INSTITUTIONAL, REGULATORY AND COOPERATIVE FRAMEWORK MODEL FOR THE NILE BASIN POWER TRADE

ANNEX 4: DELIVERABLE 4 – "BARRIERS TO POWER TRADE AND HOW TO SOLVE THEM"

Prepared for:

NILE BASIN INITIATIVE

" TO ACHIEVE SUSTAINABLE SOCIO-ECONOMIC DEVELOPMENT THROUGH THE EQUITABLE UTILIZATION OF, AND BENEFIT FROM, THE COMMON NILE BASIN WATER RESOURCES "

Prepared by:

MERCADOS ENERGY MARKETS INTERNATIONAL

Together with:

NORD POOL CONSULTING AND CEEST

October, 2007

MADRID
LONDON
MOSCOW
RIO DE JANEIRO

CONSULTANCY TO DEVELOP AN INSTITUTIONAL, REGULATORY AND COOPERATIVE FRAMEWORK MODEL FOR THE NILE BASIN POWER TRADE

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I LIST OF ACRONYMS

ACCC	Australian Competition and Consumer Commission
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
AFC	Available Flowgate Capability
ARR	Auction Revenue Rights
BA	Balancing Authority
CAT	Curtailment Adjustment Tool (in SPP)
CEB	Communauté Electrique du Benin
CEM	Common Energy Market
CER	Certified Emissions Reduction
CIE	Compagnie Ivoirienne d'Electricité
CIS	Commonwealth of Independent States
CoAG	Council of Australian Governments
CR	Congetion Rights (SIEPAC)
CRIE	Regional Regulatory Agency (SIEPAC)
CVT	Variable Transmission Charges (SIEPAC)
DAM	Day Ahead Market
ECOWAS	Economic Community of Western African States
EECI	Energie Electrique de la Côte d'Ivoire
EIS	Energy Imbalance Service
EOR	Independent system and market operator (SIEPAC)
EPC	Electricity Power Council (in CIS)
ESAA	Energy Supply Association of Australia
FCM	Forward Capacity Market
FERC	Federal Energy Regulatory Commission (US)
FTR	Financial Transmission Rights
GMS	Greater Mekong Sub Region
ICC	Information and Coordination Center (in WAPP)
ICE	Intercontinental Exchange (US)
ICT	Independent Coordinator of Transmission (SPP)
IDC	Interchange Distribution Calculator
IGA	Inter–Governmental Agreement on Power Trade in the Greater Mekong Sub–Region
IPP	Independent Power Producers/Project
IPSCIS	Interconnected Power System of Commonwealth of Independent States
JOA	Joint Operation Agreement
LIP	Locational Imbalance Prices (in SPP)
LMP	Locational Marginal Price
LOLE	Loss of Load Expectation
LSE	Load Serving Entities
LTTR	Long Term Transmission Rights
MCE	Ministerial Council on Energy (Australia)
MER	Regional Electricity Market of SIEPAC
MISO	Mid-West Independent System Operator
MO	Market Operator
MOI	Memorandum Of interest
NBI	Nile Basin Initiative
NBPTF	Nile Basin Power Trade Framework
NE - ISO	New England Independent System Operator

NEM	National Electricity Market (Australia)
NEMMCO	National Electricity Market Management Company
NERC	National Electricity Reliability Council
NSI	Net Scheduled Interchange
OMVS	Organisation pour la Mise en Valeur du fleuve Sénégal
PAC	Participant Advisory Committee (Australia)
PJM	Regional Market of Pennsylvania, New Jersey and Maryland
PMU	Project Management Unit
PPA	Power Purchase Agreement
PRSG	Planned Reserve Sharing Group (in MISO)
PTC	Power Technical Committee
PTOA	Regional Power Trade Operating Agreement (in GMS)
RPM	Reliability Pricing Model in PJM
RPTCC	Regional Power Trade Coordination Committee (in GMS)
RPTP	Regional Power Trade Project
RRO	Regional Reliability Organization
RSC	Regional State Committee (in SPP)
RTEPP	Regional Transmission Expansion Planning Process in PJM
RTN	Regional Transmission Network (in GMS)
RTO	Regional Transmission Organization (US)
RTR	Regional Transmission Grid (SIEPAC)
SADC	Southern African Development Community
SADCC	Southern African Development Co-ordination Conference
SAP	Subsidiary Action Program
SAPP	Southern African Power Pool
SCED	Security-Constrained Economic Dispatch
SCUC	Security-Constrained Unit Commitment
SERC	Southeastern Reliability Council (US)
SIEPAC	Central American Regional Electricity Market
SMD	Standard Market Design (NE-ISO)
SONABEL	Société Nationale Burkinabè d'Electricité
SPP	Southwest Power Pool
SRMC	Short Run Marginal Cost
STEM	Short Term Energy Market (in SAPP)
SVP	Shared Vision Program
TSO	Transmission System Operator
TUOS	Transmission Use of System
UES	Unified Energy System
UPS	Unified Power System (in CIS)
USSR	Union of Soviet Socialist Republics
VOLL	Value of Lost Load
VRA	Volta River Authority
WAPP	Western African Power Pool
WSPP	Western Systems Power Pool

Table 1: Acronyms

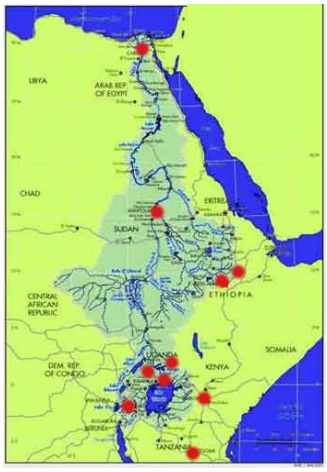
II FOREWORD

The purpose of this report, named "BARRIERS TO POWER TRADE AND HOW TO SOLVE THEM", is to present a discussion paper detailing alternatives on how to solve the various barriers to enhanced power trade.

