



# **International Experience with Cross-border Power Trading**

**Report to the Regional Electricity  
Regulators' Association (RERA) and the  
World Bank**

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# Table of Contents

<b>Executive Summary</b>	<b>9</b>
<b>1 Introduction</b>	<b>13</b>
<b>2 Overview of Case Studies</b>	<b>17</b>
<b>3 Lessons for Southern Africa from International Experience with Cross-border Power Trading</b>	<b>21</b>
3.1 Security of Supply Concerns Need to be Explicitly Addressed and Understood by the Parties to Proposed Cross-border Transactions	21
3.2 Regional Entities Must be Empowered to Make Decisions	23
3.3 Bilateral Trading Can Provide an Important Basis for Expanding Cross-border Trading Volumes	29
3.4 Power Pools Can Help to Generate Sustained Increases in Cross-border Trading	30
3.5 The Substance and Process of Regulatory Reviews Must be Clear	32
<b>4 Central America</b>	<b>35</b>
4.1 Cross-border Power Trading in Central America	35
4.2 Lessons for Southern Africa from the Experience in Central America	45
<b>5 West Africa</b>	<b>48</b>
5.1 Cross-border Power Trading in West Africa	48
5.2 Lessons for Southern Africa from the Experience in West Africa	56
<b>6 United States (New England) and Canada</b>	<b>61</b>
6.1 The New England Power Pool and Cross-Border Power Trading with Canada	62
6.2 Lessons for Southern Africa from the Experience in North America	71
<b>7 Greater Mekong Subregion</b>	<b>73</b>
7.1 Cross-border Power Trading in the Greater Mekong Subregion	73
7.2 Lessons for Southern Africa from the Experience in the Greater Mekong Subregion	79

## Tables

Table 1.1: Illustration of Recommendations for Regional Entities	13
Table 2.1: Overview of General Characteristics of Regional Trading	17
Table 3.1: Comparison of SADC and ECOWAS Treaties and Energy Protocols	24
Table 4.1: The Role of CRIE Compared to the Role of ERERA	45
Table 5.1: Annual Trading between WAPP Members (excluding Manantali output)	50
Table 5.2: Comparison of Key Parameters in SAPP and WAPP	57
Table 5.3: WAPP Member Utilities and Country Status	59
Table 6.1: Regulatory Responsibilities for Cross-border Trading in North America	69
Table 7.1: GMS Cross Border Trade Road Map	75

## Figures

Figure 2.1: Overview of Infrastructure for Cross-border Trading	19
Figure 3.1: Overview of Decision Making Process in Central America	28
Figure 4.1: Current Power Trading in the Central American Region	39
Figure 4.2: The Central America Regional Transmission Line	40
Figure 5.1: Illustrative WAPP Priority Projects	51
Figure 5.2: WAPP Organizational Structure	53
Figure 6.1: Map of Major Generation and Transmission Units in Canada (c.1985)	65
Figure 6.2: Map of Major Generation and Transmission Units in United States (c.1985)	65
Figure 6.3: Current NEPOOL Governance Structure	67
Figure 7.1: Indicative Power Sector Master Plan for the Greater Mekong Subregion	77

## Abbreviations and Defined Terms

ADB	Asian Development Bank
AFD	Agence Française de Développement
AFTEG	World Bank Africa Energy Group
CEAC	Consejo de Electrificación de América Central (Council for Central American Electrification)
CLSG	Côte d'Ivoire–Liberia–Sierra Leone–Guinea System Redevelopment Sub-program
CRIE	Comisión Regional de Interconexión Eléctrica (Regional Electric Interconnection Commission)
CRM	Cost Recovery Mechanism
CURTR	Cargo por Uso de la Red de Transmisión Regional (Fee for the Use of the Regional Transmission Network)
CVT	Costos Variables de Transmisión (Variable Transmission Costs)
DOE	United States Department of Energy
ECOWAS	Economic Community of West African States
ECT	Energy Charter Treaty
EDC	Electricite du Cambodge (Cambodia)
EGAT	Electricity Generating Authority of Thailand
EGCO	Electricity Generating Public Company (Thailand)
EOR	Ente Operador Regional (Regional System Operator)
EPR	Empresa Proprietaria de la Red
ERERA	ECOWAS Regional Electricity Regulatory Authority
FERC	United States Federal Energy Regulatory Commission
FPC	United States Federal Power Commission
GMS	Greater Mekong Subregion
HIPC	Highly Indebted Poor Country
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IDB	Inter-American Development Bank
IGA	Inter-Governmental Agreement
IGMOU	Inter-Governmental Memorandum of Understanding
IPP	Independent Power Producer

ISO	Independent System Operator
ITC	Independent Transmission Company
ITD	Italian Thai Development Public Company Limited
MEPCO	Maine Electric Power Company
MER	Mercado de Electricidad Regional (Regional Electricity Market)
MOU	Memorandum of Understanding
NEB	National Electricity Board (Canada)
NEPEX	New England Power Exchange
NEPLAN	New England Power Planning
NEPOOL	New England Power Pool
NERSA	National Energy Regulator of South Africa
OMVG	Organisation pour la Mise en Valeur du fleuve Gambie (Gambia River Basin Development Organization)
OMVS	Organisation pour la Mise en Valeur du fleuve Sénégal (Senegal River Basin Development Authority)
PJM	Pennsylvania-Jersey-Maryland
PPA	Power Purchase Agreement
PPU	Pool Plan Unit
PSP	Private Sector Participation
PTF	Pool Transmission Facility
PUC	Public Utility Commission
PWG	Planning Working Group
RERA	Regional Electricity Regulators Association
RMER	Reglamento del Mercado Eléctrico Regional (Regional Electricity Market Regulation)
RPTCC	Regional Power Trade Coordination Committee
RPTOA	Regional Power Trade Operating Agreement
RRB	Regional Regulatory Board
RTC	Regional Transactions Coordinator
RTO	Regional Transmission Organization
SADC	Southern African Development Community
SAPP	Southern Africa Power Pool
SIEPAC	Central American Electrical Interconnection System
SPV	Special Purpose Vehicle

TOR	Terms of Reference
TSO	Transmission System Operator
USAID	United States Agency for International Development
VRA	Volta River Authority (Ghana)
WAPP	West Africa Power Pool
WATRA	West African Telecommunications Regulatory Association
WESTCOR	Western Power Corridor
WTO	World Trade Organization
ZIZABONA	Zimbabwe-Zambia-Botswana-Namibia Transmission Line





# Executive Summary

## ***Main lessons from international case studies***

The five main lessons for Southern Africa from our review of the experience with cross-border power trading in other regions of the work are that:

- Security of supply concerns need to be explicitly addressed and understood by the parties to proposed cross-border transactions
- Regional entities need to be empowered to make decisions based on legally enforceable national government commitments, particularly in relation to planning, pricing, and settlement rules
- Bilateral trading provides a basis for expanding trading volumes, both through constructing the physical infrastructure that future deals will use and by establishing workable legal and regulatory frameworks
- Power pools will help to generate sustained increases in cross-border trading along with other regional trading arrangements, particularly in power systems with several interconnections
- The substance and process of regulatory reviews in importing and exporting countries must be clear to create sufficient investment certainty.

We summarise each of these lessons in this executive summary.

## ***Security of supply concerns need to be explicitly addressed and understood by the parties to proposed cross-border transactions***

Recent experience in Southern Africa has caused scepticism about the real benefits and risks of cross-border power trading. Supply shortages in South Africa in early 2008 resulted in load shedding for other countries that rely on South African generation, and reliability problems in Zimbabwe have made regional power trading more challenging.

Security of supply in cross-border trading needs to be safeguarded through trading rules, grid codes, and agreements between importing and exporting countries. Firm, standardised supply contracts have been used in Central America to manage supply risks, with explicit provisions for emergency situations. The Nam Theun 2 development in the Greater Mekong provides compensation to the buyer when the seller fails to meet certain plant performance standards on registered capacity, minimum capacity, reactive power, and loading rates. These provisions help to manage security of supply risks by providing strong incentives to provide contracted power at the point of delivery.

International experience highlights the importance of ensuring that contracts are well drafted, and that the consequences of contractual defaults and emergency events are fully understood. The experience from other regions shows that well-designed power purchase agreements (PPAs) that explicitly address the security of supply impacts increase the prospects of success for

large bilateral and multilateral cross-border transactions. The strength of contractual provisions may be further strengthened by other agreements between governments.

***Regional entities need to be empowered to make decisions based on legally enforceable national government commitments, particularly in relation to planning, pricing and settlement rules***

There is general concern in Southern Africa that decisions on developing the power sector are made based solely on national interests, and do not adequately account for regional impacts. To encourage regional interests, entities like the Southern Africa Power Pool (SAPP) and Regional Electricity Regulators' Association (RERA) will need a stronger commitment from national governments and clearer decision-making ability. To make effective decisions, the regional organisations will also need to adopt more effective processes. To date, the region has had particular difficulty finalising decisions on planning, pricing and settlement rules. For example, the pool planning process has been extended several times without agreement, and transmission pricing proposals appear to have reached an impasse.

The legal framework for regional power trading in the Southern African Development Community (SADC) is weak compared with other regions. For example, in Central America and West Africa strong government commitments have been expressed in Treaties and Protocols governing power trading. Further government commitment in SADC would send important signals about the value of cross-border trading, and would help to empower regional entities. This commitment could be achieved through an amendment to the SADC Energy Protocol, which could contain similar provisions to those found in other regions. The commitment of governments in Southern Africa could formally delegate some decision making authority to a steering committee of high-level national energy government officials, who would meet on a regular basis.

In Southern Africa, decision closure could be promoted by incorporating measures to overcome any lack of consensus among SADC members. Decision making in Central America has adopted a pragmatic "propose-respond" model, where the power pool proposes a particular approach and the regional regulator responds with a decision. The experience in Central America suggests that decisions can be made efficiently on contentious issues, provided that processes are in place to reach decision closure in the event of disagreement. Planning procedures in West Africa also appear to have incorporated stronger decision making powers.

Southern Africa might also consider using external and independent expert panels to provide credible opinions on issues that prove difficult to resolve unanimously. Such panels were the key to success in maintaining the momentum of the Central American cross-border trading initiative that has triggered regional transmission investment in countries with very different power sector structures. Similarly, the independent advisory panel established by the West African telecommunication regulators provides a useful model for accelerating the harmonisation of national electricity regulatory regimes in

Southern Africa.

These institutional measures would not directly assure more investment in cross-border trading in Southern Africa because issues concerning the financial capability of parties to enter into large cross-border purchases would remain. However, a stronger framework for regional power development would provide some impetus for moving ahead on contentious issues that are creating an uncertain investment climate.

***Bilateral trading provides a basis for expanding trading volumes, both through constructing the physical infrastructure that future deals will use and by establishing workable legal and regulatory frameworks***

Most of the cross-border electricity infrastructure in Southern Africa was developed under bilateral arrangements between governments and state-owned national utilities. Many of the transactions currently being developed are also primarily bilateral deals, with less emphasis on the need for interactions with regional organisations like SAPP.

The experience in the Greater Mekong Subregion shows that bilateral transactions can provide a useful basis for expanding future trading. In the Greater Mekong, the Nam Theun II transaction between Laos and Thailand has been developed as part of an explicit transition from one-off bilateral transactions to more integrated, multi-country trading. The interconnection between the two countries will ultimately become part of a more regional power system, as additional interconnections are added in the coming years. The legal and regulatory arrangements for the Nam Theun transaction have also provided governments and regulators with valuable experience in resolving issues that are unique to cross-border transactions.

In Southern Africa, the most advanced cross-border transaction at present is the Mmamabula coal fired power station in Botswana, which is being developed more along the lines of a bilateral deal than a multi-party development. This transaction has led to a new law in Botswana to accommodate independent power exporters, and the detailed contractual framework provides a useful starting point for future transactions.

***Power pools will help to generate sustained increases in cross-border trading along with other regional trading arrangements, particularly in power systems with several interconnections***

To capture all of the opportunities offered by cross-border power trading, several regions (including Southern Africa) have created power pools. Power pools should help to promote regional trading by providing a common set of rules for dealing with technical matters such as settlement, system balancing, and loop flows. Power pools also establish legal relationships that allow rules to be changed over time and for disputes to be efficiently resolved. Power pools should lower the costs of putting together cross-border deals, which is important in Southern Africa where recent experience of project structuring and reaching financial close has been very expensive.

While Southern Africa has established a power pool, many stakeholders consider that the Southern Africa Power Pool is not achieving its full potential, and is not realising the full benefits of coordination. Other power pools routinely complete specific functions, such as reviewing the technical impacts of new projects and monitoring the performance of member utilities. These

functions should also be undertaken by SAPP to ensure that the power pool provides a suitable basis for future cross-border power trading.

***The substance and process of regulatory reviews must be clear***

Regulatory entities—whether independent or part of government—need to develop regulatory substance and process for cross-border power trading.

Cross-border trading in Southern Africa would benefit from additional clarity from regulatory entities on the substance of regulatory reviews. Recent work by NERSA in South Africa on the cost recovery mechanism for power purchases by Eskom provides a useful starting point. Work completed in Nigeria on benchmarking of the price and non-price provisions PPAs can also provide clarity on the issues that are addressed by regulators for cross-border deals.

Clear regulatory processes will also create greater investment certainty and enhance the prospects for cross-border trading. Regulatory processes in North America are transparent and predictable, minimising investment barriers. Southern African regulators are also employing procedures, such as meeting with potential parties to cross-border trades, to clarify regulatory expectations, but more work needs to be done.

The regulatory guidelines that will be completed under this assignment should help to clarify regulatory substance and process affecting future cross-border trading in Southern Africa.

# 1 Introduction

*Castalia has been asked to prepare regulatory guidelines and a checklist for the power pool in SADC*

The Regional Electricity Regulators Association of Southern Africa (RERA) and the World Bank have asked Castalia to evaluate the role of national regulators in cross-border power trading in the Southern African Development Community (SADC).<sup>1</sup>

The main outputs of our work will be one set of guidelines for national regulators in SADC aimed at promoting efficient, large-scale, firm power transactions, and another set of guidelines for regional and national political authorities. We have also been asked to prepare a checklist for the Southern Africa Power Pool (SAPP) that clarifies the power pool’s responsibilities for progressing regional power projects.

*Our recommendations to regional entities that facilitate cross-border power trading will be divided into near-term and longer-term actions*

A clear objective of our work is to help regional entities in SADC that facilitate cross-border power trading—RERA, SAPP and the SADC Secretariat—effectively ensure that the environment in Southern Africa supports efficient cross-border power trading. To achieve this outcome our advice can be divided into two sets of recommendations:

- Near-term actions that regional entities can undertake under existing mandates
- Longer-term actions that will require changes to the rules governing cross-border power trading.

Table 1.1 provides an illustration of how the recommendations in our work will be divided into these categories for the different regional entities.

**Table 1.1: Illustration of Recommendations for Regional Entities**

	RERA, RERA Members	SAPP	SADC Secretariat
Near-term actions under existing mandates			
Longer-term actions requiring institutional changes			

<sup>1</sup> The countries in SADC include South Africa, Namibia, Botswana, Zimbabwe, Zambia, Mozambique, Lesotho, Swaziland, Tanzania, Angola, Malawi, and the Democratic Republic of Congo. References in this report to SADC or Southern Africa refer to these countries. SADC also includes Madagascar and Mauritius, which due to their location cannot be feasibly connected to the regional power system.

*This report summarises specific lessons from other regions that have dealt with the regulatory and pooling issues facing cross-border power trading in Southern Africa*

As part of preparing the regulatory guidelines and SAPP checklist, the Castalia team has reviewed experience with cross-border power trading in four other regions. The findings from these case studies are presented in this report.

The motivation for completing case studies as part of this project is to look outside the SADC region for solutions to the regulatory and pooling issues facing cross-border power trading in Southern Africa. To best achieve this objective, the case studies presented in this report focus on particular areas where regulatory and pooling arrangements in Southern Africa may be constraining cross-border trading. This type of narrow, issue specific case studies can be contrasted to broad case studies that review all of the history and arrangements in a certain region or country. Other initiatives are currently underway that will provide a broader assessment of power trading in different regions of the world.<sup>2</sup>

*There are different types of cross-border power trading, and our work is most concerned with long-term supply contracts*

Within the broad category of cross-border power projects, it is useful to further distinguish between three types of projects:

- **Large multi-party projects** with multiple owners and off-takers
- **Mid-sized multi-party projects**, potentially using Special Purpose Vehicles (SPVs) to coordinate equity and off-take arrangements
- Less-complicated **bilaterally negotiated projects** with only one or two anchor off-takers and owners.

The distinction between these types of regional power projects is relevant because regulatory requirements are quite different for different types of project. Marginal regulatory improvements might help to get the bilateral deals done, while large multi-party projects will probably require additional Governments involvement. The category of mid-sized projects involving multiple parties is not common for projects being developed in the SADC region.

*The content of this report has been informed by stakeholder interviews, and preliminary recommendations have been presented at a SADC workshop*

The main issues that will be addressed in the regulatory guidelines to be prepared for RERA members were identified in the Inception Report submitted by Castalia to RERA and the World Bank in June 2009. Based on a series of interviews with stakeholders in Southern Africa during April 2009, our team identified a number of areas where the regulatory environment and pooling arrangements could be enhanced to improve the prospects for regional power developments. The preliminary findings from these case studies were presented at an Investors' Workshop in Livingstone, Zambia in July 2009—and feedback was solicited from conference delegates on the lessons from international experience. The Investors' Workshop was followed by additional one-on-one interviews with various stakeholders.

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<sup>2</sup> See for example ESMAP, 2009 "Consulting Services for a Study of Potential of Regional Power Sector Integration".

*The four regions considered in these case studies provide different lessons for Southern Africa on how to enable cross-border trading*

This report presents findings from the following four case studies, and discusses the issues summarised below that we consider might be applied in each case:

- **Central America.** In recent years the countries of Central America have pooled resources and expertise to build infrastructure and create institutions to increase cross-border power trading. This provides an example of how decisions can be reached on critical, often contentious, trading issues such as pricing principles and transmission investment
- **West Africa.** The existing cross-border electricity infrastructure in West Africa was developed for bilateral or trilateral supply contracts. West African states are now working to significantly increase regional power trading, and are sensibly focusing on building more cross-border infrastructure. The West African Power Pool (WAPP) provides useful insights into the way to get new infrastructure built, in part by empowering regional actors to make decisions, and also by ensuring accountability for progress. WAPP plays an active role in promoting investments in new generation and transmission facilities, while SAPP has focused on developing short-trading tools for existing capacity
- **United States (New England) and Canada.** Canadian power producers and utilities in New England entered into several large, cross-border power deals in the 1970s and 1980s. These deals were subject to regulatory scrutiny from several US and Canadian government agencies. These regulatory roles did not constrain or delay investment because regulatory substance and processes were widely understood and applied transparently. Although the pool did not take the lead in promoting or negotiating these deals, the power pool had clear procedures for reviewing the technical impact of transactions on interconnected grids
- **Greater Mekong Subregion.** There has been limited experience to date with cross-border power trading in the Greater Mekong Subregion (GMS), despite reaching an inter-Governmental understanding to increase cross-border trading more than 15 years ago. Governments in the GMS have agreed to focus initially on developing bilateral deals, which appears to provide a good first step that could lead to further cross-border transactions.

*Caution is needed when drawing lessons on cross-border trading from other regions. Lessons need to be tailored to local circumstances*

As mentioned above, the four case studies in this report focus on areas where the regulatory environment and trading arrangements in Southern Africa could be enhanced by applying lessons from international experience. However, we acknowledge that the circumstances of each case are unique, and that considerable caution must be used in drawing lessons on cross-border trading from other regions of the world. For example, in SIEPAC there is a formal regional regulator and it is unlikely that such an entity would be established in the SADC region in the near future. In the United States and Canada, cross-border power trading took place between commercially viable entities charging cost-reflective tariffs. This is not currently the case in SADC. In this report, we evaluate how the lessons

from overseas would apply in the context of Southern Africa, and we have endeavoured to tailor each lesson to respond to local circumstances.

In preparing these case studies we have gone beyond published material to obtain additional insights that are relevant to Southern Africa. One member of our team (Fiona Woolf) has worked directly in Central America and the Greater Mekong Subregion. We have also spoken with individuals that were and are directly involved in setting-up the arrangements for regional power trading in West Africa and New England. We greatly appreciate the insights of these interviewees, and any errors remain our own.

***Structure of this report***

The remainder of this report is structured as follows.

- Section 2 provides an overview of the cases, highlighting the relative development of institutional arrangements and infrastructure for cross-border power trading in each region
- Section 3 summarises the main lessons that can be drawn from the case studies for cross-border power trading in Southern Africa
- Sections 4–7 present the four case studies.



## 2 Overview of Case Studies

### *Structure of case studies*

The four case studies presented in this report follow the same structure. Each case first answers a number of background questions that help to understand the context for cross-border trading in each region. These questions include:

- What are the benefits of regional trading in the region?
- What cross-border power trading currently exists in the region?
- What future investment is planned to facilitate more trading?
- What institutions are responsible for planning, building infrastructure, negotiating power deals, and regulating the impact of cross-border trading?
- What agreements have been reached on pricing and settlement?
- What role does regulation play in cross-border trading, and how have regulatory powers been exercised?

