approach for the training would comprise a combination of:

- i. Lectures and presentations in classrooms
- ii. Hands-on training, using case studies and practical exercises
- iii. On-the-job training
- iv. Site visits

■ Use of Information and Communication Technology

Information and Communication Technology (ICT) should be utilised as a training delivery platform at the Centres of Excellence (CoE) under the "Virtual Classroom" or e-learning concept. To ensure that the ICT concept can be operationalized, it is imperative that the ICT capabilities of the selected CoEs are fully developed. This option could be used to deliver classroom-based courses at relatively low prices to participants within a short period of time.

■ Create a dedicated research team of Bank staff on energy market, policies and regulation

One of the key observations from the country visits was the general low level of research in Sub-Saharan Africa on issues affecting energy markets, legal and regulatory issues, renewable energy and climate change. The low level research has affected the sharing of knowledge on 'best practices' and dissemination of information on lessons learnt from other African countries on critical issues affecting the power sector. It was also noted that the research gap has contributed to slowing down the pace of harmonisation of tariff and technical rules and standards for operation of interconnected power systems in SSA.

The team identified several interesting research projects like UNIDO which is piloting the development of an industrial park for production of renewable energy products in Durban, South Africa; as well as commercialization of biofuel projects in Malawi and Mozambique. It is in this regard that the Consulting Team recommends that the Bank creates a *dedicated Research Team comprising Bank Staff* to focus on carrying out research work on **"Energy Markets, Policies and Regulation"**.

The research team could be tasked by the Bank with the following responsibilities:

- i. Identify scholars and researchers (Masters and PhD levels) to carry out strategic research work and disseminate their findings through publications, short courses, conferences and workshops. The centre would work in close collaboration with African and overseas universities.
- ii. Accelerate the implementation of research findings within the Bank's energy operations.
- iii. Carry out research work into electricity market models in Africa, and demonstrate how transparent power markets can be developed to promote private sector investment.
- iv. Undertake regional tariff studies for the electricity sector for member utilities of the power pools.
- v. Carry out studies to benchmark the performance of member utilities within the power pools.
- vi. Establish research and knowledge partnerships with other development partners.

Going forward, the work of the proposed dedicated Research Team can be used to improve the research capacity of the Bank by leveraging on the existing partnerships such as Brazilian South-South Trust Fund.¹⁰ The Trust Fund aims to facilitate the sharing and dissemination of developed knowledge, expertise and appropriate technology between Regional Member Countries and other developing regions outside Africa under South-South cooperation. The Development of such a centre would also catapult the Bank as a leading source of energy sector knowledge on the continent, similar to sister development Banks. It is also important to apply research findings in enhancing the development and operation of energy infrastructure in Africa.

¹⁰ In June 2011, the Government of Brazil and the Bank signed an agreement to establish a Trust Fund with an untied grant of US\$ 6 million to promote South-South cooperation.

2.5 CB cost estimates for resource requirements

This section of the report provides the estimates for the resources which would be required to implement the CB programmes within the short, medium and long-term. For ease of analysis, the cost estimates have been categorised according to the following key areas:

- Regulatory Framework, including institutional strengthening of regional and national regulators,
- System Operations and Dispatch,

- Conducive Financing Environment,
- Strengthening the Technical and Financial Capacity of Member Utilities,
- Upgrading the Centres of Excellence.

2.5.1. Regulatory framework competencies

Table 18 provides cost estimates for enhancing regulatory competencies over a 5 year period.