This report is Deliverable 4 and corresponds to a sub–activity of Activity 4: "*Review of the Current Framework and Arrangements in the NBI Region*" of the project's revised terms of reference agreed during the inception mission in Dar es Salaam.

III BACKGROUND AND CONTEXT OF THIS PROJECT

The Nile Basin Initiative (NBI): Formally launched in February 1999 by the Council of Ministers of Water Affairs of the Nile Basin States, the NBI provides a forum for the countries of the Nile to move forward towards a cooperative process in order to realize tangible benefits in the Basin and build a solid foundation of trust and confidence.



The NBI has two primary areas:

1. Basin-wide projects - "Shared Vision Program" (SVP), to help create an enabling environment for action on the ground

2. Sub-basin projects - "Subsidiary Action Program" (SAP), aimed at the delivery of actual development projects involving two or more countries

The Regional Power Trade Project (RPTP) is one of the thematic projects to be implemented basin-wide, to help establish a foundation for trans-boundary regional cooperation and create an enabling environment conducive for investment and action on the ground, within an agreed basin-wide framework.

The RPTP aims to establish the institutional means to coordinate the development of regional power markets (such as a Power Pool) among the Nile Basin countries, through the creation of a power trade framework which can contribute to achieve poverty reduction including expanding access to reliable and low-cost power supply, in an environmentally sustainable manner.

The broad benefits envisaged from the NBI are poverty alleviation through improved, sustainable management and development of the shared Nile waters, and enhanced regional stability through increased cooperation and integration among the Nile states.

Project activities are coordinated by the Project Management Unit (PMU) at the regional level and by the PTC members at the country level. Activities include the establishment and operation of a power trade framework, the conduct of a comprehensive basin-wide analysis of long-term power supply, demand and trade opportunities, the identification of potential development projects within the NBI's SAPs, the preparation of a public participation plan and stakeholder analysis, and the development of knowledge management tools. These activities are carried out through studies, consultations, workshops, seminars and other modalities, for which the project may seek assistance from national and regional research and training institutions, NGOs, consultants and other public or private organizations from the Nile basin region.

The current project: “CONSULTANCY TO DEVELOP AN INSTITUTIONAL, REGULATORY AND COOPERATIVE FRAMEWORK MODEL FOR THE NILE BASIN POWER TRADE” falls within the RPTP’s framework. Key project objectives include:

a) Assisting the RPTP and the NBI Power Technical Committee (PTC) in reviewing institutional arrangements adopted by regional power trade organisations, and submitting discussion papers to the RPTP, comparing and contrasting the different arrangements.

b) Conducting an information gathering tour so as to collect basic information of the countries in the region, which will permit developing in the future recommendations and perform an informed decision making process.

c) Proposing a model for developing Regional Power Trade at the Nile sub–basin and basin levels.

d) Drafting Memoranda and legal documents as required.

IV BARRIERS TO CROSS BORDER TRADING

Cross border trading in the power sector has normally several benefits for the countries involved in this trading. However, initiating trade and making it fluid among participants may sometimes be not so easy. Based on other experiences of successful and unsuccessful initiatives, the following elements can be highlighted (but no limited to) as hurdles or barriers for the development of power trade:

a) Poor performance of many of the state-owned utilities, rendering them unable to fully conduct normal commercial activities.

b) Long distances involved, and the challenging geographical and natural environment.

c) Disparity in the countries' power sector size.

d) Weaknesses of the national grids, which require strengthening (and hence investment) before trading is possible.

e) Lack of infrastructure, such as power transmission interconnections, regional/inter-regional co-ordination centres or control centres.

f) Energy strategies that rely on self-sufficiency.

g) Difficulty in obtaining project financing for cross–border transmission interconnections, and the difficulty (and complexity) of raising government guarantees for cross-border deals.

h) Lack of a (commercial/legal/regulatory) framework for transactions to take place.

i) Lack of agreement on the tariff system to remunerate the use of transmission infrastructure.

j) Lack of institutions to give regional trading political legitimacy and to play the co-coordinating and energy trade enhancement role. In some cases exactly the opposite happens and there exist several institutions with overlapping interests and fields of intervention that require coordination.

k) Lack or non coordinated legal framework for energy trade.

l) Lack of general harmonization of technical codes, specifications and standards.

m) Lack of trading mechanisms in the energy sector, which is much more complex than trading of other goods or commodities.

n) Lack or scarcity of qualified human resources to manage technical / commercial / regulatory aspects of cross border trading.

a) Poor performance of many of the state-owned utilities

In many developing regions state owned utilities still predominate in the power sector, which are generally not performing well neither technically nor commercially. The reasons for that are generally lack of investment, intervention of policy makers who use the state owned companies as instruments for other objectives, lack of modern management techniques, etc. This results in companies that are in a vicious circle, not able to develop and not credit worthy to receive funds for the investments required.

b) Long distances involved, and challenging geographical and natural environment

Extended territories result in a challenge either from the technical point of view (state of the art technologies are necessary to transport electricity) and from the investments required to connect production centres and demand.

c) Disparity in the countries' power sector size

Big disparity in power sector size can hinder trading because: i) cross border trading will be marginal for one system but very important for the other; ii) bigger systems are normally more developed from the technical point of view than smaller ones, this implying that smaller system may need to "upgrade" to some technical standards not currently being met, to make trade possible; iii) security aspects are also relevant; traded volumes may be marginal for bigger systems but very important for smaller ones, so the risk of unexpected interruption of energy flow can be a serious problem for the latter.

d) Weaknesses of the national grids

Cross border trading involves not only international interconnectors or international transport lines, but also domestic grids. These grids are necessary when trading begins to develop and domestic transport grids are used for transit. In other words, when trading begins to develop, trading is not done exclusively between neighbouring countries; third countries begin to be involved as transit countries. Therefore, the need of reinforcements in domestic transmission grids is prominent.

e) Lack of infrastructure

The development of cross border trading obviously requires interconnecting the countries' systems. In developing countries there are not many examples of systems that have developed interconnectors having trading as main objective. Generally, interconnectors are linked to generation projects that export from one country to the other under a PPA. These interconnectors are then basically used for the PPA, with little or no spare capacity to be used for additional trading.