The case studies then focus on the main lessons that Southern Africa might draw from the experience in other regions.

### *Overview of economic, institutional, and power sector characteristics*

A summary of important economic, institutional, and power sector characteristics is presented in Table 2.1. Most of the regions have established power pools to coordinate trading, and some form of regional regulator to review trading outcomes. In addition to regional regulators, national and state-based regulatory entities play a role in regulating cross-border trading.

**Table 2.1: Overview of General Characteristics of Regional Trading**

	Central America	West Africa	North America (New England/Canada)	Greater Mekong
Number of countries	6	13	2 (6 US and 2 Canadian states)	5
Population	40 million	252 million	14 million	323 million
Peak electricity demand	7,000 MW	5,700 MW	28,000 MW	35,000 MW
Power pool	MER	WAPP (loose pool)	NEPOOL (tight pool)	Proposed
Regional regulatory entities	CRIE	ERERA	FERC	None
Main sources of finance for new investments	Concessionary loans and some private sector finance	Mainly donor grants and concessionary loans	Private sector finance	Concessionary loans

***Power pools can reduce the transaction costs associated with cross-border trading***

It is useful to draw a distinction between cross-border trading and arrangements for “power pooling”. A power pool is an arrangement between two or more interconnected utilities or systems that plan to operate their power supply and transmission in the most reliable and economic manner given their combined load requirements (USAID 2008). A power pool is not a necessary condition for successful cross-border trading.

Power pools are formed to reduce the transaction costs of cross-border trading. When parties form a power pool certain rules are agreed for future trades, which would be costly to negotiate separately for each cross-border transaction. This suggests that power pools help to enable trading that might not otherwise take place.

Each of the regions reviewed in this report are at various stages of developing a power pool. The experiences and lessons learned in each of the cases focus more on the development of specific cross-border transactions than the development of the power pool.

***The four regions studied are at different stages of developing regional trading arrangements, in terms of both institutional infrastructure and physical infrastructure***

All regions are at different stages of developing regional trading arrangements. These arrangements can be evaluated along two dimensions—institutional infrastructure and physical infrastructure.

**Institutional infrastructure** for regional trading sets the rules, enforcement characteristics of the rules and norms of behaviour for participating in cross-border power trading.<sup>3</sup> The three building blocks of regional power trading institutions are described in USAID (2008) as consisting of a “legal and regulatory framework”, a “durable framework for systems planning and operation” and an “equitable commercial framework for energy exchanges”.<sup>4</sup>

**Physical infrastructure** for cross-border trading requires available generation capacity in at least one country that exceeds demand on the domestic electricity networks during some time period, and transmission interconnections between countries that have sufficient capacity to transport surplus power.

The following bullet points summarise current institutional infrastructure and physical infrastructure in the regions studied in this report:

- **Greater Mekong Subregion** is the least-advanced region among those studied. The GMS currently has limited institutional arrangements for trading power across borders, and has some infrastructure for trading
- **West Africa** has some institutional arrangements for cross-border trading through the 2003 Economic Community of West African States (ECOWAS) Energy Protocol and subsequent WAPP agreements, although pricing and operational issues have not yet been finalised. The physical infrastructure for cross-border trading in WAPP was developed some time ago, although WAPP has raised finance for some planned new priority investments using concessional loans

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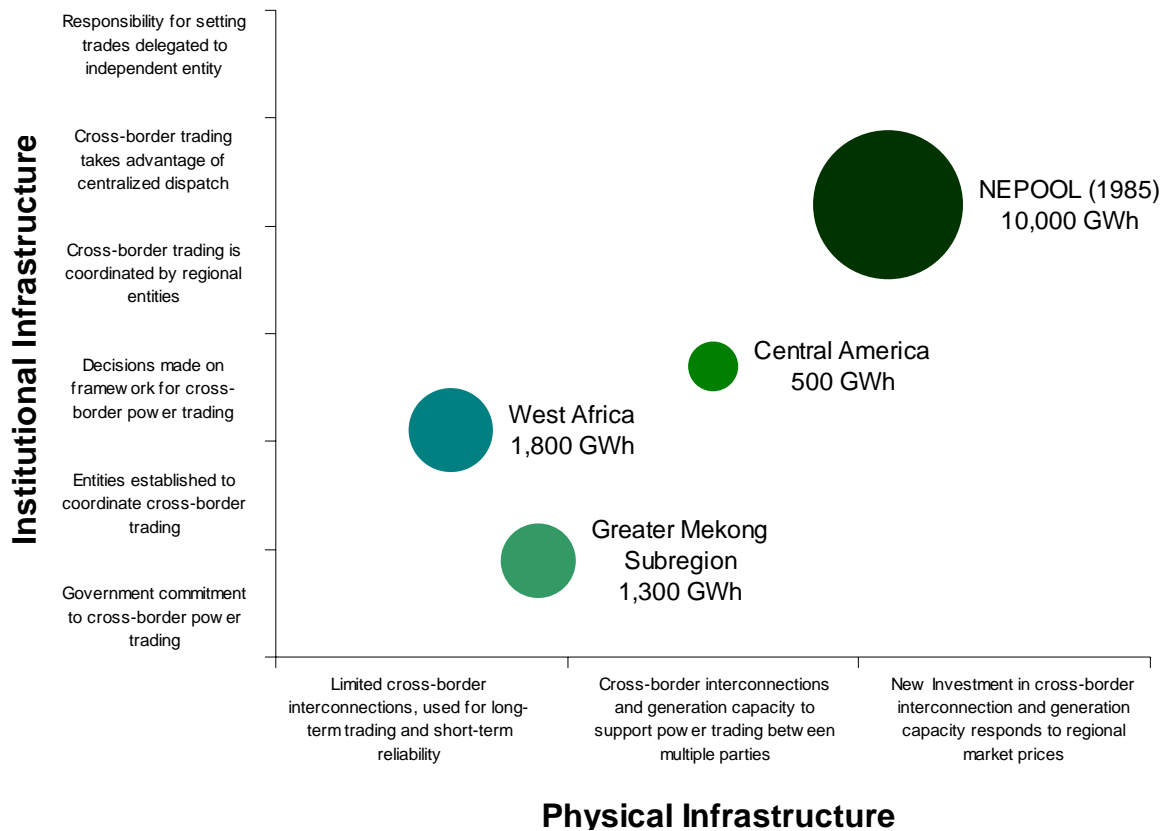
<sup>3</sup> Definition from Freiden and Lake, 1999 “International Political Economy: Perspectives on Global Power and Wealth”.

<sup>4</sup> USAID, 2008 “Sub-Saharan Africa’s Power Pools: Development Framework, A White Paper” May 2008.

- **Central America** has well-developed institutional arrangements that govern issues such as trading arrangements, transmission pricing, and dispute resolution. The transmission infrastructure to support a significant increase in cross-border power trading is nearing completion
- **North America** is the most advanced region studied in terms of both institutional arrangements and available infrastructure. Trading between New England states and Canada takes place today under well-developed institutional arrangements, which include an independent system operator and liquid trading markets. Available infrastructure also exists to settle physical trades. During the time period considered in this case study (1970–1985), new institutions were emerging to address cross-border trading issues, and little infrastructure existed to transport electricity from Canada to the United States.

Figure 2.1 highlights the relative position of the regions studied in this report in terms of institutional infrastructure and physical infrastructure. The size of the circles shown in Figure 2.1 illustrates the approximate volume of trading in the Central America, GMS, and WAPP in 2007, and New England Power Pool (NEPOOL) in 1985.

**Figure 2.1: Overview of Infrastructure for Cross-border Trading**



Note: Power trading estimates are based on exports published in the CIA World Factbook. The estimate of power trading in the Greater Mekong Subregion excludes exports from Yunnan Province in China

Sources: Castalia, USAID (2008), CIA World Factbook, International Energy Agency and US Energy Information Agency

***Trading arrangements have emerged in SAPP to facilitate short term trading. However, the region no longer has surplus capacity cross-border for trading***

Compared to other regions outside North America and Europe, Southern Africa has been described as one of the more advanced regions for power trading. In fact, Southern Africa has higher volumes of trade than the other regions reviewed, with approximately 20,000GWh traded per year.

Much of the infrastructure for cross-border trading in Southern Africa was developed some time ago for long-term bilateral deals; and in addition, until recent years surplus generation capacity was available for short-term “opportunity trading”. Demand growth throughout the SADC region now means that SAPP no longer has any capacity for trading, except under existing long-term arrangements.

This means that SAPP has well developed operating procedures that have limited prospects for being used, and a clear need for new large regional generation sources for future trading. Short-term trading does not provide sufficient revenue certainty to justify the construction of new generation and transmission facilities. In this respect, short-term trading in SAPP may distract from more important initiatives to finance new infrastructure for power trading.

### 3 Lessons for Southern Africa from International Experience with Cross-border Power Trading

*Summary of the main lessons from international case studies*

This section presents the main lessons for Southern Africa from our review of the experience with cross-border power trading in other regions of the work. In summary, the five main lessons from the case studies are that:

- Security of supply concerns need to be explicitly addressed and understood by the parties to proposed cross-border transactions
- Regional entities need to be empowered to make decisions
- Decisions need to be made on planning, pricing and settlement rules
- Power pools have important roles in regional trading
- The substance and process of regulatory reviews must be clear.

We explain each of these lessons under the subheadings below. We begin each subsection by explaining why each issue presents challenges in Southern Africa. We then consider the experience in other regions as a useful point of comparison for Southern Africa.

#### 3.1 Security of Supply Concerns Need to be Explicitly Addressed and Understood by the Parties to Proposed Cross-border Transactions

*Recent experience in Southern Africa has caused scepticism about the real benefits and risks of cross-border power trading*

Security of supply poses a significant challenge to expanding cross-border trading in Southern Africa, as shown by recent experience. The asymmetric cost of not having sufficient power supplies available makes it imperative to ensure adequate and reliable supplies even if this results in higher system capital costs.

There is a new scepticism in Southern Africa regarding the ability of regional power trading to provide reliable and secure electricity supply, particularly in importing countries. In the wake of power shortages across the region in 2008, and subsequent load shedding by South Africa, SADC countries are increasingly determined to boost investments in domestic power projects to ensure national self-sufficiency. For example, in South Africa, Eskom has an implicit cap on imports equal to its reserve margin. The Government of Namibia has issued a White Paper requiring that 75 percent of domestic energy demand and 100 percent of domestic peak capacity is able to be met from domestic sources.

*Security of supply must be assured across three dimensions—adequacy, reliability, and commercial security*

To facilitate cross-border trading, security of supply needs to be assured across three interrelated dimensions:

- **Adequacy:** Ensuring that a utility's own-generation and firm power purchases will be sufficient to meet estimated future demand
- **Reliability:** Ensuring that the system can withstand sudden disturbances,

such as electric short circuits or unanticipated loss of system facilities

- **Commercial security:** Ensuring that contracts for cross-border supplies are sufficiently firm and are honoured by counterparties, even in shortfall situations.

***Firm, standardised supply contracts have been used in Central America and GMS to manage supply risks***

In Central America, firm supply contracts are standardised and binding. There are market solutions and penalties to address generation shortfalls, transmission outages, and imbalances. System operators are empowered by market rules to manage emergencies by curtailment. The regional system operator in Central America has SCADA and other systems and information gathering powers that can check the true position of trading, and enforce the rules.

Despite the detail of the various features of the market in Central America, the countries involved in trading have never expected domestic consumers to suffer interruptions in order to enable power to be exported. Moreover, the countries involved agree that regional integration helps to manage security of supply in each country by diversifying supply sources and lessening reliance on one national utility or a small number of power distributors.

Similarly in GMS, the Nam Theun 2 PPA provides an example of a firm, standardised supply contract that manages supply risks and is well-understood by both parties to the agreement. The Nam Theun PPA provides compensation to the buyer when the seller fails to meet certain plant performance standards on registered capacity, minimum capacity, reactive power, and loading rates. These provisions help to manage security of supply risks by providing strong incentives to provide contracted power at the point of delivery.

***Contractual approaches can manage security of supply risks, but contracts need to be well-drafted and fully understood***

The lesson for SADC is that contracts and other inter-country agreements can provide good ways to address security of supply concerns. These contracts need to be clearly drafted and well understood by the parties. Some standard approaches to managing supply risk include:

- Plant operators accepting obligations to make reasonable efforts to avoid supply outages resulting from equipment failure, and to re-establish supply as quickly as possible in the event of unavoidable interruptions
- Hydro plant operators contracting to supply non-firm output based on average inflows and ensuring prudent management of hydro storage
- Rights in the event of default that enable uninterrupted supply to continue.<sup>5</sup>

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<sup>5</sup> ESMAP, 2008 “Trading Arrangements and Risk Management in International Electricity Trade” Formal Report 336/08, October 2008.

## 3.2 Regional Entities Must be Empowered to Make Decisions

*To make decisions based on regional interests, regional entities need a strong commitment from national governments and clear decision-making ability*

Regional entities need to be empowered to make decisions on a basis that reflects regional, rather than purely national, interests—this requires a strong commitment from national governments and regional institutions to implement policy. Sustained government support for regional power trading helps to send the necessary signals that cross-border trading is efficient and effective, and allows regional entities to proceed with implementing stated government policy for cross-border trading. National regulators can also send signals about the efficacy of regional power trading through their decisions.

A review of international arrangements for cross-border power trading uncovers two important indicators of empowering decision-making:

- **A strong commitment by national governments to regional power trading** via an enforceable agreement
- **Proactive regional entities** that are prepared to implement measures to progress regional trading even though it may not be possible to gain the unanimous agreement of all members, especially on issues such as planning, pricing, and settlement rules.

### **Strong government commitment to regional power trading**

*The legal framework for regional power trading in SADC is relatively weak compared with other regions*

Regional power trading in Southern Africa takes place within the framework of the SADC Energy Protocol, which entered into force in 1997. Governments in SADC also commonly sign Inter-Governmental Memoranda of Understanding (IGMOU) to provide political support to particular projects. For example, IGMOUs have been signed for the Mmamabula coal-fired power station in Botswana, the ZIZABONA (Zimbabwe-Zambia-Botswana-Namibia) transmission line, and the Mpanda Nkuwa hydro plant in Mozambique.

Compared to other regions, the expression of government commitment to regional power trading in SADC is relatively weak. The current SADC Treaty and Energy Protocol do not contain strong provisions protecting foreign investments against non-commercial risks, or providing for non-discriminatory conditions for energy trading. The Protocol also does not clearly address how disputes between participating states will be resolved. The difference in specificity and detail is reflected in length of the SADC and ECOWAS Energy Protocols—the SADC Energy Protocol is 19 pages, while the ECOWAS Protocol runs to 79 pages.

A comparison between the SADC and ECOWAS Treaties and Energy Protocols is presented in Table 3.1. The ECOWAS Treaty and Energy Protocol explicitly provide that trade in energy between states will be on terms that are non-discriminatory and accord with the most favourable treatment given to trade with other nations. In contrast, the SADC Treaty expresses more general principles on developing policies to progressively eliminate barriers to trade and secure international cooperation. While the SADC Treaty prevents SADC from discriminating against any Member State, the Treaty does not prohibit

discrimination between States.

**Table 3.1: Comparison of SADC and ECOWAS Treaties and Energy Protocols**

Provision/Issue	SADC Treaty and Energy Protocol	ECOWAS Treaty and Energy Protocol
Protection of foreign investments, based on the extension of national treatment, or most favoured nation treatment (whichever is more favourable) and protection against key non-commercial risks	<p><b>Article 5.2 (SADC Treaty)</b>  <i>In order to achieve the objectives set out in paragraph 1 of this Article, SADC shall...:</i></p> <ul style="list-style-type: none"> <li>– <i>d. develop policies aimed at the progressive elimination of obstacles to the free movement of capital and labour, goods and services, and of the people of the Region generally, among Member States...</i></li> <li>– <i>i. secure international understanding, co-operation and support, and mobilise the inflow of public and private resources into the Region</i></li> </ul>	<p><b>Article 43.1 (ECOWAS Treaty)</b>  <i>Member States shall accord to one another in relation to trade between them the most favoured nation treatment. In no case shall tariff concessions granted to a third country by a Member State be more favourable than those applicable under this Treaty</i></p> <p><b>Article 10.6 (ECOWAS Protocol)</b>  <i>Each Contracting Party shall, in its Area, accord to Investments of Investors and their related activities including management, maintenance, use, enjoyment or disposal, treatment no less favourable than that which it accords to its own Investors or of the Investors of any third state and their related activities including management, maintenance, use, enjoyment or disposal, whichever is the most favourable</i></p>
Non-discriminatory conditions for trade in energy materials, products and energy-related equipment based on WTO rules, and provisions to ensure reliable cross-border energy transit flows through pipelines, grids and other means of transportation	<p><b>Article 6.3 (SADC Treaty)</b>  <i>SADC shall not discriminate against any Member State</i></p>	<p><b>Article 44 (ECOWAS Treaty)</b>  <i>Member States undertake not to enact legislation and/or make regulations which directly or indirectly discriminate against the same or like products of another Member State</i></p> <p><b>Article 7.3 (ECOWAS Protocol)</b>  <i>Each Contracting Party undertakes that its provisions relating to transport of Energy Materials and Products and the use of Energy Transport Facilities shall treat Energy Materials and Products in Transit in no less favourable a manner than its provisions treat such materials and products originating in or destined for its own Area, unless an existing international agreement provides otherwise.</i></p>

Sources: SADC and ECOWAS

***Strong government commitment requires more than an expression of goodwill. Central America and West Africa provide good examples of government commitments expressed in Treaties***

Strong national government commitment is important to attract the necessary investment, support the decision-making processes and enable rules and agreements to be enforced. One high-level official in SADC has observed that the SADC governments have given “lip service” to regional electricity trade, but have been unwilling to take the next step of making binding commitments that would make such trade a reality.

Examples of government commitment that are instructive for Southern Africa include Central America—where the six participating countries signed and ratified a Treaty—and West Africa—where the ECOWAS members entered into a Protocol that is more specific and detailed and is very focused on attracting investment. Both cases achieve a level of government commitment



that is deeper than simply stating a commitment or expressing goodwill.

***Further government commitment in Southern Africa would send important signals about the importance of cross-border trading***

The immediate lessons for Southern Africa are that:

- Sustained government commitment sends signals to other national and regional entities that cross-border trading initiatives are important. Strong governmental commitment in the form of a Treaty that sets up and empowers regional institutions will provide the best platform for regional markets in electricity to flourish—because governments cannot be involved in the detail on a daily basis and commitments need to be enforceable
- On-going government support ensures that efficient regional power trading is not defeated by competing national interests. The wording of the Treaty should allay fears over loss of national sovereignty.

***The SADC Energy Protocol could be amended by adding an Annex that contains similar provisions to those found in other regions***

One way to get high-level commitment would be to amend the SADC Energy Protocol, either by strengthening the wording of the Protocol or by adding an Annex that specifically deals with principles discussed above. This amendment would likely require more time than is envisaged for the current assignment.

The first logical step in making an amendment to the SADC Energy Protocol would be to gain agreement on high-level principles that would be used to draft the specific wording of a later amendment. One of the outputs of this project is a set of high-level principles for political decision-makers on cross-border trading, which will be drafted to complement the proposed guidelines for national regulatory entities in SADC countries.

### **Proactive regional entities that make decisions on planning, pricing, and settlement rules**

***Regional entities in Southern Africa (SAPP and RERA) are relatively constrained in making decisions***

Regional entities have been established in Southern Africa, namely SAPP and RERA. However, these entities are relatively constrained in making decisions, compared to other regions that have committed to cross-border power trading. There is some recent evidence that SAPP and RERA are beginning to take more proactive initiatives to improve the environment for investment in regional power trading. For example, SAPP has taken a project management role in the ZIZABONA transmission project, and RERA appears to be playing a more authoritative role in the region.

***Southern Africa has experienced difficulty reaching decisions on planning, pricing, and settlement rules***

Decisions need to be made on planning, pricing, and settlement rules in order to enable efficient cross-border trading to take place. The framework for trading within a region needs to enable decisions (and, later, changes) to be made and any disputes to be resolved in a way that is authoritative and efficient. These technical and economic rules constitute a necessary “institutional platform” on which short-term and long-term cross-border trading can take place.

In Southern Africa, SAPP is having difficulty gaining resolution on important issues including transmission pricing, ancillary services and balancing. These are difficult and contentious issues. For example, the Mmamabula IPP in Botswana could contract to deliver 600MW of power to the South African border. However, the power generated at the station would flow according to physical, not contractual paths, meaning that the station might have to generate 800MW to deliver 600MW to the delivery point. Clearly, mechanisms are needed to

provide appropriate compensation for the additional 200MW generated that another party consumed.

SAPP has also had difficulty gaining agreement and finalising the pool plan. The reasons for these delays are not entirely clear, but seem to stem from the nature of the planning exercise, the decision-making process in SAPP and the SAPP governance structure. While some agreed framework for planning regional transmission is important, there appears to be no value in extensive debate on a master plan when investments will ultimately be made based on their project economics, and not as a result of SAPP agreement. Central America has completed a more constructive regional planning approach, which only aims to produce an indicative plan that will help to guide investment decisions. In many countries (such as England, Australia, Singapore and New Zealand), indicative plans are known as a “Statement of Opportunities”, and serve to identify where investments (particularly in transmission) would improve the management and efficiency of the power system.