Table 18
Cost Estimates for Enhancing Regulatory Framework Competencies

Activity	Year 1 (ST)	Cost (US\$)	Years 2-3 (MT)	Cost (US\$)	Years 4-5 (LT)	Cost (US\$)
Legal and Regulatory Framework	Implement sound legal and regulatory framework	200,000	Regulatory Review: Performance Assessment (2 regions)	400,000	Regulatory Review: Performance Assessment (2 regions)	400,000
	Support to strengthen Regional Regulators such as RERA and AFUR etc	400,000	Support to strengthen Regional Regulators such as RERA and AFUR etc	400,000	Support to strengthen Regional Regulators such as RERA and AFUR etc.	400,000
Develop Harmonised Tariff Rules	Develop and harmonise tariff principles, including the network access rules and wheeling charges	600,000	Ancillary services pricing principles and methodology	400,000	Implement ancillary services pricing rules	200,000
	Develop pricing rules and principles for RE technologies	600,000	Implement harmonised network pricing rules and wheeling charges methodology	200,000	Develop and Implement Regulatory Accounting Guidelines to strengthen regulation of utilities	600,000
Develop Market Rules	Develop and implement market rules	600,000	Rules for monitoring and surveillance of power pools	400,000		
Institutional Strengthening and Support for new legal and regulatory frameworks	Support regulatory reforms in selected countries: Focus on new regulators (4 regulators)	800,000	Support regulatory reforms in selected countries: Focus on new regulators (4 regulators)	800,000	Support regulatory reforms in selected countries: Focus on new regulators (4 regulators)	800,000
TRAINING COURSES: Course Preparation	3 courses per region	720,000 (60,000 per course)	2 Courses per region	480,000 (60,000 per course)	2 courses per region	480,000 (60,000 per course)
Course Delivery	2 programmes per region or 8 programmes in total	400,000 (50,000 per programme)	2 programmes per region or 8 programmes	400,000 (50,000 per programme per year)	2 programmes per region or 8 programmes in total	400,000 (50,000 per programme)
TOTAL		4,320,000		3,480,000		3,280,000

2.5.2 System operations competencies

Table 19 provides cost estimates for enhancing the competencies in system operations.

Table 19
Cost Estimates for System Operation Competencies

Activity	Year 1 (ST)	Cost (US\$)	Years 2-3 (MT)	Cost (US\$)	Years 4-5 (LT)	Cost (US\$)
System Operations and Dispatch	Develop Technical Operations Manual and Codes of Practice	400,000	Implement technical manuals and codes of practice	400,000	Technical Studies: Power System and Congestion	600,000
	Guidelines and rules for cross-border interconnect. and power trading	400,000	Implement guidelines and rules for cross-border trading	400,000	Technical Study: Impact of higher penetration of RE on grid stability for each region	600,000
	Develop quality of service guide lines for interconnected systems	600,000				
	Energy Efficiency Studies and Auditing	600,000	Energy Efficiency Implementation	400,000	Energy Efficiency Implementation	400,000
TRAINING PROGRAMME						
Accreditation Programme for System Operators	Develop Programme. (Review SAPP programme with Kafue Gorge and update programme)	80,000				
Course Preparation: System Operators course, including certification	2 courses per region or 8 course total	80,000				
Course Delivery: (Based on Kafue Gorge estimates for SAPP)			2 programmes per region or total of 8 programmes for 20 students	402, 000	2 programmes per region or total of 8 programmes	402,000
OTHER TRAINING: Course Preparation			1 course per region	240,000 (60,000 per course)		
Course Delivery			2 programmes per region or 8 programmes in total per year	480,000 or (60,000 per programme)		
TOTAL		2,160,000		2,322,000		2,002,000

2.5.3 Conducive financing environment

The cost estimates for enhancing the competencies to create a supportive financial environment are summarised in Table 20 below.

Table 20
Cost Estimates for Financing Environment

Activity	Year 1 (ST)	Cost (US\$)	Years 2-3 (MT)	Cost (US\$)	Years 4-5 (LT)	Cost (US\$)
Conducive Financing Environ.	Develop Model PPA: Develop a standardised PPA or template to be adapted for adoption by each region	300,000	Implement model PPA concept	150,000		
TRAINING COURSES:	2 courses per region or 8 courses in total (EADI programmes)	640,000 (80,000 per course)	2 courses per region or 8 courses in total	400,000 (50,000 per course)	1 course per region or 4 courses in total	240,000 (60,000 per course)
Course Preparation						
Course Delivery	2 programmes per region or 8 programmes in total	640,000 (80,000 per course)	2 prog. per region or 8 prog.	400,000 (50,000 per prog.)	2 prog. per region or 8 prog.	400,000 (50,000 per prog.)
TOTAL		1,580,000		950,000		640,000

2.5.4 Institutional strengthening of utility companies

The CB needs and the associated cost estimates required to enhance the technical competence and commercial viability of the Generation, Transmission and Distribution Utilities are provided in Table 21 below.