Besides, if trade develops, it is necessary to think in regional organisations such as regional coordination centres or control centres. Initially, the tasks required can be performed by one of the already existing dispatch centres when trading is still simple. As trading evolves it is necessary to develop a regional centre entailing the corresponding investments and human resources.

f) Energy strategies that rely on self-sufficiency

Many times, power trade is hindered by policies centred in self–sufficiency. Countries do not accept/trust to depend very much on non domestic production. Therefore, cross border trading can be limited by established "caps", not based on economic reasons.

g) Difficulty in obtaining project financing for cross–border transmission interconnections

The economic situation of countries in developing regions, and more specifically their utilities' performance, makes difficult obtaining financing in general terms. When it comes to cross border interconnectors this turns out to be even more difficult because: i) there are two governments involved and it is necessary to coordinate and deal with both of them; ii) there are at least two utilities involved; iii) benefits from a cross border interconnector might not be so easy to identify unless it is tied to a generation project with its PPA (see point d)).

h) Lack of a framework for transactions to take place

Fluent cross border trading involving several countries requires a full framework to be developed with a minimum of regional institutions. Once the initial stages, where cross

border trading is reduced to trade between neighbouring countries, are passed, the developments required for a more complex trade may be costly, requiring agreements which may be difficult to achieve, and human resources with the capacity to implement them.

i) Lack of agreement on transmission tariffs

Transmission tariffs to remunerate the use of transmission infrastructure (international interconnector and domestic transmission systems) may be difficult to be agreed due to the complexity in some cases, and because of differences in the systems used in each country to remunerate this service.

j) Lack of regional institutions or lack of coordination

In developing regions where "market forces" are not sufficient, it is necessary to count with at least a regional institution to: i) give regional trading a "legitimacy" and a legal basis which will allow to develop later the general framework required; ii) coordinate the process and foster trading at any moment, which is the ultimate objective. Some times, there can be different initiatives in a certain area, with overlapping objectives. In this case coordination is necessary among the different initiatives to avoid repeating efforts or non coordinated actions.

k) Lack of a common legal framework for energy trade

In many cases, differences in the countries' commercial frameworks regarding exporting/importing electricity represent a hurdle to develop trading. An example of this is taxation issues; taxes for importing and exporting electricity prevent a real optimisation of the use of the resources from the regional point of view. Even when trading between neighbouring countries, taxes can represent a problem. Regarding regulatory issues, it is required that at least regulations do not prevent this trading or do not represent a hurdle for it.

l) Lack of harmonized technical codes

Perhaps the clearest way to illustrate this point is the problems that exist when two countries with different frequencies (50 Hz and 60 Hz) want to trade. Obviously, trading is possible but at a higher cost.

Another area of difficulty is technical standards; since systems are connected, to achieve a fluent trade it is necessary to agree on some minimum technical standards, basically regarding quality and security. Security of systems and operational procedures turn into a key element when interconnectors have a capacity which is relevant compared to the system's size.

m) Lack of trading mechanisms

Trading mechanisms are needed once the stage of trading just between neighbouring countries is completed. More complex trading is not possible if minimum trading mechanisms are not in place; and this requires agreement from both the countries and the regional institutions.

n) Lack or scarcity of qualified human resources

Qualified human resources are necessary to advance in the different stages towards a final situation of "regional market". They are necessary to develop the different stages of regional trading and to actually manage it.

V THE CASE OF THE NILE BASIN REGION

The Nile Basin region presents many, if not all, of the described barriers to cross border trading. In the next points the key barriers in the region will be discussed. The previous section identified a series of potential barriers to cross border trading; this section is dedicated to analysing those barriers, which are considered as most relevant in the region and that may impact more in the design of the model and in its the first stages. To achieve this, some of the barriers identified initially have been grouped to facilitate and provide a rationale to the analysis.

1. THE GEOGRAPHICAL REGION AND THE POWER SECTOR'S SIZE

1.1. THE BARRIER

The NB region is much extended (around 5.000 Km from north to south and 2.500 from east to west in some parts), additionally involving several countries. The longest distance east to west in Europe is 3.500 Km and in the US, from east to west is 4.200 Km.

The region has also different landscapes, desert, mountains, forests. It is a real challenge, from the technical and economical point of view, to develop the required infrastructure that could link all the countries.

The size of the countries' power sectors can be seen in the following table.

Installed Capacity	Total Countries (1) (MW)	Total EIA (2) (MW)
Burundi	26,3	58
Egypt	17.878,0	18.474
DRC (3)	2.026,0	2.443
Kenya	1.177,0	1.211
Uganda	400,0	321
Rwanda	56,8	31
Tanzania	1.016,0	881
Ethiopia	813,8	755
Sudan	1.258,8	801

Table 2: Installed Capacity in the Region's Countries

(1) Source: Information provided by countries during information gathering

(2)Source: Energy Information Administration (EIA) from the Department of Energy (DOE) – USA, year 2005

(3) A good part of this generation capacity is currently out of service (around 50%)

Although heterogeneous in size, and except for Egypt (clearly of another scale), the countries' power sectors can be basically grouped in two types according, exclusively, to their size:

1. Small systems: Uganda, Rwanda, Burundi

2. Regular systems: Kenya, Tanzania, DRC (considering the high unavailability), Ethiopia, Sudan.

3. Egypt

This pattern implies that many of the countries have power sectors with "similar" size, which facilitates development of trade. On the other hand, there are small systems which may need a special treatment to be fully incorporated to regional trade.