When making important decisions on cross-border power trading “the devil lies in the detail”, and there is a lot of detail that makes decisions quite complex. This requires efficient decision-making processes and highly effective project management, for both the investment in regional infrastructure and the regional rules for planning, transmission tariffs, trading, and settlements. In addition, to enable investment and regional participation, the rules and agreements need to be easily and efficiently enforced in each country. This is best achieved by a Treaty ratified in each country that allows for enforceability or a more detailed Energy Protocol.

The following two examples highlight the benefits of empowering competent regional entities with credibility, authority, the right incentives, and skilled personnel to push cross-border developments ahead:

- The Central America Regional Regulator (CRIE), the Government Steering Committee, and the Expert Advisory Panel provided sustained momentum and decision-making where consensus could not be achieved
- A regional regulator has been established in the West African power sector, although it is too early to judge the results of this initiative. The West Africa Telecommunications Regulatory Association (WATRA) has provided authoritative advice and drafted guidelines that have been implemented by West African governments, even though WATRA has no formal powers to take action or enforce regulatory rules.

In Central America, the process of making decisions on issues such as transmission planning and pricing has not focused on achieving a resolution that is optimal or good for everyone. Instead, participants have focused on developing workable methodologies for dealing with the issues from a regional perspective.

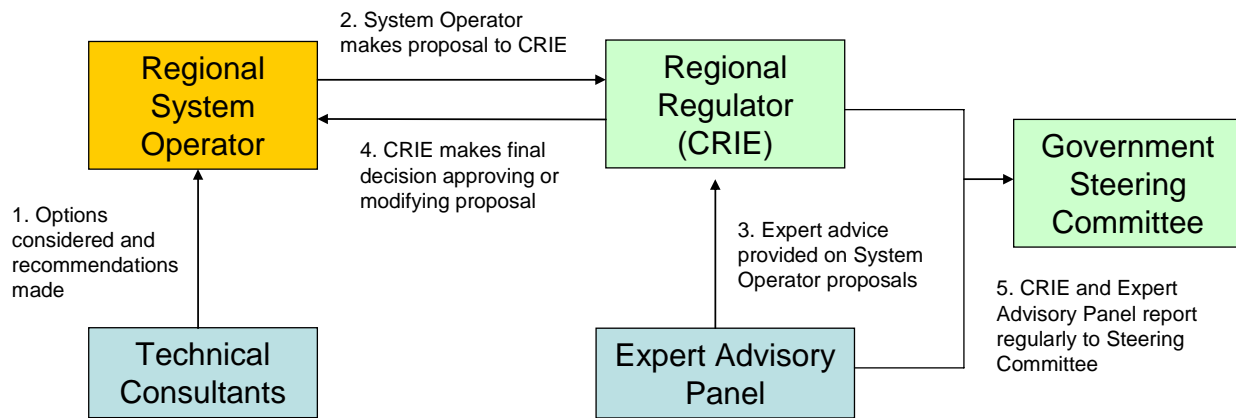
The decision-making processes in SIEPAC combines actions from the regional system operator, the regional regulator, a high-level government steering committee and a three person Expert Panel. An overview of the “propose and

***Regional entities in Central America and the telecommunications sector in West Africa have played a positive role to push regional trading ahead***

***Decision making in Central America has adopted a pragmatic “propose-respond” model***

respond” model adopted in Central America is shown in Figure 3.1.

**Figure 3.1: Overview of Decision Making Process in Central America**



*The experience in Central America suggests that decisions can be made efficiently on contentious issues, provided that processes are in place to reach decision closure in the event of disagreement*

Importantly, the process for making decisions in Central America uses outside, independent advice where required, and incorporates mechanisms to overcome impasses and sustain momentum. CRIE is empowered to make final and binding decisions, looking at the issues from the perspective of the region as a whole and can make changes to what market participants propose (after consultation). CRIE decisions and dispute resolution awards are directly enforceable in each country as a result of the ratification of the Treaty

This process has enabled timely decisions in Central America on each of the following issues:

- **Regional transmission facilities designation and transfer.** Consultants were engaged to recommend transmission plans using a simple methodology based on a regional perspective. This process determined which parts of the national transmission systems were necessary for the initial regional transmission system, and the governments facilitated the transfer of the relevant regional transmission assets to the regional transmission owner
- **Power sector planning.** An indicative expansion plan is formulated for generation and regional transmission, envisaging the establishment of regional reserve margins and allocating reserve responsibilities within the regional system. The regional regulator is then responsible for approving the plan
- **Market rules.** The market rules were approved by the regional regulator in 2005 and have full legal and regulatory force in all member countries.

*Planning procedures in West Africa appear to have incorporated stronger decision making powers*

Comparing the processes for pool planning in Southern Africa and West Africa is also instructive. The SAPP and WAPP pool plans were developed applying the same methodology, and using the same consultants. However, the priority projects were agreed relatively quickly in WAPP, and have progressed further towards implementation. In contrast, the SAPP pool plan has yet to be agreed,

and no cross-border deals in the plan have reached financial close.

To some extent the contrasting outcomes of the pool planning process reflect different conditions, including the size of the projects and how deals reach financial close in the different regions. In West Africa, projects are relatively small, and soft loans from development finance institutions are commonly used for a significant portion of the project's capital costs.<sup>6</sup> This reduces the burden for reaching financial close compared to Southern Africa. However, there are lessons that can be drawn from West Africa's experience. In particular, ECOWAS has empowered a strong Secretariat in WAPP that takes the lead in negotiations with donors, discusses the projects at a political level and pushes for what might be called "decision closure".

***Decision closure should be enabled in Southern Africa, for example through the use of independent expert panels***

There are several possible methods for reaching decision closure on important issues in Southern Africa. An initial positive step would be to involve an independent party to review planning, pricing and settlement proposals where an impasse would otherwise result. For example, an expert advisory panel on cross-border trade that is located within RERA could perform a review and produce a non-binding recommendation on the merits of the proposal.

In most regions of the world, proposed technical and commercial rules that affect cross-border trading originate within the pool and are then reviewed by a regional regulator or an independent advisory committee. However, when a pool cannot reach closure on a necessary set of rules, there has to be some mechanism for some independent outside body to step-in and reach a decision.

***Improvements could be made in Southern Africa by strengthening existing entities***

These lessons pose the question as to what organisations might play a role in moving forward on regional trading initiatives in Southern Africa. Could an expert advisory panel located in RERA fill this gap? Should there be a Steering Committee of high-level SADC ministerial officials who meet frequently (as in Central America) in order to keep the governments informed so that the support is maintained (without requiring them to approve every detail)?

### **3.3 Bilateral Trading Can Provide an Important Basis for Expanding Cross-border Trading Volumes**

***SAPP would benefit from a greater focus on longer-term trading proposals***

SAPP has focused much of its attention in recently years on developing operating procedures for short-term trading, which have limited prospects for being used given the current shortage of supply capacity in the region. Many stakeholders have observed that SAPP should refocus its efforts on new large regional generation sources that would provide the physical infrastructure, and the institutional framework, for future cross-border power trading.

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<sup>6</sup> As explained in the West Africa case study, many West Africa nations need to comply with borrowing restrictions as part of the process of debt-forgiveness under the Highly Indebted Poor Countries (HIPC) programme.

***Bilateral deals can provide a good first-step towards greater regional power integration***

Bilateral trades enable the benefits of a cross-border transaction to be realised immediately. While a centralised trading platform (or effective power pool) can take years to develop, bilateral trades can be negotiated over months. When a cross-border transaction is clearly cost-benefit justified, bilateral trading arrangements can enable the deal to proceed without detailed and complex regional agreements.

Bilateral trading helps move toward future regional trading in the future. Bilateral trades help to develop the physical infrastructure that is needed to underpin cross-border trading. Short term trading does not provide sufficient revenue certainty to justify the construction of new generation and transmission facilities, which means that long-term bilateral deals are needed to provide investment certainty. Surplus capacity can then be used for short-term trading and emergency support.

The experience in the Greater Mekong Subregion shows that bilateral transactions can provide a useful basis for expanding future trading. In the Greater Mekong, the Nam Theun II transaction between Laos and Thailand has been developed as part of an explicit transition from one-off bilateral transactions to more integrated, multi-country trading. The interconnection between the two countries will ultimately become part of a more regional power system, as additional interconnections are added in the coming years. The legal and regulatory arrangements for the Nam Theun transaction have also provided governments and regulators with valuable experience in resolving issues that are unique to cross-border transactions.

***Bilateral transactions are still the most likely type of cross-border deal to proceed in Southern Africa***

Most of the cross-border electricity infrastructure in Southern Africa was developed under bilateral arrangements between governments and state-owned national utilities. Many of the transactions currently being developed are also primarily bilateral deals, with less emphasis on the need for interactions with regional organisations like SAPP.

In Southern Africa, the most advanced cross-border transaction at present is the Mmamabula coal fired power station in Botswana, which is being developed more along the lines of a bilateral deal than a multi-party development. This transaction has led to a new law in Botswana to accommodate independent power exporters, and the detailed contractual framework provides a useful starting point for future transactions.

### **3.4 Power Pools Can Help to Generate Sustained Increases in Cross-border Trading**

***Many stakeholders consider that SAPP is not achieving its full***

There is a widely held view in Southern Africa that SAPP has not achieved its full potential in achieving the objectives of a power pool. Cross-border power trading in Southern Africa would benefit from additional technical and

*potential as a power pool*

institutional support for new generation and transmission investments. We can conclude from the stakeholder interviews conducted by our team that SAPP is currently not adequately evaluating the technical impact of new cross-border deals, and is failing to adequately monitor utilities and ensure compliance with operating rules.

*Power pools are formed to take advantage of the benefits of coordinating short-term operations, maintaining system stability, and achieving least-cost economic dispatch*

Even bilateral deals will rely on regional agreements to operate effectively. As highlighted above with the example of the Mmamabula IPP, issues such as balancing and settlement can have significant financial impacts on a potential cross-border deal. These types of issues are very relevant in Southern Africa, where a number of countries are interconnected and will be affected by any new transaction.

The benefits of coordinating within a power pool can be divided into three types:

- **Technical reasons.** Power pools allow members to address technical issues like transaction settlement, balancing, and loop flows in a consistent manner
- **Transaction costs.** Power pools should reduce the costs of developing projects by providing a standardised platform for organising trading. To date, the developers of Mmamabula have spent almost US\$90 million in risk capital, to develop the project and negotiate agreements that have not yet been signed. Regional agreements should help to minimise such transaction costs in the future
- **Economic trading opportunities.** Power pools provide participants to take advantage of opportunities to exploit price differentials in real-time, such as during a system peak in country A when spare capacity is available in country B.

In Southern Africa, where a power pool already exists, it seems reasonable to improve the way that the power pool operates, rather than return to only having bilateral trading.

*Other power pools routinely complete specific functions, which should be undertaken by SAPP*

To realise the benefits of having a power pool, certain functions need to be undertaken. In particular, in Southern Africa there appear to be significant benefits from SAPP having:

- Clear procedures for reviewing specific project impacts
- Pre-specified technical and economic rules to facilitate trading
- Authoritative and efficient dispute resolution mechanisms.

These are standard functions for any power pool in the world but they have not yet been fully and routinely implemented by SAPP. It is not clear whether the inability to complete these responsibilities in Southern Africa is the result of a lack of funding, a lack of authority, or a lack of political will. In any event, these

actions will form part of the checklist for SAPP required in the Terms of Reference for this assignment.

### 3.5 The Substance and Process of Regulatory Reviews Must be Clear

***Regulatory entities—  
whether independent or  
part of government—  
need to develop  
regulatory substance  
and process for cross-  
border power trading***

Regulatory entities play an important role in reviewing cross-border power deals to ensure that electricity consumers within their country will benefit from the transaction. In fulfilling this role, stakeholders need to understand what regulatory entities will review (the **substance** of the regulation), and how major imports and exports will be scrutinised (regulatory **process**). These two aspects of the involvement of national regulatory entities in cross-border power trading—regulatory substance and regulatory process—are separately addressed under the following sub-headings.

Normally, the regulatory review of cross-border power trading is performed by an independent regulatory body. However, if such a body does not exist, or a national government is not yet comfortable handing over such authority to an independent body, then the same regulatory functions and processes need to be undertaken by a Government department or another agency.

#### **Regulatory Substance**

***Cross-border trading  
would benefit from  
additional clarity from  
regulatory entities in  
Southern Africa on the  
substance of regulatory  
reviews***

To distil the essence of the regulator's role, national regulators are most concerned with the following issues when reviewing the pricing impacts of cross-border power deals:

- Whether the costs and risks of a power purchase and associated transmission charges should be passed through into retail tariffs (for importing countries)
- Whether the costs and risks of selling to a buyer in another country are fully recovered in the price of a power sale (for exporting countries)

In Southern Africa, further clarity could be provided on what national regulatory entities will review, particularly with respect to approving power purchase agreements and passing purchasing costs through to consumers.

***Recent work by  
NERSA in South Africa  
and in Nigeria provide  
useful references on  
reviewing PPA  
provisions and cost  
pass-through***

The regulator in South Africa (NERSA) has recently issued rules for approving the pass-through of power purchasing costs into retail tariffs, known as the Cost Recovery Mechanism (CRM). In addition, other rules that will directly affect cross-border trade are being developed in Namibia and Botswana. The CRM provides a good starting point for guidelines that could be applied throughout the region. In addition, the guidelines should address issues of risk allocation to help regulators think about the management of risk in power purchase agreements. It is also possible that a PPA benchmarking tool



proposed by the Nigerian Electricity Regulatory Commission could be used in SADC.<sup>7</sup>

## Regulatory Process

*Clear regulatory processes will create greater investment certainty and enhance the prospects for cross-border trading*

Clear regulatory processes that are consistently applied and well understood by sector participants will increase investment certainty and enhance the prospects for cross-border power deals. In Southern Africa, it is particularly important to clarify three aspects of regulatory process:

- **Regulators' involvement in negotiating cross-border trades.** The nature of regulatory engagement in the process of negotiating power trades should be clear. The process followed by regulators to engage with potential investors and utilities on cross-border power deals should be transparent
- **Timing of regulatory interactions and decisions.** When and how the regulator will give guidance or provide decisions on the acceptability of the proposed terms of a particular cross-border transaction needs to be understood. The seller, buyer, and financiers for the transaction would prefer decisions and commitments from the regulator as soon as possible
- **Public availability of information.** Regulatory entities need to take a position on how much information will be publicly released on the terms and conditions of a cross-border transaction. Greater transparency may foster confidence in the regulatory process, while commercially sensitive information should be protected.

*Regulatory processes in the North America are transparent and predictable, minimizing barriers to investment*

The processes for regulatory intervention in cross-border deals involve issues of timing and transparency:

- In North America, various different regulatory authorities were involved in approving cross-border deals—US state utility commissions, the Federal energy regulator, and the relevant Canadian authorities. Despite the numerous different processes applied, the steps required for approval were well understood and were similar to approvals required for domestic projects. An important feature of regulatory procedures in the US is to clearly specify the substance of a regulatory review in advance. This limits the amount of discretion the regulator has in its decision, which reduces regulatory risk facing the parties and therefore encourages new investment
- In addition, applicants can ask for meetings with the regulator (known as pre-application conferences) to clarify regulatory expectations. These meetings have also been allowed by some regulators in Southern Africa, for example in South Africa and Tanzania. However, these meetings may not be useful if the PPA is still under negotiation and other parts of government with an interest in the transaction (such as the Treasury or the Department of Public Enterprises have not made required decisions).

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<sup>7</sup> ESMAP, 2008b “Regulatory Review of Power Purchase Agreements: A Proposed Benchmarking Methodology” Formal Report 227/08, October 2008. Available online at [http://www.esmap.org/filez/pubs/10312008123131\\_Reg\\_review.pdf](http://www.esmap.org/filez/pubs/10312008123131_Reg_review.pdf)

***The regulatory guidelines developed in this project will help to clarify regulatory substance and process***

National regulators acting in accordance with the same published guidelines have an important role to play as an “honest broker” for the governments and the consumers in the region. The regulatory guidelines developed in this assignment will be developed to help national regulatory entities in Southern Africa to play this role both in terms of the substantive issues reviewed and the processes followed by the regulatory entities.

## 4 Central America

In this section, we provide a case study of the Central American Regional Energy Market. In Section 4.1, we discuss the experience of the regional energy market in Central America, highlighting the benefits of cross-border power trading, how the regional market is supposed to work, and how it currently works. In Section 4.2, we discuss lessons that SADC can draw from the case of Central America.

The two main lessons for Southern Africa are that:

- Strong, enforceable commitments by national governments are important to enable regional power sector agencies to effectively make decisions, and
- A participatory decision-making process helps participating countries to gain agreement on planning and pricing rules, but such a process requires an institution that is properly empowered to make detailed decisions if consensus is not reached and also to implement them.

### 4.1 Cross-border Power Trading in Central America

In 1996, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama agreed to the creation of the market by signing the Framework Treaty for the Central American Electricity Market (“the Treaty”)<sup>8</sup>. The Treaty was subsequently ratified in 1998.

The Governments’ two main objectives in signing the Treaty are to:

- **Create institutional infrastructure**—Support the progressive formation and consolidation of the regional electricity market by establishing the appropriate legal, institutional, and technical mechanisms to facilitate private sector participation (PSP), particularly in the development of additional electricity generation capacity
- **Build the required physical infrastructure**—Develop electric interconnection infrastructure (230 kV transmission lines with a capacity to transfer 300 MW) to facilitate trading of electric power among the participants of the regional electricity market. While the Sistema de Interconexion Electrica para America Central (SIEPAC) refers to all of the infrastructure that supports power trading, the 300MW line is commonly referred called “The SIEPAC line”. The line is expected to be commissioned by December 2009.

The Treaty is governed by the principles of competitiveness, gradual implementation, and reciprocity, which are defined as follows:

- **Competitiveness**—Market participants (the energy market participants in the six countries) are free to carry out activities aimed at providing service on the basis of objective, transparent, and non-discriminatory rules
- **Gradual Implementation**—Governments have committed to a gradual evolution of the market, through the incorporation of new participants, gradual expansion of coordinated operations, and the development of grids and strengthening of regional agencies

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<sup>8</sup> An English translation of the Treaty is available at: [http://untreaty.un.org/unts/144078\\_158780/6/7/138.pdf](http://untreaty.un.org/unts/144078_158780/6/7/138.pdf)

- **Reciprocity**—Each country has the right to apply to the other countries the same rules and standards that the former State applies provisionally in accordance with the principle of gradual implementation.

The Treaty gave mandates to three regional entities that have played key roles in the development and implementation of the regional market, and are expected to be at the core of the market's operation. The three regional entities are:

- **Comisión Regional de Interconexión Eléctrica (CRIE)**<sup>9</sup>—CRIE is the Regional Electric Interconnection Commission, the regional regulator. The Regional Electric Interconnection Commission (CRIE) was established in 2002, and is the regulating entity of the Central American market. CRIE consists of one Commissioner drawn from the electricity regulatory agency of each country. This was intended to minimise the scope for inconsistency between national and regional regulatory approaches and encourage the standardization of technical and operating standards and procedures
- **Ente Operador Regional (EOR)**<sup>10</sup>—The EOR is the Regional System Operator. Once the SIEPAC line is commissioned, the EOR will coordinate the day-ahead, real-time dispatch, financial settlements, and information exchange through designated national system operators. It is also responsible for formulating an indicative regional expansion plan for generation and transmission. The EOR is governed by a board of two directors per country. The directors are approved by the Governments and are usually representatives of the national utilities
- **Empresa Proprietaria de la Red (EPR)**<sup>11</sup>—EPR is a special purpose company set up to be the Regional Transmission Owner. EPR was formed to own and operate the existing interconnections and to design, engineer, construct, and own approximately 1,800 kilometres of 230kV transmission lines (including existing and new lines), connecting 15 substations in the six countries in the region. The EPR is a corporation funded 75 percent by the public utilities and transmission companies of the six Central American member countries, and 25 percent by private sources (including the Spanish company, ENDESA). EPR is subject to private law in each of the Central American countries, providing some assurance that it will not expropriate private assets.

These entities are in addition to the Consejo de Electrificación de América Central (the Council for Central American Electrification), which was established in 1985. CEAC plays an advisory role to national and regional entities to achieve energy cooperation, coordination, and integration.

### **What are the benefits of regional trading in Central America?**

The three main benefits of power trading in the region are:

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<sup>9</sup> [www.crie.org.gt/quienes\\_somos.html](http://www.crie.org.gt/quienes_somos.html).

<sup>10</sup> [www.enteoperador.org](http://www.enteoperador.org).

<sup>11</sup> [www.eprsiepac.com/descripcion\\_siepac\\_transmision\\_costa\\_rica.htm](http://www.eprsiepac.com/descripcion_siepac_transmision_costa_rica.htm).