Table 21
Cost Estimates for Strengthening of Utility Companies

Activity	Year 1 (ST)	Cost (US\$)	Years 2-3 (MT)	Cost (US\$)	Years 4-5 (LT)	Cost (US\$)
Technical Studies	Integrated Resource Planning	1,000,000	Power Factor: Impact on Energy Efficiency and Grid Stability	1,000,000	Implement Power Factor Improvement programmes.	1,000,000
	Demand and Load Forecasting Studies	1,000,000				
Projects	Performance Benchmarking of member utilities	1,000,000	Loss Studies and impact on Cost of Service Tariffs	1,000,000	Quality of Service Evaluation	800,000
	Pre-payment metering and reduction of commercial losses	800,000	Prepayment metering and reduction of comm. losses	800,000		
Training Programme	2 courses per region or 8 courses in total	480,000 (60,000 per course)	2 courses per region or 8 courses in total	480,000 (60,000 per course)	1 course per region or 4 courses	240,000 (60,000 per course)
Course Preparation						
Course Delivery	2 programmes per region or 8 programmes	480,000 (60,000 per course)	2 programmes per region or 8 programmes in total	400,000 (50,000 per prog.)	2 programmes per region or 8 programmes	400,000 (50,000 per prog.)
TOTAL		4,760,000		3,680,000		2,440,000

2.5.5 Upgrading Centres of Excellence

In addition to the above, there are additional costs which are needed to upgrade the CoE to internationally accepted level. The cost estimates for *five CoE's* identified in Section 1.7, are presented in Table 22 below.

Table 22
Estimated Cost for Centres of Excellence

Activity	Time Frame	Cost (US\$)	Total Cost (US\$)
Upgrade five Training Centres to operate as Centres of Excellence, including enhancing ICT capabilities	2 years	1,000,000 per year	2,000,000
Assistance to develop Business and Marketing Plans to ensure long-term sustainability	2 years	500,000 per centre per year	2,500,000
Equipment purchase for laboratories and workshops for five training centres	2 years	250,000 per centre per year	2,500,000
TOTAL			7,000,000

2.6 Total cost estimates

The total estimated funding requirements for implementing the CB Programme is summarised in Table 23 below.

Table 23
Total Estimated Cost for PoSSIP Programme

Major Element	Short – term (Year 1)	Medium-Term (US\$)	Long-Term (US\$)	Total (US\$)
Legal & Regional Regulatory Framework, including development and strengthening of national regulators	4,320,000	3,480,000	3,280,000	11,080,000
System Operations and Dispatch	2,160,000	2,322,000	2,002,000	6,484,000
Conducive Financing Environment	1,580,000	950,000	640,000	3,170,000
Strengthening of member utilities of power pools	4,760,000	3,680,000	2,440,000	10,880,000
Sub-Total	12,820,000	10,432,000	8,362,000	31,614,000
Total Cost for Upgrading Centres of Excellence				7,000,000
PoSSIP TOTAL				38,614,000

The total estimated cost for the CB programme comprising all the key elements shown above in Table 23 is *approximately US\$ 38.6 million*.

2.7 Proposed CB financing model

Member utilities of the power pools and other stakeholders have benefited from a number of TA assistance programmes, including training programmes. Most of these training programmes were undertaken through study tours or by sending staff overseas to international training institutions. Based on the feedback from the interviews conducted, some of the overseas courses have not always been relevant to addressing immediate national and regional power sector needs, even though the training comes at high cost.

In light of this, the current CB assessment aim to identify cross-cutting or region-wide capacity needs which would enhance implementation of projects which have regional dimensions. This would allow for the design of bankable power infrastructure projects to catalyse private sector investment in the region. In order to ensure financial sustainability for the CB programme, the following financial model is proposed.

- The cost for upgrading the Centres of Excellence and equipment purchase for the laboratories and workshops should be provided by the AfDB, development partners and the beneficiary power utilities.
- Sharing of CB programme delivery costs among AfDB, other development partners and beneficiary stakeholders (i.e. power pool secretariats, regional and national regulators, member utilities), during the short and medium terms. Development partners could fund the cost of course preparation and part of the cost for course delivery, while stakeholders pay the balance for the course delivery costs.
- Implement a “fee-for-service” business model in the long-term (i.e. starting from year 3 or 4) to ensure full cost-recovery of CB programme delivery costs. This approach is expected to lead to the programme's financial sustainability from year 5 onwards. Experience has demonstrated that there is willingness to pay among utilities where the training programmes are of *good quality, relevant, certified and accredited*.

2.8 Financing sources for CB programme

The start-up capital for the programme will be sought from the African Development Fund and various AfDB Trust Fund resources. The AfDB is also expected to partner with other development partners to mobilise funding for the CB programme.

The Consulting Team has taken cognisance of the fact that the Bank has a portfolio of US\$7 billion on energy projects, out of which it could aim to spend about 0.5% (or US\$ 35 million) on energy sector capacity building from its African Development Fund XIII replenishment.