It must also be pointed out that the size of the system is not a unique indicator; the systems' quality and current condition are also very important. This point will be approached later, but it is worth advancing that, for example, DRC is a big system from the point of view of nominal installed capacity but currently, in DRC a big part of this capacity (50% aprox) is unavailable due to lack of maintenance.

It is also important mentioning that heterogeneity in size can be a barrier, but it can also be an opportunity to foster trading. Heterogeneity transforms into a barrier when bigger countries try to "abuse their dominant position" in the region. However, it can also be an opportunity for smaller countries since bigger ones provide them an "infinite" market where they can sell or buy. Big systems also provide "economies of scale" and the required "volume" in an industry where scale and volume are important.

1.2. POSSIBLE ACTIONS TO ELIMINATE / MITIGATE THE BARRIER

The wide extension of the territory is a fact that needs to be dealt with; three actions can be envisaged:

1. Development of regional trade in sub–regions for being interconnected later. This approach consists of initiating and developing trade in sub–regions so as to later in a second step, interconnect the sub–regions. This approach allows initiating trading in more reduced spaces from the geographical point of view, which reduces technical and financial problems. In subsequent steps sub–regions can be interconnected when it is economically sound. A key requirement is that the sub-regions in their development should follow common principles, so that later it is possible to easily interconnect them, and the initial development does not become a new barrier to the region's full integration.

2. Regional planning: regional long term planning of transmission infrastructure is a key element. This planning should be done considering:

   a) the medium/long term objectives of the sub–region

   b) Long term objective of sub–regions integration

   c) Regional standards to facilitate sub–regional integration in the future.

3. Regional institution to coordinate the process: a long term process needs to be managed permanently so as not to lose momentum, and be in line with the long term objectives. The process as it is proposed clearly needs coordination in several areas: organise the sub–regions under common principles, perform regional planning, help achieve agreements on standards to be used regionally, etc.

Regarding differences in the system's size, the opportunities must be potentiated and dominant behaviour should be controlled. The best way to achieve this is by proceeding strictly through written rules. The rules must be non discriminatory, clear and transparent. Proceeding strictly by written rules prevents or at least minimises the possibility of some countries prevailing over others.

The procedure to approve the rules is also a key element: it is desirable that important rules be approved by consensus. This way it can be avoided that some countries impose their will on others.

Another element that helps to avoid the non desired effects of differences in size is sharing and publicising information. Transparent and public information is normally a barrier to undesired behaviours since they can be "demonstrated" with the information.

Obviously, the above mentioned actions will mitigate the eventual undesirable effects of differences in size; however, securing the "opportunity" will depend on the parties' good will. Maybe a good example of a positive effect of size differences can be found in the SAPP. In this case South Africa plays a role of leadership and the other countries find an enormous market to sell in. It can be argued that prices may not be fair, but transparent information helps much in this regard. Once the STEM is in place, with transparent information, the situation will definitely improve.

2. LACK OF INFRASTRUCTURE

2.1. THE BARRIER

Infrastructure is one of the key elements to have regional trade of electricity; without infrastructure it is obvious that trade will not be possible. Moreover, infrastructure needs to be adequate for the trade to be fluent. Power trade infrastructure means cross border interconnectors and domestic transmission systems which can accommodate flows that are originated in another country and transit to a third country.

2.1.1. INTERCONNECTORS

Although there are interconnectors in the region, these are limited in number and capacity.

The following cross border connections can be mentioned (existing or planned):

- Ruzizi: Rwanda – Burundi – DRC to share the hydro power plant of 36 MW.
- Burundi – Rwanda (through SINELAC)
- Uganda – Kenya
- Uganda – Rwanda
- Uganda - Tanzania
- Kenya – Tanzania
- Kenya – Ethiopia (Interconnection planned which will be coordinated by the EAPP)
- Tanzania – Rwanda – Burundi (Interconnection planned, also involving a generation plant)
- Ethiopia – Sudan (Expected to trade 100 MW)
- Uganda – Eastern DRC (Planned)

The next figure illustrates part of these interconnections and their characteristics [1]

[1] Source: NILE BASIN INITIATIVE - NILE EQUATORIAL LAKES - SUBSIDIARY ACTION PROGRAM

Strategic/Sectoral, Social and Environmental Assessment of Power Development Options in The Nile Equatorial Lakes Region. Revised Final Report Stage II (SNC Lavalin, Hydro Quebec).