- **Increasing private investment**—The key goal of the Central American market is to stimulate private sector investment in Central American electricity generation and transmission by creating a larger market of off-takers (i.e., buyers) and more consistent and predictable market rules. A larger number of sellers and buyers also create more efficient competitive markets than might be possible without regional trading
- **Achieving economies of scale**—The larger market is expected to provide incentives for the development of larger power plants with greater economies of scale. Developers have conducted feasibility studies for a number of large hydropower projects that would be too large for the domestic demand of the countries in which the projects are located. These projects include the Cutuco Energy LNG plant (525MW) in El Salvador, Boruca (1,000MW) in Costa Rica, Cangrejal (500MW) in Honduras, and Copalar (350MW) in Nicaragua. While many investors are progressing through the initial stages of project development, to date no generation projects have reached financial close and begun construction. This may be because financiers want to test the financial security provide by regional trading arrangements after the new SIEPAC line has been commissioned
- **Increasing reliability**—According to the World Bank’s 2006 Enterprise Surveys,<sup>12</sup> power outages last an average of only 1.5 hours in Panama, but last an average of 3.5 hours in the other five countries. El Salvador, Guatemala, and Honduras have about 3 outages a month; Panama has about 4; and Nicaragua has an average of 13 outages (50 hours) each month. Greater generation and transmission capacity would increase the amount of electricity available to utilities, thereby decreasing the likelihood of outages.

An additional, although less certain, benefit from regional trading may be a decrease in the region’s generating capacity requirements due to variance in peak demand amongst the six Central American member countries.

### **What is the vision for cross-border power trading in Central America?**

The Treaty outlines the vision of the six national governments for cross-border trading in the region, committing the governments to a “gradual process of electrical integration by developing a competitive regional electricity market through transmission lines interconnecting their national grids and by promoting regional generation projects.” The national governments agreed to support an increasing degree of competition in the Central American market. Article 4 of the Treaty between participating countries states that “the market should develop gradually from an initially limited situation towards a broader, more open and competitive situation underpinned by existing and future infrastructure”. The six national governments have not yet committed to a timeline for achieving the more competitive situation envisaged in the Treaty.

The Treaty allows generation, transmission, distribution, and large buyers to participate in the electricity market. It requires that national governments and regulators allow market participants to buy and sell electrical energy without discrimination, thereby providing incentives to produce power at the lowest possible cost. The market was designed to level

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<sup>12</sup> [www.enterprisesurveys.org/CustomQuery/Country.aspx?economyid=4&year=2002&characteristic=size](http://www.enterprisesurveys.org/CustomQuery/Country.aspx?economyid=4&year=2002&characteristic=size) .

the playing field for market participants and to limit, as much as possible; the Governments' scope for implementing nationalist and protectionist policies in their power sectors.<sup>13</sup>

### **What cross-border power trading currently exists in Central America?**

The amount of trading has varied since cross-border trading began and has never been higher than about four percent of regional electricity consumption. Honduras and El Salvador have historically been the largest importers, and Guatemala the biggest exporter. In the last four years, the amount of power traded has decreased from 1,068 GWh in 2004 to 276 GWh in 2007. The steepest decrease in exports was in Guatemala.

It is not clear why trading decreased in these years. Since 1998, generation capacity has grown at roughly the same rate as power demand, so it is unlikely that decreasing power trades were a result of diminishing spare capacity. The private sector may have been unable to invest in large projects that would not yet be able to inject power into the SIEPAC line, or unable to invest in small projects that would have to compete with larger ones once the SIEPAC line has been commissioned. Nonetheless, a decrease in trading has been observed over the three-year period to 2007. It is possible that power trades will increase once the SIEPAC line is commissioned in late 2009.<sup>14</sup>

The existing infrastructure consists of interconnections between national grids. The existing interconnection is weak, with the connection between Panama and Costa Rica having a capacity of only 30MW.

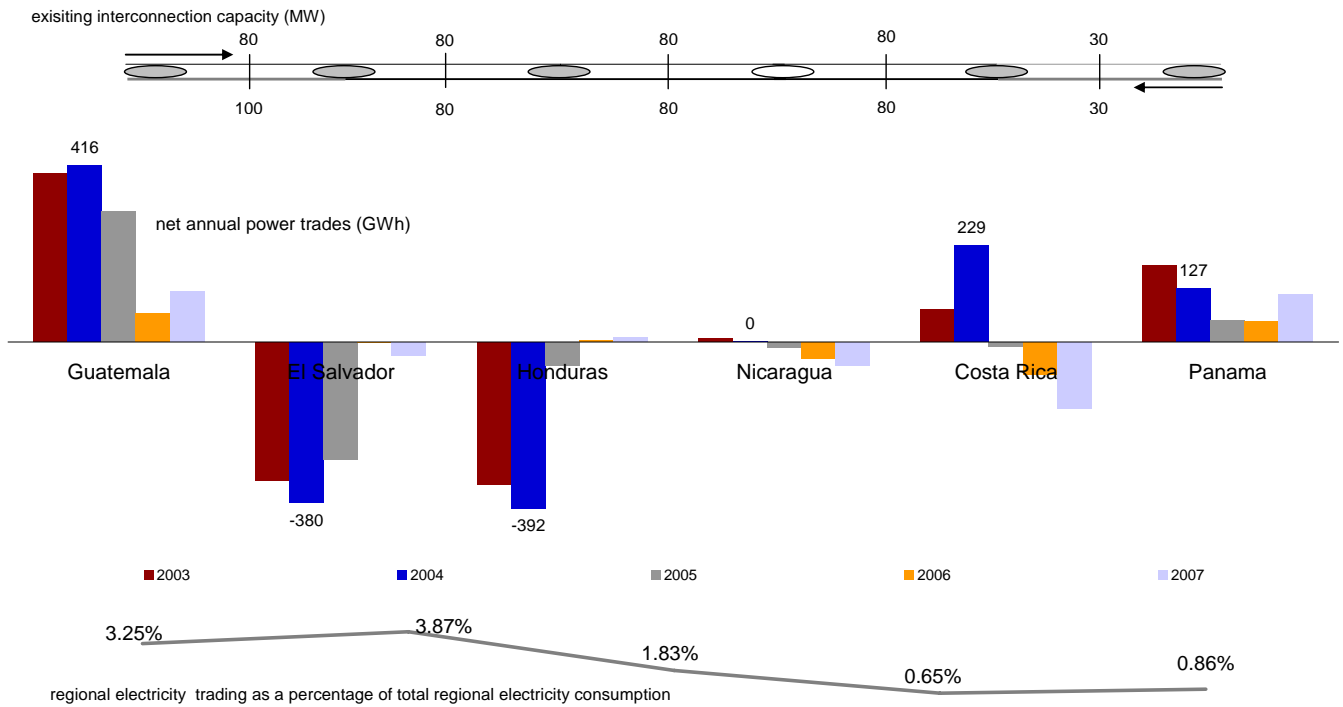
Figure 4.1 shows the current and projected power trading in the region. The top of the figure contrasts the capacities of the existing interconnections (low and varying) with the projected capacity of the SIEPAC line (300MW between each country). The middle of the figure uses a bar chart to show the net power trades in GWh for the six Central American member countries. Finally, the bottom of the figure shows the total volumes of regional power trading as a percentage of regional power consumption.

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<sup>13</sup> Market participants are further protected by rules that give firm transmission rights to the signatories of firm supply contracts.

<sup>14</sup> The reader can check monthly trading statistics on the Ente Operador Regional website at: <http://www.enteloperador.org/InformesEstadisticosMensuales.jsp>.

**Figure 4.1: Current Power Trading in the Central American Region**



Source: Ente Operador Regional website <sup>15</sup>

There are currently two types of power trading in Central America:

- Medium-to long-term contracts**—Medium- and long-term contracts (firm and non-firm contracts) account for the bulk of trading in the Central American regional market. Between 2003 and 2007, these contracts accounted for more than 80 percent of cross-border trading in Central America
- Spot-market trading**—Spot market trading has accounted for an average of 18 percent of regional trading between 2003 and 2007, with a low of 11 percent in 2003 and a high of 26 percent in 2007. There are three types of spot-market transactions. First, financial contracts, which are based on net settlement and have no impact on the dispatch other than through bids and offers to the opportunity market. Secondly, physical flexible contracts, which are bids for transmission services between two nodes and a maximum price that the bidder is willing to pay. Thirdly, physical flexible contracts that allow buyers to replace their own planned generation with spot market purchases.

While cross-border electricity trading is currently bilateral in Central America, large generation plants may be developed that will sell electricity to multiple buyers once the SIEPAC line is commissioned. Utilities might then replace some of their largely domestic, bilateral contracts with multiparty spot market transactions. We discuss some incentives for them to do so in Section 4.2.

<sup>15</sup> [www.enteoperador.org/InformesEstadisticosMensuales.jsp](http://www.enteoperador.org/InformesEstadisticosMensuales.jsp).

### What infrastructure investment is planned to facilitate more trading in the future?

As discussed above, the Regional Transmission Owner (EPR) was responsible for designing, engineering, and constructing the SIEPAC line connecting 15 substations throughout Central America. The Inter-American Development Bank (IDB) provided a US\$170 million loan for the development of the SIEPAC line, out of a total estimated capital cost of US\$385 million. More than half of the SIEPAC line is new construction, while the line uses existing assets in some areas.

Figure 4.2 shows the route of the regional transmission line and the distribution of the regional substations.

**Figure 4.2: The Central America Regional Transmission Line**



The EOR reported in June 2009, that 70 percent of the transmission towers had been constructed, and that the SIEPAC system is expected to be fully commissioned sometime between December 2009 and March 2010. The regional transmission system will then consist of the SIEPAC line, the existing interconnections, and the national assets that support the existing interconnections. EPR is already planning to run an additional HV line parallel to the SIEPAC line. While the EPR has not yet projected a commissioning date, the 2007 indicative expansion plan prepared by CEAC projects the commissioning of the parallel HV line in 2012.

There are also plans to create electricity interconnections between Guatemala and Mexico and between Panama and Colombia. Plan Puebla Panamá, an initiative promoting the integration and development of the six SIEPAC countries, Belize, and the nine southernmost states in Mexico, includes two electricity interconnection projects:



- **Guatemala-Mexico**—One 200 MW line running from Tapachula substation Mexico to Los Brillantes substation in Retalhueu in Guatemala and a 70 MW line running back were commissioned in April 2009. These lines do not reach the SIEPAC line, but may be connected at a later date. In the meantime, the lines allow power to be wheeled, through the domestic Guatemalan grid to the other five SIEPAC countries. While it is not known whether such trades have taken place, it appears unlikely, due to lack of agreement on pricing and settlement between Mexico and the other five countries. To formalise these trades, pricing and settlement arrangements would also need to be approved by CRIE
- **Panama-Colombia**—Two 300 MW lines running from Panama to Colombia are expected to be commissioned in 2012. Like the Mexico-Guatemala lines, the lines running between Panama and Colombia are not projected to be directly connected to the SIEPAC line, but the lines would allow power to be wheeled to other SIEPAC countries through Panama’s domestic grid, and would require formal pricing and settlement agreements.

These interconnections will provide the infrastructure necessary to expand the Central American electricity market. However, it is not yet clear whether national governments in the region will pursue this goal, and how the institutional infrastructure would need to change to accommodate a wider regional market that included Mexico and Colombia.

#### **How are decisions made for planning, building infrastructure, and negotiating cross-border power deals?**

The EOR is responsible for formulating an indicative expansion plan for generation (including reserve margins) and regional transmission in the region, but has not yet issued such a plan. Currently, CEAC publishes a regional plan for the expansion of generation. The most recent of these was published in 2007 and covered the period from 2007 to 2020.<sup>16</sup>

The indicative expansion plan is intended to help the private sector identify projects, and not to mandate what projects it carries out. Ultimately, the national governments will decide on the future transmission projects to be carried out by the EPR, and the private sector selects the generation and transmission projects that it will carry out.

The Treaty requires that third-party generation and transmission developers are free to enter the market on regulated or merchant terms. In the event that parties cannot agree to transmission tariffs for a merchant project, CRIE is empowered to set a price. The Treaty provides the following guidance on the participation of generation and transmission participants in the regional market:

- **Generation**—The Treaty allows market participants to install generation capacity in any of the member countries and to sell this power on the market. Governments are required to create domestic conditions that are “conducive to the development of regional electric generating plants, consistent with the efficient development of the regional market.” This means that preferential treatment for domestic market participants would be considered a violation of the Treaty. In this respect, the Treaty is similar to many free trade agreements that attempt to expand trade between countries

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<sup>16</sup> See CEAC’s website: [www.ceaconline.org/pdf/PLAN\\_INDICATIVO\\_REGIONAL.pdf](http://www.ceaconline.org/pdf/PLAN_INDICATIVO_REGIONAL.pdf)

- **Transmission**—The Treaty grants non-discriminatory access to regional and national transmission systems, including third-party access to regulated and merchant lines. While EPR is responsible for the SIEPAC line, third parties are allowed to build merchant or regulated transmission lines as necessary. Such transmission lines could take the form of feeder lines or regional lines to supplement the capacity of the SIEPAC line. The Governments have agreed to grant the necessary authorizations, permits, or concessions for future expansions of the regional transmission grid.

To further limit the scope for market discrimination, the Treaty requires that participating governments maintain no direct or indirect control over the SIEPAC transmission system controlled by EPR; and that companies involved in regional transmission do not engage in generation, distribution, or marketing services. At this time, it is not clear what arrangements might be made for vertically-integrated utilities that want to develop a cross-border transmission lines.

Cross-border power deals are negotiated on a bilateral basis, and all cross-border trades are regulated by the market rules, called the Reglamento del Mercado Eléctrico Regional (RMER).<sup>17</sup> The RMER was developed by the EOR in consultation with CRIE and specify both pricing rules and technical requirements for trading.<sup>18</sup>

#### **What agreements have been reached on pricing and settlement?**

In the RMER, the above-mentioned governments agreed to detailed rules for pricing and settlement. Creating these arrangements was a long and carefully negotiated process that required assuring the national governments that they would be able to oversee each stage of the design and implementation of the Central American market.

The implementation of the market has been overseen and been given strategic direction by:

- **Governmental steering committee**—A high-level government steering committee, initially including the energy ministers of the six countries, was formally established to help establish the market for regional power trading. The steering committee also enables national Governments to follow progress and to be involved in problem solving and decision-making, without undermining the authority of the regional institutions. The steering committee initially has formal decision-making powers; however, when the regional institutions (EOR and CRIE) were established these powers were no longer required. Since that time, the steering committee has become more of a forum for regional energy policy
- **Project management team**—A small project management team was responsible for hiring and managing consultants, and for facilitating discussions between and within all the governments and stakeholders. The project management team was crucial to the process, acting as both project manager and experts, and identifying and solving problems on a daily basis
- **An external expert panel**—The expert panel was funded by a technical assistance grant from the IDB. The panel reviewed all the work and decisions

<sup>17</sup> CRIE issued the RTMER, the temporary rules for the MER, in 2002.

<sup>18</sup> The full text of the RMER is available at:  
<http://www.ine.gob.ni/DGE/mercado/reglamento%20del%20mercado%20electrico%20regional.pdf>.

then made recommendations (that were usually followed) and gave advice when difficulties were encountered. The external expert panel consisted of three experts: Professor Ignacio Perez Ariaga (Madrid University), Luis Caruso (Mercados Energeticos) and Fiona Woolf (Cameron McKenna). The expert panel called upon consultants to provide expertise in particular areas. For example, when proposing a transmission pricing methodology and designing transmission rights external advisers were present at a series of meetings to provide comfort in choosing between different options.

During the drafting of the RMER, national institutions were given the opportunity to review successive drafts and attend meetings while the 361 closely typed pages of the RMER were developed. They also commented on the protocols entered into by the national governments that were implemented under the Treaty. Frequent meetings were held by EOR during the development stage and continue to be held with all future market participants, the national utilities, the governments, potential investors, and other stakeholders. Stakeholders had the opportunity to comment on successive drafts of the Temporary RMER, and the final RMER. After consultation with the governmental steering committee and the expert group, CRIE was responsible for approving the final rules

EOR and CRIE developed and approved a transmission pricing regime based on a regulated return for transmission line owners. To ensure non-discrimination in granting transmission access, the Treaty requires that all market participants pay for access to and use of regional grids in accordance with this pricing methodology.

The transmission pricing methodology uses operating expenses and capital expenditures to determine the allowable revenues. The transmission tariffs are designed to match the allowable revenue, and have two components:

- **Costos Variables de Transmisión (CVTs)**—The opportunity market is based on nodal prices, ensuring that the price of energy and the price of the transmission services are closely bound. The difference in the price of energy between two nodes is equivalent to the price of “using” the transmission service
- **Cargo por Uso de la Red de Transmisión Regional (CURTR)**—The charge for use of the RTR is broken into the Peaje (toll) and the Cargo Complementario (complementary charge). The CURTR is calculated as allowable revenue, adjusted for the transmission owner’s cash surplus or shortage, less the net income from the sale of CVTs and less revenue from the sale of transmission rights. Transmission rights are allocated to the owners of transmission assets and parties paying to expand transmission capacity. The CURTR charge makes up the difference between the CVTs and the transmission owners’ allowable revenue.

The CVT and CURTR charges are paid implicitly in spot-market transactions and incorporated explicitly into medium- and long-term contracts.

There is no fixed methodology for pricing transmission on third-party transmission lines. Rather, the parties to a given contract are expected to come to a bilateral agreement on pricing. CRIE will establish a price if the two parties are not able to agree.

Once the SIEPAC line is commissioned, the Regional System Operator (EOR) will be responsible for operating the regional market in close to real-time and for providing settlement information to national system operators.

### **What role does regulation play in cross-border trading, and how have regulatory powers been exercised?**

The Treaty gives CRIE responsibility for promoting the development and consolidation of the regional market, and overseeing its transparency and smooth operation. CRIE plays three principal roles in the Central American market:

- **Developing and approving market rules**—The EOR is responsible for proposing market rules and CRIE is responsible for commenting on and approving rules<sup>19</sup>
- **Monitoring and enforcing the market rules**—CRIE’s most important role is to monitor and enforce compliance with the Treaty and the market and technical rules. CRIE has the right to impose sanctions for non-compliance with the Treaty and the rules. Because CRIE’s decisions derive their legal authority from the Treaty that was signed by the governments of the six Central American countries, CRIE’s decisions are legally enforceable in the courts of each country. Since there is a very small volume of trading at present, pending the commissioning of the SIEPAC line, CRIE has not yet had to exercise this power
- **Resolving disputes**—CRIE is tasked with resolving any conflicts between market participants that are not settled through negotiation between market participants.

Table 4.1 compares the role of CRIE in the Central American market with the proposed role of the ECOWAS Regional Electricity Regulatory Authority (ERERA) in the Western Africa Power Pool (WAPP). We note that the functions of ERERA have yet to be finally determined. A team of consultants has made proposals to ERERA that are still under consideration.

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<sup>19</sup> We understand that consultants to ECOWAS in West Africa have recommended a similar approach to interactions between the West Africa Power Pool and the ECOWAS Regional Electricity Regulatory Authority (ERERA), the newly created regional regulatory body in West Africa.

**Table 4.1: The Role of CRIE Compared to the Role of EREERA**

	<b>CRIE</b>	<b>ERERA</b>
<b>Formulation of the regulator</b>	CRIE is composed of representatives of national regulators	ERERA consists of a single decision maker who must be a citizen of one of the ECOWAS countries but who functions as an independent civil servant
<b>Dispute resolution</b>	CRIE is responsible for dispute resolution	ERERA is not currently responsible for dispute resolution, as it does not currently have sufficient capacity. Dispute resolution is handled by an ECOWAS tribunal
<b>Developing market rules</b>	In SIEPAC, the EOR developed the market rules. CRIE commented on the rules and approved them	ERERA has authority to develop market rules itself, but it has been recommended that WAPP propose the rules which would then be reviewed by EREERA
<b>Relationship to national regulators</b>	CRIE's responsibility only applies to regional trading, not to the domestic power sectors	ERERA's authority extends to the domestic power sectors of countries that do not have national regulators

## **4.2 Lessons for Southern Africa from the Experience in Central America**

We conclude that there are two main lessons that Southern Africa can draw from the case of Central America.

- A strong, enforceable commitment by national governments is important to enable regional power sector agencies to effectively make and implement decisions
- An effective and conclusive decision-making process will help governments, national utilities and regulatory agencies, and market participants gain agreement on detailed issues, such as regional planning and pricing.

### **A strong, enforceable commitment by national governments has been important in Central America**

Power trading in Central America provides a good example of national governments making a binding commitment to create a truly regional electricity market. Rather than agreeing on a general list of objectives, or a list of national concessions to be made to reach the goal of regional electricity trading, the signatories to the Treaty agreed to do everything necessary in their jurisdictions to make regional electricity trading work. The strong language of the Treaty gave each Government confidence that others would promote regional (as opposed to national) trading and honour their commitments. For example, the signatories to the Treaty agreed to:

- “Create the necessary conditions to promote acceptable levels of quality, reliability and safety in the provision of electric power in the region” (Article 2)
- “Establish objective, transparent and non-discriminatory rules to govern the operation of the regional electricity market and relations between participating agents, and to create the appropriate regional agencies to achieve these objectives” (Article 2)
- “Determine the conditions that are conducive to the development of regional electric generating plants, consistent with the efficient development of the regional market” (Article 9).