Such allocation would go a long way to strengthen the power sector institutions, enhance overall regulatory framework and ensure the creation of market structures, which would make the power sector more vibrant and financially sustainable, thus attracting private investors into the sector. It would also improve delivery, operation and maintenance of infrastructure projects.

2.9 Suggested implementation arrangements for CB programme

In order to ensure a successful roll-out of the programme, the Consulting Team is recommending that a *dedicated team comprising Bank staff* be constituted to roll-out the CB Programme Implementation. This dedicated staff should comprise professionals with competencies in the following areas:

- Capacity Building Expertise with background in Human Resources development;
- Field expertise with specialisation in specific fields of knowledge and experience, for example: an engineer with background in power systems economics, system operations and regional power integration; a regulatory economist with experience in regulatory reforms and tariff design;
- Adequate logistics support will also be required.

Capacity building initiatives should be organised using modules in different fields of specialisation forming regular classes and releasing accredited experts in a particular field over a planned period of time. It is preferable to start with a limited number of modules to ensure successful implementation. Once a level of renown or critical mass has been achieved, new modules can be added to follow on and improve on the pattern of the pilot module(s).

The following candidate modules can be suggested based on the findings of the Study:

- 1. Transmission Dispatcher Training & Certification,
- 2. Power System Planning,
- 3. Regional Electricity Market Surveillance
- 4. Economic and Technical Regulation
- 5. Hydroelectric Project Preparation and/or Development.
- 6. Project Management and Monitoring, Training in PPA's, PPP's and IPP's

It is recommended that each module/programme be spread over the period of 6 or 9 months as a mix of on-line and classroom work and on-the-job training in a selected training facility. It will be preferable to identify a suitable training facility for each module with one of the suggested Centres of Excellence in Africa.

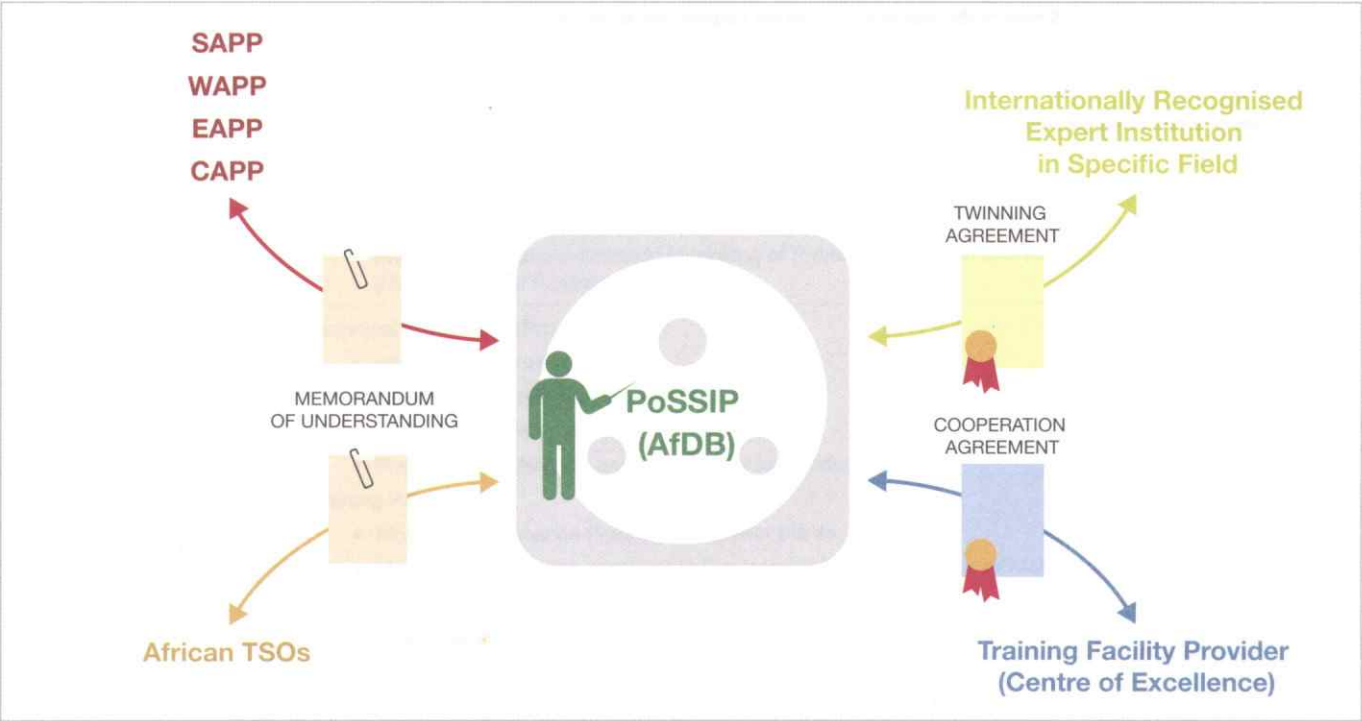
Formal tests must be given during the training period and a certification/accreditation exam at the end of each module.