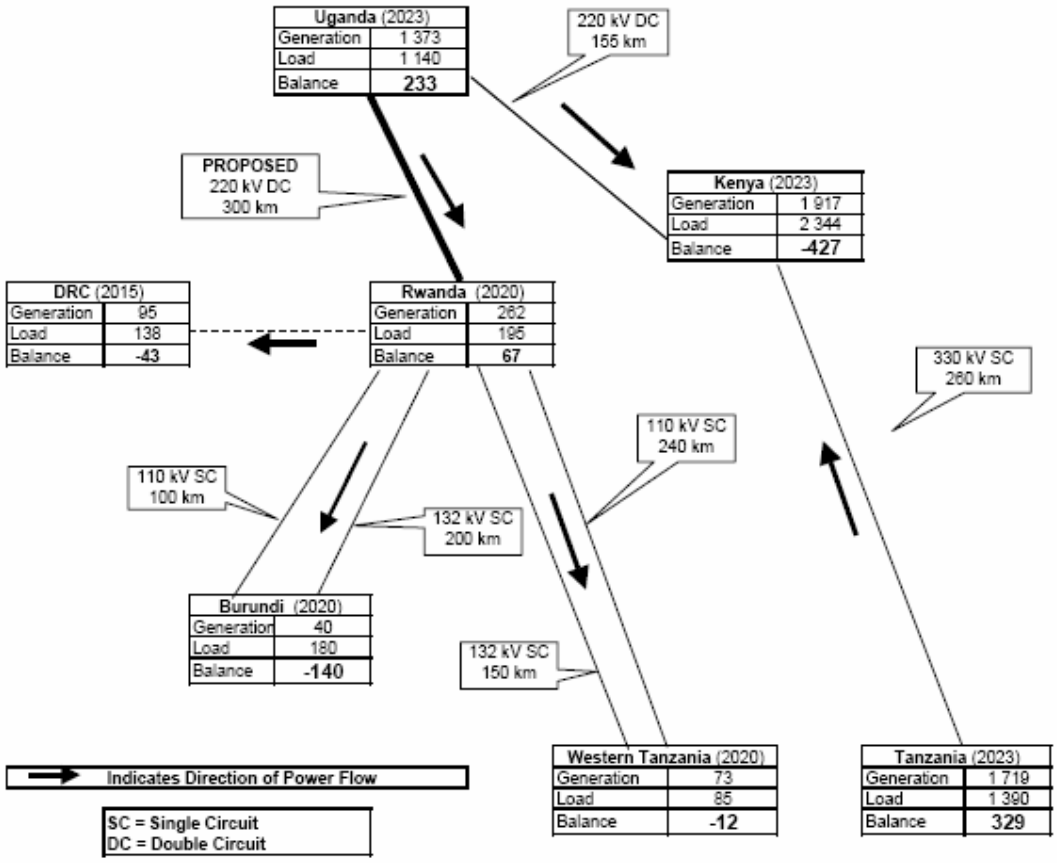


Figure 1: Interconnections in the Region

2.1.2. DOMESTIC TRANSMISSION SYSTEMS

Domestic transmission systems in the region have, as a rule, little or no capacity to accommodate extra flows. Hosting flows to third countries needs to be taken into consideration for future expansions.

2.2. POSSIBLE ACTIONS TO ELIMINATE / MITIGATE THE BARRIER

Lack of infrastructure for cross border trading, together with an extended territory and low charges (relatively small systems), is a quite negative mix of elements.

It must be considered that the biggest system (Egypt) has around 20.000 MW of installed capacity; the remaining systems are in the order of 1.000 MW (if we consider that DRC has no more than 50% of its capacity in conditions of generation) and the amounts traded across the current interconnectors are small.

It is obvious that long transport lines are only economically feasible if great loads are transported, and this seems not to be the case. Long distances may be involved but not great loads.

The following actions can help mitigate / overcome this barrier:

1. Think of developing infrastructure in sub–regions which will be later interconnected. Given the loads that can reasonably be exchanged among the countries, it is not

sensible of thinking of extremely long / big transmission lines. The configuration of the whole region does not allow a solution like SIEPAC with a backbone on which different countries inject and retire energy.

2. A regional and sub-regional long term planning: planning of infrastructure at sub regional level considering the future of a wider interconnection with both other sub–regions and the region as a whole.

3. Planning of transmission system expansion at domestic level taking into account the sub–regional (and later regional) level, the impacts of the regional, sub–regional planning in the domestic transmission systems and vice versa.

4. Planning taking into account these multiple levels, i.e. domestic – sub region – region, requires coordination and, especially, an agreement and acceptance of the countries since these additional considerations will certainly introduce modifications in the classic planning of the countries' transmission system expansion. And even more, it may introduce further costs.

5. Systematic planning at different levels, or taking into account different levels to be efficient, requires:

    a. Establishing common standards for all countries. Obviously, this cannot be achieved immediately but an agreement to evolve to a situation with common standards for planning (at least for the networks involved in cross border trading) is desirable.

    b. Standardization of methodologies and instruments for system expansion planning is desirable.

3. INSTITUTIONAL BASIS AND GOVERNMENTAL COMMITMENT

3.1. THE BARRIER

3.1.1. A REGIONAL INSTITUTION

For the development of regional power trade, taking as point of departure the region's current situation, it is necessary that a regional institution takes the responsibility and leadership of coordinating, overlooking and fostering the process required to develop trade, regardless of the chosen model (In the proposed model – Deliverable 7 – this institutions is called the Technical Secretariat). Without an institution with these characteristics and objectives the initiative will not succeed, since in developing countries/regions market forces alone are no sufficient. This happens because, in the first place, oftenly there are no markets in developing regions, and in other cases markets are quite distorted. Therefore, market forces do not produce the expected results. It is necessary to steer the process and continuously overlook it.

3.1.2. GOVERNMENTAL POLICY

It is also necessary to have a clear and explicit commitment from the governments involved; this commitment should basically deal with:

- Making the integration policy in regional cross border power trading explicit and part of the domestic policy. The integration issue does not appear generally in the main policy lines for the energy sector; other issues are generally more relevant, such as meeting the demand reliably, with quality and at low cost, and ensuring access to energy to all the population. However, when asked, officials always consider integration as desirable and part of the strategy to achieve higher level objectives

(Uganda is the only country that has explicitly at the highest level the objective of regional integration). In very few cases the country's energy strategy relies on self sufficiency, or at least "caps" on dependence on foreign supply are established unofficially (Kenya for example considers that dependence on foreign supply should be limited, Ethiopia has explicitly as a goal "self sufficiency through the development of indigenous resources", as well as Sudan). However, a self sufficiency policy is not contradictory with power trade if it is correctly interpreted and articulated with it. Countries may desire an assurance of being capable to satisfy domestic demand (with investments in capacity in their countries) but at the same time be willing to trade so as to minimize operating costs. This kind of policy takes to a "second best" from the economical point of view, in other words, there will be additional costs investment-wise. But articulating the "self sufficiency" policy with cross border trading has the benefit of meeting both the political objective (of being capable of supplying the domestic demand with domestic means) and the efficiency one, of minimizing the system's operating cost (through trading). Sometimes an old culture of planning generation with criteria that only look at the domestic market from a "self sufficiency optic" and not at the entire region, results in overlooking better possibilities. The following table presents for each country relevant policy guidelines for this study.