The best evidence that the Treaty served as an effective government commitment is that since the Treaty was ratified the institutions and infrastructure that it envisioned has been developed, roughly on time. The Governments’ commitments allowed the following core components of the market to be put in place:

- **Infrastructure**—Efficiently designating national transmission infrastructure to serve the regional grid and the design and construction of SIEPAC system
- **Regional authorities**—Creating the system operator (EOR) and regional regulator (CRIE)
- **Rules**—Providing EOR and CRIE with the decision-making authority needed to develop the rules (RMER). We discuss the process through which the RMER were agreed to in the next section.

In contrast to Central America, Governments in Southern Africa have not made a binding commitment to make regional power trading a priority. Governments in the region have expressed political goodwill and a desire to see more trading happen, but this has not yet been codified into a binding commitment through a Treaty or Protocol that has the force of law in each ratifying country. One high level official in SADC has observed that the SADC governments have given “lip service” to regional electricity trade, but have been unwilling to take the next step of making binding commitments that would make such trade a reality.

### **The process for gaining agreement on planning and pricing**

The process for making decisions on planning and pricing in the Central American market is pragmatic. Rather than focusing on reaching (sometimes unattainable) consensus on solutions that are optimal for all parties, the Treaty gives **CRIE the authority to make binding decisions on detailed issues in the absence of complete agreement**. This means that decision closure is assured, and proposals on important issues will be addressed in a timely manner.

The decision-making process in Central America follows three steps.

- **Propose.** Regional trading platform (EOR) makes proposals
- **Review.** Proposals are reviewed by CRIE, the regional regulator (consisting of one regulator from each country), and an independent expert panel. Both review bodies report periodically to a high-level government steering committee
- **Decide.** CRIE is empowered to make a final decision, looking at the issues from the perspective of the region as a whole. CRIE can make changes to what market participants propose (after stakeholder consultation).

In addition, **because the Treaty and the CRIE's decisions can all be enforced directly in the legal systems of each of the six countries, trading parties must comply with all market rules.**

Timely decisions have been made in Central America on each of the following issues:

- **Designation of the regional transmission system.** Specialist consultants were engaged to make recommendations from a regional perspective on transmission plans using a simple methodology not used in any of the six countries. This process determined which parts of the national transmission systems were necessary for the initial regional transmission system. The national governments then facilitated the transfer of these designated transmission assets to the regional transmission owner (EPR) and the payment of compensation
- **Power sector planning.** The EOR is responsible for formulating an indicative expansion plan for generation and regional transmission, envisaging the establishment of regional reserve margins. CRIE is responsible for approving the plan and for making it available to market participants.<sup>20</sup> The purpose of the indicative expansion plan is to identify needed expansions, and to alert investors of potential opportunities
- **Market rules.** The market rules were approved by CRIE in 2005. CRIE's approval and enforcement of the rules is relatively straightforward, as they have full legal and regulatory force in all member countries and each CRIE commissioner is also the commissioner of a national regulatory agency. This arrangement enhances the commitments that the national governments made to power trading under the Treaty allowing CRIE to make decisions that the national governments might not be able to make for reasons for national or constituency interests.

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<sup>20</sup> CEAC has also published an indicative plan: [http://www.ceaconline.org/pdf/PLAN\\_INDICATIVO\\_REGIONAL.pdf](http://www.ceaconline.org/pdf/PLAN_INDICATIVO_REGIONAL.pdf).

## 5 West Africa

West Africa has a long history of cross-border power trading. The existing cross-border electricity infrastructure in West Africa was developed for bilateral or trilateral supply contracts. West African states are now working to increase regional power trading with an emphasis on longer term bilateral and trilateral transactions. To facilitate this expansion, the utilities in 13 West African countries have established a power pool, which has the primary objective of constructing more cross-border infrastructure to facilitate trading. The West African Power Pool (WAPP) provides useful insights into ways to get new infrastructure built, in part by empowering entities to make decisions, and ensuing accountability for progress.

Section 5.1 provides background to the West African Power Pool, and the status of cross-border trading in West Africa. In Section 5.2, we discuss possible lessons for Southern Africa from the experience in West Africa. The two main lessons from West Africa are that:

- A strong government commitment is important
- Processes are needed to obtain agreement on planning and trading issues.

### 5.1 Cross-border Power Trading in West Africa

There have been several decades of successful cross-border trading through bilateral and trilateral agreements in West Africa, even prior to the establishment of the Economic Community of West African States (ECOWAS). For example, the Volta River Authority in Ghana first sold power to Togo and Benin in 1969.

WAPP was created in 1999 by agreement of the heads of the member states of ECOWAS.<sup>21</sup> The concept of a regional power pool was first suggested by the ECOWAS Energy Department in 1992, and WAPP was formally established with the signing of the WAPP Articles of Agreement in July 2006. WAPP is a specialised legal institution under the authority of ECOWAS.

Recognising that developing new generation and transmission infrastructure is the most pressing need for WAPP members and ECOWAS member states, WAPP has been assigned an active role in facilitating specific new projects. This clearly differs from the role of SAPP in Southern Africa, which until recently has focused on developing short trading for existing generating rather than the construction of new generation units.

#### **What are the benefits of regional trading in West Africa?**

In the ECOWAS region, increased regional power trading is expected to deliver economies of scale, increased reliability, increased market liquidity (that is, a greater number of buyers and sellers), attracting investment. Some specific benefits include:

- Demand in Benin and Togo is too small to justify the large-scale generation plants that could be developed within their borders

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<sup>21</sup> The ECOWAS member states are Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. Guinea is also a member of ECOWAS, but at the time of this report is currently suspended following a coup in December 2008.



- Relatively large networks in Nigeria, Cote d'Ivoire, and Ghana would benefit from improved security of supply and economic exchange of short-term power
- More economical electricity could be transported to energy-scarce, landlocked countries (Mali, Burkina Faso, and Niger), as well as to the inland hinterlands of coastal countries, which are currently served by off-grid diesel generator systems.

### **What is the vision for cross-border power trading in the region?**

The need for significant additions to the regional generation and transmission network in the ECOWAS region is well documented. ECOWAS member states have some of the lowest per capita energy consumption of any region in the world. In 2003, the total peak electricity demand for the region was 6,500 MW, for a population of nearly 250 million. The region is plagued by power shortages, faces significant geographic hurdles to the development of new transmission and generation assets, and its demand is expected to grow at a rate of 7.6 percent per annum to 2020, when peak demand for the expected population of 380 million will have nearly tripled to more than 22,000 MW.

The vision of WAPP for cross-border trade in the region is to integrate the national power system so that they can operate in a unified regional electricity market. The interconnected system is expected to assure a stable and reliable electricity supply at affordable costs for ECOWAS member states, over the medium- to long-term. Power sector development is also expected to create a level playing field that facilitates the balanced development of the diverse energy resources of ECOWAS members. The economic benefits of power trading are designed to be shared among member states, through long-term energy sector cooperation, unimpeded energy transit, and increasing cross-border electricity trade.

### **What cross-border power trading currently exists?**

There is a long history of successful cross-border power trading in West Africa, most of which has taken place under bilateral power purchase agreements by countries with demand shortages from their neighbours with excess supply. Some of these deals predate the establishment of ECOWAS in 1975.

The role of WAPP in power trading is still in the early stages of development, and WAPP does not currently play any role in coordinating trading. Existing cross-border interconnections are used to support long-term bilateral agreements, or for short-term emergency trades to balance supply and demand. Some of the long-term bilateral power trading agreements in West Africa have expired. These trades have either been renegotiated or have been replaced with shorter-term supply arrangements.

Existing transmission interconnections create two separate multi-country marketplaces for energy trading in West Africa:

- **Zone A: Cote d'Ivoire, Ghana and Benin/Togo.** Cote d'Ivoire is the primary seller and the only country in WAPP with a significant energy surplus
- **Zone B: Senegal, Mauritania, and Mali.** A transmission interconnection allows these countries to share the output of the Manantali Hydro Plant located in Mali.

Nigeria will join the Zone A marketplace when the Nigeria-Benin interconnection is completed in 2009. Niger currently purchases approximately 90 percent of its energy needs from Nigeria. This currently takes place outside of the Zone A and B marketplaces.

Table 5.1 provides an overview of the levels of electricity exports and imports by interconnected ECOWAS members in the most recent year for which data is available. The level of exports and imports is around 1,800 GWh per year between WAPP members. This amounts to approximately 5 percent of all electricity consumption in the region.

**Table 5.1: Annual Trading between WAPP Members (excluding Manantali output)**

Country	Exports (GWh)	Imports (GWh)
Benin	0	590
Côte d'Ivoire	1,070	0
Ghana	760	630
Niger	0	230
<b>TOTAL</b>	<b>1,830</b>	<b>1,950</b>

### What infrastructure investment is planned to facilitate more trading in the future?

Since its establishment in 2006, WAPP has focused on how to develop new regional interconnections to increase regional trading. WAPP commissioned consultants to develop a Master Plan that studied regional transmission stability (Nexant, 2005), rather than to develop an integrated plan for generation and transmission development. An integrated plan would analyse potential generation options, the West Africa Master Plan has a greater focus on identifying the transmission required to interconnect ECOWAS Members.

Regional generation projects are then added to a list of “priority projects” for the region. Priority projects are generally taken from the Master Plan, and appear to have been defined by the Secretary General of WAPP in collaboration with the donor community.

The primary energy resource in the region is natural gas—Nigeria alone has proven gas reserves that could power electricity requirements in the region for 20 years. There is also potential for significant gas development in Cote d’Ivoire, Senegal, Gambia, and Guinea-Bissau. Most countries in the region have hydro projects planned, with the most economically justified projects are located in Mali and Guinea.

Most of the natural gas resources are concentrated near the coast, and do not currently have adequate transmission facilities to transmit the power to inland areas of Togo, Benin, and Burkina Faso. Existing hydro resources in Mali provide much of their power to heavily populated coastal areas. As a result, the inland areas of West Africa currently rely on very high cost diesel and heavy fuel oil generation (Nexant, 2005).

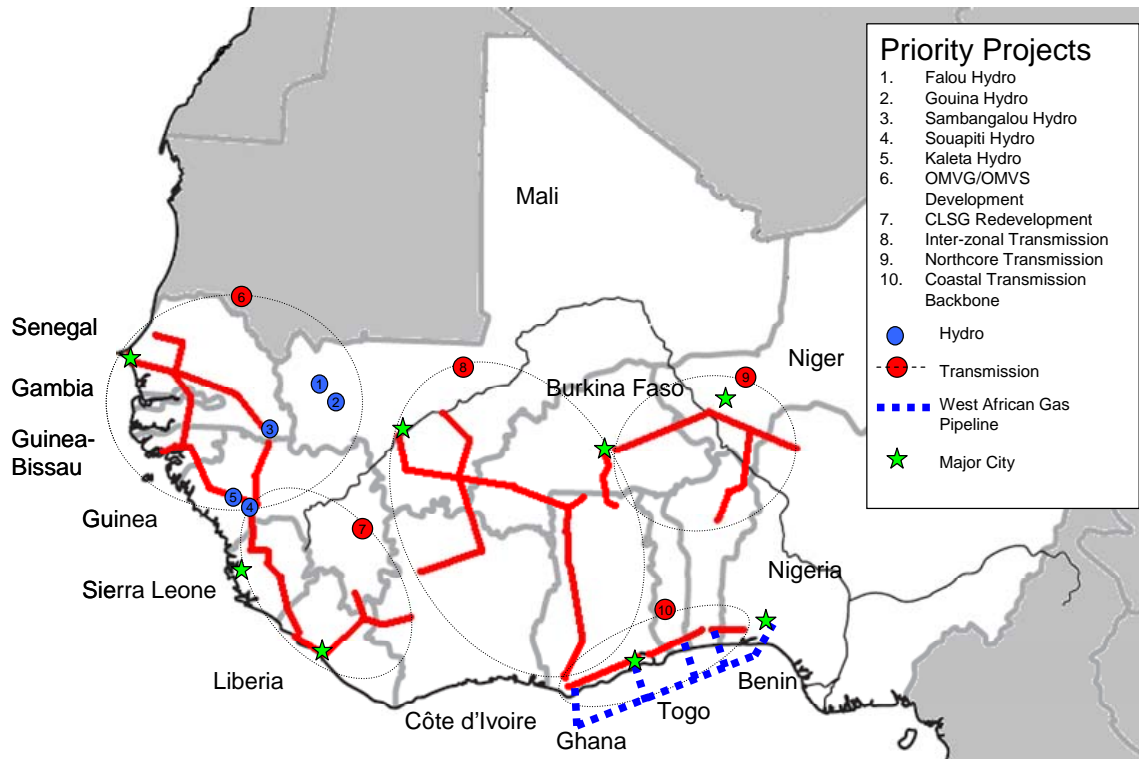
Figure 5.1 presents an illustrative list of transmission and generation projects in West Africa that are planned or under construction. These projects are:

- Coastal Transmission Backbone (Nigeria–Benin–Togo–Ghana)
- CLSG System Redevelopment Sub-program (Côte d’Ivoire–Liberia–Sierra Leone–Guinea)

- Inter-zonal Transmission Sub-program and North-core Transmission Sub-program (Mali–Cote d’Ivoire–Ghana–Burkina Faso–Niger–Benin–Nigeria)
- OMVG/OMVS Development Sub-program (Senegal–Gambia–Guinea– Guinea-Bissau)<sup>22</sup>
- Regional generation projects—the Falou and Gouina Hydro projects in Mali, and the Sambangalou Hydro project on the border of Mali and Guinea.

The status of the OMVG/OMVS, CLSG, and generation projects that involve Guinea or the Guinean electricity company EDG are somewhat unclear following the December 2008 military coup d’état. Guinea is currently suspended from ECOWAS, which presumably also includes WAPP.

**Figure 5.1: Illustrative WAPP Priority Projects**



Source: Castalia illustration based on information provided by ECOWAPP website

The WAPP list of priority transmission projects in the Master Plan is relatively long, consisting of three committed projects, four planned projects and five “other” projects. To make progress on these investments, WAPP has focused on a smaller number of projects, and identified placing less emphasis on technical feasibility and a greater focus on political acceptability and implementation.

<sup>22</sup> OMVG/OMVS stands for l’Organisation pour la mise en valeur du fleuve Guinea/ l’Organisation pour la mise en valeur du fleuve Sénégal.

The timeline for commissioning WAPP priority projects ranges from 2009 to 2020, according to WAPP presentations and the Nexant pool plan. The two transmission projects in West Africa that appear to have some momentum are the Coastal Transmission Backbone and the CLSG System Redevelopment Sub-program.

The Coastal Transmission line project is a new high-voltage transmission line that will interconnect five countries (Cote d'Ivoire, Ghana, Togo, Benin, and Nigeria). The line would originate at a substation in western Nigeria, pass through Togo and Benin, to a substation owned by the Volta River Authority (VRA) in Ghana. An additional interconnection is then planned to link the VRA's substation to Cote d'Ivoire. Each of the five countries involved is responsible for building, owning and operating the line within its national borders.

The portion of the line from Nigeria, through Benin to the Togo border was completed in early 2007. The remainder of the line is expected to be commissioned by 2013. The project had expected a commissioning date as early as 2009, however delays in financing the Togo portion of the line prevented completion. Togo was unable to secure financing from World Bank IDA credits as it had fallen into arrears, and did not have a lending relationship at the time the project was nearing financial closure. However, the German development bank, KfW, stepped in and provided grant financing for the project to move forward.

The CLSG project provides for interconnections between three of the region's fragile states. This transmission project was not identified in the Master Plan, but appears to be politically appropriate given WAPP's mission to facilitate balanced power system development throughout ECOWAS. The project would connect fragile states to the coastal backbone on the southern coast, and provide access to hydro resources in Mali and Guinea.

Many countries within WAPP have difficulty securing financing to construct new generation and transmission facilities. Ten WAPP member states are subject to borrowing restrictions as Highly Indebted Poor Countries (HIPC). The HIPC status also places borrowing restrictions on government-owned utilities, limiting the sources of finance that can be used for new investment. For example, three of the four countries involved in the CLSG project—Liberia, Sierra Leone, and Guinea—are HIPC countries, which increases the importance of obtaining grants and soft credits from multilateral development banks.

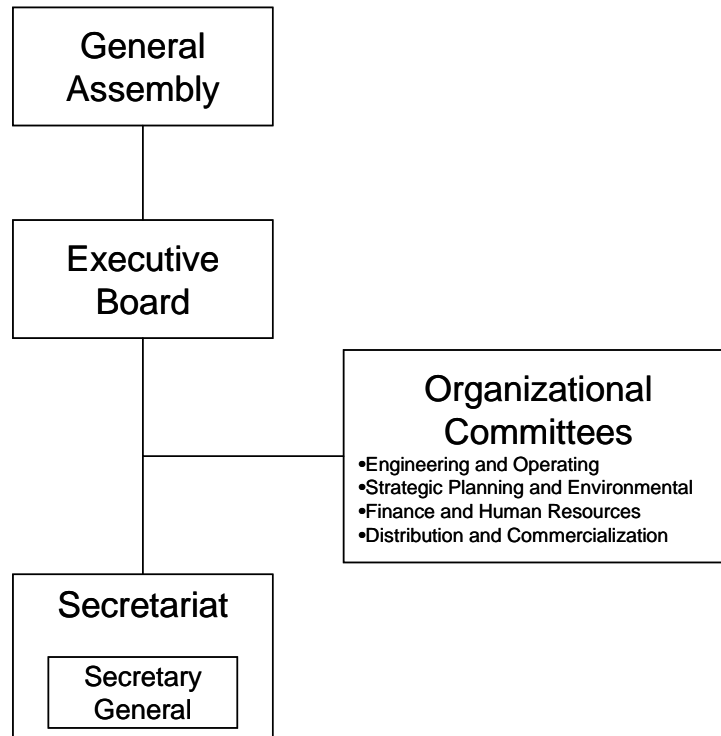
### **How are decisions made for planning, building infrastructure, and negotiating cross-border power deals?**

The ECOWAS Energy Protocol provides the framework for cross-border power trading in West Africa. The ECOWAS Energy Protocol has some similarities to the 1994 European Energy Charter Treaty (ECT). Both the ECOWAS Protocol and the ECT include strong provisions to ensure the following:

- **Protection of foreign investments**, and protection against key non-commercial risks, such as expropriation (including regulatory expropriation)
- **Non-discriminatory conditions for trade in energy**, based on an extension of WTO rules, and provisions to ensure reliable cross-border energy transit flows through pipelines, grids, and other means of transportation
- **Resolution of disputes between participating states**, and between investors and host states.

The institutions that comprise the WAPP organisational structure are shown in Figure 5.2. WAPP is governed by member utilities, and is overseen at the highest level by a General Assembly comprised of its members. WAPP members are, for the most part, the national utilities of ECOWAS member states.<sup>23</sup> WAPP's Executive Board is made up of six representative heads of WAPP members. The WAPP Secretariat and Secretary General provide the day-to-day management of WAPP. The governance structure in WAPP does not confer decision-making power on an independent Board of Directors.

**Figure 5.2: WAPP Organizational Structure**



Source: WAPP

In addition, several external coordination committees play a prominent role in WAPP. Foremost amongst these are the Donor Coordination Committee,<sup>24</sup> which along with the Secretary General, develops strategies for priority projects. The Donor Coordination Committee consists of representatives of the major aid donors, energy sector development partners, and members of the WAPP Steering Committee. The involvement of donors in determining priorities and providing technical assistance appears more prominent in WAPP than Southern Africa.

The WAPP Articles of Agreement require the approval of a majority of present voting members of the General Assembly of pool members to make decisions. It appears that several decisions made within WAPP have to be subsequently validated through

<sup>23</sup> A complete list of WAPP members is provided as an appendix to this section.

<sup>24</sup> Representative donors include WB, ESMAP, AfDB, EIB, USAID, AFD, EC, BOAD, EBID, AFC, and IsDB.

Supplemental Acts issued by ECOWAS Heads of State. The Articles of Agreement in WAPP also provide the Secretariat and the Secretary General with responsibility for the day-to-day management of WAPP.

Membership in WAPP is voluntary and open to any entity, public or private, within the ECOWAS region which is either a:

- **Transmission Using Member**—owns or operates generation facilities of 20 MW or larger and/or distributes or retails electricity
- **Transmission Owning/Operating Member**—owns or operates major transmission facilities in the region that are physically interconnected and have an impact on system operations in the ECOWAS region.

A list of the members of WAPP is provided in the Annex to this case. Unlike Eskom in Southern Africa, West Africa does not have a dominant player in regional electricity supply or demand. Nigeria has the energy resources to potentially fill this role, but at the present time Nigeria is struggling to meet the challenge to provide reliable domestic power supplies. Until domestic demand can be reliably supplied, it is unlikely that Nigeria will play a more prominent role in the region as an electricity exporter.

**A unique feature of WAPP is that the power pool has been given responsibilities for helping to develop new infrastructure.** Specifically, the WAPP Articles of Association require WAPP to ensure “the full and effective implementation of the WAPP Priority Projects.” This is commonly referred to as a project promotion role.