For implementation of each CB module, the AfDB could look to entering into partnerships various organisations, namely:

- Power pools to ensure acceptance and taking ownership. The partnerships will establish the cooperation framework and performance targets for the AfDB and the respective power pools.
- Operators that will provide training facilities for classroom and practical experience sessions for specific courses.
- Twinning agreements with globally recognized training institutions focused on specific subject areas. For example, dispatcher training could be supported under twinning with ENTSO-E in Europe, or NERC in the USA etc. This will help obtain access to the latest training technologies and techniques and establish an international level of credibility.

The recommended indicative scheme of contractual arrangements is illustrated in the figure below.

Figure 3
Relationship Framework for Modular Implementation



In addition, the PoSSIP will use e-learning platforms of the AfDB, existing African institutions specialised in e-learning such as the African Virtual University (AVU) in Kenya and the Energy Centres of Excellence.

The implementation of individual modules will be initially funded by the AfDB with cost-sharing from the participating utilities, possibly in the form of covering travel and living costs of their trainees travelling to external training centres for hands-on training periods and examinations.

Cost-sharing with other development partners that are involved in electricity infrastructure projects funding in SSA should also be pursued, whilst also introducing measures to ensure financial sustainability based on the fee-for-service principle.

The recommended implementation strategy offers the following advantages:

1. Rapid response to existing competence gaps existing at level of power pools, operators and other stakeholders,
2. System of examination and formal certification providing a clear framework for results measurability,
3. Cost effectiveness through optimisation of costs and cost-sharing,
4. Potential to evolve into an easily recognised brand name project conceptualised and supported by the AfDB.

3. List of proposed capacity building activities

The various activities within the short-, medium- and long-terms required to implement the CB programme are summarised below in Tables 24 to 26 of this section.

3.1 Short-term activities

Table 24
Short-Term Activities

Major Element	Actions
Strengthen Legal and Regulatory Framework	<p>Rules and Guidelines Development:</p> <ul style="list-style-type: none"> • Develop a template to be adopted by new and yet to be established regulators to create a robust legal and regulatory framework. The template can also be used by existing regulators to enhance their regulatory frameworks. • Develop harmonised tariff rules and methodology. This should cover network access rules and rules for calculating wheeling charges • Develop harmonised pricing framework to promote RE development <p>Support the Establishment of Regulatory Frameworks</p> <ul style="list-style-type: none"> • Target at least 4 countries • Strengthen regional regulatory bodies <p>Training Programme:</p> <ul style="list-style-type: none"> • Regional RE Programme (Based on EADI 2013 Draft Work Programme). To also include economic, technical, regulatory and financial analysis of RE technologies • Principles and fundamentals of tariff design • Electricity markets, cross-border trading and power pools.
System Operations and Dispatch	<p>Technical Rules and Regulations Development:</p> <ul style="list-style-type: none"> • Develop Operational Rules Manual for System Operators • Develop and implement Guidelines for cross- border interconnection and power trading • Develop Quality of Service Guidelines for cross-border interconnection <p>Training Courses:</p> <ul style="list-style-type: none"> • Develop accreditation and certification programme for system operators and controllers. Complete all administrative procedures for programme kick-off in year 2.
Conducive Financing Environment	<p>Develop Standardised or Model PPA:</p> <ul style="list-style-type: none"> • Develop standardised or model PPA which can be adapted and adopted by each entity in each region <p>Training Courses:</p> <ul style="list-style-type: none"> • Training Course in Power Purchase Agreements (Based on EADI 2013 Draft Work Programme). Includes a course in Negotiating Skills to become a "Power Negotiator". • Practical Simulation: Scenario Modelling of Project Completion and Assumption (Based on EADI Programme)
Strengthen Member Utility Companies	<p>Technical Studies and Projects:</p> <ul style="list-style-type: none"> • Integrated Resource Planning • Demand and Load Forecasting Studies • Performance Benchmarking • Pre-payment Metering and commercial loss reduction <p>Training Programme:</p> <ul style="list-style-type: none"> • Modern Maintenance Practices for power plants • Modern maintenance practices in line maintenance (e.g. 'live' wire maintenance) • Substation Design • Protection and Control.