Country	Energy Policy Guideline
Rwanda	• Have affordable and reliable energy supplies country wide. • Enhance the development and utilization of indigenous and renewable energy sources and technologies.
Burundi	• Ensure reliable access to energy with quality and efficiency. • Meet the demand, efficient use of indigenous resources and protection to environment.
Kenya	• Provide sustainable quality energy services for development. • Enhance security of supply. • Promote development of indigenous energy resources.
DRC	• SNEL, the DRC's integrated utility, has several exportation contracts even if this meant that domestic demand would not be met because of the contracts. • Policy is currently prioritizing domestic supply to exports
Ethiopia	• To ensure a reliable supply of energy at the right time and at affordable prices. • To give priority to the development of indigenous energy resources with a goal towards attaining self sufficiency.
Tanzania	• To satisfy the energy demand of all sectors of the economy. • To develop domestic energy sources in order to substitute for imported petroleum products.

Country	Energy Policy Guideline
Sudan	• Provide reliable power supply for all Sudan with highest efficiency and lowest costs. • Achieve "self sufficiency" in power generation and not depend on the region.
Uganda	The goal for Uganda's energy policy is: "To meet the energy needs of Uganda's population for social and economic development in an environmentally sustainable manner" in the context of: ▪ The existing economic, social and environmental policies; ▪ The nature and linkages of the energy sector with other sectors; and ▪ International and regional linkages of the sector.

Table 3: Countries' Power Policies

- Provide legal support to the regional institution: if it is agreed that a regional institution is needed to steer the process, then this institution will require a legal support to act; if not, it will turn into an empty shell because it will have no instruments to achieve its goals.

- Another aspect is the need of coordinating different initiatives in the region that deal or can deal with cross border trading. Multiplicity of initiatives results in a non efficient use of resources which are scarce and, therefore, generate the risk of not achieving the ultimate objective.

- Make the minimum domestic reforms, if necessary and when necessary, to eventually eliminate existing barriers to cross border trading; these barriers could be regulatory, commercial (taxes for example), technical.

3.2. POSSIBLE ACTIONS TO ELIMINATE / MITIGATE THE BARRIER

The best way to overcome this kind of barriers is to agree a document which will establish at least:

- The commitment of the involved governments with regional power trade.

- The creation of a regional institution with the capacity and objectives to coordinate, oversee and promote the process.

- The coordination among already existing regional initiatives that deal with power trade and profit as much as possible of advances already made.

- The acceptance to process in their respective countries' modifications such as:

    - Establish the mechanism to determine cross border trading capacity and the mechanism to allocate this capacity

    - Elimination of taxes to import/export electricity [2]

[2] Taxes to cross border trading result in sub optimal benefits for the region because taxes are distortions to prices. Taxes to exports / imports may prevent a transaction that is economically sound from being achieved, because of the distortion that they introduce.

- Accept to plan the domestic generation and transmission system taking into account the sub – regional and regional aspects. In the case of generation this may mean that projects that do not have sense if considered from a "domestic optic", may turn into feasible ones when considered in a regional context.

- Accept exchange of information.

4. FINANCING CROSS BORDER TRANSMISSION INTERCONNECTIONS

4.1. THE BARRIER

Financing cross border interconnections is in general subject to the same type of hurdles as the power sector in developing countries: big difficulties to find financial sources to fund their expansions in the power sector, mainly because:

- Countries are considered as high risk ones for investments and credit.

- Utilities are not credit worthy, nor have resources to invest.

- High losses and low tariffs that do not reflect cost of service and therefore impact in the companies' credit worthiness.

The power sectors of the region suffer, in higher or lower degree, the above mentioned problems, making difficult the access to credit.

4.2. POSSIBLE ACTIONS TO ELIMINATE / MITIGATE THE BARRIER

Two different situations can be distinguished for cross border expansion:

1. Transmission line linked to a generation project: this would be the case of a generation project that exports energy (totally or in part) to other(s) country(ies).

2. An interconnection line to link two (or more) systems (pure interconnection): this would be the case of an opportunity that it is identified for trading between two or more systems, and that requires the construction of a transmission line.

Transmission line linked to a generation project

Deliverable #5 includes a section "Best Practises for PPAs" where recommendations are provided so that PPAs do not represent a barrier to additional cross border trading, but on the contrary, cooperate with this trading.

Basically, the idea is to allow that the spare capacity of the line linked to the PPA (if existing) is used for exchanges. The owner of the line would be compensated for the use of this spare capacity.

Another issue to consider is the possibility of incrementing the capacity of the line linked to the PPA with a marginal investment. When a generation project involving a cross border line with a PPA is identified, the possibility of incrementing the capacity of the cross border line can be evaluated, so as to accommodate other flows which do not correspond to the PPA. A transmission line (cross border) designed to accommodate the power of a PPA, with a marginal additional investment can increment the capacity of transport in a relevant manner. This is a way of taking advantage of an investment that will be made anyway, and with little additional investment obtain a relevant additional capacity for regional trade.

Obviously, in this situation arrangements will have to be made with the original investors and compensations will have to be discussed case by case.

A pure interconnection project

A system interconnection project can be identified at the regional (or sub–regional) planning level, or by two or more countries.

In this case, first must be analyzed the technical and economical feasibility of the project where the key element will be the tariff.

If the project is feasible, this means that: i) for a given tariff the investment is recuperated with a reasonable gain and O&M costs are covered; ii) the countries involved receive benefits for trading after paying the transmission tariff.

In this case a specific agreement among the involved countries for the specific project can be designed so that the countries (or their utilities) become themselves "owners" of the project. Eventually, if the size of the project justifies it, a specific organization can be put in place to manage and later operate the project. The case of SINELAC is already an experience that even if it can be improved, it shows that three countries can get together to design and operate one project.

Once the organization and agreements for the project are put in place, funding for the project can be pursued among international agencies or even with private sector. A cost reflective tariff that recuperates and remunerates capital and covers O&M expenses will be the key to obtain funding.

Additional mechanisms for ensuring tariff payment could be designed if the private sector is involved in the project, so as to reduce the risk perceived by them.