#### **How does WAPP promote priority projects?**

The WAPP Executive Board has been formally tasked with developing a regional transmission and generation master plan. Within the WAPP Secretariat, the Secretary General has accepted the role of negotiating directly with donors to finance feasibility studies for new projects, and to secure grant financing for projects shown to be feasible. This role is facilitated through the Donor Coordination Committee, and appears to be productive in securing funding for new investments. WAPP has obtained funding for feasibility studies from several donors, including the World Bank and USAID.

In order to help projects secure financing for further development, WAPP often works with multilateral development banks to secure grant or credit financing for the project. This is the case with the Coastal Transmission Backbone, where the investments have been funded entirely from grants and credits to host countries from the World Bank and KfW. In other cases, WAPP proposes to create a Special Purpose Vehicle (SPV) for members to take equity stakes. WAPP has sought to use these corporate structures to develop a number of regional hydro generation projects. It is not clear why the SPV model has not yet been used for proposed transmission lines.

The WAPP Secretariat has been given additional responsibilities for developing the CLSG project due to the lack of capacity in the states where the project is located. Although the exact responsibilities delegated to WAPP for the CLSG project are not fully clear, the functions carried out by WAPP are presumably those typically undertaken by project sponsors. These responsibilities include coordinating feasibility studies, raising investment capital, negotiating supply or use of transmission agreements, and ensuring that all government and regulatory approvals are obtained.

### **What agreements have been reached on planning, pricing and settlement?**

Agreements on pricing and settlement have not yet been reached in WAPP, meaning that **new investments in both generation and transmission will receive prices negotiated between developers and utilities.**

The lack of a common approach to pricing generation and transmission is not a major constraint on new investment because most of the projects in West Africa are funded with grants or credits from multilateral development banks and direct bilateral agencies. This type of funding enables projects to proceed without firm off-take arrangements in place, whereas **projects developed using concessionary or commercial finance typically need to show that loans can be repaid from future tariff revenues.**

In contrast, large developments involving project finance vehicles that rely on private financing appear to have had more difficulty reaching financial close. For example, the Falou Hydro plant in Mali has experienced delays resulting from the inability of SPV partners to finalise off-take agreements. Without firm supply agreements with credible purchasers, outside financing for the project has been difficult to obtain.

### **What role does regulation play in cross-border trading, and how have regulatory powers been exercised?**

ECOWAS members have recently established a regional regulator, the ECOWAS Regional Electricity Regulatory Authority (ERERA). ERERA was developed in collaboration with the French development agency, AFD.

ERERA has been assigned an extensive range of responsibilities in a mandate formally approved by members of ECOWAS in January 2008 (Supplementary Act A/SA.2/1/08). This approval complemented an earlier resolution (Council Regulation C/REG.27/12/07 of the 15th December 2007) that dealt with the composition, organization, attribution and functioning of ERERA.<sup>25</sup> Under these regulations, ERERA was assigned the following broad regulatory objectives:<sup>26</sup>

- Develop technical regulations for the management of exchanges between inter-connected systems in the ECOWAS region
- Monitor the application of those technical regulations
- Monitor wholesale electricity sales between the various buyers from the States and the analysis of their efficiency with a view toward avoiding antitrust problems
- Develop dispute resolution procedures and particularly litigation procedures that ensure the respect of trade regulations and contracts
- Establish effective communication between the governments, regulators, and electricity services of member States on questions that are of common concern.

As some countries in ECOWAS do not have national regulators, and many others are weak or lack the authority and capacity to regulate cross-border exchanges effectively, ERERA is able to intervene at two distinct levels:

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<sup>25</sup> [www.acp-eu-trade.org/library/files/AU\\_EN\\_0409\\_AU\\_Status-of-integration-in-Africa.pdf](http://www.acp-eu-trade.org/library/files/AU_EN_0409_AU_Status-of-integration-in-Africa.pdf).

<sup>26</sup> [www.afd.fr/jahia/Jahia/site/afd/lang/en/pid/1347](http://www.afd.fr/jahia/Jahia/site/afd/lang/en/pid/1347).

- As a regional regulator for cross-border exchanges
- As an agency providing assistance to national regulatory entities to ensure that regional and national regulations are complementary.

It is expected that when EREERA is fully operational it will carry out two major types of activities:

- Drafting standards and automatically generating information, in the form of periodic benchmarking reports, on general questions (contractual regulations, financial and technical performance, etc.) or of a more specific nature (technical returns, production and transaction costs, application of the regulation mechanisms, etc.)
- Carrying out audits and specific expert missions, to contribute to the proper application of energy provision and management delegation contracts. EREERA will also be a mediator in regional dialogs on energy exchange.

A comparison between EREERA and the regional regulator in Central America is provided in the Central America case study (Table 4.1). A consultant was hired by ECOWAS to make recommendations on how to operationalise EREERA (Ofedie and Barker, 2009). It is our understanding that the consultant has recommended that EREERA should:

- Develop procedures for monitoring and reviewing the WAPP Master Plan
- Adopt an implementation plan for gradually implementing its functions
- Develop an organizational structure and operating budget
- Formulate and publish initial regulatory procedures, in collaboration with national regulators
- Develop pro-forma contracts for various transactions, including power purchase agreements
- Identify and agree with national regulators the boundaries of EREERA's jurisdiction.

It is our understanding that ECOWAS and the newly constituted EREERA have yet to take an official position on the consultant's recommendations.

## **5.2 Lessons for Southern Africa from the Experience in West Africa**

A number of general lessons can be drawn from the experience of WAPP. From our review we focus on two important lessons:

- A strong commitment from national governments is important. Strong commitments mean legally enforceable agreements in a regional energy treaty or energy protocol. In other words, a strong commitment must go beyond a statement of general principles
- Defined and efficient processes are needed to reach agreement on planning and trading issues. In the absence of agreement among parties, there must be some mechanism for moving forward.

It is important to bear in mind that there are significant differences in the way the economic communities, legal entities, and institutions supporting each power pool were conceived and



developed. Table 5.2 highlights some of the differences in the level of development and the promotion of new projects within the two power pools.

**Table 5.2: Comparison of Key Parameters in SAPP and WAPP**

	<b>SAPP</b>	<b>WAPP</b>
Size (Peak Demand)	43,000 MW (2008)	10,000 MW (2008 estimate)
Strength of Regional Agreement	Limited regional authority	Strong regional authority
Sources of Project Capital	Commercial and concessionary loans	Grants and concessionary finance from development banks
Areas of Emphasis	Short term trading from existing facilities	Promoting new investments

**A strong government commitment is important**

WAPP and SAPP both fall under the authority of their respective regional intergovernmental organizations. WAPP is governed by the Economic Community of West African States (ECOWAS), and SAPP by the Southern African Development Community (SADC). Both are regional organizations with similar missions to further economic, political and security cooperation between their member states.

However, **the ECOWAS and SADC treaties differ significantly in the way they treat economic issues critical to the development of successful regional cross-border power trading.** In particular, the ECOWAS protocol specifically addresses the following important issues in some detail:

- Protecting foreign investments
- Establishing non-discriminatory conditions for energy imports and exports
- Resolving disputes between participating states
- Establishing strong legal entities and institutions.

Typically, the economic relationships between member states are addressed at the level of a Treaty, particularly regarding energy trading, the protection of foreign investments, and dispute resolution. These are typically higher-level policy issues that require guidance from political decision makers and senior government officials, rather than leaving regional institutions to support of these objectives. The ECOWAS Treaty is explicit on each of these issues, while the SADC treaty only addresses them indirectly with broad principles and objectives.

In addition, the ECOWAS heads of state have issued a number of “Supplementary Acts” that give specific guidance and political approval on key implementation issues. For example, the Executive Board of ECOWAS issued a resolution adopting the outcome of the WAPP study on implementing the transmission line interconnection between Ghana, Togo, and Benin (ECOWAS Supplementary Act A/SA 3/01/08).

In contrast, the SADC Protocol on Energy does not address these points beyond outlining more general objectives such as:

- Striving to harmonise national and regional energy policies
- Cooperation in the development of energy and energy pooling to ensure security and reliability of energy supply and the minimization of costs
- Striving to ensure the provision of reliable, continued and sustainable energy services in the most efficient and cost-effective manner.

The SADC Protocol makes no specific provision for ensuring protection of foreign investments and ensuring non-discriminatory conditions for energy transit. The SADC Protocol focuses almost entirely on defining a series of broad objectives and providing for new institutions to support those objectives.

The failure of the regional community level treaty to explicitly articulate economic and legal protections would not be cause for concern if the responsibility for developing these rules was delegated to subsidiary entities established by the community. However, the arrangements in SADC do not appear to have achieved this outcome. In contrast, within WAPP the treaties, protocols, and subsidiary agreements are all consistent and explicit.

In addition to a regional energy sector protocol, WAPP and SAPP are governed by specific operating agreements that require additional commitments beyond the energy protocols for participation in the power pooling arrangement. The signatories of the operating agreements are the operating members of the pools—that is, they are typically the utilities, transmission providers, and investors as opposed to the states.

### **Processes are needed to obtain agreement on planning and trading issues**

WAPP and SAPP differ in the way their members gain agreement on planning and trading issues, and the level of recent success in developing priority projects.

The process for developing the Pool Plan is similar in WAPP and SAPP. The same consultants (Nexant) were used to develop Master Plans for each power pool, and the same methodology was applied. This methodology involved collecting information from member utilities on their national investment plans, and optimising investments to provide the lowest-cost investment sequence for the region. However, the roles of the pools in prioritising and promoting these projects, and the authority of the institutions supporting the projects vary significantly.

WAPP appears to have achieved success in recent years, very quickly agreeing on a list of immediate priority projects. In contrast, SAPP has struggled to gain agreement on the overall strategy for the pool. This may be a product of the level of energy sector development in the regions, and the formation of very different institutions and processes for moving projects forward. However, while both pools seem to have recognised the importance of new generation and transmission investments, WAPP seems to have had more success in developing effective ways of reaching financial close on a small subset of investments.

The lack of agreement on a pool plan in SAPP may not be important. It is unclear whether regional Master Plans are only indicative (as their titles would suggest), or whether the plans are binding in the sense that World Bank and other donors would limit their financing to plants that appear on the Master Plan. Several investments that would rely on cross-border trading that are not included in the Pool Plan have made some progress in recent months.

For example, the Moatize coal-fired power station and the Moamba gas fired power station in Mozambique. The more important area for agreement appears to be trading arrangements—how the physical power flows and financial payments in cross-border deals will be settled. These issues have not been finalised on a regional basis in either SAPP or WAPP, and therefore arrangements need to be negotiated as part of each transaction.

### **Annex: WAPP Member Utilities and Country Status**

Many of the countries in WAPP have been designated as fragile states by the World Bank, which means that they have recently emerged from conflict situations. In addition, many of the countries have been granted some form of debt relief under the Highly Indebted Poor Countries (HIPC) process. Table 5.3 lists the utilities in the WAPP members, and indicates whether each country is a fragile state or has been granted debt relief through the HIPC process.

**Table 5.3: WAPP Member Utilities and Country Status**

Country	Utility	Fragile State?	HIPC Country?
Benin	Société Béninoise d'Énergie Électrique(SBEE)	No	Yes
Burkina Faso	Société Nationale d'Électricité du Burkina (SONABEL)	No	No
Cote D'Ivoire	Société d'Opération Ivoirienne d'Électricité (SOPIE)	No	Decision Point
	Compagnie Ivoirienne d'Electricité (CIE)		
	AZITO - ENERGIE		
	CIPREL		
	Société de Gestion du Patrimoine du Secteur de l'Electricité (SOGPEPE)		
Ghana	Volta River Authority (VRA)	No	Yes
	Electricity Company of Ghana (ECG)		
	Ghana Grid Company limited (GRIDCo)		
Gambia	National Water and Electricity Company (NAWEC)	Yes	Yes
Guinée	Electricité de Guinée (EDG)	Yes	Decision Point
Guinea-Bissau	Empresa Publica de Electricidade e Agua de Guine-Bissau (EAGB)	Yes	
Liberia	Liberian Electricity Corporation (LEC)	Yes	
Mali	Energie du Mali (EDM)	No	No

Country	Utility	Fragile State?	HIPC Country?
Nigeria	Société Nigérienne d'Électricité (NIGELEEC)	Yes	No
	Power Holding Company of Nigeria (PHCN)		
	Transmission Company of Nigeria (TCN)		
Senegal	Société d'Électricité du Sénégal (SENELEC)	No	Yes
Sierra Leone	National Power Authority (NPA)	Yes	Yes
Togo	Compagnie Énergie Électrique du Togo (CEET)	Yes	Decision Point
Benin	Communauté Électrique du Bénin (CEB)	Yes	Decision Point / Completion Point
Mali, Senegal	Société de Gestion de l'Énergie de Manantali (SOGEM)		

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## 6 United States (New England) and Canada

North America has some of the most advanced power pools and power trading schemes in the world. The institutional arrangements for power trading between the United States and Canada are well developed, and generation and transmission infrastructure is available for cross-border trading. Three of the most mature power trading systems in the world are located in the north-eastern United States, each having independent system operators, liquid markets for power trading, and frequent investment in new infrastructure.<sup>27</sup>

This case study considers how one of these power trading systems, the New England Power Pool (NEPOOL), established large-scale cross-border power trading with Canadian power producers from 1970–1985.<sup>28</sup> During this period utilities, state governments and regulators in the north eastern region of the United States were searching for ways to improve grid reliability, following the Great Blackout of 1965. One way to ensure security of supply was to expand international power trading with Canada. As a result, new institutions emerged to address issues of power pooling within the complex, interconnected system within the United States, and to address the unique issues raised by cross-border power trading.

The main lesson that can be drawn from the North American experience is that regulation need not represent a barrier to investment, even when multiple approvals are required. Furthermore, cross-border trading appears to be more likely to occur if there are well defined processes for evaluating the impacts of proposed purchases and new transmission facilities. The regulatory roles in the United States—those of the Federal Power Commission (FPC) and later Federal Energy Regulatory Commission (FERC), as well as those of State Public Utility Commissions (PUC)—are well-defined, and regulators work with utilities, producers, and developers to clarify regulatory expectations. This level of regulatory transparency further helps potential project developers assess whether their project is competitive with other deals in the region.

Another lesson that can be drawn from North America is the benefits of introducing independent governance arrangements for regional entities. As power pools in the United States have expanded their membership to include non-utilities (IPPs, industrial customers that purchase across borders, independent transmission companies), the formal governance of the pool needs to change from stakeholder governance to independent governance.

In Section 6.1 this case provides a general overview of power trading in New England from 1970–1985, focusing on specific cross-border power trades with Canada. In Section 6.2 we discuss possible lessons that can be drawn from the case study for Southern Africa.

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<sup>27</sup> Specifically the Pennsylvania-Jersey-Maryland (PJM) interconnection, ISO-New England (ISO-NE) and the New York ISO (NYISO).

<sup>28</sup> ISO-NE evolved from NEPOOL.

## 6.1 The New England Power Pool and Cross-Border Power Trading with Canada<sup>29</sup>

Since its establishment in 1971, NEPOOL has experienced considerable change.

NEPOOL was initially conceived as a club of the larger investor-owned utilities in the region in the late 1960s. Several NEPOOL satellite control centres began operating between 1968 and 1970. However, small municipally owned utilities in the region filed a complaint with the FPC—the forerunner to FERC—challenging the exclusive nature of NEPOOL membership and the pool’s ability to jointly develop resources. The FPC ordered the membership to be opened to all utilities in the region; broadening the membership of NEPOOL and helping smaller players take advantages of the scale economies enjoyed by larger members of the pool. NEPOOL was originally divided into three separate operating divisions:

- The New England Power Exchange (NEPEX) was in charge of operating the New England system as if it were one large, vertically integrated utility operating under a centrally dispatched system
- New England Power Planning (NEPLAN) was responsible for coordinating the generation and transmission planning activities for the pool’s members
- NEPOOL Billing—though originally part of NEPEX—was responsible for settling and billing the exchange of energy, capacity and ancillary services through NEPOOL’s electricity markets.

Although the centralised dispatch from the large number of utilities involved in the pool was challenging, the emphasis on developing strong institutions has been important in maintaining flexibility to adapt to changes in the New England power system.

Today, NEPOOL is operated by a regional Independent System Operator (ISO), ISO-NE. There are 350 generating facilities located in NEPOOL, owned and operated by more than 35 companies. The pool contains more than 30,000 MW total installed generation capacity, and has more than 1,500 MW of demand response capacity. Current members of NEPOOL include investor-owned private utilities, municipal and consumer-owned systems, joint marketing agencies, power marketers, load aggregators, generation owners and large electricity users. As membership in the pool expanded, there were parallel changes in governance. Today, ISO-NE (the successor to NEPOOL) is governed by an independent board whose members are not allowed to have any affiliation with market participants.

NEPOOL’s transmission infrastructure is owned by eight companies, many of them privately-owned. Many of the transmission companies in NEPOOL also own transmission infrastructure that is located outside of their particular supply area; for example, through joint ventures with other transmission providers. The interconnected grid is made up of more than 8,000 miles (12,900 km) of transmission lines. This includes 2,000 miles (3,200 km) of high voltage 230 kV and 345 kV lines, as well as approximately 5,500 miles (8,850 km) of 69 kV to 115 kV lines. There are four high voltage transmission lines interconnecting

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<sup>29</sup> There were two types of cross-border trades in New England. The first type (which is the subject of our case study) involved imports across the international border with Canada. The second type involved long term purchases of power from new base load plants located in the service territory of one New England utility to buyers in other New England states. It was typically the case that the buyers or off-takers were also partial owners of the plant. This type of arrangement (that is, where the owners are off-takers) is similar to what has been proposed for Inga 2.

NEPOOL with neighbouring grids in the Canadian states of New Brunswick and Quebec, and eight transmission interconnections with the state of New York. New England also has three HVDC interconnections with neighbouring systems.

New England is a summer peaking system, with daily peak demand ranging from 19,000 MW to 24,000 MW in the summer, and 18,000 MW to 20,000 MW in the winter. Total import capacity limit from Canada through the three major interconnections with Canada (Hydro Quebec I and II, and New Brunswick) amounts to around 3,400 MW, or 10–15 percent of peak demand.

The market for power trading has also continued to evolve, with more than 300 participants in regional energy market and total wholesale energy sales of \$10 billion in 2007.

### **What are the benefits of regional trading for New England?**

NEPOOL's objectives were to ensure reliable bulk power supply and to attain maximum economies of scale for the pool area. These objectives have been accomplished through joint participation in planning and coordinated system expansion, centralised dispatch of generation, and information sharing on maintenance scheduling.

### **What is the vision for cross-border power trading between New England and Canada?**

The New England Power pool was conceived to provide a basic platform for trading to take place between utilities. Cross-border trading within the pool, and with Canadian provinces is undertaken through a variety of contracts, including

- Long term bilateral deals, both firm and non-firm
- Short term balancing transactions
- Day ahead trading
- Spot market trading.

### **What cross-border power trading currently exists in New England?**

During the period from 1970–1985, NEPOOL focused on developing two types of power trading, namely:

- Supply from Pool Planned Units and Pool Transmission Facilities within the United States (domestic cross-border trading)<sup>30</sup>
- Cross-border power trading with Canadian power producers (international cross-border trading).

#### Supply from Pool Planned Units and Pool Transmission Facilities

One of the major advantages to power pooling in New England was the favourable treatment of Pool Planned Units (PPUs) and Pool Transmission Facilities (PTFs) given to pool members who received these designations for their planned generation and transmission investments.

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<sup>30</sup> Here the border refers to the borders between the services territories of the various New England utilities and **not** to the international border between Canada and the United States.

- **Pool Planned Units.** PPU were new generation facilities located within pool member states. Examples of PPUs include the Canal Unit 2 thermal power station and the Seabrook Station nuclear power plant
- **Pool Transmission Facilities.** Transmission lines associated with PPUs were designated as PTFs, and owners of PTFs were paid a common NEPOOL transmission tariff. PTFs are generally higher than 69 kV, and facilities over 230 kV receive an Extra High Voltage (EHV) tariff. When open access to transmission was granted in 2000, transmission facilities that were not associated with PPUs also received the PTF designation.

The single PTF “postage stamp” transmission rate for supply from PPUs across New England overcame some of the challenges with developing new generation facilities. Utilities paid the same rate regardless of the distance that the power was deemed to travel. New and existing generation projects that were not designated as PPUs were subjected to tariff “pancaking”—that is, there was separate transmission charge for each line that the power was transmitted across based on transmission contracts.

Because the designation of PPUs was reserved for facilities located within New England, cross-border power developments with Canada were subject to different transmission pricing arrangements.

#### Cross-border power trading with Canadian power producers

Prior to the formation of NEPOOL, there had been a long history of small, bilateral power trading between Hydro Quebec and Vermont and New York states. However, this cross-border trading started to expand greatly in the late 1960s. The scale of NEPOOL’s collective purchasing power from the late 1960s (when major investor-owned utilities were planning the power pool) is illustrated by two power deals struck in the 1970s and 1980s.

- **New Brunswick**—Involved the construction of a 350 kV line between Maine and New Brunswick to facilitate supply from Quebec, wheeled through New Brunswick. The total cost of the US construction was US\$18.5 million (in 1970 dollars)
- **Hydro Quebec**—Agreement to purchase surplus power from Canada’s Hydro Quebec through Hydro Quebec Phase I in 1983 and Hydro Quebec Phase II in 1985. The Phase II power purchases were valued at US\$2.5 billion.