3.2 Medium-term activities

Table 25
Medium-term Activities

Major Element	Actions-
Strengthen Legal and Regulatory Framework	<p>Regulatory Studies and Implementation of Rules :</p> <ul style="list-style-type: none"> Regulatory Review Mechanism. Study aims at assessing the performance of all regulators under AFUR'S purview with respect to 'best' practice regulation, so that corrective measures can be taken, where necessary. Implement and disseminate network tariff rules, methodology and guidelines, including those for wheeling charges Study to develop rules, guidelines and methodology for ancillary services pricing <p>Support the Establishment of Regulatory Frameworks</p> <ul style="list-style-type: none"> Target at least 4 countries Strengthen regional regulatory bodies <p>Training Courses:</p> <ul style="list-style-type: none"> Market Rules, Electricity Trading and Financial Market Settlement Regulation and Governance of Power Pools
System Operations and Dispatch	<p>Technical Rules Implementation:</p> <ul style="list-style-type: none"> Implement and Operationalize technical manuals and Codes of Practice Implement rules and regulations for cross-border interconnection and power trading <p>Training courses:</p> <ul style="list-style-type: none"> System Operators certification course Rules, regulations and standards for interconnection
Conducive Financing Environment	<p>Implementation of PPA Template:</p> <ul style="list-style-type: none"> Implement and disseminate model PPA concept <p>Training Programme:</p> <ul style="list-style-type: none"> PPA's, IPP's and their application, includes a course on Negotiating Skills to become a "Power Negotiator". Project Finance and Economic Evaluation of Projects
Strengthen Member Utility Companies	<p>Technical Studies and Projects:</p> <ul style="list-style-type: none"> Power Factor Studies and impact on energy efficiency and grid stability System Loss Study: Technical and Non-Technical Losses Pre-payment Metering and impact on commercial loss reduction Quality of Service Evaluation

3.3 Long-term activities

Table 26
Long-term Activities

Major Element	Actions-
Strengthen Legal and Regulatory Framework	<p>Regulatory Studies and Rules Implementation:</p> <ul style="list-style-type: none"> Regulatory Review Mechanism. Study aims at assessing the performance of all regulators under AFUR'S purview with respect to 'best' practice regulation, so that corrective measures can be taken, where necessary. Develop rules and regulations for monitoring and surveillance of power pools Develop a Model Regulatory Accounting Guidelines which can be adapted and adopted by and regulators utilities of member power pools <p>Support the Establishment of Regulatory Frameworks</p> <ul style="list-style-type: none"> Target at least 4 countries Strengthen regional regulatory bodies <p>Training Programme:</p> <ul style="list-style-type: none"> Power System Economics Advanced Course in Tariff Design, Modelling, including Hands-on Training
System Operations and Dispatch	<p>Technical Studies:</p> <ul style="list-style-type: none"> Power System Analysis and Congestion Studies Study to ascertain impact of higher penetration of RE on grid stability <p>Training Programme:</p> <ul style="list-style-type: none"> System Operators certification course
Conducive Financing Environment	<p>Implementation of PPA Template:</p> <ul style="list-style-type: none"> Continue to Implement and disseminate the model PPA concept <p>Training Programme:</p> <ul style="list-style-type: none"> Engineering Economics and Finance
Strengthen Member Utility Companies	<p>Technical Studies:</p> <ul style="list-style-type: none"> Project to Implement Power Factor Correction for grid stability and promote energy efficiency Quality of Service Evaluation <p>Training Programme:</p> <ul style="list-style-type: none"> Modern line (e.g. "live" wire) and substation maintenance practices

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About AfDB

The African Development Bank is a multilateral development institution, established in 1963 by agreement by and among its member states, for the purpose of contributing to the sustainable economic development and social progress of its Regional Member Countries (RMCs) in Africa. The members of the Bank, currently seventy eight (78), comprise 54 RMCs, and 24 Non-RMCs. The Bank's principal functions include: (i) using its resources for the financing of investment projects and programs relating to the economic and social development of its RMCs; (ii) the provision of technical assistance for the preparation and execution of development projects and programs; and (iii) promoting investment in Africa of public and private capital for development purposes; and (iv) to respond to requests for assistance in coordinating development policies and plans of RMCs.

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