5. REGULATORY BARRIERS

5.1. THE BARRIER

In the region few advances have been made towards a reform processes. The State is still by far the predominant actor in the power sector; there can be found vertically integrated monopolies, unbundled sectors with ownership still in hands of the State and limited participation of private sector.

A regulatory authority exists in nearly all countries (with different degrees of independence and objectives in each country), however, in the sectors' structure, the State is by far the main actor either through integrated companies or even in unbundled sectors, through the ownership (or participation in the shares) of the unbundled companies.

This structure of the power sectors is not actually a barrier for trading; in previous documents it has been demonstrated that it is perfectly feasible to develop regional trade with different types of sector structures. However there are some elements that need to be addressed:

- **Non discriminatory open access to the transmission system's spare capacity**: few countries have this possibility, and it is generally through arrangements with the government (DRC, Ethiopia). Trade requires the possibility to access transmission systems when there is spare capacity.

- **Transmission tariffs, wheeling charges, conditions of access to the grid**: the use of infrastructure must be remunerated somehow, therefore, agreements on this

remuneration are required and they must be non discriminatory and transparent; same for the "conditions of access to the grid".

- **Licenses**: import/export of electricity in some countries is subject to licenses or authorizations i.e.: Tanzania requires a decree from government, Uganda requires a license, Rwanda is not specified.

5.2. POSSIBLE ACTIONS TO ELIMINATE / MITIGATE THE BARRIER

The above mentioned barriers are possibly the ones that will require more work for reaching agreements and building up consensus. On the other hand, it can be said that although they are important barriers to a fluent trade, there is time to work them out during the initial stages, since in those stages their negative impact is not so harmful.

a) Non discriminatory open access to the spare capacity of the transmission system

Initially, trading will begin as cross border trading between neighboring countries, where the corresponding utilities that trade will be either integrated ones or the transmission system owner. In this case, non discriminatory open access is not necessary for trading; therefore, not having open access will not represent a barrier for trading. Moreover, the utilities will be responsible for maintaining their systems' parameters, the agreed parameters at the point of delivery and their systems' stabilities.

However, when trading evolves to further stages and involves transit through third countries, then for a fluent and dynamic trade, open access would be desirable. Since this may represent a major modification in the countries' regulations, it can be substituted by a mechanism for determining the cross border trading transmission capacity together with a mechanism for allocating this capacity.

If countries are not capable to process the required modifications and achieve non discriminatory open access in their grids, then an agreement on the above mentioned mechanisms will be sufficient to allow trading according to the model proposed in Deliverable 7.

b) Transmission tariffs, wheeling charges, conditions of access to the grid

Transmission tariffs, wheeling charges and non discriminatory and transparent conditions of access to the grid are necessary once non discriminatory open access is put in place. These are the means to remunerate the transmission facilities owners for hosting energy flows.

According to the proposed model in Deliverable 7:

Open access is not indispensable, it is sufficient with agreeing on a mechanism to determine the cross border trading transmission capacity and the way to allocate this capacity. So, it will be required at least to agree on this mechanism for making trading possible (this for the 3rd of the proposed phases).

Wheeling charges are proposed to be agreed by countries if necessary, or considered as zero. A decision by the countries is needed on this proposal.

Regarding conditions of connection to the grid, the model proposes that each agent connected to a domestic grid, be considered as agent for regional trade if allowed by the country's regulation.

c) Licenses

Licenses can be a real barrier for power trading from the very initial stages. Countries with strict requirements regarding licensing should review their position if regional integration is valued as an objective.

This does not mean at all that licenses should be eliminated, rather that they should be shaped in such a form so as to not turn into a barrier for trading. They may be even helpful if correctly designed from the point of view of information production and sharing. Among some recommendations regarding the licenses and the procedure to give a license the following principles can be mentioned:

1. Licenses should be given in a non discriminatory way.

2. Licenses should be as simple as possible from the point of view of the requirements from the licensee.

3. The license itself should be standardized and public.

4. The procedure for obtaining a license should be simple, reducing as much as possible the number of steps required.

5. The maximum period that may take for the organization issuing the license to decide in each step of the procedure must be pre established. In case this period is exceeded it must be understood that the decision is in favor of the applicant.

6. The cost of the license (if any) should be minimized.

7. An agreement among the countries of the region for the general conditions of a license would be desirable.

6. THE "DOMINATION" OF ONE OR FEW COUNTRIES

6.1. THE BARRIER

In some contexts it is possible that one or few countries in the region have a dominant behavior over the rest. For example, the more developed or bigger systems may "dominate" over the smaller ones. More than a barrier, this is a "risk" because the existence of bigger and developed systems can also function as leaders for the regional development. This can be the case of ESKOM (South Africa) in the SAPP.

Dominant behavior can not be considered as a barrier "ex – ante"; it can be no more than a risk to be avoided. Dominant behaviors need to be "proved" before considering them an actual barrier.

However, it is worth addressing the "risk" and try to avoid it from the very beginning. This dominant behavior can be exercised in two ways: during the commercial relationship (when actually trading) or during the decision making process, when key issues for power trade in the region are being decided.

6.2. POSSIBLE ACTIONS TO ELIMINATE / MITIGATE THE BARRIER

In both cases the best way to avoid this undesirable behaviour is "proceeding by written rules".

The first risk, exercise of dominant position during actual trading: this problem needs to be addressed in the design of the trading rules. In a general way, the avoidance of dominant position in the markets or "market surveillance" is an issue treated specifically in the market rules. An institution (normally the regulator) is in charge of overlooking the behaviour of different agents in a market. Transparency and public information are key tools to avoid these undesirable behaviours.

The second risk, exercise of dominant position during decision making process: in this case, it is the design of the decision making process itself which ensures that no country or group of countries can exercise a dominant position. However there is no possible mechanism that can completely ensure this fact, because the decision making process is a human process and therefore subject to "human nature" forces.