Figure 6.1 illustrates the location of the transmission assets used to transport power supplied from New Brunswick and Hydro Quebec. The figure also shows the location of the major nuclear Pool Planned Units commissioned in New England prior to 1985. Figure 6.2 illustrates the major pool planned generation assets in NEPOOL in 1985. The figure also highlights the location of cross-border transmission lines.



Figure 6.1: Map of Major Generation and Transmission Units in Canada (c.1985)

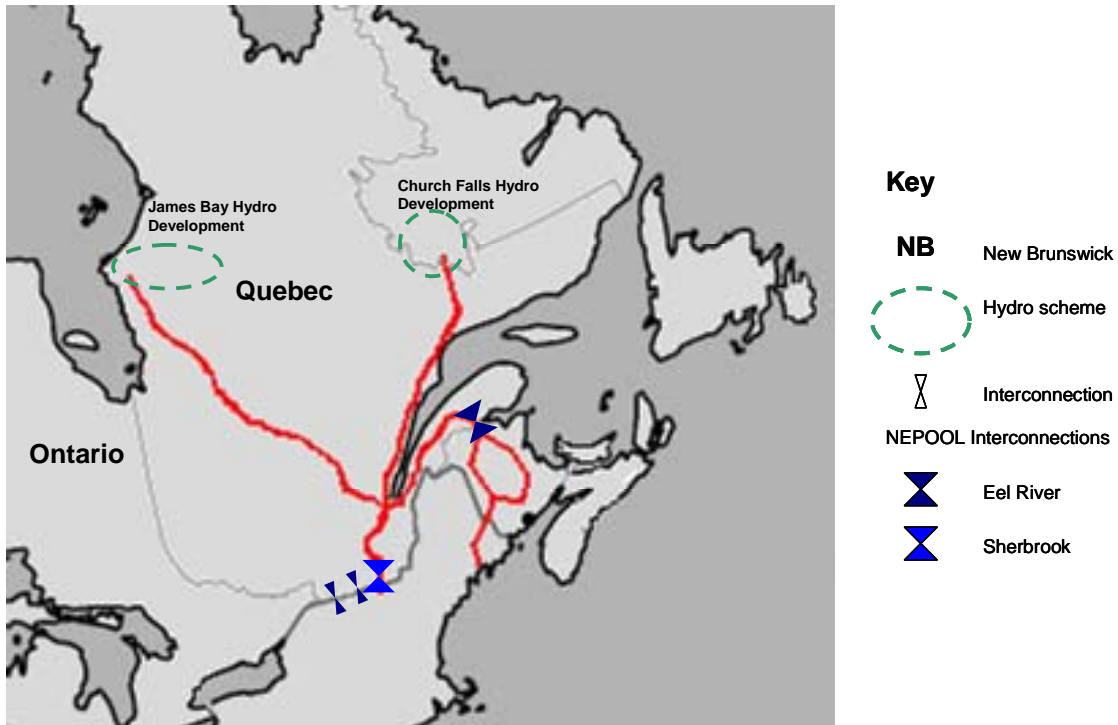
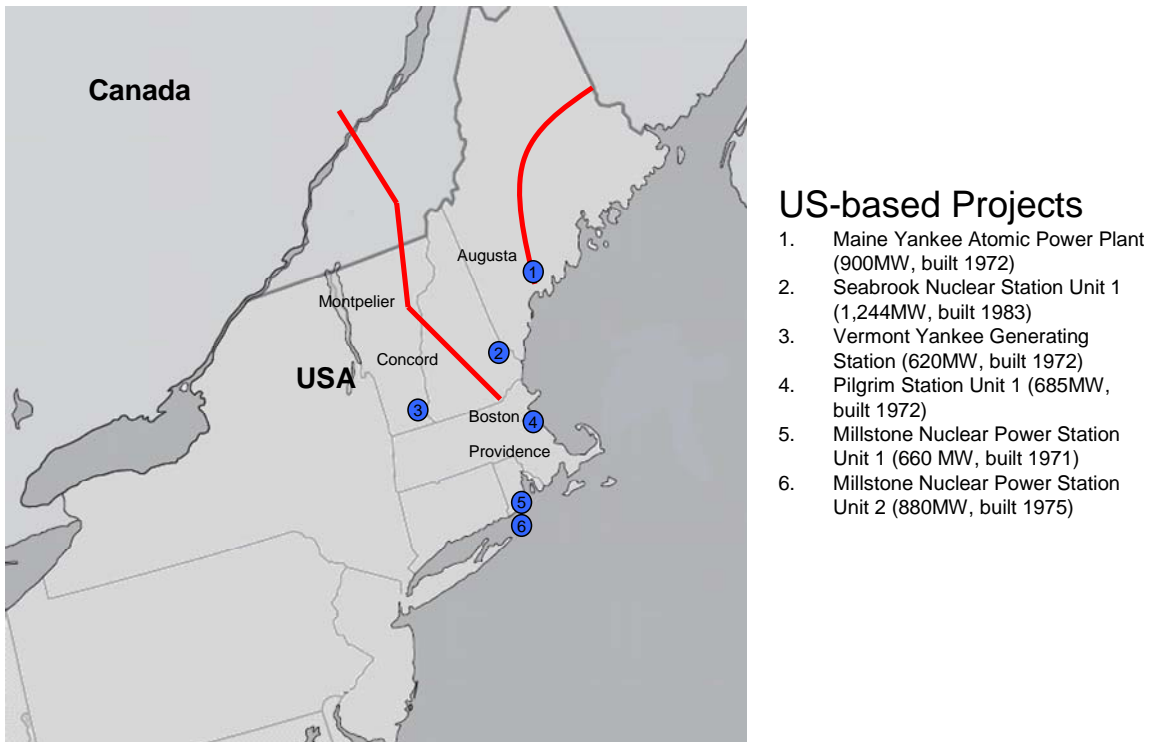


Figure 6.2: Map of Major Generation and Transmission Units in United States (c.1985)



In 1983, following several years of project development and negotiation, NEPOOL utilities agreed to a surplus power purchase agreement with Hydro Quebec for 3,000 GWh per year. This was followed shortly by the larger Hydro Quebec Phase II firm power purchase agreement that involved the importation of 7,000 GWh per year. This was estimated to meet seven percent of electricity demand within New England in 1990 (New York Times, 1984).

To provide access to facilities for the Hydro Quebec deals, NEPOOL members and Hydro Quebec negotiated use and support agreements with each generation and transmission facility. As with the earlier New Brunswick deal, formal agreements were negotiated between the various NEPOOL members that would benefit from the project and the agreements also dictated how the project costs would be shared. NEPOOL had no direct role in negotiating the terms and conditions of these imports. NEPOOL's role focused on evaluating the physical and reliability impact of integrating the imports in the New England transmission grid.

### **What infrastructure investment was planned to facilitate more trading?**

Generation and transmission infrastructure investment has been gradual following the major cross-border deals with New Brunswick and Hydro Quebec, and has mostly taken place within New England. Many of the nuclear facilities planned prior to the formation of NEPOOL were commissioned, along with supporting transmission infrastructure. New transmission lines have also been built to deliver output from jointly owned units, PPU's and long-term entitlements to meet each utility's service requirements. Some additional transmission investment has also been made to enable more efficient centralised dispatch of generation by the independent system operator.

### **How are decisions made on planning, building infrastructure, and negotiating cross-border power deals?**

NEPOOL governance and decision-making has evolved significantly from the initial pool design. Initially, NEPOOL was a club of utilities, with 13 members and 3 operating units. Decisions were made entirely by a participants' committee and each member with at least 3 percent of pool demand was allocated one representative on the committee, with larger members allocated 2 or more representatives.

The decision to participate in the Hydro Quebec and New Brunswick power deals were relatively straightforward. The deals provided the utilities in New England with access to lower cost electricity, creating an incentive for utilities to cooperate in developing and funding the projects. In both cases, the utilities negotiated formal agreements on a voluntary basis that determined how the projects would be funded.

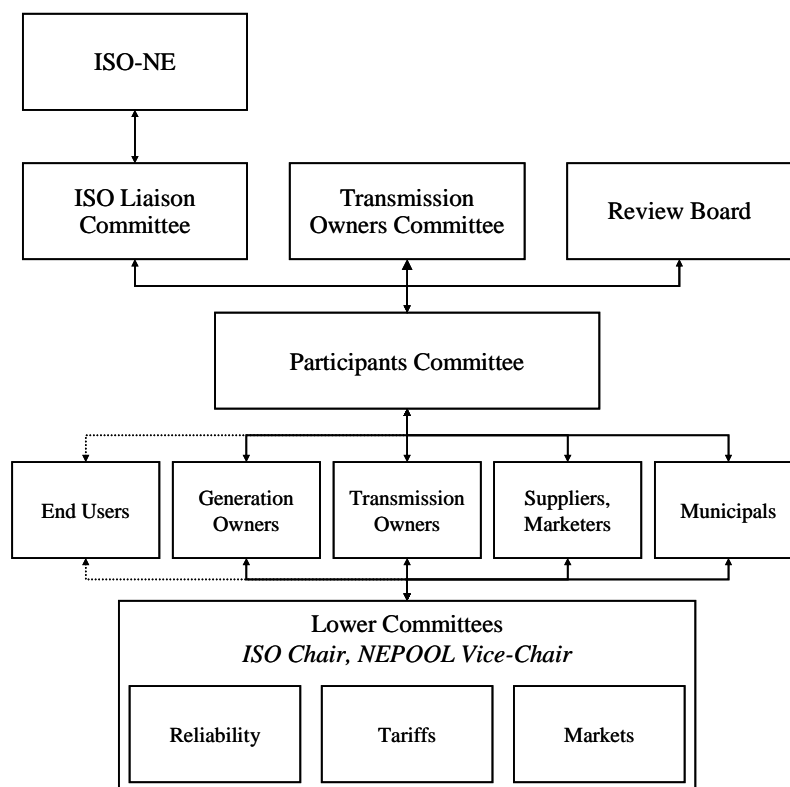
A lead purchaser was appointed by NEPOOL members to lead the negotiations for the cross-border trades with Canadian power producers. The lead purchaser also took responsibility for managing the project, and established a Special Purpose Vehicle (SPV) to fund the project. In the case of the New Brunswick power deal, the Maine Public Utilities Commission established the Maine Electric Power Company (MEPCO) to construct the transmission line to the Canadian border with New Brunswick.

All other interested parties were permitted to take an equity stake in the SPV, which then entitled the equity-holding utility to a share of the capacity of the power deal. The relationship between equity participation and off-take agreements was not necessarily one-for-one, and was subject to negotiation between the members of NEPOOL.

Today, NEPOOL has over 100 members. In the 1990s, the governance of NEPOOL moved to a multi-sector structure, with transmission, generation, public power, suppliers, and consumers all having voting rights. However, experience proved that it was difficult to make decisions under these arrangements when there was a diversity of interests between constituents—which is the very nature of the pool (AIM Foundation, 2003). Accordingly, in 2004 FERC ordered that decisions affecting the pool would be made by the independent system operator, ISO-NE. NEPOOL continues to have a participants’ committee, although this committee is now overseen by the ISO.

The current NEPOOL governance structure is illustrated in Figure 6.3. Under this structure, ISO-NE is ultimately responsible for setting market rules.

**Figure 6.3: Current NEPOOL Governance Structure**



Source: ISO-NE

**What agreements have been reached on planning, pricing and settlement rules?**

NEPOOL was structured as a “tight” power pool, which means that a single, centralised dispatch distributes the lowest-cost available generation to meet demand throughout the pool, given the physical constraints of the transmission system.

The savings generated through centralised dispatch were initially directed into a special fund, and allocated to individual utilities as ‘Savings Shares’. The shares paid to each member utility were determined by comparing the estimated cost that each utility would have borne using its own generation resources to the actual cost of generation supplied. Utilities with lower-cost generation sources and output greater than needed to supply their own customers

were compensated for their operation through savings shares. This system was difficult to administer due to the need to accurately estimate avoided generation costs, and has been replaced by a locational marginal pricing system that calculates different prices depending on the location of demand.

Transmission tariffs are authorised by FERC for both cross-border and pool planned transmission units. For purchases where generation resources are located far from the demand this approach resulted in the payment of multiple transmission charges to different transmission operators—known as tariff “pancaking”. In addition to FERC-authorized rates and common tariffs for PPU’s, there were also some unique transmission arrangements that pre-dated NEPOOL, such as the transmission arrangements for some of the older nuclear units.

In 1997 a new transmission pricing regime went into effect in NEPOOL to overcome some of the barriers of having multiple different transmission charges. Under the new regime, New England has started to move towards common postage stamp transmission tariffs for using any line using pool transmission facilities.

**What role does regulation play in cross-border trading, and how have regulatory powers been exercised?**

Cross-border power trading between the United States and Canada is subject to regulatory scrutiny by various government and regulatory agencies on both sides of the border. However, the involvement of different regulatory entities does not appear to have significantly delayed new investment, with regulatory processes widely understood and consistently applied.

This case study considers two particularly important regulatory powers for cross-border trading between New England and Canada:

- Licensing and permitting of new cross-border generation and transmission assets and cross-border trading
- Allowing pass-through of power purchasing costs into retail tariffs.

The responsibilities of the principal regulatory bodies in the United States and Canada are summarised in Table 6.1. The two sets of responsibilities are then explained in more detail under the following sub-headings.

**Table 6.1: Regulatory Responsibilities for Cross-border Trading in North America**

	<b>US DOE</b>	<b>US FERC</b>	<b>US State PUCs</b>	<b>Canada NEB</b>
Licensing and permitting new generation and transmission	Responsibility for licensing new generation and transmission assets for cross-border power trading	Proposal must not have adverse impacts on the reliability of domestic power systems FERC approves “just and reasonable” transmission tariffs	Responsibility for granting right-of-way approvals	Responsibility for licensing exports Proposal must not have adverse impacts on the reliability of domestic power systems Proposal must meet “Fair Market Test”
Allowing pass-through of power purchasing costs into retail tariffs			Review the reasonableness of power imports (prices and quantities) Financial benefits to consumers must exceed the associated cost increase	

Licensing and permitting of new generation and transmission assets

The US Department of Energy (DOE) has responsibility for licensing new generation and transmission assets that will be used for cross-border power trading. Any party, public or private, wishing to build a transmission facility near the United States border, or engage in cross-border power exports, must apply to the Department of Energy for approval. The cross-border deals completed during the 1970s and 1980s also needed the approval of the Federal Power Commission (the predecessor to FERC) for transmission plans.<sup>31</sup>

In the United States, a transmission owner or operator submits proposed prices and conditions in the form of a sales contract or a tariff of general applicability for FERC approval. FERC assesses transmission tariffs according to whether the rates are “just and reasonable.” The rates, terms and conditions also must not be unduly discriminatory or preferential.

Similar approvals are needed to from Canadian provincial authorities, in particular the National Energy Board (NEB). Applications for these approvals in the transactions in the 1970s and 1980s were made by the Canadian parties to the cross-border deals. In Canada, there is no Federal presence in pricing tariffs and transmission tariffs, although trading quantities and costs must be reported. Prices were based on commercial dealings between exporting and importing jurisdictions, reflecting market supply and demand conditions. Some provinces also have market rules that prevent imports from setting the market price when the import price is above the price that would be established by domestic generators (NAEWG, 2002).

<sup>31</sup> The authority to issue export licenses to US utilities now resides with the US Department of Energy. The US DOE is comparable to an energy or power ministry.

Exporters in Canada and the United States must obtain export licenses for their proposed exports in addition to the licenses to build the facilities. In both the United States and Canada, proposed transmission facilities for cross-border power trading must not have adverse impacts on the reliability of domestic power systems. Some of the other criteria used by the Canadian NEB and the US FERC differ. For example, the NEB in Canada employs a “Fair Market Test” in reviewing exports, while authorities in the United States do not impose this requirement (NAEWG, 2002). The Fair Market Test requires proposed exporters to:

- Inform parties that have declared an interest in buying electricity for consumption in Canada of the quantities and class of service for sale
- Provide those parties with an opportunity to purchase the electricity on terms and conditions as favourable as the proposed electricity export.

Unlike many countries in the SADC region, in the United States and Canada there is no requirement that the importing entity obtain an import license from any national governmental entity.

Applications for permits for new assets must be submitted to the relevant state PUC(s), which hold public hearings to decide whether to grant the permit application based on the costs and benefits of the proposal to the state. FERC has recently been granted responsibility for approving or rejecting transmission projects in designated National Interest Corridors. These corridors are defined by the DOE, and to date have been domestic rather than cross-border corridors. However, prior to this authority being granted, siting authority over transmission lines was exclusively a state function. These proceedings have become contentious and active civil society groups have fundamentally altered the context in which permitting regulation is applied in the United States.

The parties to the cross-border deals were also responsible for seeking right-of-way approvals from State governments. State PUCs take the lead role in transmission issues at the state level, deciding on transmission corridor access (*ex ante*) and the recovery of transmission investment costs (*ex post*).

#### Allowing pass-through of power purchasing costs into retail tariffs

All cross-border deals were initially agreed on the basis that all the costs of purchasing power would be passed through to consumers. Regulators provided tacit *ex-ante* approval for pass-through by meeting with parties to the deal at specified occasions in the negotiation process. Once the deal had been finally negotiated it would be formally approved by the relevant authority.

The reasonableness of power imports (prices and quantities) are reviewed in proceedings run by state PUCs, which have regulatory jurisdiction over the retail tariffs of the buying utility. In the application for cost pass-through, utilities needed to demonstrate that the financial benefits to consumers from the power purchase exceeded the associated cost increase. Because the cross-border deals allowed NEPOOL member utilities to take advantage of lower cost generation, and therefore lowered the cost of serving New England consumers, regulatory approvals were relatively straightforward.

Unlike in Southern Africa, the New England state PUCs did not review the purchases in the context of a request for an import license. Instead, they looked at the “prudence” of the

purchase in separate proceedings or as one cost element to review in the context of a general tariff review. However, the standards that they applied are similar to those that have recently been proposed by NERSA in its consultation on proposed rules for allowing Eskom to pass through power purchase costs (whether from domestic or international suppliers).

Regulation in the United States has evolved to accommodate new trading arrangements. ISO-NE now is responsible for setting market rules, and submits all applications for changes in tariffs and new transmission investments to FERC.

## **6.2 Lessons for Southern Africa from the Experience in North America**

In this section, we discuss the lessons that can be drawn for SAPP from the experience of NEPOOL in the 1970s and 1980s. Comparison between the early stages of NEPOOL and SAPP is useful because NEPOOL in the 1970s and 1980s was at a similar level of institutional and infrastructure development as SAPP is today.

NEPOOL and SAPP are also similar in the way that Power Pool agreements and Operating Agreement between members are drafted. The NEPOOL agreement provides a detailed institutional framework for the Pool, but the agreement contains limited detail on the pool's operational procedures. This is also the case with SAPP—the agreement contains general objectives and statements about what the operational procedures should do, but the details and drafting of formal rules are left to relevant committee within the pool.

Under the following subheading we discuss a particular lesson from the experience in North America that helped to facilitate the development of cross-border power trading and large-scale generation investments within the region—that effective and well-managed regulation should not represent a barrier to investment, even when multiple approvals are required.

### **Effective and well-managed regulation can assist cross-border power trading**

In NEPOOL, various different authorities were involved in approving cross-border power deals—State PUCs in the US, the US FERC, and the Canadian National Energy Board. . Additional approvals were also required for the MEPCO line for the first cross-border trades in the 1970s. The regulatory approvals process was sufficiently similar to other approvals they had to obtain for domestic projects that there were not major regulatory barriers to investments. The interaction of NEPOOL members and the variety of Federal and State regulators in the United States illustrate the role of effective regulation in an importing country. The role of a regulator in an importing country is to assess whether the price and non-price conditions—such as costs and risks—of a power purchase should be passed through into retail tariffs. In order to ensure that this role does not cause unnecessary burdens on power producers, investors and project developers, it is important for them to have clarity on how regulatory responsibilities will be carried out. For example, it is important that a regulator does not get involved in negotiations, but rather is available to give benchmark indications as to acceptable prices and risks.

The regulatory roles in the United States—those of the FPC and later FERC, as well as those of State PUCs—are well defined and regulators work with utilities, producers and developers to clarify regulatory expectations. This level of regulatory transparency further helps potential project developers assess whether their project is competitive with other deals in the region.

### **Independent governance arrangements can facilitate cross-border trading**

A second lesson that can be drawn from North America is the benefits of introducing independent governance arrangements for regional entities. As power pools in the United States have expanded their membership to include non-utilities (IPPs, industrial customers that purchase across borders, independent transmission companies), the formal governance of the pool needs to change from stakeholder governance to independent governance.

In the 1990s, the governance of NEPOOL moved to a multi-sector structure, with transmission, generation, public power, suppliers and consumers all having voting rights. However, experience proved that it was difficult to make decisions under these arrangements when there was a diversity of interests between constituents—which is the very nature of the pool. Accordingly, in 2004 FERC ordered that decisions affecting the pool would be made by the independent system operator, ISO-NE.