For the case of the Nile Basin countries, the "Treaty" is the first document to address this problem, establishing how the decision making process should be carried out at least for key issues. Different alternatives can be envisaged: total consensus, special majorities, etc.

7. SUMMARY OF BARRIERS AND MITIGATION MEASURES

The following table summarizes the identified relevant barriers for the Nile Basin region and the corresponding mitigation measures proposed.

BARRIERS AND MITIGATION MEASURES	
Barriers	**Measures**
Geographical region and power sector sizes: extended region: extended region (long distances), several countries, difficult landscape, power sectors with different size and different degrees of development.	1. The Power Trade model must be flexible, able to recognize sub-regions that better accommodate its features. Initial development of power trade in sub – regions. 2. Planning: gradually introduce the concept of indicative regional planning starting with coordinating country planning to take into account the "regional factor". NELSAP is a good example of successful efforts in sub – regional planning. 3. Regional institution to coordinate and promote regional power trade, regional planning and especially the link between domestic planning with regional objectives and regional planning. Gradual development.
Lack of infrastructure: few and weak existing interconnectors; domestic transmission systems with difficulties to host transit flows.	1. Develop infrastructure in sub – regions foreseeing that later they will be interconnected with other sub – regions. This reduces distances and therefore investment needs. SINELAC is a good example showing that infrastructure can be developed through an effort carried out by several countries. 2. Planning at sub – regional level (like NELSAP). 3. Coordinating sub – regional planning with domestic planning. 4. Establish regional standards for planning. 5. Agree on common methodologies and instruments for planning.

BARRIERS AND MITIGATION MEASURES	
Barriers	**Measures**
Institutional basis and Governmental commitment: need of a regional institution to take the responsibility of coordinating and promoting regional power trade; governmental commitment with power trade articulating "self sufficiency" policies.	1. Explicit and transparent commitment of the Governments with regional power trade and coordination with other existing initiatives. 2. Creation of a regional institution with the capacity and objectives to coordinate, overlook and promote the process. 3. Acceptance to process in the respective countries the modifications needed to develop power trade. 4. Planning G&T from a regional optic and not only taking into account domestic needs and domestic market. Again, there are already in the region, good examples of regional planning (NELSAP)
Financing cross border interconnections: counties considered as high risk for credit, utilities not credit worthy, bad performance of utilities and vicious circle (low tariffs, lack of investment, lack of credit worthiness to develop investment)	1. Transmission line linked to generation regional project: a. Consider "Best Practices in PPAs" b. Enforce "open access" to spare capacity of line to use it for cross border trading. c. Consider possibility of incrementing capacity of decided line with marginal investment, to use this additional capacity for international trading. 2. Pure interconnection project (opportunity identified at regional planning or by group of countries): a. Analysis of project feasibility with cost reflecting tariffs for the line. b. Involved countries "owners" of the project and responsible for it. (See SIEPAC example Deliverable 5) c. Development and exploitation of the project individually (example of EGL and Ruzzizi) with a specific agreement among the countries and, eventually, with an organization to achieve this. d. Search for funding the project once previous points are achieved. If previous points are achieved, this provides credibility to the project.

BARRIERS AND MITIGATION MEASURES	
Barriers	**Measures**
Regulatory barriers: non discriminatory open access to spare capacity of transmission, remuneration of transmission services, licenses.	1. Countries should at least agree on the mechanism to determine cross border trading transmission capacity and its allocation. 2. Non discriminatory open access to spare capacity of cross border lines that are constructed by PPAs dedicated to exportation must be established from the beginning (even if some agents have priority on the capacity, like PPAs that finance the line). 3. Remuneration to transmission systems hosting transits must be agreed. Initially there can be no remuneration. Other cases may be agreed on a case to case negotiation basis. 4. Licenses should be designed so as to not become a barrier to trade.
Domination of one or few countries: exercise of dominant position during trade or during decision making process.	1. The (regional) regulator or the institution acting as regulator should perform market surveillance. 2. Proceed by "written rules" 3. Establish a "decision making process" that minimizes the possibility of domination during the process itself by one or few countries.

Table 4: Summary of Barriers and Mitigation Measures

According to the proposed model for power trade, the different mitigation actions can be organized according to each phase of power trading. In other words, it can be established which of these actions are required to be achieved in each of the proposed phases.

The next table shows correlation between power trade phases (The Power Trade Model – Deliverable #7) and the actions required to mitigate barriers to power trade.

Power Trade Phases and Actions Required	
Power Trading Phase	**Actions to be achieved**
Phase I: Initial Stage – Preparatory Stage	1. Regional institution creation through a treaty among governments, which would also include the governments' commitment in favor of regional power trade. 2. Establishment of the concept of regional planning, coordination of domestic planning with a regional view. 3. Definition of regional standards to meet, and the transition to achieve, these standards within a timeline. 4. Harmonization of planning methodologies and standards. 5. Agreement to use "Best Practices for PPAs" for future cases. 6. Agreement on information exchange and establishment of regional data base.

Power Trade Phases and Actions Required	
Power Trading Phase	**Actions to be achieved**
Phase II: Bilateral Cross Border Trading	1. Regional and sub – regional planning tightly coordinated with domestic expansion planning. 2. Development of "regional" projects that involve two or more countries by the incumbents. 3. Define what will be the "regional network" (or sub – regional) and establish the principle of non discriminatory open access to the lines' spare capacity in this network. This will be a condition to begin Phase III. 4. Advances towards regional standards. Common methodologies and tools for planning should be developed. 5. Requirements for import / export licenses should be minimized.
Phase III: Multilateral Trading or Parties Transactions. Transits	1. Non discriminatory open access or agreement on mechanism to determine cross border trading transmission capacity and its allocation. 2. Domestic – sub regional and regional planning functioning in coordination. 3. Agreement on remuneration to transmission systems that host third parties flows (transits). 4. Harmonized regional technical standards.

Table 5: Power Trade Phases and Actions Required