There are alternative “hybrid” governance arrangements in addition to utility decision-making and independent boards (Tenenbaum, Woolf and Barker, 1997). For example, certain seats on a decision-making body can be set aside for independent members. External experts can also be brought in to provide a measure of independence or to incorporate regional benefits into decisions. Southern Africa may begin by adopting these hybrid approaches as a step towards independent governance.

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## 7 Greater Mekong Subregion

In this section, we provide a case study of the Greater Mekong Subregion (GMS) electricity market consisting of the China (Yunnan Province), Lao PDR, Myanmar, Thailand, and Vietnam. In Section 7.1, we describe the GMS electricity market and the efforts undertaken to expand the market. In Section 7.2, we draw upon the experiences in GMS in developing lessons for the SADC region.

From our review of the experience in GMS, we conclude that the region has had success developing bilateral cross-border power trades. This may be due to the emphasis that has been placed on ensuring a gradual evolution of the regional market from bilateral contracts to a more complex, centralised regional trading system. This has allowed the countries to successfully focus on the developing bilateral trades in the short-term, without having to rely on regional trading arrangements.

The GMS has the aim of progressing towards a more centralised regional trading system, which would be helped by a:

- Strong, enforceable inter-governmental commitment, and
- Regional decision-making entities.

### 7.1 Cross-border Power Trading in the Greater Mekong Subregion

The countries of GMS first documented their intention to develop the infrastructure and institutions necessary for cross-border power trading in the 1998 Policy Statement on Regional Power Trade in Greater Mekong Sub-Region, adopted at the Fifth Electric Power Forum Meeting. In 2003, the GMS governments (“the Governments”) signed an Inter-Governmental Agreement (IGA) on Regional Power Trade in the Greater Mekong Sub-Region. The IGA created the Regional Power Trade Coordination Committee (RPTCC), which is tasked with coordinating the activities of the GMS member states and conducting planning and system operation studies to move towards common power trading guidelines.

More recently, the Governments have signed two memoranda of understanding (MOUs). In signing the first MOU, the Governments agreed to implement the first of four stages in the development regional power trading. In the second MOU, the Governments agreed to a timeline for the implementation of the first stage. An overview of this timeline is provided in Table 7.1.

Over the last 15 years, both the World Bank and Asian Development Bank (ADB) have supported the development of the regional market through technical assistance packages. The ADB has also provided debt finance for specific cross-border, bilateral transmission and generation projects, including:

- US\$60 million (approx.) in debt financing for the Theun-Hinboun Hydropower Project
- US\$52 million for the Nam Leuk Hydropower
- US\$100 million for the Na Bong-Udon Thani Power Transmission project
- US\$120 million in support (loans and credit guarantees) for the Nam Theun 2 Hydroelectric Project.

## What are the benefits of electricity trading in the Greater Mekong Subregion?

Power trading in the GMS has the following potential benefits:

- **Efficiency benefits**—The substitution of hydropower for coal and other fossil fuels is expected to decrease the cost of power production
- **Environmental benefits**—The regional electricity market is expected to allow hydropower development in Lao PDR, Burma and Yunnan, which is anticipated to achieve environmental benefits by substituting hydropower for coal and other fossil fuels
- **Competition driving down prices**—Competition among different dam projects in a regional spot market is expected to drive prices down so consumers will enjoy low, competitive prices
- **Decreased reliance on petroleum imports**—The ADB reports that the region imports 20 percent of its crude oil and 47 percent of its petroleum products. In 2005, 23 percent of the region’s energy was imported (Zhai, 2008)
- **Concessional debt financing and technical assistance from the ADB and the World Bank**—The ADB and the World Bank have funded several of the studies on the feasibility of power trading. The ADB has provided debt financing to three large hydropower projects and one transmission project, and plans to provide debt financing for 10 large hydropower plants and two major transmission lines between 2009 and 2010. The World Bank has provided debt financing for feasibility studies and transmission projects
- **Reduced costs and reserve margin needs through peak sharing**—This is a commonly cited benefit of the power trading in the GMS. However, it is estimated that peaking shifting would result in only a 2.5 to 2.6 percent peak load reduction for the entire GMS region.

It is not clear what proportion of these benefits would be achieved by simply creating a more conducive investment environment for large bilateral trades (as opposed to introducing competitive market platforms). If most of the overall benefits could be obtained from bilateral or trilateral deals, it would appear to make sense to focus on establishing a framework to facilitate those large trades, and leave other developments for the future.

## What is the vision for cross-border power trading in the Greater Mekong Subregion?

With the assistance of two consulting firms, Energy Markets Group and Soluziona, the RPTCC developed a Regional Power Trade Operating Agreement (RPTOA). Based on the comments received from GMS countries and ADB, the final RPTOA in 2004 decided that the GMS countries would eventually move to a wholly competitive centralised regional trading system. While it appears that “wholly competitive” means an electricity spot market, this is not clear from existing documentation.

The RPTOA recommends that the GMS regional electricity market develop in four stages. While the GMS Governments have agreed to a detailed implementation plan for Stage 1, the remaining three stages are still under discussion. The bullet points below describe the four stages, and what GMS Government agreements will likely be necessary to complete them:

- **Stage 1**—Bilateral cross-border connections through power purchase agreements (PPAs)
- **Stage 2**—Grid-to-grid power trading between any pair of GMS countries, eventually using transmission facilities of a third regional country. Grid-to-grid trading is not defined, but presumably includes short-term and non-firm trading. In order to complete the Stage 2, the GMS countries would need to reach an agreement on how wheeling services are to be priced
- **Stage 3**—Development of transmission links dedicated to cross-border trading. This stage envisages that new transmission investments will be made solely for cross-border trading. To complete Stage 3, the GMS Governments would likely have to agree to a transmission pricing methodology
- **Stage 4**—Most GMS countries moving to a centralised regional trading system, allowing a regional wholly competitive market to be implemented. To complete Stage 4, the GMS countries would need to come to agreements on regulating cross-border power trading and regional dispatch.<sup>32</sup>

The Governments have signed a Memorandum of Understanding (MOU) agreeing to the implementation of Stage 1 of the RPTOA. Three years later, the 2008 MOU on the Road Map for Implementing the Greater Mekong Subregion Cross Border Power Trading provided a more concrete plan and timeline for completing Stage 1.

To date, the ADB has supported four studies costing a total of US\$8.6 million. In 2005, the World Bank approved funding for a tariff study, technical assistance to support the implementation of transmission projects, and technical assistance to support the institutional development of Electricite du Cambodge (EDC), Cambodia’s state-owned, vertically-integrated utility. The World Bank-funded technical assistance projects are part of loans for the development of generation and transmission projects.

Table 7.1 shows the indicative timeline outlined in the Second MOU to complete of Stage 1 and to prepare for Stage 2.

**Table 7.1: GMS Cross Border Trade Road Map**

Milestone	Schedule
<i>Timeline to Fully Achieve Stage 1</i>	
Complete the indicative power interconnection Master Plan and select priority new interconnection projects for undertaking feasibility studies	2010
Complete the study on a GMS Performance Standards, for new regional interconnections and for the synchronised operation of interconnected grids	2010
Complete the study on Transmission Regulations	2010

<sup>32</sup> In contrast, SAPP seems to have undertaken Stages 1 and 4 at the same time with perhaps more emphasis, until recently, on the short-term Day Ahead Market, which normally not be expected to have much impact on investment decisions because it represents “trading around the edges.”

Milestone	Schedule
Complete studies of standard regional metering arrangements and power trade rules	2010
<b><i>Timeline to Prepare for Stage 2</i></b>	
Identify regulatory barriers to the development of power trade and implementation of next stages	2012
Complete a study of GMS Grid Code operating procedures	2012
Complete a study on Stage 2 Transmission Regulations to allow third party access in interconnections, giving priority to contracts/PPAs including Stage 2 power trade rules, and Dispute Resolution Mechanism	2012

Source: Memorandum of Understanding on the Road Map for Implementing the Greater Mekong Subregion Cross Border Power Trading<sup>33</sup>

### **What cross-border power trading currently exists in the Greater Mekong Subregion?**

The first power trade in the GMS occurred in 1971 with Lao PDR's power export from its Nam Ngum hydropower plant to northern Thailand. According to the ADB, this trade allowed the electrification of a remote area of Thailand that would have been much more expensive to accomplish from a domestic Thai source (Zhai, 2008).

From 1994 to 2005, the ADB loaned the Governments US\$1.7 billion for three generation projects and one transmission project. In 2005, the World Bank approved loans to support the development of one generation project and six transmission projects.

Existing power trades in the GMS are based on long-term, bilateral contracts for one-way power flows between hydro IPPs in Lao PDR and the Electricity Generating Authority of Thailand (EGAT).<sup>34</sup> These contracts have allowed the development of export-oriented IPPs in a less-developed country with abundant energy resources, to export to a more developed country with higher demand for electricity. The IPPs in Lao PDR that sell power in to Thailand are:

- **Nam Ngum**—150 MW
- **Xeset**—1.40 MW
- **Theun Hinboun**—210 MW
- **Houay Ho**—150 MW.

There will be a large increase in bilateral, cross-border trading when Nam Theun 2 (a 1,088MW hydro IPP in Lao PDR) begins selling electricity to Thailand later this year.

<sup>33</sup> The MOU is available at: [www.adb.org/Documents/Events/Mekong/Proceedings/FG6-Appendix3.pdf](http://www.adb.org/Documents/Events/Mekong/Proceedings/FG6-Appendix3.pdf) (accessed 24 August, 2009).

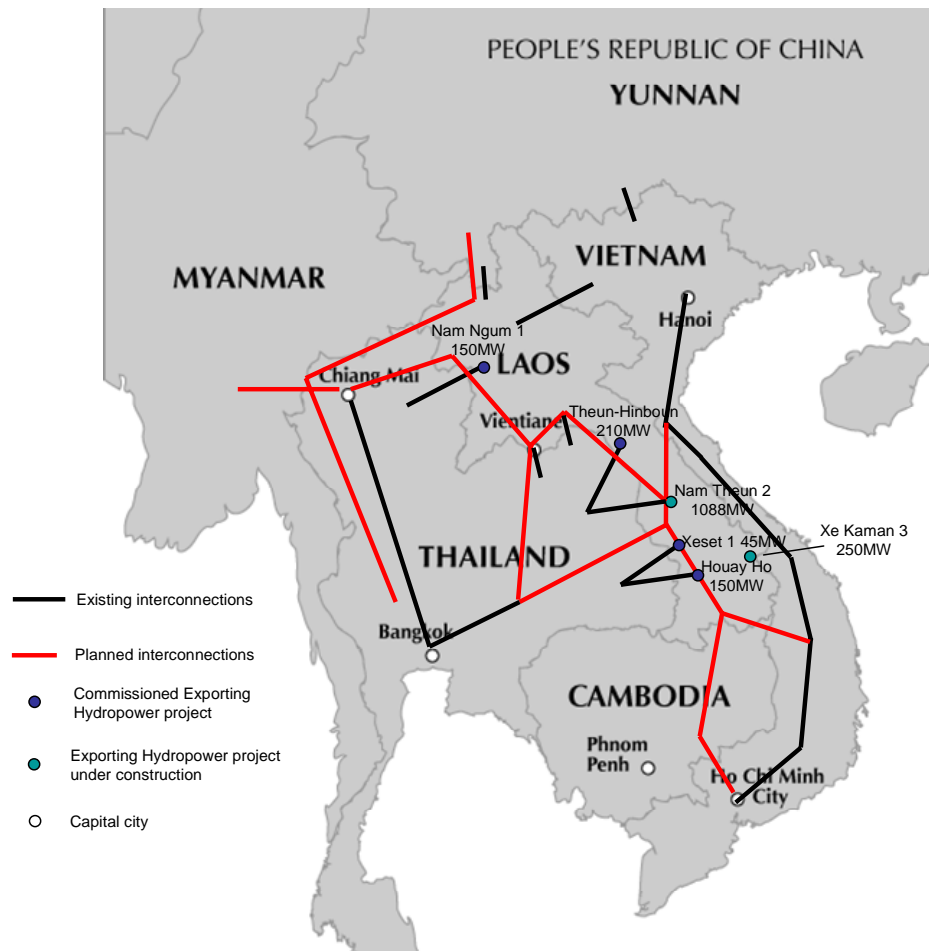
<sup>34</sup> GMS is similar to SADC in that the current market has one dominant buyer. For GMS, it is EGAT. For SADC, it is Eskom.

### What infrastructure investment is planned to facilitate more trading in the future?

In 2000, the ADB published the Indicative Master Plan on Power Interconnection in the Greater Mekong Subregion (the “Master Plan”). The Master Plan estimates that the total cost of the proposed interconnections to be US\$1,902 million. It is unclear whether the GMS Master Plan is only an indicative plan, or whether the Governments and development partners intend to limit their support to plants that appear on the Master Plan.

Figure 7.1 shows the key generation and transmission interconnections that are indicated in the Master Plan.

**Figure 7.1: Indicative Power Sector Master Plan for the Greater Mekong Subregion**



Source: Asian Development Bank

While most of the transmission interconnections outlined in the Master Plan do not yet have concrete implementation timelines, two of its key projects are currently being planned:

- **Ban Sok–Pleiku Project**—A group of hydropower projects in Lao PDR to be exported through a single 500kV transmission facility from Ban Sok substation in Lao PDR to Pleiku substation in Vietnam. The hydropower projects are Dak Emeule (138MW), Sekong 3A & 3B (152MW and 96MW), Sekong 4 (440MW), Xe Kaman 1 (468MW), Nam Kong 1 (240MW). The ADB is currently processing

a technical assistance package, and expects to provide debt funding to the project in 2010. Vietnam would be the major off-taker for these plants

- **Na Bon–Udon Thani Project**—Four hydropower projects in Lao PDR to be exported through a single 500kV transmission facility to Thailand. The hydropower projects are Nam Ngum 2 (615MW), Nam Ngum 3 (440MW), Nam Ngiep 1 (263MW), and Nam Theun 1 (520MW). ADB is providing an ongoing technical assistance package and will disburse a loan for the project in 2009.

### **How are decisions made for planning, building infrastructure, and negotiating cross-border power deals?**

There are two regional bodies that are currently responsible for planning transmission infrastructure:

- **The RPTCC** is tasked with coordinating the activities of the GMS member states and conducting planning and system operation studies to move towards common power trading guidelines. The Focal Group of the RPTCC was established to coordinate priority RPTCC activities in each country
- **The Planning Working Group (PWG)** was established to undertake planning and system operation studies that will help GMS countries move towards common power trading guidelines. The PWG is currently implementing the regional transmission planning provisions of the RPTOA.

To date, generation and transmission projects have been planned and built by consortiums of private companies and governments, and power deals have been negotiated on a bilateral basis. For example, Nam Theun 2 is owned 35 percent by Electricité de France, 25 percent by Electricity Generating Public Company (EGCO) of Thailand, 15 percent by the Italian Thai Development Public Company Limited (ITD) of Thailand, and 25 percent by the Government of Lao PDR. The consortium was responsible for building the facility and for negotiating the bilateral PPA with the Electricity Generating Authority of Thailand (EGAT), the sole off-taker.

The Nam Theun agreements provide compensation to the buyer (EGAT) when the seller fails to meet certain plant performance standards on registered capacity, minimum capacity, reactive power, and loading rates. These provisions help to manage security of supply risks by providing strong incentives to provide contracted power at the point of delivery. For additional information on the project, the Nam Theun 2 website provides useful summaries of the concession agreement, as well as a public version of the PPA ([www.namtheun2.com](http://www.namtheun2.com)).

### **What agreements have been reached on pricing?**

Currently, planning and pricing agreements are negotiated on a bilateral basis. As indicated above, the Governments have agreed to complete a study on transmission regulations and power trade rules, including a resolution mechanism for disputes outside existing PPAs by 2010. The RPTOA documents the Governments' intention to create a Regional Transactions Coordinator (RTC).

### **What role does regulation play in cross-border trading, and how have regulatory powers been exercised?**

The existing cross-border trades were negotiated and approved by the national utilities and various ministries in each of the countries.<sup>35</sup> This is because national electricity regulators were only recently created in GMS countries.

The RPTOA documents the Governments' intention to create a Regional Regulatory Board (RRB), which will consist of one member from each GMS country. (This is similar to the approach taken by ECOWAS in creating ERERA, the regional electricity regulator for the WAPP region.) The RRB would:

- Review and improve the RPTOA
- Set transmission tariffs
- Facilitate arrangements for construction of cross-border transmission facilities
- Evaluate reports of the PWG, and making decisions linked with recommendations for such reports
- Solve disputes that may arise from cross-border transactions, or from the use of cross-border transmission facilities, and
- Decide how to move to future stages of implementing the RPTOA.

Each GMS country has its own process for licensing new generation and transmission facilities. For example, a mining company in Thailand wishing to develop and power itself with a hydropower project in Lao PDR would be required to file separately for transmission licenses in both countries. It is not clear if there will eventually be a regional licensing process.

## **7.2 Lessons for Southern Africa from the Experience in the Greater Mekong Subregion**

In this section, we discuss the lessons that SAPP can draw from the GMS electricity market. An initial conclusion is that the GMS has made progress in reaching financial close on bilateral transactions, such as the Nam Theun II development between Laos and Thailand. This project should help to provide impetus for future trading arrangements, and provide valuable experience with the complex agreements required for a cross-border deal. However, the ability to conclude a bilateral deal like Nam Theun would clearly be more difficult in Southern Africa due to the greater interconnectedness between SADC countries. The level of interconnection in SADC makes issues such as balancing, loop flows, and transmission pricing more complex.

We also conclude that the Governments' progress towards their goal of developing a centralised regional trading system might be helped by:

- Bilateral trading, which is a good first step for developing cross-border supply

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<sup>35</sup> At this date (August 2009), national electricity regulators exist in Cambodia, Thailand, Vietnam and China. However, it appears that none of these regulators had any significant substantive involvement in the GMS discussions. One of the principal outputs of this project will be a set of guidelines for regulators in importing and exporting countries within SADC.

- Strong, enforceable inter-governmental commitment.

### **Bilateral trading is a good first step for developing cross-border supply**

Since the publication of the RPTOA, the GMS Governments' have emphasised a gradual evolution of the regional electricity market from bilateral trading to a centralised regional trading system. This emphasis on a gradual implementation has two potential advantages:

- Bilateral trades enable the benefits of a cross-border transaction to be realised immediately. While a centralised trading platform (or effective power pool) can take years to develop, bilateral trades can be negotiated over months. When a cross-border transaction is clearly cost-benefit justified or a purchasing utility has a strong preference for the deal, bilateral trading arrangements can enable the deal to proceed without detailed and complex regional agreements. In GMS, the Nam Theun II transaction was seen as a good option for the purchasing utility in Thailand
- Bilateral trading helps move toward future regional trading in the future. Bilateral trades help to develop the physical infrastructure that is needed to underpin cross-border trading. Short term trading does not provide sufficient revenue certainty to justify the construction of new generation and transmission facilities, which means that long-term bilateral deals are needed to provide investment certainty. Surplus capacity can then be used for short-term trading and emergency support.

While long-term cross border transactions have taken place in GMS despite the absence of a regional power pool, the GMS transaction-by-transaction approach may be feasible only when there are limited cross-border interconnections within the region. As regional interconnections grow, it becomes increasingly difficult and inefficient to pursue large cross-border transactions without an accepted region-wide foundation of accepted technical rules and transmission pricing agreements. Power pools are the logical vehicle for developing these rules and agreements that increase certainty and reduce transaction costs.

Bilateral agreements in the Greater Mekong provide compensation to the buyer for failing to meet certain plant performance standards on registered capacity, minimum capacity, reactive power, and loading rates. The provisions help to manage security of supply risks by providing strong incentives to provide contracted power at the point of delivery.

These lessons are certainly relevant to Southern Africa. SAPP has focused much of its attention in recently years on developing operating procedures for short-term trading, which have limited prospects for being used given the current shortage of supply capacity in the region. SAPP needs to focus on new large regional generation sources for future trading.

### **A strong, enforceable commitment would help move towards a centralised regional trading system**

The Governments of the GMS Member States have not signed and ratified a Treaty or made any sort of binding commitment specifically to implement the regional electricity market. The Governments of the GMS first documented the intention to develop the necessary institutions and infrastructure to support regional electricity trading in 1998. Since then, they have affirmed this intention in various documents that they have signed and the RPTCC has commissioned a number of studies on the benefits and logistics of power trading, but have been relatively slow in moving towards the centralised regional trading system envisioned in the first MOU.



The development of specific binding government commitments might help the Governments to come to agreements on detailed issues such as expansion planning, ancillary services, and market rules. One reason for this is that, whether independent of direct government control or not, regulators and utilities will usually try to make decisions that are consistent with what they perceive to be government policy in their own countries.

Another potential reason for the slow progress towards a centralised regional trading system is that there are no regional decision-making entities. In the absence of a strong decision-making entity, it is very difficult for the GMS Governments to create infrastructure, institutions, and rules necessary for the development of a centralised regional trading system.

A stronger decision-making institution might help the Governments complete the four stages of regional electricity market development that they agreed to in the first MOU. This is because the region's cultures tend towards decision-making by consensus. Without a decision-making institution, the inability to reach consensus on an issue may lead to inaction.

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